

The effectiveness and cost-effectiveness of remotely monitored assistive technology in community-dwelling older people

An evidence review



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List of abbreviations

Abbreviation	Explanation
AF	atrial fibrillation
AP	assistive products
AT	assistive technology
BP	blood pressure
CENTRAL	Cochrane Central Register of Controlled Trials
CHEC	Consensus Health Economic Criteria
CI	confidence interval
CINAHL	Cumulative Index to Nursing and Allied Health Literature
CNV	choroidal neovascularisation
CNV1	choroidal neovascularisation in a single eye
COPD	chronic obstructive pulmonary disease
ECG	electrocardiogram
ED	emergency department
EUR	euro
GP	general practitioner
GRADE	Grading of Recommendations Assessment, Development, and Evaluation
HBTec-TS	home-based technologies coupled with tele-assistance service
HRB	Health Research Board
HTM	home telemonitoring
ICER	incremental cost-effectiveness ratio
iECG	intracardiac electrocardiogram
interRAI	international Resident Assessment Instrument
ISO	International Organization for Standardization
IV	inverse variance
MeSH	Medical Subject Headings
N/A	not applicable
NOK	Norwegian kroner
NRSI	non-randomised study of interventions
NYHA	New York Heart Association
OECD	Organisation for Economic Co-operation and Development
OR	odds ratio
PRESS	Peer Review of Electronic Search Strategies
PPPY	per person per year
PRISMA	Preferred Reporting Items for Systematic reviews and Meta-Analyses
SCAD	suivi clinique à domicile (home-based clinical follow-up)
SD	standard deviation
SWiM	Synthesis Without Meta-analysis
QALY	quality-adjusted life year
RCT	randomised controlled trial
REML	restricted maximum likelihood
RoB 2	Risk of Bias 2
ROBINS-I	Risk Of Bias In Non-Randomized Studies - of Interventions
robvis	Risk-Of-Bias VISualization
RPM	remote patient monitoring
SMD	standardised mean difference
TIDieR	Template for Intervention Description and Replication

Abbreviation	Explanation
UK	United Kingdom
USA	United States of America
USD	United States dollar
WHO	World Health Organization
WTP	willingness to pay

Glossary of terms

Term	Explanation
absolute effect	The actual difference in risk between two groups, which is often expressed as how many more (or less) events there are due to an intervention, usually expressed as a ratio per 100 or 1,000 people. Absolute effects are more informative than relative effects as they take baseline risk into account.
assistive product	Any external product (including devices, equipment, instruments, or software), especially produced or generally available, the primary purpose of which is to maintain or improve an individual's functioning and independence.
assistive technology	An umbrella term for assistive products and their related systems. Assistive technology enables and promotes the inclusion, participation, and engagement of persons with disabilities, ageing populations, and people living with chronic conditions.
atrial fibrillation	An irregular, often rapid heart rhythm, which can be asymptomatic or can cause one to feel general heart palpitations, lightheaded, short of breath, or more easily tired. When the heart's rhythm is irregular, this can lead to blood clots and, potentially, stroke.
bias	Bias is a systematic overestimation or underestimation of an association in research. There are many types of bias, such as selection, recall, observer, and interviewer bias. Bias is minimised through good study design and implementation.
blood pressure (systolic and diastolic)	The force of blood pushing against the walls of the arteries in the heart as blood is pumped throughout the body. There is systolic and diastolic blood pressure, which are commonly presented as a ratio, with systolic blood pressure on top. Systolic blood pressure is the force when the heart beats and diastolic blood pressure is the force when the heart rests between beats.
CHA ₂ DS ₂ -VASc score	A clinical tool that doctors use in order to estimate a person's stroke risk in those with atrial fibrillation. Each letter represents a risk factor and has one or more points assigned, which accumulate to indicate a greater risk of stroke. The CHA₂DS₂-VASc score is also used to guide decisions about blood-thinning (anticoagulant) treatment. The letters stand for the following risk factors: • C – congestive heart failure (1 point) • H – hypertension (1 point) • A₂ – age ≥75 years (2 points) • D – diabetes mellitus (1 point) • S₂ – prior stroke or transient ischaemic attack or thromboembolism (2 points) • V – vascular disease (e.g. previous heart attack, peripheral artery disease) (1 point) • A – age 65–74 years (1 point) • Sc – sex category: female sex (1 point)
choroidal neovascularisation (CNV)	The growth of abnormal blood vessels from the choroid (the layer of tissue beneath the retina in the eye) into the retina. These new blood vessels can leak fluid or blood, distorting and damaging vision. CNV levels 1–3 describe different patterns or stages of severity of this abnormal vessel growth. CNV is commonly associated with neovascular (wet) age-related macular degeneration, which is a leading cause of vision loss for older adults.
chronic obstructive pulmonary disease	A chronic condition that affects the lungs, making it difficult to breathe due to lung tissue damage and narrowed airways. Symptoms can include trouble breathing, a cough, wheezing,

Term	Explanation
	lack of energy, chest tightness or heaviness, frequent lung infections, unintended weight loss, and swelling in the ankles, feet, or legs.
cohort study	A cohort study is a form of longitudinal (analytic observational) epidemiological study in which a group of subjects, called a cohort, is followed over a period of time, and data relating to predetermined exposures and outcomes are collected on two or more occasions over this time period. The incidence (new cases) of the outcome(s) of interest is calculated in the exposed people and compared with the incidence in the non-exposed people. The data for the cohort can be collected either by following the participants into the future (a prospective study) or by asking them about their past (a retrospective study). Cohort studies contribute to causality or disease aetiology and provide, at best, moderate-quality evidence for intervention studies.
community-dwelling older adult	An older adult who lives independently or with others (e.g. family member(s) or friend(s)) in a private residence within the community, rather than in a long-term care facility such as a supportive or assisted living facility or nursing home.
confidence interval	A confidence interval is the range of values (for example, proportions) in which the true value is likely to be found with a degree of certainty (by convention, a 95% degree); that is, the range of values will include the true value 95% of the time.
confounding	Confounding is when a factor has an association with the exposure and can independently cause the outcome or disease. It can over- or underestimate an effect of interest or association. A confounding variable (also called a confounding factor or confounder) is a variable that has a relationship with both the exposure and the outcome variable. Confounding is controlled for by restricting the study population, matching the study population (for age, sex, geography, and/or socioeconomic factors), randomly selecting the study population, undertaking a stratification in the analysis (for example, by age, sex, geography, and/or socioeconomic factors), and performing regression analysis.
continuous outcome	A measured result that is a numerical value within a given range or scale; for example, weight or test scores.
cost-benefit analysis	A form of economic evaluation that evaluates two or more alternatives where both the costs and outcomes are expressed in monetary terms. It should include the preferences of those affected (i.e. one's willingness to pay).
cost-benefit ratio	A metric that compares the expected benefits of an intervention to its costs in order to evaluate whether it is worth investing in the intervention. A ratio of greater than 1 indicates that the benefits outweigh the costs.
cost-consequence analysis	A form of comparative economic evaluation that evaluates two or more alternatives in terms of their relative costs and outcomes, where the outcomes are not summarised in a single measure, and multiple outcomes of interest are reported.
cost-effectiveness analysis	A form of economic evaluation that compares two or more alternatives in terms of their relative costs and outcomes. Outcomes are a single unit (e.g. life years gained).
cost-minimisation analysis	A form of economic evaluation that compares the cost of two equally clinically effective interventions in order to determine which one is less expensive.
cost-utility analysis	A specific type of cost-effectiveness economic evaluation that compares the costs of an intervention with its health benefits and considers both mortality and morbidity (e.g. quality-adjusted life years). The results can help better allocate resources in order to get the best value for money.
dichotomous outcome	A binary variable with only two values to choose from; for example, yes or no.
discounting	A common practice in economic evaluations that weights future gains and losses less heavily than those that occur in the present.

Term	Explanation
dominant strategy	The superior course of action in health economics that is the most effective and efficient use of resources.
e-GEROPASS	The e-GEROPASS is an algorithm-based software that analyses the data for baseline data and then out-of-range data, which then get transmitted to the monitoring platform and external biometric sensors that transmit data to a control centre.
economic evaluation	A type of health economic analysis which compares two or more interventions, programmes, or policies and examines both their costs (use of resources) and their consequences (outcomes) to determine which option provides the best value for available resources. A full economic evaluation compares the costs and consequences of the health intervention(s) in question to an alternative course of action, known as the comparator. A partial economic evaluation reports the costs and/or outcomes of an intervention without formally comparing them with a relevant alternative. It does not assess the relative costs and consequences of competing options and therefore cannot establish cost-effectiveness.
effect estimate	A statistical measurement or value that quantifies the magnitude and direction of the impact of an intervention, treatment, or outcome.
electrocardiogram (ECG)	A test used to check one's heart rhythm and electrical activity.
heart failure	A condition in which the heart's ability to pump is impaired, often resulting in breathlessness, tiredness, or swelling in the legs or ankles. Chronic heart failure persists over time and can fluctuate between periods of stability and flare-ups. Heart failure can also be congestive, leading to fluid accumulation in the lungs or peripheral tissues.
Grading of Recommendations Assessment, Development, and Evaluation (GRADE) certainty of evidence	GRADE is the most widely used approach for summarising the confidence in intervention effects by outcome across studies. It gives a certainty level of high, moderate, low, or very low confidence that indicates how confident we are that the observed effect is a good approximation of the true effect.
I^2	The approximate proportion of total variability in point estimates that can be attributed to heterogeneity rather than sampling error (chance). It is commonly classified as follows: • $I^2 = 0-40\%$: might not be important • $I^2 = 30-60\%$: may represent moderate heterogeneity • $I^2 = 50-90\%$: may represent substantial heterogeneity • $I^2 = 75-100\%$: represents considerable heterogeneity.
incremental cost-effectiveness ratio (ICER)	The difference in the cost between two interventions or therapies divided by the health or the quality-adjusted life years gained. This ratio gives the cost per additional quality-adjusted life year.
inferential statistics	Statistics used in order to make conclusions, predictions, or inferences about a population. Inferential statistics assume that the dataset is a sample of a larger population and use a variety of different statistical tests in order to test hypotheses and compare groups. Generally, they will provide an estimate of the size of an effect and some measure of uncertainty.
long-term care	Residential facilities, such as supportive or assisted living facilities, or nursing homes, that provide a range of supports and services to the older people who require assistance with activities of daily living and live in these facilities on a long-term basis.

Term	Explanation
mean difference	The mean difference (or difference in means) is a standard statistic that measures the absolute difference between the mean value in two groups in an epidemiological study. It estimates the amount by which the exposure or intervention changes the outcome on average compared with the control.
n-of-1 trial	A study design where a single participant ($n=1$) undergoes multiple treatments to evaluate the effectiveness of the intervention tailored to that individual, rather than a larger population. Participants are often randomised to treatments and blinded. A crossover design is often used within n-of-1 trials where the participant alternates between different treatments, often with a washout period between the intervention options to prevent carryover effects.
non-randomised study of interventions (NRSI)	A quantitative study that estimates the effectiveness of an intervention (harm or benefit) that does not use randomisation to allocate units (individuals or clusters of individuals) to intervention groups. Allocation to groups often occurs during usual treatment decisions or according to people's choices (i.e. studies often called observational).
New York Heart Association (NYHA) classification system	A widely used classification system that is used by healthcare professionals in order to assess the severity of heart failure. The NYHA classification system includes four classes: • Class I: No limitations on physical activity. The patient does not experience undue fatigue, palpitations, or shortness of breath with exercise. • Class II: Some limitations on physical activity. Ordinary physical activity results in fatigue, heart palpitations, shortness of breath, or chest pain. • Class III: Significant limitations on physical activity. The patient is comfortable at rest but develops symptoms with light activities (that most people could otherwise do easily). • Class IV: Symptomatic at rest. Any physical activity causes more discomfort.
observed effect	The measured effect estimate from a study or a group of studies (within a meta-analysis), which may deviate from the true effect due to things such as bias, small sample sizes or imprecision, or study populations that are not fully representative of the population of interest.
odds ratio (OR)	An odds ratio (OR) is a statistic that measures the strength of association between two events by comparing the odds of an outcome occurring in one group with the odds of it occurring in the other. It is calculated as the ratio of the odds of event A in the presence of B to the odds of event A in the absence of B.
P waves	A P wave represents the electrical activity of the atria in the heart, which leads to their contraction.
payer perspective	In economic evaluation studies, the viewpoint of those who finance healthcare services and interventions, such as governments, insurance companies, or employers. All payers desire value for money and optimal resource allocation. See perspective.
perspective	In economic evaluation studies, a perspective is the viewpoint from which the analysis is being conducted. It determines whose costs, outcomes, and benefits are being considered.
quality-adjusted life year (QALY)	A measure of the quality and quantity (length) of life. In health economics, it is used in order to help assess the value of an intervention. A quality-adjusted life year can range from 0 to 1, where 0 is dead and 1 is perfect health.
randomised controlled trial (RCT)	An RCT is a study that aims to investigate the effects of an intervention and randomly assigns participants to one of at least two groups. The first group is the experimental group, which receives the intervention of interest, and the other group is the comparison or control group, which receives an alternative treatment (such as current conventional therapy or a placebo). The two groups are then followed up on in order to see if there are any differences between

Term	Explanation
	them with respect to the outcome(s) of interest. RCTs are the most stringent study design for evaluating the effect of an intervention on an outcome.
relative effect	How an outcome differs in the intervention group compared proportionally with the control group. This is often expressed as a ratio (e.g. a relative risk ratio or an odds ratio), which reveals whether an outcome is more or less likely in the intervention group.
relative risk or risk ratio	The relative risk or risk ratio is the ratio of the probability of an outcome in an exposed (or intervention) group relative to the probability of the outcome in an unexposed (or control) group, and it compares the incidence of the outcome in the exposed group with the incidence of the outcome in the unexposed group.
RCT – parallel design	A type of RCT where the participants are randomly allocated to one of two treatment groups and all the participants in each group only receive one treatment for the entirety of the study. The researcher then measures and compares the outcomes in the two groups at the end of the study.
RCT – cluster design	A type of RCT where the unit of randomisation is at the group level, rather than at the individual participant level. This study design is often used in order to evaluate a new standard of care, guideline, or other practice-, hospital-, or system-wide change that can affect patient outcomes. Cluster RCTs are helpful when there is a high risk of contamination, such as when members of the group that was not randomised to treatment could learn about and adopt parts of the intervention (e.g. in school or care home settings).
remote patient monitoring (RPM)	The collection and transmission of personal health data from patients to healthcare providers, allowing for continuous or periodic monitoring of an individual's health status without the individual having to visit a healthcare facility. Electronic remote or telemonitoring can involve assistive products and/or mobile devices and can include both physiologic and non-physiologic data (pain levels, therapy adherence, etc.).
remotely monitored assistive technology	The transmission and collection of personal physiologic health data (blood pressure, weight, etc.) from patients by healthcare providers using one or more assistive products and their related systems. Data received by healthcare providers are continuously or periodically monitored.
Risk-Of-Bias VISualization	A web-based application tool to assist with visualising risk of bias assessments as part of a systematic review.
societal perspective	In economic evaluation studies, a societal perspective considers relevant costs and consequences of healthcare services and interventions, including those borne by healthcare systems, patients, caregivers, employers, and the wider community. See perspective.
standard deviation	The standard deviation is a summary measure of the differences of each observation from the mean within a normal distribution. It measures the amount of variation or dispersion within a set of normally distributed values. A low standard deviation indicates that the values tend to be close to the mean of the set of values, while a high standard deviation indicates that the values are spread out over a wider range. For a normal distribution, around 68.0% of scores are within 1 standard deviation of the mean; around 95.0% of scores are within 2 standard deviations of the mean; and around 99.7% of scores are within 3 standard deviations of the mean.
time horizon	The time period over which the costs and effects of an intervention and comparator are calculated in economic evaluation studies.
true effect	The actual ideal (unobservable) effect of an intervention that we aim to estimate. This underlying effect is free from bias, random error, and confounding.
usual care	The standard treatment that a study participant would be expected to receive in the ordinary course of normal practice. An experimental study may compare outcomes between an

Term	Explanation
	experimental group, which receives the intervention of interest, and a usual care group, which receives the standard care that would be provided if no experiment were being undertaken.

Executive summary

Context

The population of those aged 65 years and over is expected to double by 2050, surpassing 1.6 billion globally. Ireland has one of the fastest ageing populations in the European Union. This demographic change is likely to result in an increased demand for care in hospitals and residential care facilities. Current Government policy aims to support older people to live at home and in their own communities with dignity and independence for as long as possible. Assistive technology (AT), particularly with remote patient monitoring (RPM) capabilities, has the potential to enable and enhance the delivery of home support by reducing carer and healthcare provider workloads and costs by optimising the flow of health information to healthcare providers, tracking and identifying existing and new health issues, and detecting emergency situations (like falls) and subsequently alerting family carers or emergency services. In the recent *Department of Health Statement of Strategy 2025–2028*, greater use of remote health monitoring and virtual care is noted as a key focus to progress the implementation of *Digital for Care: A Digital Health Framework for Ireland 2024–2030*. Investigating remotely monitored AT and its impact on healthcare utilisation is important in order to identify ways to improve the home care being delivered to older adults in Ireland in a cost-effective manner. The purpose of this review is to provide an evidence base on the effectiveness and cost-effectiveness of remotely monitored AT for older community-dwelling adults in Organisation for Economic Co-operation and Development (OECD) member countries.

Review questions

The review questions were as follows:

1. Is remotely monitored AT for older community-dwelling adults (65 years of age and over) in OECD member countries effective in improving healthcare utilisation and provision?
2. Is remotely monitored AT cost-effective for community-dwelling older adults (65 years of age and over) in OECD member countries?

Methods

This evidence review comprises a systematic review of primary quantitative studies and full economic evaluations in order to synthesise the evidence on the effectiveness and cost-effectiveness of remotely monitored AT for older community-dwelling adults (aged 65 years of age and over) in OECD member countries. It adhered to the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) Statement and the Synthesis Without Meta-analysis (SWiM) guidelines.

Identifying and screening research evidence

In order to identify information for this review, we conducted comprehensive searches of relevant bibliographic databases, clinical trial registries, and grey literature sources. We conducted one structured systematic database search in order to answer the first research question on the effectiveness of remotely monitored AT on healthcare utilisation and provision. We used a separate structured systematic database search in order to answer the second research question on cost-effectiveness. We also identified grey literature resources for both research questions and conducted supplemental searches for systematic reviews and reference-chased relevant reviews. After full-text screening from both searches, we conducted forward and backward citation screening of our included studies. We performed an updated search in January 2026 in order to ensure that the most up-to-date evidence could be included.

Two reviewers independently conducted title and abstract screening and full-text double-screening in EPPI-Reviewer Web. Over half of the primary search results for our first research question were double-screened and we used EPPI-Reviewer's priority screening function to inform our decision to switch to single screening. Double-screening was undertaken for all other titles and abstracts and all full-text screening items. Disagreements in double-screening were resolved by discussion or referral to a third reviewer where necessary.

Data extraction

One reviewer extracted data from each included study using a bespoke piloted data extraction form, and another reviewer validated the extracted data for accuracy and comprehensiveness. Disagreements were resolved through discussion with or referral to a third reviewer, where necessary. Data extracted included publication, study, and intervention details; measures of effect; confounding variables; and other relevant information.

Critical appraisal and certainty assessment

One reviewer conducted risk of bias and methodological quality assessments, and another reviewer validated the assessments. Disagreements were resolved through discussion or referral to a third reviewer where necessary. We assessed the risk of bias or methodological quality of each study using relevant standards: the Risk Of Bias In Non-Randomized Studies - of Interventions (ROBINS-I) tool for non-randomised studies of interventions (NRSIs), the Cochrane Risk of Bias 2 (RoB 2) tool for randomised controlled trials (RCTs), the Philips checklist for economic modelling studies, and the Consensus Health Economic Criteria (CHEC) list for the trial-based economic evaluation. Following this, we assessed the certainty of evidence for each healthcare utilisation outcome for the effectiveness studies using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) system, and scored it as high, moderate, low, or very low. There is no equivalent assessment of quality for the cost-effectiveness studies.

Synthesis

We documented descriptive data on study characteristics in tables and presented results by outcome and health condition. For our first research question, we have organised the findings according to broader-level groupings of healthcare utilisation outcomes: emergency department (ED) visits; hospitalisations (including length of stay); admissions to long-term care; outpatient visits (including primary care visits, specialist visits, same-day surgery days, and urgent care visits); days at home and home care episodes; access to diagnosis; and other assorted healthcare utilisation outcomes. For each outcome grouping, we completed an assessment of the feasibility of meta-analysis, a Health Research Board Evidence Centre step informed by feasibility assessments in network meta-analyses. We found that it was appropriate to proceed with meta-analysis for two outcome groupings: ED visits and hospitalisations. For the second research question on cost-effectiveness, we did not pool data for meta-analysis due to the heterogeneity of study designs and populations. Outcomes which could not be meta-analysed, were presented using narrative synthesis.

Findings

After deduplication, screening of titles and abstracts and full texts, and citation chasing, we included 25 studies, of which 20 reported on effectiveness outcomes and 5 reported on cost-effectiveness outcomes.

Healthcare utilisation

Healthcare utilisation or effectiveness outcomes were reported for 7 major outcome groupings related to healthcare utilisation and provision (listed as subheadings in this section) across 21 papers covering 20 studies. Fourteen studies were RCTs (70%) and 6 were NRSIs (30%). The studies covered several different clinical conditions or healthcare populations, including: six on heart failure (chronic, congestive, and general heart failure) (30%); one on heart failure or chronic obstructive pulmonary disease (COPD) (5%); one on COPD (5%); four on hypertension (20%); two on those at risk of stroke (10%); one on those at risk of atrial fibrillation (AF) (5%); one on Alzheimer's disease (5%); one on those with chronic disease (5%); one on older adults who are frail (5%); and two on general older adults (10%). Nine studies (45%) were based in the United States of America (USA), 4 were based in France (20%), 2 were based in the United Kingdom (UK) (10%), 2 were based in Italy (10%), 1 was based in Canada (5%), 1 was based in Germany (5%), and 1 was based in Australia (5%).

ED visits

Ten studies (50%) assessed 11 outcomes related to ED utilisation. Nine studies were RCTs and included 10 outcomes, while 1 study was an NRSI and included 1 outcome. Data from four RCTs that reported on the effects of remotely monitored AT on ED visits as a dichotomous outcome (at least one ED visit versus no ED visits) were pooled together. The meta-analysis suggested that there was no difference between the remotely monitored AT intervention group and the usual or enhanced usual care groups in terms of having at least one ED visit. However, there was high heterogeneity between studies. Data from three RCTs that reported the average number of ED visits were pooled together. The meta-analysis suggested that there was no statistically significant difference between the remotely monitored AT intervention group and the usual or enhanced usual care groups in relation to the average number of ED visits. However, there was moderate heterogeneity between studies.

Four studies could not be pooled into our meta-analysis, three RCTs and one NRSI. One RCT provided very low certainty evidence that remotely monitored AT may reduce post-fall admission to ED when compared to the usual care group. The other three studies reported no statistically significant differences between the remotely monitored AT groups and the usual care groups in ED visits. Across the 10 studies reporting outcome data for ED visits, the certainty of the evidence was very low.

Hospitalisations

Twelve studies (60%) assessed 24 outcomes related to hospitalisations. Ten studies were RCTs and included 22 outcomes, while 2 studies were NRSIs and included 3 outcomes. Only one RCT reported that remotely monitored AT may reduce the hazard of being hospitalised for acute coronary syndrome when compared with the usual care group, but it also did not report outcome data for hospital admissions for venous thromboembolism. The rest of the studies reporting hospitalisation outcome data found no significant differences between groups.

Three RCTs that reported on having at least one hospital admission were pooled together. The meta-analysis suggested that there was no statistically significant difference in having at least one hospital admission between the remotely monitored AT group and the usual or enhanced usual care groups. There was moderate heterogeneity between studies. Three RCTs that reported on the mean number of hospitalisations were pooled together. The meta-analysis suggested that there was no difference in having at least one hospital admission between the remotely monitored AT group and the usual or enhanced usual care groups. There was negligible heterogeneity between studies. The certainty of the evidence was very low for this outcome.

Only one RCT found a statistically significant difference in the days of hospitalisation when comparing a remotely monitored AT group with a usual care group, although this same study also found no difference in the average length of stay. Another RCT reported a difference between groups in the average length of

stay, with 9.7 days in the remotely monitored AT group versus 6.9 days in the enhanced usual care group, but no *p*-value was reported, so it is not known if this difference is statistically significant. The rest of the studies found no statistically significant difference between remotely monitored AT groups and usual care groups. Two studies did not report outcome data on the number of hospital days due to all causes and the number of days of hospitalisation.

Admissions to long-term care

Two studies (10%) assessed three outcomes related to admissions to long-term care. One study was an RCT and included one outcome on admissions to long-term care facilities, while the other study was an NRSI and included two outcomes related to the number of days in long-term care. Both studies indicated that remotely monitored AT may have little to no effect on admissions to or days in long-term care. Time points of assessment ranged from 100 days to 12 months. The certainty of the evidence for all outcomes was very low.

Outpatient visits

Four studies (20%) assessed seven outcomes related to outpatient visits, including primary care, specialist, same-day surgery days, and urgent care visits. Three studies were RCTs, while one study was an NRSI. Across the four studies reporting outcome data on outpatient visits, the certainty of evidence was low or very low. The evidence from two RCTs was very uncertain about the effect of remotely monitored AT on primary care visits and on patients having at least one general practitioner (GP) visit. However, one NRSI found that remotely monitored AT probably reduces the number of primary care visits slightly. One RCT found that remotely monitored AT results in a slight increase in urgent care visits. The evidence is uncertain about the effect of remotely monitored AT on same-day surgery days and the number of physician office visits. Two additional RCTs described outcomes related to outpatient visits but did not provide outcome data that could be used.

Days at home and home care episodes

Three studies (15%) assessed three outcomes related to days at home and home care episodes. Days at home are representative of lower costs (and potentially indicative of a better health status) as opposed to days spent in hospital, long-term care, or other care settings while home care episodes represent the number of times a provider gave care in the home during the study period. Two studies were RCTs and included two outcomes on episodes of home care and days to readmission, while the third study was an NRSI and included one outcome on days at home. The certainty of the evidence was very low for the RCT outcomes, episodes of home care and days to readmission, and moderate for the days at home outcome from the NRSI. The results of the two RCTs indicated that the evidence is very uncertain regarding the effect of remotely monitored AT on days to readmission and on episodes of home care. One RCT did not report outcome data on home care visits. The one NRSI comparing remotely monitored AT with a usual home care group provided moderate-certainty evidence indicating that remotely monitored AT probably slightly increases days at home.

Access to diagnosis

Two studies (10%) assessed two outcomes related to time to diagnosis of AF, one outcome on time to diagnosis of AF (at 12 months), and one outcome of a new diagnosis of AF (at 6 months). Both studies were RCTs. The two studies found that remotely monitored AT may increase access to diagnosis (by reducing time to diagnosis) when compared with the usual care group, but the certainty of evidence was very low.

Other assorted healthcare utilisation outcomes

Four studies (20%) assessed six outcomes related to other assorted healthcare utilisation outcomes that were not captured in the other healthcare utilisation outcome groupings. Two studies were RCTs, and two

were NRSIs. One RCT reported on anticoagulant therapy and the other reported a composite outcome on overall healthcare utilisation. One NRSI reported on medical emergency contacts and the other reported on three outcomes in relation to rehabilitation days, mental health inpatient days, and alternate level of care days. Across the four studies reporting on six outcomes related to other assorted healthcare utilisation outcomes, the certainty of evidence is very low. The evidence is very uncertain about the effect of remotely monitored AT on anticoagulant therapy prescriptions, overall healthcare utilisation, rehabilitation days, inpatient mental health days, alternate level of care days, and number of medical emergency contacts. Five other studies (four NRSIs and one RCT) did not provide outcome data or outcome data that we could use, as the relevant outcomes were not reported for those who initiated remote monitoring compared with the control group.

Cost-effectiveness

We identified five papers that assessed the cost-effectiveness of remotely monitored AT for older community-dwelling adults in four OECD member countries (Canada, the Netherlands, Norway, and the USA). Three were cost-utility studies, one was a cost-consequence study, and one contained both a cost-utility and cost-benefit analysis. Two were from societal perspectives, one was from a Dutch third-party payer perspective, one was from a Canadian payer perspective, and one was from both a USA federal payer perspective and a societal perspective. Two studies focused on those with (chronic) heart failure, one study focused on older adults with mild to severe impairment, one focused on older adults (aged 80 years and over) with hypertension, and one focused on those at high risk of choroidal neovascularisation (CNV) i.e. the growth of abnormal blood vessels from the choroid (the layer of tissue beneath the retina in the eye) into the retina.

The studies were generally well conducted, with clear decision problems, model structure, options under evaluation, and incorporation of utilities (where appropriate). However, we identified some concerns with regard to a lack of clear reporting about the primary decision-maker, the assessment of data quality, and the choice of data sources, particularly for important parameters in the model. There were also some concerns about not addressing uncertainty, not clearly justifying and defining cycle length in relation to the natural history of disease, and not framing or comparing model results with other relevant work. These limitations may therefore affect the conclusions of the studies regarding cost-effectiveness.

One study projected increased quality-adjusted life years (QALYs) in nursing telephone support for most patients (New York Heart Association (NYHA) heart failure classes I–III) and lower costs (i.e. the dominant choice). Only in the most severe cases (NYHA heart failure class IV) was telemonitoring a potentially cost-effective choice. Another study projected that a home-based visual-field monitoring system was more cost-effective for high-risk patients compared with low-risk patients. Otherwise, the majority of the cost-effectiveness studies demonstrated an impact, with models focused on remotely monitored AT projecting better cost-benefit ratios or cost-savings (i.e. lower treatment costs and equal effectiveness), although the benefits sometimes varied across levels of risk.

A Norwegian cost-consequence study, from a societal perspective, projected that smart home technology for older adults was cost-saving compared with older adults living at home without smart home technology, with cost-savings increasing with greater functional impairment severity. When compared with older adults living in a nursing home, smart home technology at home was still projected to be cost-saving, but the savings decreased with greater functional impairment severity.

A Dutch cost-utility study, from a societal perspective, projected that a home telemonitoring (HTM) system with a diagnostic algorithm for older adults with heart failure improved QALYs compared with

HTM only or enhanced usual care, but the HTM system with a diagnostic algorithm cost more than the HTM only or enhanced usual care options, at 34,368 euro (EUR) for each QALY gained.

A cost-utility study, from a third-party payer perspective in the Netherlands, projected that a HTM system had higher QALYs but cost more compared with usual care, costing EUR 12,479 for each QALY gained. However, nursing telephone support projected higher QALYs gained for most patients (NYHA heart failure classes I–III) and lower costs (i.e. the dominant choice) when compared to HTM. Only in the most severe cases (NYHA heart failure class IV) were higher QALYs projected for HTM compared with nursing telephone support, with HTM costing EUR 44,040 for each QALY gained.

A cost-benefit and cost-utility study, from both a USA federal payer perspective and a societal perspective, projected that a home-based visual-field monitoring system for older adults at high risk of CNV had higher QALYs and lower cost (i.e. was dominant) compared with usual care for patients who were at high risk of progressing to CNV in both eyes. The cost-effectiveness of the home-based visual-field monitoring system was projected to decrease for patients at lower risk.

One cost-utility analysis, from a Canadian payer perspective, compared three screening durations (7 days, 30 days, and 60 days) with no remotely monitored AT screening in older adults (aged 80 years and over) with hypertension. Seven-day screening was projected to be cost-effective at a willingness to pay (WTP) threshold of USD 50,000 whereas thirty- and sixty- day screening were not cost-effective at that WTP threshold. Higher QALYS and costs were reported for all screening options compared with no screening.

Conclusions

This evidence review identified 20 studies assessing the impact of remotely monitored AT on healthcare utilisation for older community-dwelling adults, and 5 full economic evaluations examining cost-effectiveness in OECD member countries. In relation to healthcare utilisation outcomes, most outcomes were graded as very low certainty, meaning that our confidence in the findings is limited in terms of the effect of remotely monitored AT on ED visits; hospitalisations and length of stay; admissions to long-term care; outpatient visits; days at home and home care episodes; and access to diagnosis. One outcome demonstrated low-certainty evidence, that remotely monitored AT results in an increase in urgent care visits (incidence rate ratio: 1.6). Two outcomes, days at home and primary care encounters, demonstrated moderate-certainty evidence that remotely monitored AT results in a small increase in the number of days at home (mean difference: 3.4 more days at home) and fewer primary care encounters (mean difference: 0.4 fewer visits) among a general population of older adults. We found no studies which included formal (i.e. home support worker or healthcare professional) caregiver outcomes such as hours of care delivered or measures of efficiency or productivity. The diversity in healthcare populations, products studied, monitoring processes, and follow-up durations, combined with methodological limitations and small sample sizes, all likely contributed to the lack of observed effects and low certainty ratings.

In relation to cost-effectiveness outcomes, generalisability and certainty for the cost-effectiveness evidence was limited in the remotely monitored AT packages that were studied, with differences in healthcare systems, perspectives, and modelling assumptions. Additionally, no Irish studies were identified, limiting applicability within the Irish context. However, the majority of the cost-effectiveness studies demonstrated an impact, with models focused on remotely monitored AT projecting better cost-benefit ratios or cost-savings (i.e. lower treatment costs and equal effectiveness), although the benefits sometimes varied across levels of risk.

Although our review was comprehensive, it also highlighted a weak evidence base, research gaps, and challenges in the evaluation of complex personalised AT for remote patient monitoring. Given the global

demographic shift, there is a need for more robust research into community-dwelling older adults that more clearly describes intervention components and explores varying monitoring intensities for longer periods of time. The expansion of this evidence base, paired with explorations into acceptability, experience, and clinical outcomes, will help better integrate remotely monitored AT into the lives of older adults.

1 Introduction

1.1 Background

By 2050, the population of those aged 65 years and over is expected to double, surpassing 1.6 billion globally [1]. Ireland has one of the fastest ageing populations in the European Union, with the population of those aged 65 years and over expected to double by 2051 [2]. This demographic shift is likely to result in an increased demand for care in hospitals and residential care facilities. Ireland's governmental policy to support older people to live at home with dignity and independence for as long as possible supports the individual preference to age in place and can be more financially viable from a societal perspective [3,4].

Home care packages were introduced in Ireland in 2006 in order to support older people to remain living at home for as long as possible by providing assistance with daily activities such as mobility, personal care, and dressing. They have since been combined with home help services to form Home Support Services, an important pillar in the healthcare system [5]. Home care packages focus on personal care, home care, and therapies (e.g. physiotherapy), with remote health monitoring not being a part of the standard package of provision. According to projections of national demand for older people's care in Ireland, home support hour requirements are projected to increase from 28.7 million hours in 2022 to between 44.9 million and 54.9 million hours by 2040 [6].

The Department of Health is collaborating with the Health Service Executive to reform the home support model of service in order to help meet this increased need. Reforms to date have included: establishing a National Home Support Office [7], rolling out the international Resident Assessment Instrument (interRAI) standard assessment tool [8], developing a new home support information technology system [9], developing a national framework for digital health [10], and regulating home support providers [11,12]. The *Path to Universal Healthcare: Sláintecare & Programme for Government 2025+* also outlines the role of home support providers and carers in supporting older people to live in their own home for as long as possible. It pledges additional supports for family carers and more home support hours, including complex home support and intensive individually tailored enhanced usual care, which is often provided to individuals with more significant medical, cognitive, or functional needs [9].

Assistive technology (AT) offers an opportunity to deliver home support in a more efficient manner by reducing carer and healthcare provider workloads and costs, such as those that result from recurrent hospital admissions, or state benefits [13–16]. The World Health Organization (WHO) describes AT as “an umbrella term for assistive products and their related systems...which enable and promote the inclusion, participation and engagement of persons with disabilities, ageing populations and people living with chronic conditions” [16 p11]. AT has the potential for broad healthcare system-level impacts, as it includes such a wide range of technological supports for a variety of different conditions across the lifespan [16]. There are hundreds of assistive products (AP) classified by the International Organization for Standardization (ISO) encompassing devices, equipment, software, and other technologies which are designed to optimise a person's functioning and reduce disability [17]. For the purposes of this report, the terms AT and AP will be used as they are defined above, while specific products will be referred to by name, regardless of the language used. The Home and Supports Hub, a Government initiative developed

as part of the *National Housing Strategy for Disabled People 2022 – 2027*, provides a list of AP that is currently available through the Health Service Executive and includes mobility aids, communication devices, computer access technology, hearing aids, visual aids, and aids for daily living [18].

The broad definition of AT has resulted in a lack of structured research, harmonised recommendations, and guidance, as it includes conventional technology (such as hearing and walking aids) as well as newer telemedicine applications, robotics, virtual reality, and sensors [19]. One could even argue that all technology is ‘assistive’, as it helps individuals function and manage their environments [20]. Given the extensive variety and evolving nature of AT, the WHO recommends investment in research and innovation in the AT sector in order to promote and ensure that technological advances can reach and meet the needs of ageing populations [16].

While there have been innovations in physical products or adaptations to physical environments, the arena of digital AT has seen the most change. Since roughly 2000, AT as a research field has witnessed a nearly tenfold increase in publications [21], largely influenced by the rise in digital assistive products such as telemonitoring systems, ambient/active assisted living robots, GPS-based monitoring, smart home technology, and smartphone applications [22]. The use of electronic information and telecommunication technologies offers new opportunities for telehealth by allowing for the remote monitoring (telemonitoring) of vital signs, activity levels (like sleep and physical movement), and location [23]. These opportunities are especially relevant for the home healthcare sector, as older people may have disabilities, be isolated, or have transportation difficulties in accessing traditional in-person care.

Remote patient monitoring (RPM) can promote ageing in place by aiding patients with automating health management and activities of daily living, optimising the flow of information to healthcare providers [24], tracking and identifying existing and new health issues, and detecting emergency situations (like falls) and alerting family carers or emergency services [25]. Some public health insurance providers, such as Medicaid in the United States of America (USA), reimburse products such as location tracking, activity-monitoring sensors, and remote physiologic monitoring [26,27]. The European Parliamentary Research Service has also recommended that European Union member states integrate AT into health and social protection schemes [28]. In the *Department of Health Statement of Strategy 2025–2028*, greater use of remote health monitoring and virtual care is noted as a key focus to progress the implementation of *Digital for Care: A Digital Health Framework for Ireland 2024-2030* [3].

However, some have raised concerns about the evidence of clinical benefit for RPM, with positive results limited to primary care providers focused on hypertension or diabetes care management [29]. Existing reviews have largely focused on family carer burden [30,31] or individual-level clinical outcomes, such as quality of life, vital signs, mobility, and falls [30,32–34]. There has been little focus on healthcare utilisation impacts or service level outcomes that could guide policy decisions [35].

Furthermore, the cost benefits of AT are unclear, with limited economic evaluations [36]. Notably, in the Irish context, the Health Information and Quality Authority has reported a need to undertake an assessment of the effectiveness and cost-effectiveness of health technology in home care and support [23]. The economic case for AT needs to be strengthened by a thorough assessment of the effectiveness of AT at the user, provider, and system levels [14]. Investigating the cost-effectiveness of remotely monitored ATs and their impact on healthcare utilisation is important in order to identify ways to improve the home care being delivered to older adults in Ireland in an economical manner.

1.2 Review questions

This systematic review addressed two research questions:

1. Is remotely monitored AT for older community-dwelling adults (65 years of age and over) in Organisation for Economic Co-operation and Development (OECD) member countries effective in improving healthcare utilisation and provision?
2. Is remotely monitored AT cost-effective for community-dwelling older adults (65 years of age and over) in OECD member countries?

2 Methods

2.1 Review design and context

This evidence review comprises a systematic review of remotely monitored AT interventions in older people as described in primary quantitative studies, and a systematic review of full economic evaluations of remotely monitored AT. This project protocol was registered on PROSPERO (CRD420251102238) [37] and written in accordance with the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) for protocols [38]. The evidence review is reported in accordance with the PRISMA Statement [39] (Appendix A) and the Synthesis Without Meta-analysis (SWiM) guidelines (Appendix B) [40]. This review was requested by national policymakers to inform current Government policy to support older people to live at home and in their own communities with dignity and independence for as long as possible. While these commissioners regularly engage interest holders and patients with lived experience [3], we did not include people with lived experience directly in this review design or process.

2.2 Eligibility criteria

For this systematic review, we used the population, intervention, comparator, outcomes, and study design (PICOS) structure to delineate our inclusion and exclusion criteria. An overview of the eligibility criteria for each research question is described in Sections 2.2.1 and 2.2.2. Across both research questions, there were no date or language restrictions. However, we only included studies that were conducted in at least 1 of the 38 member countries of the OECD [41]. We focused on OECD member countries to potentially enhance the generalisability or transferability of findings to the Irish context as this review was commissioned to inform national policy. Accordingly, we used the Irish Central Statistics Office's definition of an older adult being aged over 65 years [2] and we only included studies where the authors explicitly specified the eligibility criterion of being aged 65 years and over.

As we aimed to inform general home support in Ireland, we also focused only on older adults who are "community-dwelling" (i.e. older people who live independently or with family members or friends in a private residence within the community) and excluded studies focused on COVID-19 interventions as these were used under emergency circumstances which reorganised health services which could have affected some of our outcomes (e.g. waiting times to access care, admissions to long term facilities, etc.). We also required a clear statement to be given in study reports that described:

- the AT itself
- the transfer of data
- who has access to the data and how they are acted upon.

For the purposes of our review, we made the distinction between RPM and remote monitoring with AT and did not include studies where the transfer of data was only occurring via a mobile device. This rationale was so we could focus on assistive products and not on general RPM or mobile health (mhealth) which may use self-response questionnaires for monitoring patients with no physiologic data collected or which may help patients self-monitor health (e.g. by linking to a smart watch which tracks physical

activity). We defined remotely monitored AT as involving the transmission and collection of personal physiologic health data (blood pressure (BP), weight, etc.) from patients to healthcare providers using one or more assistive products and their related systems and where data received by healthcare providers are continuously or periodically monitored. We conceptualised healthcare utilisation as the consumption of healthcare services (including social care or long term care) and were guided by the OECD [42] and Agency for Healthcare Research and Quality's [43] operationalisations of healthcare utilisation data (e.g. consultations, waiting times, hospital aggregates, hospital average length of stay, ED visits, ambulatory surgery and service encounters). We included studies which additionally reported other clinical outcomes but we did not extract outcome data for these. For our second request question, we used conceptualisations and definitions of full economic evaluations as specified in Turner *et al.*'s review on economic evaluations [44].

2.2.1 Research question 1

Table 1 outlines the inclusion and exclusion criteria for selecting studies to answer research question 1: Is remotely monitored AT for older community-dwelling adults in OECD member countries effective in improving healthcare utilisation and provision?

Table 1: Eligibility criteria for research question 1: Is remotely monitored AT for older community-dwelling adults in OECD member countries effective in improving healthcare utilisation and provision?

Domain	Inclusion criteria	Exclusion criteria
Population	Community-dwelling older adults (aged 65 years and over) living in an OECD member country	- Adults aged under 65 years - Studies where the sample age was not explicitly reported as at least 65 years old - Adults living in long-term care, assisted living facilities, or nursing homes - Adults admitted to virtual home hospital or wards, or receiving acute care, post-discharge rehabilitation care, or end-of-life care
Intervention	A non-invasive commercially available or prototype AT (product, device, or system) that promotes independent daily living by: - monitoring well-being or welfare (e.g. wearable or non-wearable remote monitoring systems, wearable medical alarms) - supporting mobility (e.g. ambient assisted living, sensors), memory, communication, or personal disease management (e.g. digital pill cases) and that: - is delivered primarily in the home - includes some direct transfer (i.e. not filtered through an informal caregiver) of personal physiologic health data that can be accessed by a healthcare	- Assistive products with no digital aspect (e.g. spectacles, prostheses, walking aids, continence pads, portable ramps, grab rails) - Computer- or mobile-based interventions that are solely education-focused - Solely mobile-based applications (i.e. m-health), or telephone-based or handheld device (e.g. personal digital assistant) reporting of symptoms via questionnaires or surveys - Augmented reality devices or virtual reality training - Rehabilitation-, physical therapy-, or exercise-focused interventions - Personal care, service, or companion robots (e.g. PARO) - Socially interactive or conversational agents (e.g. chatbots)

Domain	Inclusion criteria	Exclusion criteria
	- professional or formal home support worker - includes or does not include triggers for assistance.	- Computerised decision support systems - Technologies used exclusively by healthcare professionals, or basic telehealth consultations or therapy - Technology specifically related to COVID-19 interventions
Comparator	- Usual care - No intervention - Partial intervention - Alternative intervention	No separate comparator group
Outcomes	Patient-related healthcare utilisation outcomes, including: - admission to hospital - emergency department (ED) visits - admission to residential care - in-person or remote physician visits - waiting times to access care (i.e. unmet need) - treatment adherence or compliance (i.e. medication use). Formal caregiver provision outcomes, including: - hours of care delivered - efficiency or productivity.	Patient-related outcomes, including: - clinical physical and mental health measures (e.g. blood sugar levels, gait, mortality, quality of life, depression, anxiety, or loneliness) - user experience, including acceptability or usability of technology - knowledge gained. Formal caregiver outcomes, including: - user experience, including acceptability or usability of technology - perceived burden - knowledge gained.
Study design	- Randomised controlled trials (RCTs) - Non-randomised studies of interventions (NRSIs) - Controlled before and after studies - Prospective cohort studies - Retrospective cohort studies within the same time period	- Interrupted time series studies - Cross-sectional studies - Case studies or case series - Diagnostic test accuracy studies - Opinion pieces - Qualitative studies - Reviews - Conference abstracts
Date	None	None

2.2.2 Research question 2

Table 2 outlines the inclusion and exclusion criteria for selecting studies to answer research question 2: Is remotely monitored AT cost-effective for community-dwelling older adults in OECD member countries?

Table 2: Eligibility criteria for research question 2: Is remotely monitored AT cost-effective for community-dwelling older adults in OECD member countries?

Domain	Inclusion criteria	Exclusion criteria
Population	Community-dwelling older adults (aged 65 years and over) living in an OECD member country	- Adults aged under 65 years - Studies where the sample age within models was not explicitly reported as at least 65 years old - Adults living in long-term care, assisted living facilities, or nursing homes - Adults admitted to virtual home hospital or wards, or receiving acute care, post-discharge rehabilitation care, or end-of-life care
Intervention	A non-invasive AT commercially available or prototype (product, device, or system) that promotes independent daily living by: - monitoring well-being or welfare (e.g. wearable or non-wearable remote monitoring systems, wearable medical alarms) - supporting mobility (e.g. ambient assisted living, sensors), memory, communication, or personal disease management (e.g. digital pill cases) and that: - is delivered primarily in the home - includes some direct transfer (i.e. not filtered through an informal caregiver) of personal physiologic health data that can be accessed by a healthcare professional or formal home support worker - includes or does not include triggers for assistance.	- Assistive products with no digital aspect (e.g. spectacles, prostheses, walking aids, continence pads, portable ramps, grab rails) - Computer- or mobile-based interventions that are solely education-focused - Solely mobile-based applications (i.e. m-health), or telephone-based or handheld device (e.g. personal digital assistant) reporting of symptoms via questionnaires or surveys - Augmented reality devices or virtual reality training - Rehabilitation-, physical therapy-, or exercise-focused interventions - Personal care, service, or companion robots (e.g. PARO) - Socially interactive or conversational agents (e.g. chatbots) - Computerised decision support systems - Technologies used exclusively by healthcare professionals, or basic telehealth consultations or therapy - Technology specifically related to COVID-19 interventions
Comparator	- Usual care - No intervention - Partial intervention - Alternative intervention	No separate comparator group
Outcomes	Cost-effectiveness outcomes, including: - quality-adjusted life years (QALYs) - disability-adjusted life years (DALYs)	- Cost analysis without reference to outcomes - Outcome analysis without reference to costs

Domain	Inclusion criteria	Exclusion criteria
	• average cost-effectiveness ratio (ACER) • incremental cost-effectiveness ratio (ICER) • net benefit • benefit-cost ratio • cost-minimisation • cost-consequence.	
Study design	Full economic evaluations [44], including: • cost-utility studies • cost-benefit studies • cost-consequence studies • cost-minimisation studies.	• Costing studies • Partial economic evaluations
Date	None	None

2.3 Information searches

2.3.1 Search approach

In order to identify evidence for this review, we conducted comprehensive searches of relevant bibliographic databases, clinical trial registries, and grey literature sources. The search strategies were developed, tested, and peer-reviewed in early July and the final searches were run on the 14 July, 2025. A second information specialist (Mr Niall O’Brian) peer-reviewed the search strategy using Peer Review of Electronic Search Strategies (PRESS) on 7 July 2025, aligned with best practices [45]. One structured systematic database search was conducted in order to answer the first research question on the effects of remotely monitored AT on healthcare utilisation and provision. We used a separate structured systematic database search in order to answer the second research question on cost-effectiveness. The search details are reported in Section 2.3.3.

We identified additional relevant grey literature resources using the Google [46] and DuckDuckGo [47] search engines. We also conducted additional supplemental searches for systematic reviews and reference-chased relevant reviews in addition to our included papers identified from the bibliographic database searches. After full-text screening from both searches, we conducted forward and backward citation chasing of our included studies. We updated the search in January 2026 in order to ensure that the most up-to-date evidence could be included in the final report.

2.3.2 Search concepts

As recommended in the *Cochrane Handbook for Systematic Reviews of Interventions* [48], we included terms relating to the population, intervention, and study design in the review searches. The concepts for both research questions included terminology to capture the population (‘older adult’), the interventions (‘digital assistive technology’ and ‘remote patient monitoring’), and the study designs included (Figure 1, Figure 2). The *Cochrane Handbook for Systematic Reviews of Interventions* [48] states that it is usually unnecessary to search on every aspect of a review’s research question, and notes that elements such as

outcomes and comparators are particularly poorly indexed, so it is not recommended to search on this aspect. Our search concept terminology utilised Medical Subject Headings (MeSH) terms and natural language in order to capture relevant research.

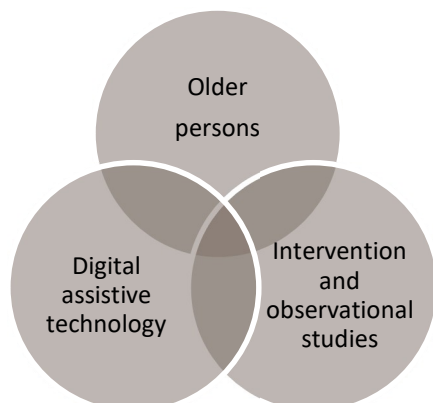


Figure 1: Research question 1 search concepts

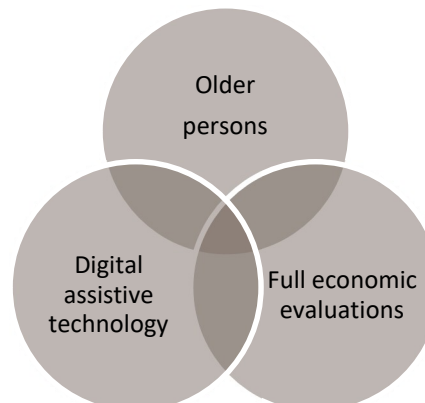


Figure 2: Research question 2 search concepts

2.3.3 Search strategies

The initial search strategy was constructed in MEDLINE (on the EBSCO platform) using MeSH terms and keywords. Search blocks for concepts were combined using Boolean operators (AND/OR/NOT). No date or language limits were applied. Canada's Drug Agency search filters [49] for MEDLINE were referenced for development of the language around clinical trials and for search terminology for the costs question.

The MEDLINE search strategy was then translated and adapted to other databases using MeSH or thesaurus terms where available. The MEDLINE search strategy for the first research question is provided in Appendix C. The MEDLINE search was translated for use on the Cumulative Index to Nursing and Allied Health Literature (CINAHL) (also on the EBSCO platform) and on EMBASE (on the Ovid platform), and the IEEE Xplore digital library. The Canada's Drug Agency clinical trials filter for CINAHL (Ovid) was adapted [49] to perform a search on CINAHL (EBSCO). For the second research question, the MEDLINE search for costs was translated for use in CINAHL, EMBASE, and the online repository EconPapers [50]. The search strategies for the second research question are provided in Appendix D and Appendix E.

Completed and ongoing trials were identified through a search of the Cochrane Central Register of Controlled Trials (CENTRAL), which indexes the WHO's International Clinical Trials Registry Platform and ClinicalTrials.gov registers. ClinicalTrials.gov is searched daily, but the WHO International Clinical Trials Registry Platform is only indexed weekly; therefore, we also conducted a separate supplemental search on the WHO registry in order to address this gap. We identified relevant systematic reviews through a structured search of Epistemonikos [51], an online repository of systematic reviews, and the Cochrane Library [52].

We identified grey literature from searches of national and international bodies, such as AGE-WELL [53], Canada's technology and ageing network; the European Commission's Active Assisted Living Programme: Ageing Well in the Digital World [54]; and the International HTA Database [55]. For resources where structured searching was not possible, we used abbreviated searches.

2.3.4 Supplementary search strategies

We supplemented our bibliographic database searches with forward and backward reference and citation chasing of the included full-text papers. We used Dimensions AI and Google Scholar for reference

retrieval, and citationchaser [56] for reference and citation chasing of included papers with additional cross-checking with Google Scholar. We screened the identified citations and references against our inclusion criteria. Any relevant systematic reviews also went through the same reference and citation chasing and screening process.

2.3.5 Study screening and selection

We used EPPI-Reviewer Web [57] in order to manage the screening and selection process for this review. We uploaded the results from the individual bibliographic database searches to EPPI-Reviewer Web for de-duplication.

We double-screened our primary search results for our first research question at the title and abstract stage using EPPI-Reviewer Web's priority screening machine learning tool. Priority screening presents records in an order where records that are deemed to be more relevant are presented first and, through the coding of 'includes' and 'excludes', learns and adapts the presentation of items in order to prioritise those that are more likely to be coded as 'includes'. Therefore, a point is reached in the screening process where the screening progress graph plateaus, meaning that despite screening more items, there are no additional 'includes'. At that point, it is considered safe to switch to single screening of records in order to expedite the screening process.

All supplemental searches and full-text items were independently dual screened against the pre-established eligibility criteria detailed in Sections 2.2.1 and 2.2.2. After screening full-text items against the eligibility criteria, we performed forward and backward citation chasing on each included item through the process described in Section 2.3.4. At both the title and abstract and the full-text screening stages, disagreements were resolved through discussion between two reviewers (MKS, AB, or MR), or a third reviewer was consulted if necessary (MKS, NMG, or ÁT). The screening process is presented in a PRISMA flow diagram outlining the number of items examined at each stage. For non-English studies, we used DeepL Translate [58] to assist with translation.

2.4 Data extraction

We extracted data using standardised bespoke data extraction forms, which we piloted on a sample of papers and added, clarified, or split fields as necessary. We created one Microsoft Excel workbook for data related to research question 1, and a separate one to capture data related to research question 2. In order to maximise completeness and accuracy, extraction was performed by one reviewer (AB, MR, or MKS) and reviewed by a second (AB, MR, or MKS). Information was added or edited by the secondary reviewer if necessary and the primary reviewer reviewed and accepted changes. Columns were added to the data extraction template to track initials of the primary and secondary reviewer and for the primary reviewer to sign off on the final check (Appendix E). Disagreements were resolved through discussion or through consultation with a third reviewer. Template data collection forms are included in Appendix F and data is available upon request. Due to time constraints, we did not contact authors for additional information. Data extracted included:

- bibliographic details: first author, year of publication, and title
- study details: study design, country, setting, healthcare population, comparator groups, and funder
- intervention details: aim and intervention details (products, procedure and remote monitoring details, provider, training given, delivery modes, frequency of exposure to intervention and duration of follow-up, tailoring, modifications, and adherence) informed by the Template for Intervention Description and Replication (TIDieR) Checklist [59]

- effectiveness details: measurement time points, outcome units and definition, point estimate and upper and lower limits, outcome or tool validation, power, missing data, and statistical methods used
- cost-effectiveness details: analytic framework (trial- or model-based), type (cost-utility, cost-benefit, cost-consequence, or cost-minimisation), perspective for analysis, time horizon, base year for costing data, uncertainty or sensitivity analyses conducted, and results (e.g. ICER value, incremental costs, and effectiveness outcomes).

2.5 Critical appraisal

Risk of bias and methodological quality assessments are helpful to describe the main strengths and limitations or biases that could affect the validity of the findings. As highlighted in Section 2.2, we included a range of study designs in this evidence review; therefore, a variety of risk of bias and methodological assessment tools were needed in order to appropriately assess each study design. All risk of bias assessments were performed by one reviewer (AB, MR, or MKS) and reviewed by a second (AB, MR, or MKS). All quality assessments of economic evaluations were performed by one reviewer (AB or MKS) and reviewed by a second (AB, ÁT, or MKS). Disagreements were resolved through discussion or referral to a third reviewer (NMG).

2.5.1 Risk of bias assessment

For research question 1, we used the Cochrane Risk of Bias 2 (RoB 2) tool [60] in order to evaluate the included RCTs, and the Risk Of Bias In Non-Randomized Studies - of Interventions (ROBINS-I) tool to evaluate the included NRSIs [61,62].

The RoB 2 tool has five domains, assessing bias arising from the randomisation process; deviations from the intended interventions; missing outcome data; measurement of the outcome; and selection of the reported result. Each domain is rated as having a low risk of bias, some concerns, or a high risk of bias. These domain-level judgements then inform the overall judgement for each outcome. The overall risk of bias is generally determined by the highest-risk domain rating; for example, a high risk of bias rating in one domain would result in a high risk of bias overall. The overall rating may also be upgraded due to cumulative concerns. For example, if several domains have some concerns of bias, the overall rating could be upgraded to a high risk of bias. Risk of bias domain and overall scores for each study outcome are presented in Appendix G.

The 2025 version of the ROBINS-I tool has six domains for assessing NRSIs: bias due to confounding; classification of interventions; selection of participants; missing data; measurement of outcomes; and selection of the reported result. Confounders were pre-specified and are detailed in Appendix H. Each domain is rated as having a low, moderate, serious, or critical risk of bias based on answers to a series of signalling questions. These domain-level judgements then inform the overall judgement for each outcome. Risk of bias domain and overall scores are presented in Appendix I.

We used the Risk-Of-Bias VISualization (robvis) tool and R code [63] in order to visually present the domain-level and overall study-level assessments of bias, and have also narratively described the results.

Aligned with guidance, if there was no numerical result presented for an outcome, we did not perform a risk of bias assessment but remarked on the reporting bias narratively [64,65]. We did not specify a prior time point for assessment, so we assessed all time points given in a study and, where different numerical results were given for each outcome (e.g. hospital days, hospital average length of stay, and hospital admissions), we assessed each one separately.

2.5.2 Quality assessment of economic evaluations

For research question 2, we used the Philips checklist [66] for full economic evaluation modelling studies and the Consensus Health Economic Criteria (CHEC) list [67] for trial-based full economic evaluations conducted alongside clinical effectiveness trials.

The Philips checklist assesses domains such as model structure, data sources, model consistency, uncertainty analysis, and validation. Each item is assessed based on predefined criteria and categorised as 'Yes' (meets criteria), 'No' (does not meet criteria), 'Yes/No' (partially meets criteria), 'Unclear' (insufficient information), or 'N/A' (not applicable). Quality assessments for full economic evaluation modelling studies are presented in Appendix J.

The CHEC list assesses 19 criteria, including study population, perspective, cost measurement, outcome identification, sensitivity analysis, and the generalisability of findings. Each item is assessed based on predefined criteria and categorised as 'Yes' (meets criteria), 'No' (does not meet criteria), or N/A (not applicable). The quality assessment of the trial-based economic evaluation is presented in Appendix K.

2.6 Data synthesis

2.6.1 Feasibility assessment for meta-analysis

For each outcome of interest for our first research question, we completed an assessment of the feasibility of meta-analysis following published guidance [68]. A feasibility assessment is a stepwise framework that ensures that the underlying assumptions in extracted data are systematically explored and that the risks (and benefits) of pooling and comparing intervention effects are identified. First, we grouped together similar outcomes, ordered by the time point of outcome assessment (which largely aligned with intervention duration) and by study design, i.e. separating randomised and non-randomised studies. Following this, for each set of papers, we assessed the comparability of the following variables:

1. healthcare condition
2. outcome measurement, including analysis to control for confounding (non-randomised designs).

As all studies included older adults in community-dwelling settings using remote monitoring AT, we did not consider population or interventions as reasons to exclude studies from the meta-analysis. However, given differences in healthcare conditions, we considered this, as well as time points of assessment, for subgroup analyses.

We required three studies in order for an outcome to be feasible for meta-analysis. As recommended by the *Cochrane Handbook for Systematic Reviews of Interventions* [69], NRSIs that were judged to have a critical risk of bias were excluded from meta-analyses, and we did not combine RCTs and NRSIs in the same meta-analysis. Where possible, we aimed to conduct sensitivity analyses in order to test the robustness of findings by excluding results with a high risk of bias. Prediction intervals were not presented because the small number of studies precluded a reliable estimate of between study variance. We did not have any instances where we had 10 or more studies, thus publication bias (e.g. Egger's test [70]) could not be assessed, as we stated in the protocol.

We used RevMan in order to conduct the meta-analyses [71]. Therefore, there is no analytic code to provide. We used a random-effects model to account for between-study variability. Pooled effect sizes for healthcare utilisation and provision outcomes were calculated using standardised mean difference for continuous outcomes and odds ratio for dichotomous outcomes. If outcome data could be transformed into a usable standardised format, this was done using RevMan. If adjusted metrics were given (e.g. an adjusted odds ratio), these were used. If multiple time points were given, we used the longest time point available. We assessed statistical heterogeneity using the Chi-square test (significance threshold: $p < 0.10$)

and the I^2 statistic, with thresholds of 25%, 50%, and 75% indicating low, moderate, and high heterogeneity, respectively.

For the second research question on cost-effectiveness, due to the heterogeneity of study designs and populations, we did not pool data for meta-analysis.

2.6.2 Narrative synthesis

Where feasible, we quantitatively synthesised data using meta-analytic methods. When meta-analyses were not feasible, we used a narrative approach following the SWiM guidelines [72]. The narrative approach was informed by our bespoke data extraction sheet, which, as described in Section 2.4, included details on the populations, interventions, comparators, outcomes, and study design and analyses. As all included studies included community-dwelling older adults, we chose to primarily group studies by outcomes, but have presented this information alongside the healthcare population and remotely monitored AT studied (e.g. in the summary of included studies tables). Within subsections, we separated findings by study design (e.g. RCTs and NRSIs) but do not prioritise one over the other. Metrics were transformed for meta-analyses, as noted in Section 2.6.1, but we did not transform effects to standardised metrics, often due to insufficient reporting in included studies. We also created summary of key characteristics and summary of findings tables, which summarise effect estimates across studies.

2.7 Certainty of evidence assessment

We graded the certainty of evidence using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) approach [73] for each outcome of interest relating to healthcare utilisation and provision outcomes for research question 1. All certainty of evidence assessments were performed by one reviewer (MKS) and reviewed by a second (AB).

GRADE is the most widely used approach for summarising the confidence in intervention effects by outcome across studies. Evidence related to an outcome receives one of four levels of certainty: high, moderate, low, or very low (Table 3). The initial certainty of evidence is influenced by study design. Well-designed RCTs provide a high degree of certainty, whereas well-designed observational studies provide a moderate or low degree of certainty. However, as we used the ROBINS-I assessment tool for NRSIs, all studies may start with a high certainty of evidence and then can be downgraded based on five criteria:

1. risk of bias: considers the within- and across-study limitations in study design and execution or methodological quality
2. inconsistency: considers heterogeneity in the effect estimates
3. indirectness: evaluates whether the evidence directly addresses the question of interest, or if there are limitations in the populations, interventions, comparators, or outcomes studied
4. imprecision: assesses variances, optimal information size, and the number of events that influence them
5. publication bias: recognises the selective publication of studies where those with statistically significant positive results are more likely to be published.

Although infrequent and rare [74], the certainty of evidence can also be upgraded based on three criteria:

1. large effect size: large, consistent, and precise estimates of the magnitude of an intervention effect in a methodologically well-done observational study

2. dose-response gradient: as the dose of an intervention increases, the effect on the outcome also increases in a predictable manner, which can provide greater confidence in the effectiveness of the intervention
3. opposing bias and confounders: when all plausible biases may be working to underestimate an apparent intervention effect, meaning that it is likely that the actual intervention or exposure effect is larger than the data suggest.

Table 3: Four GRADE levels of the certainty of evidence

Level of evidence	Symbol	Explanation of quality rating
High certainty	⊕⊕⊕⊕	There is high confidence that the true value of the reported effect estimate for an outcome is on one side of a threshold (for dichotomous outcomes) or within a specific range (for continuous outcomes).
Moderate certainty	⊕⊕⊕○	There is moderate confidence that the true value of the estimate of interest is on one side of a threshold of interest or within a certain range. The true value of the estimate may deviate slightly from the target of the certainty rating (i.e. may possibly fall in a different range).
Low certainty	⊕⊕○○	There is low confidence that the true value of the estimate of interest is on one side of a threshold of interest or within a certain range. The true value of the estimate may deviate from the target of the certainty rating (i.e. likely falls in a different range).
Very low certainty	⊕○○○	There is very low confidence that the true value of the estimate of interest is on one side of a threshold of interest or within a certain range. The true value of the estimate may deviate significantly from the target of the certainty rating (i.e. probably falls in a different range).

Source: Neumann and Schünemann, 2024 [75]

We used the GRADEpro tool [76] in order to document assessments and to produce summary of findings tables. Santesso *et al.*'s informative statements (Table 4) [77] to communicate the findings of systematic reviews of interventions are integrated within the GRADEpro tool, and they are provided to help interpret and communicate the results of the review.

Table 4: Santesso *et al.*'s (2020) list of informative statements to communicate the results of systematic reviews

Level of evidence	Size of the effect estimate	Suggested statements (replace X with intervention, replace 'reduce/increase' with direction of effect, replace 'outcome' with name of outcome, include 'when compared with Y' when needed)
High certainty of the evidence	Large effect	X results in a large reduction/increase in outcome
	Moderate effect	X reduces/increases outcome X results in a reduction/increase in outcome
	Small important effect	X reduces/increases outcome slightly X results in a slight reduction/increase in outcome
	Trivial, small, unimportant effect or no effect	X results in little to no difference in outcome X does not reduce/increase outcome
	Large effect	X likely results in a large reduction/increase in outcome X probably results in a large reduction/increase in outcome

Level of evidence	Size of the effect estimate	Suggested statements (replace X with intervention, replace 'reduce/increase' with direction of effect, replace 'outcome' with name of outcome, include 'when compared with Y' when needed)
Moderate certainty of the evidence	Moderate effect	X likely reduces/increases outcome X probably reduces/increases outcome X likely results in a reduction/increase in outcome X probably results in a reduction/increase in outcome
	Small important effect	X probably reduces/increases outcome slightly X likely reduces/increases outcome slightly X probably results in a slight reduction/increase in outcome X likely results in a slight reduction/increase in outcome
	Trivial, small, unimportant effect or no effect	X likely results in little to no difference in outcome X probably results in little to no difference in outcome X likely does not reduce/increase outcome X probably does not reduce/increase outcome
	Large effect	X may result in a large reduction/increase in outcome The evidence suggests X results in a large reduction/increase in outcome
Low certainty of the evidence	Moderate effect	X may reduce/increase outcome The evidence suggests X reduces/increases outcome X may result in a reduction/increase in outcome The evidence suggests X results in a reduction/increase in outcome
	Small important effect	X may reduce/increase outcome slightly The evidence suggests X reduces/increases outcome slightly X may result in a slight reduction/increase in outcome The evidence suggests X results in a slight reduction/increase in outcome
	Trivial, small, unimportant effect or no effect	X may result in little to no difference in outcome The evidence suggests that X results in little to no difference in outcome X may not reduce/increase outcome The evidence suggests that X does not reduce/increase outcome
Very low certainty of the evidence	Any effect	The evidence is very uncertain about the effect of X on outcome X may reduce/increase/have little to no effect on outcome but the evidence is very uncertain

Source: Santesso *et al.* (2020) [77]

2.8 Differences between our protocol and review

Since the publication of our protocol, a new version of the ROBINS-I tool was published, so we used the most up-to-date version from November 2025 rather than the November 2024 version [62]. The newer version is streamlined, and questions are improved upon and clarified. The Consolidated Health Economic Evaluation Reporting Standards (CHEERS) Statement [78] was also erroneously referred to in our protocol. It is a reporting guideline for economic evaluations rather than syntheses, so we have not used these standards in our report. Based on feedback from peer reviewers, we added clarifications to our eligibility criteria for each research question (Section 2.2) but these were added to provide further details, rather than representing deviations from our protocol.

3 Findings

3.1 Search results

3.1.1 Healthcare utilisation

Our initial searches of databases and registers identified 8,135 records, of which 388 were duplicates, leaving 7,747 records for title and abstract screening. Two researchers (AB and MKS) screened 7,747 records on title and abstract using the priority screening feature in EPPI-Reviewer Web. The team switched to single screening after 4,362 records had been screened and with 217 included records. After single screening the remaining 43% (n=3385) of records, we included an additional 4 records, resulting in having 221 records for full-text screening, one of which we could not retrieve. Figure 3 shows the priority screening curve from EPPI-Reviewer Web.

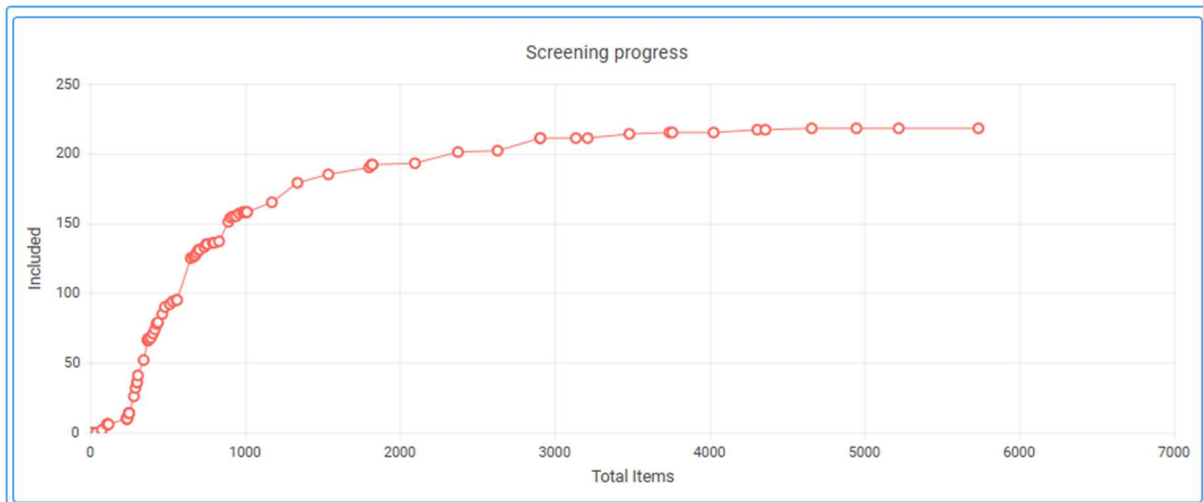


Figure 3: Priority screening graph for research question 1 (n=7747 items) from EPPI-Reviewer Web

After screening against our inclusion and exclusion criteria (detailed in Section 2.2), we excluded 204 records at the full-text stage, leaving 16 records for data extraction. Through forward and backward citation screening of these items, supplemental searches, and updated searches, we identified an additional 6,695 eligible records, which, after deduplication, left 4,694 records to be screened on title and abstract. After full-text screening of 101 records, an additional 5 records remained and were included in the final analysis.

Figure 4 outlines the searching and screening process for research question 1. All of the studies that we excluded at the full-text screening stage, together with our reasons for their exclusion, are presented in Appendix L.

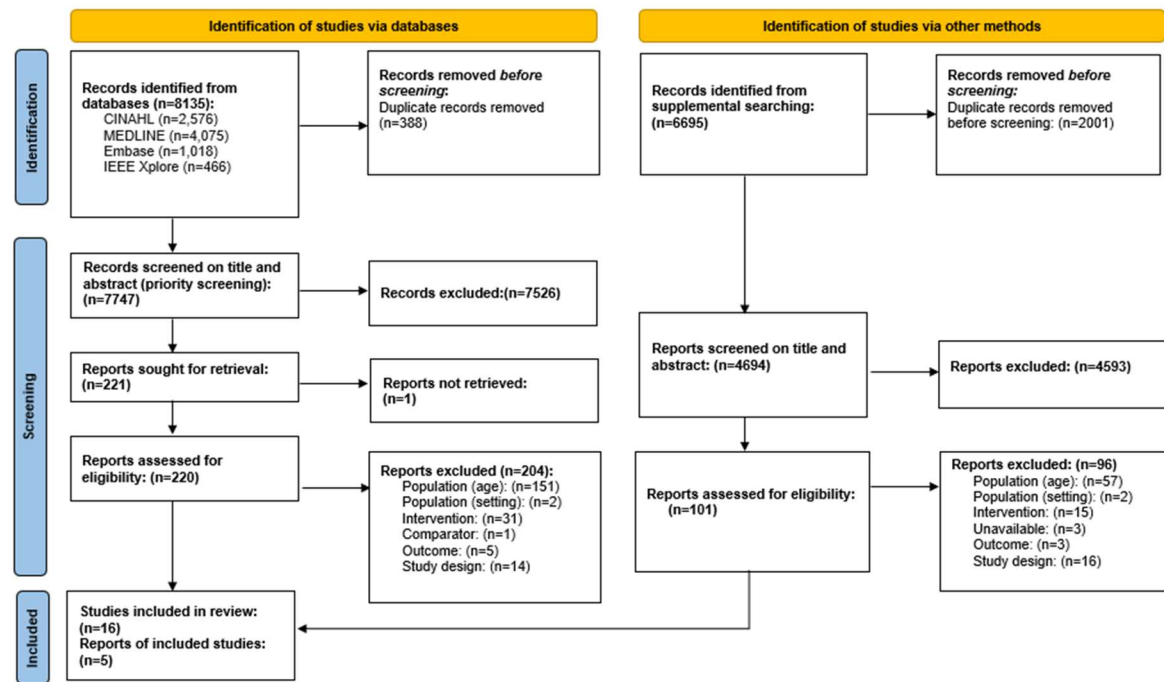


Figure 4: PRISMA flow diagram for research question 1

Source: Page *et al.*, 2021 [79]

3.1.2 Cost-effectiveness

Our initial searches of databases identified 3,300 records, of which 1,266 were duplicates, leaving 2,034 records for title and abstract screening. During title and abstract screening, we excluded 1,991 records, leaving 43 records for full-text screening. After screening against our inclusion and exclusion criteria (detailed in Section 2.2), 1 record could not be retrieved and we excluded 40 records at the full-text stage, leaving 2 records for data extraction. Through forward and backward citation searching of these items and relevant systematic reviews, supplemental searches of registers and grey literature, material identified in screening for the first research question (i.e. team includes), and updated searches, we identified an additional 1,068 eligible records for screening. We removed 490 records as duplicates, which left 578 records for title and abstract screening. After title and abstract screening, 558 records were excluded, leaving 20 records to be assessed at the full-text screening stage. Of those, we included three in the final paper.

Figure 5 outlines the searching and screening process for research question 2. All studies that we excluded at the full-text screening stage, with their reason for exclusion, are presented in Appendix M.

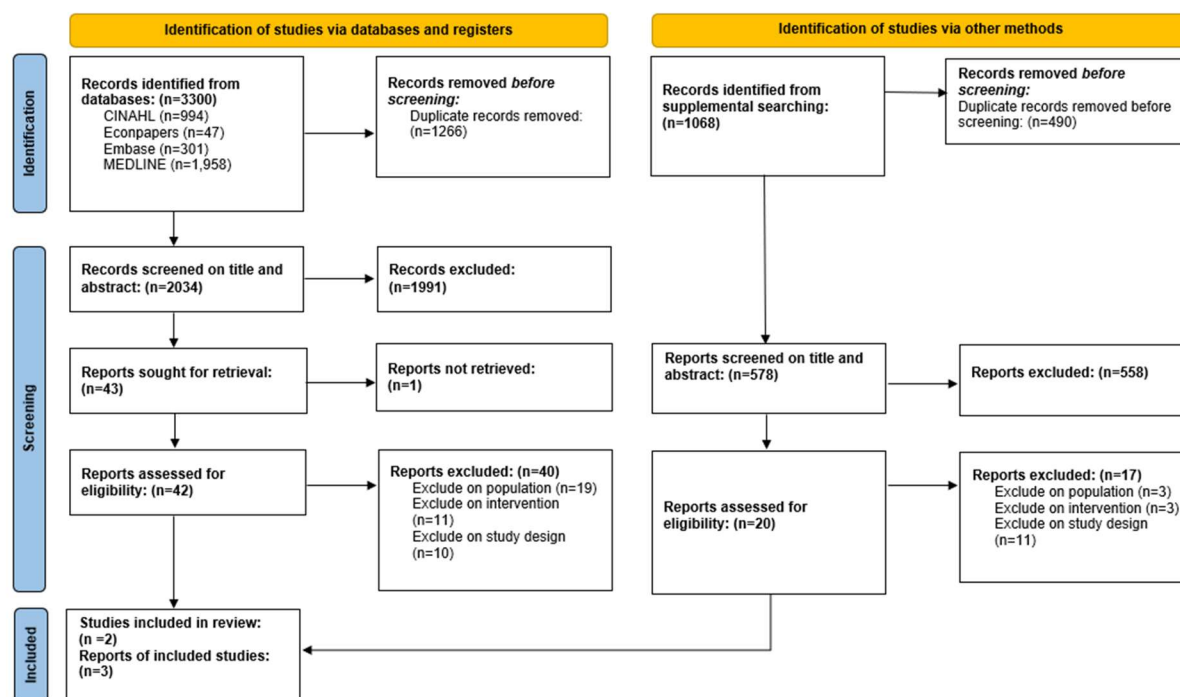


Figure 5: PRISMA flow diagram for research question 2

Source: Page *et al.*, 2021 [79]

3.2 Grouping studies for synthesis

We have organised our findings into headings that align with the focus of each research question: healthcare utilisation and cost-effectiveness. For our first research question, we have organised the findings according to broader-level healthcare utilisation outcomes: emergency department visits; hospitalisations (including length of stay); admissions to long-term care; outpatient visits (including primary care visits, specialist visits, same-day surgery days, and urgent care visits); days at home and home care episodes; access to diagnosis; and other assorted healthcare utilisation outcomes. Within each section, results from RCTs and NSRIs are presented. For our second research question, we have organised our findings according to whether the full economic evaluation is a modelling study or a trial-based evaluation.

3.3 Characteristics of included studies

We identified 21 papers [80–100] for our first research question on the impact of remotely monitored AT on healthcare utilisation and provision for older community-dwelling adults in Organisation for Economic Co-operation and Development (OECD) member countries, and 5 papers [101–105] for our second research question on the cost-effectiveness of remotely monitored AT for older community-dwelling adults in OECD member countries.

3.3.1 Healthcare utilisation studies

We identified 21 papers reporting on 20 studies that assessed the impact of remotely monitored AT on healthcare utilisation and provision for older community-dwelling adults in OECD member countries [80–100]. The results from one participant group and study were covered by two separate publications, so

although we have only counted it as one study, both references are provided [82,83]. One study [100] is an extended follow-up study of another included study [84]. In addition, four studies [89–92] all report on the same clinics and participants. One study [89] reports that it provides a longer-term 18-month follow-up for the two pilot studies that were conducted at six primary care practices by *Petito et al.* (2023b) [92] and *Persell et al.* (2023) [90]. Meanwhile, *Petito et al.* (2023a) [91] is a paper that presents a comparison of the same patients with propensity-score-matched controls from those same clinics. An overview of study characteristics is provided in Table 5.

Healthcare utilisation or effectiveness outcomes were reported for 7 major outcome groupings: emergency department (ED) visits; hospitalisations (including length of stay); admissions to long-term care; outpatient visits (including primary care visits, specialist visits, same-day surgery days, and urgent care visits); days at home and home care episodes; access to diagnosis; and other assorted healthcare utilisation outcomes. Ten studies assessed 11 outcomes related to ED utilisation. Twelve studies assessed 24 outcomes related to hospitalisations. Two studies assessed three outcomes related to admissions to long-term care. Four studies assessed seven outcomes related to outpatient visits, including primary care, specialist, same-day surgery, and urgent care visits. Three studies assessed three outcomes related to days at home and home care episodes. Two studies assessed two outcomes related to time to diagnosis of AF. Four studies assessed six outcomes related to other assorted healthcare utilisation outcomes that were not captured in the other healthcare utilisation outcome groupings. No studies reported outcomes on unmet need for services, treatment adherence or compliance (i.e. prescription medication use), of formal caregiver outcomes such as hours of care delivered or efficiency or productivity.

Publication dates ranged from 2006 to 2025. Across the 38 OECD member countries that were eligible for inclusion (as detailed in Section 2.2), 7 were represented, with 9 studies based in the United States of America (USA) (Pennsylvania, New York, Illinois, Ohio, and Arizona), 4 based in France (Basse-Normandie, Limousin, and Limoges), 2 based in the United Kingdom (UK) (Wales), 2 based in Italy (Rome and the Vento region), 1 based in Canada (Toronto), 1 based in Germany (Berlin), and 1 based in Australia (Sydney).

The effect of the remotely monitored AT was evaluated through a variety of study designs: 14 studies were RCTs [80–87,93–98,100] and 6 were NRSIs, with all of the NRSIs describing themselves as cohort studies in some manner [88–92,99]. Several different clinical conditions or healthcare populations were represented in the studies, including six on (chronic, congestive, and general) heart failure [80,81,85,86,93,97] one on a mixed population, including those with heart failure or chronic obstructive pulmonary disease (COPD) [82,83]; one on COPD [87]; four on hypertension [89–92]; two on those at risk of stroke [84,100]; one on those at risk of atrial fibrillation (AF) [98]; one on Alzheimer’s disease [94]; one on those with chronic disease [95]; one on older adults who are frail [96]; and two on older adults in general [88,99].

A range of different products were used across the studies, from products aimed at a single metric (e.g. AliveCor Kardia for detecting AF) to more complex packages or systems (e.g. the e-GEROPASS software, a hub with seven external biometric sensors) that monitor several different metrics. There was inadequate information about device details such as manufacturer, model, make, etc. which often made it difficult to determine if devices were commercially available or prototypes for research purposes. Comparator groups were most often defined as usual or standard care (13 studies) [80,84,88–93,96–100] or an enhanced level of usual care (e.g. additional education) with no or lesser monitoring (7 studies) [81–83,85–87,94,95]. Analytic sample sizes ranged from 20 to 12,051 participants. The mean age of participants ranged from 72.6 to 87.8 years, and the proportion of women participants in groups ranged from 21.0% to 78.1% (Appendix N). The intervention duration was the same as the follow-up duration or time point of outcome assessment in all studies, except for two [82,83,100]. One of these studies [100]

was an extended follow-up of another study [84] and reported a 12-month monitoring period with a median follow-up of 4.2 years. The other study [82,83] reported a 3-month monitoring period with a 12-month outcome follow-up. One study [80] also provided interim findings (at 60 days), although we have chosen to report the findings at 120 days for all outcomes in this study.

Table 5: Characteristics of included healthcare utilisation and provision studies

Author (year)	Country	Study design	Healthcare population ⁶	Intervention product(s)	Comparator	Analytic sample size	Follow-up duration
Biannic <i>et al.</i> (2012) [81]	France	RCT	Chronic heart failure	SCAD (suivi clinique à domicile; home-based clinical follow-up) dedicated touch screen patient terminal	Enhanced usual care. No SCAD system, but two therapeutic education workshops provided to both groups.	73	3 months
Dansky <i>et al.</i> (2008) [80]	USA	RCT	Heart failure	Monitor only: One-way system (HomMed Health Monitor or the ViTel Net system) Monitor and video: Two-way system (Aviva)	Usual home care. No monitor, but routine home visits only.	284	120 days (6 months)
Ellins <i>et al.</i> (2023) [100]*	UK	RCT	Those at risk of stroke with a CHA ₂ DS ₂ -VASc score ≥2	AliveCor Kardia intracardiac electrocardiogram (iECG) version 2.2.0 (build 21)	Usual care. No iECG, but followed up as normal by their general practitioner (GP).	997	12 months monitoring (median follow-up: 4.2 years)
Gellis <i>et al.</i> (2012; 2014) [82,83]†	USA	RCT	Heart failure or COPD patients who screened positive for depression	HomMed Health Monitoring System 2011	Enhanced usual care. No system, but with in-home nursing plus psychoeducation.	94	3 months monitoring (12-month outcome follow-up)
Halcox <i>et al.</i> (2017) [84]*	UK	RCT	Those at risk of stroke with a CHA ₂ DS ₂ -VASc score ≥2	AliveCor Kardia (iECG) version 2.2.0 (build 21)	Usual care. No iECG, but followed up as normal by their GP.	1001	12 months
Lehmann <i>et al.</i> (2006) [85]	USA	RCT	Congestive heart failure	Viterion 500® telehealth system containing a wireless blood pressure (BP) monitoring system, a weight scale, and a 1% oxygen saturation monitor	Enhanced usual care. Limited phone reporting of weight. No system, but received a 1-hour educational programme.	20	6 months

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Author (year)	Country	Study design	Healthcare population [§]	Intervention product(s)	Comparator	Analytic sample size	Follow-up duration
Olivari <i>et al.</i> (2018) [86]	Italy	RCT	Heart failure	Personal Health System (a wearable Wrist Clinic device and a digital weight scale)	Enhanced usual care. No system, but received outpatient visits and a personal alarm.	339	12 months
Pedone <i>et al.</i> (2013) [87]	Italy	RCT	COPD	SweetAge monitoring system including a wristband, a commercial pulse oximeter, and a commercial cellular telephone	Enhanced usual care. No system, but given basic instructions regarding their perception of changing health status and offered ambulatory support.	99	9 months
Persell <i>et al.</i> (2023) [90]‡	USA	NRSI	Hypertension	Both intervention groups using a Bluetooth-enabled automated BP monitor, cuff, cellular data transmitter, and optional scale. Remote patient monitoring (RPM) with care coordination or RPM only.	Usual care. No product, not prescribed RPM. Matched controls from the same Medical Group primary care sites.	RPM prescribed: 149 Matched controls: 12051‡	6 months
Persell <i>et al.</i> (2024) [89]‡	USA	NRSI	Hypertension	Product not reported (same as [90–92])	Usual care. No product, not prescribed RPM. Matched controls from the same Medical Group primary care sites.	RPM prescribed: 288 Matched controls: 1152	18 months
Petito <i>et al.</i> (2023a) [91]‡	USA	NRSI	Hypertension	Bluetooth-enabled automated BP monitor, cuff, cellular data transmitter, and optional scale	Usual care. No product, not prescribed RPM. Matched controls from the same Medical Group primary care sites.	RPM prescribed: 288 Matched controls: 1152	12 months

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Author (year)	Country	Study design	Healthcare population [§]	Intervention product(s)	Comparator	Analytic sample size	Follow-up duration
Petito <i>et al.</i> (2023b) [92] ‡	USA	NRSI	Hypertension	Omron VitalSight RPM, automated BP monitor, cellular data hub, and optional scale	Usual care. No product, not prescribed RPM. Matched controls from the same Medical Group primary care sites.	RPM: 207 Matched controls: 828	6 months
Salahub <i>et al.</i> (2025) [88]	Canada	NRSI	Older adults	An OdysseyGO personal alert device (received by all) with possible additions of: - a home medication dispenser (requested for 11.4% of participants) - passive home monitoring sensors (unknown what proportion of patients received/requested these).	Usual home care. No product, but home care visits.	1494 Matched controls: 1494	100 days
Schwarz <i>et al.</i> (2008) [93]	USA	RCT	Heart failure	Cardiocom electronic health monitoring system (Cardiocom, LLC, Chanhassen, Minnesota)	Usual care. No product, but usual post-hospital care.	84	90 days
Tchalla <i>et al.</i> (2012) [96]	France	RCT	Older adults who are frail	Light path, remote intercom, and electronic bracelet	Usual care. No equipment.	190	12 months
Tchalla <i>et al.</i> (2013) [94]	France	RCT	Alzheimer's disease	Home-based technologies coupled with tele-assistance service (HBTec-TS) system, and a light path	Enhanced usual care. No HBTec-TS system, but participants undertook a fall reduction programme.	96	12 months
Tchalla <i>et al.</i> (2025) [95]	France	RCT	≥2 chronic diseases	e-GEROPASS software, a hub with seven external biometric sensors; also received additional recommended exercises and information about fall factors	Enhanced usual care. No biosensors, but additional recommended exercises and information about fall factors provided.	534	12 months
Tompkins and Orwat (2010) [97]	USA	RCT	Heart failure	Honeywell HomMed Sentry and Genesis monitors and proprietary Central Station software	Usual care. No product, but both groups received intensive care management in hospital pre-discharge.	390	6 months

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Author (year)	Country	Study design	Healthcare population [§]	Intervention product(s)	Comparator	Analytic sample size	Follow-up duration
Wong <i>et al.</i> (2024) [98]	Australia	RCT	Those at high risk of AF (aged 75 years and over)	AliveCor Kardia handheld mobile single-lead electrocardiogram (ECG) device.	Usual care (wait-list). No product, but patients received usual care from their GP for the first 6 months.	175	12 months
Zoellick <i>et al.</i> (2025) [99]	Germany	NRSI	Older adults (aged 75 years and over)	Ambient assisted living integrated home-based emergency call system consisting of a base station, eight motion sensors for the home, and a home emergency call system that included a necklace with an accelerometer and an emergency button pendant	Usual care. No product.	Intervention: 180 Matched controls: 708	12 months

*Ellins *et al.* (2023) is an extended follow-up study of the patients in Halcox *et al.* (2017). There was no active remote monitoring in Ellins *et al.* (2023) past the 12-month monitoring period in Halcox *et al.* (2017).

†Gellis *et al.* (2012) and Gellis *et al.* (2014) reported on the same study. This table provides information based on both papers for completeness. We have therefore noted in this table in relation to healthcare population that, in addition to having a diagnosis of heart failure or COPD, Gellis *et al.* (2014) added the specifier that the study population had screened positively for depression.

‡Persell *et al.* (2023), Persell *et al.* (2024), Petito *et al.* (2023a), and Petito *et al.* (2023b) report on the same clinics and participants. The paper by Persell *et al.* (2024) provides a longer-term 18-month follow-up for the two pilot studies that were conducted at six primary care practices by Petito *et al.* (2023a) and Persell *et al.* (2023). Petito *et al.* (2023b), meanwhile, was a comparison of the same patients with propensity-score-matched controls from those same clinics. No outcome data for any of these four papers could be included in this review because outcome data for those who initiated remote patient monitoring (RPM) interventions were not compared with controls. Instead, the focus for reporting was on patients in practices who had the potential to be prescribed RPM. It is assumed that Persell *et al.* (2023) had the same matching ratio of 4:1 or 2:1 for controls based on referencing of Petito *et al.* (2023b).

§All sample participants are aged 65 years and over unless otherwise noted.

3.3.1.1 Study interventions

Across the 21 included papers, there were a variety of different products used. An overview of product characteristics is provided in Table 6. Twenty studies investigated 17 different products or systems. Two papers [82,83] reported on the same study and utilised the same product, which was the HomeMed Health Monitoring System (2011)[106]. Two studies [84,100] utilised the same product, which was the AliveCor Kardia (iECG) version 2.2.0 (build 21), as one study [100] was an extended follow-up of the other study [84]. One study [98], unlinked to these two studies [84,100], reported using a similar product, the AliveCor Kardia handheld mobile single-lead ECG product, but did not specify the version or build. Four studies [89–92] were all linked, as these studies reported on the same group of clinics and participants; however, there was slight variation in terms of the reported products utilised. Two of these studies [90,91] reported a Bluetooth-enabled automated BP monitor, cuff, cellular data transmitter, and optional scale. One of the studies [92] specified that the Omron VitalSight RPM product was utilised, along with an automated BP monitor, cellular data hub, and optional scale. Finally, the fourth of these four linked studies [89] did not report the name of the product used.

A majority of studies [81–83,85–93,95,97–99] reported some level of patient education or training on how to use the products, although details were highly variable, ranging from more cursory reports such as “participants also received explanations for the monitoring system” [99] to more detailed descriptions such as “participants were sent the handheld ECG device by mail and offered the option of telephone or video call for training in the setup and use of the device. Participants were encouraged to have a family member involved if available to assist. Reported training on how to use device took around ten minutes and was via instructional videos and followed up with a phone call from the research team. After training, participants received a text message with a weblink to an instructional video created by the device manufacturer as a reference for participants to refresh their memory” [98]. Patient education or training on using the products was not reported or unclear in 6 studies [80,84,94,96,107].

The metrics that were remotely monitored varied across studies, with some common metrics reported. Eleven studies monitored BP [80–83,85,86,89–92,95,97], 11 studies monitored weight [80–83,85,86,90–93,95,97], 9 studies monitored pulse [80–83,85,86,90–92,95], 5 studies monitored heart rate [82,83,86,87,95,97], 4 studies monitored oxygen saturation or blood oxygen [82,83,85,87,97], 5 studies monitored ECG or heart electrical activity [84,86,95,98,100], 3 studies monitored temperature [82,83,87,95], 2 studies monitored blood sugar [80,95], and 2 studies monitored falls [88,96] or emergency alerts. One study [94] had unclear reporting about the metric collected or monitored, but a related study from the same authors used a very similar system; thus, we assumed that it is likely that the bracelet used in the Tchalla *et al.* (2013)[94] study was activated for falls only.

Other metrics that were remotely monitored were each collected by single studies only, and these consisted of:

- unspecified ‘vital signs’ [80]
- a nurse listening to the patient’s heart and lungs via a digital stethoscope [80]
- galvanic skin response [87]
- missed medication doses [88]
- not fully specified ‘other peripheral devices’ (with a glucose monitor for patients with diabetes listed as an example) [97].

Beyond the remotely monitored metrics included in this review, 9 of the 20 studies reported some additional information collected and sent by patients. This included information on:

- physical exercise [80,81,87,93]
- swelling [85,93]
- shortness of breath [81,93]
- tiredness or fatigue [85,93]
- medication use or effectiveness [80,81,93]
- oedema [81]
- sodium intake [80,93]
- fluid intake [80]
- diet in general [81]
- sleep [85]
- breathing [85]
- cough, chest discomfort, urination, or dizziness [93]
- additional non-specified predetermined or customised questions [82,83,97]
- low battery in any device [88].

Data for remotely monitored metrics were most frequently transmitted from patients on a daily or nearly daily basis, with four studies reporting daily transmission [82,83,86,93,97], one study reporting once-daily transmission on weekdays [98], and another [85] implying daily transmission of metrics for the intervention group (as reported in Table 6). Three studies reported weekly transmission only [81,84,100]. Six studies reported responsive transmission, with two studies reporting automatic transmission [87,88], one specifying an additional ability for emergency contact [99], and three implying that transmission frequency was as needed [94–96] (details are reported in Table 6).

Other studies were more complex in terms of their reporting on the frequency of data transmission. One study reported that transmission was dependent on the system being used, as one product transmitted at a predetermined time and the other product transmitted data to the nurse during synchronous connection [80]. One study reported that each clinician could decide how often they should tell their patients to monitor, and customised patient monitoring frequencies such that systolic BP below 90 or above 180 or diastolic BP below 40 or above 110 were transmitted immediately [92]. The three studies linked to this study (as described in the footnotes of Table 6) were also somewhat unclear in reporting the frequency of data transmission, with one reporting no information on transmission [89], one reporting automatic transmission [90], and one reporting that most RPM users transmitted a BP reading at least every other day in months when they used the device [91].

Nurses were most commonly the individuals who were monitoring the information sent [80–83,85,90,93,97]. Other individuals involved included:

- physicians [80,87]
- physiologists and cardiologists [84,98,100]
- regional eHealth centre operators and clinicians [86]
- clinicians [92]
- geriatricians [95]

- trained personnel or technicians [98]
- personal support workers [88]
- tele-assistance centre medical staff [94,96]
- social service providers [99].

One study reported two different monitoring processes due to the two interventions utilised, with one intervention (RPM with care coordination) using nurses to monitor the information sent and the other intervention (RPM only) reporting that the information was submitted straight to the electronic health record for access by the prescribing clinician [90]. One study reported that the individuals monitoring the information differed based on practices, as two practices implemented RPM with the support of nurse care coordination and four implemented it exclusively at the discretion of the primary care clinicians [91]. Only one study did not report who monitored the information sent [89]; however, this information was reported within the other linked studies [90–92], which report on the same clinics and participant pool. Persell *et al.* (2024) [89] is an 18-month follow-up of the other three studies [90–92].

In terms of alerts or algorithms, which would notify monitors to results that needed attention or prioritisation, 15 studies reported alerts that notified monitors of abnormal results [80–84,86–88,90,92,95–100], 4 studies did not report this information [85,89,91,93], and 1 study stated that a bracelet could be activated to trigger an alarm with the central hotline that coordinates aid [94].

Three studies reported that the data collected were sent to an electronic health record [90–92], and 14 reported that data were managed by an independent central hub [80–84,86–88,93–100]. The remaining three studies were unclear on whether data were sent to an electronic health record or managed by a central hub [85,89].

With regard to the frequency of monitoring, four studies reported daily monitoring [93,95,97,99] and another implied daily monitoring on weekdays [98]. Nine studies reported responsive monitoring that was automatic or real time [86–88], as needed [82–84,94,107], when notified [81], or provided via central hotline telephone support at all times [96]. The frequency of monitoring was unclear in three studies [85,90,91], and two studies did not report the frequency of monitoring [89,91]. One study reported different monitoring frequencies due to the presence of two products, as one product did not report the monitoring frequency and the other product reported that monitoring was done two or three times per week [80].

Table 6: Remotely monitored AT intervention details

Author (year)	Main product(s) used	Clinical metrics collected and monitored (and additional information sent without the use of AT)	Transmission frequency	Who monitors the information sent	Frequency of monitoring	Alert or algorithm for monitors
Biannic <i>et al.</i> (2012) [81]	SCAD dedicated touch screen patient terminal	Weight, BP, and pulse (Shortness of breath, oedema, treatment compliance, medication, diet, and physical exercise)	Three times per week (weight, BP, pulse, shortness of breath, and oedema) Twice weekly (treatment compliance, medication, diet, and physical exercise)	Specialised registered nurse	When notified	Yes
Dansky <i>et al.</i> (2008) [80]	One-way system (monitor only): HomMed Health Monitor or the ViTel Net system)	One-way system: weight, BP, and pulse Two-way system: vital signs, blood sugar, or pulse oximetry readings (collected as ordered by the physician); nurse also listened to heart and lungs via digital stethoscope	Unclear, as it depends on the system One-way system: typically programmed to be used every day at a predetermined time	Home health nurse or physician	One-way system: not reported	Yes
	Two-way system (monitor and video): Aviva	(Symptoms of heart failure related to sodium and fluid intake, medication effectiveness, and physical activity via the Omaha System Problem Rating Scale for Outcomes for both systems)	Two-way system: data stored offline and later transmitted to the nurse during the synchronous connection		Two-way system: usually two to three times per week, according to the patient's condition and care plan	
Ellins <i>et al.</i> (2023) [100]*	AliveCor Kardia (iECG) version 2.2.0 (build 21)	Twice-weekly recording of a 30-second single-lead iECG trace for 12 months (see Halcox <i>et al.</i> (2017) for further details) (No additional information reported)	Twice-weekly recording (see Halcox <i>et al.</i> (2017) for further details)	Automated software algorithm (AliveCor), analysis by a physiologist-led electrocardiographic reading service (Technomed Ltd UK), and additional review or interpretation by a cardiologist (abnormal and 10% of normal ECGs)	As needed	Yes

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Author (year)	Main product(s) used	Clinical metrics collected and monitored (and additional information sent without the use of AT)	Transmission frequency	Who monitors the information sent	Frequency of monitoring	Alert or algorithm for monitors
Gellis <i>et al.</i> (2012; 2014) [82,83] [†]	HomeMed Health Monitoring System (2011)	Heart rate, weight, BP, pulse, oxygen saturation, and temperature (Modifiable (YES/NO) questions that were customised to the patient's condition)	Daily (preset scheduled time based on patient preference)	Home care nurse	Daily/as needed	Yes
Halcox <i>et al.</i> (2017) [84]*	AliveCor Kardia (iECG) version 2.2.0 (build 21)	AF, defined as a 30-second iECG recording with irregular rhythm without P waves (No additional information reported)	Twice weekly (Monday and Wednesday) plus additional submissions if symptomatic	Physiologist-led electrocardiographic reading service. Abnormal ECGs were overread by a cardiologist.	As needed	Yes
Lehmann <i>et al.</i> (2006) [85]	Viterion 500® telehealth system containing a wireless BP monitoring system, a weight scale, and a 1% oxygen saturation monitor	BP, pulse rate, weight, and oxygen saturation/blood oxygen level (Sleep, tiredness, breathing, and swelling)	Assumed daily, as the study reported that equipment "signalled the patient when it was time to take a vital sign measurement" and the healthcare provider could "continually monitor" and "observe their patients' vital signs on a daily basis". Control group known to report data three times per week.	Nurse	Unclear	Not reported
Olivari <i>et al.</i> (2018) [86]	Personal Health System, composed of a wearable Wrist Clinic device and a digital weight scale	Weight, BP, heart rate, 1-lead ECG, and pulse oximetry (No additional information reported)	Daily, 5 days per week, to the eHealth regional centre	Regional eHealth centre operators and clinicians	Data processed automatically	Yes
Pedone <i>et al.</i> (2013) [87]	SweetAge monitoring system including a wristband, a commercial pulse oximeter, and a commercial cellular telephone	Oxygen saturation, heart rate, near-body temperature, and galvanic skin response (Physical activity)	Mostly automatic (as long as the patient was wearing the wristband, it was on, and it was within range of Bluetooth transmission)	A physician skilled in the care of respiratory patients	Real-time by software Daily by a skilled physician	Yes
Persell <i>et al.</i> (2023) [90] [‡]	Bluetooth-enabled automated BP	BP, pulse, and optional weight data	Unclear set frequency. As performed by the patient	RPM with care coordination: nurse	Unclear	Yes

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Author (year)	Main product(s) used	Clinical metrics collected and monitored (and additional information sent without the use of AT)	Transmission frequency	Who monitors the information sent	Frequency of monitoring	Alert or algorithm for monitors
	monitor, cuff, cellular data transmitter, and optional scale	(No additional information reported)	and automatically transmitted to patient records.	RPM only (without care coordination): prescribing clinician (submitted straight to electronic health record)	Automatic monitoring of clinical status	
Persell <i>et al.</i> (2024) [89] [†]	Product not reported	BP (No additional information reported)	Not reported	Not reported	Not reported	Not reported
Petito <i>et al.</i> (2023a) [91] [†]	Bluetooth-enabled automated BP monitor, cuff, cellular data transmitter, and optional scale	BP, pulse, and optional weight data (No additional information reported)	Unclear. Most RPM users transmitted a BP reading at least every other day in months when they used the product.	Two practices implemented RPM with support of nurse care coordination, and four implemented it exclusively at the discretion of the primary care clinicians.	Not reported	Not reported
Petito <i>et al.</i> (2023b) [92] [†]	Omron VitalSight RPM, automated BP monitor, cellular data hub, and optional scale	BP, pulse, and optional weight data (No additional information reported)	Variable by clinician choice at time of ordering (not dictated to clinicians how often or long). Concerning levels of systolic BP (adjustable by clinician) were transmitted to clinicians immediately.	Clinicians	Unclear	Yes
Salahub <i>et al.</i> (2025) [88]	An OdysseyGO personal alert device, with possible additions of a home medication dispenser (requested for 11.4% of participants) and/or passive home monitoring sensors (unknown what proportion of	Location and movement (falls, lack of movement), missed medication dose, and SOS alerts (Low battery in any device)	Automatic transmission	Personal support worker at health centre (with additional support from a 24/7 call centre)	In real time, supported by a 24/7 centrally hosted call centre	Yes

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Author (year)	Main product(s) used	Clinical metrics collected and monitored (and additional information sent without the use of AT)	Transmission frequency	Who monitors the information sent	Frequency of monitoring	Alert or algorithm for monitors
	patients received/requested these)	Weight				
Schwarz <i>et al.</i> (2008) [93]	Cardiocom electronic health monitoring system (Cardiocom, LLC, Chanhassen, Minnesota)	(‘Yes’ or ‘no’ to questions about shortness of breath, cough, fatigue, swelling, chest discomfort, urination, exercise, dizziness, medication use, and sodium intake. BP, apical pulse, and oxygen saturation assessed at baseline and 3 months.)	Daily	The heart failure care manager (an advanced practice nurse)	Daily	Not reported
Tchalla <i>et al.</i> (2012) [96]	Light path, remote intercom, and electronic bracelet (with a medallion and dialler with a long-life lithium battery)	Risk of falling or fall (Verbal reports of falls collected via regular monthly telephone contact with all participants)	Unclear. Medallion and dialler used as needed to request assistance or to report a dangerous situation.	24/7 central technical hotline (tele-assistance centre)	Telephone support provided at all times by central hotline	Yes
Tchalla <i>et al.</i> (2013) [94]	HBTEC-TS system, including a light path, remote intercom, and electronic bracelet coupled with tele-assistance service	Unclear, but likely activations of bracelet for falls only (Monthly monitoring phone calls to GP using a questionnaire focusing on sociodemographic characteristics and the primary end-point of falls)	Unclear, but likely as needed in case of a fall. Data were transmitted from the bracelet to the remote tele-assistance and monitoring site via the Bluetooth hub intercom.	Tele-assistance service centre, which involves a central technical hotline providing telephone support at all times. The caregiver or GP is alerted if the patient is not responsive to the centre.	As needed Automatic if the centre received a fall alarm	Bracelet can be activated to trigger an alarm with the central hotline that coordinates aid
Tchalla <i>et al.</i> (2025) [95]	e-GEROPASS software, a hub with seven external biometric sensors	BP, heart rate, body temperature, oximetry (pulse and oxygen saturation), capillary blood sugar, weight, and electrical activity of the heart (No additional information reported)	As needed	Geriatrician	Daily	Yes, for out-of-range values
Tompkins and Orwat (2010) [97]	Honeywell HomMed Sentry and Genesis monitors and proprietary Central Station software	Weight, BP, heart rate, blood oxygen levels, and data from other peripheral products (e.g. glucose meters for patients with diabetes)	Daily	CIGNA Medical Group healthcare registered nurse	Daily	Yes

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Author (year)	Main product(s) used	Clinical metrics collected and monitored (and additional information sent without the use of AT)	Transmission frequency	Who monitors the information sent	Frequency of monitoring	Alert or algorithm for monitors
		(Weekly prompts to answer a predetermined set of questions)				
Wong <i>et al.</i> (2024) [98]	AliveCor Kardia handheld mobile single-lead ECG device	Heart rhythm/ECG (No additional information reported)	Once daily on weekdays	Trained research personnel/technicians, GP researcher, and cardiologist	Unclear, but appears to be daily on weekdays	Yes, for algorithm
Zoellick <i>et al.</i> (2025) [99]	Ambient assisted living integrated home-based emergency call system consisting of a base station, eight motion sensors for the home, and a home emergency call system necklace with an accelerometer and an emergency button pendant	Fall data from the sensors, the emergency button pendant, and emergency calls from the base station (No additional information reported)	Automatic transmission unless the patient uses the button or base station to make an emergency call or contact the social services provider	Social service providers	Daily	Yes

*Ellins *et al.* (2023) is an extended follow-up study of the patients in Halcox *et al.* (2017). There was no active remote monitoring in Ellins *et al.* (2023) past the 12-month monitoring period in Halcox *et al.* (2017).

[†]Gellis *et al.* (2012) and Gellis *et al.* (2014) reported on the same study. This table provides information based on both papers for completeness. We have therefore noted in this table in relation to healthcare population that, in addition to having a diagnosis of heart failure or COPD, Gellis *et al.* (2014) added the specifier that the study population had screened positively for depression.

[‡]Persell *et al.* (2023), Persell *et al.* (2024), Petito *et al.* (2023a), and Petito *et al.* (2023b) report on the same clinics and participants. The paper by Persell *et al.* (2024) provides a longer-term 18-month follow-up for the two pilot studies that were conducted at six primary care practices by Petito *et al.* (2023a) and Persell *et al.* (2023). Petito *et al.* (2023b), meanwhile, was a comparison of the same patients with propensity-score-matched controls from those same clinics. No outcome data for any of these four papers could be included in this review because outcome data for those who initiated remote patient monitoring (RPM) interventions were not compared with controls. Instead, the focus for reporting was on patients in practices who had the potential to be prescribed RPM. It is assumed that Persell *et al.* (2023) had the same matching ratio of 4:1 or 2:1 for controls based on referencing of Petito *et al.* (2023b).

[§]All sample participants are aged 65 years and over unless otherwise noted.

3.3.2 Cost-effectiveness studies

We identified five papers that assessed the cost-effectiveness of remotely monitored AT for older community-dwelling adults in four Organisation for Economic Co-operation and Development (OECD) member countries (Canada, the Netherlands, Norway, and the USA) [101–105]. An overview of study characteristics is provided in Table 7.

Publication dates ranged from 2009 to 2022. One study was a trial-based economic evaluation [103], while the rest were modelling studies [101,102,104,105]. Three studies were cost-utility studies [101–103], one was a cost-consequence analysis [104], and one contained both a cost-utility and cost-benefit analysis [105]. Outcomes across studies varied including per patient per year savings [104], quality-adjusted life years (QALYs) [101–103,105] and incremental cost-effectiveness ratios (ICER) [101–103,105]. Two were from societal perspectives [101,104], one was from a Dutch third-party payer perspective [102], one was from a Canadian payer perspective [103], and one was from both a USA federal payer perspective and a societal perspective [105]. Two studies focused on those with (chronic) heart failure [101,102], one study focused on older adults mild to severe functional impairment (e.g. dementia, physical disabilities, or age-related decline) [104], one focused on older adults (aged 80 years and over) with hypertension [103], and one focused on those who were at high risk of choroidal neovascularisation (CNV), a condition where abnormal blood vessels in the retina can distort or damage vision, leading to vision loss [105]. Some studies compared remotely monitored AT with more than one comparator group (e.g. both usual care and alternate care).

Comparator groups were mainly composed of participants who received usual or standard care (no intervention) [102–105] or enhanced usual care (e.g. with an individualised written pharmacological treatment management plan) [101]. Some studies also compared remotely monitored AT with alternative monitoring, such as home telemonitoring (HTM) only without a diagnostic algorithm [101], nursing telephone support [102], or nursing home or facility-based care [104].

Table 7: Characteristics of included full economic evaluations

Author (year)	Country and perspective	Study design (model type)	Healthcare population*	Intervention product(s)	Intervention versus comparator	Time horizon
Albuquerque de Almeida <i>et al.</i> (2022) [101]	The Netherlands Societal perspective	Cost-utility analysis (discrete event simulation model)	Heart failure	Low-profile electronic weighing scales, an automated sphygmomanometer (to measure BP), and a single-lead ECG using wristband electrodes	HTM plus a diagnostic algorithm versus HTM or enhanced usual care with an individualised written pharmacological treatment management plan	Lifetime
Grustam <i>et al.</i> (2018) [102]	The Netherlands Dutch third-party payer perspective	Cost-utility analysis (Markov)	Chronic heart failure (aged 70 years and over)	Weight scales, BP and pulse monitor, ECG/rhythm strip recorder, and a home hub (for transferring data) (Philips)	HTM versus nurse telephone support or usual care	20 years
McIntyre <i>et al.</i> (2020) [103]	Canada Canadian payer perspective	Cost-utility analysis (Markov)	Hypertension (aged 80 years and over)	Single-lead device with automatic AF detection (Vitaphone 3100)	Continuous non-invasive ECG monitoring versus no screening	Lifetime
Norut Tromsø <i>et al.</i> (2009) [104]	Norway Societal perspective	Cost-consequence analysis (not specified)	Elderly users of home care services who live at home with mild, moderate, or severe functional impairment such as dementia, physical disabilities, or age-related decline	A smart home technology package, which may include a safety alarm; fall sensor; smoke, fire, and heat detectors; and a door sensor	Smart home technology versus living at home without smart home technology or living in an institution/nursing home	1 year
Wittenborn <i>et al.</i> (2017) [105]	USA USA federal payer perspective (cost-utility analysis) Societal perspective (cost-benefit analysis)	Cost-utility and cost-benefit analysis (Markov)	At high risk for CNV (individuals with high bilateral risk of CNV and those who already have CNV in a single eye (CNV1)) (aged 65 years and over)	ForeseeHome home-based visual-field monitoring system (Notal Vision Ltd)	Home-based daily monitoring versus usual care	Lifetime

*All sample participants were aged 65 years and over unless otherwise noted.

3.3.2.1 Study interventions

The five full economic evaluation papers evaluated five different AT packages. An overview of the evaluated products is provided in Table 8. The products were generalised or tailored to each condition, ranging from smart home technology which included sensors for general movement, falls, and location [104], to packages that included weight scales, BP monitors, ECG wristbands, or strip recorders for monitoring weight, BP, and heart rate and rhythm for heart failure [101,102]. There were also single-metric focused products, such as a single-lead device (Vitaphone 3100) for automatic AF detection in older adults (aged 80 years and over) with hypertension [103], or the ForseeHome home-based visual-field detection monitoring system to help detect changes in the eye's visual field for those at high risk of CNV [105].

Data were transmitted twice daily [101,102], daily [105], or continuously via sensors or wristbands [103,104]. Data were sent to and monitored by central monitoring centres or services [103–105] or by nurses [101,102]. The frequency of monitoring, where reported, was twice daily, daily, or passive. For all five studies, an alert or algorithm was present for monitors. Detailed product information was often lacking due to poor reporting, and additional information was sought from linked publications where possible [108,109].

Table 8: Characteristics of remotely monitored AT intervention details within included full economic evaluations

Author (year)	Main product(s) used	Clinical metrics collected and monitored	Transmission frequency	Who monitors the information sent	Frequency of monitoring	Alert or algorithm for monitors
Norut Tromsø <i>et al.</i> (2009) [104]	A smart home technology package, which may include a safety alarm; fall sensor; smoke, fire, and heat detectors; and a door sensor	Falls, movement, and location, as various sensors trigger an alarm	Continuous	Home care service	Not reported	Yes
Albuquerque de Almeida <i>et al.</i> (2022) [101]	Low-profile, electronic, weighing scales, an automated sphygmomanometer (to measure BP), and a single-lead ECG using wrist-band electrodes. Based on a cited paper which previously described the intervention product these were provided by Philips [108].	Patient self-measurement of weight, BP, and heart rate and rhythm	Twice daily	Study nurses for triage and a primary care physician for additional consultation	Twice daily	Yes (daily alarms)
Grustam <i>et al.</i> (2018) [102]	Weight scales, BP and pulse monitor, ECG/rhythm strip recorder, and a home hub (for transferring data) (Philips)	Weight, BP, and heart rate and rhythm	Twice daily	Nurses	Twice daily	Yes
McIntyre <i>et al.</i> (2020) [103]	Single-lead device with automatic AF detection (Vitaphone 3100)	Heart rhythm	Continuous (for 30 days)	Centralised service with adjudication by an arrhythmia expert	Not reported	Yes
Wittenborn <i>et al.</i> (2017) [105]	ForeseeHome home-based visual-field monitoring system (Notal Vision Ltd)	Visual-field monitoring	Daily	Central data monitoring centre	Daily	Yes

3.4 Risk of bias assessments of included healthcare utilisation studies

3.4.1 Randomised controlled trials

We used the Cochrane Risk of Bias 2 (RoB 2) tool for randomised controlled trials (RCTs) in order to assess the risk of bias in 43 outcomes reported across the 14 included RCTs [80–87,93–98,100]. Two papers reported on the same RCT, so we only assessed these outcomes once [82,83]. No risk of bias assessment was conducted for eight outcomes from six of the RCTs, as the data were either not reported on or were insufficiently reported for these outcomes (e.g. no effect estimates were given or only a measure of significance value was reported) [81,85,86,95,98,100]. Within each relevant outcome section, missing outcome data will be reported when describing the included studies and in the summary of findings tables. Figure 6 provides an overall summary of the risk of bias assessment by each domain. Guidance on interpreting these assessments is outlined in Section 2.5.1.

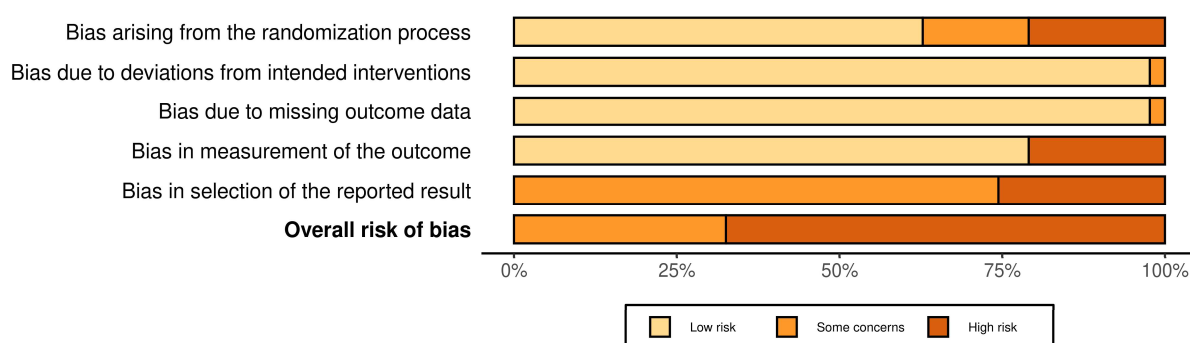


Figure 6: Overall summary of risk of bias assessment for RCTs using the RoB 2 tool

Bias in the selection of the reported results was the most common area of concern across studies, followed by bias arising from the randomisation process and bias in the measurement of the outcome. The overall risk of bias was scored as 'high risk of bias' for 29 outcomes and 'some concerns' for 14 outcomes, with no outcomes achieving an overall score of 'low risk of bias'. A full account of the RoB 2 assessments for RCTs is provided in Appendix G.

3.4.2 Non-randomised studies of interventions

We used the Risk Of Bias In Non-Randomized Studies - of Interventions (ROBINS-I) V2 tool in order to assess the risk of bias in 13 outcomes reported across 2 non-randomised studies of interventions (NRSIs) [88,99]. There were 4 additional NRSIs (I S. Persell et al. 2024; S. D. Persell et al. 2023; Petito, Anthony Lauren, Peprah Yaw, et al. 2023; Petito, Anthony Lauren, Peprah Yaw Amofa, et al. 2023) that had 18 outcomes without effect estimates reported for the samples that we were interested in (i.e. community-dwelling older adults who initiated and used RPM), so no ROBINS-I assessments were performed for these outcomes due to this lack of reported effect estimates. Within each relevant outcome section, missing outcome data are included in the narrative synthesis and summary of findings tables. Figure 7 provides an overall summary of the risk of bias assessment for each domain. Guidance on interpreting these assessments is outlined in Section 2.5.1.

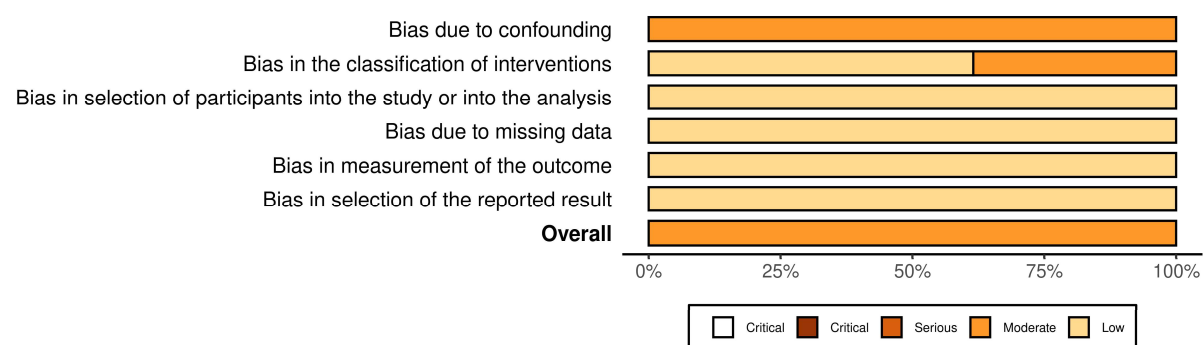


Figure 7: Overall summary of risk of bias assessment for NRSIs using the ROBINS-I V2 tool

Bias due to confounding and bias in the classification of interventions were the most common areas of concern across studies. The overall risk of bias was scored as ‘moderate risk of bias’ for all 13 outcomes, with no outcomes scored as being at ‘critical risk of bias’ or ‘low risk of bias’. A full account of the ROBINS-I V2 risk of bias assessments is provided in Appendix I.

3.5 Methodological quality of included economic studies

We used the Philips checklist [66] in order to assess the quality of four modelling studies [101,102,104,105], and the Consensus Health Economic Criteria (CHEC) list [110] in order to assess one trial-based economic evaluation [103]. One of the four modelling studies [101] was assessed only in relation to its subgroup analysis of adults aged 65 years and over. It was assumed in assessing this study that the researchers applied the same structural assumptions for the subgroup of adults aged 65 years and over as they did overall. These tools do not provide overall scores or figures, so summarised findings are provided in Section 3.8, and a full account of these assessments can be found in Appendix J and Appendix K.

3.6 Certainty of the evidence of included healthcare utilisation studies

Healthcare utilisation outcomes were assessed using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) tool [73] in order to assess the certainty of evidence. Nearly all evidence on the healthcare utilisation and provision outcomes was graded as being very low certainty. One outcome demonstrated low-certainty evidence, that remotely monitored AT results in an increase in urgent care visits (incidence rate ratio: 1.6). Two outcomes, days at home and primary care encounters, demonstrated moderate-certainty evidence that remotely monitored AT results in a small increase in the number of days at home (mean difference: 3.4 more days at home) and fewer primary care encounters (mean difference: 0.4 fewer visits) among a general population of older adults. GRADE evidence profiles are provided in Appendix O.

3.7 Healthcare utilisation results

Twenty studies [80–100] reported 56 healthcare utilisation outcomes, which we have largely grouped into the following broader-level healthcare utilisation outcomes: emergency department visits; hospitalisations (including length of stay); admissions to long-term care; outpatient visits (including primary care visits, specialist visits, same-day surgery days, and urgent care visits); days at home and home care episodes; access to diagnosis; and other assorted healthcare utilisation outcomes.

Forty-three outcomes were reported from the 14 included RCTs, while 13 outcomes were reported across 2 NRSIs [88,99]. The remaining four studies [89–92] did not provide outcome data that we could use, as

they did not report clear outcome data on those who initiated the use of remotely monitored AT, only data on those who were prescribed to use it.

We conducted a feasibility assessment for all outcomes and found that outcomes related to ED visits and hospitalisations were reported in such a way that they could be combined in a meta-analysis. The rest of the outcomes are presented narratively in text only. The results of the feasibility analysis are presented in Appendix P.

3.7.1 ED visits

3.7.1.1 Summary of included studies

Ten studies reported on 11 outcomes related to ED utilisation [80,82,83,85,86,88,93,96–98]. Nine studies were RCTs and included 10 outcomes (1 of which was measured at 2 time points), while 1 study was an NRSI [88] and included 1 outcome. The certainty of the evidence for all outcomes was very low. GRADE evidence profiles are available in Appendix O.

Five studies investigated remotely monitored AT in heart failure [80,85,86,93,97]: one was in a mixed population of those with heart failure and those with chronic obstructive pulmonary disease (COPD) [82,83], one was in those at high risk of AF [98], one was in those with at least two chronic diseases [95], one was in older adults who are frail [96], and one was in older adults (aged 65 years and over) [88]. Time points of assessment ranged from 60 days to 12 months. A summary of these studies can be found in Table 9.

Table 9: Summary of studies investigating the impact of remotely monitored AT on ED visits

Healthcare population (author, year)	Outcomes [‡]	Product(s)	Clinical (and additional) metrics collected
RCTs			
Heart failure (Dansky <i>et al.</i> , 2008) [80]	Total ED visits (at 60 days)	One-way system (monitor only): HomMed Health Monitor or the ViTel Net system)	One-way system (monitor only): BP, pulse, and weight
	Total ED visits (at 120 days)	Two-way system (monitor and video): Aviva	Two-way system (monitor and video): vital signs, blood sugar, or pulse oximetry readings (collected as ordered by the physician); nurse also listened to heart and lungs via digital stethoscope (Symptoms of heart failure related to sodium and fluid intake, medication effectiveness, and physical activity via Omaha System Problem Rating Scale for Outcomes for both systems)
Heart failure or COPD (Gellis <i>et al.</i> , 2012; 2014) [82,83]	ED visits (at 12 months)	HomMed Health Monitoring System (2011)	Heart rate, weight, BP, pulse, oxygen saturation, and temperature (Modifiable (YES/NO) questions that were customised to the patient's condition)
Congestive heart failure	ED visits (at 6 months)	Viterion 500® telehealth system	

Healthcare population (author, year)	Outcomes [‡]	Product(s)	Clinical (and additional) metrics collected
(Lehmann <i>et al.</i> , 2006) [85]			BP, pulse rate, weight, and oxygen saturation/blood oxygen level (Sleep, tiredness, breathing, and swelling)
Heart failure (Olivari <i>et al.</i> , 2018) [86]	Patients with at least one urgent evaluation in ED (at 12 months)	Personal Health System, composed of a wearable Wrist Clinic device and a digital weight scale	Weight, BP, heart rate, 1-lead ECG, and pulse oximetry (No additional information reported)
Heart failure (Schwarz <i>et al.</i> , 2008) [93]	ED visits for heart failure (at 90 days)	Cardicom electronic health monitoring system (Cardicom, LLC, Chanhassen, Minnesota)	Weight (‘Yes’ or ‘no’ to questions about shortness of breath, cough, fatigue, swelling, chest discomfort, urination, exercise, dizziness, medication use, and sodium intake. BP, apical pulse, and oxygen saturation were also collected but not monitored.)
Older adults who are frail (Tchalla <i>et al.</i> , 2012) [96]	Cumulative incidence of post-fall admission to hospital emergency (department) for fall at home (at 12 months)	Light path, remote intercom, and electronic bracelet (with a medallion and dialler with a long-life lithium battery)	Risk of falling or fall (Verbal reports of falls collected via regular monthly telephone contact with all participants)
Those with at least two chronic diseases (Tchalla <i>et al.</i> , 2025) [95]	Proportion of emergency admissions/ED visits without hospitalisation (at 12 months)	e-GEROPASS software, a hub with seven external biometric sensors	BP, heart rate, body temperature, oximetry, capillary blood sugar, weight, and electrical activity of the heart (No additional information reported)
Heart failure (Tompkins and Orwat, 2010) [97]	ED visits (at 6 months)	Honeywell HomMed Sentry and Genesis monitors and proprietary Central Station software	Weight, BP, heart rate, blood oxygen levels, and data from other peripheral products (e.g. glucose meters for patients with diabetes) (Weekly prompts to answer a predetermined set of questions)
Those at high risk of AF (Wong <i>et al.</i> , 2024) [98]	A visit to the ED (at 6 months)	AliveCor Kardia handheld mobile single-lead ECG device	Heart rhythm/ECG (No additional information reported)
NRSIs			
Older adults (aged 65 years and over)	ED days (at 100 days)	An OdysseyGO personal alert device, with possible additions of a home medication dispenser (requested for 11.4% of	Location and movement (falls, lack of movement), missed medication dose, and SOS alerts (Low battery in any device)

Healthcare population (author, year)	Outcomes [‡]	Product(s)	Clinical (and additional) metrics collected
(Salahub <i>et al.</i> , 2025) [88]		participants) and/or passive home monitoring sensors (unknown what proportion of patients received/requested these)	

‡ No outcome data reported for items indicated in **bold**.

3.7.1.2 Risk of bias assessments

Nine RCTs [80,82,83,85,86,93,95–98] reported 10 ED outcomes that were at high risk of bias, 1 reported an ED outcome with some concerns for bias [97], and no studies had outcomes with a low risk of bias (Figure 8). One study [80] had two outcomes assessed at two different time points, but the same risk of bias assessment resulted, so that study is only shown once in Figure 8. A full list of risk of bias assessments for individual outcomes using the RoB 2 tool can be found in Appendix G.

		Risk of bias domains					
		D1	D2	D3	D4	D5	Overall
Study	Dansky et al. (2008)	+	+	+	+	X	X
	Gellis et al. (2012/2014)	X	+	+	+	-	X
	Lehmann et al. (2006)	X	+	+	+	-	X
	Olivari et al. (2018)	+	+	+	X	-	X
	Schwarz et al. (2008)	-	+	+	+	X	X
	Tchalla et al. (2012)	X	-	+	+	-	X
	Tchalla et al. (2025)	-	+	+	X	-	X
	Tompkins et al. (2010)	+	+	+	+	-	-
	Wong et al. (2024)	+	+	+	+	X	X

Domains:

D1: Bias arising from the randomization process.

D2: Bias due to deviations from intended intervention.

D3: Bias due to missing outcome data.

D4: Bias in measurement of the outcome.

D5: Bias in selection of the reported result.

Judgement

X

 High

-

 Some concerns

+

 Low

Figure 8: ED visits risk of bias assessment using the RoB 2 tool

One NRSI [88] reported on an ED outcome that had moderate concerns (

Figure 9). A full list of risk of bias assessments for individual outcomes using the ROBINS-I tool can be found in Appendix I.

		Risk of bias						
		D1	D2	D3	D4	D5	D6	Overall
Study	Salahub et al. (2025)							
	D1: Bias due to confounding D2: Bias in the classification of interventions D3: Bias in selection of participants into the study or into the analysis D4: Bias due to missing data D5: Bias in measurement of the outcome D6: Bias in selection of the reported result							
		Judgement						
		 Moderate						
		 Low						

Figure 9: ED visits risk of bias assessment using the ROBINS-I tool

3.7.1.3 Meta-analysis

ED visits were largely reported in two ways:

1. participants with at least one ED visit
2. the average or mean number of ED visits.

3.7.1.3.1 Participants with at least one ED visit

We pooled data from four RCTs [80,86,95,98] that reported on the effects of remotely monitored AT on ED visits as a dichotomous outcome (i.e. at least one ED visit versus no ED visits). One study reported outcomes at two time points [80], so we used the longer time point in our analysis. All outcomes were at high risk of bias, so we did not conduct a sensitivity analysis. Due to the small number of studies, we did not conduct subgroup analyses either.

The results of the pairwise random effects meta-analysis (Figure 10) indicate an odds ratio (OR) of 1.05 (95% confidence interval (CI): 0.48–2.27; I^2 : 84%; 4 papers) in favour of the usual care or enhanced usual care group (i.e. higher odds of having at least one ED visit in the comparator group versus the intervention group). The p -value ($p > 0.05$) and the wide CI, which crossed the line of no effect (OR=1), indicate that the effect estimate is not statistically significant (i.e. there was no statistically significant difference in the odds of ED visits between the remotely monitored AT intervention group and the usual care or enhanced usual care groups). The high I^2 value of 84% indicated substantial heterogeneity between the studies. It is worth noting that these studies were conducted in different populations, with two involving those with heart failure [80,86] and the other two having a mixed population of those at high risk of AF and those with multiple chronic diseases [95,98].

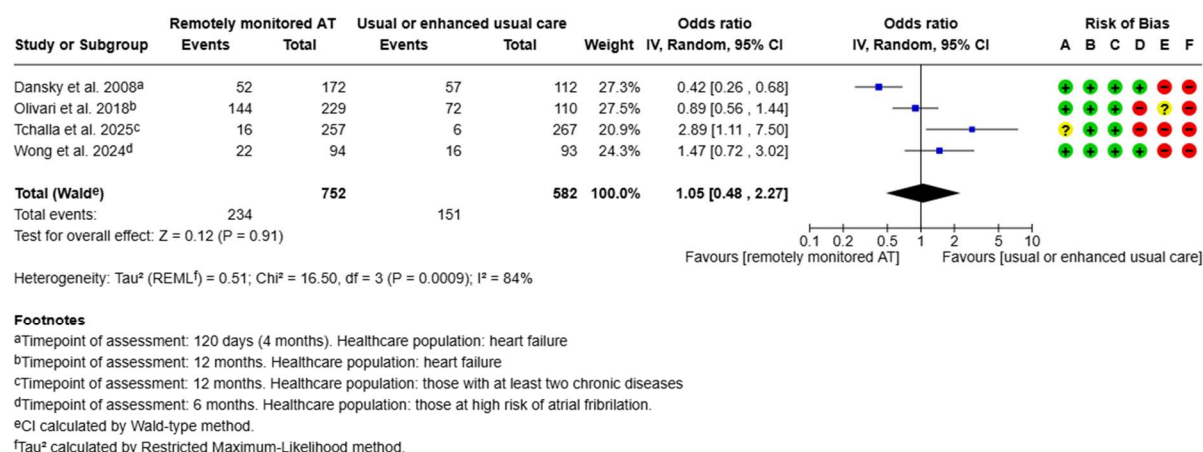


Figure 10: Meta-analysis forest plot for one or more ED visits

3.7.1.3.2 Average number of ED visits

We pooled data from three RCTs [80,82,93] that reported on the average number of ED visits. All were at high risk of bias, so we did not conduct a sensitivity analysis, and due to the small number of studies, we did not conduct subgroup analyses either.

The results of the pairwise random effects meta-analysis (Figure 11) for average number of ED visits indicate a standardised mean difference (SMD) of -0.24 (95% CI: -0.50 to 0.01; I^2 : 37%; 3 papers) in favour of the remotely monitored AT group. Taken together, the wide CI (which crossed the line of no effect (SMD=0)) and the p -value of >0.05 indicate no statistically significant difference between the remotely monitored intervention group and the control groups. The I^2 value of 37% indicates moderate heterogeneity between studies. Notably, these studies were conducted in similar populations, with two involving those with heart failure [80,93] and the third having a mixed population of those with heart failure and those with COPD [82,83].

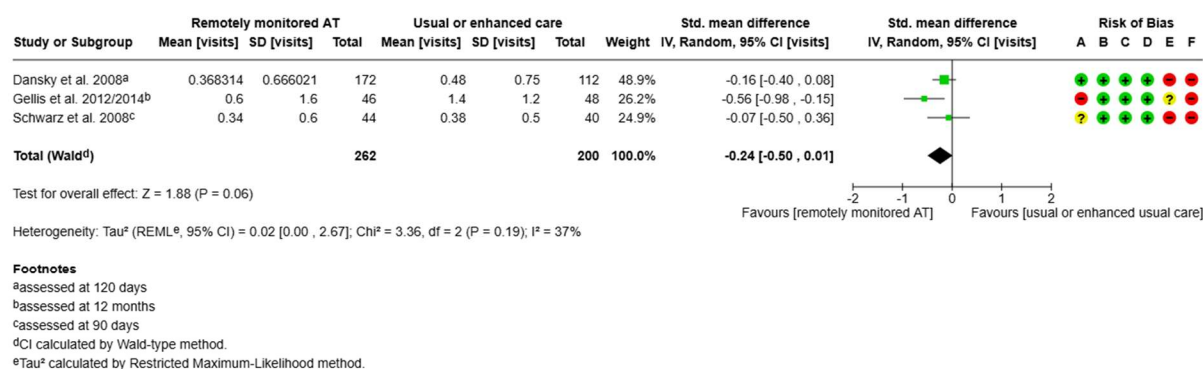


Figure 11: Meta-analysis forest plot for average number of ED visits

3.7.1.4 Narrative synthesis

Four studies could not be pooled into our meta-analyses [85,88,96,97].

One RCT was conducted with older adults who were frail and reported on post-fall admissions to the ED for falls at home at 12 months [96]. The adjusted OR of 0.32 (95% CI: 0.14–0.73) indicated that the odds of post-fall admission to the ED were statistically significantly lower in the remotely monitored AT group when compared with the usual care group. This outcome had a high risk of bias. Overall, this RCT provided very low-certainty evidence that remotely monitored AT may reduce ED visits when compared with the usual care group.

One RCT was conducted with older adults with heart failure and reported on ED visits at 6 months [97]. An adjusted incidence rate ratio of 0.94 indicated fewer visits in the remotely monitored AT group when compared with the usual care group, but this result was not statistically significant ($p>0.10$) and no CI was reported. This outcome had some concerns for bias. There was very low-certainty evidence that there was no difference between the remotely monitored AT group and the usual care group.

One RCT was conducted with older adults with congestive heart failure and reported on ED visits at 6 months [85]. Six ED visits were reported in the enhanced usual care comparator group who had limited phone reporting of weight, while four ED visits were reported in the remotely monitored AT group, although it was not clear whether this was a per-patient (i.e. dichotomous, patients with at least one ED visit) or continuous (i.e. total number of ED visits) metric. This outcome had a high risk of bias. There was very low-certainty evidence that there was no difference between the remotely monitored AT group and the comparator group, which had limited phone reporting of weight.

One NRSI was conducted with older adults (aged 65 years and over) and reported number of ED days at a follow-up of 100 days [88]. The remotely monitored AT group had a mean difference of 0.01 fewer visits than the usual care (home care) group, but the CI indicated that the difference was not statistically significant as it crossed 0, spanning from a mean difference of 0.03 fewer visits to 0.02 more visits. The outcome had a moderate risk of bias. Overall, there was very low-certainty evidence that there was no difference between the remotely monitored AT group and the usual care (home care) group.

3.7.1.5 Summary of findings

The summary of findings table provides an overview of the available information on ED visits (Table 10). The table contains information on the magnitude of relative and absolute effects, as well as the quality or certainty of the body of evidence for each individual outcome, which were assessed using the GRADE system. Guidance on interpreting these assessments is outlined in Section 2.7.

Across the 10 studies [80,82,83,85,86,88,93,96–98] reporting outcome data related to ED visits, the certainty of evidence is very low. Nine studies indicated that the evidence is very uncertain about the effect of remotely monitored AT on ED visits. One RCT [96], meanwhile, found that remotely monitored AT may reduce post-fall admissions to the ED when compared with the usual care group, but the certainty of evidence was still very low.

Table 10: Summary of findings for ED visits

Summary of findings for the effect of remotely monitored AT on ED visits**Patient or population group:** Community-dwelling older adults (aged 65 years and over)**Setting:** OECD member countries**Intervention:** Remotely monitored AT**Comparison:** Usual care (or enhanced usual care)

Outcome and follow-up time point	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	Number of participants (number of studies)	Certainty of the evidence (GRADE)	Comments
	Risk with comparator (usual care or enhanced usual care)	Risk with remotely monitored AT				
At least one ED visit [80,86,95,98] Follow-up: 4–12 months	26 per 100	27 per 100 (14 per 100–44 per 100)	OR: 1.05 (95% CI: 0.48–2.27)	1334 (4 RCTs)	⊕○○○ Very low ^{a,b,c,d}	The evidence is very uncertain about the direction of the effect of remotely monitored AT on ED visits.
Post-fall admission to ED for falls at home [96] Follow-up: 12 months	The adjusted OR of 0.32 and 95% CI of 0.14–0.73 indicated statistically significantly reduced odds of post-fall admission to the ED in the remotely monitored AT group when compared with the usual care group.			190 (1 RCT)	⊕○○○ Very low ^{d,e,f}	Remotely monitored AT may reduce post-fall admission to ED for falls at home, but the evidence is very uncertain.
Average number of ED visits [80,82,83,93] Follow-up: 90 days to 12 months	-	SMD: 0.24 lower (0.5 fewer visits to 0.01 more visits)	-	462 (3 RCTs)	⊕○○○ Very low ^{d,e,g}	The evidence is very uncertain about the direction of the effect of remotely monitored AT on the average number of ED visits.
ED visits [85,97] Follow-up: 6 months	Tompkins and Orwat (2010) reported an adjusted incidence rate ratio of 0.94 for ED visits, but it was not significant ($p>0.1$). Lehmann <i>et al.</i> (2006) reported four ED visits in the enhanced usual care control group and six ED visits in the intervention group ($p=0.377$).			430 (2 RCTs)	⊕○○○ Very low ^{d,h,i}	The evidence is very uncertain about the direction of the effect of remotely monitored AT on ED visits.
ED visits [88] Follow-up: 100 days	Salahub <i>et al.</i> (2025) reported a mean difference of 0.01 fewer visits in the remotely monitored AT group than the usual care (home care) group, but the CI spanned from a mean difference of 0.03 fewer visits to 0.02 more visits.			2988 (1 NRSI)	⊕○○○ Very low ^{d,j}	The evidence is very uncertain about the direction of the effect of remotely monitored AT on ED visits.

Outcome and follow-up time point	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	Number of participants (number of studies)	Certainty of the evidence (GRADE)	Comments
	Risk with comparator (usual care or enhanced usual care)	Risk with remotely monitored AT				

* **The risk in the intervention group** (and its 95% CI) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

GRADE Working Group grades of evidence

High certainty: We are very confident that the true effect lies close to that of the estimate of the effect.

Moderate certainty: We are moderately confident in the effect estimate; the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.

Low certainty: Our confidence in the effect estimate is limited; the true effect may be substantially different from the estimate of the effect.

Very low certainty: We have very little confidence in the effect estimate; the true effect is likely to be substantially different from the estimate of the effect.

Explanations

- All outcomes had a high risk of bias overall, and multiple domains had a high risk of bias.
- Minimal overlap of CIs.
- Most CIs are not very wide, but they do cross the threshold of no effect.
- Fewer than 10 studies; no formal assessment of publication bias (e.g. Egger's test) could be performed.
- All outcomes had a high risk of bias.
- Small sample size and number of events.
- Wide CI, which includes both benefit and harm.
- Lehmann *et al.* (2006) had a high risk of bias. Tompkins and Orwat (2010) had some concerns for bias.
- No CI reported for Tompkins and Orwat (2010). Low number of events and sample size.
- CI crosses the threshold of no effect, including both benefit and harm. Only one study.

3.7.2 Hospitalisations

3.7.2.1 Summary of included studies

Twelve studies reported on 22 outcomes related to hospitalisations [80–83,85–88,93,95,97,99,100]. Nine RCTs and 1 NRSI included 12 hospitalisation outcomes (1 study was measured at 2 time points) [80,81,85–87,93,95,97,99,100], while 7 RCTs included 10 length of stay outcomes [81–83,86,87,93,95,97]. Three studies did not report outcome data on hospital admissions for venous thromboembolism [100], the number of hospital days due to all causes [81], and the number of days of hospitalisation [95]. The certainty of evidence for all outcomes was very low. GRADE evidence profiles are available in Appendix O.

Six studies investigated remotely monitored AT in patients with heart failure [80,81,85,86,93,97]; two reported on older adults aged 65 years and over [88] and 75 years and over [99]; one reported on older adults with at least two chronic diseases [95]; one reported on those at risk of stroke [100]; one reported on those with COPD [85]; and one reported on a mixed population of those with heart failure and those with COPD [82,83]. Time points of assessment ranged from 60 days to a median of 4.2 years. A summary of the studies can be found in Table 11.

Table 11: Summary of studies investigating the impact of remotely monitored AT on hospitalisations and length of stay

Healthcare population (author, year)	Outcomes [‡]	Product(s)	Clinical (and additional) metrics collected
RCTs			
Chronic heart failure (Biannic <i>et al.</i> , 2012) [81]	Readmission rate (at 3 months) Days of hospitalisation (due to acute cardiac events) (at 3 months) Days of hospitalisation due to all causes (at 3 months)	SCAD (suivi clinique à domicile; home-based clinical follow-up) dedicated touch screen patient terminal	Weight, BP, and pulse (Shortness of breath, oedema, medication, diet, and physical exercise)
Heart failure (Dansky <i>et al.</i> , 2008) [80]	Hospitalisation (at 60 days) Hospitalisation (at 120 days)	One-way system (monitor only): HomMed Health Monitor or the ViTel Net system Two-way system (monitor and video): Aviva	One-way system: BP, pulse, and weight Two-way system: vital signs, blood sugar, or pulse oximetry readings (collected as ordered by the physician); nurse also listened to heart and lungs via digital stethoscope (Symptoms of heart failure related to sodium and fluid intake, medication effectiveness, and physical activity via the Omaha System Problem Rating Scale for Outcomes for both systems)
Those at risk of stroke (Ellins, 2023) [100]	Hospital admissions for acute coronary syndrome (at a median of 4.2 years) Hospital admissions for bleeds (at a median of 4.2 years) Hospital admissions for venous thromboembolism (at a median of 4.2 years)	AliveCor Kardia intracardiac electrocardiogram (iECG) version 2.2.0 (build 21)	Twice-weekly recording of a 30-second single-lead iECG trace for 12 months (see Halcox <i>et al.</i> (2017) for further details) (No additional information reported)
Heart failure or COPD (Gellis <i>et al.</i> , 2012; 2014) [82,83]	Hospital days/days of rehospitalisation (at 12 months)	HomeMed Health Monitoring System (2011)	Heart rate, weight, BP, pulse, oxygen saturation, and temperature (Modifiable (YES/NO) questions that were customised to the patient's condition)
Congestive heart failure (Lehmann <i>et al.</i> , 2006) [85]	Hospital admissions (at 6 months)	Viterion 500® telehealth system containing a wireless BP monitoring system, a weight scale, and a 1% oxygen saturation monitor	BP, pulse rate, weight, and oxygen saturation/blood oxygen level (Sleep, tiredness, breathing, and swelling)
Heart failure (Olivari <i>et al.</i> , 2018) [86]	Duration of hospital admissions (all-cause) (days) (at 12 months)	Personal Health System, composed of a wearable Wrist	Weight, BP, heart rate, 1-lead ECG, and pulse oximetry (No additional information reported)

Healthcare population (author, year)	Outcomes [‡]	Product(s)	Clinical (and additional) metrics collected
	At least one all-cause hospital admission (at 12 months)	Clinic device and a digital weight scale	
	All-cause hospital admissions (at 12 months)		
	Duration of hospital admissions for heart failure (days) (at 12 months)		
	Hospital admissions for heart failure (at 12 months)		
COPD (Pedone <i>et al.</i> , 2013) [87]	Hospital admissions related to respiratory exacerbations (at 9 months)	SweetAge monitoring system including a wristband, a commercial pulse oximeter, and a commercial cellular telephone	Oxygen saturation, heart rate, near-body temperature, and galvanic skin response
	Length of stay (hospitalisations related to respiratory exacerbations) (at 9 months)		(Physical activity)
Heart failure (Schwarz <i>et al.</i> , 2008) [93]	Unplanned hospital readmission for heart failure symptoms (at 90 days)	Cardiocom electronic health monitoring system (Cardiocom, LLC, Chanhassen, Minnesota)	Weight (‘Yes’ or ‘no’ to questions about shortness of breath, cough, fatigue, swelling, chest discomfort, urination, exercise, dizziness, medication use, and sodium intake. BP, apical pulse, and oxygen saturation assessed at baseline and 3 months.)
Two or more chronic diseases (Tchalla <i>et al.</i> , 2025) [95]	Unplanned rehospitalisations/cumulative incidence of rehospitalisations for functional decompensation (at 12 months)	e-GEROPASS software, a hub with seven external biometric sensors	BP, heart rate, body temperature, oximetry, capillary blood sugar, weight, and electrical activity of the heart (No additional information reported)
	Number of days of hospitalisation (at 12 months)		
Heart failure (Tompkins and Orwat, 2010) [97]	Hospital admissions (at 6 months)	Honeywell HomMed Sentry and Genesis monitors and proprietary Central Station software	Weight, BP, heart rate, blood oxygen levels, and data from other peripheral devices (e.g. glucose meters for patients with diabetes)
	Hospital days (at 6 months)		(Weekly prompts to answer a predetermined set of questions)
	Hospital average length of stay (average acute days per hospital admission) (at 6 months)		
NRSIs			
Older adults (aged 65 years and over) (Salahub <i>et al.</i> , 2025) [88]	Hospitalisation days (at 100 days)	An OdysseyGO personal alert device, with possible additions of a home medication dispenser	Location and movement (falls, lack of movement), missed medication dose, and SOS alerts (Low battery in any device)

Healthcare population (author, year)	Outcomes [‡]	Product(s)	Clinical (and additional) metrics collected
		(requested for 11.4% of participants) and/or passive home monitoring sensors (unknown what proportion of patients received/requested these)	
Older adults (aged 75 years and over) (Zoellick <i>et al.</i> , 2025) [99]	Number of hospitalisations (at 12 months) Duration of hospitalisations (days) (at 12 months)	Ambient assisted living integrated home-based emergency call system consisting of a base station, eight motion sensors for the home, and a home emergency call system necklace with an accelerometer and an emergency button pendant	Fall data from the sensors, the emergency button pendant, and emergency calls from the base station (No additional information reported)

‡ No outcome data reported for items indicated in **bold**.

3.7.2.2 Risk of bias assessments

There were 10 RCTs that reported hospitalisation and length of stay outcomes [80–83,85–87,93,95,97,100]. Six RCTs reported outcomes that were at high risk of bias, four reported outcomes with some concerns for bias, and no studies had outcomes with a low risk of bias (

Figure 12). Five studies had multiple outcomes related to hospitalisation (e.g. length of stay and admissions) (see Table 11), but the same risk of bias assessment resulted, so each study is only shown once in

Figure 12. A full list of risk of bias assessments for individual outcomes using the RoB 2 tool can be found in Appendix G.

		Risk of bias domains					
		D1	D2	D3	D4	D5	Overall
Study	Biannic et al. (2012)	+	+	+	+	-	-
	Dansky et al. (2008)	+	+	+	+	X	X
	Ellins et al. (2023)	+	+	+	+	-	-
	Gellis et al. (2012/2014)	X	+	-	+	-	X
	Lehmann et al. (2006)	X	+	+	+	-	X
	Olivari et al. (2018)	+	+	+	X	-	X
	Pedone et al. (2013)	-	+	+	+	-	-
	Schwarz et al. (2008)	-	+	+	+	X	X
	Tchalla et al. (2025)	-	+	+	X	-	X
	Tompkins et al. (2010)	+	+	+	+	-	-

Domains:
D1: Bias arising from the randomization process.
D2: Bias due to deviations from intended intervention.
D3: Bias due to missing outcome data.
D4: Bias in measurement of the outcome.
D5: Bias in selection of the reported result.

Judgement
X High
- Some concerns
+ Low

Figure 12: Hospitalisation risk of bias assessment using the RoB 2 tool

Two NRSIs [88,99] reported three hospitalisation outcomes that had moderate concerns. Zoellick *et al.* had two outcomes related to hospitalisation (length of stay and number of admissions) (see Table 11), but the same risk of bias assessment resulted, so it is only shown once in

Figure 13. There were no outcomes with a serious or low risk of bias (

Figure 13). A full list of risk of bias assessments for individual outcomes using the ROBINS-I tool can be found in Appendix I.

		Risk of bias						
		D1	D2	D3	D4	D5	D6	Overall
Study	Salahub et al. (2025)							
	Zoellick et al. (2025)							

D1: Bias due to confounding

D2: Bias in the classification of interventions

D3: Bias in selection of participants into the study or into the analysis

D4: Bias due to missing data

D5: Bias in measurement of the outcome

D6: Bias in selection of the reported result

Judgement

 Moderate

 Low

Figure 13: Hospitalisation risk of bias assessment using the ROBINS-I tool

3.7.2.3 Meta-analysis

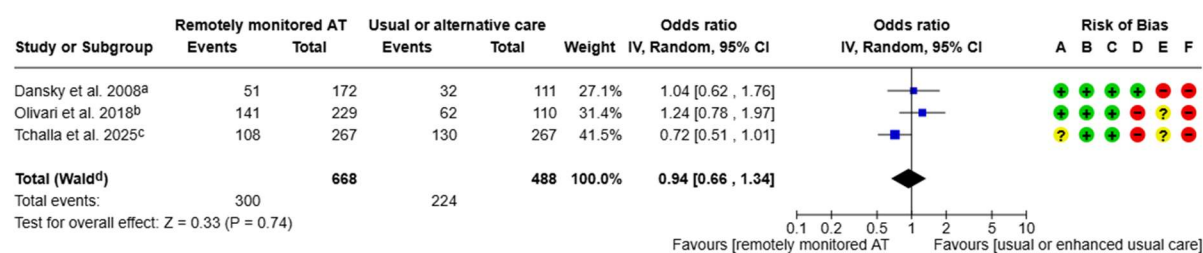
Hospitalisations were largely reported in two ways:

1. the number of hospitalisations
2. the duration or length of stay of hospitalisations.

3.7.2.3.1 Participants with at least one hospital admission

We pooled data from three RCTs [80,86,95] that reported on patients with at least one hospitalisation. One study reported outcomes at two time points [80], so we used the longer time point in the analysis. All had a high risk of bias, so we did not conduct a sensitivity analysis, and due to the small number of studies, we did not conduct subgroup analyses.

The results of the pairwise random effects meta-analysis (Figure 14) indicated reduced odds of having at least one hospital admission in the remotely monitored AT group compared with the usual care or enhanced usual care group (OR: 0.94 (95% CI: 0.66–1.34), $p=0.74$). The p -value of >0.05 and the wide CI, which crossed the line of no effect (OR=1), indicate that the effect estimate is not statistically significant (i.e. there was no statistically significant difference between the remotely monitored AT intervention group and the usual care or enhanced usual care groups). The I^2 value of 49% indicates moderate heterogeneity between studies. Notably, these studies were conducted in similar populations, with two involving patients with heart failure [80,93] and the third having a mixed population of older adults with at least two chronic diseases [95].



Footnotes

- ^aTimepoint of assessment: 120 days. Healthcare population: heart failure
^bTimepoint of assessment: 12 months. Healthcare population: heart failure
^cTimepoint of assessment: 12 months. Healthcare population: chronic diseases
^dCI calculated by Wald-type method.
^eTau² calculated by Restricted Maximum-Likelihood method.

Risk of bias legend

- (A) Bias arising from the randomization process
 (B) Bias due to deviations from intended interventions
 (C) Bias due to missing outcome data
 (D) Bias in measurement of the outcome
 (E) Bias in selection of the reported result
 (F) Overall bias

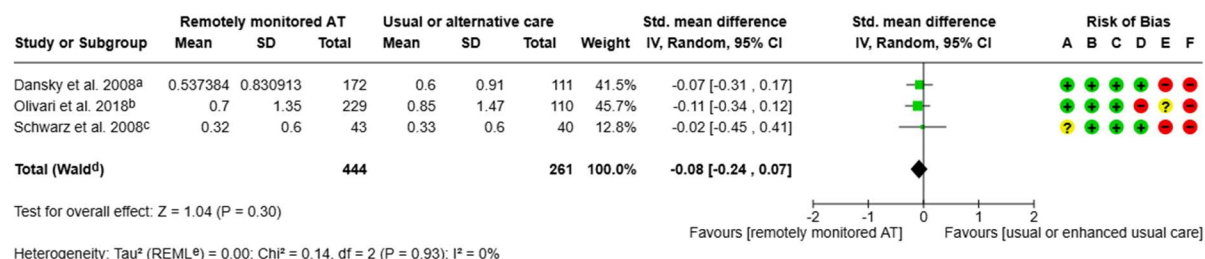
Figure 14: Meta-analysis forest plot for at least one hospital admission

3.7.2.3.2 Average number of hospital admissions

We pooled data from three RCTs [80,86,93] that reported on the effects of remotely monitored AT on the mean number of hospitalisations. One study reported outcomes at two time points [80], so we used the longer time point in the analysis. All outcomes had a high risk of bias, so we did not conduct a sensitivity analysis. Due to the small number of studies, we did not conduct subgroup analyses.

The results of the pairwise random effects meta-analysis (Figure 15) indicated a small reduction in the mean number of hospitalisations among people in the remotely monitored AT group compared with

those receiving usual care or enhanced usual care (SMD: -0.08 (95% CI: -0.24 to 0.07), $p=0.30$). Taken together, the wide CI (which crossed the line of no effect (SMD=0)) and the p -value of >0.05 indicate no statistically significant difference between the remotely monitored intervention group and the control groups. The I^2 value of 0% indicates negligible heterogeneity of importance between studies. Notably, these studies were conducted in similar populations, with all involving individuals with heart failure [80,86,93].



Footnotes

^aTimepoint of assessment: at 120 days

^bTimepoint of assessment: 12 months

^cTimepoint of assessment: 90 days

^dCI calculated by Wald-type method.

^e Tau^2 calculated by Restricted Maximum-Likelihood method.

Risk of bias legend

- (A) Bias arising from the randomization process
- (B) Bias due to deviations from intended interventions
- (C) Bias due to missing outcome data
- (D) Bias in measurement of the outcome
- (E) Bias in selection of the reported result
- (F) Overall bias

Figure 15: Meta-analysis forest plot for average number of hospital admissions

3.7.2.3.3 Length of stay

For the length of stay in hospital, only two studies reported outcomes in such a manner that they could be pooled for a meta-analysis [82,83,86], which did not meet our pre-specified criteria of at least three studies in order to conduct a meta-analysis. The other three studies reported data that either could not be combined due to missing data on variance (e.g. standard deviation or standard errors) [81,87] or could not be converted to a standardised format [97]. Two NRSIs [88,99] also reported on the length of stay, but there were not enough studies to pool these into their own meta-analysis, so they could not be combined in a meta-analysis. These are described narratively in Section 3.7.2.4.2.

3.7.2.4 Narrative synthesis

3.7.2.4.1 Hospitalisations

Six studies reported outcome data on hospitalisations for those in remotely monitored AT groups when compared with usual care or enhanced usual care, but could not be pooled into a meta-analysis [81,85,87,97,99,100]. One study did not report outcome data for hospital admissions for venous thromboembolism [100]. There was very low-certainty evidence across all reported outcomes for hospitalisations, meaning that the evidence is very uncertain about the effect of remotely monitored AT on hospitalisations.

One RCT conducted with older adults with chronic heart failure [81] reported a readmission rate of 16% and no difference between the remotely monitored AT group and the enhanced usual care comparator group, but no additional information was reported. The outcome had some concerns for bias.

Another RCT conducted with older adults with heart failure [97] reported on hospital admissions with an adjusted incidence rate ratio of 0.87, indicating a lower incidence in the remotely monitored AT group

when compared with the usual care group, but this was not statistically significant ($p>0.1$). The outcome had some concerns for bias.

One RCT conducted with older adults with congestive heart failure [85] reported on hospital admissions, with five admissions in the remotely monitored AT group and seven admissions in the enhanced usual care group; this difference in the number of admissions was not statistically significant ($p=0.3872$). The outcome had a high risk of bias.

One RCT conducted with older adults at risk of stroke [100] reported on hospital admissions for acute coronary syndrome and for bleeds separately. Ellins *et al.* (2023) reported adjusted hazard ratios of 0.45 (95% CI: 0.21–0.97; $p=0.044$) and 0.88 (95% CI: 0.53–1.35; p -value not reported), respectively, indicating a statistically significantly lower hazard of being hospitalised for acute coronary syndrome but no statistically significant difference in hospitalisations for bleeds for those in the remotely monitored AT group when compared with the usual care group. Both outcomes had some concerns for bias.

One RCT conducted with older adults with COPD [87] reported an incidence rate ratio of 0.66 (95% CI: 0.21–1.86; no p -value reported), indicating no statistically significant difference between the remotely monitored AT group and enhanced usual care group with regard to hospital admissions related to respiratory exacerbations. The outcome had some concerns for bias.

One NRSI conducted with older adults aged 75 years and over [99] reported on the number of hospitalisations. Zoellick *et al.* (2025) reported a mean of 0.8 hospitalisations (SD: 1.4) in the remotely monitored AT group compared with 0.6 hospitalisations (SD: 1.2) in the usual care group, and an incidence rate ratio of 1.23 (95% CI: 0.95–1.60) that was not statistically significant ($p=0.122$). The outcome had a moderate risk of bias.

3.7.2.4.2 Length of stay

Seven studies reported outcome data on the length of stay for those in remotely monitored AT groups when compared with usual care or enhanced usual care [81–83,86–88,97,99]. Five RCTs and two NRSIs reported on length of stay for hospitalisations but could not be pooled into a meta-analysis [81–83,86–88,97,99]. Two studies did not report the number of hospital days due to all causes [81] or the number of days of hospitalisation [95]. There was very low-certainty evidence across all reported outcomes for length of stay, meaning that the evidence is very uncertain about the effect of remotely monitored AT on the length of stay.

One RCT conducted with older adults with chronic heart failure [81] reported a not significant difference ($p=0.89$) of 97 days of hospitalisation due to acute cardiac events in the remotely monitored AT group compared with 98 days in the enhanced usual care group. It did not report outcome data on days of hospitalisation due to all causes despite reporting this as an outcome of interest. The days of hospitalisation due to acute cardiac events outcome had some concerns for bias.

Another RCT conducted with older adults with heart failure [86] reported a not statistically significant ($p=0.21$) mean difference of –3.33 days of hospitalisation due to all causes (95% CI: –8.5 to 1.9) in the remotely monitored AT group compared with the enhanced usual care group. For days of hospitalisation specifically due to heart failure, there was mean difference of –5.4 days (95% CI: –13.8 to 2.9) between the remotely monitored AT group and the enhanced usual care group, but this difference was not statistically significant ($p=0.2$). These outcomes had a high risk of bias.

A third RCT conducted with older adults with heart failure [97] reported both the number of days of hospitalisation and the average length of stay per hospital admission. There was no statistically significant difference ($p\geq 0.1$) in the average length of stay, with an adjusted incidence rate ratio of 0.85, but an adjusted incidence rate ratio of 0.73 was reported for days of hospitalisation ($p<0.01$), both indicating a

shorter length of stay for those in the remotely monitored AT group when compared with the usual care group. These outcomes had some concerns for bias.

One RCT conducted with a mixed population of older adults with heart failure or COPD [82,83] reported a mean of 7.5 (SD: 4.3) hospital days in the remotely monitored AT group compared with a mean of 10.5 (SD: 6.5) hospital days in the enhanced usual care group, but this difference was not statistically significant ($p=0.06$). This outcome had a high risk of bias.

One RCT conducted with older adults with COPD [87] reported an average length of stay due to respiratory exacerbations of 9.7 days in the remotely monitored AT group and 6.9 days in the enhanced usual care group, but no p -value was reported, so it is not known if this difference is statistically significant. This outcome had some concerns for bias.

Two NRSIs conducted with older adults aged 65 years and over [88] and aged 75 years and over [99] reported length of stay outcomes. Salahub *et al.* (2025) reported a mean of 3.3 days (SD: 10.6) in the remotely monitored AT group compared with 3.9 days (SD: 11.6) in the usual care group, with a mean difference of 0.6 fewer days (95% CI: -1.4 to 2.0) and a relative risk of 0.84 (95% CI: 0.66–1.06), indicating no statistically significant difference between the remotely monitored AT group and the usual care group based on the 95% CIs crossing the line of no effect. Zoellick *et al.* (2025) reported fewer days in hospital in the remotely monitored AT group with a mean difference of -2.79 days (95% CI: -7.63 to 2.06; $p=0.260$) compared with the usual care group, although this was not statistically significant. The outcomes had a moderate risk of bias, and there was very low-certainty evidence that there was no difference between the remotely monitored AT group and the usual care (home care) group.

3.7.2.5 Summary of findings

The summary of findings table provides an overview of the available information on hospitalisations and length of stay (Table 12). The table contains information on the magnitude of relative and absolute effects as well as the quality or certainty of a body of evidence for each individual outcome, assessed using the GRADE system. Guidance on interpreting these assessments is outlined in Section 2.7.

Across 10 studies reporting outcome data related to hospitalisations, the certainty of evidence is very low, meaning that the evidence is very uncertain about the effect of remotely monitored AT on hospitalisations. Only one RCT [100] reported that remotely monitored AT may reduce the hazard of being hospitalised for acute coronary syndrome when compared with the usual care group; the rest of the studies reporting hospitalisation outcome data found no significant differences between groups. One study did not report outcome data for hospital admissions for venous thromboembolism [100].

Across the seven studies reporting outcome data related to length of stay, the certainty of evidence is very low, meaning that the evidence is very uncertain about the effect of remotely monitored AT on length of stay. Only one RCT [97] Only one RCT found a statistically significant difference in the days of hospitalisation when comparing a remotely monitored AT group with a usual care group, although this same study also found no difference in the average length of stay. The rest of the studies found no significant difference between remotely monitored AT groups and usual care groups. Two studies did not report outcome data on the number of hospital days due to all causes [81] and the number of days of hospitalisation [95].

Table 12: Summary of findings for hospitalisations and length of stay

Summary of findings for the effect of remotely monitored AT on hospitalisations and length of stay**Patient or population group:** Community-dwelling older adults (aged 65 years and over)**Setting:** OECD member countries**Intervention:** Remotely monitored AT**Comparison:** Usual care (or enhanced usual care)

Outcome and follow-up time point	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	Number of participants (number of studies)	Certainty of the evidence (GRADE)	Comments
	Risk with comparator (usual care or enhanced usual care)	Risk with remotely monitored AT				
At least one hospital admission [80,86,95] Follow-up: 4–12 months	50 per 100	48 per 100 (40 per 100–64 per 100)	OR: 0.94 (95% CI: 0.66–1.34)	1116 (3 RCTs)	⊕○○○ Very low ^{a,b,c,d}	The evidence is very uncertain about the direction of the effect of remotely monitored AT on having at least one hospital admission.
Average number of hospitalisations [80,86,93] Follow-up: 4–12 months	-	SMD: 0.08 lower (0.24 lower to 0.07 higher)	-	705 (3 RCTs)	⊕○○○ Very low ^{a,c,d}	The evidence is very uncertain about the direction of the effect of remotely monitored AT on the average number of hospitalisations.
Hospitalisations [81,85,87,97,100] Follow-up: 3 months to 4.2 years	Biannic <i>et al.</i> (2012) reported a readmission rate of 16% “with no difference between the two groups”, but no additional information was reported. Tompkins and Orwat (2010) reported an adjusted incidence rate ratio of 0.87, but this was not statistically significant ($p>0.1$). Lehmann <i>et al.</i> (2006) reported five admissions in the remotely monitored AT group versus seven admissions in the enhanced usual care group. This result was not statistically significant ($p=0.3872$). Ellins <i>et al.</i> (2023) reported adjusted hazard ratios of 0.45 (95% CI: 0.21–0.97; $p=0.044$) for admissions for acute coronary syndrome and 0.88 (95% CI: 0.53–1.35; p-value not reported) for admissions for bleeds. Pedone <i>et al.</i> (2013) reported an incidence rate ratio of 0.66 (95% CI: 0.21–1.86; no p-value reported).			1580 (5 RCTs)	⊕○○○ Very low ^{d,e,f,g}	The evidence is very uncertain about the direction of the effect of remotely monitored AT on hospitalisations.
Hospitalisations [99]	Zoellick <i>et al.</i> (2025) reported a mean of 0.8 hospitalisations (SD: 1.4) in the remotely monitored AT group compared with 0.6			888 (1 NRSI)	⊕○○○ Very low ^{c,d,h}	The evidence is very uncertain about the direction of the effect of

Outcome and follow-up time point	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	Number of participants (number of studies)	Certainty of the evidence (GRADE)	Comments
	Risk with comparator (usual care or enhanced usual care)	Risk with remotely monitored AT				
Follow-up: 12 months	hospitalisations (SD: 1.2) in the usual care group, and an incidence rate ratio of 1.23 (95% CI: 0.95–1.60) that was not statistically significant (p=0.122).					remotely monitored AT on hospitalisations.
Hospital admissions for venous thromboembolism [100] Follow-up: 12 months	-	-	-	-	-	No results reported
Length of stay [81,83,86,87,97] Follow-up: 3–12 months	Biannic <i>et al.</i> (2012) reported 97 days of hospitalisation due to acute cardiac events in the remotely monitored AT group compared with 98 days in the enhanced usual care group, with no statistically significant difference between groups (<i>p</i>=0.89). Olivari <i>et al.</i> (2018) reported a mean difference of –3.33 days of hospitalisation due to all causes (95% CI: –8.5 to 1.9), which was not statistically significant (<i>p</i>=0.21). For days of hospitalisation specifically due to heart failure, there was a mean difference of –5.4 days (95% CI: –13.8 to 2.9) between groups, which was not statistically significant (<i>p</i>=0.2). Tompkins and Orwat (2010) reported no statistically significant difference (<i>p</i>≥0.1) in the average length of stay, with an adjusted incidence rate ratio of 0.85, but an adjusted incidence rate ratio of 0.73 was reported for days of hospitalisation (<i>p</i><0.01). Gellis <i>et al.</i> (2012; 2014) reported a mean of 7.5 (SD: 4.3) hospital days in the remotely monitored AT group compared with a mean of 10.5 (SD: 6.5) hospital days in the enhanced usual care group, but this difference was not statistically significant (<i>p</i>=0.06). Pedone <i>et al.</i> (2013) reported an average length of stay due to respiratory exacerbations of 9.7 days in the remotely monitored AT group and 6.9 days in the			995 (5 RCTs)	⊕○○○ Very low ^{c,d,i}	The evidence is very uncertain about the direction of the effect of remotely monitored AT on length of stay.

Outcome and follow-up time point	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	Number of participants (number of studies)	Certainty of the evidence (GRADE)	Comments
	Risk with comparator (usual care or enhanced usual care)	Risk with remotely monitored AT				
	enhanced usual care group, but no <i>p</i> -value was reported, so it is not known if this difference is statistically significant.					
Length of stay [88,99] Follow-up: 100 days to 12 months	Salahub <i>et al.</i> (2025) reported a mean difference of 0.6 fewer days between the remotely monitored AT group and the usual care group (95% CI: -1.4 to 2.0) and a relative risk of 0.84 (95% CI: 0.66–1.06), indicating no significant difference based on the 95% CIs crossing the line of no effect. Zoellick <i>et al.</i> (2025) reported fewer days in hospital in the remotely monitored AT group with a mean difference of -2.79 days (95% CI: -7.63 to 2.06) compared with the usual care group, although this was not statistically significant (<i>p</i>=0.260).			3876 (2 NRSIs)	⊕○○○ Very low ^{d,j}	The evidence is very uncertain about the direction of the effect of remotely monitored AT on length of stay.
Number of days of hospitalisation [95] Follow-up: median 4.2 years	-	-	-	-	-	No results reported
Days of hospitalisation due to all causes [81] Follow-up: 3 months	-	-	-	-	-	No results reported

* The risk in the intervention group (and its 95% CI) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

GRADE Working Group grades of evidence

High certainty: We are very confident that the true effect lies close to that of the estimate of the effect.

Moderate certainty: We are moderately confident in the effect estimate; the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.

Low certainty: Our confidence in the effect estimate is limited; the true effect may be substantially different from the estimate of the effect.

Very low certainty: We have very little confidence in the effect estimate; the true effect is likely to be substantially different from the estimate of the effect.

Explanations

- All outcomes had a high risk of bias overall.
- There was moderate heterogeneity and variability of point estimates across studies.
- There were wide CIs, which include both benefit and harm.

- d. Fewer than 10 studies; no formal assessment of publication bias (e.g. Egger's test) could be performed.
- e. Most outcomes had some/moderate concerns of bias; one had a high risk of bias.
- f. Several studies did not report CIs. Results generally indicated no difference between groups, but there were outliers that showed benefit in the remotely monitored AT group.
- g. Several studies did not report CIs. For those that did, CIs often included both benefit and harm.
- h. One study had a wide CI, which includes both benefit and harm.

3.7.3 Admissions to long-term care

3.7.3.1 Summary of included studies

Two studies reported on three outcomes related to admissions to long-term care [88,94]. One study was an RCT [94] and included one outcome on admissions to nursing care facilities, and the other study was an NRSI [88] and included two outcomes related to number of days in long-term care. The certainty of evidence for all outcomes was very low. GRADE evidence profiles are available in Appendix O.

One study investigated remotely monitored atrial fibrillation (AF) in patients with Alzheimer's disease [94], while the other investigated a general population of older adults (aged 65 years and over) [88]. Time points of assessment ranged from 100 days to 12 months. A summary of studies can be found in Table 13.

Table 13: Summary of studies investigating the impact of remotely monitored AT on admissions to long-term care

Healthcare population (author, year)	Outcomes	Product(s)	Clinical (and additional) metrics collected
RCT			
Alzheimer's disease (Tchalla <i>et al.</i> , 2013) [94]	Admissions to nursing care facilities (at 12 months)	Home-based technologies coupled with tele-assistance service (HBTec-TS) system, including a light path, remote intercom, and electronic bracelet coupled with tele-assistance service	Unclear, but likely activations of bracelet for falls only (Monthly monitoring phone calls to general practitioner (GP) using a questionnaire focusing on sociodemographic characteristics and the primary end-point of falls)
NRSI			
Older adults (aged 65 years and over) (Salahub <i>et al.</i> , 2025) [88]	Long-term care days (at 100 days) At least 1 day in long-term care (at 100 days)	An OdysseyGO personal alert device, with possible additions of a home medication dispenser (requested for 11.4% of participants) and/or passive home monitoring sensors (unknown what proportion of patients received/requested these)	Location and movement (falls, lack of movement), missed medication dose, and SOS alerts (Low battery in any device)

3.7.3.2 Risk of bias assessments

One RCT [94] reported one outcome related to admissions to long-term care, which had a high risk of bias (

Figure 16). A full list of risk of bias assessments for individual outcomes using the RoB 2 tool can be found in Appendix F.

		Risk of bias domains					
		D1	D2	D3	D4	D5	Overall
Study	Tchalla et al. (2013)						
		Domains:					Judgement
		D1: Bias arising from the randomization process.					 High
		D2: Bias due to deviations from intended intervention.					 Some concerns
		D3: Bias due to missing outcome data.					 Low
		D4: Bias in measurement of the outcome.					
		D5: Bias in selection of the reported result.					

Figure 16: Admissions to long-term care risk of bias assessment using the RoB 2 tool

One NRSI [88] reported two outcomes related to admissions to long-term care, which had a moderate risk of bias (

Figure 17). A full list of risk of bias assessments for individual outcomes using the ROBINS-I tool can be found in Appendix I.

		Risk of bias						
		D1	D2	D3	D4	D5	D6	Overall
Study	Salahub et al. (2025)							
		Domains:						Judgement
		D1: Bias due to confounding						 Moderate
		D2: Bias in the classification of interventions						 Low
		D3: Bias in selection of participants into the study or into the analysis						
		D4: Bias due to missing data						
		D5: Bias in measurement of the outcome						
		D6: Bias in selection of the reported result						

Figure 17: Admissions to long-term care risk of bias assessment using the ROBINS-I tool

3.7.3.3 Narrative synthesis

One RCT was conducted with older adults with Alzheimer's disease and reported admissions to nursing care facilities at a follow-up of 12 months [94]. Two admissions (4.1%) were reported in the remotely monitored AT group (95% CI: 1.1–13.7), while three admissions (6.4%) were reported in the enhanced usual care group, which received a fall reduction programme only (95% CI: 2.2–17.2). No *p*-value was reported, but the 95% CIs were wide and overlapping, indicating no statistically significant difference in the proportion of admissions between the remotely monitored AT group and the enhanced usual care group. This outcome had a high risk of bias.

One NRSI conducted with older adults (aged 65 years and over) reported the average number of long-term care days and the risk of spending at least 1 day in long-term care at a follow-up of 100 days [88]. An adjusted relative risk of 1.02 was reported for long-term care days (95% CI: 0.59–1.75). This outcome had a moderate risk of bias, and there was very low-certainty evidence that there was no difference between

the remotely monitored AT group and the enhanced usual home care group. When measured as the risk of spending at least 1 day in long-term care, the adjusted relative risk was 1.37 (95% CI: 0.84–2.23). This outcome had a moderate risk of bias.

3.7.3.4 Summary of findings

The summary of findings table provides an overview of the available information on admissions to long-term care (Table 14). The table contains information on the magnitude of relative and absolute effects, as well as the quality or certainty of the body of evidence for each individual outcome, assessed using the GRADE system. Guidance on interpreting these assessments is outlined in Section 2.7.

Across two studies [88,94] reporting outcome data related to admissions to long-term care, the certainty of evidence was very low. Both studies reported no significant differences between groups on admissions to and days in long-term care, but the evidence was very uncertain regarding the effect of remotely monitored AT on admissions to or days in long-term care.

Table 14: Summary of findings for admissions to long-term care

Summary of findings for the effect of remotely monitored AT on admissions to long-term care						
Patient or population group: Community-dwelling older adults (aged 65 years and over)						
Setting: OECD member countries						
Intervention: Remotely monitored AT						
Comparison: Usual home care or enhanced usual care						
Outcome and follow-up time point	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	Number of participants (number of studies)	Certainty of the evidence (GRADE)	Comments
	Risk with comparator (usual care or enhanced usual care)	Risk with remotely monitored AT				
Admissions to nursing care facilities [94] Follow-up: 12 months	Two admissions were reported (4.1%; 95% CI: 1.1–13.7).	Three admissions were reported (6.4%; 95% CI: 2.2–17.2).	Not estimable	96 (1 RCT)	⊕○○○ Very low ^{a,b,c}	The evidence is very uncertain about the direction of the effect of remotely monitored AT on admissions to nursing care facilities.
At least 1 day in long-term care [88] Follow-up: 100 days	2 per 100	1 more per 100 (from 0 fewer to 2 more)	Risk ratio: 1.37 (0.84–2.23)	2988 (1 NRSI)	⊕⊕○○ Very low ^{b,c}	The evidence is very uncertain about the direction of the effect of remotely monitored AT on spending at least 1 day in long-term care.
Long-term care days [88] Follow-up: 100 days	The mean number of long-term care days was 1.1 days	Mean difference: 0.2 days (0.5 fewer to 0.6 more)	-	2988 (1 NRSI)	⊕○○○ Very low ^{b,c,d}	The evidence is very uncertain about the direction of the effect of remotely monitored AT on long-term care days.

* **The risk in the intervention group** (and its 95% CI) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

GRADE Working Group grades of evidence

High certainty: We are very confident that the true effect lies close to that of the estimate of the effect.

Moderate certainty: We are moderately confident in the effect estimate; the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.

Low certainty: Our confidence in the effect estimate is limited; the true effect may be substantially different from the estimate of the effect.

Very low certainty: We have very little confidence in the effect estimate; the true effect is likely to be substantially different from the estimate of the effect.

Explanations

- a. Outcome had a high risk of bias overall. There was a high risk of bias for one domain, some concerns for another, and three domains had a low risk of bias.
- b. CI is wide and includes both benefit and harm. Small number of events with insufficient length of follow-up.
- c. Fewer than 10 studies; no formal assessment of publication bias can be performed.
- d. Admission (at least one day in long-term care) is likely to be more relevant to patients as unlikely to be transitioned back to independent living.

3.7.4 Outpatient visits

3.7.4.1 Summary of included studies

Four studies reported on seven outcomes related to outpatient visits (including primary care visits, specialist visits, same-day surgery days, and urgent care visits) [85,88,97,98]. Two studies did not report outcome data on the number of scheduled and urgent outpatient visits and the number of office visits [86,92]. Olivari *et al.* (2018) mentioned these outcomes but did not report any definition or data for them. Petito *et al.* (2023b) provided outcome data, but for those eligible for remote monitoring compared with controls, rather than for those for whom remote monitoring was initiated. The certainty of evidence of all outcomes was moderate, low, or very low. GRADE evidence profiles are available in Appendix O.

Two RCTs investigated remotely monitored AT in those with heart failure [85,97], while one RCT focused on those at high risk of AF [98]. The fourth study was an NRSI and investigated remotely monitored AT in a general population of older adults (aged 65 years and over) [88]. Time points of assessment ranged from 100 days to 6 months. A summary of studies can be found in Table 15.

Table 15: Summary of studies investigating the impact of remotely monitored AT on outpatient visits

Healthcare population (author, year)	Outcomes [‡]	Product(s)	Clinical (and additional) metrics collected
RCTs			
Congestive heart failure (Lehmann <i>et al.</i> , 2006) [85]	Number of physician office visits (at 6 months)	Viterion 500® telehealth system containing a wireless blood pressure (BP) monitoring system, a weight scale, and a 1% oxygen saturation monitor	BP, pulse rate, weight, and oxygen saturation/blood oxygen level (Sleep, tiredness, breathing, and swelling)

Healthcare population (author, year)	Outcomes [‡]	Product(s)	Clinical (and additional) metrics collected
Heart failure (Olivari <i>et al.</i> , 2018) [86]	Number of scheduled outpatient visits* Number of urgent outpatient visits*	Personal Health System, composed of a wearable Wrist Clinic device and a digital weight scale	Weight, BP, heart rate, 1-lead electrocardiogram (ECG), and pulse oximetry (No additional information reported)
Heart failure (Tompkins and Orwat, 2010) [97]	Primary care visits (at 6 months) Urgent care visits (at 6 months)	Honeywell HomMed Sentry and Genesis monitors and proprietary Central Station software	Weight, BP, heart rate, blood oxygen levels, and data from other peripheral devices (e.g. glucose meters for patients with diabetes) (Weekly prompts to answer a predetermined set of questions)
Those at high risk of AF (Wong <i>et al.</i> , 2024) [98]	Visits to GP (at 6 months) Visits to specialists (at 6 months)	AliveCor Kardia handheld mobile single-lead ECG device	Heart rhythm/ECG (No additional information reported)
NRSIs			
Hypertension (Petito <i>et al.</i> , 2023b) [92]	Number of office visits (at 6 months)	Omron VitalSight remote patient monitoring (RPM), automated BP monitor, cellular data hub, and optional scale	BP, pulse, and optional weight data (No additional information reported)
Older adults (aged 65 years and over) (Salahub <i>et al.</i> , 2025) [88]	Primary care encounters (at 100 days) Same-day surgery days (at 100 days)	An OdysseyGO personal alert device, with possible additions of a home medication dispenser (requested for 11.4% of participants) and/or passive home monitoring sensors (unknown what proportion of patients received/requested these)	Location and movement (falls, lack of movement), missed medication dose, and SOS alerts (Low battery in any device)

‡ No outcome data reported for items indicated in bold.

*Outcome definitions were not reported and outcomes are reported as “number of scheduled outpatient controls” and “Number of urgent outpatient controls”. We are assuming they are outpatient visits.

3.7.4.2 Risk of bias assessments

Two RCTs [85,98] reported three outpatient visit outcomes that had a high risk of bias. One RCT [97] reported two outcomes with some concerns for bias. No studies had outcomes with a low risk of bias (Figure 18). A full list of risk of bias assessments for individual outcomes using the RoB 2 tool can be found in Appendix F.

		Risk of bias domains					
		D1	D2	D3	D4	D5	Overall
Study	Lehmann et al. (2006)						
	Tompkins et al. (2010)						
	Wong et al. (2024)						

Domains:

D1: Bias arising from the randomization process.

D2: Bias due to deviations from intended intervention.

D3: Bias due to missing outcome data.

D4: Bias in measurement of the outcome.

D5: Bias in selection of the reported result.

Judgement

High

Some concerns

Low

Figure 18: Outpatient visits risk of bias assessment using the RoB 2 tool

One NRSI reported two outpatient visit outcomes that both had moderate concerns for bias. As these two outcomes rated differently on domain two, both are displayed separately in Figure 19. There were no outcomes with a serious or low risk of bias. A full list of risk of bias assessments for individual outcomes using the ROBINS-I tool can be found in Appendix I.

		Risk of bias						
		D1	D2	D3	D4	D5	D6	Overall
Study	Salahub et al. (2025) Same-day surgery days							
	Salahub et al. (2025) Primary care encounters							

D1: Bias due to confounding
D2: Bias in the classification of interventions
D3: Bias in selection of participants into the study or into the analysis
D4: Bias due to missing data
D5: Bias in measurement of the outcome
D6: Bias in selection of the reported result

Judgement
 Moderate
 Low

Figure 19: Outpatient visits risk of bias assessment using the ROBINS-I tool

3.7.4.3 Narrative synthesis

One RCT was conducted with older adults who had congestive heart failure, and reported on the number of physician office visits at 6 months [85]. A rate of 0.65 visits per patient per month was reported in the remotely monitored AT group compared with 1.133 visits per patient per month in the enhanced usual care group. This difference was statistically significantly different significant ($p=0.00253$), and the outcome had a high risk of bias.

One RCT was conducted with older adults with heart failure, and reported on the number of primary care and urgent care visits at 6 months [97]. An adjusted incidence rate ratio of 1.06 was reported for primary care visits, indicating slightly more primary care visits in the remotely monitored AT group when compared with the usual care group, but this was not statistically significant ($p\geq 0.01$). However, an adjusted incidence rate ratio of 1.6 was reported for urgent care visits, indicating more urgent care visits in the remotely monitored AT group compared with the usual care group, a difference that was statistically significant ($p<0.05$). Both outcomes had some concerns for risk of bias.

One RCT was conducted in older adults who were at high risk of AF, and reported on GP and specialist visits at 6 months [98]. Eighty-nine (94.7%) of the participants in the remotely monitored AT group visited their GP at least once during the study period compared with 90 (96.8%) participants from the usual care group, a difference that was not statistically significant ($p=0.72$). Fifty-one (54.3%) participants from the remotely monitored AT group had a specialist visit during the study period compared with 55 (59.1%) participants in the usual care group, but this difference was not statistically significant ($p=0.56$). Both outcomes had a high risk of bias.

One NRSI was conducted in older adults (aged 65 years and over) and reported on primary care encounters and same-day surgery days at a follow-up of 100 days [88]. An adjusted relative risk of 0.87 was reported (95% CI: 0.80–0.95), indicating fewer primary care encounters for the remotely monitored AT group compared with the usual care group, a difference that is statistically significant based on the 95% CI not crossing the line of no effect (risk ratio: 1). An adjusted relative risk of 0.84 (95% CI: 0.57–1.23) was reported, indicating fewer same-day surgery days, but the 95% CI included the line of no effect (risk ratio: 1), meaning that the difference was not statistically significant. Both outcomes had a moderate risk of bias.

3.7.4.4 Summary of findings

The summary of findings table provides an overview of the available information on outpatient visits (Table 16). The table contains information on the magnitude of relative and absolute effects, as well as the quality or certainty of the body of evidence for each individual outcome, assessed using the GRADE system. Guidance on interpreting these assessments is outlined in Section 2.7.

Across four studies [85,88,97,98] reporting outcome data on outpatient visits (including primary care visits, specialist visits, same-day surgery days, and urgent care visits), the certainty of evidence is moderate, low, or very low.

The evidence from two RCTs is very uncertain about the effect of remotely monitored AT on primary care visits and on patients having at least one GP visit [97,98]. However, one NRSI found that remotely monitored AT probably reduces primary care visits slightly [88]. The evidence suggests that remotely monitored AT results in a slight increase in urgent care visits [97]. The evidence is very uncertain about the effect of remotely monitored AT on same-day surgery days [88] and the number of physician office visits [85]. Two studies did not report outcome data on the number of scheduled and urgent outpatient visits and the number of office visits [86,92].

Table 16: Summary of findings for outpatient visits

Summary of findings for the effect of remotely monitored AT on outpatient visits
Patient or population group: Community-dwelling older adults (aged 65 years and over)
Setting: OECD member countries
Intervention: Remotely monitored AT
Comparison: Usual care (or enhanced usual care)

Outcome and follow-up time point	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	Number of participants (number of studies)	Certainty of the evidence (GRADE)	Comments
	Risk with comparator (usual care or enhanced usual care)	Risk with remotely monitored AT				
Primary care visits [97] Follow-up: 6 months	Tompkins and Orwat (2010) reported an adjusted incidence rate ratio of 1.06, indicating slightly more primary care visits in the remotely monitored AT group compared with the usual care group, but this was not statistically significant ($p \geq 0.01$).			390 (1 RCT)	⊕○○○ Very low ^{a,b}	The evidence is very uncertain about the direction of the effect of remotely monitored AT on primary care visits.
Primary care encounters [88] Follow-up: 100 days	The mean number of primary care visits was 2.7 (SD: 3.2)	Mean difference: 0.4 fewer encounters (0.6 fewer to 0.1 fewer)	-	2988 (1 NRSI)	⊕⊕⊕○ Moderate ^b	Remotely monitored AT probably reduces primary care visits slightly.
At least one GP visit [98] Follow-up: 6 months	Ninety (96.8%) participants visited their GP at least once during the study period.	Eighty-nine (94.7%) participants visited their GP at least once during the study period.	-	187 (1 RCT)	⊕○○○ Very low ^{b,c,d}	The evidence is very uncertain about the direction of the effect of remotely monitored AT on having at least one GP visit.
Urgent care visits [97] Follow-up: 6 months	Tompkins and Orwat (2010) reported an adjusted incidence rate ratio of 1.6 urgent care visits, indicating more urgent care visits in the remotely monitored AT group compared with the usual care group, a difference that was statistically significant ($p < 0.05$).			390 (1 RCT)	⊕⊕○○ Low ^{b,e}	Remotely monitored AT may result in a slight increase in urgent care visits.
Same-day surgery days [88] Follow-up: 100 days	The mean number of same-day surgery days was 0.1 days.	Mean difference: 0.01 fewer days (0.03 fewer to 0.02 more)	-	2988 (1 NRSI)	⊕○○○ Very low ^{b,f,g}	The evidence is very uncertain about the direction of the effect of remotely monitored AT on same-day surgery days.
Number of physician office visits [85] Follow-up: 6 months	Lehmann <i>et al.</i> (2006) reported a per patient per month rate of 0.65 was reported in the remotely monitored AT group compared to 1.133 visits per patient per month in the usual care group. This difference was statistically significantly different ($p = 0.00253$).			20 (1 RCT)	⊕○○○ Very low ^{b,d,h}	Remotely monitored AT may reduce the number of physician office visits, but the evidence is very uncertain.

Outcome and follow-up time point	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	Number of participants (number of studies)	Certainty of the evidence (GRADE)	Comments
	Risk with comparator (usual care or enhanced usual care)	Risk with remotely monitored AT				
Number of office visits [92] Follow-up: 6 months	-	-	-	-	-	No results reported
Number of scheduled outpatient visits [86]	-	-	-	-	-	No results reported
Number of urgent outpatient visits [86]	-	-	-	-	-	No results reported

* The risk in the intervention group (and its 95% CI) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

GRADE Working Group grades of evidence

High certainty: We are very confident that the true effect lies close to that of the estimate of the effect.

Moderate certainty: We are moderately confident in the effect estimate; the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.

Low certainty: Our confidence in the effect estimate is limited; the true effect may be substantially different from the estimate of the effect.

Very low certainty: We have very little confidence in the effect estimate; the true effect is likely to be substantially different from the estimate of the effect.

Explanations

- a. Adjusted incidence ratio paired with p-value indicates CI crosses the line of no effect, including both benefit and harm. Single study.
- b. Less than 10 studies; no formal assessment of publication bias (e.g. Egger's test) can be performed.
- c. Small sample size, single study. No CI reported but a difference which was not statistically significant.
- d. Outcome at high risk of bias
- e. Small sample size (underpowered). Single study. No CI reported.
- f. May be influenced by external health-system factors and may not be as relevant to the impact of remotely monitored AT.
- g. Few events. CI is wide and includes both benefit and harm
- h. Very small sample size, single study. No CI reported.

3.7.5 Days at home and home care episodes

3.7.5.1 Summary of included studies

Three studies reported on three outcomes related to days at home or to readmission and home care episodes [82,83,88,93]. Two studies were RCTs [82,83,93] and included one outcome on episodes of

home care (i.e. a care worker providing care in one's own home) and one on days to readmission. The other study was an NRSI [88] and included one outcome on days at home. This study hypothesised that patients enrolled in the programme would spend more days at home instead of in hospital, long-term care, or other care settings, thus more days at home would have lower costs and be potentially indicative of a better health status. One RCT did not report outcome data on number of home healthcare provider visits [85]. The certainty of evidence was very low and moderate for the RCTs and NRSI, respectively. GRADE evidence profiles are available in Appendix O.

Two studies investigated remotely monitored AF in patients with heart failure [93] or a mixed population of those with heart failure or chronic obstructive pulmonary disease (COPD) [82,83]. The third focused on a general population of older adults (aged 65 years and over) [88]. Time points of assessment ranged from 90 days to 12 months. A summary of studies can be found in Table 17.

Table 17: Summary of studies investigating the impact of remotely monitored AT on days at home and home care episodes

Healthcare population (author, year)	Outcomes [‡]	Product(s)	Clinical (and additional) metrics collected
RCTs			
Heart failure or COPD (Gellis <i>et al.</i> , 2012; 2014) [82,83]	Episodes of home care (at 12 months)	HomeMed Health Monitoring System (2011)	Heart rate, weight, BP, pulse, oxygen saturation, and temperature (Modifiable (YES/NO) questions that were customised to the patient's condition)
Congestive heart failure (Lehmann <i>et al.</i> , 2006) [85]	Number of home healthcare provider visits (at 6 months)	Viterion 500® telehealth system containing a wireless BP monitoring system, a weight scale, and a 1% oxygen saturation monitor	BP, pulse rate, weight, and oxygen saturation/blood oxygen level (Sleep, tiredness, breathing, and swelling)
Heart failure (Schwarz <i>et al.</i> , 2008) [93]	Days to readmission (at 90 days)	Cardicom electronic health monitoring system (Cardicom, LLC, Chanhassen, Minnesota)	Weight (‘Yes’ or ‘no’ to questions about shortness of breath, cough, fatigue, swelling, chest discomfort, urination, exercise, dizziness, medication use, and sodium intake. BP, apical pulse, and oxygen saturation assessed at baseline and 3 months.)
NRSIs			
Older adults (aged 65 years and over) (Salahub <i>et al.</i> , 2025) [88]	Days at home (at 100 days)	An OdysseyGO personal alert device, with possible additions of a home medication dispenser (requested for 11.4% of participants) and/or passive home monitoring sensors (unknown what proportion of patients received/requested these)	Location and movement (falls, lack of movement), missed medication dose, and SOS alerts (Low battery in any device)

[‡] No outcome data reported for items indicated in **bold**.

3.7.5.2 Risk of bias assessments

One RCT [82,83] reported one home care episode outcome that had a high risk of bias, and another RCT [93] reported on days to readmission, which also had a high risk of bias (Figure 20). A full list of risk of bias assessments for individual outcomes using the RoB 2 tool can be found in Appendix F.

		Risk of bias domains					
		D1	D2	D3	D4	D5	Overall
Study	Gellis et al. (2012/2014)						
	Schwarz et al. (2008)						
		Domains:					Judgement
		D1: Bias arising from the randomization process.					High
		D2: Bias due to deviations from intended intervention.					Some concerns
		D3: Bias due to missing outcome data.					Low
		D4: Bias in measurement of the outcome.					
		D5: Bias in selection of the reported result.					

Figure 20: Episodes of home care risk of bias assessment using the RoB 2 tool

One NRSI [88] reported an average number of days at home outcome that had moderate concerns for risk of bias (Figure 21). A full list of risk of bias assessments for individual outcomes using the ROBINS-I tool can be found in Appendix I.

		Risk of bias						
		D1	D2	D3	D4	D5	D6	Overall
Study	Salahub et al. (2025)							
		Domains:						Judgement
		D1: Bias due to confounding						Moderate
		D2: Bias in the classification of interventions						Low
		D3: Bias in selection of participants into the study or into the analysis						
		D4: Bias due to missing data						
		D5: Bias in measurement of the outcome						
		D6: Bias in selection of the reported result						

Figure 21: Days at home risk of bias assessment using the ROBINS-I tool

3.7.5.3 Narrative synthesis

One RCT conducted with older adults with heart failure or COPD [82,83] reported on home care episodes at a follow-up of 12 months. A mean of 1.3 (SD: 1.0) episodes of home care was reported in the remotely monitored AT group compared with a mean of 1.8 (SD: 1.5) episodes in the enhanced usual care group, but this result was not statistically significant ($p=0.10$). The outcome had a high risk of bias.

One RCT conducted with older adults with heart failure [93] reported days to readmission at a follow-up of 90 days. The remotely monitored AT group had a mean of 40.6 (SD: 31.3) days to readmission compared with 41.2 (SD: 24.0) days in the usual care group, a difference that was not statistically significant ($p=0.96$). This outcome had a high risk of bias.

One NRSI conducted with older adults [88] reported an average number of days at home outcome. The remotely monitored AT group spent an average of 92.3 (SD: 19.5) days at home compared with 88.9 (SD:

24.6) days in the usual home care group, a mean difference of 3.4 days (95% CI: 1.9–5.0) and a relative risk of 1.04 (95% CI: 1.02–1.06), indicating a significant difference between the remotely monitored AT group and the usual home care group. This outcome had moderate concerns for risk of bias.

3.7.5.4 Summary of findings

The summary of findings table provides an overview of the available information on admissions to long-term care (Table 18). The table contains information on the magnitude of relative and absolute effects, as well as the quality or certainty of the body of evidence for each individual outcome, assessed using the GRADE system. Guidance on interpreting these assessments is outlined in Section 2.7.

Across the three studies [82,83,88,93] reporting outcome data on days at home, days to readmission, and home care episodes, the certainty of evidence was moderate and very low.

The one NRSI [88] comparing remotely monitored AT with a usual home care group provided moderate-certainty evidence indicating that remotely monitored AT probably increases days at home slightly. The results of the two RCTs, meanwhile, indicated that the evidence is very uncertain regarding the effect of remotely monitored AT on days to readmission and on episodes of home care. One RCT did not report outcome data on home care visits [85].

Table 18: Summary of findings for days at home and home care episodes

Summary of findings for the effect of remotely monitored AT on days at home and home care episodes						
Patient or population group: Community-dwelling older adults (aged 65 years and over)						
Setting: OECD member countries						
Intervention: Remotely monitored AT						
Comparison: Usual home care or enhanced usual home care (received in-home nursing plus psychoeducation)						
Outcome and follow-up time point	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	Number of participants (number of studies)	Certainty of the evidence (GRADE)	Comments
	Risk with comparator (enhanced usual care or usual home care)	Risk with remotely monitored AT				
Days at home [88] Follow-up: 100 days	The mean number of days at home was 88.9 days.	Mean difference: 3.4 more days (1.9 more to 5.0 more)	Risk ratio: 1.04 (1.02–1.04)	2988 (1 NRSI)	⊕⊕⊕○ Moderate ^a	Remotely monitored AT probably increases days at home slightly.
Episodes of home care [82,83] Follow-up: 12 months	The mean number of episodes of home care was 1.8 episodes.	Mean difference: 0.5 fewer episodes (1.0246 fewer to 0.0246 more)	-	94 (1 RCT)	⊕○○○ Very low ^{a,b,c}	The evidence is very uncertain about the direction of the effect of remotely monitored AT on episodes of home care.

Days to readmission [93] Follow-up: 90 days	The mean number of days to readmission was 41.2 days.	Mean difference: 0.6 fewer days (12.80 fewer to 11.60 more)	-	84 (1 RCT)	⊕○○○ Very low ^{a,b,d}	The evidence is very uncertain about the direction of the effect of remotely monitored AT on days to readmission.
Number of home healthcare provider visits [85] Follow-up: 6 months	-	-	-	-	-	No results reported

* **The risk in the intervention group** (and its 95% CI) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

GRADE Working Group grades of evidence

High certainty: We are very confident that the true effect lies close to that of the estimate of the effect.

Moderate certainty: We are moderately confident in the effect estimate; the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.

Low certainty: Our confidence in the effect estimate is limited; the true effect may be substantially different from the estimate of the effect.

Very low certainty: We have very little confidence in the effect estimate; the true effect is likely to be substantially different from the estimate of the effect.

Explanations

- a. Fewer than 10 studies; no formal assessment of publication bias (e.g. Egger's test) could be performed.
- b. Outcome had a high risk of bias overall.
- c. Small sample size and number of events. CIs include both benefit and harm.
- d. Small sample size. CIs include both benefit and harm.

3.7.6 Access to diagnosis

3.7.6.1 Summary of included studies

Two studies reported on two outcomes related to time to a new diagnosis of AF [84,98]. Both of the studies were RCTs. One study included one outcome on time to diagnosis of AF [84], and the other study included one outcome on new diagnosis of AF [98]. A third RCT [100] provided a longer-term follow-up of the Halcox *et al.* study [84], but it did not report usable outcome data for time to diagnosis of AF because the remotely monitored AT was no longer being used to detect AF [100]. The certainty of evidence was very low. GRADE evidence profiles are available in Appendix O.

Halcox *et al.* and Ellins *et al.* investigated remotely monitored AT in the same sample of older adults who were at risk of stroke (with a CHA₂DS₂-VASc score ≥ 2) [84,100], while Wong *et al.* investigated remotely monitored AT in patients who were reported to be at high risk of AF (and aged 75 years and over) [98]. Time points of assessment ranged from 6 months to 12 months. A summary of studies can be found in Table 19.

Table 19: Summary of studies investigating the impact of remotely monitored AT on access to diagnosis

Healthcare population (author, year)	Outcomes [‡]	Product(s)	Clinical (and additional) metrics collected
RCTs			
Those at risk of stroke (Ellins <i>et al.</i> , 2023) [100]	(Time to) diagnosis (of AF) (at a median of 4.2 years)	AliveCor Kardia intracardiac electrocardiogram (iECG) version 2.2.0 (build 21)	Twice-weekly recording of a 30-second single-lead iECG trace for 12 months (see Halcox <i>et al.</i> (2017) for further details) (No additional information reported)
Those at risk of stroke (Halcox <i>et al.</i> , 2017) [84]	(Time to) diagnosis of AF (at 12 months)	AliveCor Kardia (iECG) version 2.2.0 (build 21)	AF, defined as a 30-second iECG recording with irregular rhythm without P waves (No additional information reported)
Those at high risk of AF (Wong <i>et al.</i> , 2024) [98]	New diagnosis of AF (at 6 months)	AliveCor Kardia handheld mobile single-lead ECG device	Heart rhythm/ECG (No additional information reported)

‡ No outcome data reported for items indicated in **bold**.

3.7.6.2 Risk of bias assessments

One RCT reported a (time to) diagnosis of AF outcome with some concerns for bias [84], and the other RCT reported a new diagnosis of AF outcome that had a high risk of bias [98] (Figure 22). The full list of risk of bias assessments for individual outcomes using the RoB 2 tool can be found in Appendix G.

		Risk of bias domains					
		D1	D2	D3	D4	D5	Overall
Study	Wong et al. (2024)	+	+	+	+	X	X
	Halcox et al. (2017)	+	+	+	+	-	-

Domains:

D1: Bias arising from the randomization process.

D2: Bias due to deviations from intended intervention.

D3: Bias due to missing outcome data.

D4: Bias in measurement of the outcome.

D5: Bias in selection of the reported result.

Judgement

X

 High

-

 Some concerns

+

 Low

Figure 22: Time to diagnosis risk of bias assessment using the RoB 2 tool

3.7.6.3 Narrative synthesis

One RCT [84] was conducted with older adults who were at risk of stroke and reported that 19 (3.8%) participants were diagnosed with AF during the 12-month study period in the remotely monitored AT group, compared with 5 (1.0%) participants in the usual care group. A hazard ratio of 3.9 (95% CI: 1.4–10.4) and a *p*-value of 0.007 indicated that the remotely monitored AT group had a significantly higher likelihood of AF detection compared with those receiving usual care. This outcome had some concerns for bias.

The other RCT [98] was conducted with older adults who were at high risk of AF and reported that 10 (10.3%) participants were diagnosed with AF in the study period in the remotely monitored AT group, compared with 2 (2.0%) in the usual care group. An odds ratio of 5.6 (95% CI: 1.4–37.3) and a *p*-value of 0.03 indicated that the remotely monitored AT group had a significantly higher likelihood of AF detection compared with those receiving usual care. This outcome had a high risk of bias.

3.7.6.4 Summary of findings

The summary of findings table provides an overview of the available information on access to diagnosis of AF (Table 20). The table contains information on the magnitude of relative and absolute effects, as well as the quality or certainty of the body of evidence for each individual outcome, assessed using the GRADE system. Guidance on interpreting these assessments is outlined in Section 2.7.

Across the two studies reporting outcome data related to access to diagnosis, remotely monitored AT may increase access to diagnosis (by reducing time to diagnosis), but the evidence is very uncertain. One RCT [100] did not report usable outcome data for access to diagnosis of AF.

Table 20: Summary of findings for access to diagnosis

Summary of findings for the effect of remotely monitored AT on access to diagnosis						
Patient or population group: Community-dwelling older adults (aged 65 years and over)						
Setting: OECD member countries						
Intervention: Remotely monitored AT						
Comparison: Usual care (or enhanced usual care)						
Outcome and follow-up time point	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	Number of participants (number of studies)	Certainty of the evidence (GRADE)	Comments
	Risk with comparator (usual care or enhanced usual care)	Risk with remotely monitored AT				
(Time to) diagnosis of AF [84,98] Follow-up: 6–12 months	Halcox <i>et al.</i> (2017) reported that 19 (3.8%) participants were diagnosed with AF during the study period in the remotely monitored AT group, compared with 5 (1%) participants in the usual care group. A hazard ratio of 3.9 (95% CI: 1.4–10.4) and a <i>p</i>-value of 0.007 indicated that the remotely monitored AT group had a significantly higher likelihood of AF detection compared with those receiving usual care Wong <i>et al.</i> (2024) reported that 10 (10.3%) participants were diagnosed with AF in the study period in the remotely monitored AT group, compared with 2 (2.0%) in the usual care group. An odds ratio of 5.6 (95% CI: 1.4–37.3) and a <i>p</i>-value of 0.03			1198 (2 RCTs)	⊕○○○ Very low ^{a,b,c}	Remotely monitored AT may reduce time to diagnosis, but the evidence is very uncertain.

Outcome and follow-up time point	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	Number of participants (number of studies)	Certainty of the evidence (GRADE)	Comments
	Risk with comparator (usual care or enhanced usual care)	Risk with remotely monitored AT				
	indicated that the remotely monitored AT group had a significantly higher likelihood of AF detection compared with those receiving usual care.					
(Time to) diagnosis (of AF) [100] Follow-up: median 4.2 years	-			-	-	Results not reported

* **The risk in the intervention group** (and its 95% CI) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

GRADE Working Group grades of evidence

High certainty: We are very confident that the true effect lies close to that of the estimate of the effect.

Moderate certainty: We are moderately confident in the effect estimate; the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.

Low certainty: Our confidence in the effect estimate is limited; the true effect may be substantially different from the estimate of the effect.

Very low certainty: We have very little confidence in the effect estimate; the true effect is likely to be substantially different from the estimate of the effect.

Explanations

- One outcome had a high risk of bias.
- There were wide CIs and a small number of events.
- Fewer than 10 studies; no formal assessment of publication bias (e.g. Egger's test) could be performed.

3.7.7 Other assorted healthcare utilisation outcomes

3.7.7.1 Summary of included studies

Four studies reported on six outcomes related to other assorted healthcare utilisation outcomes that were not captured in Sections 3.7.1–3.7.6. Two studies were RCTs [85,100] and two were NRSIs [88,99]. One RCT reported on anticoagulant therapy [100] and the other reported a composite outcome on overall healthcare utilisation [85]. One NRSI reported on medical emergency contacts [99] and the other reported on three outcomes in relation to rehabilitation days, mental health inpatient days, and alternate level of care days [88]. The certainty of evidence for all outcomes was very low, which meant that the evidence for these six outcomes was very uncertain. Five additional studies [89–92,98] did not provide outcome data related to 14 outcomes, 4 of which were measured at 2 separate time points. Thirteen of those outcomes were not reported for those who initiated remote monitoring AT compared with the usual care group. GRADE evidence profiles are available in Appendix O.

One study investigated remotely monitored AT in those at risk of stroke [100] and one study investigated those with congestive heart failure [85]. The other two studies were general samples of older adults aged 65 years and over [88] and aged 75 years and over [99]. Time points of assessment ranged from 100 days to a median of 4.2 years. A summary of studies can be found in Table 21.

Table 21: Summary of studies investigating the impact of remotely monitored AT on other assorted healthcare utilisation outcomes

Healthcare population (author, year)	Outcomes [‡]	Product(s)	Clinical (and additional) metrics collected
RCTs			
Those at risk of stroke (Ellins <i>et al.</i> , 2023) [100]	Anticoagulant therapy (at a median of 4.2 years)	AliveCor Kardia iECG version 2.2.0 (build 21)	Twice-weekly recording of a 30-second single-lead iECG trace for 12 months (see Halcox <i>et al.</i> (2017) for further details) (No additional information reported)
Congestive heart failure (Lehmann <i>et al.</i> , 2006) [85]	Overall healthcare utilisation (physician office visits, emergency department (ED) visits, and hospital admissions) (at 6 months)	Viterion 500® telehealth system containing a wireless BP monitoring system, a weight scale, and a 1% oxygen saturation monitor	BP, pulse rate, weight, and oxygen saturation/blood oxygen level (Sleep, tiredness, breathing, and swelling)
Those at high risk of AF (Wong <i>et al.</i> , 2024) [98]	Initiation of anticoagulant therapy (at 6 months)	AliveCor Kardia handheld mobile single-lead ECG device	Heart rhythm/ECG (No additional information reported)
NRSIs			
Hypertension (Persell <i>et al.</i> , 2023) [90]	Antihypertensive medication intensification (at 3 and 6 months)		
	In-person/telehealth encounters (at 3 and 6 months)	Bluetooth-enabled automated BP monitor, cuff, cellular data transmitter, and optional scale	BP, pulse, and optional weight data (No additional information reported).
	Patient portal messages (at 3 and 6 months)		
Hypertension (Persell <i>et al.</i> , 2024) [89]	Telephone encounters (at 3 and 6 months)		
	Net antihypertensive medication increase (%) (at 18 months)	Product not reported	BP (No additional information reported)

Healthcare population (author, year)	Outcomes [‡]	Product(s)	Clinical (and additional) metrics collected
Hypertension (Petito <i>et al.</i> , 2023a) [91]	In-person/telehealth encounters (%) (at 12 months)	Bluetooth-enabled automated BP monitor, cuff, cellular data transmitter, and optional scale	BP, pulse, and optional weight data (No additional information reported)
	Net antihypertensive medication increase (%) (at 12 months)		
	Patient portal encounters (%) (at 12 months)		
	Telephone encounters (%) (at 12 months)		
Hypertension (Petito <i>et al.</i> , 2023b) [92]	In-person/telehealth encounters (%) (at 12 months)	Omron VitalSight remote patient monitoring (RPM), automated BP monitor, cellular data hub, and optional scale	BP, pulse, and optional weight data (No additional information reported)
	Net number of hypertensive medication intensifications (at 6 months)		
	Patient portal messages (at 6 months)		
	Telephone encounters (at 6 months)		
Older adults (aged 65 years and over) (Salahub <i>et al.</i> , 2025) [88]	Rehabilitation days (at 100 days)	An OdysseyGO personal alert device, with possible additions of a home medication dispenser (requested for 11.4% of participants) and/or passive home monitoring sensors (unknown what proportion of patients received/requested these)	Location and movement (falls, lack of movement), missed medication dose, and SOS alerts (Low battery in any device)
	Inpatient mental health days (at 100 days)		
	Alternate level of care days (in hospital awaiting transfer to another care setting) (at 100 days)		
Older adults (aged 75 years and over) (Zoellick <i>et al.</i> , 2025) [99]	Number of medical emergency contacts* (at 12 months)	Ambient assisted living integrated home-based emergency call system consisting of a base station, eight motion sensors for the home,	Fall data from the sensors, the emergency button pendant, and emergency calls from the base station (No additional information reported)

Healthcare population (author, year)	Outcomes [‡]	Product(s)	Clinical (and additional) metrics collected
		and a home emergency call system necklace with an accelerometer and an emergency button pendant	

[‡] No outcome data reported for items indicated in **bold**.

*These contacts included those made from home via the home emergency call systems provided to the intervention group. It is not clearly stated in the paper, but this outcome is likely to also include ED presentations and calls made using traditional channels, given that the control group did not receive the home-based emergency call system.

3.7.7.2 Risk of bias assessments

Two RCTs reported one healthcare utilisation outcome that had a high risk of bias {Citation}{Lehmann *et al.*, 2006) and one healthcare utilisation outcome with some concerns for bias (Ellins, 2023) [85,100]. No studies had outcomes with a low risk of bias (Figure 23). A full list of risk of bias assessments for individual outcomes using the RoB 2 tool can be found in Appendix G.

		Risk of bias domains					
		D1	D2	D3	D4	D5	Overall
Study	Lehmann et al. (2006)						
	Ellins et al. (2023)						
		Domains:					Judgement
		D1: Bias arising from the randomization process.					High
		D2: Bias due to deviations from intended intervention.					Some concerns
		D3: Bias due to missing outcome data.					Low
		D4: Bias in measurement of the outcome.					
		D5: Bias in selection of the reported result.					

Figure 23: Other assorted healthcare utilisation outcomes risk of bias assessment using the RoB 2 tool

Two NRSIs reported four assorted healthcare utilisation outcomes that had moderate concerns for bias. As one outcome in one study rated differently on one domain than the other two outcomes in that study, all four individual outcomes are displayed in Figure 24. There were no outcomes with a serious or low risk of bias. A full list of risk of bias assessments for individual outcomes using the ROBINS-I tool can be found in Appendix I.

	Risk of bias						Overall
	D1	D2	D3	D4	D5	D6	
Study							
Salahub et al. (2025) Rehabilitation days	○	○	+	+	+	+	○
Salahub et al. (2025) Inpatient mental health days	○	○	+	+	+	+	○
Salahub et al. (2025) Alternate level of care days	○	+	+	+	+	+	○
Zoellick et al. (2025) Number of medical emergency contacts	○	+	+	+	+	+	○

D1: Bias due to confounding
 D2: Bias in the classification of interventions
 D3: Bias in selection of participants into the study or into the analysis
 D4: Bias due to missing data
 D5: Bias in measurement of the outcome
 D6: Bias in selection of the reported result

Judgement
 ○ Moderate
 + Low

Figure 24: Other assorted healthcare utilisation outcomes risk of bias assessment using the ROBINS-I tool

3.7.7.3 Narrative synthesis

One RCT [100] that was conducted with older adults who were at risk of stroke reported that there were 50 (10.0%) patients in the remotely monitored AT group receiving anticoagulant therapy prescriptions at a median follow-up of 4.2 years, compared with 37 (7.4%) in the usual care group. An adjusted hazard ratio of 1.28 (95% CI: 0.83–1.96) indicated no statistically significant difference between the two groups, meaning that there were no long-term differences in anticoagulant therapy prescriptions from the 12-month monitoring programme in Halcox *et al.* (2017). This outcome had some concerns for bias.

Another RCT [85] conducted with older adults with congestive heart failure reported a per person per month rate of 0.8 composite utilisation score (including physician office visits, ED visits, and hospital admissions) in the remotely monitored AT group, compared with a rate of 1.35 in the enhanced usual care group. This difference was statistically significant ($p=0.00183$), meaning that the remotely monitored group had lower overall healthcare utilisation than the enhanced usual care group. This outcome had a high risk of bias.

One NRSI [88] conducted with general older adults (aged 65 years and over) reported rehabilitation, inpatient mental health and alternate level of care days at a follow-up of 100 days. The remotely monitored AT group had a mean difference of 0.1 fewer rehabilitation days than the usual care (home care) group, but the CI indicated that the difference was not statistically significant because it crossed 0, spanning from a mean difference of 0.05 fewer days to 0.2 more days. The remotely monitored AT group had a mean difference of 0.2 fewer inpatient mental health days than the usual care (home care) group, but the CI indicated that the difference was not statistically significant because it crossed 0, spanning from a mean difference of 0.5 fewer days to 0.07 more days. The remotely monitored AT group had a mean difference of 0.3 more alternate level of care days (in hospital awaiting transfer to another care setting) than the usual care (home care) group, but the CI indicated that the difference was not statistically significant because it crossed 0, spanning from a mean difference of 0.2 fewer days to 0.9 more days. All outcomes had a moderate risk of bias.

One NRSI [99] conducted with general older adults (aged 75 years and over) reported on the number of medical emergency contacts at a follow-up of 12 months. An adjusted incidence rate ratio of 0.89 (95% CI: 0.62–1.28) indicated fewer contacts in the remotely monitored AT group compared with the usual care group, but the difference was not statistically significant ($p=0.523$). This outcome had a moderate risk of bias.

3.7.7.4 Summary of findings

The summary of findings table provides an overview of the available information on assorted healthcare utilisation outcomes (Table 22). The table contains information on the magnitude of relative and absolute effects, as well as the quality or certainty of the body of evidence for each individual outcome, assessed using the GRADE system. Guidance on interpreting these assessments is outlined in Section 2.7.

The certainty of evidence is very low across the four studies reporting six outcomes related to other assorted healthcare utilisation outcomes. The evidence is very uncertain about the effect of remotely monitored AT on anticoagulant therapy prescriptions, overall healthcare utilisation, rehabilitation days, inpatient mental health days, alternate level of care days, and the number of medical emergency contacts.

Five additional studies [89–92,98] did not provide outcome data, and four of these were measured at two separate time points. Thirteen of the outcomes were not reported for those who initiated remote monitoring AT compared with the usual care group.

Table 22: Summary of findings for other assorted healthcare utilisation outcomes

Summary of findings for the effect of remotely monitored AT on other assorted healthcare utilisation outcomes						
Patient or population group: Community-dwelling older adults (aged 65 years and over)						
Setting: OECD member countries						
Intervention: Remotely monitored AT						
Comparison: Usual care (or enhanced usual care)						
Outcome and follow-up time point	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	Number of participants (number of studies)	Certainty of the evidence (GRADE)	Comments
	Risk with comparator (usual care or enhanced usual care)	Risk with remotely monitored AT				
Anticoagulant therapy prescription [100] Follow-up: median 4.2 years	Thirty-seven (7.4%) patients in the usual care group received anticoagulant prescriptions.	Fifty (10%) patients in the remotely monitored AT group received anticoagulant prescriptions.	Adjusted hazard ratio: 1.28 (0.83–1.96)	997 (1 RCT)	⊕○○○ Very low ^{a,b,c}	The evidence is very uncertain about the direction of the effect of remotely monitored AT on anticoagulant therapy prescriptions.
Overall healthcare utilisation (physician office visits, ED visits, and hospital admissions) [85] Follow-up: 6 months	Per person per month rate of 1.35 composite utilisation score	Per person per month rate of 0.8 composite utilisation score	-	20 (1 RCT)	⊕○○○ Very low ^{c,d,e,f}	Remotely monitored AT may reduce overall healthcare utilisation, but the evidence is very uncertain.

Outcome and follow-up time point	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	Number of participants (number of studies)	Certainty of the evidence (GRADE)	Comments
	Risk with comparator (usual care or enhanced usual care)	Risk with remotely monitored AT				
Rehabilitation days [88] Follow-up: 100 days	The mean number of rehabilitation days was 0.6 days.	Mean difference: 0.1 fewer days (0.05 fewer to 0.2 more)	-	2988 (1 NRSI)	⊕○○○ Very low ^{b,c}	The evidence is very uncertain about the direction of the effect of remotely monitored AT on rehabilitation days.
Inpatient mental health days [88] Follow-up: 100 days	The mean number of inpatient mental health days was 0.3 days.	Mean difference: 0.2 fewer days (0.5 fewer to 0.07 more)	-	2988 (1 NRSI)	⊕○○○ Very low ^{b,c,g}	The evidence is very uncertain about the direction of the effect of remotely monitored AT on inpatient mental health days.
Alternate level of care days [88] Follow-up: 100 days	The mean number of alternate level of care days was 1.2 days.	Mean difference: 0.3 more days (0.2 fewer to 0.9 more)	-	2988 (1 NRSI)	⊕○○○ Very low ^{b,c,h}	The evidence is very uncertain about the direction of the effect of remotely monitored AT on alternate level of care days.
Number of medical emergency contacts [99] Follow-up: 12 months	The mean number of medical emergency contacts was 0.6 contacts.	Mean difference: 0.1 fewer contacts (0.3075 fewer to 0.1075 more)	-	2988 (1 NRSI)	⊕○○○ Very low ^{b,c,h}	The evidence is very uncertain about the direction of the effect of remotely monitored AT on number of medical emergency contacts.
Initiation of anticoagulant therapy [98] Follow-up: 6 months	-	-	-	-	-	Results not reported
Antihypertensive medication intensification [89–92] Follow-up: 3–18 months	-	-	-	-	-	Results not reported
In-person/telehealth encounters [90–92] Follow-up: 3–12 months	-	-	-	-	-	Results not reported
Patient portal messages [90–92]	-	-	-	-	-	Results not reported

Outcome and follow-up time point	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	Number of participants (number of studies)	Certainty of the evidence (GRADE)	Comments
	Risk with comparator (usual care or enhanced usual care)	Risk with remotely monitored AT				
Follow-up: 3–12 months						
Telephone encounters [90–92] Follow-up: 3–12 months	-	-	-	-	-	Results not reported

* **The risk in the intervention group** (and its 95% CI) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

GRADE Working Group grades of evidence

High certainty: We are very confident that the true effect lies close to that of the estimate of the effect.

Moderate certainty: We are moderately confident in the effect estimate; the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.

Low certainty: Our confidence in the effect estimate is limited; the true effect may be substantially different from the estimate of the effect.

Very low certainty: We have very little confidence in the effect estimate; the true effect is likely to be substantially different from the estimate of the effect.

Explanations

- Could be prescribed for various health conditions. Could indicate that a healthcare provider was acting upon the AF diagnosis.
- CI include both benefit and harm. Single study.
- Fewer than 10 studies; no formal assessment of publication bias (e.g. Egger's test) could be performed.
- Outcome had a high risk of bias overall.
- Composite outcome that includes serious (hospital admissions), emergency (ED visits), and routine outpatient (physician office) care. Meaningful to patients individually, but not when combined.
- CI include both benefit and harm. Single study. Small sample size and number of events.
- Intervention (personal alert device with optional medication dispenser/home monitoring sensors) may not be expected to have a direct impact on this. More relevant for emergency situations (e.g. a fall).
- In hospital awaiting transfer to another care setting may be related to healthcare system, staffing, or personal reasons.

3.8 Cost-effectiveness results

We included five studies that reported on cost-effectiveness outcomes [101–105] in four OECD member countries (Canada, the Netherlands, Norway, and the United States of America (USA)). One study was a trial-based economic evaluation [103], while the rest were modelling studies [101,102,104,105]. We will present the results of the modelling studies and the trial-based economic evaluation separately in Sections 3.8.1 and 3.8.2, respectively.

Five healthcare populations were included: those with heart failure [101] or chronic heart failure (aged 70 years and over) [102], those with hypertension (aged 80 years and over) [103], those who were at high risk of choroidal neovascularisation (CNV) (aged 65 years and over) [105], and home care service users with mild to severe functional impairment (e.g. living with dementia, physical disabilities, or general age-

related decline) [104]. Two of the studies were from societal perspectives [101,104], one was from a Dutch third-party payer perspective [102], one was from a Canadian payer perspective [103], and one was from both a USA federal payer perspective and a societal perspective [105].

3.8.1 Modelling full economic evaluations

3.8.1.1 Methodological quality assessments

Four studies assessed the cost-effectiveness of remotely monitored AT in community-dwelling older adults in OECD member countries. The studies were generally well conducted, with clear decision problems, model structure, options under evaluation, and incorporation of utilities (where appropriate). However, we identified some concerns with regard to a lack of clear reporting about the primary decision-maker, the assessment of data quality, and the choice of data sources, particularly for important parameters in the model. There were also some concerns about not addressing uncertainty, not clearly justifying and defining cycle length in relation to the natural history of disease, and not framing or comparing model results with other relevant work. These limitations may, therefore, affect the cost-effectiveness conclusions of the studies. A condensed summary of the quality assessment using the Philips checklist is provided in Table 23; a full assessment is provided in Appendix J.

Table 23: Critical appraisal summary of modelling studies using the Philips checklist

Quality dimension and criterion	Quality dimension met			
	Albuquerque de Almeida <i>et al.</i> (2022) [101]	Grustam <i>et al.</i> (2018) [102]	Norut Tromsø <i>et al.</i> (2009) [104]	Wittenborn <i>et al.</i> (2017) [105]
S1 Statement of decision problem/objective	Yes	Yes	Yes	Yes
S2 Statement of scope/perspective	Yes	Yes	No	Yes
S3 Rationale for structure	Yes	Yes	No	Yes
S4 Structural assumptions	Yes	Yes	No	Yes
S5 Strategies/comparators	Yes	Yes	No	Yes
S6 Model type	Yes	Yes	No	Yes
S7 Time horizon	Yes	Yes	No	Yes
S8 Disease states/pathways	Yes	Yes	N/A	Yes
S9 Cycle length	N/A	Yes	No	No
D1 Data identification	Yes	Yes	No	Yes
D2 Data modelling	Yes	Yes	N/A	Yes
D2a Baseline data	Yes	Yes	No	Yes
D2b Treatment effects	N/A	Yes	N/A	Yes
D2c Costs	Yes	Yes	No	Yes
D2d Quality of life weights (utilities)	Yes	Yes	N/A	Yes
D3 Data incorporation	Yes	Yes	No	Yes
D4 Assessment of uncertainty	Yes	No	No	Yes
D4a Methodological	N/A	Yes	No	Yes
D4b Structural	N/A	No	No	Yes
D4c Heterogeneity	N/A	Yes	No	Yes
D4d Parameter	N/A	Yes	Yes	Yes
C1 Internal consistency	Yes	No	No	No
C2 External consistency	N/A	Yes	N/A	No

N/A = not applicable

3.8.1.2 Summary of study findings

A brief overview of the study designs, modelling details, and key findings is presented in Table 24.

One Dutch study conducted a cost-utility analysis of a HTM system plus a diagnostic algorithm for adults with heart failure from a societal perspective [101]. Subgroup analyses for those aged 65 years and over reported improved quality-adjusted life years (QALYs) with HTM plus a diagnostic algorithm, yielding 1.32 QALYs compared with 1.14 QALYs for HTM only and 0.82 QALYs for enhanced usual care. However, a higher cost was projected: 56,483 euro (EUR) for HTM plus a diagnostic algorithm, EUR 52,035 for HTM only, and EUR 39,380 for enhanced usual care. When compared with enhanced usual care, HTM plus a diagnostic algorithm had an incremental cost-effectiveness ratio (ICER) of EUR 34,368 per QALY, which is cost-effective at the EUR 80,000 willingness to pay (WTP) threshold in the Netherlands. Of note, WTP thresholds vary by health system (or society) and represents the maximum amount that the system is willing to pay for one unit of health gain, most commonly a QALY.

One study conducted a cost-utility analysis of HTM for adults with chronic heart failure (aged 70 years and over) from a third-party payer perspective in the Netherlands [102]. This study reported improved QALYs with HTM compared with usual care (2.93 QALYs versus 1.91 QALYs) in all New York Heart Association (NYHA) classification system classes, but a higher cost (EUR 27,186 versus EUR 14,414). The reported ICER was EUR 12,479 per QALY gained, which is cost-effective at a WTP threshold of EUR 14,000 per QALY gained. When HTM was compared with nursing telephone support, nursing telephone support was the dominant intervention (higher QALYs and lower costs) when all NYHA classes were combined. Only in the most severe cases (NYHA heart failure class IV) were higher QALYs projected for HTM compared with nursing telephone support, with HTM costing EUR 44,040 for each QALY gained. For all classes of heart failure, nursing telephone support was projected to have higher QALYs and higher costs in comparison with usual care.

One study conducted a cost-utility analysis of home-based visual-field monitoring for those at high risk of CNV from a USA federal payer perspective [105]. In home-based monitoring compared with standard care, higher QALYs (4.361 versus 4.317 QALYs) and higher costs (USD 89,968 versus USD 88,416) were projected for combined stages three and four of age-related macular degeneration and CNV stage one. This analysis projected an ICER of USD 35,663 per QALY gained, which is cost-effective at a USD 50,000 WTP threshold. In subgroup analyses reported for those with only CNV in a single eye (CNV1), home-based monitoring was projected to be dominant (higher QALYs and lower costs). Subgroup analyses reported decreasing cost-effectiveness for age-related macular degeneration stages one to four. Overall, home-based monitoring is projected to be more cost-effective for patients who are at a higher risk of progressing to bilateral CNV.

One study conducted a cost-consequence analysis (from a societal perspective) of a smart home technology package for older adult users of home care services with mild to severe impairment [104]. This study projected a per patient per year (PPPY) savings of 61,023 Norwegian kroner (NOK) for those with mild functional impairment, a PPPY savings of NOK 145,151 for those with moderate functional impairment, and a PPPY savings of NOK 245,652 for those with severe functional impairment for older adults living at home with smart home technology compared with older adults living at home without smart home technology. The study projected a PPPY savings of NOK 485,276 for those with mild functional impairment, a PPPY savings of NOK 391,428 for those with moderate functional impairment, and a PPPY savings of NOK 219,960 for those with severe functional impairment for older adults living at home with smart home technology compared with older adults living in a nursing home. The authors also identified additional qualitative costs and consequences including the older persons preference to live at home, user well-being and social contact, reduced worry for spousal carers, staff job satisfaction.

The effectiveness and cost-effectiveness of remotely monitored assistive technology

However, the authors did not assign monetary value to these variables, so they are not represented in projected savings.

Table 24: Summary of modelling studies investigating the cost-effectiveness of remotely monitored AT

Study design (model type)	Healthcare population	Product(s) (and clinical metrics collected/monitored)	Intervention versus comparator	Perspective	Time horizon	Price year (currency); discount rate	Key findings
Cost-utility analysis (discrete event simulation model) [101]	Heart failure	Low-profile electronic weighing scales, an automated sphygmomanometer (to measure BP), and a single-lead ECG using wristband electrodes (based on a cited paper which previously described the intervention product, these were provided by Philips [108]) (Twice-daily patient self-measurement of weight, BP, and heart rate and rhythm, sent to study nurses for triage and sent to primary care physician for additional consultation)	HTM plus a diagnostic algorithm versus HTM or enhanced usual care with an individualised written pharmacological treatment management plan	Societal perspective	Lifetime	2020 (EUR); 4% for utilities, 1.5% for costs	HTM plus a diagnostic algorithm and HTM were both projected to have higher QALYs and higher costs compared with enhanced usual care. The projected ICER per QALY gained for HTM plus a diagnostic algorithm compared with enhanced usual care was EUR 34,368 EUR per QALY gained, which was cost-effective at the EUR 80,000 WTP threshold. No ICER was reported for HTM only compared with enhanced usual care.
Cost-utility analysis (Markov) [102]	Chronic heart failure (aged 70 years and over)	Weight scales, BP and pulse monitor, ECG/rhythm strip recorder, and a home hub (for transferring data) (Philips) (Twice-daily monitoring of weight, BP, and heart rate and rhythm by nurses)	HTM versus nurse telephone support or usual care	Dutch third-party payer perspective	20 years	2015 (EUR); 4% and 1.5% yearly	HTM was projected to have higher QALYs and higher costs in comparison with usual care. The projected ICER was EUR 12,479 per QALY gained, which is cost-effective at the EUR 14,000 WTP threshold. Nursing telephone support was projected to dominate HTM (higher QALYs and lower costs) across combined NYHA classes of heart failure. For all classes of heart failure, nursing telephone support was projected to have higher QALYs

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Study design (model type)	Healthcare population	Product(s) (and clinical metrics collected/monitored)	Intervention versus comparator	Perspective	Time horizon	Price year (currency); discount rate	Key findings
							and higher costs in comparison with usual care. The projected ICER was EUR 8,270, which is cost-effective at a EUR 14,000 WTP threshold.
Cost-consequence analysis (not specified) [104]	Elderly users of home care services who live at home with mild, moderate, or severe functional impairment such as dementia, physical disabilities, or age-related decline	A smart home technology package, which may include a safety alarm; fall sensor; smoke, fire, and heat detectors; and a door sensor. No brand or manufacturer reported. (Falls, movement, and location, as various sensors trigger an alarm)	Smart home technology versus living at home without smart home technology or living in an institution/nursing home	Societal perspective	1 year	Assumed 2009 (NOK); N/A	Projected to be cost-saving for those with smart home technology
Cost-utility and cost-benefit analysis (Markov) [105]	At high risk for CNV (those who already have CNV in a single eye (CNV1) and individuals with high bilateral risk of CNV) (aged 65 years and over)	ForeseeHome home-based visual-field monitoring system (Notal Vision Ltd) (Daily visual-field monitoring transmitted to a central data monitoring centre)	Home-based daily monitoring versus usual care	USA federal payer perspective (cost-utility analysis) Societal perspective (cost-benefit analysis)	Lifetime	2016 (USD); 3%	Home-based monitoring was projected to have higher QALYs and higher costs for patients at high risk of progression to bilateral CNV (CNV1 and age-related macular degeneration stages three and four). The projected ICER was USD 35,663 per QALY, which is cost-effective at a USD 50,000 WTP threshold. For those with only CNV1, home-based daily monitoring was

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Study design (model type)	Healthcare population	Product(s) (and clinical metrics collected/monitored)	Intervention versus comparator	Perspective	Time horizon	Price year (currency); discount rate	Key findings
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dominant (higher QALYs and lower costs). Cost-effectiveness decreased for patients with lower risk.

3.8.2 Trial-based full economic evaluation

3.8.2.1 Methodological quality assessment

One study assessed the cost-effectiveness of remotely monitored AT in older adults (aged 80 years and over) with hypertension as part of a trial-based full economic evaluation [103]. The quality assessment for this study is provided in Table 25. There were only two items of potential concern. The first is regarding the potential conflict of interest of study researcher(s) and funder(s) (item 18), and the second is ethical and distributional issues not being discussed appropriately (item 19). The full assessment is available in Appendix K.

Table 25: Critical appraisal summary of trial-based full economic evaluation using the Consensus Health Economic Criteria (CHEC) list

Quality dimension	Quality dimension met McIntyre <i>et al.</i> (2020) [103]
1. Is the study population clearly described?	Yes
2. Are competing alternatives clearly described?	Yes
3. Is a well-defined research question posed in answerable form?	Yes
4. Is the economic study design appropriate to the stated objective?	Yes
5. Is the chosen time horizon appropriate to include relevant costs and consequences?	Yes
6. Is the actual perspective chosen appropriate?	Yes
7. Are all important and relevant costs for each alternative identified?	Yes
8. Are all costs measured appropriately in physical units?	Yes
9. Are costs valued appropriately?	Yes
10. Are all important and relevant outcomes for each alternative identified?	Yes
11. Are all outcomes measured appropriately?	Yes
12. Are outcomes valued appropriately?	Yes
13. Is an incremental analysis of costs and outcomes of alternatives performed?	Yes
14. Are all future costs and outcomes discounted appropriately?	Yes
15. Are all important variables, whose values are uncertain, appropriately subjected to sensitivity analysis?	Yes
16. Do the conclusions follow from the data reported?	Yes
17. Does the study discuss the generalisability of the results to other settings and patient/client groups?	Yes
18. Does the article indicate that there is no potential conflict of interest of study researcher(s) and funder(s)?	No
19. Are ethical and distributional issues discussed appropriately?	No

3.8.2.2 Summary of study findings

This study conducted a cost-utility analysis of remotely monitored AT for screening detection of AF in older adults (aged 80 years and over) with hypertension from a Canadian payer perspective [103]. The analysis compared three screening durations (7 days, 30 days, and 60 days) with no screening. Higher QALYs and higher costs were projected for 7-day screening compared with no screening (5 QALYs gained; USD 274,000 more expensive) per 1,000 patients screened, resulting in an ICER of USD 50,000, which was reported to be cost-effective at a WTP threshold of USD 50,000. Higher QALYs and higher costs were projected for 30-day screening compared with no screening (7 QALYs gained; USD 492,000 more expensive) per 1,000 patients screened, resulting in an ICER of USD 70,000, which was reported to not be cost-effective at a WTP threshold of USD 50,000. Higher QALYs and higher costs were projected for 60-day screening compared with no screening (9 QALYs gained; USD 763,000 more expensive) per 1,000

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patients screened, resulting in an ICER of USD 84,000, which was reported to not be cost-effective at a WTP threshold of USD 50,000. An overview of the study is provided in Table 26.

Table 26: Summary of trial-based full economic evaluations studies investigating the cost-effectiveness of remotely monitored AT

Study design (model type) (author, year)	Healthcare population	Product(s) (and clinical metrics collected/monitored)	Intervention versus comparator	Perspective	Time horizon	Price year (currency); discount rate	Key findings
Cost-utility analysis (Markov) [103]	Hypertension (aged 80 years and over)	Single-lead device with automatic AF detection (Vitaphone 3100) (Heart rhythm monitored continuously for 30 days by a centralised service model and adjudicated by an arrhythmia expert)	Continuous non-invasive ECG monitoring versus no screening	Canadian payer perspective	Lifetime	2014 (USD); 1.50%	Seven-day screening was projected to be cost-effective compared with no screening. The projected ICER was USD 50,000, which is cost-effective at a USD 50,000 WTP threshold. Thirty-day screening was projected to not be cost-effective compared with no screening. The projected ICER was USD 70,000, which is not cost-effective at a USD 50,000 WTP threshold. Sixty-day screening was projected to not be cost-effective compared with no screening. The projected ICER was USD 84,000, which was not cost-effective at a USD 50,000 WTP threshold.

4 Discussion

4.1 Summary of findings

This evidence review included 26 papers [80–105,111] that assess the impact of remotely monitored AT on healthcare utilisation and provision, as well as the cost-effectiveness of remotely monitored AT for older community-dwelling adults in OECD member countries. We identified 21 papers [80–98,100], comprising 20 studies, that reported on 60 healthcare utilisation outcomes, and 5 papers that reported on cost-effectiveness [101–105,111]. Publication dates spanned 2 decades (2006–2025) and included diverse healthcare populations across 9 OECD member countries and 22 different packages of AT which monitored a wide variety of metrics.

4.1.1 Is remotely monitored AT effective in improving healthcare utilisation and provision?

Across the 20 studies [80–98,100] reporting on healthcare utilisation outcomes, we identified 17 different remotely monitored AT packages aimed at improving older adults' health across different healthcare populations, including individuals with heart failure, chronic obstructive pulmonary disease (COPD), hypertension, Alzheimer's disease, chronic disease, and frailty; those at risk of stroke and of AF; and general older adults. Seven OECD member countries (the USA, France, the United Kingdom (UK), Italy, Canada, Germany, and Australia) were represented across the 14 randomised controlled trials (RCTs) and 6 non-randomised studies of interventions (NRSIs). The remotely monitored ATs that were used across studies varied from more simple products aimed at a single metric (e.g. AliveCor Kardia for detecting AF) to more complex packages or systems (e.g. e-GEROPASS software, a hub with seven external biometric sensors) that monitored several different metrics. Intervention duration varied widely from 60 days to 18 months, with one study having an extended follow-up period of a median of 4.2 years. The frequency of transmission, the monitoring, and the healthcare providers who monitored information was also diverse, potentially contributing to the lack of effect of remotely monitored AT on healthcare utilisation outcomes.

The 56 healthcare utilisation outcomes were grouped into broader-level healthcare utilisation outcome groupings: ED visits; hospitalisations (including length of stay); admissions to long-term care; outpatient visits (including primary care visits, specialist visits, same-day surgery days, and urgent care visits); days at home and home care episodes; access to diagnosis; and other assorted healthcare utilisation outcomes. Across nearly all outcomes, the certainty of evidence was very low, meaning that the research on the impact of remotely monitored AT on healthcare utilisation outcomes is subject to methodological limitations that reduce our confidence regarding the effect of remotely monitored AT on healthcare utilisation. One outcome demonstrated low-certainty evidence, that remotely monitored AT results in an increase in urgent care visits (incidence rate ratio: 1.6) [97]. Two outcomes, days at home and primary care encounters, demonstrated moderate-certainty evidence that remotely monitored AT probably increases the number of days at home slightly (mean difference: 3.4 more days at home) and decreases primary care encounters slightly (mean difference: 0.4 fewer visits) among a general population of older adults [88]. However, results from two RCTs indicated no difference in primary care visits between groups, so the evidence is very uncertain about the effect of remotely monitored AT on primary care visits. The certainty of evidence was often downgraded due to issues such as outcomes at a high risk of bias, a low number of studies and participants contributing to an outcome, and wide CIs around measures of effect.

4.1.1.1 ED visits

Across the 10 studies [80,82,83,85,86,88,93,96–98] reporting outcome data related to ED visits, the certainty of evidence is very low, meaning that the evidence is very uncertain about the effect of remotely monitored AT on ED visits.

We were able to pool six studies into two meta-analyses: one pooled analysis on participants with at least one ED visit [80,86,95,98] and one pooled analysis on the average number of ED visits [80,82,93]. The meta-analyses suggested that there was no statistically significant difference between the remotely monitored AT intervention group and the usual care or enhanced usual care groups in relation to having at least one ED visit or to the average number of ED visits. Four studies with ED visit outcomes could not be pooled into the meta-analyses. Two RCTs [85,97] and one NRSI [88] found no difference between the remotely monitored AT groups and comparator groups. One RCT [96], meanwhile, found that remotely monitored AT may reduce post-fall admissions to the ED when compared with the usual care group, but the certainty of evidence was still very low.

4.1.1.2 Hospitalisations and length of stay

Across 12 studies [80–83,85–88,93,95,97,99,100] reporting outcomes related to hospitalisations and length of stay, the certainty of evidence is very low, meaning that the evidence is very uncertain about the effect of remotely monitored AT on hospitalisations and length of stay.

We were able to pool four studies into two meta-analyses on hospitalisations. One pooled analysis examined having at least one hospital admission, and the second pooled analysis examined the average number of hospitalisations. The meta-analyses results found no statistically significant difference in having at least one hospital admission or in the average number of hospitalisations between the remotely monitored AT group and the usual or enhanced usual care groups. Six studies reported outcome data on hospitalisations that could not be pooled into meta-analyses. Of these, only one RCT [107] reported that remotely monitored AT may reduce the hazard of being hospitalised for acute coronary syndrome when compared to the usual care group but it also did not report outcome data for hospital admissions for venous thromboembolism. The rest of the RCTs [81,85,87,97] and one NRSI [99] reporting hospitalisation outcome data found no significant differences in hospitalisation outcomes between the remotely monitored AT groups and comparator groups.

For duration or length of stay in hospital, seven studies [81–83,86–88,97,99] with length of stay outcomes could not be pooled into a meta-analysis. Two studies did not report outcome data on the number of hospital days due to all causes [81] and the number of days of hospitalisation [95]. Only one RCT [97] found no significant difference in the average length of stay when comparing a remotely monitored AT group with a usual care group, although this same study did find a statistically significant difference in number of days of hospitalisation. One RCT [87] reported differences between groups but no *p*-values, so it is not known whether this difference is statistically significant. Three RCTs [81–83,86] and two NRSIs [88,99] found no significant difference between remotely monitored AT groups and usual care groups.

4.1.1.3 Admissions to long-term care

Across two studies [88,94] reporting outcome data related to admissions to long-term care, the certainty of evidence was very low, meaning that the evidence is very uncertain about the effect of remotely monitored AT on admissions to or days in long-term care. Both studies reported no statistically significant differences between groups on admissions to and days in long-term care.

4.1.1.4 Outpatient visits

Across four studies [85,88,97,98] reporting outcome data on outpatient visits (including primary care visits, specialist visits, same-day surgery days, and urgent care visits), the certainty of evidence is low or very low.

The evidence from two RCTs is very uncertain about the effect of remotely monitored AT on primary care visits and on patients having at least one general practitioner (GP) visit [97,98]. However, one NRSI found that remotely monitored AT may reduce primary care visits slightly [88].

The evidence from one RCT suggests that remotely monitored AT results in a slight increase in urgent care visits [97].

The evidence is very uncertain about the effect of remotely monitored AT on same-day surgery days [88] and the number of physician office visits [85]. Two studies referred to outcomes related to the number of scheduled and urgent outpatient visits and the number of office visits, but did not report outcome data [86,92].

4.1.1.5 Days at home and home care episodes

Across the three studies [82,83,88,93] reporting outcome data on days at home, days to readmission, and home care episodes, the certainty of evidence was moderate and very low. The one NRSI [88] comparing remotely monitored AT with a usual home care group provided moderate-certainty evidence indicating that remotely monitored AT probably increases days at home slightly. The results of the two RCTs, meanwhile, indicated that the evidence is very uncertain regarding the effect of remotely monitored AT on days to readmission and on episodes of home care. One RCT did not report outcome data on home care visits [85].

4.1.1.6 Access to diagnosis

Based on the two studies reporting outcome data related to access to diagnosis, remotely monitored AT may increase access to diagnosis (by reducing time to diagnosis), but the evidence is very uncertain. One RCT [100] did not report usable outcome data for access to diagnosis of AF.

4.1.1.7 Other assorted healthcare utilisation outcomes

The certainty of evidence is very low across the four studies reporting on six outcomes related to other assorted healthcare utilisation outcomes. The evidence is very uncertain about the effect of remotely monitored AT on anticoagulant therapy prescriptions, overall healthcare utilisation, rehabilitation days, inpatient mental health days, alternate level of care days, and the number of medical emergency contacts. Five additional studies [89–92,98] did not provide usable outcome data.

4.1.2 Is remotely monitored AT cost-effective?

Across the five full economic evaluations identified in order to answer our second research question on cost-effectiveness, we identified five different remotely monitored AT packages aimed at improving older adults' health across five different healthcare populations, including (chronic) heart failure, hypertension, those at high risk of CNV, and older adults with mild to severe impairment. Four OECD member countries (Canada, the Netherlands, Norway, and the USA) were represented across the three cost-utility studies [101–103], one cost-consequence study [104], and one mixed cost-benefit and cost-utility study [105].

A Norwegian cost-consequence study [104], from a societal perspective, projected that smart home technology for older adults was cost-saving compared with older adults living at home without smart home technology, with cost-savings increasing with greater functional impairment severity. When compared with older adults living in a nursing home, smart home technology at home was still projected to be cost-saving, but the savings decreased with greater functional impairment severity.

A Dutch cost-utility study [101], from a societal perspective, projected that a HTM system with a diagnostic algorithm for older adults with heart failure improved QALYs compared with HTM only or enhanced usual care, but the HTM system with a diagnostic algorithm cost more than the HTM only or enhanced usual care option, at EUR 34,368 for each QALY gained.

A cost-utility study [102], from a third-party payer perspective in the Netherlands, projected that a HTM had higher QALYs but cost more compared with usual care, costing EUR 12,479 for each QALY gained. However, nursing telephone support projected higher QALYs gained for most patients (NYHA heart failure classes I–III) and lower costs (i.e. the dominant choice over HTM). Only in the most severe cases (NYHA heart failure class IV) were higher QALYs projected in HTM compared with nursing telephone support, with HTM costing EUR 8,270 for each QALY gained.

A cost-benefit and cost-utility study [105], from both a USA federal payer perspective and a societal perspective, projected that a home-based visual-field monitoring system for older adults at high risk of CNV had higher QALYs and lower cost (i.e. was dominant) compared with usual care for patients who were at high risk of progressing to bilateral CNV. The cost-effectiveness of the home-based visual-field monitoring system was projected to decrease for patients at lower risk.

One cost-utility analysis, from a Canadian payer perspective [103], compared three screening durations (7 days, 30 days, and 60 days) with no remotely monitored AT screening in older adults (aged 80 years and over) with hypertension. Seven-day screening was projected to be cost-effective at a WTP threshold of USD 50,000 whereas thirty- and sixty- day screening were not cost-effective at that WTP threshold. Higher QALYs and costs were reported for all screening options compared with no screening.

4.2 Comparison with other research

Although our review included 20 studies on healthcare utilisation and 5 full economic evaluations, one could expect more research to have been done in this area due to the global demographic shift of ageing populations. However, the limited evidence base found in our review is perhaps unsurprising, as users of home care services and older adults generally are often excluded from clinical trials due to advanced age, multimorbidity, and frailty [112,113]. Some AT can also be highly personalised, based on a patient's preferences and the specific monitoring needs related to their condition.

While we included a wide range of study designs in our evidence review, there is discussion in the field of AT of the appropriateness of relying on evidence from clinical trials or other cohort-based study designs, given the complex and individual nature of AT [20,114]. NRSIs of any size were eligible for inclusion in our review, as well as n-of-1 trials, but we did not find any of the latter in our searches. Prototype testing in controlled experimental conditions is common, but these studies are not often realised at scale with even small-scale pilots [115]. While we included both commercially available AT and prototypes, small-scale pilots also likely would not inform the healthcare utilisation outcomes included in our review due to limited time frames and small sample sizes often without control groups. Anecdotally, during the screening process, we encountered a lot of prototype testing, particularly when screening results identified from IEEE Explore, a database from the Institute of Electrical and Electronics Engineers which includes research articles, conference papers, technical standards, book chapters, and more. Multidisciplinary partnerships between developers, clinicians, economists, and patients to acquire funding and test AT should be prioritised.

Limited economic evaluations on AT have also been reported [36]. We identified several different AP evaluated across different health systems but the number of studies evaluating cost-effectiveness was less than a quarter of those evaluating healthcare utilisation. Furthermore, it was often difficult to

compare between studies as costs are context-specific and driven within market forces within different healthcare systems.

Across both our research questions, a variety of healthcare populations were represented; however, certain chronic conditions affecting older people may be underrepresented in our findings, as identified research on diabetes, obstructive sleep apnoea, Parkinson's disease, and chronic heart failure often included large age ranges for included participants (see Appendix L for a list of studies that we excluded on age). Since we were guided by the Irish Central Statistics Office's definition of an older adult being aged over 65 years [2], we only included studies where the authors explicitly specified the eligibility criterion of being aged 65 years and over. In addition, certain conditions, such as those pertaining to mental health, pain or movement (e.g. rheumatoid arthritis, Parkinson's disease), or nutrition, often rely on self-reported patient symptoms completed via questionnaire, which were out of the scope of this review.

4.2.1 Healthcare utilisation

Our review identified a wide range of AP, from single products focusing on one or a few metrics to complex systems monitoring numerous metrics. This product and monitoring diversity is common in related reviews on remote monitoring systems and AT, identifying wearables, smart home sensors, and more [19,30,116]. Some of our included studies involved sensors [88] including an ambient assisted living system [99] unlike a 2008 Cochrane review on smart home technologies, which found no studies testing the effectiveness of smart technologies such as sensors within the home [117]. Our review also identified a few studies that monitored falls via wearables or sensors [88,94,96]; however, one would expect more research in this area, as falls are the leading cause of injuries in older adults, with some conditions such as Alzheimer's disease linked to experiencing an average of 1.30 falls per person per year [118].

Broadly speaking, our findings did not indicate that remotely monitored AT was effective for reducing ED visits, hospitalisations (including length of stay), admissions to long-term care, home care episodes, or outpatient visits. However, we generally had very low certainty evidence for the healthcare utilisation outcomes, indicating substantial uncertainty in these findings and that future research is likely or very likely to change the effect estimates. One outcome demonstrated low-certainty evidence, that remotely monitored AT may result in an increase in urgent care visits (incidence rate ratio: 1.6) [97]. Two outcomes, days at home and primary care encounters, demonstrated moderate-certainty evidence that remotely monitored AT probably results in a slight increase in the number of days at home (mean difference: 3.4 more days at home) and a slight reduction in primary care encounters (mean difference: 0.4 fewer visits) among a general population of older adults [88].

This adds to a mixed evidence base in the area, which largely does not seem to affirm the effectiveness of AT [19]. A 2025 scoping review on remote monitoring systems for older adults at risk of complications found reduced hospitalisations but no decline in ED visits or in length of stay [116], whereas a 2019 meta-analysis of the effect of smart homes on older adults with chronic conditions found no significant effects on hospital admissions, ED admissions, length of stay, or quality of life, but reported that almost all participants were satisfied with the smart homes [119]. A 2023 review of the use of mobile-based telemonitoring strategies in general heart failure patients, meanwhile, found a reduced risk of hospitalisation but no reduced risk in mortality [120].

Heart failure was the most common healthcare population within our review, a finding that is perhaps unsurprising given that heart failure is a leading cause of hospitalisation in older adults [121]. Our overall meta-analysis did not find an effect of remotely monitored AT on hospitalisations, and we did not have enough studies to conduct subgroup analyses in order to explore the effect in the heart failure subgroup. Our findings also indicated that remotely monitored AT may increase access and/or reduce time to

diagnosis of AF, but the evidence was very uncertain. The 2024 European Society of Cardiology Guidelines for the management of AF recommend routine heart rhythm assessment in all individuals aged 65 years and over for earlier detection [122]. It is estimated that from 2010 to 2060, the number of adults aged 55 years and over with AF in the European Union will more than double, and AF is associated with significant morbidities and mortality [123]. Through our screening process, we identified screening programmes and general outpatient monitoring (e.g. through products like wearable Holter monitors), but screening evolving into remote patient monitoring (RPM) (requiring oversight and engagement with incoming data and longer monitoring periods) was uncommon. Relatedly, the European Society of Cardiology also notes that “remote monitoring and telemedicine for identification and follow-up of patients with AF, or its subgroups is non-established, though widely applied” [122 p3378], and recommends prolonged monitoring for higher-risk patients, which perhaps will result in more research that qualifies as RPM.

A lack of observed effects of remotely monitored AT on healthcare utilisation could be linked to the highly personalised nature of AT and the complexity of the interventions themselves, which varied in terms of metrics monitored, the frequency of monitoring, and the monitors themselves, as well as how information was acted upon. Similar to an evidence review within the 2015 National Institute for Health and Care Excellence guideline on home care [124], we experienced difficulties with the reporting of studies and their clarity on intervention details, so it can be difficult to determine which components or combination of components (and metrics monitored) are needed. The UK Medical Research Council and National Institute for Health Research’s framework for developing and evaluating complex interventions [125,126] recognises that the paradigms that focus solely on effectiveness may be inadequate to delivering solutions for real world practice. When considering the complexity of the remotely monitored AT included in this study across many healthcare populations, it may be more relevant to shift the focus from a “binary question of effectiveness” to “whether and how the intervention will be acceptable, implementable, cost effective, scalable, and transferable across contexts” [127].

Our included studies also had a wide range of monitoring periods, from 60 days to 18 months, and often involved nurses and alerts or algorithms to help providers triage incoming results. Nurse operators supported by automated alert systems were also seen in a 2025 scoping review on remote monitoring systems [116]. Notably, Medicare in the USA states that remote physiologic monitoring must be collected for at least 16 out of 30 days in order to be eligible for reimbursement [128]. Although the frequency of monitoring was unclear in some studies, a majority of our included studies had automatic, real-time, or daily monitoring.

Across most of our outcomes, we identified low- or very low-certainty evidence, which reflects a common pattern in evidence related to public health interventions. A 2025 systematic survey of the use of GRADE in *Campbell Systematic Reviews*, found that the majority of outcomes in the identified reviews had low- or very low-certainty evidence [129], whereas a 2026 scoping review of World Health Organization (WHO) public health guidelines found that less than one-third of the assessed outcomes reported moderate- or high-certainty evidence [130]. Generally, GRADE guidance warns against strong recommendations when the certainty of the evidence is low or very low, but there are five situations or paradigms where this may be justified [131]: 1) life-threatening situations; 2) the potential equivalence of options where one is clearly less risky or costly; 3) uncertain benefit and certain harm; 4) high certainty in similar benefits where one option is potentially more risky or costly; and 5) potential catastrophic harm. A 2023 analysis of Irish National Clinical Guidelines found that 63.6% of strong recommendations were based on low- or very low-certainty evidence, although the majority (73.7%) aligned with at least one of the five paradigmatic situations outlined and were thus considered justifiable [132]. Within these contexts, policy-makers can develop policies based on lower levels of evidence provided that they are supported by considered judgement and that the benefits of intervening generally outweigh the risks.

4.2.2 Cost-effectiveness

Our finding that remotely monitored AT is largely cost-effective aligns with some of the research in this area, although contextualisation and interpretation is often complicated by the lack of evaluations that focus specifically on older adult populations and on definitions of AT and RPM. A 2018 evidence review and economic pathway analysis that focused on AT for older Australians found that AT could reduce service costs, although further funding of information and awareness services was recommended [20]. Although these interventions are typically deemed cost-effective at the review level, individual economic evaluations do not always support this conclusion. For instance, the Whole Systems Demonstrator trial, which investigated telemonitoring in adults with long-term conditions, found that the incremental cost per QALY was GBP 92,000, thus concluding that it did not “seem to be a cost effective addition to standard support and treatment” [133].

The matter is further complicated by the varying impacts within different health systems. For example, ambulatory blood pressure monitoring has not been embraced in the USA despite it being the gold standard for hypertension diagnosis in the UK, where it is cost-effective from a societal perspective [134]. This is largely because ambulatory blood pressure monitoring is deemed to be impractical in the USA due to the country’s pluralistic healthcare market, where the longer-term cost savings may not accrue to the same insurance provider as patients move between insurance plans [134].

Much of the research on remotely monitored AT comes from the field of heart failure, where remote monitoring is largely found to be cost-effective compared with usual care. An integrated economic model that was derived from a meta-analysis of RCTs on heart failure, where the median age across all studies was 70.7 years (age range: 45–78 years), also found that RPM was dominant over standard care (i.e. higher QALYs and lower cost) [135]. Additionally, a cost-effectiveness analysis of remote monitoring strategies for heart failure patients after discharge from hospital found that, from a UK National Health Service perspective, telemonitoring was the most cost-effective strategy when compared with usual care or with two different types of structured telephone support [136].

The issue of complex interventions and variability in the frequency of metrics gathering and monitoring can also be seen in cost-effectiveness research. For example, a 2021 decision-analytic model quantifying the comparative effectiveness of 45 distinct AF screening strategies for those aged 65 years and over found that effective strategies were typically multimodal, including the use of technology that continuously or nearly continuously monitored cardiac rhythms through products such as wrist-worn wearables [137]. A similar 2022 cost-effectiveness analysis of eight screening strategies for AF in older adults using wearable devices found that AF screening using wearables may be cost-effective, with the preferred strategy being the use of a wearable photoplethysmography device, followed by a wearable electrocardiography device with patch monitor confirmation [138]. The cost-effectiveness of AT may therefore be reliant on the specific product(s) employed and the monitoring frequency, with continuous monitoring likely to be optimal.

4.3 Strengths and limitations

Our review provides a comprehensive overview of remotely monitored AT research in community-dwelling older adults in OECD member countries. However, we may not have identified all remotely monitored ATs that are relevant for older people. This limitation is largely related to the scope of our review and the restrictions placed on age, settings, types of remotely monitored AT, and outcomes. This meant that we did not find eligible studies for conditions which have an earlier age of onset (e.g. diabetes or heart failure) or those which are more researched in institutionalised settings (e.g. bed sensors in nursing care facilities). In addition to the setting limitation which excluded institutionalised settings, we

also only included evidence from OECD member countries, thus we may have missed relevant evidence from non-member countries. Poor reporting of information about products, particularly information about transfer of data, who has access to the data, and how they are acted upon, was often unclear, resulting in the potential exclusion of relevant products. Unclear and varied reporting also extended to population characteristics where eligibility criteria regarding age were not clear or older people were defined in various ways. Additionally, missing outcome data and varied reporting of effect estimates precluded the ability to perform meta-analyses for many of our outcomes.

Our review did, however, include 26 studies that we identified by searching multiple databases and grey literature sources and double-screening the results. Although inclusive in search terminology, both remote monitoring and AT are complex topics. An information specialist (AF) developed searches that were peer-reviewed by another information specialist (Mr Niall O'Brian) using the Peer Review of Electronic Search Strategies (PRESS) guidelines. We also adhered to the best methodological practices for double-screening, and all extractions and quality assessments included two researchers.

Additional products that were outside of the scope of the current review may also help older adults to live independently for longer. Implantable devices, such as implantable cardioverter defibrillators, pacemakers, or ambulatory or automated peritoneal dialysis equipment, may be relevant for remote monitoring in older adults, as well as remotely monitored therapy delivery or assessments (e.g. transcranial direct current stimulation for Parkinson's disease, or wearables to assess physical activity). Our exclusion of studies which investigated AT specifically related to COVID-19 also meant that we only identified AT tested in non-emergency circumstances and there may be interventions tested during this time period that could be applicable and used under non-emergency circumstances. This is especially important as the pandemic increased the appetite for remote patient monitoring and therapy based on patient risks and needs [139]. The use of these technologies may be more closely studied in assisted living facilities because fall alarms and bed sensors are more commonly used in such settings [140,141].

4.4 Future research

Remotely monitored AT is used across the lifespan, and individuals can age both with and into disability [20], so it is important that researchers continue to study the impact of remotely monitored AT specifically in older adults. Specific research funding calls that bring together industry (e.g. product manufacturers) and researchers can help bridge the gap between pilot-testing and larger studies and real-world implementation. For example, the UK's National Institute for Health and Care Research has had a number of funding calls related to AT and digital health [142,143], and the National Institute for Health and Care Excellence introduced early value assessments in 2022 in order to accelerate access to promising health technologies [144,145]. A recently awarded project from the Health Research Board (HRB) in 2026, the Attune Project, aims to explore how older people experience home support services. Integrating questions that are specific to remotely monitored AT into their national survey, interview, and discussion groups would provide an opportunity to locally explore what is working well and what needs to be improved [146]. Additionally, a recommendation from the 2026 *Assistive technology capacity assessment in Ireland* [147] proposes the creation of a national user panel of key stakeholders who can be involved in decision-making processes at regional and national levels.

Furthermore, there are specific remotely monitored AT, such as fall alarms and bed sensors, that have largely been tested in residential care facilities [148], and testing of these products should be extended to community-dwelling older adults. Although we identified a few studies with general older people [88,99], those with chronic disease [95], those with Alzheimer's disease [94], and those who are frail [96], interventions targeting general cognitive, activities of daily living, or physical decline were limited. Given the importance of mobility, safety, and overall quality of life in older people, future research is warranted

to evaluate the effectiveness and cost-effectiveness of remotely monitored AT in these areas. Potentially relevant remotely monitored AT is also available for chronic diseases with earlier ages of onset (e.g. diabetes, heart failure, Alzheimer's disease, or Parkinson's disease) and should also be studied specifically in community-dwelling older people.

Our first research question focused only on the effectiveness of AT in terms of the impact it can have on healthcare utilisation. Clinical outcomes (e.g. quality of life) may be more salient to patients and should be considered alongside the acceptability of the products from the perspectives of staff and patients. Of note, the National Institute for Health and Care Excellence reported that much research focuses on shorter follow-up and clinical outcomes, which partially informed our focus on the impact that AT can have on healthcare utilisation metrics such as visits and admissions [149]. Future research should clearly describe the products being investigated (e.g. using the TIDIER checklist), follow patients for longer periods of time, and investigate the impacts of remotely monitored AT on healthcare utilisation, clinical, economic, and formal caregiver outcomes. We found no studies which included formal caregiver outcomes such as hours of care delivered or measures of efficiency or productivity. Leveraging AT to support the care workforce is an important area of research as it can assist in particularly under resourced or rural areas, enabling more efficient and scalable service delivery [147]. This information will provide policy makers with better information about the effectiveness, acceptability, and costs of products so they can prioritise investments. Patient experience and acceptability of AT and how the clinician–patient relationship is affected are also important to consider in the ethical context of the trade-offs between autonomy, privacy, and safety [115,124,150,151].

Lastly, while full economic evaluations were generally well-conducted, we did not find many cost-effectiveness studies, particularly trial-based economic evaluations. Despite most of our studies for our first research question being RCTS, we only found one trial-based economic evaluation for our second research question on cost-effectiveness. Future research should try to incorporate economic evaluations alongside trials and extend to more populations and products.

5 Conclusion

This evidence review identified 20 studies assessing the impact of remotely monitored AT on healthcare utilisation for older community-dwelling adults, and 6 full economic evaluations examining cost-effectiveness in OECD member countries. In relation to healthcare utilisation outcomes, most outcomes were graded as very low certainty, meaning that our confidence in the findings is limited in terms of the effect of remotely monitored AT on ED visits; hospitalisations and length of stay; admissions to long-term care; outpatient visits; days at home and home care episodes; and access to diagnosis. One outcome demonstrated low-certainty evidence, that remotely monitored AT results in an increase in urgent care visits (incidence rate ratio: 1.6). Two outcomes, days at home and primary care encounters, demonstrated moderate-certainty evidence that remotely monitored AT results in a small increase in the number of days at home (mean difference: 3.4 more days at home) and fewer primary care encounters (mean difference: 0.4 fewer visits) among a general population of older adults. We found no studies which included formal caregiver outcomes such as hours of care delivered and measure of efficiency or productivity. The diversity in healthcare populations, products studied, monitoring processes, and follow-up durations, combined with methodological limitations and small sample sizes, all likely contributed to the lack of observed effects and low certainty ratings.

Despite there being a lack of impact identified in the healthcare utilisation studies, in relation to cost-effectiveness outcomes, most of the cost-effectiveness studies did demonstrate an impact, with models focused on remotely monitored AT projecting better cost-benefit ratios or cost-savings (i.e. lower treatment costs and equal effectiveness), although the benefits sometimes varied across levels of risk.

Generalisability and certainty for the cost-effectiveness evidence was similarly limited in the remotely monitored AT packages that were studied, with differences in healthcare systems, perspectives, and modelling assumptions.

Although our review was comprehensive, it also highlighted a weak evidence base, research gaps, and challenges in the evaluation of complex personalised AT packages. Given the global demographic shift, there is a need for more robust research into community-dwelling older adults that more clearly describes intervention components and explores varying monitoring intensities for longer periods of time. The expansion of this evidence base, paired with explorations into acceptability, experience, and clinical outcomes, will help better integrate remotely monitored AT into the lives of older adults.

6 Author contributions

MKS is the guarantor of the protocol and review. MKS, AB, AF, and NMG drafted the protocol document. All authors contributed to developing the selection criteria, the risk of bias assessment strategy, and the data extraction criteria. AF developed the search strategy and ran all searches. MKS, AB, and MR screened records, extracted data, and performed quality assessments. All authors read, provided feedback on, and approved the final review.

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9 Appendices

Appendix A Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) checklist

Table 27: Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) checklist

Section and topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Section 2.1
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Not applicable
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Section 1.1
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Section 1.2
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Section 2.2
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Section 2.3
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Section 2.3.3, Appendix C, Appendix D, Appendix E
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Section 2.2, Section 2.3.5
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Section 2.4
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were	Section 2.2

Section and topic	Item #	Checklist item	Location where item is reported
		compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Section 2.4
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Section 2.5.1
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	Section 2.6
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Section 2.6
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Section 2.6
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Section 2.6.2
	13d	Describe any methods used to synthesise results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Section 2.6.1
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	Section 2.6.1
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesised results.	Section 2.6.1
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	Section 2.5.1
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Section 2.7

Section and topic	Item #	Checklist item	Location where item is reported
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Section 3.1
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Appendix L, Appendix M
Study characteristics	17	Cite each included study and present its characteristics.	Section 3.3.1, Section 3.3.2
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Appendix F, Appendix I
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	The last section (Summary of findings) within each of the outcome sections 3.7.1-3.7.7 (e.g. 3.7.1.5 and 3.7.2.5). Additional information is available in the narrative summary sections.
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	The first two sections within each of the outcome sections 3.7.1-3.7.7 (e.g. 3.7.1.1 and 3.7.1.2)
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	Section 3.7.1.3, Section 3.7.2.3
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	Meta-analysis sections and footnotes on forest plots. Sections 3.7.1.3 and 3.7.2.3
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesised results.	Not applicable. No sensitivity analyses could be/were performed (noted in meta-analysis sections)
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Missing outcome data reported in summary of findings table at the end of each outcome section.
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	The last section (Summary of findings) within each of the outcome sections 3.7.1-3.7.7 (e.g. 3.7.1.5 and 3.7.2.5). Additional

Section and topic	Item #	Checklist item	Location where item is reported
			information is available in Appendix O
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Section 4.1
	23b	Discuss any limitations of the evidence included in the review.	Section 4.2
	23c	Discuss any limitations of the review processes used.	Section 4.3
	23d	Discuss implications of the results for practice, policy, and future research.	Section 4.4
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Section 2.1
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Section 2.1
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	Section 2.8
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Section 7
Competing interests	26	Declare any competing interests of review authors.	Section 7
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	Section 2.4, Section 2.6.1, and Appendix F

Appendix B Synthesis Without Meta-analysis (SWiM) checklist

Table 28: Synthesis Without Meta-analysis (SWiM) checklist

SWiM reporting item	Item description	Page in manuscript where item is reported
1 Grouping studies for synthesis	1a) Provide a description of, and rationale for, the groups used in the synthesis (eg, groupings of populations, interventions, outcomes, study design)	Section 3.2, page 40
	1b) Detail and provide rationale for any changes made subsequent to the protocol in the groups used in the synthesis	Not applicable. Protocol stated 'Where possible, we will group studies by relevant characteristics (e.g. populations, interventions, outcomes, study design, study quality)'
2 Describe the standardised metric and transformation methods used	Describe the standardised metric for each outcome. Explain why the metric(s) was chosen and describe any methods used to transform the intervention effects, as reported in the study, to the standardised metric, citing any methodological guidance consulted	Section 2.6.2, page 35
3 Describe the synthesis methods	Describe and justify the methods used to synthesise the effects for each outcome when it was not possible to undertake a meta-analysis of effect estimates	Section 2.6.2, page 35
4 Criteria used to prioritise results for summary and synthesis	Where applicable, provide the criteria used, with supporting justification, to select the particular studies, or a particular study, for the main synthesis or to draw conclusions from the synthesis (eg, based on study design, risk of bias assessments, directness in relation to the review question)	Section 2.6.2, page 35
5 Investigation of heterogeneity in reported effects	State the method(s) used to examine heterogeneity in reported effects when it was not possible to undertake a meta-analysis of effect estimates and its extensions to investigate heterogeneity	Summary of included studies in Sections 3.7 is organised by study design and healthcare population (with accompanying product details) as noted in Section 2.6.2, page 35
6 Certainty of evidence	Describe the methods used to assess the certainty of the synthesis findings	Section 2.7, page 35
7 Data presentation methods	Describe the graphical and tabular methods used to present the effects (eg, tables, forest plots, harvest plots)	Sections 3.7.1 - 3.7.7, page 61 - 95
	Specify key study characteristics (eg, study design, risk of bias) used to order the studies, in the text and any tables or graphs, clearly referencing the studies included	
8 Reporting results	For each comparison and outcome, provide a description of the synthesised findings and the certainty of the findings. Describe the result in language that is consistent with the question the synthesis addresses, and indicate which studies contribute to the synthesis	
9 Limitations of the synthesis	Report the limitations of the synthesis methods used and/or the groupings used in the synthesis and how these affect the conclusions that can be drawn in relation to the original review question	Section 4.3, page 118

PRISMA=Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

* If the information is not provided in the systematic review, give details of where this information is available (eg, protocol, other published papers (provide citation details), or website

Appendix C Research question 1: healthcare utilisation literature search details

9.1 Overview of database results

Table 29: Overview of database search results

Database	Date	Results	Duplicates removed	Screened on title and abstract
Medline	14 July 2025	(n=4,075)	327	3,748
CINAHL	14 July 2025	(n=2,576)	30	2,546
Embase	14 July 2025	(n=1,018)	28	990
IEEE	09 July 2025	(n=466)	3	463
Total:		(n=8,135)	(n=388)	(n=7,747)
Supplemental search				
Cochrane Library	16 July 2025	(n=90)	(n=7)	(n=83)
Epistemonikos	16 July 2025	(n=36)	(n=4)	(n=32)
Cochrane CENTRAL	01 Oct 2025	(n=501)	(n=307)	(n=194)
Total:		(n=627)	(n=318)	(n=309)
Updated search		Results	Duplicates removed	Screened on title and abstract
Medline		796	444	352
CINAHL		384	88	296
Embase		241	101	140
IEEE		0	0	0
Total:		1,421	633	788
Supplemental search				
Cochrane CENTRAL		12	9	3
Total:		1,433	642	791
Total included in final paper: 21				

9.1.1 Q1 CINAHL search strategy

Platform: CINAHL (OVID)

Date range: 1981-14 July 2025

#	Query	Limiters/Expanders	Last Run Via	Results
S30	S27 AND S28	Limiters - Exclude MEDLINE records Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	2,576
S29	S27 AND S28	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	5,938
S28	S8 AND S26	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	17,992
S27	(MH "Experimental Studies+") OR (MH "Multicenter Studies") OR (MH "Random Sample+") OR (MH "Placebos") OR	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	1,317,449

#	Query	Limiters/Expanders	Last Run Via	Results	
	(MH "Control (Research)+") OR (MH "Crossover Design") OR ((TI random* OR AB random*) OR (TI sham OR AB sham) OR (TI placebo* OR AB placebo*)) OR (((TI singl* OR AB singl*) OR (TI doubl* OR AB doubl*)) W1 ((TI blind* OR AB blind*) OR (TI dumm* OR AB dumm*) OR (TI mask* OR AB mask*))) OR (((TI tripl* OR AB tripl*) OR (TI trebl* OR AB trebl*)) W1 ((TI blind* OR AB blind*) OR (TI dumm* OR AB dumm*) OR (TI mask* OR AB mask*))) OR ((TI control* OR AB control*) N3 ((TI study OR AB study) OR (TI studies OR AB studies) OR (TI trial* OR AB trial*) OR (TI group* OR AB group*))) OR ((TI clinical OR AB clinical) N3 ((TI study OR AB study) OR (TI studies OR AB studies) OR (TI trial* OR AB trial*))) OR ((TI Nonrandom* OR AB Nonrandom*) OR (TI "non random*" OR AB "non random*") OR (TI "non- random*" OR AB "non- random*") OR (TI "quasi- random*" OR AB "quasi- random*") OR (TI quasirandom* OR AB quasirandom*)) OR ((TI phase OR AB phase) N6 ((TI study OR AB study) OR (TI studies OR AB studies) OR (TI trial* OR AB trial*))) OR (((TI crossover OR AB crossover) OR (TI "cross- over" OR AB "cross-over")) N3 ((TI study OR AB study) OR (TI studies OR AB studies) OR (TI trial* OR AB trial*))) OR (((TI multicent* OR AB multicent*) OR (TI "multi-cent*" OR AB "multi-cent*")) N3 ((TI study OR AB study) OR (TI studies OR AB studies) OR (TI trial* OR AB trial*))) OR (TI allocated OR AB allocated) OR (((TI "open label" OR AB "open label") OR (TI "open-label" OR AB "open-label")) N5 ((TI study OR AB study) OR (TI studies OR AB studies) OR (TI trial*				

#	Query	Limiters/Expanders	Last Run Via	Results
	OR AB trial*)) OR (((TI equivalence OR AB equivalence) OR (TI superiority OR AB superiority) OR (TI "non-inferiority" OR AB "non-inferiority") OR (TI noninferiority OR AB noninferiority)) N3 ((TI study OR AB study) OR (TI studies OR AB studies) OR (TI trial* OR AB trial*)) OR ((TI "pragmatic study" OR AB "pragmatic study") OR (TI "pragmatic studies" OR AB "pragmatic studies")) OR (((TI pragmatic OR AB pragmatic) OR (TI practical OR AB practical)) N3 (TI trial* OR AB trial*)) OR (((TI quasiexperimental OR AB quasiexperimental) OR (TI "quasi-experimental" OR AB "quasi-experimental")) N3 ((TI study OR AB study) OR (TI studies OR AB studies) OR (TI trial* OR AB trial*)) OR (TI trial))			
S26	S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	96,281
S25	(MM "Biomedical Enhancement") OR (MM "Digital Technology")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	3,773
S24	TX (gerontotechnology or gerontechnology)	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	1,463
S23	TI (("Activities of Daily Living") N10 "assistive technolog*") OR AB (("Activities of Daily Living") N10 "assistive technolog*")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	28
S22	TI (("mobile application*" N5 (health OR monitor* or assist*) or AB (("mobile application*" N5 (health OR monitor* or assist*))	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	411
S21	TI (("self-help device*" or "Motion sensor*" or "Pressure detector*" or Wristband* or "Tactile carpet*" or "Motion detector*" or "Ambient sensor*" or "wearable sensor*" or "Heart rate monitor*" or Telemonitor* or "Smart Scales*" or	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	4,276

#	Query	Limiters/Expanders	Last Run Via	Results
	"Digital medication box*" or "voice command*" or "wearable alarm*" or "voice guid*" or "voice activ*" or "remote weight manag*" or "passive remote monitor*" or "PRM")) OR AB (("self-help device*" or "Motion sensor*" or "Pressure detector*" or Wristband*" or "Tactile carpet*" or "Motion detector*" or "Ambient sensor*" or "wearable sensor*" or "Heart rate monitor*" or Telemonitor*" or "Smart Scales*" or "Digital medication box*" or "voice command*" or "wearable alarm*" or "voice guid*" or "voice activ*" or "remote weight manag*" or "passive remote monitor*" or "PRM"))			
S20	TI (("home care" or "independent living" or "community-dwelling") N7 ("assistive technolog*" or "adaptive technolog*")) OR AB (("home care" OR "independent living" or "community-dwelling") N7 ("assistive technolog*" or "adaptive technolog*"))	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	51
S19	TI ("adaptive technolog*" or "assistive technolog*" or "remote patient monitoring") OR AB ("adaptive technolog*" or "assistive technolog*" or "remote patient monitoring")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	2,282
S18	TI ((remind* and (medication* or medicine* or pill* or tablet*)) N5 home)) or AB ((remind* and (medication* or medicine* or pill* or tablet*)) N5 home))	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	56
S17	TI ((dementia and ("self-help device" or "assistive technolog*" or "adaptive technolog*")) or AB ((dementia and ("self-help device" or "assistive technolog*" or "adaptive technolog*"))	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	420
S16	TI ((ATTILA or "Assistive Technology and Telecare")) OR AB ((ATTILA or	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	21

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#	Query	Limiters/Expanders	Last Run Via	Results
	"Assistive Technology and Telecare"))			
S15	(MM "Fitness Trackers")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	263
S14	(MH "Wearable Sensors+")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	9,074
S13	(MH "Digital Health+")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	34,793
S12	TI ("Mobile Health" or "Tele-Care" or "Tele-ICU" or "Tele-Intensive Care" or "Tele-Referral" or Telecare or Telehealth or "Virtual Medicine" or "digital health") or AB ("Mobile Health" or "Tele-Care" or "Tele-ICU" or "Tele-Intensive Care" or "Tele-Referral" or Telecare or Telehealth or "Virtual Medicine" or "digital health")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	17,072
S11	(MH "Telemedicine+") OR (MH "Telehealth+")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	49,805
S10	(MM "Monitoring, Physiologic")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	11,241
S9	(MH "Remote Patient Monitoring+")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	7,776
S8	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	1,179,878
S7	TI ((elderly or "older people" or "older adults" or "seniors" or "Senior citizens" or "over-65s" or "over 65s" or "65+" or "65 and older" or "sixty-five and older" or "65+ years" or "70+ years" or "80+ years" or "over 65 years" or "over 70 years" or "over 80 years" or "80 years and older" or "80 years and over" or "70 years and over" or "70 years and over" or "65 years and over" or "65 years and over" or ((aged or ageing or ageing or elder* or senior*	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	408,246

#	Query	Limiters/Expanders	Last Run Via	Results
	or old* or retired) N2 (adult* or people* or person* or individual* or wom#n or man or men or age) or (senior* N2 citizen*) or retiree* or sexagenarian* or septuagenarian* or octagenarian* or nonagenarian* or centenarian* or supercentenarian*)) OR AB ((elderly or "older people" or "older adults" or "seniors" or "Senior citizens" or "over-65s" or "over 65s" or "65+" or "65 and older" or "sixty-five and older" or "65+ years" or "70+ years" or "80+ years" or "over 65 years" or "over 70 years" or "over 80 years" or "80 years and older" or "80 years and over" or "70 years and older" or "70 years and over" or "65 years and older" or "65 years and over" or ((aged or ageing or ageing or elder* or senior* or old* or retired) N2 (adult* or people* or person* or individual* or wom#n or man or men or age) or (senior* N2 citizen*) or retiree* or sexagenarian* or septuagenarian* or octagenarian* or nonagenarian* or centenarian* or supercentenarian*))			
S6	(MM "Homebound Persons")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	560
S5	(MM "Frail Elderly")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	5,823
S4	(MH "Aged, 80 and Over+")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	353,343
S3	(MH "Aged+")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	991,030
S2	(MH "Aging")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	58,119

#	Query	Limiters/Expanders	Last Run Via	Results
S1	(MH "Aging in Place")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	155

9.1.2 Q1 Embase search strategy

Platform: Embase (OVID)

Date range: 1974-14 July 2025

#	Query	Results
1	exp aged/	4279120
2	frail elderly/	13918
3	homebound patient/	807
4	"Aging in Place".ti,ab.	927
5	"Elderly people".kw.	1542
6	(elderly or "older people" or "older adults" or "seniors" or "Senior citizens" or "over-65s" or "over 65s" or "65+" or "65 and older" or "sixty-five and older" or "65+ years" or "70+ years" or "80+ years" or "over 65 years" or "over 70 years" or "over 80 years" or "80 years and older" or "80 years and over" or "70 years and older" or "70 years and over" or "65 years and older" or "65 years and over").ti,ab.	1592389
7	2 or 3 or 4 or 6	1597006
8	telemonitoring/	7988
9	(telemonitor or telemonitoring).mp.	9345
10	"physiologic monitoring"/	8063
11	telemedicine/	55542
12	digital health/	4667
13	exp wearable device/	28800
14	exp activity tracker/	8191
15	exp accident prevention/	18546
16	falling/pc	2947
17	("Mobile Health" or "Tele-Care" or "Tele-ICU" or "Tele-Intensive Care" or "Tele-Referral" or Telecare or Telehealth or "Virtual Medicine" or "digital health").ti,ab.	41832
18	((remind* and (medication* or medicine* or pill* or tablet*)) adj5 home).ti,ab.	539
19	("adaptive technolog*" or assistive technolog* or remote patient monitoring).ti,ab.	6431
20	(ATTILA or "Assistive Technology and Telecare").ti,ab.	101
21	((("Home Care" or "independent living" or "community-dwelling") adj7 ("assistive technolog*" or "adaptive technolog*")).ti,ab.	63
22	("time assistive product*" or "self-help device*" or "Motion sensor*" or "Pressure detector*" or Wristband* or "Tactile carpet*" or "Motion detector*" or "Ambient sensor*" or "wearable sensor*" or "Heart rate monitor*" or Telemonitor* or "Smart Scales*" or "Digital medication box*" or "voice command*" or "wearable alarm*" or "voice guid*" or "voice activ*" or "remote weight manag*" or "passive remote monitor*" or "PRM" or "Remote Patient Monitoring" or "remote monitoring").ti,ab.	34417
23	("mobile application*" adj5 (health or monitor* or assist*)).ti,ab.	1152
24	("Activities of Daily Living" adj10 "assistive technology").ti,ab.	23
25	(dementia and ("self-help device" or "assistive technolog*" or "adaptive technolog*")).ti,ab.	298
26	(gerontotechnology or gerontechnology).ti,ab.	128
27	8 or 9 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26	170315
28	exp clinical study/	14025800
29	exp "multicenter study (topic)"/	45508
30	exp clinical trial protocol/	4693
31	("Double Blind Procedure" or "Double-Blind Stud*" or "Single Blind Procedure" or "Single Blind stud*" or "Placebos" or "Cross-Over Stud*" or "Crossover Procedure" or sham or nonrandom* or "non random*" or non-random* or quasi-random* or quasirandom*).ti,ab.	301822
32	("controlled clinical trial" or "randomi#ed controlled trial" or "pragmatic clinical trial" or "clinical stud*" or "adaptive clinical trial" or "equivalence trial" or "clinical trial" or "clinical trial, phase I" or	976173

#	Query	Results
	"clinical trial, phase II" or "clinical trial, phase III" or "clinical trial, phase IV" or "clinical trial protocol" or "multicenter stud*").ti,ab.	
33	exp "randomized controlled trial (topic)"/	296064
34	exp randomization/	101460
35	exp double blind procedure/	305592
36	exp control group/	109498
37	*crossover procedure/	1731
38	exp controlled study/	11838343
39	exp controlled clinical trial/	1279069
40	exp randomized controlled trial/	1089069
41	exp clinical trial/	2561089
42	exp major clinical study/	5893200
43	exp health care utilization/ or ("health care utilization" or "utilization review" or "telecare assessment").ti,ab.	761583
44	"Health Technology Assessment".mp. or "utilization review".ti,ab. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword heading word, floating subheading word, candidate term word]	13175
45	28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44	20902192
46	7 and 27	14278
47	45 and 46	8824
48	limit 47 to "remove medline records"	5037
49	limit 48 to "remove clinical trial (clinicaltrials.gov) records"	3748
50	limit 49 to (article or article in press or data paper or "preprint (unpublished, non-peer reviewed)" or "review")	1018

9.1.3 Q1 Medline search strategy

Platform: Medline (EBSCO)

Date range: 1946-14 July 2025

#	Query	Limiters/Expanders	Last Run Via	Results
S49	S47 AND S48	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	4,075
S48	S8 AND S24	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	18,167
S47	S25 OR S26 OR S27 OR S28 OR S29 OR S30 OR S31 OR S32 OR S33 OR S34 OR S35 OR S36 OR S37 OR S38 OR S39 OR S40 OR S41 OR S42 OR S43 OR S44 OR S45 OR S46	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	2,758,917
S46	(MM "Non-Randomized Controlled Trials as Topic")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	68
S45	(MH "Clinical Trial Protocols as Topic+")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases	164

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#	Query	Limiters/Expanders	Last Run Via	Results
			Search Screen - Advanced Search Database - MEDLINE	
S44	(MH "Multicenter Studies as Topic+")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	26,079
S43	(MH "Clinical Studies as Topic+")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	419,683
S42	(TI "Health Technology Assessment" OR AB "Health Technology Assessment")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	7,287
S41	(PT "randomi#ed controlled trial") or (PT "non-randomi#ed controlled trial")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	641,072
S40	(PT "non-randomi#ed controlled trial")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	0
S39	(MH "Clinical Studies as Topic+")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	419,683
S38	TI ((quasiexperimental or quasi-experimental) N1 (study or studies or trial*)) OR AB ((quasiexperimental or quasi-experimental) N1 (study or studies or trial*))	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	13,751
S37	TI ((pragmatic or practical) N2 (study or studies or trial*)) OR AB ((pragmatic or practical) N2 (study or studies or trial*)) OR SU ((pragmatic or practical))	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	23,031
S36	TI (((equivalence or superiority or non-inferiority or noninferiority) N2 (study or studies or trial*)) OR AB (((equivalence or superiority or non-inferiority or noninferiority) N2 (study or studies or trial*)) OR SU ((equivalence or superiority or non-inferiority or noninferiority))	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	16,430
S35	TI ((multicent* or multi-cent*) N2 (study or studies or trial*)) OR AB ((multicent* or multi-cent*)	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	205,237

#	Query	Limiters/Expanders	Last Run Via	Results
	N2 (study or studies or trial*)) OR SU ((multicent* or multi-cent*))			
S34	TI ((crossover or cross-over) N2 (study or studies or trial*)) OR AB ((crossover or cross-over) N2 (study or studies or trial*))	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	57,067
S33	TI (control* N3 (study or studies or trial* or group*)) OR AB (control* N3 (study or studies or trial* or group*))	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	1,463,181
S32	TX ((singl* or doubl* or tripl*) N3 (trial* or clinical* or stud*)) AND TX ((blind* or dumm* or mask*) N3 (trial* or clinical* or stud*))	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	196,315
S31	(MH "Cross-Over Studies")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	59,501
S30	(MH "Control Groups")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	2,151
S29	(MH "Double-Blind Method")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	184,810
S28	(MH "Random Allocation")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	108,614
S27	(MH "Randomized Controlled Trials as Topic+") OR (MM "Non-Randomized Controlled Trials as Topic")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	188,498
S26	TI ("controlled clinical trial" OR "randomi#ed controlled trial" or "pragmatic clinical trial" or "clinical stud*" or "adaptive clinical trial" or "equivalence trial" or "clinical trial" or "clinical trial, phase I" or "clinical trial, phase II" or "clinical trial, phase III" or "clinical trial, phase IV" or "clinical trial protocol" or "multicenter stud*") OR AB	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	598,638

#	Query	Limiters/Expanders	Last Run Via	Results
S25	("controlled clinical trial" OR "randomi#ed controlled trial" or "pragmatic clinical trial" or "clinical stud*" or "adaptive clinical trial" or "equivalence trial" or "clinical trial" or "clinical trial, phase I" or "clinical trial, phase II" or "clinical trial, phase III" or "clinical trial, phase IV" or "clinical trial protocol" or "multicenter stud*") TI ("Double Blind Procedure" or "Double- Blind Stud*" or "Single Blind Procedure" or "Single Blind stud*" or "Placebos" or "Cross-Over Stud*" or "Crossover Procedure" or sham or nonrandom* or "non random*" or non- random* or quasi-random* or quasirandom*) or AB ("Double Blind Procedure" or "Double-Blind Stud*" or "Single Blind Procedure" or "Single Blind stud*" or "Placebos" or "Cross-Over Stud*" or "Crossover Procedure" or sham or nonrandom* or "non random*" or non-random* or quasi-random* or quasirandom*)	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	205,015
S24	S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	115,949
S23	(MH "Technology Assessment, Biomedical")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	11,653
S22	(MH "Biomedical Technology")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	7,545
S21	TX (gerontotechnology or gerontechnology)	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	903

#	Query	Limiters/Expanders	Last Run Via	Results
S20	TI (("Activities of Daily Living") N10 "assistive technolog*")) OR AB (("Activities of Daily Living") N10 "assistive technolog*"))	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	38
S19	TI ("mobile application*" N5 (health OR monitor* or assist*) or AB ("mobile application*" N5 (health OR monitor* or assist*))	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	869
S18	TI (("self-help device*" or "Motion sensor*" or "Pressure detector*" or Wristband* or "Tactile carpet*" or "Motion detector*" or "Ambient sensor*" or "wearable sensor*" or "Heart rate monitor*" or Telemonitor* or "Smart Scales*" or "Digital medication box*" or "voice command*" or "wearable alarm*" or "voice guid*" or "voice activ*" or "remote weight manag*" or "passive remote monitor*" or "PRM")) OR AB (("self-help device*" or "Motion sensor*" or "Pressure detector*" or Wristband* or "Tactile carpet*" or "Motion detector*" or "Ambient sensor*" or "wearable sensor*" or "Heart rate monitor*" or Telemonitor* or "Smart Scales*" or "Digital medication box*" or "voice command*" or "wearable alarm*" or "voice guid*" or "voice activ*" or "remote weight manag*" or "passive remote monitor*" or "PRM"))	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	18,267
S17	TI ("home care" or "independent living" or "community-dwelling") N7 ("assistive technolog*" or "adaptive technolog*")) OR AB ("home care" OR "independent living" or "community-dwelling") N7	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	54

#	Query	Limiters/Expanders	Last Run Via	Results
S16	("assistive technolog*" or "adaptive technolog*") TI ("adaptive technolog*" or "assistive technolog*" or "remote patient monitoring") OR AB ("adaptive technolog*" or "assistive technolog*" or "remote patient monitoring")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	1,902
S15	TI ((remind* and (medication* or medicine* or pill* or tablet*)) N5 home)) or AB ((remind* and (medication* or medicine* or pill* or tablet*)) N5 home))	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	96
S14	TI ((dementia and ("self-help device" or "assistive technolog*" or "adaptive technolog*")) or AB ((dementia and ("self-help device" or "assistive technolog*" or "adaptive technolog*"))	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	441
S13	TI ((ATTILA or "Assistive Technology and Telecare")) OR AB ((ATTILA or "Assistive Technology and Telecare"))	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	107
S12	(MH "Digital Health") or (MM "Wearable Electronic Devices/SD") or (MH "Fitness Trackers") or (MH "Self-Help Devices+")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	16,627
S11	TI ("Mobile Health" or "Tele-Care" or "Tele-ICU" or "Tele-Intensive Care" or "Tele-Referral" or Telecare or Telehealth or "Virtual Medicine" or "digital health") or AB ("Mobile Health" or "Tele-Care" or "Tele-ICU" or "Tele-Intensive Care" or "Tele-Referral" or Telecare or Telehealth or "Virtual Medicine" or "digital health")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	33,221
S10	(MH "Telemedicine")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	45,193

#	Query	Limiters/Expanders	Last Run Via	Results
S9	(MH "Remote Patient Monitoring")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	35
S8	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	4,395,070
S7	TI ((elderly or "older people" or "older adults" or "seniors" or "Senior citizens" or "over-65s" or "over 65s" or "65+" or "65 and older" or "sixty-five and older" or "65+ years" or "70+ years" or "80+ years" or "over 65 years" or "over 70 years" or "over 80 years" or "80 years and older" or "80 years and over" or "70 years and older" or "70 years and over" or "65 years and older" or "65 years and over" or ((aged or ageing or ageing or elder* or senior* or old* or retired) N2 (adult* or people* or person* or individual* or wom#n or man or men or age) or (senior* N2 citizen*) or retiree* or sexagenarian* or septuagenarian* or octagenarian* or nonagenarian* or centenarian* or supercentenarian*)) OR AB ((elderly or "older people" or "older adults" or "seniors" or "Senior citizens" or "over-65s" or "over 65s" or "65+" or "65 and older" or "sixty-five and older" or "65+ years" or "70+ years" or "80+ years" or "over 65 years" or "over 70 years" or "over 80 years" or "80 years and older" or "80 years and over" or "70 years and older" or "70 years and over" or "65 years and older" or "65 years and	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	1,130,851

#	Query	Limiters/Expanders	Last Run Via	Results
	over" or ((aged or ageing or ageing or elder* or senior* or old* or retired) N2 (adult* or people* or person* or individual* or wom#n or man or men or age) or (senior* N2 citizen*) or retiree* or sexagenarian* or septuagenarian* or octagenarian* or nonagenarian* or centenarian* or supercentenarian*))			
S6	MH "Homebound Persons"	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	763
S5	(MH "Frail Elderly")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	17,473
S4	(MH "Aged, 80 and Over")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	1,084,599
S3	(MH "Aging")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	264,491
S2	(MH "Aged")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	3,667,505
S1	(MH "Aging in Place")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE	39

9.1.4 Overview of Q1 supplemental searches

Source	Date	Date range	Results	Duplicates removed	Screened on title and abstract
PROSPERO (SRs)	16 July 2025	No limit	(n=4)	(n=0)	(n=4)
Cochrane Library (SRS)	16 July 2025	No limit	(n=90)	(n=7)	(n=83)
Epistemonikos (SRS)	16 July 2025	No limit	(n=36)	(n=4)	(n=32)
WHO Trials Registry	10 Oct 2025	1 st -10 th Oct 2025	(n=0)	(n=0)	(n=0)
Cochrane CENTRAL	01 Oct 2025	No limit	(n=501)	(n=307)	(n=194)
Grey Literature*	20 th -23 rd Oct 2025	No limit	(n=95)	(n=2)	(n=93)
Total:			(n=726)	(n=320)	(n=406)

Updated search					
WHO Trials Registry	20 th Jan 2026	13 th -20 th Jan 2026	(n=1)	(n=1)	(n=1)
Cochrane CENTRAL	20 th Jan 2026	1 st Oct 2025-20 th Jan 2026	(n=12)	(n=10)	(n=2)
Total:			(n=13)	(n=11)	(n=3)
Total included in final paper:					

9.1.5 Q1 IEEE search strategy

Platform: IEEE Xplore Journals (online)

Date range: 1884-09 July 2025

Query	Result
("Mesh_Terms":Aged) OR	
("Mesh_Terms": Aging) OR	
("Mesh_Terms":Aged,80 and Over) OR	
("Mesh_Terms": Frail Elderly) OR	
("Mesh_Terms": Homebound Persons) AND	
("Document Title": elderly or "older people" or "older adults" or "seniors" or "Senior citizens") OR	
("Full Text Only": elderly or "older people" or "older adults" or "seniors" or "Senior citizens") AND ("Full Text Only": gerontotechnology or gerontechnology) OR	
AND ("Document Title": "self-help device" or "assistive technology" or assistive technologies" or "adaptive technology" or "adaptive technologies" or "independent living" or "Home care" or "Activities of daily living" or "community-dwelling") OR	
("Full Text Only": "mobile application" or self-help device" or "Motion sensor" or "Pressure detector" or Wristband or "Tactile carpet" or "Motion detector") OR	
("Document Title": "mobile application" or self-help device" or "Motion sensor" or "Pressure detector" or Wristband or "Tactile carpet" or "Motion detector")	
Result:	(n=466)

9.1.6 Q1 Cochrane Library search strategy

Platform: Cochrane Library (online)

Date range: 1995-16 July 2025

ID	Search	Results
#1	MeSH descriptor: [Aged] explode all trees	281611
#2	MeSH descriptor: [Aged, 80 and over] this term only	71266

#3	MeSH descriptor: [Frail Elderly] explode all trees	1201
#4	MeSH descriptor: [Homebound Persons] explode all trees	52
#5	elderly or "older people" or "older adults":ti,ab	88092
#6	"over-65s" or "over 65s" or "65+" or "65 and older" or "sixty-five and older" or "65+ years" or "70+ years" or "80+ years" or "over 65 years" or "over 70 years" or "over 80 years" or "80 years and older" or "80 years and over" or "70 years and older" or "70 years and over" or "65 years and older" or "65 years and over":ti,ab	199696
#7	#1 OR # OR# 3 OR #4 OR #5 OR #6	1064690
#8	MeSH descriptor: [Remote Patient Monitoring] explode all trees	1
#9	MeSH descriptor: [Telemedicine] explode all trees	5499
#10	MeSH descriptor: [Digital Health] explode all trees	61
#11	MeSH descriptor: [Self-Help Devices] explode all trees	584
#12	MeSH descriptor: [Biomedical Technology] explode all trees	81
#13	MeSH descriptor: [Technology Assessment, Biomedical] explode all trees	378
#14	ATTILA or "Assistive Technology and Telecare":ti,ab	23
#15	dementia and ("self-help device" or "assistive technology" or "assistive technologies" or "adaptive technologies" or "adaptive technology"):ti,ab	53
#16	"remote patient monitoring":ti,ab	197
#17	gerontotechnology or gerontechnology	43
#18	mobile application* N5 (health OR monitor* or assist#)	50
#19	#8 or #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18	6868
#20	#7 and #19 in Cochrane Reviews	90

9.1.7 Q1 Epistemonikos search strategy

Platform Epistemonikos (online)

Date range: 2009-16 July 2025

Search string

(title:

Search string
((("older people" OR "elderly people" OR "senior people" OR elderly OR "seniors" OR "geriatric" OR "Over 65" OR "over-65"))
OR abstract:
((("older people" OR "elderly people" OR "senior people" OR elderly OR "seniors" OR "geriatric" OR "Over 65" OR "over-65")))
AND
(title:
((("adaptive technology" OR "adaptive technologies" OR "assistive technology" OR "assistive technologies" OR "wearable device" OR sensor OR ambient OR "remote monitor" OR ((smart OR digital) AND wearable OR voice OR track OR measure"))))
OR abstract:
((("adaptive technology" OR "adaptive technologies" OR "assistive technology" OR "assistive technologies" OR "wearable device" OR sensor OR ambient OR "remote monitor" OR ((smart OR digital) AND wearable OR voice OR track OR measure")))))
Result: 206
Limit: Publication type: systematic reviews
Result: 36

9.1.8 Q1 WHO Clinical Trial Registry search strategy

Platform: WHO ICTRP search portal (online)

Date Range: 01 July-10 October 2025

Keywords:
((("adaptive technology" OR "adaptive technologies" OR "assistive technology" OR "assistive technologies" OR "wearable device" OR sensor OR ambient OR "remote monitor"

9.1.9 Q1 Cochrane CENTRAL search strategy

Platform: Cochrane CENTRAL (online)

Date Range: 1996-01 October 2025

ID	Search	Hits
#1	MeSH descriptor: [Self-Help Devices] explode all trees	589
#2	((("adaptive technology" or "assistive technology" or "remote patient monitoring")):kw	158
#3	((("self-help device" or "supportive device" or "Motion sensor" or "Pressure detector" or Wristband or "Tactile carpet" or "Motion detector" or "Ambient sensor" or "wearable sensor" or "Heart rate monitor" or Telemonitor or "Smart Scale" or "Digital medication box" or "voice	3334

ID	Search	Hits
	command" or "wearable alarm" or "voice guide" or "voice activation" or "remote weight management" or "passive remote monitor" or "PRM" OR "personal alarm#" OR "pill organizer#" OR electrotherapy OR "assistive device" or "adaptive technology" or "assistive technology" or "remote patient monitoring")):ti OR (("self-help device" or "supportive device" or "Motion sensor" or "Pressure detector" or Wristband or "Tactile carpet" or "Motion detector" or "Ambient sensor" or "wearable sensor" or "Heart rate monitor" or Telemonitor or "Smart Scale" or "Digital medication box" or "voice command" or "wearable alarm" or "voice guide" or "voice activation" or "remote weight management" or "passive remote monitor" or "PRM" OR "personal alarm#" OR "pill organizer#" OR electrotherapy OR "assistive device" or "adaptive technology" or "assistive technology" or "remote patient monitoring")):ab	
#4	#1 or #2 or #3	3940
#5	MeSH descriptor: [Frail Elderly] explode all trees	1222
#6	MeSH descriptor: [Aged] explode all trees	285147
#7	MeSH descriptor: [Geriatrics] explode all trees	297
#8	((gerontotechnology or gerontechnology)):ti,ab,kw	29
#9	(("older adult#" OR "aging population#" OR elder* OR senior* OR "old people" OR "older people" OR aged OR "frail elder#")):ti AND (("older adult#" OR "aging population#" OR elder* OR senior* OR "old people" OR "older people" OR aged OR "frail elder#")):ab	28489
#10	#5 or #6 or #7 or #8 or #9	302415
#11	#4 AND #10	504

9.2 Q1 Overview of supplemental search results

Table 30: Overview of results from the supplemental search

Source	Date	Date range	Results	Duplicates removed	Screened on title and abstract
PROSPERO (SRs)	16 July 2025	No limit	(n=4)	(n=0)	(n=4)
Cochrane Library (SRs)	16 July 2025	No limit	(n=90)	(n=7)	(n=83)
Epistemonikos (SRs)	16 July 2025	No limit	(n=36)	(n=4)	(n=32)
WHO Trials Registry	10 Oct 2025	1 st -10 th Oct 2025	(n=0)	(n=0)	(n=0)
Cochrane CENTRAL	01 Oct 2025	No limit	(n=501)	(n=307)	(n=194)
Grey Literature*	20 th -23 rd Oct 2025	No limit	(n=95)	(n=2)	(n=93)
Total:			(n=726)	(n=320)	(n=406)

Updated search					
WHO Trials Registry	20 th Jan 2026	13 th -20 th Jan 2026	(n=1)	(n=1)	(n=1)
Cochrane CENTRAL	20 th Jan 2026	1 st Oct 2025-20 th Jan 2026	(n=12)	(n=10)	(n=2)
Total:			(n=13)	(n=11)	(n=3)

9.2.1 Q1 Overview of systematic reviews retrieved

Table 31: Overview of systematic review search and forward and backward citation retrieval

Repository of Systematic Reviews	Date	Results	Duplicates removed	Screened on title and abstract
PROSPERO		94	0	94
Cochrane Library				
Repository of Systematic Reviews	16 July 2025	90	7	83
Epistemonikos				
Repository of Systematic Reviews	16 July 2025	36	4	32
Systematic reviews identified during database screening	September, 2025	16	0	16
Total # of systematic reviews identified	September, 2025	236	11	225
Forward and backward citation chasing				
Records identified after citation chasing of 19 relevant systematic reviews	September, 2025	2,813	859	1,954
Records identified after citation chasing (n=21) included papers	September, 2025	1,749	205	1,544
Total # screened		4,562	1,064	3,498

9.2.2 Q1 Overview of citation chasing

(n=19) included systematic reviews, of which (n=6) were identified from a systematic search in Cochrane Library and Epistemonikos, and (n=13) were identified during the screening of the main database material, were forward and backward citation chased to retrieve a comprehensive view of the data for the research question. This supplemental search resulted in (n=2,813) of which (n=859) duplicates were removed. The remaining (n=1,954) papers were screened on title and abstract along with the material retrieved from forward and backward citation chasing from the (n=21) included papers from the main database screening. This resulted in (n=1,749) records retrieved, of which (n=205) were duplicates. When the (n=1,749) and the (n=2,813) were deduplicated, the team dual screened the remaining (n=3,498) records on title and abstract. (N=88) records were identified for full text screening and this resulted in (n=5) papers being included in the final report.

Table 32: Overview of source of included papers for Q1 (healthcare utilisation)

Source of references and citations	References and citations retrieved:	Removed through deduplication:	Screened on title and abstract:	Included in final paper
(n=19) systematic Reviews from systematic review search in Cochrane Library and Epistemonikos and identified through the database screening	(n=2,813)	(n=859)	(n=1,954)	(n=5)
(n=18) included studies	(n=1,749)	(n=205)	(n=1,544)	(n=16)
Total	(n=4,562)	(n=1,064)	(n=3,498)	(n=21)

9.2.3 Q1 grey literature search

Source	Link	Date	#	Duplicates	Screened
Age Well Canada	https://agewell-nce.ca/	03/10/2025	7	0	7
CEA Registry	https://cevr.tuftsmedicalcenter.org/databases/cea-registry	03/10/2025	20	0	20
Health Technology Assessment international (HTAi)	https://htai.org/what-is-htai/	03/10/2025	2	0	2
International HTA Database	https://database.inahta.org/	03/10/2025	10	0	10
The Professional Society for Health Economics and Outcomes Research (ISPOR)	https://www.ispor.org/about	03/10/2025	7	0	7
The International Society for Quality of Life Research (ISOQOL)	https://www.isoqol.org/resource-center/	03/10/2025	0	0	0
NICE	https://www.nice.org.uk/	03/10/2025	21	12	9

9.2.4 Q1 web browser search

Link	Date	Search String	Filter	#	off-topic or duplicate	Screened	
http://www.google.com	03/10/2025	("assistive technology" or "assistive technologies" or "adaptive technology" or "adaptive technologies" or "remote patient monitoring") AND ("older people" or elderly or Aged or frail)	2	0		0	
http://www.google.com	03/10/2025	("assistive technology" or "adaptive technology") AND ("older people" or elderly or Aged or frail)	49	27	22		
https://duckduckgo.com/	03/10/2025	("assistive technology" or "assistive technologies" or "adaptive technology" or "adaptive technologies" or "remote patient monitoring") AND ("older people" or elderly or Aged or frail)	0	0		0	
https://duckduckgo.com/	03/10/2025	("assistive technology" or "adaptive technology" or "remote patient monitoring") AND ("older people" or elderly or Aged or frail)	0		0	0	
https://duckduckgo.com/	03/10/2025	("assistive technology" or "adaptive technology") AND ("older people" or elderly or Aged or frail)	0	0	0		

https://duckduckgo.com/	03/10/2025	("assistive technology" or adaptive technology) AND ("older people" or elderly or Aged or frail)	60	42	18
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Appendix D Research question 2: cost-effectiveness literature search details

In creating the search strategies and selecting supplemental sources of evidence for this research question, the information specialist referred to Costs and Economic Evaluation by J Glanville [152]

9.3 Overview of Costs database results

Table 33: Overview of citation chasing for Q2 Costs

Database	Date	Results	Duplicates removed	Screened on title and abstract
Medline	14 July 2025	(n=1,958)	(n=899)	(n=1,059)
CINAHL	14 July 2025	(n=994)	(n=256)	(n=738)
Embase	14 July 2025	(n=301)	(n=85)	(n=216)
Econpapers	15 July 2025	(n=47)	(n=26=)	(n=21)
Total:		(n=3,300)	(n=1,266)	(n=2,034)
Updated search				
Medline	13 January 2026	(n=236)	(n=149)	(n=87)
CINAHL	13 January 2026	(n=141)	(n=99)	(n=42)
Embase	13 January 2026	(n=43)	(n=28)	(n=15)
Econpapers		0	0	0
Total:		(n=420)	(n=276)	(n=144)

9.3.1 Q2 CINAHL search strategy

Platform: CINAHL (OVID)

Date range: 1981-14 July 2025

#	Query	Limiters/Expanders	Last Run Via	Results
S37	S35 AND S36	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	994
S36	S8 AND S26	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	17,992
S35	S27 OR S28 OR S29 OR S30 OR S31 OR S32 OR S33 OR S34	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	194,668
S34	TI ("Health Technology Assessment" or "health care utili#ation" or "utili#ation review" or "health technology assessment" or "economic	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	13,739

#	Query	Limiters/Expanders	Last Run Via	Results
	assessment")) OR AB (("Health Technology Assessment" or "health care utilization" or "utilization review" or "health technology assessment" or "economic assessment")) OR MW (("Health Technology Assessment" or "health care utilization" or "utilization review" or "health technology assessment" or "economic assessment"))			
S33	TI (((cost N5 (benefit* or effectiv* or comparat* or analy*)))) OR AB (((cost N5 (benefit* or effectiv* or comparat* or analy*))))	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	71,654
S32	TX (("cost benefit" or "cost-benefit" or "cost analysis" or "cost-analysis" or "cost compar*" or "cost implication*" or "cost-effectiv*" or "health-care reference costs" or "cost minimi#ation analysis"))	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	95,283
S31	(MH "Cost Control+")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	24,524
S30	(MH "Costs and Cost Analysis+")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	141,598
S29	(MH "Cost Effectiveness Analysis")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	2,474
S28	(MH "Cost Benefit Analysis")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	38,343
S27	(MH "Cost Sharing")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	0

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#	Query	Limiters/Expanders	Last Run Via	Results
S26	S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	96,281
S25	(MM "Biomedical Enhancement") OR (MM "Digital Technology")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	3,773
S24	TX (gerontotechnology or gerontechnology)	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	1,463
S23	TI (("Activities of Daily Living") N10 "assistive technolog*")) OR AB (("Activities of Daily Living") N10 "assistive technolog*"))	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	28
S22	TI (("mobile application*" N5 (health OR monitor* or assist*)) OR AB (("mobile application*" N5 (health OR monitor* or assist*)))	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	411
S21	TI (("self-help device*" or "Motion sensor*" or "Pressure detector*" or Wristband* or "Tactile carpet*" or "Motion detector*" or "Ambient sensor*" or "wearable sensor*" or "Heart rate monitor*" or Telemonitor* or "Smart Scales*" or "Digital medication box*" or "voice command*" or "wearable alarm*" or "voice guid*" or "voice activ*" or "remote weight manag*" or "passive remote monitor*" or "PRM")) OR AB (("self-help device*" or "Motion sensor*" or "Pressure detector*" or Wristband* or "Tactile carpet*" or "Motion detector*" or "Ambient sensor*" or "wearable sensor*" or "Heart rate monitor*" or Telemonitor* or "Smart	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	4,276

#	Query	Limiters/Expanders	Last Run Via	Results
	Scales*" or "Digital medication box*" or "voice command*" or "wearable alarm*" or "voice guid*" or "voice activ*" or "remote weight manag*" or "passive remote monitor*" or "PRM"))			
S20	TI (("home care" or "independent living" or "community-dwelling") N7 ("assistive technolog*" or "adaptive technolog*")) OR AB (("home care" OR "independent living" or "community-dwelling") N7 ("assistive technolog*" or "adaptive technolog*"))	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	51
S19	TI ("adaptive technolog*" or "assistive technolog*" or "remote patient monitoring") OR AB ("adaptive technolog*" or "assistive technolog*" or "remote patient monitoring")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	2,282
S18	TI ((remind* and (medication* or medicine* or pill* or tablet*)) N5 home)) or AB ((remind* and (medication* or medicine* or pill* or tablet*)) N5 home))	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	56
S17	TI ((dementia and (("self-help device" or "assistive technolog*" or "adaptive technolog*")) or AB ((dementia and (("self-help device" or "assistive technolog*" or "adaptive technolog*"))	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	420
S16	TI ((ATTILA or "Assistive Technology and Telecare")) OR AB ((ATTILA or "Assistive Technology and Telecare"))	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	21
S15	(MM "Fitness Trackers")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	263

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#	Query	Limiters/Expanders	Last Run Via	Results
S14	(MH "Wearable Sensors+")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	9,074
S13	(MH "Digital Health+")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	34,793
S12	TI ("Mobile Health" or "Tele-Care" or "Tele-ICU" or "Tele-Intensive Care" or "Tele-Referral" or Telecare or Telehealth or "Virtual Medicine" or "digital health") or AB ("Mobile Health" or "Tele-Care" or "Tele-ICU" or "Tele-Intensive Care" or "Tele-Referral" or Telecare or Telehealth or "Virtual Medicine" or "digital health")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	17,072
S11	(MH "Telemedicine+") OR (MH "Telehealth+")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	49,805
S10	(MM "Monitoring, Physiologic")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	11,241
S9	(MH "Remote Patient Monitoring+")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	7,776
S8	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	1,179,878
S7	TI ((elderly or "older people" or "older adults" or "seniors" or "Senior citizens" or "over-65s" or "over 65s" or "65+" or "65 and older" or "sixty-five and older" or "65+ years" or "70+ years" or "80+ years" or "over 65 years" or "over 70 years" or "over 80 years" or "80 years and older" or "80 years and	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	408,246

#	Query	Limiters/Expanders	Last Run Via	Results
	over" or "70 years and older" or "70 years and over" or "65 years and older" or "65 years and over" or ((aged or ageing or ageing or elder* or senior* or old* or retired) N2 (adult* or people* or person* or individual* or wom#n or man or men or age) or (senior* N2 citizen*) or retiree* or sexagenarian* or septuagenarian* or octagenarian* or nonagenarian* or centenarian* or supercentenarian*)) OR AB ((elderly or "older people" or "older adults" or "seniors" or "Senior citizens" or "over-65s" or "over 65s" or "65+" or "65 and older" or "sixty-five and older" or "65+ years" or "70+ years" or "80+ years" or "over 65 years" or "over 70 years" or "over 80 years" or "80 years and older" or "80 years and over" or "70 years and older" or "70 years and over" or "65 years and older" or "65 years and over" or ((aged or ageing or ageing or elder* or senior* or old* or retired) N2 (adult* or people* or person* or individual* or wom#n or man or men or age) or (senior* N2 citizen*) or retiree* or sexagenarian* or septuagenarian* or octagenarian* or nonagenarian* or centenarian* or supercentenarian*))			
S6	(MM "Homebound Persons")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	560

#	Query	Limiters/Expanders	Last Run Via	Results
S5	(MM "Frail Elderly")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	5,823
S4	(MH "Aged, 80 and Over+")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	353,343
S3	(MH "Aged+")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	991,030
S2	(MH "Aging")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	58,119
S1	(MH "Aging in Place")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	

9.3.2 Q2 Embase search strategy

Platform: Embase (OVID)

Date range: 1974-14 July 2025

#	Query	Results
1	exp aged/	4279120
2	frail elderly/	13918
3	homebound patient/	807
4	"Aging in Place".ti,ab.	927
5	"Elderly people".kw.	1542
6	(elderly or "older people" or "older adults" or "seniors" or "Senior citizens" or "over-65s" or "over 65s" or "65+" or "65 and older" or "sixty-five and older" or "65+ years" or "70+ years" or "80+ years" or "over 65 years" or "over 70 years" or "over 80 years" or "80 years and older" or "80 years and over" or "70 years and older" or "70 years and over" or "65 years and older" or "65 years and over").ti,ab.	1592389
7	2 or 3 or 4 or 6	1597006
8	telemonitoring/	7988
9	(telemonitor or telemonitoring).mp.	9345

#	Query	Results
10	"physiologic monitoring"/	8063
11	telemedicine/	55542
12	digital health/	4667
13	exp wearable device/	28800
14	exp activity tracker/	8191
15	exp accident prevention/	18546
16	falling/pc	2947
17	("Mobile Health" or "Tele-Care" or "Tele-ICU" or "Tele-Intensive Care" or "Tele-Referral" or Telecare or Telehealth or "Virtual Medicine" or "digital health").ti,ab.	41832
18	((remind* and (medication* or medicine* or pill* or tablet*)) adj5 home).ti,ab.	539
19	("adaptive technolog*" or assistive technolog* or remote patient monitoring).ti,ab.	6431
20	(ATTILA or "Assistive Technology and Telecare").ti,ab.	101
21	((("Home Care" or "independent living" or "community-dwelling") adj7 ("assistive technolog*" or "adaptive technolog*")).ti,ab.	63
22	("time assistive product*" or "self-help device*" or "Motion sensor*" or "Pressure detector*" or Wristband* or "Tactile carpet*" or "Motion detector*" or "Ambient sensor*" or "wearable sensor*" or "Heart rate monitor*" or Telemonitor* or "Smart Scales*" or "Digital medication box*" or "voice command*" or "wearable alarm*" or "voice guid*" or "voice activ*" or "remote weight manag*" or "passive remote monitor*" or "PRM" or "Remote Patient Monitoring" or "remote monitoring").ti,ab.	34417
23	("mobile application*" adj5 (health or monitor* or assist*)).ti,ab.	1152
24	("Activities of Daily Living" adj10 "assistive technology").ti,ab.	23
25	(dementia and ("self-help device" or "assistive technolog*" or "adaptive technolog*")).ti,ab.	298

#	Query	Results
26	(gerontotechnology or gerontechnology).ti,ab.	128
27	8 or 9 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26	170315
28	Cost of illness/	22469
29	Cost control/	81664
30	exp "cost benefit analysis"/	101088
31	((cost adj2 estimate\$) or (cost adj2 estimate\$) or (cost adj2 variable\$) or "cost benefit analysis" or "cost effectiveness analysis" or "comparative effectiveness" or "controlled stud*" or "cost control" or "economic stud*" or "economic evaluation*" or "cost minimi#ation analysis" or "outcome assessment*" or "utili#ation review*" or "or biomedical technology assessment").ti,ab,kw.	255842
32	("Costs and Cost Analysis" or Cost Analysis or macroeconomic cost benefit analysis).mp.	19179
33	(Costs and Cost Analysis).mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword heading word, floating subheading word, candidate term word]	12750
34	*health care cost/	52775
35	("cost benefit" or "cost-benefit" or "cost analysis" or "cost-analysis" or "cost compar*" or "cost implication*" or "cost-effectiv*" or "health-care reference costs" or "cost minimi#ation analysis").mp.	465888
36	(cost adj5 (benefit* or effectiv* or comparat* or analy*)).ti,ab.	354991
37	("Health Technology Assessment" or "health care utili#ation" or "utili#ation review" or "health technology assessment" or "economic assessment").ti,ab.	30238
38	biomedical technology assessment/	19528
39	28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38	822886

#	Query	Results
40	7 and 27	14278
41	39 and 40	1050
42	limit 41 to "remove clinical trial (clinicaltrials.gov) records"	875
43	limit 42 to "remove medline records"	301

9.3.3 Q2 Medline search strategy

Platform: Medline (EBSCO)

Date range: 1946-11 July 2025

#	Query	Results
S36	S34 AND S35	1,956
S35	S8 AND S24	18,129
S34	S25 OR S26 OR S27 OR S28 OR S29 OR S30 OR S31 OR S32 OR S33	545,436
S33	TI (("Health Technology Assessment" or "health care utilization" or "utilization review" or "health technology assessment" or "economic assessment")) OR AB (("Health Technology Assessment" or "health care utilization" or "utilization review" or "health technology assessment" or "economic assessment")) OR MW (("Health Technology Assessment" or "health care utilization" or "utilization review" or "health technology assessment" or "economic assessment"))	31,812
S32	(MH "Technology Assessment, Biomedical+")	12,762
S31	TI (((cost N5 (benefit* or effectiv* or comparat* or analy*)))) OR AB (((cost N5 (benefit* or effectiv* or comparat* or analy*))))	281,349
S30	TX (("cost benefit" or "cost-benefit" or "cost analysis" or "cost-analysis" or "cost compar*" or "cost implication*" or "cost-effectiv*" or "health-care reference costs" or "cost minimization analysis"))	352,600
S29	(MH "Cost Control+")	34,541
S28	(MH "Cost of Illness+")	37,843
S27	(MH "Cost Sharing") OR (MH "Cost of Illness+")	40,639
S26	(MH "Costs and Cost Analysis+")	280,090
S25	(MM "Cost-Benefit Analysis")	11,947
S24	S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23	115,825
S23	(MH "Technology Assessment, Biomedical")	11,650
S22	(MH "Biomedical Technology")	7,543
S21	TX (gerontotechnology or gerontechnology)	902
S20	TI (("Activities of Daily Living") N10 "assistive technolog*") OR AB (("Activities of Daily Living") N10 "assistive technolog*")	38
S19	TI ("mobile application*" N5 (health OR monitor* or assist*)) OR AB ("mobile application*" N5 (health OR monitor* or assist*))	869
S18	TI ("self-help device*" or "Motion sensor*" or "Pressure detector*" or Wristband* or "Tactile carpet*" or "Motion detector*" or "Ambient sensor*" or "wearable sensor*" or "Heart rate monitor*" or Telemonitor* or "Smart Scales*" or "Digital medication box*" or "voice command*" or "wearable alarm*" or "voice guid*" or "voice activ*" or "remote weight manag*" or "passive remote monitor*" or "PRM")) OR AB ("self-help device*" or "Motion sensor*" or "Pressure detector*" or Wristband* or "Tactile carpet*" or "Motion detector*" or "Ambient sensor*" or "wearable sensor*" or "Heart rate monitor*" or Telemonitor* or "Smart Scales*" or "Digital medication box*" or "voice command*" or "wearable alarm*" or "voice guid*" or "voice activ*" or "remote weight manag*" or "passive remote monitor*" or "PRM"))	18,238
S17	TI ("home care" or "independent living" or "community-dwelling") N7 ("assistive technolog*" or "adaptive technolog*") OR AB ("home care" OR "independent living" or "community-dwelling") N7 ("assistive technolog*" or "adaptive technolog*")	54

#	Query	Results
S16	TI ("adaptive technolog*" or "assistive technolog*" or "remote patient monitoring") OR AB ("adaptive technolog*" or "assistive technolog*" or "remote patient monitoring")	1,901
S15	TI ((remind* and (medication* or medicine* or pill* or tablet*)) N5 home) or AB ((remind* and (medication* or medicine* or pill* or tablet*)) N5 home)	96
S14	TI ((dementia and (("self-help device" or "assistive technolog*" or "adaptive technolog*")) or AB ((dementia and (("self-help device" or "assistive technolog*" or "adaptive technolog*"))	440
S13	TI ((ATTILA or "Assistive Technology and Telecare")) OR AB ((ATTILA or "Assistive Technology and Telecare"))	107
S12	(MH "Digital Health") or (MM "Wearable Electronic Devices/SD") or (MH "Fitness Trackers") or (MH "Self-Help Devices+")	16,600
S11	TI ("Mobile Health" or "Tele-Care" or "Tele-ICU" or "Tele-Intensive Care" or "Tele-Referral" or Telecare or Telehealth or "Virtual Medicine" or "digital health") or AB ("Mobile Health" or "Tele-Care" or "Tele-ICU" or "Tele-Intensive Care" or "Tele-Referral" or Telecare or Telehealth or "Virtual Medicine" or "digital health")	33,165
S10	(MH "Telemedicine")	45,151
S9	(MH "Remote Patient Monitoring")	35
S8	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7	4,393,347
S7	TI ((elderly or "older people" or "older adults" or "seniors" or "Senior citizens" or "over-65s" or "over 65s" or "65+" or "65 and older" or "sixty-five and older" or "65+ years" or "70+ years" or "80+ years" or "over 65 years" or "over 70 years" or "over 80 years" or "80 years and older" or "80 years and over" or "70 years and older" or "70 years and over" or "65 years and older" or "65 years and over" or ((aged or ageing or ageing or elder* or senior* or old* or retired) N2 (adult* or people* or person* or individual* or wom#n or man or men or age) or (senior* N2 citizen*) or retiree* or sexagenarian* or septuagenarian* or octagenarian* or nonagenarian* or centenarian* or supercentenarian*)) OR AB ((elderly or "older people" or "older adults" or "seniors" or "Senior citizens" or "over-65s" or "over 65s" or "65+" or "65 and older" or "sixty-five and older" or "65+ years" or "70+ years" or "80+ years" or "over 65 years" or "over 70 years" or "over 80 years" or "80 years and older" or "80 years and over" or "70 years and older" or "70 years and over" or "65 years and older" or "65 years and over" or ((aged or ageing or ageing or elder* or senior* or old* or retired) N2 (adult* or people* or person* or individual* or wom#n or man or men or age) or (senior* N2 citizen*) or retiree* or sexagenarian* or septuagenarian* or octagenarian* or nonagenarian* or centenarian* or supercentenarian*))	1,130,210
S6	MH "Homebound Persons"	762
S5	(MH "Frail Elderly")	17,464
S4	(MH "Aged, 80 and Over")	1,084,243
S3	(MH "Aging")	264,428
S2	(MH "Aged")	3,666,169
S1	(MH "Aging in Place")	38

9.3.4 Q2 Econpapers search strategy

Platform: Econpapers (online)

Date range: 1990s-15 July 2025

Search string		July '25	Jan '26
(older OR elderly) AND ("assistive technology" or "adaptive technology")	+ cost or "economic evaluation" or "cost benefit analysis" in titles and keywords in articles	6	0
older OR elderly) AND "remote monitoring"	+ cost or economic in titles and keywords in articles	1	0
(older OR elderly) AND "wearable sensor"	+ cost in titles and keywords in articles	1	0
(older OR elderly) AND digital	+ cost in titles and keywords in articles	16	0

Search string		July '25	Jan '26
(older OR elderly) AND device	+cost-effectiveness in titles and keywords	5	0
(older OR elderly) AND "Activities of Daily Living"	+ cost in titles and keywords in articles	11	0
(older OR elderly) AND ("Mobile Health" or "Tele-Care" or "Tele-ICU" or "Tele-Intensive Care" or "Tele-Referral" or Telecare or Telehealth or "Virtual Medicine" or "digital health")	+ cost OR economic in titles and keywords in articles	7	0
Total		47	

9.3.5 Q2 overview of citation chasing

(N=17) systematic reviews and (n=4) papers included, for Q2, in the final report were subject to forward and backward citation chasing. (n=57) systematic reviews were initially identified from a systematic search in Cochrane Library and Epistemonikos, and (n=12) were identified during the screening of the main database material. After deduplication, (n=17) systematic reviews and the (n=4) included studies were forward and backward citation chased resulting in (n=500) papers with (n=114) duplicates removed. (N=386) records were screened on title and abstract. (N=8) were selected for full text screening and this resulted in (n=3) papers included extraction. (N=2) records were included in the final report. The two papers included in the final report deriving from this supplemental search [102,105] originated in the material screened for Q1 and identified as on topic for Q2.

Appendix E Research question 2: supplementary search details

Table 34: Overview of systematic reviews retrieved for Q2

Repository of Systematic Reviews	Date	#	Screened on title and abstract
Cochrane Library Repository of Systematic Reviews	06 November 2025	17	
Epistemonikos Repository of Systematic Reviews	06 November 2025	40	
Included from Q1 screening		12	
Duplicates removed		52	
Total systematic reviews screened on title and abstract for Q2			17
Forward and backward citation searching for (n=17) systematic reviews		500	386

9.4 Q2 overview of citation chasing

(N=17) systematic reviews and (n=4) papers included, for Q2, in the final report were subject to forward and backward citation chasing. (n=57) systematic reviews were initially identified from a systematic search in Cochrane Library and Epistemonikos, and (n=12) were identified during the screening of the main database material. After deduplication, (n=17) systematic reviews and the (n=4) included studies were forward and backward citation chased resulting in (n=500) papers with (n=114) duplicates removed. (N=386) records were screened on title and abstract. (N=8) were selected for full text screening and this resulted in (n=5) papers included for extraction. (N=4) records were included in the final report.

9.4.1 Q2 grey literature search

Source	Link	Date	Search	Results	Duplicates	Screened
CEA Registry	https://cevr.tuftsmedicalcenter.org/databases/cea-registry	16/01/2026	("assistive technology" or "assistive technologies" or "adaptive technology" or "adaptive technologies" or "remote patient monitoring") AND ("older people" or elderly or Aged or frail) AND ("cost effectiveness" or "cost control" or "economic stud*" or "economic evaluation*" or "cost benefit analysis" or "cost effectiveness analysis" or "comparative effectiveness" or "controlled stud*")			
Health Technology Assessment international (HTAi)	https://htai.org/what-is-hta/	16/01/2026	Browsed site	0	0	0
International HTA Database	https://database.inahta.org/	16/01/2026	((("assistive technology" or "assistive technologies" or "adaptive	0	0	0

Source	Link	Date	Search	Results	Duplicates	Screened
The Professional Society for Health Economics and Outcomes Research (ISPOR)	https://www.ispor.org/about	17/01/2026	technology" or "adaptive technologies" or "remote patient monitoring")))[Title] AND ("costs" or "cost benefit" or "cost benefit") [abs]			
			("assistive technology" or "adaptive technology") AND cost	0	0	0
NICE	https://www.nice.org.uk/		("assistive technology" or "assistive technologies" or "adaptive technology" or "adaptive technologies" or "remote patient monitoring") AND ("older people" or elderly or Aged or frail)	0	0	0
WHO	https://www.who.int/	17/01/2026	variety of terms			

9.4.2 Q2 web browsers search strategies

Link	Date	Search String	Filter	#	off-topic or duplicate	Screened
http://www.google.com	03/10/2025	("assistive technology" or "assistive technologies" or "adaptive technology" or "adaptive technologies" or "remote patient		2	0	2

Link	Date	Search String	Filter	#	off-topic or duplicate	Screened
		monitoring") AND ("older people" or elderly or Aged or frail)				
http://www.google.com	03/10/2025	("assistive technology" or "adaptive technology") AND ("older people" or elderly or Aged or frail)		49	27	22
https://duckduckgo.com/	03/10/2025	("assistive technology" or "assistive technologies" or "adaptive technology" or "adaptive technologies" or "remote patient monitoring") AND ("older people" or elderly or Aged or frail)		0	0	0
https://duckduckgo.com/	03/10/2025	("assistive technology" or "adaptive technology" or "remote patient monitoring") AND ("older people" or elderly or Aged or frail)		0	0	0
https://duckduckgo.com/	03/10/2025	("assistive technology" or "adaptive technology") AND ("older people" or elderly or Aged or frail)		0	0	0
https://duckduckgo.com/	03/10/2025	("assistive technology" or adaptive technology) AND ("older people" or elderly or Aged or frail)		60	42	18

9.4.3 Q2 Cochrane Library search strategy

Platform: Cochrane Library

Date Range: 1995-06 November 2025

Line number		results
#1	MeSH descriptor: [Self-Help Devices] explode all trees	591
#2	((("adaptive technology" or "assistive technology" or "remote patient monitoring")):kw	164
#3	((("self-help device" or "supportive device" or "Motion sensor" or "Pressure detector" or Wristband or "Tactile carpet" or "Motion detector" or "Ambient sensor" or "wearable sensor" or "Heart rate monitor" or Telemonitor or "Smart Scale" or "Digital medication box" or "voice command" or "wearable alarm" or "voice guide" or "voice activation" or "remote weight management" or "passive remote monitor" or "PRM" OR "personal alarm#" OR "pill organizer#" OR electrotherapy OR "assistive device" or "adaptive technology" or "assistive technology" or "remote patient monitoring")):ti OR ((("self-help device" or "supportive device" or "Motion sensor" or "Pressure detector" or Wristband or "Tactile carpet" or "Motion detector" or "Ambient sensor" or "wearable sensor" or "Heart rate monitor" or Telemonitor or "Smart Scale" or "Digital medication box" or "voice command" or "wearable alarm" or "voice guide" or "voice activation" or "remote weight management" or "passive remote monitor" or "PRM" OR "personal alarm#" OR "pill organizer#" OR electrotherapy OR "assistive device" or "adaptive technology" or "assistive technology" or "remote patient monitoring")):ab	3364
#4	#1 or #2 or #3	3976
#5	MeSH descriptor: [Frail Elderly] explode all trees	1239
#6	MeSH descriptor: [Aged] explode all trees	286474
#7	MeSH descriptor: [Geriatrics] explode all trees	297

#8	((gerontotechnology or gerontechnology)):ti,ab,kw	29
#9	(("older adult#" OR "aging population#" OR elder* OR senior* OR "old people" OR "older people" OR aged OR "frail elder#")):ti AND (("older adult#" OR "aging population#" OR elder* OR senior* OR "old people" OR "older people" OR aged OR "frail elder#")):ab	28750
#10	#5 or #6 or #7 or #8 or #9	303943
#11	#4 AND #10	505
#12	"cost-benefit analysis" or ("cost benefit analysis")	14294
#13	"economic analysis" or "economic evaluation"	8400
#14	("cost benefit" or "cost-benefit" or "cost analysis" or "cost-analysis" or "cost compar#" or "cost implication#" or "cost-effectiv#" or "health-care reference costs" or "cost minimisation analysis")	17751
#15	#12 or #13 or #14	22792
#16	#11 and #15	18
#17	in Cochrane Reviews	1

9.4.4 Q2 Epistemonikos search strategy

Platform: Epistemonikos (online)

Date range: Date range: 2009-6 November 2025

Field	Query
title	((("older people" OR "elderly people" OR "senior people" OR elderly OR "seniors" OR "geriatric" OR "Over 65" OR "over-65")))
OR abstract	((("older people" OR "elderly people" OR "senior people" OR elderly OR "seniors" OR "geriatric" OR "Over 65" OR "over-65")))
AND	
title	((("adaptive technology" OR "adaptive device" OR "assistive device" OR "adaptive technologies" OR "assistive technology" OR "assistive technologies" OR "wearable device" OR sensor OR ambient OR "remote monitor" OR ((smart OR digital) AND wearable OR voice OR track OR measure))))
OR abstract	((("adaptive technology" OR "adaptive device" OR "assistive device" OR "adaptive technologies" OR "assistive technology" OR "assistive technologies" OR "wearable device" OR sensor OR ambient OR "remote monitor" OR ((smart OR digital) AND wearable OR voice OR track OR measure))))
AND	
title	((("cost benefit" OR "cost-benefit" OR "cost analysis" OR "cost-analysis" OR "cost compar#" OR "cost implication#" OR "cost-effectiv#" OR "health-care reference costs" OR "cost minimisation analysis" OR evaluation OR economic)))) OR abstract:((((("cost benefit" OR "cost-benefit" OR "cost analysis" OR "cost-analysis" OR "cost compar#" OR "cost implication#" OR "cost-effectiv#" OR "health-care reference costs" OR "cost minimisation analysis" OR evaluation OR economic)) OR abstract:((("cost benefit" OR "cost-benefit" OR "cost analysis" OR "cost-analysis" OR "cost compar#" OR "cost

Field	Query	
	implication#" OR "cost-effectiv#" OR "health-care reference costs" OR "cost minimisation analysis" OR evaluation OR economic))))))	
OR	((("cost benefit" OR "cost-benefit" OR "cost analysis" OR "cost-analysis" OR "cost compar#" OR "cost implication#" OR "cost-effectiv#" OR "health-care reference costs" OR "cost minimisation analysis" OR evaluation OR economic)))) OR abstract:((((("cost benefit" OR "cost-benefit" OR "cost analysis" OR "cost-analysis" OR "cost compar#" OR "cost implication#" OR "cost-effectiv#" OR "health-care reference costs" OR "cost minimisation analysis" OR evaluation OR economic)) OR abstract:(("cost benefit" OR "cost-benefit" OR "cost analysis" OR "cost-analysis" OR "cost compar#" OR "cost implication#" OR "cost-effectiv#" OR "health-care reference costs" OR "cost minimisation analysis" OR evaluation OR economic))))))	
abstract		
Result		213

Appendix F Data extraction

As reported in Section 2.4, we extracted data using standardised bespoke data extraction forms, which we piloted on a sample of papers and added, clarified, or split fields as necessary. We created one Microsoft Excel workbook for data related to research question 1, and a separate one to capture data related to research question 2. Headers for the Excel sheets (i.e. template data collection forms) are included below and templates and data are available upon request.

Research question one data extraction workbook details

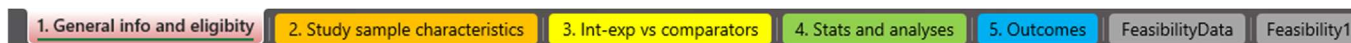


Figure 25: Screenshot of workbook tab layout

Tab 1 headers: General info and eligibility

Study ID <i>From Eppi</i>	First author (Year)	*Year of publication	Screening batch (main or citation chasing)	Title	Study location (Country of study including state, province, or territory)	Study name (eg acronym)	Study design (as stated by the authors)	Study design (HRB assigned)	Assessment Tool to use (RoB2/ROBINS-I)	Health condition/ population	Study aims and/or objectives
Study funding source (copied text)	Conflicts of interest (copied text)	Ethical approval obtained (copied text)	Additional relevant publication(s)/documents (First author, Year, Link)				Extracted (Reviewer's initials)	Validated (Reviewer's initials)	Final check (yes/no)	Ready for citation chasing (yes/no)	Notes

Tab 2 headers: Study sample characteristics

Author (Year)	Recruitment method <i>e.g., hospital records, consecutive patients</i>	Participant eligibility criteria <i>Inclusion:</i> <i>Exclusion:</i>	Sampling frame <i>Source(s) used to draw/recruit participants (clinic, hospital, records)</i>	Sample size <i>(starting size)</i>	Sample size <i>(Final sample size/analytic size)</i>	% lost to follow-up
Baseline differences between groups? <i>(Y/N/Not reported), freetext note</i>	Mean age / Age range <i>Intervention:</i> <i>Control:</i>	% Female	Random assignment to study group <i>(yes/no/not reported/not applicable)</i>	Type of random assignment	Healthcare utilisation/provision outcomes captured <i>(list 1., 2., 3.)</i>	Clinical outcomes captured <i>(list 1., 2., 3.)</i>

Tab 3 headers: Int-exp vs comparators

Author (Year)	Intervention name <i>Brief name/phrase to describe the intervention (devices)</i>	Intervention (devices) description <i>List individual devices. Detail to the level appropriate for the review</i>	**Supplemental intervention description <i>Additional education, training, etc.</i>	Main device(s)	Clinical metrics collected/sent via device (relevant for our review)	Additional information collected/sent	Comparator name <i>Brief name/phrase to describe the intervention</i>	Comparator description <i>Detail to the level appropriate for the review</i>
Intervention provider (monitor)	Interventionist training	Patient training	Level of blinding <i>(Specificity if possible eg patient blinded, interventionist blinded, research assistant blinded)</i>	Tailoring/modifications <i>Planned:</i> <i>Unplanned:</i>	Frequency of transmission <i>e.g., transmitted daily, weekly, etc.</i>	Frequency of monitoring <i>e.g., checked daily, weekly, etc.</i>	Alert/algorithm for out-of-range values <i>Yes, no, no information</i>	Duration of follow-up

Tab 4 headers: Stats and analyses

Author (Year)	Available/apparent pre-specified analysis plan? (SAP or protocol?) (Y, PY, PN, N)	Sample size calculation <i>How the author estimated the sample size and for what outcome</i>	Planned subgroup analyses <i>List subgroups examined e.g. gender, age</i>	Planned sensitivity analyses <i>List assumptions tested e.g. alternative analytic approach, exclusion of data</i>	Method for handling missing data	Confounders <i>Accounted for in study</i>	Method to control for confounding	Effect modifiers <i>List variables being tested</i>
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Tab 5 headers: Outcomes

Author (Year)	Outcome name (timeframe)	Intervention sample size (<i>analysis</i>)	Comparator sample size (<i>analysis</i>)	Name of statistical measure and variance	Name of statistical test(s) used to calculate unadjusted effect(s)	Intervention outcome	Comparator outcome
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Significance of change <i>i.e. p-value</i>	For RoB2/ROBINS-I Numerical results being assessed (paste-values)	Unadjusted outcome effect measurement e.g. mean, median, OR, RR, MD, SMD	Outcome effect variance e.g. SD, range, 95% CI	Unadjusted effect	95% lower CI	95% upper CI	Significance of change <i>i.e. p-value</i>
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List of adjusted variables	Adjusted outcome effect measurement	Adjusted effect	95% lower CI	95% upper CI	Significance of change <i>i.e. p-value</i>	Subgroup name e.g. participant	Subgroup outcome effect measurement	Subgroup outcome effect	95% lower CI	95% upper CI	Significance of change <i>i.e. p-value</i>
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	<i>e.g. OR, RR, MD, SMD</i>					<i>gender, age, health status</i>	<i>e.g. OR, RR,MD, SMD</i>				
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Sensitivity analysis name	Sensitivity analysis effect measurement <i>e.g. OR, RR, MD, SMD</i>	Sensitivity analysis effect	95% lower CI	95% upper CI	Significance of change <i>i.e. p-value</i>	Effect modifier name	Effect modifier measurement <i>e.g. OR, RR MD/SMD</i>	Effect modifier effect	95% lower CI	95% upper CI	Significance of change <i>i.e. p-value</i>
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Research question two data extraction workbook details

Author	Type	Study design	Model	Perspective	Country	Price year	Health condition/population	Intervention	Device(s)	Frequency of monitoring
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Alert or algorithm for monitors	Comparator	Time horizon	Discounting	Clinical outcome	Utility outcomes	Economic outcome	Summary of findings	Sensitivity analysis conducted	Sensitivity analysis findings	Extracted by	Validated by	Ready for citation chasing	Notes
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Appendix G Cochrane Risk of Bias 2 (RoB 2) assessments

Table 35: Cochrane RoB 2 risk of bias assessments

Author (year)	Outcome	1. Randomisation	2. Deviations from intended interventions (variant a)	3. Missing data	4. Measurement of Outcome	5. Selection of the reported result	Overall assessment
Biannic <i>et al.</i> (2012) [81]	Days of hospitalisation (due to acute cardiac events) (at 3 months)	Low	Low	Low	Low	Some concerns	Some concerns
Biannic <i>et al.</i> (2012) [81]	Readmission rate (at 3 months)	Low	Low	Low	Low	Some concerns	Some concerns
Dansky <i>et al.</i> (2008) [80]	Hospitalisation (at 60 days)	Low	Low	Low	Low	High	High
Dansky <i>et al.</i> (2008) [80]	Hospitalisation (at 120 days)	Low	Low	Low	Low	High	High
Dansky <i>et al.</i> (2008) [80]	Total ED visits (at 60 days)	Low	Low	Low	Low	High	High
Dansky <i>et al.</i> (2008) [80]	Total ED visits (at 120 days)	Low	Low	Low	Low	High	High
Ellins <i>et al.</i> (2023) [107]	Anticoagulant therapy (at median 4.2 years)	Low	Low	Low	Low	Some concerns	Some concerns
Ellins <i>et al.</i> (2023) [107]	Hospital admissions for acute coronary syndrome (at median 4.2 years)	Low	Low	Low	Low	Some concerns	Some concerns
Ellins <i>et al.</i> (2023) [107]	Hospital admissions for bleeds (at median 4.2 years)	Low	Low	Low	Low	Some concerns	Some concerns
Gellis <i>et al.</i> (2012/2014) [82,83]	Emergency room/department visits (at 12 months)	High	Low	Low	Low	Some concerns	High
Gellis <i>et al.</i> (2012/2014) [82,83]	Hospital days/days of rehospitalisation (at 12 months)	High	Low	Some concerns	Low	Some concerns	High
Gellis <i>et al.</i> (2012/2014) [82,83]	Episodes of (home) care (at 12 months)	High	Low	Low	Low	Some concerns	High
Halcox <i>et al.</i> (2017)	time to diagnosis (of AF) (at 12 months)	Low	Low	Low	Low	Some concerns	Some concerns
Lehmann <i>et al.</i> (2006) [84,85]	Number of physician office visits (at 6 months)	High	Low	Low	Low	Some concerns	High

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Author (year)	Outcome	1. Randomisation	2. Deviations from intended interventions (variant a)	3. Missing data	4. Measurement of Outcome	5. Selection of the reported result	Overall assessment
Lehmann <i>et al.</i> (2006) [85]	Overall healthcare utilisation [physician office visits, ED visits, and hospital admissions] (at 6 months)	High	Low	Low	Low	Some concerns	High
Lehmann <i>et al.</i> (2006) [85]	Visits to emergency department (at 6 months)	High	Low	Low	Low	Some concerns	High
Lehmann <i>et al.</i> (2006) [85]	Hospital admissions (at 6 months)	High	Low	Low	Low	Some concerns	High
Olivari <i>et al.</i> (2018) [86]	Duration of hospital admissions for HF (days) (at 12 months)	Low	Low	Low	High	Some concerns	High
Olivari <i>et al.</i> (2018) [86]	Duration of hospital admissions (all-cause) (days) (at 12 months)	Low	Low	Low	High	Some concerns	High
Olivari <i>et al.</i> (2018) [86]	Patients with at least one all-cause hospital admission (at 12 months)	Low	Low	Low	High	Some concerns	High
Olivari <i>et al.</i> (2018) [86]	Patients with at least one urgent evaluation in ED (at 12 months)	Low	Low	Low	High	Some concerns	High
Olivari <i>et al.</i> (2018) [86]	All-cause hospital admissions (at 12 months) (count and average)	Low	Low	Low	High	Some concerns	High
Olivari <i>et al.</i> (2018) [86]	Hospital admissions for HF (at 12 months) (count and average)	Low	Low	Low	High	Some concerns	High
Olivari <i>et al.</i> (2018) [86]	At least one hospitalisation for HF	Low	Low	Low	High	Some concerns	High
Pedone <i>et al.</i> (2013) [87]	hospitalization admissions related to respiratory exacerbations (at 9 months)	Some concerns	Low	Low	Low	Some concerns	Some concerns
Pedone <i>et al.</i> (2013) [87]	length of stay (hospitalisation related to respiratory exacerbation)	Some concerns	Low	Low	Low	Some concerns	Some concerns
Schwarz <i>et al.</i> (2008) [93]	unplanned Hospital readmission for HF symptoms (after 90 days) (average and count)	Some concerns	Low	Low	Low	High	High
Schwarz <i>et al.</i> (2008) [93]	ED visits for HF (at 90 days)	Some concerns	Low	Low	Low	High	High
Schwarz <i>et al.</i> (2008) [93]	days to readmission (at 90 days)	Some concerns	Low	Low	Low	High	High
Tchalla <i>et al.</i> (2012) [96]	Cumulative incidence of post-fall hospitalisations for fall at home	High	Some concerns	Low	Low	Some concerns	High

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Author (year)	Outcome	1. Randomisation	2. Deviations from intended interventions (variant a)	3. Missing data	4. Measurement of Outcome	5. Selection of the reported result	Overall assessment
	(Falls at home with admission to hospital emergency) (at 12 months)						
Tchalla <i>et al.</i> (2013) [94]	Admissions to nursing care facilities (12 months)	High	Low	Low	Low	Some concerns	High
Tchalla <i>et al.</i> (2025) [95]	Unplanned rehospitalisations / cumulative incidence of rehospitalizations for functional decompensation (at 12 months)	Some concerns	Low	Low	High	Some concerns	High
Tchalla <i>et al.</i> (2025) [95]	Proportion of emergency admissions / ED visits without hospitalisation (at 12 months)	Some concerns	Low	Low	High	Some concerns	High
Tompkins and Orwat (2010) [97]	ED visits (at 6 months)	Low	Low	Low	Low	Some concerns	Some concerns
Tompkins and Orwat (2010) [97]	urgent care visits (at 6 months)	Low	Low	Low	Low	Some concerns	Some concerns
Tompkins and Orwat (2010) [97]	Hospital admissions (at 6 months)	Low	Low	Low	Low	Some concerns	Some concerns
Tompkins and Orwat (2010) [97]	Hospital days (at 6 months)	Low	Low	Low	Low	Some concerns	Some concerns
Tompkins and Orwat (2010) [97]	Hospital average length of stay [average acute days per hospital admission] (at 6 months)	Low	Low	Low	Low	Some concerns	Some concerns
Tompkins and Orwat (2010) [97]	Primary care visits (at 6 months)	Low	Low	Low	Low	Some concerns	Some concerns
Wong <i>et al.</i> (2024) [98]	New diagnosis of AF (at 6 months)	Low	Low	Low	Low	High	High
Wong <i>et al.</i> (2024) [98]	A Healthcare visits to GP (at 6 months)	Low	Low	Low	Low	High	High
Wong <i>et al.</i> (2024) [98]	A visit to specialists (at 6 months)	Low	Low	Low	Low	High	High
Wong <i>et al.</i> (2024) [98]	A visit to the emergency departments (at 6 months)	Low	Low	Low	Low	High	High

Appendix H Pre-specified confounders (Risk Of Bias In Non-Randomized Studies - of Interventions (ROBINS-I))

At planning stage: list confounding factors

P1. List the important confounding factors relevant to all or most studies on this topic. Specify whether these are particular to specific intervention-outcome combinations.

Age, sex, severity of condition, multimorbidity, cognitive status, geographic location (rurality), previous experience with technology (particularly for AT with more active engagement)
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D. Specify a (hypothetical) target randomised trial specific to the study

D1. Specify the participants and eligibility criteria	Adults ≥65, cognitively intact
D2. Specify the intervention strategy	Digital assistive technology with data transfer capabilities which is employed in a home setting and monitored by a health care professional or home care worker
D3. Specify the comparator strategy	No assistive technology/usual or standard care

Appendix I Cochrane Risk Of Bias In Non-Randomized Studies - of Interventions (ROBINS-I) assessments

Table 36: Cochrane Risk Of Bias In Non-Randomized Studies - of Interventions (ROBINS-I) assessments

Author (year)	Outcome	1. Confounding (variant A)	2. Classification of interventions	3. Selection of participants	4. Missing data	5. Measurement of Outcome	6. Selection of the reported result	Overall assessment
Salahub <i>et al.</i> (2025) [88]	Emergency department days (at 100 days)	Moderate	Moderate	Low	Low	Low	Low	Moderate
Salahub <i>et al.</i> (2025) [88]	Hospitalisation days (at 100 days)	Moderate	Moderate	Low	Low	Low	Low	Moderate
Salahub <i>et al.</i> (2025) [88]	Same-day surgery days (at 100 days)	Moderate	Low	Low	Low	Low	Low	Moderate
Salahub <i>et al.</i> (2025) [88]	Long-term care days (at 100 days)	Moderate	Low	Low	Low	Low	Low	Moderate
Salahub <i>et al.</i> (2025) [88]	Rehabilitation days (at 100 days)	Moderate	Moderate	Low	Low	Low	Low	Moderate
Salahub <i>et al.</i> (2025) [88]	Inpatient mental health days (at 100 days)	Moderate	Moderate	Low	Low	Low	Low	Moderate
Salahub <i>et al.</i> (2025) [88]	Alternate level of care days (in hospital awaiting transfer to another are setting) (at 100 days)	Moderate	Low	Low	Low	Low	Low	Moderate
Salahub <i>et al.</i> (2025) [88]	Primary care encounters (at 100 days)	Moderate	Moderate	Low	Low	Low	Low	Moderate
Salahub <i>et al.</i> (2025) [88]	At least 1 day in long-term care (at 100 days)	Moderate	Low	Low	Low	Low	Low	Moderate
Salahub <i>et al.</i> (2025) [88]	Days at home (at 100 days)	Moderate	Low	Low	Low	Low	Low	Moderate
Zoellick <i>et al.</i> (2025) [99]	Number of medical emergency contacts (at 12 months)	Moderate	Low	Low	Low	Low	Low	Moderate
Zoellick <i>et al.</i> (2025) [99]	Number of hospitalisations (at 12 months)	Moderate	Low	Low	Low	Low	Low	Moderate
Zoellick <i>et al.</i> (2025) [99]	Duration of hospitalisations (at 12 months) linear model/zero inflate	Moderate	Low	Low	Low	Low	Low	Moderate

Appendix J Philips checklist assessment

Table 37: Philips checklist assessment

Dimension of Quality	Quality Criterion	Question(s)	Author (Year)			
			Grustam <i>et al.</i> (2018) [102]	Wittenborn <i>et al.</i> (2017) [105]	Albuquerque de Almeida <i>et al.</i> (2022) [101]	Norut Tromsø <i>et al.</i> (2009) [104]
Structure	S1	Is there a clear statement of the decision problem?	Yes	Yes	Yes	Yes
		Is the objective of the evaluation and model specified and consistent with the stated decision problem?	Yes	Yes	Yes	No
		Is the primary decision-maker specified?	No	No	No	No
	S2	Is the perspective of the model stated clearly?	Yes	Yes	Yes	No
		Are the model inputs consistent with the stated perspective?	Yes	Yes	Yes	NA
		Has the scope of the model been stated and justified?	Yes	Yes	Yes	No
		Are the outcomes of the model consistent with the perspective, scope and overall objective of the model?	Yes	Yes	Yes	NA
	S3	Is the structure of the model consistent with a coherent theory of the health condition under evaluation?	Yes	Yes	Yes	No
		Are the sources of data used to develop the structure of the model specified?	Yes	Yes	Yes	No
		Are the causal relationships described by the model structure justified appropriately?	Yes	Yes	Yes	NA
	S4	Are the structural assumptions transparent and justified?	Yes	Yes	Yes	No
		Are the structural assumptions reasonable given the overall objective, perspective and scope of the model?	Yes	Yes	Yes	NA

Dimension of Quality	Quality Criterion	Question(s)	Author (Year)			
			Grustam <i>et al.</i> (2018) [102]	Wittenborn <i>et al.</i> (2017) [105]	Albuquerque de Almeida <i>et al.</i> (2022) [101]	Norut Tromsø <i>et al.</i> (2009) [104]
	S5	Is there a clear definition of the options under evaluation?	Yes	Yes	Yes	No
		Have all feasible and practical options been evaluated?	Yes	CD	Yes	No
		Is there justification for the exclusion of feasible options?	NA	NA	NA	No
	S6	Is the chosen model type appropriate given the decision problem and specified causal relationships within the model	Yes	Yes	Yes	No
	S7	Is the time horizon of the model sufficient to reflect all important differences between options?	Yes	Yes	Yes	No
		Are the time horizon of the model, the duration of treatment and the duration of treatment effect described and justified?	Yes	Yes	Yes	No
	S8	Do the disease states (state transition model) or the pathways (decision tree model) reflect the underlying biological process of the disease in question and the impact of interventions?	Yes	Yes	Yes	NA
	S9	Is the cycle length defined and justified in terms of the natural history of disease?	Yes	No	NA	No
Data	D1	Are the data identification methods transparent and appropriate given the objectives of the model?	Yes	Yes	Yes	No
		Where choices have been made between data sources, are these justified appropriately?	No	Yes	No	No
		Has particular attention been paid to identifying data for the important parameters in the model?	No	Yes	Yes	No

Dimension of Quality	Quality Criterion	Question(s)	Author (Year)			
			Grustam <i>et al.</i> (2018) [102]	Wittenborn <i>et al.</i> (2017) [105]	Albuquerque de Almeida <i>et al.</i> (2022) [101]	Norut Tromsø <i>et al.</i> (2009) [104]
		Has the quality of the data been assessed appropriately?	No	No	No	No
		Where expert opinion has been used, are the methods described and justified?	No	NA	No	NA
	D2	Is the data modelling methodology based on justifiable statistical and epidemiological techniques?	Yes	Yes	Yes	NA
	D2a	Is the choice of baseline data described and justified?	Yes	Yes	Yes	No
		Are transition probabilities calculated appropriately?	Yes	Yes	NA	NA
		Has a half-cycle correction been applied to both cost and outcome?	No	CD	NA	NA
		If not, has this omission been justified?	No	NA	NA	NA
	D2b	If relative treatment effects have been derived from trial data, have they been synthesised using appropriate techniques?	NA	NA	NA	NA
		Have the methods and assumptions used to extrapolate short-term results to final outcomes been documented and justified?	Yes	Yes	Yes	NA
		Have alternative extrapolation assumptions been explored through sensitivity analysis?	Yes	Yes	NA	NA
		Have assumptions regarding the continuing effect of treatment once treatment is complete been documented and justified?	Yes	Yes	Yes	NA
		Have alternative assumptions regarding the continuing effect of treatment been explored through sensitivity analysis?	NA	Yes	NA	NA

Dimension of Quality	Quality Criterion	Question(s)	Author (Year)			
			Grustam <i>et al.</i> (2018) [102]	Wittenborn <i>et al.</i> (2017) [105]	Albuquerque de Almeida <i>et al.</i> (2022) [101]	Norut Tromsø <i>et al.</i> (2009) [104]
	D2c	Are the costs incorporated into the model justified?	Yes	Yes	Yes	No
		Has the source for all costs been described?	Yes	Yes	Yes	No
		Have discount rates been described and justified given the target decision-maker?	Yes	Yes	Yes	NA
	D2d	Are the utilities incorporated into the model appropriate?	Yes	Yes	Yes	NA
		Is the source for the utility weights referenced?	Yes	Yes	Yes	NA
		Are the methods of derivation for the utility weights justified?	Yes	Yes	Yes	NA
	D3	Have all data incorporated into the model been described and referenced in sufficient detail?	Yes	Yes	Yes	No
		Has the use of mutually inconsistent data been justified (i.e. are assumptions and choices appropriate)?	No	NA	NA	NA
		Is the process of data incorporation transparent?	Yes	Yes	Yes	No
		If data have been incorporated as distributions, has the choice of distribution for each parameter been described and justified?	Yes	Yes	Yes	NA
		If data have been incorporated as distributions, is it clear that second order uncertainty is reflected?	Yes	Yes	NA	NA
	D4	Have the four principal types of uncertainty been addressed?	No	Yes	Yes	No
		If not, has the omission of particular forms of uncertainty been justified?	No	No	NA	No
	D4a	Have methodological uncertainties been addressed by running alternative	Yes	Yes	NA	No

Dimension of Quality	Quality Criterion	Question(s)	Author (Year)			
			Grustam <i>et al.</i> (2018) [102]	Wittenborn <i>et al.</i> (2017) [105]	Albuquerque de Almeida <i>et al.</i> (2022) [101]	Norut Tromsø <i>et al.</i> (2009) [104]
		versions of the model with different methodological assumptions?				
	D4b	Is there evidence that structural uncertainties have been addressed via sensitivity analysis?	No	Yes	NA	No
	D4c	Has heterogeneity been dealt with by running the model separately for different subgroups?	Yes	Yes	NA	No
	D4d	Are the methods of assessment of parameter uncertainty appropriate?	Yes	Yes	NA	Yes
		If data are incorporated as point estimates, are the ranges used for sensitivity analysis stated clearly and justified?	Yes	Yes	NA	No
Consistency	C1	Is there evidence that the mathematical logic of the model has been tested thoroughly before use?	No	No	Yes	No
	C2	Are any counterintuitive results from the model explained and justified?	NA	NA	NA	NA
		If the model has been calibrated against independent data, have any differences been explained and justified?	NA	No	NA	NA
		Have the results of the model been compared with those of previous models and any differences in results explained?	Yes	No	Yes	No

Appendix K Consensus Health Economic Criteria (CHEC) list assessment

Table 38: Consensus Health Economic Criteria (CHEC) list assessment

Quality dimension	Quality dimension met McIntyre <i>et al.</i> (2020) [103]
1. Is the study population clearly described?	Yes
2. Are competing alternatives clearly described?	Yes
3. Is a well-defined research question posed in answerable form?	Yes
4. Is the economic study design appropriate to the stated objective?	Yes
5. Is the chosen time horizon appropriate to include relevant costs and consequences?	Yes
6. Is the actual perspective chosen appropriate?	Yes
7. Are all important and relevant costs for each alternative identified?	Yes
8. Are all costs measured appropriately in physical units?	Yes
9. Are costs valued appropriately?	Yes
10. Are all important and relevant outcomes for each alternative identified?	Yes
11. Are all outcomes measured appropriately?	Yes
12. Are outcomes valued appropriately?	Yes
13. Is an incremental analysis of costs and outcomes of alternatives performed?	Yes
14. Are all future costs and outcomes discounted appropriately?	Yes
15. Are all important variables, whose values are uncertain, appropriately subjected to sensitivity analysis?	Yes
16. Do the conclusions follow from the data reported?	Yes
17. Does the study discuss the generalisability of the results to other settings and patient/client groups?	Yes
18. Does the article indicate that there is no potential conflict of interest of study researcher(s) and funder(s)?	No
19. Are ethical and distributional issues discussed appropriately?	No

Appendix L Research question 1: List of excluded studies

9.5 Studies excluded on Population (age) (151)

	Excluded on population (age)
1	Achelrod Dmitrij, Schreyögg Jonas, Stargardt Tom. Health-economic evaluation of home telemonitoring for COPD in Germany: evidence from a large population-based cohort. The European journal of health economics : HEPAC : health economics in prevention and care 2017;18:869–82. doi:10.1007/s10198-016-0834-x
2	Achury-Saldaña Diana M, Gonzalez Rafael A, Garcia Angel, et al. Efficacy of a telemonitoring system as a complementary strategy in the treatment of patients with heart failure: randomized clinical trial. CIN: Computers, Informatics, Nursing 2024;42:522–9. doi:10.1097/CIN.0000000000001115
3	Agboola Stephen, Jethwani Kamal, Khateeb Kholoud, et al. Heart failure remote monitoring: evidence from the retrospective evaluation of a real-world remote monitoring program. Journal of medical Internet research 2015;17:e101. doi:10.2196/jmir.4417
4	Ahmed Sara, Ernst Pierre, Bartlett Susan J, et al. The effectiveness of web-Bbased asthma self-management system, My Asthma Portal (MAP): a pilot randomized controlled trial. Journal of medical Internet research 2016;18:e313. doi:10.2196/jmir.5866
5	Alonso Albert. A new model for home care for COPD. Studies in health technology and informatics 2004;103:368–73.
6	Andersen Frank D, Trolle Christian, Pedersen Asger Roer, et al. Effect of telemonitoring on readmissions for acute exacerbation of chronic obstructive pulmonary disease: A randomized clinical trial. Journal of telemedicine and telecare 2024;30:1417–24. doi:10.1177/1357633X221150279
7	Antonini A, Reichmann H, Gentile G, et al. Toward objective monitoring of Parkinson’s disease motor symptoms using a wearable device: wearability and performance evaluation of PDMonitor. Frontiers in Neurology 2023;14:1080752. doi:10.3389/fneur.2023.1080752
8	Artinian Nancy T, Flack John M, Nordstrom Cheryl K, et al. Effects of nurse-managed telemonitoring on blood pressure at 12-month follow-up among urban African Americans. Nursing research;56:312–22. doi:10.1097/01.NNR.0000289501.45284.6e
9	Baker Laurence C, Macaulay Dendy S, Sorg Rachael A, et al. Effects of care management and telehealth: a longitudinal analysis using medicare data. Journal of the American Geriatrics Society 2013;61:1560–7. doi:10.1111/jgs.12407
10	Bardsley Martin, Steventon Adam, Doll Helen. Impact of telehealth on general practice contacts: findings from the whole systems demonstrator cluster randomised trial. BMC health services research 2013;13:395. doi:10.1186/1472-6963-13-395
11	Bendixen RM. Assessment of a telerehabilitation and a telehomecare program for veterans with chronic illnesses. Assessment of a Telerehabilitation & a Telehomecare Program for Veterans With Chronic Illnesses. 2006;:184 p.https://ufdcimages.ufliib.ufl.edu/UF/E0/01/75/37/00001/bendixen_r.pdf
12	Bernocchi Palmira, Scalvini Simonetta, Bertacchini Fabio, et al. Home based telemedicine intervention for patients with uncontrolled hypertension—a real life non-randomized study. BMC medical informatics and decision making 2014;14:52. doi:10.1186/1472-6947-14-52
13	Blum Kay, Gottlieb Stephen S. The effect of a randomized trial of home telemonitoring on medical costs, 30-day readmissions, mortality, and health-related quality of life in a cohort of community-dwelling heart failure patients. Journal of cardiac failure 2014;20:513–21. doi:10.1016/j.cardfail.2014.04.016

	Excluded on population (age)
14	Bohingamu Mudiyansele, Shalika, Stevens Jo, et al. Personalised telehealth intervention for chronic disease management: a pilot randomised controlled trial. <i>Journal of telemedicine and telecare</i> 2019;25:343–52. doi:10.1177/1357633X18775850
15	Boman Kurt, Davidson Thomas, Gustavsson Mats, et al. Telemedicine improves the monitoring process in anticoagulant treatment. <i>Journal of telemedicine and telecare</i> 2012;18:312–6. doi:10.1258/jtt.2012.120319
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114	Poelzl G, Egelseer-Bruendl T, Pfeifer B, et al. Feasibility and effectiveness of a multidimensional post-discharge disease management programme for heart failure patients in clinical practice: the HerzMobil Tirol programme. <i>Clinical research in cardiology : official journal of the German Cardiac Society</i> 2022;111:294–307. doi:10.1007/s00392-021-01912-0
115	Ramaekers Bram L T, Janssen-Boyne Josianne J, Gorgels Anton P M, et al. Adherence among telemonitored patients with heart failure to pharmacological and nonpharmacological recommendations. <i>Telemedicine journal and e-health : the official journal of the American Telemedicine Association</i> 2009;15:517–24.
116	Ringbæk Thomas, Green Allan, Laursen Lars Christian, et al. Effect of tele health care on exacerbations and hospital admissions in patients with chronic obstructive pulmonary disease: a randomized clinical trial. <i>International journal of chronic obstructive pulmonary disease</i> 2015;10:1801–8. doi:10.2147/COPD.S85596
117	Rogers M A, Small D, Buchan D A, et al. Home monitoring service improves mean arterial pressure in patients with essential hypertension. A randomized, controlled trial. <i>Annals of internal medicine</i> 2001;134:1024–32. doi:10.7326/0003-4819-134-11-200106050-00008
118	Sarwal Alok, Lim Jeehyun, Sarwal Ashwin. Telemedicine for the underserved racial and ethnic minorities during COVID-19 and beyond. <i>Telemedicine journal and e-health</i> 2024;30:1588–93. doi:10.1089/tmj.2023.0270
119	Scalvini Simonetta, Zanelli Emanuela, Martinelli Giovanna, et al. [Cardiac event recorder yields more diagnoses than 24-hour Holter monitoring in patients with palpitations]. <i>Italian heart journal Supplement : official journal of the Italian Federation of Cardiology</i> 2004;5:186–91.
120	Schmidt Silke, Sheikzadeh Sarah, Beil Britta, et al. Acceptance of telemonitoring to enhance medication compliance in patients with chronic heart failure. <i>Telemedicine journal and e-health</i> 2008;14:426–33. doi:10.1089/tmj.2007.0076

	Excluded on population (age)
121	Schoch Otto D, Baty Florent, Boesch Maximilian, et al. Telemedicine for Continuous Positive Airway Pressure in Sleep Apnea. A Randomized, Controlled Study. <i>Annals of the American Thoracic Society</i> 2019;16:1550–7. doi:10.1513/AnnalsATS.201901-013OC
122	Segrelles Calvo, G, Gómez-Suárez C, et al. A home telehealth program for patients with severe COPD: the PROMETE study. <i>Respiratory medicine</i> 2014;108:453–62. doi:10.1016/j.rmed.2013.12.003
123	Seto Emily, Leonard Kevin J, Cafazzo Joseph A, et al. Mobile phone-based telemonitoring for heart failure management: a randomized controlled trial. <i>Journal of medical Internet research</i> 2012;14:e31. doi:10.2196/jmir.1909
124	Shany Tal, Hession Michael, Pryce David, et al. Home telecare study for patients with chronic lung disease in the Sydney West Area Health Service. <i>Studies in health technology and informatics</i> 2010;161:139–48.
125	Shany Tal, Hession Michael, Pryce David, et al. A small-scale randomised controlled trial of home telemonitoring in patients with severe chronic obstructive pulmonary disease. <i>Journal of telemedicine and telecare</i> 2017;23:650–6. doi:10.1177/1357633X16659410
126	Sicotte Claude, Paré Guy, Morin Sandra, et al. Effects of home telemonitoring to support improved care for chronic obstructive pulmonary diseases. <i>Telemedicine journal and e-health : the official journal of the American Telemedicine Association</i> 2011;17:95–103. doi:10.1089/tmj.2010.0142
127	Soriano Joan B, García-Río Francisco, Vázquez-Espinosa Emma, et al. A multicentre, randomized controlled trial of telehealth for the management of COPD. <i>Respiratory medicine</i> 2018;144:74–81. doi:10.1016/j.rmed.2018.10.008
128	Srivastava Anshul, Do Jacquelyn-My, Sales Virna L, et al. Impact of patient-centred home telehealth programme on outcomes in heart failure. <i>Journal of telemedicine and telecare</i> 2019;25:425–30. doi:10.1177/1357633X18775852
129	Steinhubl Steven R, Waalen Jill, Sanyal Anirudh, et al. Three year clinical outcomes in a nationwide, observational, siteless clinical trial of atrial fibrillation screening-mHealth Screening to Prevent Strokes (mSToPS). <i>PLoS one</i> 2021;16:e0258276. doi:10.1371/journal.pone.0258276
130	Sten-Gahmberg Susanna, Pedersen Kine, Harsheim Ingrid Gaarder, et al. Pragmatic randomized controlled trial comparing a complex telemedicine-based intervention with usual care in patients with chronic conditions. <i>The European journal of health economics</i> 2024;25:1275–89. doi:10.1007/s10198-023-01664-w
131	Stepnowsky Carl J, Palau Joe J, Marler Matthew R, et al. Pilot randomized trial of the effect of wireless telemonitoring on compliance and treatment efficacy in obstructive sleep apnea. <i>Journal of medical Internet research</i> 2007;9:e14. doi:10.2196/jmir.9.2.e14
132	Steventon Adam, Ariti Cono, Fisher Elizabeth, et al. Effect of telehealth on hospital utilisation and mortality in routine clinical practice: a matched control cohort study in an early adopter site. <i>BMJ open</i> 2016;6:e009221. doi:10.1136/bmjopen-2015-009221
133	Steventon Adam, Bardsley Martin, Billings John, et al. Effect of telehealth on use of secondary care and mortality: findings from the Whole System Demonstrator cluster randomised trial. <i>BMJ (Clinical research ed)</i> 2012;344:e3874. doi:10.1136/bmj.e3874
134	Steventon Adam, Bardsley Martin, Billings John, et al. Effect of telecare on use of health and social care services: findings from the Whole Systems Demonstrator cluster randomised trial. <i>Age and ageing</i> 2013;42:501–8. doi:10.1093/ageing/aft008
135	Stone Roslyn A, Rao R Harsha, Sevic Mary Ann, et al. Active care management supported by home telemonitoring in veterans with type 2 diabetes: the DiaTel randomized controlled trial. <i>Diabetes care</i> 2010;33:478–84. doi:10.2337/dc09-1012
136	Takahashi Paul Y, Hanson Gregory J, Thorsteinsdottir Bjorg, et al. The impact of telemonitoring upon hospice referral in the community: a randomized controlled trial. <i>Clinical interventions in aging</i> 2012;7:445–51. doi:10.2147/CIA.S36461

	Excluded on population (age)
137	Takahashi Paul Y, Pecina Jennifer L, Upatising Benjavan, et al. A randomized controlled trial of telemonitoring in older adults with multiple health issues to prevent hospitalizations and emergency department visits. Archives of internal medicine 2012;172:773–9. doi:10.1001/archinternmed.2012.256
138	Tang Paul C, Overhage J Marc, Chan Albert Solomon, et al. Online disease management of diabetes: engaging and motivating patients online with enhanced resources-diabetes (EMPOWER-D), a randomized controlled trial. Journal of the American Medical Informatics Association : JAMIA 2013;20:526–34. doi:10.1136/amiajnl-2012-001263
139	Turino Cecilia, de Batlle Jordi, Woehrle Holger, et al. Management of continuous positive airway pressure treatment compliance using telemonitoring in obstructive sleep apnoea. The European respiratory journal 2017;49. doi:10.1183/13993003.01128-2016
140	Valdivieso Bernardo, García-Sempere Anibal, Sanfélix-Gimeno Gabriel, et al. The effect of telehealth, telephone support or usual care on quality of life, mortality and healthcare utilization in elderly high-risk patients with multiple chronic conditions. A prospective study. Medicina clinica 2018;151:308–14. doi:10.1016/j.medcli.2018.03.013
141	van Berkel Cees, Almond Peter, Hughes Carol, et al. Retrospective observational study of the impact on emergency admission of telehealth at scale delivered in community care in Liverpool, UK. BMJ open 2019;9:e028981. doi:10.1136/bmjopen-2019-028981
142	Vianello Andrea, Fusello Massimo, Gubian Lorenzo, et al. Home telemonitoring for patients with acute exacerbation of chronic obstructive pulmonary disease: a randomized controlled trial. BMC pulmonary medicine 2016;16:157. doi:10.1186/s12890-016-0321-2
143	Vitacca M, Bianchi L, Guerra A, et al. Tele-assistance in chronic respiratory failure patients: a randomised clinical trial. The European respiratory journal 2009;33:411–8. doi:10.1183/09031936.00005608
144	Wade Marcia J, Desai Akshay S, Spettell Claire M, et al. Telemonitoring with case management for seniors with heart failure. American Journal of Managed Care 2011;17:e71–9.
145	Walker Paul P, Pompilio Pasquale P, Zanaboni Paolo, et al. Telemonitoring in chronic obstructive pulmonary disease (CHROMED). A randomized clinical trial. American journal of respiratory and critical care medicine 2018;198:620–8. doi:10.1164/rccm.201712-2404OC
146	Warren Robin, Carlisle Karen, Mihala Gabor, et al. Effects of telemonitoring on glycaemic control and healthcare costs in type 2 diabetes: A randomised controlled trial. Journal of telemedicine and telecare 2018;24:586–95. doi:10.1177/1357633X17723943
147	Wild Sarah H, Hanley Janet, Lewis Stephanie C, et al. Supported telemonitoring and glycemic control in people with Type 2 Diabetes: the Telescot Diabetes Pragmatic Multicenter Randomized Controlled Trial. PLoS medicine 2016;13:e1002098. doi:10.1371/journal.pmed.1002098
148	Woodend A Kirsten, Sherrard Heather, Fraser Margaret, et al. Telehome monitoring in patients with cardiac disease who are at high risk of readmission. Heart & lung : the journal of critical care;37:36–45. doi:10.1016/j.hrtlng.2007.04.004
149	Yildirim Keskin, Alev, Özpancar Şolpan, et al. The effect of mobile application follow-up on treatment compliance and self-care management in patients with hypertension: randomized controlled trial. Public Health Nursing 2025;42:275–85. doi:10.1111/phn.13476
150	Yoon Minjae, Lee Seonhwa, Choi Jah Yeon, et al. Effectiveness of a smartphone app-based intervention with bluetooth-connected monitoring devices and a feedback system in heart failure (SMART-HF Trial): randomized controlled trial. Journal of medical Internet research 2024;26:e52075. doi:10.2196/52075
151	Zietzer Andreas, Düsing Philip, Brokamp Felix, et al. A smartphone-guided digital health application for hypertension: the randomized controlled HELP trial. Deutsches Arzteblatt international 2025;122:292–7. doi:10.3238/arztebl.m2025.0066

9.6 Studies excluded on Population (setting) (2)

	Excluded on population (setting)
1	Shah MN, Wasserman EB, Gillespie SM, et al. High-intensity telemedicine decreases emergency department use for ambulatory care sensitive conditions by older adult senior living community residents. <i>J Am Med Dir Assoc</i> 2015;16:1077–81. doi:10.1016/j.jamda.2015.07.009
2	Villani A, Malfatto G, Compare A, et al. Clinical and psychological telemonitoring and telecare of high risk heart failure patients. <i>J Telemed Telecare</i> 2014;20:468–75. doi:10.1177/1357633X14555644

9.7 Studies excluded on Intervention (31)

	Excluded on intervention
1	Barnason S, Zimmerman L, Nieveen J, et al. Influence of a symptom management telehealth intervention on older adults' early recovery outcomes after coronary artery bypass surgery. <i>Heart & Lung: The Journal of Cardiopulmonary and Acute Care</i> 2009;38:364–76. doi:10.1016/j.hrtlng.2009.01.005
2	Chumbler NR, Neugaard B, Ryan P, et al. An observational study of veterans with diabetes receiving weekly or daily home telehealth monitoring. <i>J Telemed Telecare</i> 2005;11:150–6. doi:10.1258/1357633053688723
3	Donelle L, Hiebert B, Warner G, et al. Passive remote monitoring technologies' influence on home care clients' ability to stay home: multiprovincial randomized controlled trial. <i>JMIR Aging</i> 2025;8:e69107. doi:10.2196/69107
4	Düsing R, Handrock R, Klebs S, et al. Impact of supportive measures on drug adherence in patients with essential hypertension treated with valsartan: the randomized, open-label, parallel group study VALIDATE. <i>Journal of Hypertension</i> 2009;27:894. doi:10.1097/HJH.0b013e328323f9be
5	Dyrvig A-K, Gerke O, Kidholm K, et al. A cohort study following up on a randomised controlled trial of a telemedicine application in COPD patients. <i>J Telemed Telecare</i> 2015;21:377–84. doi:10.1177/1357633X15572202
6	Farias R, Sedeno M, Beaucage D, et al. Innovating the treatment of COPD exacerbations: a phone interactive telesystem to increase COPD Action Plan adherence. <i>BMJ Open Res</i> 2019;6. doi:10.1136/bmjresp-2018-000379
7	Favela J, Castro LA, Franco-Marina F, et al. Nurse home visits with or without alert buttons versus usual care in the frail elderly: a randomized controlled trial. <i>CIA</i> 2013;8:85–95. doi:10.2147/CIA.S38618
8	Fernández-Salido M, Alhambra-Borrás T, Garcés-Ferrer J. Efficacy of a comprehensive and personalised approach for frail older people in Valencia (Spain): a pre–post controlled trial. <i>Healthcare</i> 2024;12. doi:10.3390/healthcare12171754
9	Goldstein CM, Gathright EC, Dolansky MA, et al. Randomized controlled feasibility trial of two telemedicine medication reminder systems for older adults with heart failure. <i>J Telemed Telecare</i> 2014;20:293–9. doi:10.1177/1357633X14541039
10	Havreng-Théry C, Fouchard A, Denis F, et al. Cost-effectiveness analysis of a machine learning–based eHealth system to predict and reduce emergency department visits and unscheduled hospitalizations of older people living at home: retrospective study. <i>JMIR Formative Research</i> 2025;9:e63700. doi:10.2196/63700
11	Houlihan BV, Jette A, Friedman RH, et al. A pilot study of a telehealth intervention for persons with spinal cord dysfunction. <i>Spinal Cord</i> 2013;51:715–20. doi:10.1038/sc.2013.45
12	Jiang Y, Sereika SM, Dabbs AD, et al. Acceptance and use of mobile technology for health self-monitoring in lung transplant recipients during the first year post-transplantation. <i>Appl Clin Inform</i> 2016;07:430–45. doi:10.4338/ACI-2015-12-RA-0170
13	Kao DP, Lindenfeld J, Macaulay D, et al. Impact of a telehealth and care management program on all-cause mortality and healthcare utilization in patients with heart failure. <i>Telemedicine and e-Health</i> 2016;22:2–11. doi:10.1089/tmj.2015.0007

	Excluded on intervention
14	Kim BJ, Park J-M, Park TH, et al. Remote blood pressure monitoring and behavioral intensification for stroke: a randomized controlled feasibility trial. PLOS ONE 2020;15:e0229483. doi:10.1371/journal.pone.0229483
15	Kroenke K, Krebs EE, Wu J, et al. Telecare collaborative management of chronic pain in primary care: a randomized clinical trial. JAMA 2014;312:240–8. doi:10.1001/jama.2014.7689
16	Mann WC, Ottenbacher KJ, Fraas L, et al. Effectiveness of assistive technology and environmental interventions in maintaining independence and reducing home care costs for the frail elderly. A randomized controlled trial. Arch Fam Med 1999;8:210–7. doi:10.1001/archfami.8.3.210
17	McGowan P, Hofer S. The Victoria Assistive Devices and Coach (VADAC) study. Can J Public Health 2023;114:507–20. doi:10.17269/s41997-022-00717-6
18	Moor CC, Mostard RLM, Grutters JC, et al. Home monitoring in patients with idiopathic pulmonary fibrosis. A randomized controlled trial. Am J Respir Crit Care Med 2020;202:393–401. doi:10.1164/rccm.202002-0328OC
19	Olalla J, Lomas JMG de, Márquez E, et al. Experience of using an app in HIV patients older than 60 years: pilot program. JMIR mHealth and uHealth 2019;7:e9904. doi:10.2196/mhealth.9904
20	Porterfield L, Yu X, Warren V, et al. A community health worker led diabetes self-management education program: Reducing patient and system burden. J Diabetes Complications 2024;38:108794. doi:10.1016/j.jdiacomp.2024.108794
21	Rainero I, Summers MJ, Monter M, et al. The My Active and Healthy Aging ICT platform prevents quality of life decline in older adults: a randomised controlled study. Age Ageing 2021;50:1261–7. doi:10.1093/ageing/afaa290
22	Scronce G, Ramakrishnan V, Vatinno AA, et al. Effect of self-directed home therapy adherence combined with TheraBracelet on poststroke hand Recovery: a pilot study. Stroke Research and Treatment 2023;2023:3682898. doi:10.1155/2023/3682898
23	Solmaz T, Altay B. The role of training and medication reminder wristwatch in adherence to treatment in geriatric patients diagnosed with hypertension: a randomized controlled trial. Geriatrics & Gerontology International 2024;24:1189–95. doi:10.1111/ggi.14999
24	Tang M, Nakamoto CH, Stern AD, et al. Effects of remote patient monitoring use on care outcomes among Medicare patients With hypertension. Ann Intern Med 2023;176:1465–75.
25	Toscos T, Coupe A, Wagner S, et al. Engaging patients in atrial fibrillation management via digital health technology: the impact of Tailored Messaging. J Innov Card Rhythm Manag 2020;11:4209–17. doi:10.19102/icrm.2020.110802
26	Trappenburg JCA, Niesink A, de Weert-van Oene GH, et al. Effects of telemonitoring in patients with chronic obstructive pulmonary disease. Telemed J E Health 2008;14:138–46. doi:10.1089/tmj.2007.0037
27	Wakefield BJ, Holman JE, Ray A, et al. Effectiveness of home telehealth in comorbid diabetes and hypertension: a randomized, controlled trial. Telemed J E Health 2011;17:254–61. doi:10.1089/tmj.2010.0176
28	Wakefield BJ, Holman JE, Ray A, et al. Outcomes of a home telehealth intervention for patients with diabetes and hypertension. Telemed J E Health 2012;18:575–9. doi:10.1089/tmj.2011.0237
29	Winland-Brown JE, Valiante J. Effectiveness of different medication management approaches on elders' medication adherence. Outcomes Manag Nurs Pract 2000;4:172–6.
30	Xu R, Xing M, Javaherian K, et al. Improving HbA1c with glucose self-monitoring in diabetic patients with EpxDiabetes, a phone call and text message-based telemedicine platform: a randomized controlled trial. Telemed J E Health 2020;26:784–93. doi:10.1089/tmj.2019.0035
31	Zimmerman L, Barnason S, Nieveen J, et al. Symptom management intervention in elderly coronary artery bypass graft patients. Outcomes Manag 2004;8:5–12.

9.8 Studies excluded on Comparator (n=1)

Excluded on Comparator	
1	Doñate-Martínez A, Ródenas F, Garcés J. Impact of a primary-based telemonitoring programme in HRQOL, satisfaction and usefulness in a sample of older adults with chronic diseases in Valencia (Spain). Arch Gerontol Geriatr 2016;62:169–75. doi:10.1016/j.archger.2015.09.008

9.9 Studies excluded on outcome (5)

Excluded on outcome	
1	Dansky KH, Vasey J, Bowles K. Use of telehealth by older adults to manage heart failure. Res Gerontol Nurs 2008;1:25–32. doi:10.3928/19404921-20080101-01
2	Dupuy L, Sauzéon H. Effects of an assisted living platform amongst frail older adults and their caregivers: 6 months vs. 9 months follow-up across a pilot field study. Gerontechnology 2020;19:16–27. doi:10.4017/gt.2020.19.1.003.00
3	Prescher S, Deckwart O, Koehler K, et al. Wird Telemonitoring von Patienten mit chronischer Herzinsuffizienz angenommen? [Will telemonitoring be adopted by patients with chronic heart failure?]. Dtsch Med Wochenschr 2014;139:829–34. doi:10.1055/s-0034-1369849
4	Prescher S, Winkler S, Riehle L, et al. Patient reported experience and adherence to remote patient management in chronic heart failure patients: a posthoc analysis of the TIM-HF2 trial. Eur J Cardiovasc Nurs 2023;22:245–53. doi:10.1093/eurjcn/zvac080
5	Trief PM, Teresi JA, Izquierdo R, et al. Psychosocial outcomes of telemedicine case management for elderly patients with diabetes: the randomized IDEATel trial. Diabetes Care 2007;30:1266–8. doi:10.2337/dc06-2476

9.10 Studies excluded on Study Design (age) (14)

Excluded on study design	
1	Cappon D, den Boer T, Jordan C, et al. Safety and feasibility of tele-supervised home-based transcranial direct current stimulation for major depressive disorder. Front Aging Neurosci 2021;13:765370. doi:10.3389/fnagi.2021.765370
2	DiCarlo L, Moon G, Intondi A, et al. A digital health solution for using and managing medications: wirelessly observed therapy. IEEE Pulse 2012;3:23–6. doi:10.1109/MPUL.2012.2205777
3	Fabbri G, Gorini M, Maggioni AP, et al. Heart failure: the importance of a disease management program. G Ital Cardiol (Rome) 2007;8:353–8.
4	Finkelstein SM, Speedie SM, Demir G, et al. Telehomecare: quality, perception, satisfaction. Telemed J E Health 2004;10:122–8. doi:10.1089/tmj.2004.10.122
5	Hall WJ. ACP Journal Club. Telemonitoring did not reduce hospitalizations or ED visits in high-risk elderly patients. Ann Intern Med 2012;157:JC3-8. doi:10.7326/0003-4819-157-6-201209180-02008
6	Hernando ME, García-Sáez G, Martínez-Sarriegui I, et al. Automatic data processing to achieve a safe telemedical artificial pancreas. J Diabetes Sci Technol 2009;3:1039–46. doi:10.1177/193229680900300507
7	Hunich L, Dinesen B, Grann O, et al. Empowering patients with COPD using Tele-homecare technology. Stud Health Technol Inform 2010;155:48–54.
8	Luprano J, de Carvalho P, Eilebrecht B, et al. HeartCycle: advanced sensors for telehealth applications. Annu Int Conf IEEE Eng Med Biol Soc 2013;2013:6984–7. doi:10.1109/EMBC.2013.6611165
9	Mehta SJ, Volpp KG, Asch DA, et al. Rationale and design of EMPOWER, a pragmatic randomized trial of automated hovering in patients with congestive heart failure. Circ Cardiovasc Qual Outcomes 2019;12:e005126. doi:10.1161/CIRCOUTCOMES.118.005126
10	Molin G, Pettersson C, Jonsson O, et al. Living at home with acquired cognitive impairment – can assistive technology help? Technology and Disability 2007;19:91–101. doi:10.3233/TAD-2007-192-306

	Excluded on study design
11	Murga N, Romo M, Castro P, et al. Deploying telemonitoring services in an integrated care model. <i>International Journal of Integrated Care</i> 2016;16. doi:10.5334/ijic.2786
12	Pinna G, Maestri R, Capomolla S. Domiciliary telemonitoring of vital and cardiorespiratory signs of the HHH project. <i>Monaldi archives for chest disease = Archivio Monaldi per le malattie del torace / Fondazione clinica del lavoro, IRCCS [and] Istituto di clinica fisiologica e malattie apparato respiratorio, Università di Napoli, Secondo ateneo</i> 2005;64:145–7.
13	Rostill H, Nilforooshan R, Morgan A, et al. Technology integrated health management for dementia. <i>Br J Community Nurs</i> 2018;23:502–8. doi:10.12968/bjcn.2018.23.10.502
14	Woods LW, Snow SW. The impact of telehealth monitoring on acute care hospitalization rates and emergency department visit rates for patients using home health skilled nursing care. <i>Home Healthc Nurse</i> 2013;31:39–45. doi:10.1097/NHH.0b013e3182778dd3

Appendix M Research question 2: List of excluded studies

9.11 Studies excluded on Population (age) (3)

	Excluded on population (age)
1	Almeida FA de, Ramos IC, Mölken MR, et al. Modeling early warning systems: construction and validation of a discrete event simulation model for heart failure. <i>Value in Health</i> 2021;24:1435–45. doi:10.1016/j.jval.2021.04.004
2	Caillon M, Sabatier R, Legallois D, et al. A telemonitoring programme in patients with heart failure in France: a cost-utility analysis. <i>BMC Cardiovasc Disord</i> 2022;22:441. doi:10.1186/s12872-022-02878-1
3	Thokala P, Baalbaki H, Brennan A, et al. Telemonitoring after discharge from hospital with heart failure: cost-effectiveness modelling of alternative service designs <i>BMJ Open</i> . <i>BMJ Open</i> 2013;3. doi:10.1136/bmjopen-2013-003250

9.12 Studies excluded on Intervention (3)

	Excluded on intervention
1	Aronsson M, Svennberg E, Rosenqvist M, et al. Cost-effectiveness of mass screening for untreated atrial fibrillation using intermittent ECG recording. <i>Europace</i> 2015;17:1023–9. doi:10.1093/europace/euv083
2	Burge AT, Cox NS, Holland AE, et al. Telerehabilitation compared with center-based pulmonary rehabilitation for people with chronic respiratory disease: economic analysis of a randomized controlled clinical trial. <i>Ann Am Thorac Soc</i> 2025;22:47–53. doi:10.1513/AnnalsATS.202405-549OC
3	Harvey BP, Barenfeld E, Fors A, et al. Economic evaluation of a person-centred care intervention with a digital platform and structured telephone support for people with chronic heart failure and/or chronic obstructive pulmonary disease: results from a randomised controlled trial in Sweden. <i>BMJ Open</i> 2025;15:e093083. doi:10.1136/bmjopen-2024-093083

9.13 Studies excluded on Study Design (11)

1	Bola H, Rai A, Penumaka R, et al. Cardiac rehabilitation for coronary artery disease: Ggaps, digital models, and the future of personalized prevention. <i>Am J Cardiol</i> 2026;262:16–27. doi:10.1016/j.amjcard.2025.12.013
2	Celler BG, Lovell NH, Chan DKY. The potential impact of home telecare on clinical practice. <i>Med J Aust</i> 1999;171:518–21. doi:10.5694/j.1326-5377.1999.tb123782.x
3	Feldman DI, Schlicher J, Baars K, et al. Scaling remote patient care: the mechanics of a paradigm shift in chronic disease management. <i>NEJM Catal</i> 2025;6:CAT.24.0521. doi:10.1056/CAT.24.0521
4	Grustam AS, Buyukkaramikli N, Koymans R, et al. Value of information analysis in telehealth for chronic heart failure management. <i>PloS One</i> 2019;14:e0218083. doi:10.1371/journal.pone.0218083
5	Kim D, Atlas S, Singer D, et al. Comparative effectiveness of atrial fibrillation screening guided by age versus estimated risk: a decision-analytic model. <i>Eur Heart J</i> 2025;46:ehaf784.4462. doi:10.1093/eurheartj/ehaf784.4462
6	Leleu H, Testa D, Dutech M, et al. EE100 Budget impact analysis of the EPOCA telemonitoring system for elderly patients in France. <i>Value Health</i> 2025;28:S120. doi:10.1016/j.jval.2025.09.484
7	Price-Haywood EG, Olet S, Singh SD, et al. Digital Pharmacist-Physician collaborative care management of hypertension for Medicare patients. <i>J Gen Intern Med</i> 2025;40:3831–9. doi:10.1007/s11606-025-09823-w
8	Schneider JE, Cooper J, Scheibling C, et al. Economic evaluation of passive monitoring technology for seniors. <i>Aging Clin Exp Res</i> 2020;32:1375–82. doi:10.1007/s40520-019-01323-2
9	Tsuji M, Miyahara S, Taoka F, et al. An Estimation of Economic Effects of Tele-Home-Care: Hospital Cost-Savings of the Elderly. <i>Stud Health Technol Inform</i> 2001;1:858–62. doi:10.3233/978-1-60750-928-8-858
10	Wilson L, Malone D, Potukuchi P, et al. Effects of a digital health intervention for adults with Type 2 Diabetes Mellitus on health care resource use and health care charges in the United States: retrospective cohort study. <i>J Med Internet Res</i> 2025;25.https://www.jmir.org/2025/1/e67320/ (accessed 20 Mar 2026).

- 11 Wong KC, Nguyen TN, Marschner S, et al. A randomized controlled implementation study integrating patient self-screening with a remote central monitoring system to screen community dwellers aged 75 years and older for atrial fibrillation. *Eur J Prev Cardiol* 2024;31:2104–14. doi:10.1093/eurjpc/zwae312

Appendix N Additional information on characteristics of included studies

Author (year)	Mean age (age range)	Percentage of women participants
Biannic <i>et al.</i> (2012) [81]	Intervention: 75.6 years (standard deviation (SD): 6.2 years) Control: 77.9 years (SD: 6.9 years)	Intervention: 22.9% Control: 21.0%
Dansky <i>et al.</i> (2008) [§] [80]	Monitor only: 76.72 years (SD: 10.52 years) Monitor and video: 78.11 years (SD: 7.11 years) Control: 76.88 years (SD: 10.00 years)	Not reported
Ellins <i>et al.</i> (2023)*[107]	Intervention: 72.6 years (SD: 5.5 years) Control: 72.6 years (SD: 5.4 years)	Intervention: 52.1% Control: 54.8%
Gellis <i>et al.</i> (2012) [†] [82]	Intervention: 80.1 years (SD: 7.8 years) Control: 78.3 years (SD: 6.9 years)	Intervention: 62.7% Control: 68.6%
Gellis <i>et al.</i> (2014) [†] [83]	Intervention: 80.1 years (SD: 7.8 years) Control: 78.3 years (SD: 6.9 years)	Intervention: 62.7% Control: 68.6%
Halcox <i>et al.</i> (2017)* [84]	Intervention: 72.6 years (SD: 5.4 years) Control: 72.6 years (SD: 5.4 years)	Intervention: 52% Control: 55%
Lehmann <i>et al.</i> (2006) [85]	Not reported	Not reported
Olivari <i>et al.</i> (2018) [86]	Intervention 79.6 years (SD: 6.8 years) Control: 80.9 years (SD: 7.3 years)	Intervention: 38.9% Control: 34.5%
Pedone <i>et al.</i> (2013) [87]	Intervention: 74.1 years (SD: 6.4 years) Control: 75.4 years (SD: 6.7 years)	Intervention: 28% Control: 37%
Persell <i>et al.</i> (2023) [‡] [90]	General hypertension cohort: Intervention with care coordination: 72.6 years (SD: 5.0 years) Intervention without care coordination: 73.6 years (SD: 5.3 years) Control: 73.3 years (SD: 5.2 years)	General hypertension cohort: Intervention with care coordination: 65.2% Intervention without care coordination: 65.3% Control: 56.3%
Persell <i>et al.</i> (2024) [‡] [89]	Intervention: 73.6 years (SD: 7.4 years) Matched controls: 73.8 years (SD: 7.9 years)	Intervention: 67.7% Matched controls: 70.7%
Petito <i>et al.</i> (2023a) [‡] [91]	Prescribed intervention: 73.6 years (SD: 7.4 years) Matched controls: 73.8 years (SD: 7.9 years)	Prescribed intervention: 67.7% Matched controls: 70.7%
Petito <i>et al.</i> (2023b) [‡] [92]	General hypertension (eligible): Pilot practices: 73.1 years (SD: 5.1 years) Matched controls: 73.2 years (SD: 5.1 years)	General hypertension (eligible): Pilot practices: 66.0% Matched controls: 66.2%
	Uncontrolled hypertension sub-cohort (eligible): Pilot practices: 73.6 years (SD: 5.4 years) Matched controls: 73.6 years (SD: 5.2 years)	Uncontrolled hypertension sub-cohort (eligible): Pilot practices: 70.5% Matched controls: 70.3%
	Prescribed or ordered intervention (not all transmitted); n=118 which includes 78 general hypertension and 14 uncontrolled hypertension cohort members: 75.2 years (SD: 6.5 years)	Prescribed or ordered intervention (not all transmitted); n=118 which includes 78 general hypertension and 14 uncontrolled hypertension cohort members: 66.1%
Salahub <i>et al.</i> (2025) [88]	Intervention: 80.8 years (SD: 8.2 years) Control: 80.5 years (SD: 8.3 years)	Intervention: 59.8% Control: 59.8%
Schwarz <i>et al.</i> (2008) [93]	Intervention: 77.1 years (SD: 7.3 years) Control: 79.1 years (SD: 6.9 years)	Intervention: 43% Control: 61%
Tchalla <i>et al.</i> (2012) [96]	Intervention: 84.9 years (SD: 6.5 years) Control: 82.0 years (SD: 5.7 years)	Intervention: 76.6% Control: 78.1%

Author (year)	Mean age (age range)	Percentage of women participants
Tchalla <i>et al.</i> (2013) [94]	Intervention: 87.8 years (SD: 6.5 years) Control: 85.3 years (SD: 6.3 years)	Intervention: 77.6% Control: 76.6%
Tchalla <i>et al.</i> (2025) [95]	Intervention: 80.3 years (SD: 8.3 years) Control: 80.3 years (SD: 7.9 years)	Intervention: 55.0% Control: 49.8%
Tompkins and Orwat (2010) [97]	Intervention: 76.7 years (SD: 8.2 years) Control: 75.7 years (SD: 7.7 years)	Total sample: 40.4% Intervention: 42.0% Control: 38.6%
Wong <i>et al.</i> (2024) [98]	Intervention: 78.8 years (3.4 years) Control: 79.2 years (3.4 years)	Intervention: 55.0% Control: 53.0%
Zoellick <i>et al.</i> (2025) [99]	Intervention: 81.7 years (4.1 years) Matched controls: 81.4 years (3.9 years)	Intervention: 68% Matched controls: 68%

§ In Dansky *et al.* (2008), the reported mean age is from time point 3 (120 days) rather than from baseline, as the paper only reported the mean age at time point 3.

* Ellins *et al.* (2023) is an extended follow-up of Halcox *et al.* (2017).

†Gellis *et al.* (2012) and Gellis *et al.* (2014) reported on the same study. This table provides information based on both papers for completeness. We have therefore noted differences between reports in the table. In relation to healthcare population, Gellis *et al.* (2012) specified only a diagnosis of heart failure or chronic obstructive pulmonary disease (COPD), while Gellis *et al.* (2014) added the specifier that the study population had screened positively for depression. Note that participant numbers and outcome data were the same; both studies used the same population. Gellis *et al.* (2012) reported the collection of heart rate data, while Gellis *et al.* (2014) did not. In Gellis *et al.* (2012), modifiable (YES/NO) questions that were customised to the patient's condition were reported, while these were not reported in Gellis *et al.* (2014). In Gellis *et al.* (2012), it was reported that a home care nurse monitored information, while in Gellis *et al.* (2014), three nurses received telehealth training and provided chronic disease and depression care and problem-solving therapy for depression.

‡These four papers report on the same clinics and participants. The paper by Persell *et al.* (2024) provides a longer-term 18-month follow-up for the two pilot studies that were conducted at six primary care practices by Petito *et al.* (2023a) and Persell *et al.* (2023). Petito *et al.* (2023b), meanwhile, was a comparison of the same patients with propensity-score-matched controls from those same clinics. No outcome data for any of these four papers could be included in this review because outcome data for those who initiated RPM interventions were not compared with controls. Instead, the focus for reporting was on patients in practices who had the potential to be prescribed RPM. We do not have a mean age specifically for those patients who were prescribed or ordered RPM; only for those who were eligible.

Appendix O Grading of Recommendations Assessment, Development, and Evaluation (GRADE) evidence profiles

ED visits

Table 39 GRADE evidence profile for the effect of remotely monitored AT on ED visits

Certainty assessment							Number of patients		Effect		Certainty	Importance
Number of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	remotely monitored AT	usual or alternative care	Relative (95% CI)	Absolute (95% CI)		
At least one ED visit [80,86,95,98] (follow-up: range 4 months to 12 months)												
4	randomised trials	serious ^a	serious ^b	not serious	very serious ^c	publication bias strongly suspected ^d	234/752 (31.1%)	151/582 (25.9%)	OR 1.05 (0.48 to 2.27)	1 more per 100 (from 12 fewer to 18 more)	⊕○○○ Very low ^{a,b,c,d}	
Post-fall admission to hospital emergency for fall at home [96] (follow-up: 12 months)												
1	randomised trials	serious ^e	not serious	not serious	serious ^f	publication bias strongly suspected ^d	The adjusted OR of 0.32 and 95% CI of 0.14–0.73 indicated statistically significantly reduced odds of post-fall admission to the ED in the remotely monitored AT group when compared with the usual care group.			⊕○○○ Very low ^{d,e,f}		
Average number of ED visits [80,82,83,93] (follow-up: range 90 days to 12 months)												

Certainty assessment							Number of patients		Effect		Certainty	Importance
Number of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	remotely monitored AT	usual or alternative care	Relative (95% CI)	Absolute (95% CI)		
3	randomised trials	serious ^e	not serious	not serious	serious ^g	publication bias strongly suspected ^d	262	200	-	SMD 0.24 SD lower (0.5 fewer to 0.01 more visits)	⊕○○○ Very low ^{d,e,g}	

ED visits [85,97] (follow-up: range 100 days to 6 months)

2	randomised trials	serious ^h	not serious	not serious	very serious ⁱ	publication bias strongly suspected ^d	Tompkins and Orwat (2010) reported an adjusted incidence rate ratio of 0.94 for ED visits, but it was not significant ($p>0.1$). Lehmann <i>et al.</i> (2006) reported four ED visits in the enhanced usual care control group and six ED visits in the intervention group ($p=0.377$).				⊕○○○ Very low ^{d,h,i}	
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ED visits [88] (follow-up: 100 days)

1	non-randomised studies	not serious	not serious	not serious	very serious ^j	publication bias strongly suspected ^d	Salahub <i>et al.</i> (2025) reported a mean difference of 0.01 fewer visits in the remotely monitored AT group than the usual care (home care) group, but the CI spanned from a mean difference of 0.03 fewer visits to 0.02 more visits.				⊕○○○ Very low ^{d,j}	
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CI: confidence interval; MD: mean difference; OR: odds ratio; SMD: standardised mean difference

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Explanations

- a. All outcomes had a high risk of bias overall, and multiple domains were at high risk of bias.
- b. Minimal overlap of CIs.
- c. Most CIs are not very wide, but they do cross the threshold of no effect.
- d. Fewer than 10 studies; no formal assessment of publication bias (e.g. Egger's test) could be performed.
- e. All outcomes had a high risk of bias.
- f. Small sample size and number of events.
- g. Wide CI, which includes both benefit and harm.
- h. Lehmann *et al.* (2006) had a high risk of bias. Tompkins and Orwat (2010) had some concerns for bias.
- i. No CI reported for Tompkins and Orwat (2010). Low number of events and sample size.
- j. CI crosses threshold of no effect, including both benefit and harm. Only one study.

Hospitalisations

Table 40: GRADE evidence profile for the effect of remotely monitored AT on hospitalisations

Certainty assessment							Number of patients		Effect		Certainty	Importance
Number of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	remotely monitored AT	usual or alternative care	Relative (95% CI)	Absolute (95% CI)		

At least one hospital admission [80,86,95] (follow-up: range 4 months to 12 months)

3	randomised trials	serious ^a	serious ^b	not serious	serious ^c	publication bias strongly suspected ^d	300/668 (44.9%)	224/448 (50.0%)	OR 0.94 (0.66 to 1.34)	2 fewer per 100 (from 10 fewer to 7 more)	⊕○○○ Very low ^{a,b,c,d}	
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Average number of hospitalisations [80,86,93] (follow-up: range 4 months to 12 months)

3	randomised trials	serious ^a	not serious	not serious	serious ^c	publication bias strongly suspected ^d	444	261	-	SMD 0.08 SD lower (0.24 lower to 0.07 higher)	⊕○○○ Very low ^{a,c,d}	
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Hospitalisations [81,85,87,97,100] (follow-up: range 3 months to 4.2 years)

Certainty assessment							Number of patients		Effect		Certainty	Importance
Number of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	remotely monitored AT	usual or alternative care	Relative (95% CI)	Absolute (95% CI)		
5	randomised trials	serious ^e	serious ^f	not serious	very serious ^g	publication bias strongly suspected ^d	Biannic et al. (2012) reported a readmission rate of 16% “with no difference groups”, but no additional information was reported. Tompkins et al. (2010) reported an adjusted incidence rate ratio of .87 but this was not statistically significantly different ($p>.1$). Lehmann et al. (2006) 5 admissions in the remotely monitored AT group versus 7 admissions in the usual care group. This result was not statistically significant ($p=0.3872$). Ellins et al. (2023) reported adjusted hazard ratios of 0.45 (95% CI: 0.21 to 0.97; $p=0.044$) for admissions for acute coronary syndrome and 0.88 (95%CI: 0.53 to 1.35, p value not reported) for admissions for bleeds. Pedone et al. (2013) reported an incidence rate ratio of 0.66 (95% CI: 0.21 to 1.86; no p value reported).				⊕○○○ Very low ^{d,e,f,g}	

Hospitalisations [99] (follow-up: 12 months)

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Certainty assessment							Number of patients		Effect		Certainty	Importance
Number of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	remotely monitored AT	usual or alternative care	Relative (95% CI)	Absolute (95% CI)		
1	non-randomised studies	not serious	not serious	not serious	very serious ^h	publication bias strongly suspected ^d	Zoellick et al. (2025) reported a mean of 0.8 hospitalisations (SD: 1.4) in the remotely monitored AT group compared with 0.6 hospitalisations (SD: 1.2) in the usual care group, and an incidence rate ratio of 1.23 (95% CI: 0.95–1.60) that was not statistically significant (p=0.122).			⊕○○○ Very low ^{c,d,h}		

Hospital admissions for venous thromboembolism [100] - not reported

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Length of stay [81,83,86,87,97] (follow-up: range 3 months to 12 months)

5	randomised trials	serious ⁱ	not serious	not serious	very serious ^g	publication bias strongly suspected ^d	Biannic <i>et al.</i> (2012) reported 97 days of hospitalisation due to acute cardiac events compared to 98 days, with no statistically significant difference between groups ($p=0.89$). Olivari <i>et al.</i> (2018) reported a mean difference of -3.33 days of hospitalisations due to all-causes (95% CI: -8.5 to 1.9) which was not significant ($p=0.21$). For days of hospitalisations specifically due to heart failure, there was a mean difference of -5.4 days (95% CI: -13.8 to 2.9) between groups which was not significantly different ($p=0.2$). Tompkins <i>et al.</i> (2010) reported no significant difference ($p\geq 0.1$) in the average length of stay with an adjusted incidence rate ratio of 0.85 but an adjusted incidence rate ratio of 0.73 was reported for days of hospitalisation ($p<0.01$). Gellis <i>et al.</i> (2012/2014) reported a mean of 7.5 (4.3 SD) hospital days in the remotely monitored AT group compared to a mean of 10.5 (6.5 SD) days in the enhanced usual care group, but this difference was not statistically significantly different ($p=0.06$). Pedone <i>et al.</i> (2013) reported an average length of stay due to respiratory exacerbations of 9.7 days in the remotely monitored AT group and 6.9 days in the enhanced usual care group, but no p-value was reported so it is not known if this difference is significant.	⊕○○○ Very low^{d,g,i}	
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Length of stay [88,99] (follow-up: range 100 days to 12 months)

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Certainty assessment							Number of patients		Effect		Certainty	Importance
Number of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	remotely monitored AT	usual or alternative care	Relative (95% CI)	Absolute (95% CI)		
2	non-randomised studies	not serious	not serious	not serious	very serious ^c	publication bias strongly suspected ^d	Salahub et al. (2010) reported a mean of 3.3 days (10.6 SD) compared to 3.9 days (11.6 SD) but p value. Zoellick et al. (2006) reported a mean difference of -2.79 days (95%-CI: -7.63 to 2.06) between the remotely monitored AT group and the usual care group, although not significant (p = .260)				⊕○○○ Very low ^{c,d}	

Number of days of hospitalization [95] - not reported

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Number of hospital days due to all causes [81] - not reported

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CI: confidence interval; **MD:** mean difference; **OR:** odds ratio; **SMD:** standardised mean difference

Explanations

- All outcomes at high risk of bias overall
- Moderate heterogeneity and variability of point estimates across studies
- Wide confidence interval(s) which include both benefit and harm
- Less than 10 studies; no formal assessment can be preformed
- Most outcomes had some/moderate concerns of bias, one was at a high risk of bias.

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- f. Several studies did not report confidence intervals. Results generally indicated no difference between groups but there were outliers which showed benefit in the remotely monitored AT group.
- g. Several studies did not report confidence intervals. For those that did, confidence intervals included both benefit and harm
- h. Wide confidence interval which includes both benefit and harm. Single study with small sample size.
- i. Three studies had some concerns for bias while two had high risk of bias

Admissions to long-term care

Table 41: GRADE evidence profile for the effect of remotely monitored AT on admissions to long-term care

Certainty assessment							Number of patients		Effect		Certainty	Importance
Number of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	remotely monitored AT	usual or alternative care	Relative (95% CI)	Absolute (95% CI)		
Admissions to nursing care facilities [94] (follow-up: 12 months)												
1	randomised trials	serious ^a	not serious	not serious	serious ^b	publication bias strongly suspected ^c	2/49 (4.1%)	3/47 (6.4%)	not estimable		⊕○○○ Very low ^{a,b,c}	
At least one day in long-term care [88] (follow-up: 100 days)												
1	non-randomised studies	not serious	not serious	not serious	very serious ^b	publication bias strongly suspected ^c	37/1494 (2.5%)	27/1494 (1.8%)	RR 1.37 (0.84 to 2.23)	1 more per 100 (from 0 fewer to 2 more)	⊕○○○ Very low ^{b,c}	
Long-term care days [88] (follow-up: 100 days)												
1	non-randomised studies	not serious	not serious	serious ^d	very serious ^b	publication bias strongly suspected ^c	1494	1494	-	MD 0.2 days (0.5 fewer to 0.6 more)	⊕○○○ Very low ^{b,c,d}	

CI: confidence interval; **MD:** mean difference; **RR:** risk ratio

Explanations

a. Outcome had a high risk of bias overall. There was a high risk of bias for one domain, some concerns for another, and three domains had a low risk of bias.

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- b. CI is wide and includes both benefit and harm. Small number of events with insufficient length of follow-up.
- c. Fewer than 10 studies; no formal assessment of publication bias can be performed.
- d. Admission (at least one day in long-term care) is likely to be more relevant to patients as unlikely to be transitioned back to independent living

Outpatient visits

Table 42: GRADE evidence profile for the effect of remotely monitored AT on outpatient visits

Certainty assessment							Number of patients		Effect		Certainty	Importance
Number of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	remotely monitored AT	usual or alternative care	Relative (95% CI)	Absolute (95% CI)		

Primary care visits [97] (follow-up: 6 months)

1	randomised trials	not serious	not serious	not serious	very serious ^a	publication bias strongly suspected ^b	Tompkins <i>et al.</i> (2010) reported an adjusted incidence rate ratio of 1.06, indicating slightly more primary care visits in the remotely monitored AT group compared to the usual care group but this was not statistically significant ($p \geq .01$).			⊕○○○ Very low ^{a,b}	
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Primary care visits [88] (follow-up: 100 days)

1	non-randomised studies	not serious	not serious	not serious	not serious	publication bias strongly suspected ^b	1494	1494	-	MD 0.4 encounters lower (0.6 lower to 0.1 lower)	⊕⊕○○ Moderate ^b	
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At least one GP visit [98] (follow-up: 6 months)

Certainty assessment							Number of patients		Effect		Certainty	Importance
Number of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	remotely monitored AT	usual or alternative care	Relative (95% CI)	Absolute (95% CI)		
1	randomised trials	serious ^d	not serious	not serious	very serious ^c	publication bias strongly suspected ^b	Wong et al. (2024) reported that eighty-nine (94.7%) participants in the remotely monitored AT group visited their GP at least once during the study period compared with 90 (96.8%) from the usual care group, a difference which was not statistically significant ($p=0.72$).				⊕○○○ Very low ^{b,c,d}	

Urgent care visits [97] (follow-up: 6 months)

1	randomised trials	not serious	not serious	not serious	very serious ^e	publication bias strongly suspected ^b	Tompkins et al. (2010) reported an adjusted incidence of 1.6 was reported for urgent care visits, indicating more urgent care visits in the remotely monitored AT group compared to the usual care group, a difference which was statistically significant ($p<.05$).				⊕⊕○○ Low ^{b,e}	
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Same-day surgery days [88] (follow-up: 100 days)

1	non-randomised studies	not serious	not serious	serious ^f	very serious ^g	publication bias strongly suspected ^b	1494	1494	-	MD 0.01 days lower (0.03 lower to 0.02 higher)	⊕○○○ Very low ^{b,f,g}	
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Number of physician office visits [85] (follow-up: 6 months)

Certainty assessment							Number of patients		Effect		Certainty	Importance
Number of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	remotely monitored AT	usual or alternative care	Relative (95% CI)	Absolute (95% CI)		
1	randomised trials	serious ^d	not serious	not serious	extremely serious ^h	publication bias strongly suspected ^b	Lehmann et al. (2006) reported a per patient per month rate of 0.65 was reported in the remotely monitored AT group compared to 1.133 visits per patient per month in the usual care group. This difference was statistically significantly different ($p=0.00253$).				⊕○○○ Very low ^{b,d,h}	

Number of office visits [85] - not reported

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Number of scheduled or urgent outpatient controls [86] - not reported

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CI: confidence interval; **MD:** mean difference

Explanations

- Adjusted incidence ratio paired with p -value indicates CI crosses the line of no effect, including both benefit and harm. Single study.
- Less than 10 studies; no formal assessment of publication bias (e.g. Egger's test) can be performed.
- Small sample size, single study. No CI reported but a difference which was not statistically significant.
- Outcome at high risk of bias
- Small sample size (underpowered). Single study. No CI reported.
- May be influenced by external health-system factors and may not be as relevant to the impact of remotely monitored AT.
- Few events. CI is wide and includes both benefit and harm

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h. Very small sample size, single study. No CI reported.

Days at home and home care episodes

Table 43: GRADE evidence profile for the effect of remotely monitored AT on days at home and home care episodes

Certainty assessment							Number of patients		Effect		Certainty	Importance
Number of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	remotely monitored AT	usual or alternative care	Relative (95% CI)	Absolute (95% CI)		

Days at home [88] (follow-up: 100 days)

1	non-randomised studies	not serious	not serious	not serious	not serious	publication bias strongly suspected ^a	1494	1494	-	mean 3.4 days higher (1.8 higher to 5 higher)	⊕⊕⊕○ Moderate ^a	
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Episodes of home care [82,83] (follow-up: 12 months)

1	randomised trials	serious ^b	not serious	not serious	very serious ^c	publication bias strongly suspected ^a	46	48	-	MD 0.5 episodes lower (1.0246 fewer to 0.0246 more)	⊕○○○ Very low ^{a,b,c}	
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Days to readmission [93] (follow-up: 90 days)

Certainty assessment							Number of patients		Effect		Certainty	Importance
Number of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	remotely monitored AT	usual or alternative care	Relative (95% CI)	Absolute (95% CI)		
1	randomised trials	serious ^b	not serious	not serious	very serious ^d	publication bias strongly suspected ^a	44	40	-	MD 0.6 days lower (12.8 lower to 11.6 higher)	⊕○○○ Very low ^{a,b,d}	

Number of home healthcare provider visits [85] - not reported

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CI: confidence interval; MD: mean difference

Explanations

- a. Fewer than 10 studies; no formal assessment of publication bias (e.g. Egger's test) could be performed.
- b. Outcome had a high risk of bias overall.
- c. Small sample size and number of events. CIs include both benefit and harm.
- d. Small sample size. Wide CIs which include both benefit and harm.

Access to diagnosis

Table 44: GRADE evidence profile for the effect of remotely monitored AT on access to diagnosis

Certainty assessment							Number of patients		Effect		Certainty	Importance
Number of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	remotely monitored AT	usual or enhanced usual care	Relative (95% CI)	Absolute (95% CI)		

Time to diagnosis [84,98] (follow-up: range 6 months to 12 months)

2	randomised trials	serious ^a	not serious	not serious	serious ^b	publication bias strongly suspected ^{b,c}	Halcox <i>et al.</i> (2017) reported that 19 (3.8%) participants were diagnosed with AF during the study period in the remotely monitored AT group, compared with 5 (1%) participants in the usual care group. A hazard ratio of 3.9 (95% CI: 1.4–10.4) and a p-value of 0.007 indicated that the remotely monitored AT group had a significantly higher likelihood of AF detection compared with those receiving usual care Wong <i>et al.</i> (2024) reported that 10 (10.3%) participants were diagnosed with AF in the study period in the remotely monitored AT group, compared with 2 (2.0%) in the usual care group. An odds ratio of 5.6 (95% CI: 1.4–37.3) and a p-value of 0.03 indicated that the remotely monitored AT group had a significantly higher likelihood of AF detection compared with those receiving usual care.				⊕○○○ Very low ^{a,b,c}	
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Time to diagnosis [100] - not reported

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CI: confidence interval

Explanations

- a. One outcome had a high risk of bias.
- b. There were wide CIs and a small number of events.
- c. Fewer than 10 studies; no formal assessment of publication bias (e.g. Egger's test) could be performed.

Other assorted healthcare utilisation outcomes

Table 45: GRADE evidence profile for the effect of remotely monitored AT on other assorted healthcare utilisation outcomes

Certainty assessment							Number of patients		Effect		Certainty	Importance
Number of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	remotely monitored AT	usual or enhanced usual care	Relative (95% CI)	Absolute (95% CI)		
Anticoagulant therapy prescriptions [107] (follow-up: median 4.2 years)												
1	randomised trials	not serious	not serious	serious ^a	very serious ^b	publication bias strongly suspected ^c	Ellins <i>et al.</i> (2023) reported 50 (10%) participants received anticoagulant prescriptions in the remotely monitored AT group compared with 37 (7.4%) participants in the usual care group and an adjusted hazard ratio of 1.28 (95% CI: 0.83 to 1.96).			⊕○○○ Very low ^{a,b,c}		
Overall healthcare utilisation [physician office visits, ED visits, and hospital admissions] [85] (follow-up: 6 months)												
1	randomised trials	serious ^d	not serious	very serious ^e	extremely serious ^f	publication bias strongly suspected ^c	Lehmann <i>et al.</i> (2006) reported a per person per month rate of 0.8 composite utilisation score in the remotely monitored AT group compared with a per person per month rate of 1.35 composite utilisation score in the usual care group, a difference which was statistically significantly different (p=0.00183).			⊕○○○ Very low ^{c,d,e,f}		
Rehabilitation days [88] (follow-up: 100 days)												
1	non-randomised studies	not serious	not serious	not serious	very serious ^b	publication bias strongly suspected ^c	1494	1494	-	MD 0.1 days fewer (0.05 fewer to 0.2 more)	⊕○○○ Very low ^{b,c}	

Certainty assessment							Number of patients		Effect		Certainty	Importance
Number of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	remotely monitored AT	usual or enhanced usual care	Relative (95% CI)	Absolute (95% CI)		

In-patient mental health days [88] (follow-up: 100 days)

1	non-randomised studies	not serious	not serious	serious ^g	very serious ^b	publication bias strongly suspected ^c	1494	1494	-	MD 0.2 days fewer (0.5 fewer to 0.07 more)	⊕○○○ Very low ^{b,c,g}	
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Alternate level of care days [88] (follow-up: 100 days)

1	non-randomised studies	not serious	not serious	serious ^h	very serious ^b	publication bias strongly suspected ^c	1494	1494	-	MD 0.3 days more (0.2 fewer to 0.9 more)	⊕○○○ Very low ^{b,c,h}	
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Number of medical emergency contacts [99] (follow-up: 12 months)

1	non-randomised studies	not serious	not serious	not serious	very serious ^b	publication bias strongly suspected ^c	180	708	-	MD 0.1 contacts fewer (0.3075 fewer to 0.1075 more)	⊕○○○ Very low ^{b,c}	
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Certainty assessment							Number of patients		Effect		Certainty	Importance
Number of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	remotely monitored AT	usual or enhanced usual care	Relative (95% CI)	Absolute (95% CI)		
Initiation of anticoagulant therapy [98] (follow-up: 6 months - not reported)												
-	-	-	-	-	-	-	-	-	-	-	-	
Antihypertensive medication intensification [89–92] (follow-up: 3 to 18 months - not reported)												
-	-	-	-	-	-	-	-	-	-	-	-	
In person/ telehealth encounters [90–92] (follow-up: 3 to 12 months - not reported)												
-	-	-	-	-	-	-	-	-	-	-	-	
Patient portal messages [90–92] (follow-up: 3 to 12 months - not reported)												
-	-	-	-	-	-	-	-	-	-	-	-	
Telephone encounters [90–92] (follow-up: 3 to 12 months - not reported)												
-	-	-	-	-	-	-	-	-	-	-	-	

CI: confidence interval; MD: mean difference

Explanations

- Could be prescribed for various health conditions. Could indicate that a healthcare provider was acting upon the AF diagnosis.
- CI: include both benefit and harm. Single study.
- Fewer than 10 studies; no formal assessment of publication bias (e.g. Egger's test) could be performed.
- Outcome had a high risk of bias overall.
- Composite outcome that includes serious (hospital admissions), emergency (ED visits), and routine outpatient care (physician office). Meaningful to patients individually, but not when combined.

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f. CIs include both benefit and harm. Single study. Small sample size and number of events.

g. Intervention (personal alert device with optional medication dispenser/home monitoring sensors) may not be expected to have a direct impact on this. More relevant for emergency situations (e.g. fall).

h. In hospital awaiting transfer to another care setting may be related to health system, staffing, or personal reasons.

Appendix P Feasibility assessment for meta-analysis

ED visits

Table 46: Feasibility assessment for meta-analysis for ED visits

Candidate studies	Outcome measure	Outcome measurement period(s)	Risk of bias (RoB2 or ROBINS-I)	Study design (RCT or NSRI)	Statistical measure and variance	Population Key demographic 1: health condition	Intervention	Comparison	Initial feasibility decision	Final feasibility decision
Dansky <i>et al.</i> (2008) [80]	Total ED visits	60 days	High	RCT	Odds ratio (95% CI); Count/percentage	Heart failure	Monitor only; Monitor and video	Usual home care	No meta-analysis (MA). <3 studies. Different timepoints	Dansky, Olivari, Tchalla 2025, Wong = at least one ED visit. All high RoB, no sensitivity analysis. Too few for subgroup by condition/timepoint (footnotes on forest plot for transparency). Dansky, Gellis, Schwarz = average number of ED visits. All high RoB, no sensitivity analysis. Too few for subgroup by condition/timepoint (footnotes on forest plot for transparency). Salahub cannot be combined with anything (NSRI). Tompkins cannot be converted (insufficient information) and Lehmann has unclear reporting.
	Total ED visits	120 days	High	RCT	Odds ratio (95% CI); Count/percentage	Heart failure	Monitor only; Monitor and video	Usual home care		
Schwarz <i>et al.</i> (2008) [93]	ED visits for HF	90 days	High	RCT	Mean (SD)	Heart failure	Cardiocom	Usual care		

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Candidate studies	Outcome measure	Outcome measurement period(s)	Risk of bias (RoB2 or ROBINS-I)	Study design (RCT or NRSI)	Statistical measure and variance	Population Key demographic 1: health condition	Intervention	Comparison	Initial feasibility decision	Final feasibility decision
Salahub <i>et al.</i> (2025) [88]	Emergency department days	100 days	Moderate	NRSI	Mean (SD)	Older adults (aged 65 and older)	Personal alert device (plus possible medication dispenser and sensors)	Usual home care	No MA. <3 studies. No other NRSIs	
Gellis <i>et al.</i> (2012/2014) [82,83]	Emergency room visits	12 months	High	RCT	Mean (SD)	Heart failure or COPD patients who screened positive for depression	HomMed Health Monitoring System	Enhanced usual care	Olivari and Tchalla 2025 alone are not enough but could be combined	
Olivari <i>et al.</i> (2018) [86]	Patients with at least one urgent evaluation in ED	12 months	Some concerns	RCT	Count/percentage; RR (95% CI)	Heart failure	Personal Health System	Enhanced usual care	potentially with Dansky/Wong.	
Tchalla <i>et al.</i> (2025) [95]	Proportion of emergency admissions/ED visits without hospitalisation	12 months	High	RCT	Count/percentage	≥2 chronic diseases	e-GEROPASS software, a hub with seven external biometric sensors	Enhanced usual care		
Tchalla <i>et al.</i> (2012) [96]	Falls at home with admission to hospital emergency	12 months	High	RCT	(Adjusted) Odds ratio (95% CI)	Frail older adults	Light path with tele-assistance (exposed group)	No equipment/usual care (unexposed group)		
Lehmann <i>et al.</i> (2006) [85]	Visits to emergency department	6 months	High	RCT	Count? (Unclear)	Congestive heart failure	Viterion 500® telehealth system	Enhanced usual care	No MA. Can't standardise outcome data	

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Candidate studies	Outcome measure	Outcome measurement period(s)	Risk of bias (RoB2 or ROBINS-I)	Study design (RCT or NRSI)	Statistical measure and variance	Population Key demographic 1: health condition	Intervention	Comparison	Initial feasibility decision	Final feasibility decision
Tompkins and Orwat (2010) [97]	ED visits	6 months	Some concerns	RCT	Incidence rate ratio	Heart failure	Honeywell HomMed Sentry and Genesis monitors	Usual care	(Tompkins). Lehmann reporting is unclear (e.g., whether it is 4 patients out of 10 with ED visits or whether there are 4 ED visits across all 10 patients).	
Wong <i>et al.</i> (2024) [98]	A visit to the emergency departments	6 months	High	RCT	Count/percentage	Those at high risk of AF (aged 75 years and over)	AliveCor Kardia	Usual care (wait-list)		

Hospitalisations

Table 47: Feasibility assessment for meta-analysis for hospitalisations

Candidate studies	Outcome measure	Outcome measurement period(s)	Risk of bias (RoB2 or ROBINS-I)	Study design (RCT or NRSI)	Statistical measure and variance	Population Key demographic 1: health condition	Intervention	Comparison	Initial feasibility decision	Final feasibility decision
Gellis <i>et al.</i> (2012/2014) [82,83]	Hospital days/days of rehospitalisation	12 months	High	RCT	Mean (SD)	Heart failure or COPD patients who screened positive for depression	HomMed Health Monitoring System	Enhanced usual care	No MA. <3 studies. Only 2 studies for length of stay. 2 for hospital admissions	No MA Length of stay. At face value, length of stay/days of hospitalisation-> Gellis, Olivari, Pedone, Biannic, and Tompkins, but there is no measure of variance for Biannic/Pedone and Tompkins can't be converted, so only Gellis/Olivari are eligible for MA and that's not enough studies to combine (<3). Can't put in Salahub/Zoellick (NRSIs and not enough for their own). MA. Hospitalisations --> at least one hospitalisation -> Dansky, Olivari, Tchalla 2025. All high RoB, no sensitivity analysis. Not enough studies for subgroup analysis by timepoint/condition. MA. Hospitalisations --> average number of hospitalisations -> Dansky, Olivari, Schwarz. All high RoB, no sensitivity analysis. Not enough studies for subgroup analysis by timepoint/condition. Pedone = no measure of spread/variance. Lehmann
Olivari <i>et al.</i> (2018) [86]	Duration of hospital admissions (all-cause) (days)	12 months	High	RCT	Mean (SD)	Heart failure	Personal Health System	Enhanced usual care		
Olivari <i>et al.</i> (2018) [86]	At least one all-cause hospital admission	12 months	High	RCT	Count/percentage	Heart failure	Personal Health System	Enhanced usual care		
Olivari <i>et al.</i> (2018) [86]	All-cause hospital admissions	12 months	High	RCT	Mean (SD); count	Heart failure	Personal Health System	Enhanced usual care		
Olivari <i>et al.</i> (2018) [86]	Duration of hospital admissions for HF (days)	12 months	High	RCT	Mean (SD)	Heart failure	Personal Health System	Enhanced usual care		
Olivari <i>et al.</i> (2018) [86]	Hospital admissions for HF	12 months	High	RCT	Mean (SD); count	Heart failure	Personal Health System	Enhanced usual care		

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Candidate studies	Outcome measure	Outcome measurement period(s)	Risk of bias (RoB2 or ROBINS-I)	Study design (RCT or NRSI)	Statistical measure and variance	Population Key demographic 1: health condition	Intervention	Comparison	Initial feasibility decision	Final feasibility decision
Tchalla <i>et al.</i> (2025) [95]	Unplanned rehospitalisations / cumulative incidence of rehospitalizations for functional decompensation	12 months	High	RCT	Count/percentage; RR 95% CI	≥2 chronic diseases	e-GEROPASS software, a hub with seven external biometric sensors	Enhanced usual care		reporting issues (see note in ED visits). Can't convert Tompkins.
Zoellick <i>et al.</i> (2025) [99]	Number of hospitalisations	12 months	Moderate	NRSI	Mean (SD)	Older adults (aged 75 years and over)	Ambient assisted living, necklace, and emergency button pendant	Usual care	No MA. 1 study (NRSI)	
Zoellick <i>et al.</i> (2025) [99]	Duration of hospitalisations (days)	12 months	Moderate	NRSI	Mean (SD)	Older adults (aged 75 years and over)	Ambient assisted living, necklace, and emergency button pendant	Usual care		
Pedone <i>et al.</i> (2013) [87]	hospitalization admissions related to respiratory exacerbations	9 months	Some concerns	RCT	Incidence rate ratio (95% CI)	COPD	SweetAge monitoring system	Enhanced usual care	MA. Not enough studies	
Pedone <i>et al.</i> (2013) [87]	length of stay (hospitalisation related to respiratory exacerbation)	9 months	Some concerns	RCT	Mean	COPD	SweetAge monitoring system	Enhanced usual care		

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Candidate studies	Outcome measure	Outcome measurement period(s)	Risk of bias (RoB2 or ROBINS-I)	Study design (RCT or NRSI)	Statistical measure and variance	Population Key demographic 1: health condition	Intervention	Comparison	Initial feasibility decision	Final feasibility decision	
Lehmann <i>et al.</i> (2006) [85]	Hospital admissions	6 months	High	RCT	Count	Congestive heart failure	Viterion 500	Enhanced usual care	No MA. Not enough studies		
Tompkins and Orwat (2010) [97]	Hospital admissions	6 months	Some concerns	RCT	Incidence rate ratio	Heart failure	Honeywell HomMed Sentry and Genesis monitors	Usual care			
Tompkins and Orwat (2010) [97]	Hospital days	6 months	Some concerns	RCT	Incidence rate ratio	Heart failure	Honeywell HomMed Sentry and Genesis monitors	Usual care			
Tompkins and Orwat (2010) [97]	Hospital average length of stay [average acute days per hospital admission]	6 months	Some concerns	RCT	Incidence rate ratio	Heart failure	Honeywell HomMed Sentry and Genesis monitors	Usual care			
Biannic <i>et al.</i> (2012) [81]	Readmission rate	3 months	Some concerns	RCT	Percent	Chronic heart failure	SCAD	Enhanced usual care	No MA. < 3 studies		
Biannic <i>et al.</i> (2012) [81]	Days of hospitalisation (due to acute cardiac events)	3 months	Some concerns	RCT	Count; mean	Chronic heart failure	SCAD	Enhanced usual care			
Schwarz <i>et al.</i> (2008) [93]	unplanned hospital readmission for HF symptoms	90 days	High	RCT	Mean (SD); count	Heart failure	Cardiocom	Usual care			
Salahub <i>et al.</i> (2025) [88]	Hospitalisation days	100 days	Moderate	NRSI	Mean (SD)	Older adults (aged 65 and older)	Personal alert device (plus possible	Usual home care			

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Candidate studies	Outcome measure	Outcome measurement period(s)	Risk of bias (RoB2 or ROBINS-I)	Study design (RCT or NRSI)	Statistical measure and variance	Population Key demographic 1: health condition	Intervention	Comparison	Initial feasibility decision	Final feasibility decision
							medication dispenser and sensors)		No MA. Mixed RCT/NRSI. < 3 studies	
Dansky <i>et al.</i> (2008) [80]	Hospitalisation	120 days	High	RCT	Odds ratio (95% CI)	Heart failure	Monitor only; Monitor and video	Usual home care		
Dansky <i>et al.</i> (2008) [80]	Hospitalisation	60 days	High	RCT	Odds ratio (95% CI)	Heart failure	Monitor only; Monitor and video	Usual home care	No MA. 1 study	
Ellins <i>et al.</i> (2023) [100]	Hospital admissions for acute coronary syndrome	Median 4.2 years	Some concerns	RCT	Count/percentage; hazard ratio	Those at risk of stroke with a CHA ₂ DS ₂ -VASc score ≥2	AliveCor Kardia	Usual care	No MA. 1 study	
Ellins <i>et al.</i> (2023) [100]	Hospital admissions for bleeds	Median 4.2 years	Some concerns	RCT	Count/percentage; hazard ratio	Those at risk of stroke with a CHA ₂ DS ₂ -VASc score ≥2	AliveCor Kardia	Usual care		

Admissions to long-term care

Table 48: Feasibility assessment for meta-analysis for admissions to long-term care

Candidate studies	Outcome measure	Outcome measurement period(s)	Risk of bias (RoB2 or ROBINS-I)	Study design (RCT or NRSI)	Statistical measure and variance	Population Key demographic 1: health condition	Intervention	Comparison	Initial feasibility decision	Final feasibility decision
Tchalla et al. (2013) [94]	Admissions to nursing care facilities	12 months	High	RCT	Count/percentage (95% CI)	Alzheimer's Disease	HBtec-TS system and a light path	Enhanced usual care	No MA. <3 studies. Different timepoints. Mixed RCT/NRSIs.	No MA. <3 studies. Different timepoints. Mixed RCT/NRSIs.
Salahub et al. (2025) [88]	Long-term care days	100 days	Moderate	NRSI	Mean (SD)	Older adults (aged 65 and older)	Personal alert device (plus possible medication dispenser and sensors)	Usual home care		
	At least 1 day in long-term care	100 days	Moderate	NRSI	Mean (SD)	Older adults (aged 65 and older)	Personal alert device (plus possible medication dispenser and sensors)	Usual home care		

Outpatient visits

Table 49: Feasibility assessment for meta-analysis for outpatient visits

Candidate studies	Outcome measure	Outcome measurement period(s)	Risk of bias (RoB2 or ROBINS-I)	Study design (RCT or NRSI)	Statistical measure and variance	Population Key demographic 1: health condition	Intervention	Comparison	Initial feasibility decision	Final feasibility decision
Lehmann <i>et al.</i> (2006) [85]	Number of physician office visits	6 months	High	RCT	Rate (per patient per month)	Congestive heart failure	Viterion 500® telehealth system	Enhanced usual care	No MA. Can't standardise outcome data (Tompkins)	No MA. Can't standardise outcome data (Tompkins)
Tompkins and Orwat. (2010) [97]	Primary care visits	6 months	Some concerns	RCT	Incidence rate ratio	Heart failure	Honeywell HomMed Sentry and Genesis monitors	Usual care		
Tompkins and Orwat (2010) [97]	Urgent care visits	6 months	Some concerns	RCT	Incidence rate ratio	Heart failure	Honeywell HomMed Sentry and Genesis monitors	Usual care		
Wong <i>et al.</i> (2024) [98]	A Healthcare visits to GP	6 months	High	RCT	Count/percentage for seen GP [Table s6 in S1 also provides categorical breakdown for number of visits]	Those at high risk of AF (aged 75 years and over)	AliveCor Kardia	Usual care (wait-list)		
Wong <i>et al.</i> (2024) [98]	A visit to specialists	6 months	High	RCT	Count/percentage	Those at high risk of AF (aged 75 years and over)	AliveCor Kardia	Usual care (wait-list)		
Salahub <i>et al.</i> (2025) [88]	Primary care encounters	100 days	Moderate	NRSI	Mean (SD)	Older adults (aged 65 and older)	Personal alert device (plus possible medication	Usual home care	No MA. <3 studies	No MA. <3 studies

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Candidate studies	Outcome measure	Outcome measurement period(s)	Risk of bias (RoB2 or ROBINS-I)	Study design (RCT or NRSI)	Statistical measure and variance	Population Key demographic 1: health condition	Intervention	Comparison	Initial feasibility decision	Final feasibility decision
							dispenser and sensors)			
Salahub <i>et al.</i> (2025) [88]	Same-day surgery days	100 days	Moderate	NRSI	Mean (SD)	Older adults (aged 65 and older)	Personal alert device (plus possible medication dispenser and sensors)	Usual home care		

Days at home and home care episodes

Table 50: Feasibility assessment for meta-analysis for days at home and home care episodes

Candidate studies	Outcome measure	Outcome measurement period(s)	Risk of bias (RoB2 or ROBINS-I)	Study design (RCT or NRSI)	Statistical measure and variance	Population Key demographic 1: health condition	Intervention	Comparison	Initial feasibility decision	Final feasibility decision
Gellis <i>et al.</i> , 2012; 2014 [82,83]	Episodes of home care	12 months	High	RCT	Count/percentage (95% CI)	Heart failure or COPD patients who screened positive for depression	HomMed Health Monitoring System	Enhanced usual care	No MA. Mixed RCT/NRSIs. <3 studies.	No MA. Mixed RCT/NRSIs. <3 studies.
Salahub <i>et al.</i> (2025) [88]	Days at home	100 days	Moderate	NRSI	Mean (SD)	Older adults (aged 65 and older)	Personal alert device (plus possible medication dispenser and sensors)	Usual home care		
Schwarz <i>et al.</i> , 2008) [93]	Days to readmission	90 days	High	RCT	Mean (SD)	Heart failure	Cardiocom electronic health monitoring system	Usual care. No product, but usual post-hospital care		

Access to diagnosis

Table 51: Feasibility assessment for meta-analysis for access to diagnosis

Candidate studies	Outcome measure	Outcome measurement period(s)	Risk of bias (RoB2 or ROBINS-I)	Study design (RCT or NRSI)	Statistical measure and variance	Population Key demographic 1: health condition	Intervention	Comparison	Initial feasibility decision	Final feasibility decision
Halcox et al. (2017) [84]	Time to diagnosis (of AF)	12 months	Some concerns	RCT	Count	Those at risk of stroke with a CHA ₂ DS ₂ -VASc score ≥2	AliveCor Kardia	Usual care	No MA. < 3 studies	No MA. < 3 studies
Wong et al. (2024) [98]	New diagnosis of AF	6 months	High	RCT	Odds ratio (95% CI)	Those at high risk of AF (aged 75 years and over)	AliveCor Kardia	Usual care (wait-list)		

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Other assorted healthcare utilisation outcomes

There is no feasibility assessment table for this outcome grouping as all were unique and could not be pooled.