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Admission avoidance hospital at home (Review)

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[Intervention Review]

Admission avoidance hospital at home

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ABSTRACT

Background

Admission avoidance hospital at home provides active treatment by healthcare professionals in the patient's home for a condition that would otherwise require acute hospital inpatient care, and always for a limited time period. This is the fourth update of this review.

Objectives

To determine the effectiveness and cost of managing patients with admission avoidance hospital at home compared with inpatient hospital care.

Search methods

We searched the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, Embase, and CINAHL on 24 February 2022, and checked the reference lists of eligible articles. We sought ongoing and unpublished studies by searching ClinicalTrials.gov and WHO ICTRP, and by contacting providers and researchers involved in the field.

Selection criteria

Randomised controlled trials recruiting participants aged 18 years and over. Studies comparing admission avoidance hospital at home with acute hospital inpatient care.

Data collection and analysis

We followed the standard methodological procedures expected by Cochrane and the Effective Practice and Organisation of Care (EPOC) Group. We performed meta-analysis for trials that compared similar interventions, reported comparable outcomes with sufficient data, and used individual patient data when available. We used the GRADE approach to assess the certainty of the body of evidence for the most important outcomes.

Main results

We included 20 randomised controlled trials with a total of 3100 participants; four trials recruited participants with chronic obstructive pulmonary disease; two trials recruited participants recovering from a stroke; seven trials recruited participants with an acute medical

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condition who were mainly older; and the remaining trials recruited participants with a mix of conditions. We assessed the majority of the included studies as at low risk of selection, detection, and attrition bias, and unclear for selective reporting and performance bias.

For an older population, admission avoidance hospital at home probably makes little or no difference on mortality at six months' follow-up (risk ratio (RR) 0.88, 95% confidence interval (CI) 0.68 to 1.13; P = 0.30; I^2 = 0%; 5 trials, 1502 participants; moderate-certainty evidence); little or no difference on the likelihood of being readmitted to hospital after discharge from hospital at home or inpatient care within 3 to 12 months' follow-up (RR 1.14, 95% CI 0.97 to 1.34; P = 0.11; I^2 = 41%; 8 trials, 1757 participants; moderate-certainty evidence); and probably reduces the likelihood of living in residential care at six months' follow-up (RR 0.53, 95% CI 0.41 to 0.69; P < 0.001; I^2 = 67%; 4 trials, 1271 participants; moderate-certainty evidence).

Hospital at home probably results in little to no difference in patient's self-reported health status (2006 patients; moderate-certainty evidence). Satisfaction with health care received may be improved with admission avoidance hospital at home (1812 participants; low-certainty evidence); few studies reported the effect on caregivers. Hospital at home reduced the initial average hospital length of stay (2036 participants; low-certainty evidence), which ranged from 4.1 to 18.5 days in the hospital group and 1.2 to 5.1 days in the hospital at home group. Hospital at home length of stay ranged from an average of 3 to 20.7 days (hospital at home group only). Admission avoidance hospital at home probably reduces costs to the health service compared with hospital admission (2148 participants; moderate-certainty evidence), though by a range of different amounts and using different methods to cost resource use, and there is some evidence that it decreases overall societal costs to six months' follow-up.

Authors' conclusions

Admission avoidance hospital at home, with the option of transfer to hospital, may provide an effective alternative to inpatient care for a select group of older people who have been referred for hospital admission. The intervention probably makes little or no difference to patient health outcomes; may improve satisfaction; probably reduces the likelihood of relocating to residential care; and probably decreases costs.

PLAIN LANGUAGE SUMMARY

'Hospital at home' services to avoid admission to hospital

What is the aim of this review?

The aim of this Cochrane Review was to find out if providing health care in an admission avoidance hospital at home setting improves patient health outcomes and reduces health service costs.

Key messages

Admission avoidance hospital at home probably makes little or no difference to risk of death; probably increases the chances of living at home at six months' follow-up; and may be slightly less expensive.

What was studied in this review?

There continues to be more demand for acute hospital beds than there are beds available. One way to reduce reliance on hospital beds is to provide people with acute health care at home, sometimes called 'admission avoidance hospital at home'. In contrast, 'early discharge hospital at home' refers to patients being discharged early from hospital to be treated at home; this topic has been reviewed separately.

What did we want to find out?

We wanted to find out if hospital at home makes a difference to patient health outcomes and to living independently at home. We also wanted to find out if it was less expensive than hospital care, and if it affects length of stay in treatment and patient satisfaction.

What did we do?

We searched for studies that compared hospital at home treatment for an acute health event with inpatient hospital care. We compared and summarised the results of the studies, and rated our confidence in the evidence based on factors such as study methods and sizes.

What did we find?

We found 20 studies, of which four were identified for this update, with a total of 3100 patients with a range of acute conditions. Four studies recruited participants with chronic obstructive (lung) disease; two studies recruited participants recovering from a stroke; seven studies recruited participants with a (sudden or short-term) medical condition who were mainly older; and the remaining studies recruited participants with a mix of conditions.

When compared to in-hospital care, admission avoidance hospital at home services for a select group of patients probably make little or no difference to risk of death or to the likelihood of being taken to hospital in the next 3 to 12 months, and probably increase the chances of

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living at home at six months' follow-up. Patients who receive care at home may have increased satisfaction compared to those in hospital; however, the effects of this type of care on the caregivers who support them are unclear. Hospital at home probably results in little to no difference in patients' health status. Hospital at home decreases the amount of time patients spend in hospital, while length of stay in hospital at home tended to be longer than a typical hospital stay. Admission avoidance hospital at home probably decreases treatment costs, though by a range of different amounts.

What are the limitations of the evidence?

Due to the small size of most of the studies, we are moderately confident that admission avoidance hospital at home does not make a difference to the number of people who died when compared to in-hospital care. Our confidence in the evidence for readmission and living in residential care was reduced to moderate because the lengths of follow-up differed among studies. We are moderately confident in the evidence for patient-reported health status, as participants were aware of which treatment they were getting, which could have influenced the results. We have little confidence in the evidence on patient satisfaction because not many studies reported this outcome, and on length of stay because length of stay varied across studies. We are moderately confident in the evidence for cost because only three trials looked at this fully.

How up-to-date is the review?

We searched for studies published up to February 2022.

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SUMMARY OF FINDINGS

Summary of findings 1. Admission avoidance hospital at home compared with inpatient admission for older people requiring admission to hospital

Admission avoidance hospital at home compared with inpatient admission for older people requiring admission to hospital

Patient or population: older people requiring hospital admission

Settings: home

Intervention: admission avoidance hospital at home

Comparison: inpatient care

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	Number of participants (studies)	Certainty of the evidence (GRADE)
	Assumed risk	Corresponding risk			
	Inpatient care	Admission avoidance hospital at home			
Mortality (6 months' follow-up) (using data from trialists and published data)	**Study population**		**RR 0.88** (0.68 to 1.13)	1502 (5 studies)[A]	⊕⊕⊕⊖[a] Moderate
	208 per 1000	**183 per 1000** (141 to 235)			
Admission to hospital (3 to 12 months' follow-up) (using individual patient data and published data)	**Study population**		**RR 1.14** (0.97 to 1.34	1757 (8 studies)[B]	⊕⊕⊕⊖[b] Moderate
	407 per 1000	**464 per 1000** (395 to 546)			
Living in residential care at follow-up (6 months' follow-up)	**Study population**		**RR 0.53** (0.41 to 0.69)	1271 (4 studies)[C]	⊕⊕⊕⊖[b] Moderate
	124 per 1000	**66 per 1000** (51 to 85)			

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Patient self-reported health status	Patient-reported health status was largely the same for participants treated in hospital at home and hospital, with some reporting higher quality of life or better health status in hospital at home.[D]	-	2006 (9 studies)	⊕⊕⊕⊖[c] Moderate
Patient satisfaction	Patients allocated to hospital at home reported higher levels of satisfaction on average; a small proportion preferred hospital, or satisfaction was equal between groups.[E]	-	1812 (8 studies)	⊕⊕⊖⊖[d] Low
Length of stay in hospital and hospital at home	Hospital at home reduced average length of stay in hospital, which ranged from an average of 4.1 to 18.5 days in the hospital group to 1.2 to 5.1 days in the hospital at home group.[F] Hospital at home length of stay ranged from an average of 3 to 20.7 days (hospital at home group only).[G] Length of stay for the acute episode ranged from a mean increase of 0.7 to 9.1 days[F] for the hospital at home group compared to the hospital group.	-	2036 (11 studies)	⊕⊕⊖⊖[e] Low
Cost and resource use	Hospital at home was generally less costly than hospital care, with a range of estimates for the mean reduction per episode with different levels of certainty, from USD −215 (P = 0.38) to GBP −1981 (95% CI −2551 to −1411).[H] Estimates for the difference in total health and social care costs for a variety of follow-up durations also varied, ranging from GBP −1015.7 (95% CI −2735.5 to 644.8) to GBP −2265 (95% CI −4279 to −252).[I]	-	2148 (12 studies)	⊕⊕⊕⊖[f] Moderate

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (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).
CI: confidence interval; **RR:** risk ratio

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 effect.

[a]We downgraded the certainty of the evidence by one level to moderate due to imprecision of the estimate.
[b]We downgraded the certainty of the evidence by one level to moderate due to indirect comparisons between studies.
[c]We downgraded the certainty of the evidence by one level to moderate due to risk of performance bias since patients cannot be blinded to the intervention.
[d]We downgraded the certainty of the evidence by two levels to low as only 35% of the studies reported this outcome, and there is a risk of detection bias due to subjective reporting of this outcome.
[e]We downgraded the certainty of the evidence by two levels to low due to imprecision and indirect comparisons between studies.
[f]We downgraded the certainty of the evidence by one level to moderate since only three trials reported a full cost analysis.
[A]Caplan 1999; Ricauda 2008; Shepperd 2021; Tibaldi 2009; Wilson 1999.
[B]Caplan 1999; Davies 2000; Harris 2005; Mendoza 2009; Ricauda 2008; Shepperd 2021; Tibaldi 2009; Wilson 1999.

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[C] Ricauda 2008; Shepperd 2021; Tibaldi 2004; Tibaldi 2009.
[D] Corwin 2005; Echevarria 2018; Mendoza 2009; Ricauda 2008; Richards 2005; Shepperd 2021; Talcott 2011; Tibaldi 2009; Wilson 1999.
[E] Caplan 1999; Corwin 2005; Levine 2018; Levine 2020; Ricauda 2008; Richards 2005; Shepperd 2021; Wilson 1999.
[F] Davies 2000; Echevarria 2018; Shepperd 2021; Wilson 1999.
[G] Harris 2005; Levine 2018; Levine 2020; Mendoza 2009; Ricauda 2008; Tibaldi 2009; Wilson 1999.
[H] Caplan 1999; Nicholson 2001; Ricauda 2004; Ricauda 2008; Richards 2005; Shepperd 2021; Wilson 1999.
[I] Echevarria 2018; Mendoza 2009; Shepperd 2021.

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BACKGROUND

In the last 20 years, efforts to manage the steady increase in hospital admissions have included expanding out-of-hospital services. Examples include hospital at home services, which are designed to avoid a hospital admission or to provide early supported discharge from hospital (Leong 2021; Oliver 2021). Possible benefits of these services include releasing hospital beds; reducing the risk of adverse events associated with time in hospital (Rafter 2015); loss of independence associated with prolonged hospitalisations (Loyd 2020); receiving rehabilitation within the home environment (Kimmel 2020); and improved patient satisfaction and communication (Leff 2006).

Recent developments in remote monitoring technology, as well as pressures on health systems caused by the COVID-19 pandemic, have motivated more countries to prioritise hospital at home services. Examples include Queensland Australia Hospital in the Home (Mackay 2023; Queensland Government 2022), Spain (Nogues 2021), and the UK, where NHS England has committed to funding the set-up of virtual wards (otherwise known as 'hospital at home'), and Integrated Care Systems have been asked to deliver capacity equivalent to 40 to 50 virtual ward 'beds' per 100,000 population (NHS England 2021). In Scotland, health boards are required to provide hospital at home services, and some of these services have been running for many years (British Geriatrics Society 2022). In Spain, hospital at home units became popular in the 1990s, and gradually progressed to most of the country (de Sousa Vale 2020). In Australia, 'hospital in the home' activity is also growing, accounting for 3.7% of admissions from 2011 to 2017, and there are calls for more systematic monitoring and oversight (Montalto 2020).

The type of patient treated in hospital at home services varies, as does the use of technology, similar to the variation in hospitals. Some services are designed to care for specific conditions, such as chronic obstructive pulmonary disease, or to provide specific skills such as parenteral nutrition (Kumpf 2019). These services usually have close ties with acute hospitals and may be encouraged by the different structure of incentives in insurance-based systems of health care by providing the type of service that is reimbursed.

Description of the condition

The demographic shift of a rising number of older people has increased the demand for hospital-level care. For example, in the UK more than 40% of people admitted to hospital are over 65 years of age (NHS Digital 2019; WHO 2021 to 2030), and between 2006 and 2018 there was a 59% increase in the number of people aged over 85 who required emergency hospital admission (Steventon 2018). Healthcare decision-makers in a number of countries are attempting to reconfigure services to deal with a year-on-year increase in hospital admissions, often with an inadequate evidence base (Nolte 2008; Steventon 2018). These changes have raised concerns that the pressure of delivering health care to greater numbers may be at odds with the provision of person-centred, high-quality care (RCP 2017). In addition to ageing, other factors such as remote monitoring are driving the adoption of hospital at home services.

Description of the intervention

The majority of admission avoidance hospital at home services provide co-ordinated, multidisciplinary health care in the home for people who would otherwise be admitted to hospital (Arsenault-Lapierre 2021; Leff 2009). Similar to hospitals, services are adapted to suit the patient population. People are admitted to admission avoidance hospital at home after assessment in the community by their primary care physician or in the emergency department or a medical admissions unit. Hospital at home may also provide hospital-level care following early discharge from hospital (we have conducted a parallel systematic review of early discharge hospital at home, recently updated with no new studies identified (Gonçalves-Bradley 2017), and a review of home-based end-of-life care (Shepperd 2016b).

In single-payer systems, hospital at home is commonly integrated with existing services, for example using telehealth that is routinely available, or existing emergency services or out-of-hours stand-by services to provide publicly funded 24-hour cover for patients if they deteriorate. This is the case in the UK, Spain, and Canada.

How the intervention might work

As well as reducing the demand for acute hospital beds, receiving hospital at home may lower the risk of functional decline from the limited mobility that can occur during an admission to hospital. This may be particularly beneficial for older people living with frailty, by providing co-ordinated health care in the less restrictive home environment and thereby providing patients with the opportunity for continued involvement in activities of daily living (Covinsky 2003).

Why it is important to do this review

With the current policy emphasis on care closer to home (WHO 2021 to 2030), and concern about the steadily increasing demand for hospital bed-based care (Monitor 2015; Virtual Wards 2022), we are updating this review to incorporate new randomised evidence. Along with more widespread use of admission avoidance hospital at home services, concerns have been raised about standards of care, lack of data, oversight systems, and the role of financial incentives in insurance-based health systems that motivate providers to establish these services (Batt 2023). An up-to-date systematic review of the global evidence is needed to establish whether hospital at home is effective and cost-effective when compared with bed-based hospital care, or if there is a risk that it reduces the quality of care (Batt 2023). This is the fourth update of this review (Shepperd 2016a).

OBJECTIVES

To determine the effectiveness and cost of managing patients with admission avoidance hospital at home compared with inpatient hospital care.

METHODS

Criteria for considering studies for this review

Types of studies

Randomised controlled trials.

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Types of participants

This review included evaluations of admission avoidance hospital at home schemes involving people aged 18 years and over. We did not include people with long-term care needs unless they required admission to hospital for an acute episode of care. We excluded evaluations of obstetric, paediatric, and mental health hospital at home schemes from the review as our preliminary literature searches suggested that separate reviews would be justified for each of these groups. For the purposes of this review, we defined older patients as those aged 65 years and older.

Types of interventions

Studies comparing admission avoidance hospital at home with acute hospital inpatient care. The admission avoidance hospital at home studies may have admitted patients directly from the community, thereby avoiding physical contact with the hospital, or may have admitted from the emergency room or an acute assessment unit. We used the following definition to determine whether studies should be included in the review: hospital at home is a service that can avoid the need for hospital admission by providing active treatment by healthcare professionals (including doctors) in the patient's home for a condition that would otherwise require acute hospital inpatient care, and always for a limited time period. In particular, hospital at home has to offer a specific service to patients in their home requiring healthcare professionals to take an active part in the patient's care. If hospital at home were not available, then the patient would be admitted to an acute hospital ward. We have therefore excluded the following services from this review:

- services providing long-term care;
- services provided in outpatient settings or postdischarge from hospital; and
- self-care by the patient in their home such as self-administration of an intravenous infusion.

Types of outcome measures

Primary outcomes

- Mortality.
- Admission to hospital.

Secondary outcomes

- Living in residential care at follow-up.
- Patient self-reported health status: quality of life, functional status, psychological health.
- Satisfaction: patient, caregiver, health professionals.
- Length of stay in hospital and hospital at home.
- Cost and resource use.
- Clinical outcomes.

Search methods for identification of studies

Electronic searches

For this update we searched the following databases on 24 February 2022 for references published since 2 March 2016, the last version of this review:

- Cochrane Central Register of Controlled Trials (CENTRAL; 2022, Issue 2);
- MEDLINE (Ovid) (MEDALL);
- Embase (Ovid);
- CINAHL (Cumulative Index to Nursing and Allied Health Literature) (EBSCOhost).

We sought ongoing and unpublished studies by searching ClinicalTrials.gov and the World Health Organization International Clinical Trials Registry Platform (WHO ICTRP) and by contacting providers and researchers involved in the field.

Search strategies are comprised of natural language and controlled vocabulary terms. Search terms for this update were revised based on terminology used in studies included in previous versions of the review. We applied no limits on language. We ran searches from 2015 onwards, the date of publication of the previous version of the review. In databases where it was possible and appropriate, study design filters for randomised trials were used; in MEDLINE we used a modified version of the Cochrane Highly Sensitive Search Strategy for identifying randomised trials in MEDLINE: sensitivity- and precision-maximising version (2008 revision) (Lefebvre 2021). Limits were used in Embase to remove MEDLINE records in order to avoid duplication in downloaded results. Remaining results were deduplicated in EndNote against each other and against results from searches conducted for previous versions of the review. All search strategies used in this version of the review are provided in Appendix 1. Search strategies and search methods used in previous versions of the review are published within those prior publications.

Searching other resources

We searched the following trial registries on 14 November 2022 (Appendix 1):

- WHO ICTRP (trialsearch.who.int);
- US National Institutes of Health Ongoing Trials Register ClinicalTrials.gov (clinicaltrials.gov).

We checked the reference lists of articles identified electronically for evaluations of hospital at home and obtained potentially relevant articles. We checked relevant systematic reviews for other relevant studies.

Data collection and analysis

For a previous version of this review we contacted the investigators of 10 of the included trials that recruited similar populations, inviting them to contribute individual patient data (IPD) to the hospital at home admission avoidance collaborative review (Shepperd 2005), and had access to IPD for one new study for this update (Shepperd 2021).

Selection of studies

Three review authors (KE, SS, DGB) read all the abstracts in the records retrieved by the electronic searches to identify potentially eligible publications. We retrieved the full-text papers for these publications, and two review authors (KE, SS, SI or DGB) independently assessed their eligibility. We selected studies for the review according to the prespecified inclusion criteria and resolved any disagreements by discussion. As an author of one of the studies (Shepperd 2021), SS was not involved in assessing their own study for inclusion, risk of bias, or data extraction.

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Data extraction and management

Four review authors (SS, SI, DGB, KE) independently completed data extraction using a good-practice extraction form developed by Cochrane that was modified and amended for the purposes of this review (EPOC 2015a).

Assessment of risk of bias in included studies

Four review authors (SS, SI, DGB, KE) independently assessed risk of bias in the included studies using the suggested risk of bias criteria for Cochrane Effective Practice and Organisation of Care (EPOC) reviews (EPOC 2015b):

- random sequence generation;
- allocation concealment;
- baseline outcome measurement;
- baseline characteristics;
- blinding of participants and personnel;
- blinding of outcome assessment;
- incomplete outcome data;
- selective reporting of outcomes.

Measures of treatment effect

We used IPD data and published data to conduct meta-analyses on the outcomes of mortality, admission to hospital after discharge from hospital at home or inpatient care, and place of residence (living in residential care). We used a two-stage approach: first we obtained or calculated the study treatment effects and their standard errors, and then subsequently combined them.

For mortality at three months, treatment effects adjusted for age and sex were estimated in a previous version of the review, based on IPD received from three trialists (Davies 2000; Harris 2005; Wilson 1999). These risk ratios were then combined using fixed-effect inverse variance meta-analysis (Deeks 2001). The pooled effect is expressed as the risk ratio for hospital at home compared with usual hospital care, with 95% confidence interval.

For mortality at six months, we extracted numbers of dead and alive in each group from published data from three studies, Caplan 1999; Ricauda 2008; Tibaldi 2009, and from IPD from two studies (Shepperd 2021; Wilson 1999), and combined this information as unadjusted risk ratios using a fixed-effect model with inverse variance weights. Though studies published some adjusted risk ratios, they varied in the covariates they adjusted for, and therefore it was most straightforward to use only unadjusted estimates.

We analysed the effect of admission avoidance hospital at home on admission to hospital after discharge from hospital at home or inpatient care using IPD received from five trialists (Davies 2000; Harris 2005; Mendoza 2009; Shepperd 2021; Wilson 1999), and published data from three studies (Caplan 1999; Ricauda 2008; Tibaldi 2009), again combined using a fixed-effect model and inverse variance weights. This outcome describes subsequent admission to inpatient hospital care after discharge (from either hospital at home or hospital) for a range of follow-up times (3 to 12 months). We also extracted and presented data for transfer to hospital during the hospital at home episode, but as this only applies to the intervention group, we did not meta-analyse these data.

There were insufficient IPD for living in residential care, therefore for this outcome we used available published data from three studies, Ricauda 2008; Tibaldi 2004; Tibaldi 2009, combined with the unadjusted risk ratio obtained from (Shepperd 2021), using a fixed-effect model with inverse variance weights. The analyses in this review were carried out in Stata 16.1.

Our statistical analyses sought to include all randomised participants, using the intention-to-treat principle. We relied on published data when the IPD did not include the relevant outcomes.

Unit of analysis issues

The unit of allocation was the participant in all trials.

Dealing with missing data

In one data set contributing to the IPD meta-analysis (Davies 2000), some dates were missing for known events, and so we gave the missing event a time at the midpoint between randomisation and last follow-up, or as the midpoint between follow-up times if these were known. For one trial where follow-up was 90 days, we set the time to event as 45 days for three cases in the admission avoidance hospital at home arm and for one case in the control group where we knew death had occurred but we did not have a date (Davies 2000).

Assessment of heterogeneity

We quantified heterogeneity by Cochran's Q and the I^2 statistic (Cochran 1954), the latter quantifying the percentage of the total variation across studies that is due to heterogeneity rather than chance (Higgins 2003); smaller percentages suggest less observed heterogeneity.

Assessment of reporting biases

If we identified an adequate number of studies (more than 10) and included these in a meta-analysis, we explored publicaion bias using a funnel plot to visually assess funnel plot asymmetry (Higgins 2019).

Data synthesis

We used IPD when this information was available for studies that recruited similar populations (Davies 2000; Harris 2005; Mendoza 2009; Shepperd 2021; Wilson 1999). The pooled effect is expressed as the risk ratio for hospital at home compared with usual hospital care. Throughout the analyses, we took statistical significance at the two-sided 5% level ($P < 0.05$), presenting data as the estimated effect with 95% confidence intervals. For this update, we conducted the analysis using Review Manager 5 (Review Manager 2020).

When combining outcome data was not possible because of differences in the measurement or reporting of outcomes, or in the case of outcomes that only applied to the intervention group, we presented data from individual studies in tables. Although planned, we did not attempt a direct comparison of costs because the trials collected data on different resources and used different methods to calculate costs.

Subgroup analysis and investigation of heterogeneity

We grouped studies by study population to reduce the amount of variation in the analysis.

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Sensitivity analysis

We did not conduct a sensitivity analysis.

Summary of findings and assessment of the certainty of the evidence

We assessed our confidence in the evidence by creating a summary of findings table using the approach recommended by the GRADE Working Group, in Guyatt 2008, and specific guidance developed by EPOC (EPOC 2017), employing GRADEpro GDT software (GRADEpro GDT 2022). We included the main outcomes of mortality and admission to hospital, as well as living in residential care at follow-up, patient satisfaction, length of stay, patient self-reported health status, and cost and resource use. We used the five GRADE considerations (study limitations, consistency of effect, imprecision, indirectness, and risk of bias) to assess the certainty of the evidence as it relates to the main outcomes (Guyatt 2008). We used the methods and recommendations described in Chapter 14 of the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2019).

RESULTS

Description of studies

We identified 20 trials that randomised individual participants (N = 3100), of which four were located in this update (Echevarria 2018; Levine 2018 (a pilot study); Levine 2020; Shepperd 2021) (Characteristics of included studies).

Results of the search

The updated search retrieved 2982 records from the electronic databases. We found 10 additional records from other sources, for a total of 2992 records after duplicates were removed, of which 2973 were ineligible. We obtained the full texts for the remaining 19 records, four of which fulfilled the inclusion criteria (four trials, five records), bringing the total number of trials included in the review to 20 (Figure 1). We excluded 12 studies with reasons provided (Excluded studies). We also identified two ongoing trials (NCT03156686; Pouw 2018; see Characteristics of ongoing studies).

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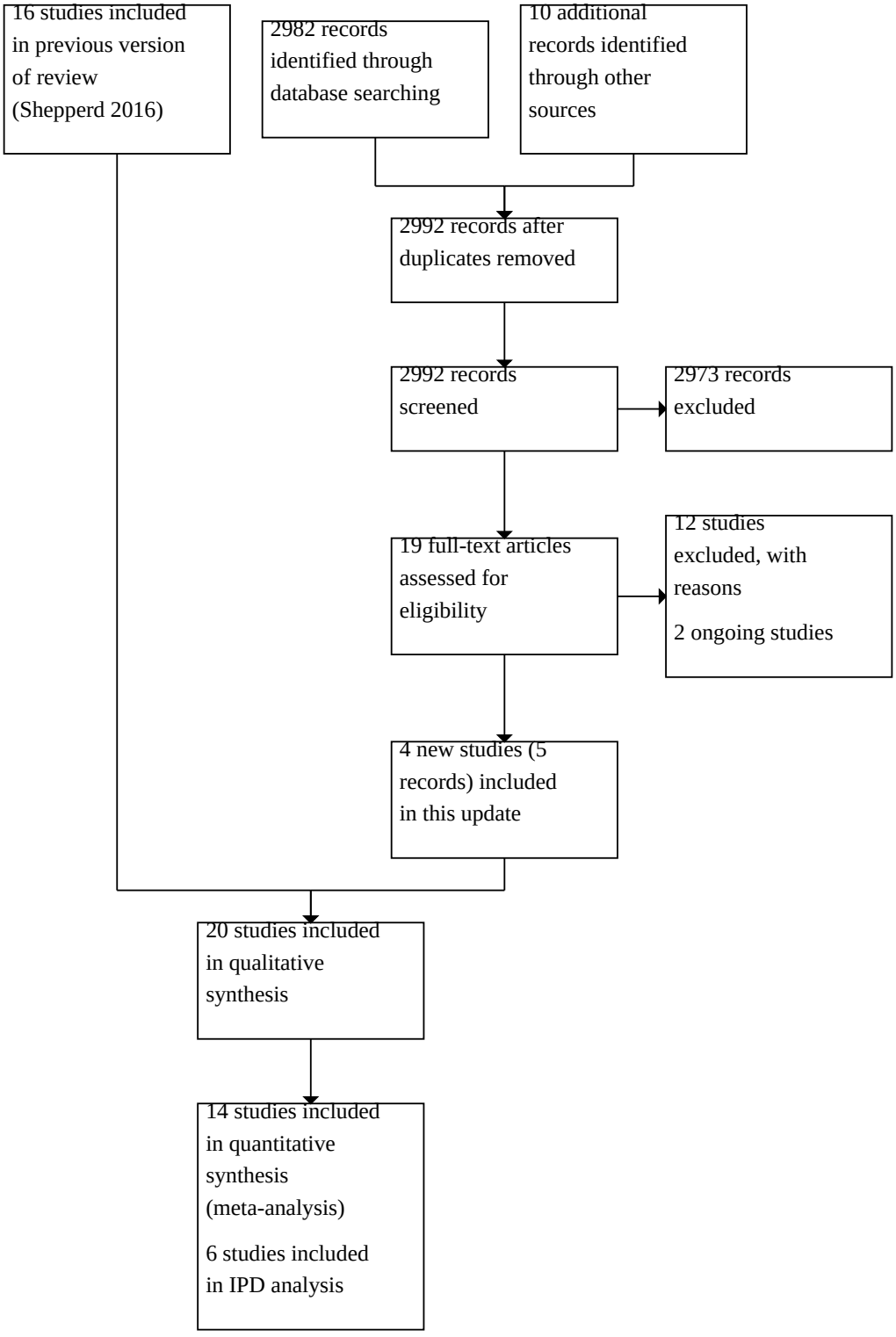
Figure 1. PRISMA flow diagram.



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Included studies

See Characteristics of included studies.

For a previous version of this review, we contacted the investigators of 10 of the included trials that recruited similar populations, inviting them to contribute IPD to the hospital at home admission avoidance collaborative review (Shepperd 2005). We used summaries of this information from the previous review for the three-month mortality comparison using three studies (Davies 2000; Harris 2005; Wilson 1999), and had access to IPD for one new study (Shepperd 2021). We have summarised each study in Table 1, including details of the intervention and population in each study.

Study populations

Four trials recruited participants with chronic obstructive pulmonary disease (COPD), with an average age range of 69.9 to 81 years (Davies 2000; Echevarria 2018; Nicholson 2001; Ricauda 2008). Two trials recruited participants recovering from a moderately severe stroke who were clinically stable, with an average age range of 77.5 to 81 years (Kalra 2000; Ricauda 2004). Seven trials recruited participants with an acute medical condition who were mainly elderly, with an average age range of 76 to 84 years (Andrei 2011; Caplan 1999; Harris 2005; Mendoza 2009; Shepperd 2021; Tibaldi 2009; Wilson 1999). Harris 2005 included two treatment groups and a control (hospital) group. One treatment group was an "admission prevention" group, and the other was an "early discharge" group. Harris provided IPD data for the admission prevention and control groups only. Two trials, one of which was the pilot for the main effectiveness trial, recruited adults attending the emergency department with a primary diagnosis of any infection, heart failure exacerbation, COPD exacerbation, or asthma exacerbation, with an average age of each 62.5 and 65 years respectively (Levine 2018; Levine 2020). There was one trial each for participants with cellulitis, average age 51.5 years (Corwin 2005), community-acquired pneumonia, average age 50 (Richards 2005), fever and neutropenia, average age 47 (Talcott 2011), frail elderly participants with dementia, average age 83.5 (Tibaldi 2004), and neuromuscular disease, average age 45.7 years (Vianello 2013). The 20 trials were conducted in seven countries: Australia (two trials), Italy (five trials), New Zealand (three trials), Romania (one trial), Spain (one trial), the UK (five trials), and the USA (three trials).

Interventions

Details of the intervention components are described in Table 1 and Table 2. Participants were admitted to hospital at home from the emergency room (Andrei 2011; Caplan 1999; Corwin 2005; Davies 2000; Levine 2018; Levine 2020; Mendoza 2009; Nicholson 2001; Ricauda 2004; Ricauda 2008; Richards 2005; Tibaldi 2004; Tibaldi 2009; Vianello 2013), after a hospital assessment (within 24 hours) (Echevarria 2018), the community following referral by their primary care physician (Harris 2005; Kalra 2000; Wilson 1999), an outpatient department (Talcott 2011), and a hospital acute assessment unit or primary care (Shepperd 2021). For participants allocated to hospital at home, health care was provided by a hospital outreach team (Caplan 1999; Echevarria 2018; Harris 2005; Mendoza 2009; Ricauda 2004; Ricauda 2008; Talcott 2011; Tibaldi 2004; Tibaldi 2009), a mix of outreach and community staff (Davies 2000; Kalra 2000; Levine 2018; Levine 2020; Nicholson 2001; Shepperd 2021; Vianello 2013), or by the general practitioner (GP) and community nursing staff (Corwin 2005; Richards 2005; Wilson 1999). For one trial it was not clear who provided care (Andrei 2011). In two trials, the intervention was provided by Pegasus Health, an independent association of GPs (Corwin 2005; Richards 2005). One trial was a three-group comparison of stroke unit care, inpatient stroke team, and hospital at home (Kalra 2000); we selected the inpatient stroke team as the comparison group, as this was most similar to the comparator in the other trials.

Physiotherapy care was described in 10 of the interventions (Harris 2005; Kalra 2000; Levine 2018; Levine 2020; Nicholson 2001; Ricauda 2004; Ricauda 2008; Shepperd 2021; Tibaldi 2004; Wilson 1999), and occupational therapist care in seven (Harris 2005; Kalra 2000; Levine 2018; Levine 2020; Nicholson 2001; Shepperd 2021; Wilson 1999). A social worker was part of the hospital at home team in 10 of the interventions (Davies 2000; Harris 2005; Kalra 2000; Levine 2018; Levine 2020; Ricauda 2004; Shepperd 2021; Talcott 2011; Tibaldi 2004; Wilson 1999), and a counsellor in one (Talcott 2011). Access to a speech therapist was described in three of the interventions (Kalra 2000; Ricauda 2004; Wilson 1999). In two trials, participants could access a home health aide and medical meals, if required (Levine 2018; Levine 2020). One trial described access to a cultural link worker (Wilson 1999). The intervention in one trial included the use of a portable ventilator; a respiratory therapist made daily visits for the first three days of home care, and district nurses and caregivers were trained in the application of the device and on assisting with coughing (Vianello 2013). District nurses visited daily until recovery from the respiratory tract infection; participants also had telephone access to pulmonary specialists (Vianello 2013).

Excluded studies

The main reason for exclusion was that the trial tested the feasibility of introducing technologies for ameliorating a condition at home (four trials), Duiverman 2019; Hazenberg 2014; Mascardi 2016; NCT02363413, and not hospital at home (see Characteristics of excluded studies).

Risk of bias in included studies

See Characteristics of included studies. Summaries of the risk of bias assessments for the included studies are presented in Figure 2 and Figure 3.

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Figure 2. Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies.

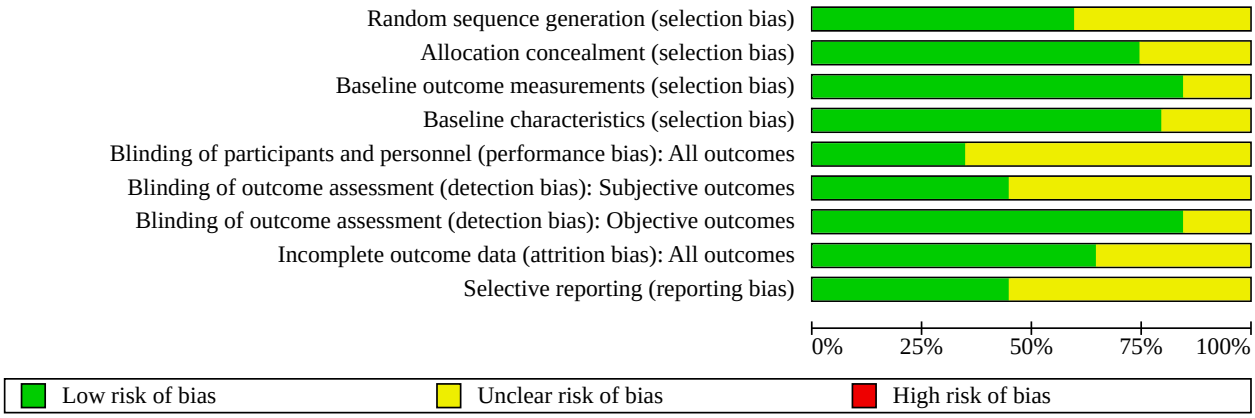

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Figure 3. Risk of bias summary: review authors' judgements about each risk of bias item for each included study.

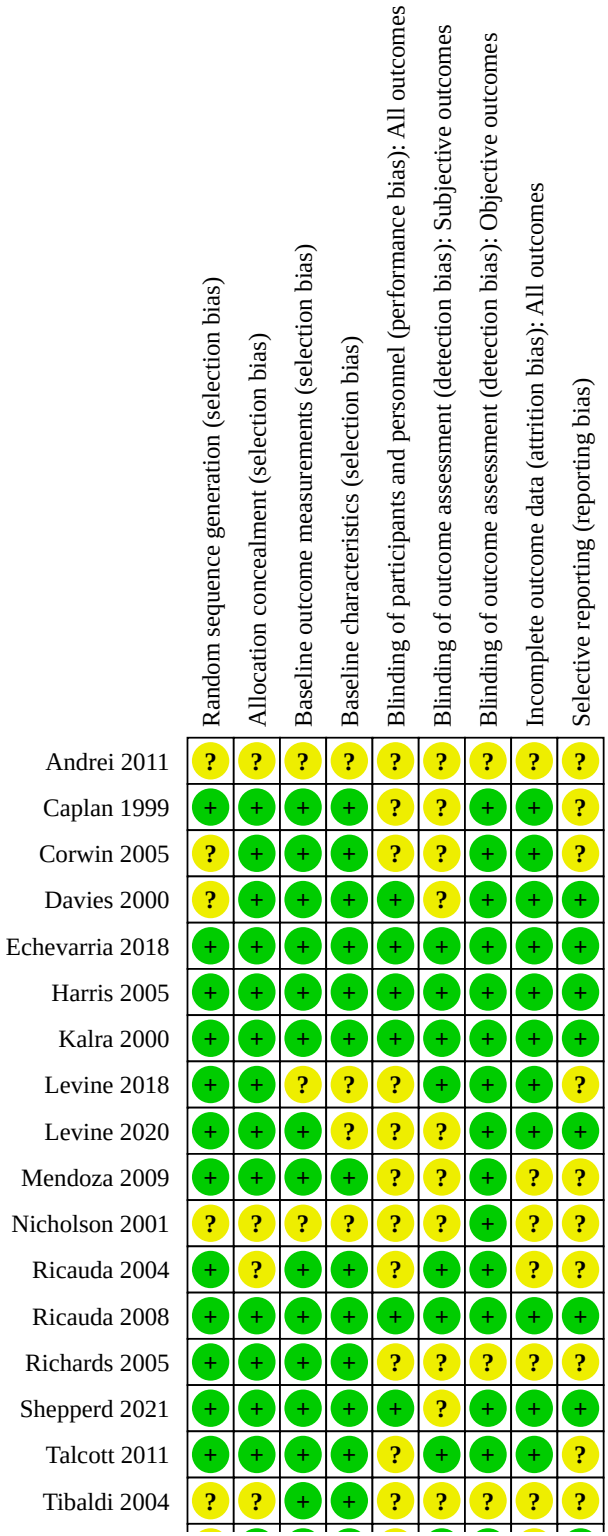

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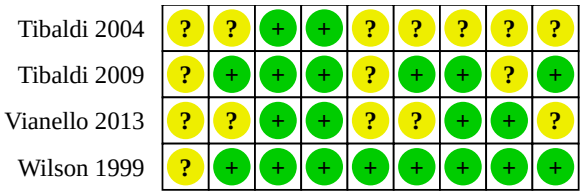
Figure 3. (Continued)



Allocation

In 15 studies concealment of allocation was adequate (Figure 2; Figure 3) (Caplan 1999; Corwin 2005; Davies 2000; Echevarria 2018; Harris 2005; Kalra 2000; Levine 2018; Levine 2020; Mendoza 2009; Ricauda 2008; Richards 2005; Shepperd 2021; Talcott 2011; Tibaldi 2009; Wilson 1999), and in 12 studies sequence generation was adequately described (Caplan 1999; Echevarria 2018; Harris 2005; Kalra 2000; Levine 2018; Levine 2020; Mendoza 2009; Ricauda 2004; Ricauda 2008; Richards 2005; Shepperd 2021; Talcott 2011).

Blinding

We assessed seven studies as having a low risk of performance bias (Davies 2000; Echevarria 2018; Harris 2005; Kalra 2000; Ricauda 2008; Shepperd 2021; Wilson 1999). Three studies were at unclear risk of bias for the measurement of objective outcomes, and nine studies were at low risk of bias for the measurement of subjective outcomes (Figure 3).

Incomplete outcome data

Most studies had a low risk of attrition bias, with seven studies having an unclear risk (Andrei 2011; Mendoza 2009; Nicholson 2001; Ricauda 2004; Richards 2005; Tibaldi 2004; Tibaldi 2009).

Selective reporting

Nine studies were at low risk of bias for selective reporting (Davies 2000; Echevarria 2018; Harris 2005; Kalra 2000; Levine 2020; Ricauda 2008; Shepperd 2021; Tibaldi 2009; Wilson 1999).

Other potential sources of bias

Other sources of bias were not assessed.

Effects of interventions

See: **Summary of findings 1** Admission avoidance hospital at home compared with inpatient admission for older people requiring admission to hospital

See Summary of findings 1 for the main comparison admission avoidance hospital at home versus inpatient admission for older people requiring admission to hospital.

Mortality

We combined IPD for a subset of three studies (N = 420), adjusted for age and sex, for mortality at three months' follow-up (risk ratio (RR) 0.89, 95% confidence interval (CI) 0.55 to 1.45; P = 0.64; N = 420 participants; moderate-certainty evidence) (Davies 2000; Harris 2005; Wilson 1999) (Analysis 1.1). We combined published data from three studies, Caplan 1999; Ricauda 2008; Tibaldi 2009, with data received from trialists of two studies, Shepperd 2021; Wilson 1999, for mortality at six months (RR 0.88, 95% CI 0.68 to 1.13; P = 0.30; N = 1502 participants; moderate-certainty evidence) (Analysis 1.2). Results indicated that admission avoidance hospital at home probably makes little to no difference to mortality when compared with in-hospital care.

Admission to hospital

We analysed the effect of admission avoidance hospital at home on hospital admission after discharge from hospital at home or inpatient care at 3 to 12 months' follow-up using data received from five trialists, Davies 2000; Harris 2005; Mendoza 2009; Shepperd 2021; Wilson 1999, and published data from three studies, Caplan 1999; Ricauda 2008; Tibaldi 2009. Results indicated that admission avoidance hospital at home probably makes little to no difference to hospital admission (RR 1.14, 95% CI 0.97 to 1.34; P = 0.11; I^2 = 41%; N = 1757 participants; moderate-certainty evidence) (Analysis 1.3). Four trials reported transfer to hospital while receiving hospital at home (Analysis 1.4) (Corwin 2005; Ricauda 2008; Richards 2005; Talcott 2011).

Living in residential care at follow-up

Admission avoidance probably reduces the likelihood of living in residential care, measured at discharge to six months' follow-up (RR 0.53, 95% CI 0.41 to 0.69; P < 0.001; I^2 = 67%; 4 trials; N = 1271 participants; moderate-certainty evidence) (Analysis 1.5) (Ricauda 2008; Shepperd 2021; Tibaldi 2004; Tibaldi 2009).

Patient self-reported health status

Quality of life

Nine trials assessed health status or quality of life using different measures, as described below (Analysis 1.6).

One trial that recruited people with cellulitis reported 36-Item Short Form Health Survey (SF-36) scores at six days' follow-up. The difference in score from day 0 was compared between the treatment groups; each item is scored between 0 and 100, with a higher score indicating better health; a difference above 0 favours the treatment group (physical component scale mean difference (MD) −5.2, 95% CI −13.7 to 3.2; role physical scale MD 2.2, 95% CI −10.7 to 15.1; pain scale MD −3.8, 95% CI −10.6 to 3.0) (Corwin 2005).

A second trial measuring health status with the SF-36 reported follow-up data at one year for the physical component scale (treatment group (T): 3.6 (−0.5 to 7.7), control group (C): 2.2 (−1.9 to 6.4); P = 0.47) and the mental component scale (T: 4.0 (−0.9 to 8.9), C: 2.8 (−2.4 to 8.0); P = 0.38) (Mendoza 2009). One trial measured quality of life with the SF-12 at six weeks' follow-up and reported similar scores for each group on the physical component (T: 42.2, C: 45.8; P = 0.18) and mental component scale (T: 50.4, C: 51.0; P = 0.81) (Richards 2005).

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Two trials assessed quality of life using the Nottingham Health Profile at six months' follow-up. Yes/no answers are given for 38 items, which are then weighted to give a score between 0 and 100, with a higher score indicating better health. In these two trials, the change from baseline to six months was compared between treatment groups (T: +1.09 (standard deviation (SD) 2.57) N = 48, C: +0.18 (SD 1.94); P = 0.046) (Tibaldi 2009) and (T: 3.6 (SD 7.9), C: 0.8 (SD 4.5); P = 0.04) (Ricauda 2008).

One trial assessed change from baseline in quality of life when a participant had a health event using the EORTC QLQ-C30, measuring the change before and after the episode (range 0 to 100, higher is better quality of life) (T: 0.58, C: 0.78, P = 0.05; emotional function hospital at home 3.27, hospital −6.94; P = 0.04) (Talcott 2011). One trial reported median values at three months' follow-up for the Sickness Impact Profile (range 0 to 100, higher score is better health) (T: 24 (interquartile range (IQR) 20 to 31), C: 26 (IQR 20 to 31); MD −2, 95% CI −4 to 4; P = 0.73) and the EuroQol (utility score anchored at 0 for death and 1 for perfect health) (T: 0.64, n = 73, C: 0.63, n = 96; MD 0.01, 95% CI −0.12 to 0.09; P = 0.94) (Wilson 1999). Two trials reported mean changes for the EQ-5D: Echevarria 2018 reported small changes from baseline to 14- and 90-day follow-up, and Shepperd 2021 reported that there was likely little or no difference between groups at six months' follow-up.

Functional status

Ten trials reported measures of functional ability, for which higher scores indicate greater independence (see Analysis 1.7 for specific details on the scales used), described as follows.

Caplan 1999 reported scores for instrumental activities of daily living between admission and discharge (MD −0.23, P = 0.04) and the Barthel Index (high score = greater independence) (hospital at home (T): 0.37 (0.27), hospital (C): −0.04 (0.27)). A trial that recruited participants with dementia reported that fewer participants in the hospital at home group had problems with sleep (difference 34%, P < 0.001), agitation and aggression (difference 32.5%, P < 0.001), and feeding (difference 31%, P < 0.001) (Tibaldi 2004).

One trial recruiting participants who had had a stroke reported the number of participants with a favourable outcome measured by the Barthel Index (score of 15 to 20) at three months (T: 106/145 (73%), C: 106/151 (70%); RR 0.96, 95% CI 0.83 to 1.11; P = 0.58) (Kalra 2000). Ricauda 2004, which also recruited participants with a stroke, reported activities of daily living (scale 0 to 6) at six months (median (IQR), T: 4 (2 to 5), C: 4 (2 to 6); P = 0.57). Two trials recruiting participants with COPD reported follow-up data: Ricauda 2008 reported change in activities of daily living at six months (score 0 to 6) (T: 0.12 (SD) 0.64, C: 0.08 (SD 0.73); P = 0.81), and Davies 2000 reported forced expiratory volume in 1 second (FEV1) at three months' follow-up (T: 41.5%, 95% CI 8.2% to 74.8%; C: 41.9%, 95% CI 6.2% to 77.6%).

Two studies recruiting participants with heart failure reported little or no change in activities of daily living measured by the Barthel Index at baseline and six months' follow-up (mean T: −1.95 (SD 9.61), C: −0.30 (SD 10.12)) (Tibaldi 2009); and at one year (T: 4.0, 95% CI −0.9 to 8.9; C: 4.7, 95% CI −2.2 to 11.5; P = 0.21), adjusted for baseline differences (Mendoza 2009). Wilson 1999, which recruited older people with a mix of conditions, assessed functional ability at three months using the Barthel Index (median (IQR) T: 16 (13 to 19), C: 16 (12 to 20)). Levine 2020 reported that patients who received their health care at home were less sedentary than those in hospital, and that reductions in functional status at 30 days after discharge were similar in both groups. Shepperd 2021 reported little or no difference between groups in activities of daily living measured by the Barthel Index at six months' follow-up (Analysis 1.7).

Psychological health

Seven trials measured cognitive function and depression, detailed as follows (Analysis 1.8).

One trial that recruited participants recovering from a stroke reported that hospital at home may lead to lower scores on the Geriatric Depression Scale (GDS) (lower scores = fewer symptoms) (MD 7 points on a 0-to-30-point scale, P < 0.001) (Ricauda 2004), and one trial reported a lower score at six months for participants who had COPD and were allocated to hospital at home (T: −3.1 (SD 4.7), C: 0.7 (SD 3.2); P < 0.001) (Ricauda 2008). One trial that recruited participants with acute chronic heart failure reported fewer depressive symptoms at six months follow-up (measured by the GDS) for those allocated to admission avoidance hospital at home (mean change T: 1.48 (SD 1.86), C: 0.12 (SD 3.36); P = 0.02) (Tibaldi 2009). Wilson 1999 reported median (IQR) scores for the Philadelphia Geriatric Morale Scale at three months, finding little to no difference between groups (T: 37 (30 to 42), C: 37 (31 to 43); MD 0, 95% CI −4.1 to 4.1). Echevarria 2018 and Shepperd 2021, using the Hospital Anxiety and Depression Scale and the Montreal Cognitive Assessment (MoCA) questionnaire, respectively, reported little or no differences between groups.

Two trials used the Mini-Mental State Examination (max score 30) to assess cognitive functioning at six months' follow-up and reported little to no difference between groups (T: −0.4 (SD 4.0), C: −0.5 (SD 1.8); P = 0.88) (Ricauda 2004); and (T: 0.07 (SD 1.38), C: 0.08 (SD 1.36); P = 0.97) (Tibaldi 2009). One trial that recruited participants with a mix of conditions reported cognitive function scores: mean T: 0.43 (standard error of the mean (SEM) 0.12), C: 0.27 (SEM 0.12); and that fewer people receiving hospital at home care experienced short-term confusion during an episode of care (MD −20.4%, 95% CI −32% to −9%) (Caplan 1999). One trial used the Confusion Assessment Method (CAM) to screen for delirium at baseline, three days, five days, and one month, and reported a difference at one month (T: 10/602 (1.7%), C: 13/297 (4.4%), RR 0.38 (0.19, 0.76); P = 0.006) (Shepperd 2021).

Satisfaction: patient, caregiver, and health professionals

Admission avoidance may increase patient satisfaction with the health care received. Participants allocated to hospital at home care reported higher levels of patient satisfaction across a range of different conditions (8 studies; 1812 participants; low-certainty evidence). Twenty-seven per cent (P < 0.001) more participants with cellulitis in the hospital at home group reported increased satisfaction with their location of care compared with those admitted to hospital (Corwin 2005), and 40% (P < 0.001) more participants with community-acquired pneumonia allocated to hospital at home reported that they were happy with their care (Richards 2005). Two trials (recruiting mainly older participants with a mix of medical conditions) also reported increased levels of satisfaction for those allocated to hospital at home care (median difference of 3 on a 0-to-18-point scale, P < 0.001 (Wilson 1999); and MD of 0.9 on a 4-point scale, P < 0.001 (Caplan 1999)). However, in the latter trial, there was a low response rate for the control group:

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40% compared with 78% in the hospital at home group (Caplan 1999).

Some participants (6/101; 6%) refused hospital at home care and were admitted to hospital, and a greater number of participants allocated to hospital care (23/97; 24%) were not admitted because of refusal by the participant, caregiver, or general practitioner (Wilson 1999). One trial recruiting participants with COPD reported the number of participants assessing satisfaction with care as very good or excellent (hospital at home 49/52 (94%), hospital 46/52 (88%); P = 0.83) (Analysis 1.9) (Ricauda 2008), and one trial reported that overall satisfaction scores favoured hospital at home (Shepperd 2021). Two trials (one pilot study, Levine 2018) found that patients in both groups had the same or similar median global satisfaction score, both indicating high satisfaction, though one point lower in the hospital group in Levine 2020.

One trial reported that caregivers in the hospital at home group had significantly higher levels of satisfaction compared with those in the hospital group (difference −0.8 on a 4-point scale, P < 0.001) (Caplan 1999), although the response rate was 27% in the hospital group and 55% in the hospital at home group. A second trial assessed caregiver satisfaction through semi-structured interviews; caregivers reported that although hospital would potentially relieve them from caring, the upheaval of visiting hospital and the accompanying anxiety was a less satisfactory option (Wilson 1999). One trial recruiting participants with COPD reported change in relatives' stress at six months (mean scores (SD) T: 4.6 (5.6), C: 2.6 (6.1); P = 0.16) (Analysis 1.10) (Ricauda 2008).

Health professionals' views

One trial evaluated general practitioners' satisfaction with the service (T: 1.17, C: 1.8, score of 1 to 4, high score = excellent, low score = poor); the response rate was poor: 63% in the hospital at home group and 37% in the control group (Analysis 1.11) (Caplan 1999).

Length of stay in hospital and hospital at home

Eleven trials reported the effect of admission avoidance hospital at home on length of hospital stay or hospital at home stay, or both, with differing results (Analysis 1.12). Four trials reported length of stay in hospital, for both the intervention and control groups (Davies 2000; Echevarria 2018; Shepperd 2021; Wilson 1999). Hospital length of stay ranged from an average of 4.1 days, Echevarria 2018, to 18.5 days, Wilson 1999, in the hospital group, and 1.2 days, Echevarria 2018, to 5.1 days, Wilson 1999, in the hospital at home group. Hospital at home length of stay ranged from an average of 3 to 20.7 days (hospital at home group only) (Harris 2005; Levine 2018; Levine 2020; Mendoza 2009; Ricauda 2008; Tibaldi 2009; Wilson 1999). One trial (Singh 2022 for Shepperd 2021) reported a reduction in hospital length of stay of just over a day at six months follow-up for those allocated to hospital at home.

For the total length of stay in the acute episode, admission avoidance hospital at home increased the length of stay or made no difference. The increase ranged from 0.7 days, in Levine 2020, to 9.1 days, in Tibaldi 2009. In one study there was no difference in length of stay between treatment groups (Levine 2018).

Cost and resource use

Three trials reported a full evaluation of healthcare resources and costs (Echevarria 2018; Shepperd 2021; Wilson 1999); one of these trials included informal-care costs (Shepperd 2021). Four trials reported the difference in mean cost per initial acute health episode (Caplan 1999; Nicholson 2001; Shepperd 2021; Wilson 1999); three trials reported the mean cost per patient (Ricauda 2004; Ricauda 2008; Richards 2005); and two trials reported the percentage reduction in median cost of episode and subsequent 30 days (Levine 2018; Levine 2020) (Analysis 1.13).

Admission avoidance hospital at home probably decreases healthcare costs (2148 participants, moderate-certainty evidence) (Caplan 1999; Corwin 2005; Echevarria 2018; Levine 2018; Levine 2020; Mendoza 2009; Nicholson 2001; Ricauda 2004; Ricauda 2008; Richards 2005; Shepperd 2021; Wilson 1999), though by a range of different amounts, and there is some evidence that it decreases overall societal costs to six months' follow-up (Shepperd 2021).

Older participants with a medical condition

One trial reported a cost minimisation analysis (Wilson 1999), finding an initial increase in the mean cost per day for hospital at home (difference GBP 99.71, P < 0.001) for all those randomised, and little or no difference in cost at three months' follow-up (GBP −210.9, 95% CI GBP −1025 to GBP 635.47). When participants refusing their allocated place of care (T: 6/101, C: 23/97) were removed from the analysis, there was a reduction in costs for those receiving hospital at home for the initial episode of care (difference GBP −1070.53, 95% CI GBP −1843.2 to GBP −245.73) and at three months' follow-up (difference GBP −1063.45, 95% CI GBP −2043 to GBP −162.7). The difference in mean cost per day between hospital at home and hospital care was reduced, although hospital at home care remained more costly per day (GBP 206.68 versus GBP 133.7, MD GBP 72.98, P < 0.001).

Another trial, recruiting mainly older participants with a mix of conditions, examined health service costs using average costs (Board 2000 secondary publication to Caplan 1999), and reported reduced health service costs for the intervention group (T: AUD 1764 (SD AUD 1253), C: AUD 3775 (SD AUD 2496) for an episode of care, MD per episode AUD −2011) and cost per day (T: AUD 191 (SD AUD 58), C: AUD 484 (SD AUD 67.23); MD AUD 293). The costs of the nurse co-ordinator and hospital doctor involved were excluded from this analysis (see Analysis 1.13.1). Mendoza 2009 reported the mean (SD) cost at one-year follow-up (T: EUR 2541 (1334), C: EUR 4502 (2153); difference EUR 1961, P < 0.001).

Singh 2022 for Shepperd 2021 compared total health and social care costs, and total societal costs (includes the productivity loss of informal carers costed by the hour). They reported reduced health and social care costs for the intervention group from baseline to six months' follow-up (T: GBP 15,124, C: GBP 17,390; difference GBP −2265, 95% CI GBP −4279 to GBP −252), adjusting for gender, cognitive decline, utilities, pre-randomisation costs, and site. Total adjusted societal costs were also reduced for the intervention group at six months' follow-up (T: GBP 19,067, C: GBP 21,907; difference GBP −2840, 95% CI GBP −5495 to GBP −185).

Participants recovering from a stroke

A trial recruiting participants recovering from a stroke compared stroke unit care, inpatient stroke team care, and hospital at home.

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Regarding immediate care, hospital at home care was less costly than inpatient stroke team care (MD GBP −2096, 95% CI GBP −3272 to GBP −920). The inclusion of costs of informal care, based on the minimum wage, resulted in an MD of GBP −2216 (95% CI GBP −4771 to GBP 339) (Analysis 1.13) (Patel 2004 for Kalra 2000). In another trial recruiting participants with a stroke, a small reduction in mean cost per patient was reported for those allocated to hospital at home (USD 6413.5 versus USD 6504.8) (Ricauda 2004), which translated to a lower cost per day for hospital at home of USD 112.00 (USD 163.0, SD 20.5 versus USD 275.6, SD 27.7; P < 0.001).

COPD and community-acquired pneumonia

One trial recruiting participants with COPD reported a lower mean health service cost for participants allocated to hospital at home; hospital costs were based on an average DRG (a diagnostic-related group categorised by resource use) cost per bed day (cost per episode MD GBP −1798, P < 0.01) (Nicholson 2001). Another trial recruiting participants with community-acquired pneumonia, again using DRG costs for the control and actual resource use for costing the intervention, reported a reduced cost for those allocated to hospital at home (mean cost per patient T: NZD 1157.9, C: NZD 1556.28) (Richards 2005). Ricauda 2008 reported the total mean cost per patient (T: USD 1175.9, C: USD 1390.9, P = 0.38) and the total mean cost per day (T: USD 101.4 (SD 61.3), C: USD 151.7 (SD 96.4)).

Use of other health services and informal care

Davies 2000 reported an increase in referrals for social support for participants with COPD who were allocated to hospital at home. This occurred during the time they were receiving hospital at home or when the control group had been discharged from hospital (24% versus 6%, difference 18%, 95% CI 7.3% to 28.6%) (Analysis 1.13). One trial recruiting participants recovering from a stroke reported that 71% (100/140) of those allocated to hospital at home received informal care, compared with 67% (98/147) receiving care from the inpatient stroke team (Patel 2004). This translated into 979 hours (SD 1749) versus 846 hours (SD 1549) of care over a 12-month period (Analysis 1.13). Singh 2022 for Shepperd 2021 found no significant difference in the total hours of informal care between the treatment groups up to six months' follow-up (mean (SD) T: 594.89 (1093.63), C: 657.64 (1170.87); difference −62.76, 95% CI −224.61 to 99.09).

Clinical outcomes

One trial measured clinical complications, with fewer participants allocated to hospital at home reporting bowel complications (difference −22.5%, 95% CI −34% to −10.8%) or urinary complications (difference −14.4%, 95% CI −25.4% to −3.3%) (Caplan 1999). In a trial recruiting participants with dementia, fewer participants in the hospital at home group were prescribed antipsychotic drugs at discharge (difference −14%, 95% CI −28% to 0.3%) (Tibaldi 2004). One trial that recruited people with cellulitis reported risk of advancement of cellulitis (hazard ratio 0.98, 95% CI 0.73 to 1.32) (Corwin 2005), and one trial recruiting participants with COPD reported that more participants allocated to hospital at home were prescribed an antibiotic (difference 18%, 95% CI 1.4% to 34.6%) (Davies 2000). Talcott 2011 reported the difference in major complications during the episode of care (difference 1%, 95% CI −10% to 13%) (Analysis 1.14).

DISCUSSION

Summary of main results

Admission avoidance hospital at home probably makes little or no difference to risk of death at six months' follow-up and to readmission to hospital after discharge from hospital at home or inpatient care within 3 to 12 months (range of follow-up times from the included studies), and probably reduces the likelihood of relocating from home to residential care at six months. Admission avoidance hospital at home probably results in little to no difference in patient-reported health status, and the evidence suggests that it may increase patient satisfaction and reduce hospital length of stay; that total length of stay for hospital at home may be greater than for those allocated to hospital; and that hospital at home can be less costly than in-hospital care (Summary of findings 1).

Patients valued the quality of communication and personal care received in a hospital at home setting (Shepperd 2021; Wilson 1999). However, the increased satisfaction reported by patients must be balanced against the potential burden on caregivers; for example, interviews with caregivers showed that their contributions might be required to facilitate an episode of hospital at home (Makela 2020), and that this can place an additional burden on families. Comparing cost data from the different studies was limited by the different methods used to cost resources, and follow-up times that ranged from 1 to 12 months. Three trials conducted a full economic evaluation (Jones 1999 for Wilson 1999; Singh 2022 for Shepperd 2021; and Patel 2004 for Kalra 2000), reporting that hospital at home may lead to a small reduction in health service cost, a reduction in societal costs, and can be a cost-effective alternative to hospital admission for select groups of patients.

There was some variation in the way the admission avoidance hospital at home services operated that reflected different health systems, existing services available, and financing. Services admitted patients directly from the community (Harris 2005; Kalra 2000; Vianello 2013; Wilson 1999), outpatients (Talcott 2011), and from an accident and emergency department or medical assessment unit (Andrei 2011; Caplan 1999; Corwin 2005; Davies 2000; Echevarria 2018; Levine 2018; Levine 2020; Mendoza 2009; Nicholson 2001; Ricauda 2004; Ricauda 2008; Richards 2005; Shepperd 2021; Tibaldi 2004; Tibaldi 2009). Six trials evaluated interventions where the patient could be living alone, and five trials required a caregiver to be either living with the patient or nearby. This variation reflects the nature of complex interventions (i.e. similar to stroke units, case management, telemedicine), and we did not combine data from studies with a high level of clinical heterogeneity. There were some important common features across the different hospital at home services; these included access to a doctor, co-ordinated care provided by a multidisciplinary team, the provision of 24-hour cover if required, and a safe home environment being a requirement for the provision of hospital at home. Inevitably, hospital at home does not function as an isolated intervention, with the organisation of services reflecting local health systems, workforce, and available social care services. For some countries, integrating hospital at home into existing services is the most efficient way to deliver these services.

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Overall completeness and applicability of evidence

The evidence indicates that admission avoidance hospital at home may provide an effective alternative to inpatient care for a select group of patients requiring hospital admission. The majority of the included trials recruited participants who were older, with an average age that ranged from 70 to over 80 years, and who had experienced a medical event that required admission to hospital. All trials but one, Andrei 2011, were conducted in high-income countries. Eight trials excluded patients who did not have continuous family support (Caplan 1999; Mendoza 2009; Ricauda 2004; Ricauda 2008; Richards 2005; Tibaldi 2004; Tibaldi 2009; Vianello 2013). Four trials reported the number of participants recruited from ethnic minority groups; this ranged from 14% to 20% of all recruited participants (Corwin 2005; Levine 2020; Richards 2005; Talcott 2011). In one trial, hospital at home included remote monitoring for heart rate, respiratory rate, telemetry, movement, falls, and sleep via a small skin patch; cost was the primary outcome (Levine 2020), and the study was stopped early by the funder (who was also the service provider) due to the cost benefit of the intervention.

The 20 trials included in this review were conducted in Australia, Italy, New Zealand, Romania, Spain, the UK, and the USA. There is growing interest from other health systems in testing the delivery of hospital-level care in the home. For example, in Singapore a large study that seeks to recruit 2000 participants is under way (Chong 2022; NCT04330378), and a large hospital in Pune, India expects to increase its capacity by 40% to 60% using remote patient monitoring (Mernin 2021). A large hospital in Bangkok, Thailand has also set up an @Home service, suitable for patients after surgery or acute illness, patients with chronic conditions who need regular follow-up, and the dependent elderly (Bumrungrad 2023). Such services were also set up in the Philippines during COVID-19 (CNN Philippines 2021). Additional large, high-quality randomised trials will improve the certainty of the evidence and generalisability of these findings, and be a valuable guide to the development of out-of-hospital services to increase the capacity of health systems.

We defined admission avoidance hospital at home as: a service that can avoid the need for hospital admission by providing active treatment by healthcare professionals in the patient's home for a condition that would otherwise require acute hospital inpatient care, and always for a limited time period. All of the included studies met these criteria, and the evidence applies to services that also meet these criteria and do not provide long-term care, outpatient care, or self-administration of treatment. The studies varied in the amount of time that patients were in the emergency department before being admitted to hospital at home or a hospital bed; this was due to the type of illness and severity (and was not often analysed) and the ongoing demands on the health system in question. We did not apply a time threshold in the emergency room for the study to qualify as admission avoidance. If we had, it would likely have resulted in the exclusion of patients in the most pressured health systems, where evidence is arguably most needed, and have risked imposing an artificial time limit that isn't experienced on the ground, and thus limited the applicability of the evidence.

Hospital at home services inevitably place demands on those who live with the person receiving care, and family and friends who live elsewhere. Safety in the home, cultural considerations, and health problems experienced by the main carer pose further challenges (Simon 2022). An additional concern is inequality in the resources available to unpaid carers across different populations, which might increase the potential burden of receiving hospital at home (Vlachantoni 2012). A Cochrane qualitative evidence synthesis of factors that influence the implementation of hospital at home reports in detail on the barriers that limit implementation, as well as factors that support the implementation of sustainable hospital at home services (Wallis 2024). A limitation of the trials included in this review is that few reported if deaths occurred during the hospital at home admission, and if they were unexpected and related to the hospital at home intervention. The reason for this is likely the small sample size of many of the studies, and early death being a rare event. Mortality occurring during an episode of hospital at home or hospital (control group) admission might not be related to hospital at home or hospital care, and the cause would have to be assessed case by case. The cause of such adverse events was not always clearly reported in the included studies; further investigation would provide clarity on the causes of death and any links with the intervention.

Certainty of the evidence

While we assessed the overall risk of bias as low, most of the included studies were small. Shepperd 2021 was the largest trial, recruiting 1032 participants who contributed to the analysis. The meta-analysis for the main outcome included a subgroup of five trials recruiting participants with similar conditions (older patients with a mix of medical conditions, excluding stroke) to limit heterogeneity. We downgraded the certainty of the evidence for mortality due to imprecision of the estimate: the result could be consistent with hospital at home being associated with both higher or lower risk of mortality. We downgraded for readmission to hospital and relocating to residential care, because the studies evaluated these outcomes at different lengths of follow-up, therefore the comparison was indirect. We downgraded for patient satisfaction because only 35% of the studies evaluated this outcome, and patients/researchers were not blinded. We downgraded for patient self-reported health status due to non-blinding, and for length of stay because the time frame for measuring this outcome differed among studies, and the estimates covered a wide range. We downgraded for cost because only three trials did a full cost analysis (Kalra 2000; Shepperd 2021; Wilson 1999).

Potential biases in the review process

We limited publication bias by conducting an extensive search that included different databases of published articles and sources of unpublished literature; this was facilitated by a long-established international network of people working in the field who alert us to new randomised controlled trials. Three review authors screened the search results of potentially eligible studies to reduce the risk of missing any eligible studies. To check that inclusion criteria had been applied consistently, eligibility of studies was discussed with the review team. As an author of one of the included studies (Shepperd 2021), review author SS was not involved in assessing their own study for inclusion, risk of bias assessment, or data extraction.

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Agreements and disagreements with other studies or reviews

Other reviews have looked at the effect of hospital at home schemes for end-of-life care (Shepperd 2021), and hospital at home for early discharge (Gonçalves-Bradley 2017). A review of a few studies of end-of-life care at home found that such programmes increase the chance of dying at home rather than in hospital, and patient satisfaction may be higher at one-month follow-up (Shepperd 2021). A review of early discharge hospital at home services found insufficient evidence for economic benefit, or improved health outcomes (Gonçalves-Bradley 2017). The search for this review was updated in March 2020 and identified no new studies.

Systematic reviews of hospital at home services for patients with specific conditions, such as COPD and heart failure, have been published (Jeppesen 2012; Qaddoura 2015). For patients with COPD, it was reported that hospital at home reduced the number of readmissions when compared with hospital care, with uncertain evidence for mortality, health-related quality of life, cost, and clinical outcomes (Jeppesen 2012). A review of a few studies that specifically recruited patients with heart failure found a slight increase in time to readmission, improved health-related quality of life, and reduced index costs, with limited evidence for mortality for those allocated to hospital at home. The authors judged these studies to be of modest quality (Qaddoura 2015). A systematic review of studies of hospital at home for chronic disease identified nine studies: five trials of COPD, two of heart failure, one of stroke, and one of neuromuscular disease (Arsenault-Lapierre 2021). We included all studies included in the Arsenault-Lapierre 2021 review in the current review update except for Hernandez 2003, which did not compare admission avoidance hospital at home with inpatient care. In Hernandez 2003, patients who required immediate hospitalisation were excluded, and the control group was evaluated by a physician who decided on inpatient admission or discharge. The review found no significant difference in mortality for a range of follow-up times, and a lower risk of readmission in the hospital at home group, using the longest follow-up time for each study. In addition, similar to the current review, Arsenault-Lapierre 2021 reported that length of treatment was longer in the hospital at home group, and relocation to residential care was less likely in the hospital at home group than in the in-hospital group; study authors did not analyse mortality occurring during the hospital or hospital at home admission.

AUTHORS' CONCLUSIONS

Implications for practice

Admission avoidance hospital at home, with the option of transfer to hospital, may provide an effective alternative to inpatient care for selected patients who require hospital admission. The 20 trials included in this review were conducted in several different countries. Although the health systems in these countries vary with respect to the way healthcare financing is structured, the policy objectives are the same, with admission avoidance hospital at home being provided to control costs and reduce demand for inpatient hospital beds (Aviv 2021; Naik 2006; Oliver 2021). The level of primary care in a country, and the enthusiasm of local clinicians and healthcare managers, may determine the degree to which admission avoidance hospital at home operates as an outreach model or is run by supplementing existing primary care services. Other aspects that might vary by health system include the level of integration with existing services to avoid duplication of services, for example using existing out-of-hours services as in a single-payer system with free access at the point of care versus setting up a new out-of-hours service for patients that do not have access to this through their usual healthcare coverage (such as in a multipayer health system). Admission avoidance hospital at home may not completely substitute for hospital, as hospital admission remains an option if required, for example patients whose condition unexpectedly deteriorated or who could no longer be managed at home had access to transfer to a traditional acute hospital ward. Policymakers should consider what type of hospital care is planned to be substituted with hospital at home, and the impact this will have on cost-effectiveness.

The way health care for the control group is organised will have an impact on cost-effectiveness, for example the routine use of comprehensive geriatric assessment to structure hospital care will provide an additional layer of geriatrician-led multidisciplinary assessment and co-ordination of care that can improve outcomes (Ellis 2017). The entry criteria required that patients be clinically stable and not require specialist diagnostic investigation or emergency interventions. Patients eligible for the trials included in this review did not include those whose condition was so severe that death was an expected outcome. Furthermore, patients whose condition deteriorated or who could no longer be managed at home had access to hospital admission.

Although admission avoidance hospital at home provides an alternative to inpatient admission for some patients, the volume of such patients recruited to the included trials was comparatively low, and some of these patients required access to hospital services, which might make the closure of a ward or hospital in favour of hospital at home an unrealistic option. In Shepperd 2021, 37/687 (5%) participants allocated to hospital at home received required admission to hospital bed-based care, and 76/345 (22%) participants allocated to hospital instead received hospital at home care. This indicates that some patients require a greater intensity of care due to their condition deteriorating, that others have a preference for health care in their own home, and at times when no hospital beds were available for those randomised to hospital admission, hospital at home admission was required. Being less likely to be relocated to residential care at follow-up might be due to the location of the patient influencing the decision to move to residential care, or be related to the patient's maintaining their usual routines at home while avoiding some of the harms associated with the inpatient environment such as sleep deprivation, poor nutrition, confusion, and falls and infection risk (Mudge 2019). A reduction in relocating to residential care may contribute to cost savings from hospital at home.

Many of the studies in this review are over 10 years old and do not reflect the recent improvement of remote patient monitoring technology. These developments are advancing rapidly and may allow hospital at home to care for different groups of patients. However, there have been concerns about excluding patients based on their or their caregiver's low technological literacy (British Geriatrics Society 2022).

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Implications for research

Over the last 20 years the randomised evidence has grown from 1 to 20 trials, using a pragmatic randomised trial design that includes a process evaluation to inform real-world implementation.

Future research of admission avoidance hospital at home should assess the impact of hospital at home services in more disadvantaged populations, who are more likely to have a higher percentage of informal caregivers (Young 2005). Mortality should be measured, in particular during admission to hospital at home and hospital, along with transfer to hospital during a hospital at home admission, readmission to hospital after discharge from hospital at home or inpatient care, relocation to residential care at follow-up, and cost-effectiveness. Studies should clarify if mortality during the acute episode was assessed as related to the hospital at home intervention or hospital control and unexpected.

There is little evidence on the impact of hospital at home on patients, caregivers and their networks, despite the potential for them to have a significant role when health care is being delivered in the patient's home. A qualitative study linked to the randomised trial by Shepperd 2021 (Makela 2020) describes how patients and caregivers facilitate the delivery of hospital at home care, and this includes monitoring the patient. A recent study found that caregiver burden should be a key aspect to assessing appropriate social support during hospital at home (Levine 2021). Additional evidence on how staff experience hospital at home, the training required, and how roles evolve would help with workforce planning (e.g. Karacaoglu 2021; Leary 2022), and if hospital at home services represent a shift in care provision to patients' families and lower skilled workers (Batt 2023). A recent survey identified several domains for future research, including defining the type of hospital at home care, defining optimal study outcomes, patient and caregiver experience, the education of hospital at home clinicians, and the use of technology and telehealth, among others (Leff 2022). Other important outcomes for future research should include the assessment of unintended impacts, person-centred care, advanced care planning, and the impact on unpaid carers and their networks. As hospital at home services are more widely implemented, evidence on the impact on caregiver outcomes that includes burden, experience, satisfaction, and quality of life becomes increasingly important.

The potential for admission avoidance hospital at home to increase the capacity of health systems was explored during the COVID-19 pandemic (Aviv 2021; Nundy 2020; Oliver 2021). Further study has been done regarding 'virtual wards' and remote monitoring in this context (Thornton 2020), with a review of 27 studies finding that patient/carer training was a determining factor of success, but there was uncertainty of evidence around patient safety or deterioration (Vindrola-Padros 2021). This is another area that requires more research, as there is a risk that remote monitoring might not be used effectively.

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Editorial and peer-reviewer contributions

The following people conducted the editorial process for this article:

- Sign-off Editor (final editorial decision): Rebecca Fortescue (née Normansell), Population Health Research Institute, St George's, University of London;
- Managing Editor (selected peer reviewers, provided editorial guidance to authors, edited the article): Luisa M Fernandez Mauleffinch, Cochrane Central Editorial Service;
- Editorial Assistant (conducted editorial policy checks, collated peer-reviewer comments, and supported the editorial team): Leticia Rodrigues, Cochrane Central Editorial Service;
- Copy Editor (copy editing and production): Lisa Winer, Cochrane Central Production Service;
- Peer reviewers (provided comments and recommended an editorial decision): Jennifer Hilgart, Cochrane (methods); Steve McDonald, Cochrane Australia (search); Jonathan M Fuchs, FACHE Kidder Street Consulting Group (consumer); Bruce Leff, MD, Johns Hopkins University School of Medicine (clinical); Jorge Arias de la Torre, King's College London (clinical); Yi Feng Lai, MOH Office for Healthcare Transformation, Singapore (clinical); Maria Cristina Martin (clinical); and Víctor J González-Ramallo, Hospital at Home Service, Hospital General Universitario Gregorio Marañón, Madrid, Spain (clinical). One additional peer reviewer provided clinical peer review but chose not to be publicly acknowledged.

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REFERENCES

References to studies included in this review

Andrei 2011 *{published data only}*

Andrei CL, Sinescu CJ, Ianula RM, Popa AI, Chioncel VP, Mischie AN, et al. Can be the home care of the heart failure patients a better economic alternative? *European Journal of Heart Failure Supplements (Abstract)* 2011;**10**(S1):S29.

Caplan 1999 *{published data only}*

Board N, Brennan N, Caplan G. A randomised controlled trial of the costs of hospital as compared with hospital at home for acute medical patients. *Australian and New Zealand Journal of Public Health* 2000;**24**(3):305-11. [PMID: 10937409]

Caplan GA, Coconis J, Woods J. Effect of hospital in the home treatment on physical and cognitive function: a randomized controlled trial. *Journal of Gerontology* 2005;**60**(8):1035-8. [PMID: 16127109]

* Caplan GA, Ward JA, Brennan NJ, Coconis J, Board N, Brown A. Hospital in the home: a randomised controlled trial. *Medical Journal of Australia* 1999;**170**(4):156-60. [PMID: 10078179]

Corwin 2005 *{published data only}*

Corwin P, Toop L, McGeoch G, Than M, Wynn-Thomas S, Wells JE, et al. Randomised controlled trial of intravenous antibiotic treatment for cellulitis at home compared with hospital. *BMJ* 2005;**330**(7483):129. [PMID: 15604157]

Davies 2000 *{published and unpublished data}*

Davies L, Wilkinson M, Bonner S, Calverley PM, Angus RM. Hospital at home versus hospital care in patients with exacerbations of chronic obstructive pulmonary disease: prospective randomised controlled trial. *BMJ* 2000;**321**(7271):1265-8. [PMID: 11082090]

Echevarria 2018 *{published data only}*

Dismore LL, Echevarria C, van Wersch A, Gibson J, Bourke S. What are the positive drivers and potential barriers to implementation of hospital at home selected by low-riskDECAF score in the UK: a qualitative study embedded within a randomised controlled trial. *BMJ Open* 2019;**9**:e026609. [DOI: 10.1136/bmjopen-2018-026609]

* Echevarria C, Gray J, Hartley T, Steer J, Miller J, Simpson AJ, et al. Home treatment of COPD exacerbation selected by DECAF score: a non-inferiority, randomised controlledtrial and economic evaluation. *Thorax* 2018;**73**:713-22. [DOI: 10.1136/thoraxjnl-2017-211197]

Harris 2005 *{published and unpublished data}*

Harris R, Ashton T, Broad J, Connolly G, Richmond D. The effectiveness, acceptability and costs of a hospital-at-home service compared with acute hospital care: a randomised controlled trial. *Journal of Health Services and Research Policy* 2005;**10**(3):158-66. [PMID: 16053592]

Kalra 2000 *{published data only}*

* Kalra L, Evans A, Perez I, Knapp M, Donaldson N, Swift CG. Alternative strategies for stroke care: a prospective randomised controlled trial. *Lancet* 2000;**356**(9233):894-9. [PMID: 11036894]

Patel A, Knapp M, Perez I, Evans A, Kalra L. Alternative strategies for stroke care: cost effectiveness and cost-utility analyses from a prospective randomized controlled trial. *Stroke* 2004;**35**(1):196-203. [PMID: 14684783]

Levine 2018 *{published data only}*

Levine DM, Ouchi K, Blanchfield B, Diamond K, Licurse A, Pu CT, et al. Hospital-level care at home for acutely ill adults: a pilot randomized controlled trial. *Journal of General Internal Medicine* 2018;**33**(5):729-36. [DOI: 10.1007/s11606-018-4307-z]

Levine 2020 *{published data only}*

* Levine DM, Ouchi K, Blanchfield B, Saenz A, Burke K, Paz M, et al. Hospital-level care at home for acutely ill adults: a randomized controlled trial. *Annals of Internal Medicine* 2020;**172**(2):77-92. [DOI: 10.7326/M19-0600]

Levine DM, Pian J, Mahendrakumar K, Patel A, Saenz A, Schnipper JL. Hospital-level care at home for acutely ill adults: a qualitative evaluation of a randomized controlled trial. *Journal of General Internal Medicine* 2021;**36**(7):1965-73. [DOI: 10.1007/s11606-020-06416-7]

Mendoza 2009 *{published and unpublished data}*

Mendoza H, Martin MJ, Garcia A, Aros F, Aizpuru F, Regalado de Los Cobos J, et al. Hospital at home care model as an effective alternative in the management of decompensated chronic heart failure. *European Journal of Heart Failure* 2009;**11**:1208-13.

Nicholson 2001 *{published data only}*

Nicholson C, Bowler S, Jackson C, Schollay D, Tweeddale M, O'Rourke P. Cost comparison of hospital- and home-based treatment models for acute chronic obstructive pulmonary disease. *Australian Health Review* 2001;**24**(4):181-7. [PMID: 11842709]

Ricauda 2004 *{published data only}*

Ricauda NA, Bo M, Molaschi M, Massaia M, Salerno K, Amati D, et al. Home hospitalization service for acute uncomplicated first ischemic stroke in elderly patients: a randomized trial. *Journal of the American Geriatrics Society* 2004;**52**(2):278-83. [PMID: 14728641]

* Ricauda NA, Pla LF, Marinello M, Molaschi M, Fabris F. Feasibility of an acute stroke home care service for elderly patients. *Archives of Gerontology and Geriatrics* 1998;**26**(Suppl 6):17-22. [EMBASE: 1998333220]

Ricauda 2008 *{published data only}*

Ricauda NA, Tibaldi V, Leff B, Scarafiotti C, Marinello R, Zanocchi M, et al. Substitutive hospital at home versus inpatient care for elderly patients with exacerbations of chronic obstructive pulmonary disease: a prospective randomised controlled trial. *Journal of the American Geriatrics Society* 2008;**56**:493-500.

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Richards 2005 *{published data only}*

Richards DA, Toop LJ, Epton MJ, McGeoch RB, Town GI, Wynn-Thomas SM, et al. Home management of mild to moderately severe community-acquired pneumonia: a randomised controlled trial. *Medical Journal of Australia* 2005;**183**(5):235-8. [PMID: 16138795]

Shepperd 2021 *{published and unpublished data}*

Mäkelä P, Godfrey M, Cradduck-Bamford C, Ellis G, Shepperd S. A protocol for the process evaluation of a multi-centre randomised trial to compare the effectiveness of geriatrician-led admission avoidance hospital at home versus inpatient admission. *Trials* 2018;**19**:569. [DOI: 10.1186/s13063-018-2929-4]

* Shepperd S, Butler C, Cradduck-Bamford A, Ellis G, Gray A, Hemsley A, et al. Is comprehensive geriatric assessment admission avoidance hospital at home an alternative to hospital admission for older persons?: a randomized trial. *Annals of Internal Medicine* 2021;**174**(7):889-98. [DOI: 10.7326/M20-5688]

Shepperd S, Cradduck-Bamford A, Butler C, Ellis G, Goddfrey M, Gray A, et al. A multi-centre randomised trial to compare the effectiveness of geriatrician-led admission avoidance hospital at home versus inpatient admission. *Trials* 201;**18**:491. [DOI: 10.1186/s13063-017-2214-y]

Singh S, Gray A, Shepperd S, Stott DJ, Ellis G, Hemsley A, et al. Is comprehensive geriatric assessment hospital at home a cost-effective alternative to hospital admission for older people? *Age and Ageing* 2022;**51**(1):afab220. [DOI: 10.1093/ageing/afab220]

Talcott 2011 *{published data only}*

Hendricks AM, Loggers ET, Talcott JA. Costs of home versus inpatient treatment for fever and neutropenia: analysis of a multicenter randomized trial. *Journal of Clinical Oncology* 2011;**29**:3984-9.

* Talcott JA, Yeap JA, Siegal RD, Loggers ET, Lu C, Godley PA. Safety of early discharge for low risk patients with febrile neutropenia: A multicentre randomised controlled trial. *Journal of Clinical Oncology* 2011;**29**:3977-83.

Tibaldi 2004 *{published data only}*

Tibaldi V, Aimonino N, Ponzetto M, Stasi MF, Amati D, Raspo S, et al. A randomized controlled trial of a home hospital intervention for frail elderly demented patients: behavioral disturbances and caregiver's stress. *Archives of Gerontology and Geriatrics - Supplement* 2004;**38**(9):431-6. [PMID: 15207444]

Tibaldi 2009 *{published data only}*

Tibaldi V, Isaia G, Scarafiotti C, Gariglio F, Zanocchi M, Bo M, et al. Hospital at home for elderly patients with acute decompensation of chronic heart failure: a prospective randomized controlled trial. *Archives of Internal Medicine* 2009;**169**:1569-75.

Vianello 2013 *{published data only}*

Vianello A, Savoia F, Pipitone E, Nordio B, Gallina G, Paladini L, et al. “Hospital at home” for neuromuscular disease patients with respiratory tract infection: a pilot study. *Respiratory Care* 2013;**12**(58):2061-8.

Wilson 1999 *{published and unpublished data}*

Jones J, Wilson A, Parker H, Wynn A, Jagger C, Spiers N, et al. Economic evaluation of hospital at home versus hospital care: cost minimisation analysis of data from randomised controlled trial. *BMJ* 1999;**319**(7224):1547-50. [PMID: 10591720]

* Wilson A, Parker H, Wynn A, Jagger C, Spiers N, Jones J, et al. Randomised controlled trial of effectiveness of Leicester hospital at home scheme compared with hospital care. *BMJ* 1999;**319**(7224):1542-6. [PMID: 10591717]

Wilson A, Wynn A, Parker H. Patient and carer satisfaction with 'hospital at home': quantitative and qualitative results from a randomised controlled trial. *British Journal of General Practice* 2002;**52**(474):9-13. [PMID: 11791829]

References to studies excluded from this review

Cabrol 2000 *{published data only}*

Cabrol J, Güell M, Brullet E, Campo R, Calvet X, Laporte E. Home versus hospital treatment of patients with uncomplicated upper gastrointestinal bleeding. Prospective randomized study [Tratamiento domicilario versus ingreso hospitalario de los pacientes con hemorragia digestiva alta no complicada: Estudio prospectivo y randomizado]. *Revista Española of Enfermedades Digestivas* 2000;**92**(Suppl. 1):31.

Duiverman 2019 *{published data only}*

Duiverman ML, Vonk JM, Bladder G, Van Melle JP, Nieuwenhuis J, Hazenberg A, et al. Home initiation of chronic non-invasive ventilation in COPD patients with chronic hypercapnic respiratory failure: a randomised controlled trial. *Thorax* 2019;**75**:244-52.

Hazenberg 2014 *{published data only}*

Hazenberg A, Kerstjens HA, Prins SC, Vermeulen KM, Wijkstra PJ. Initiation of home mechanical ventilation at home: a randomised controlled trial of efficacy, feasibility and costs. *Respiratory Medicine* 2014;**108**(9):1387-95.

Hill 1978 *{published data only}*

* Hill JD, Hampton JR, Mitchell JR. A randomised trial of home-versus-hospital management for patients with suspected myocardial infarction. *Lancet* 1978;**1**(8069):837-41.

King 2000 *{published data only}*

King MT, Hall J, Caleo S, Gurney HP, Harnett PR. Home or hospital? An evaluation of the costs, preferences and outcomes of domiciliary chemotherapy. *International Journal of Health Services* 2000;**30**:557-79.

Levine 2021 *{published data only}*

Levine DM, Schnipper JL. Remote physician care for home hospital patients: a randomized controlled noninferiority trial. *Journal of General Internal Medicine* 2021;**36**:S48.

Copyright © 2024 The Authors. Cochrane Database of Systematic Reviews published by John Wiley & Sons, Ltd. on behalf of The Cochrane Collaboration.

Mascardi 2016 *{published data only}*

Mascardi V, Grecchi B, Barlascini C, Banfi P, Nicolini A. Effectiveness of temporary positive expiratory pressure (T-PEP) at home and at hospital in patients with severe chronic obstructive pulmonary disease. *Journal of Thoracic Disease* 2016;**8**(10):2895-902.

Mather 1976 *{published data only}*

Mather HG, Morgan DC, Pearson NG, Read KL, Shaw DB, Steed GR, et al. Myocardial infarction: a comparison between home and hospital care for patients. *BMJ* 1976;**1**(6015):925-9.

NCT02363413 *{published data only}*

NCT02363413. Initiation of non-invasive ventilation at home versus hospital among patients with overlap syndrome (OVNI-Dom). clinicaltrials.gov/ct2/show/NCT02363413 (first received 16 February 2015).

NCT03490084 *{published data only}*

NCT03490084. Impacts on health outcomes and resources utilization of hospital-at-home for elderly patients with multiple myeloma (PAMM-HAD1). clinicaltrials.gov/ct2/show/NCT03490084 (first received 27 February 2020).

Wade 1985 *{published data only}*

Wade DT, Langton-Hewer R, Skilbeck CE, Bainton D, Burns-Cox C. Controlled trial of a home-care service for acute stroke patients. *Lancet* 1985;**1**(8424):323-6. [PMID: 2857372]

Wolfe 2000 *{published data only}*

Wolfe CDA, Tilling K, Rudd AG. The effectiveness of community-based rehabilitation for stroke patients who remain at home: a pilot randomized trial. *Clinical Rehabilitation* 2000;**14**(6):563-9. [PMID: 11128729]

References to ongoing studies

NCT03156686 *{published data only}*

NCT03156686. SAFEty and Efficacy of HOME-based hospitalization versus inpatient care for patients with acute heart failure in chronic heart failure. (SAFE-HOME). clinicaltrials.gov/ct2/show/NCT03156686 (first received 17 May 2017).

Pouw 2018 *{published data only}*

Pouw MA, Calf AH, van Munster BC, Ter Maaten JC, Smidt N, de Rooij SE. Hospital at Home care for older patients with cognitive impairment: a protocol for a randomised controlled feasibility trial. *BMJ Open* 2018;**8**(3):e020332.

Additional references

Arsenault-Lapierre 2021

Arsenault-Lapierre G, Henein M, Gaid D, Le Berre M, Gore G, Vedel I. Hospital-at-home interventions vs in-hospital stay for patients with chronic disease who present to the emergency department: a systematic review and meta-analysis. *JAMA Network Open* 2021;**4**(6):e2111568. [DOI: 10.1001/jamanetworkopen.2021.11568]

Aviv 2021

Aviv R. Intensive home care for COVID-19 to reduce admissions. *Home Health Care Management & Practice* 2021;**33**(4):320-2.

Batt 2023

Batt R, Appelbaum E. The new hospital at home movement: opportunity or threat for patient care? *Public Policy & Aging Report* 2023;**33**(2):63-9. [DOI: 10.1093/ppar/prad004]

Board 2000

Board N, Brennan N, Caplan G. A randomised controlled trial of the costs of hospital as compared with hospital at home for acute medical patients. *Australian and New Zealand Journal of Public Health* 2000;**24**(3):305-11. [PMID: 10937409]

British Geriatrics Society 2022

British Geriatrics Society. Bringing hospital care home: Virtual Wards and Hospital at Home for older people; August 2022. www.bgs.org.uk/virtualwards (accessed prior to 3 November 2023).

Bumrungrad 2023

Bumrungrad International Hospital. Bumrungrad @ Home Service Center. www.bumrungrad.com/en/centers/home-service-center (accessed prior to 23 August 2023).

Chong 2022

Chong C. Some patients can now be hospitalised at home and be cared for via teleconsultations, home visits; October 2022. www.straitstimes.com/singapore/some-patients-can-now-be-hospitalised-at-home-and-be-cared-for-via-teleconsultations-home-visits (accessed prior to 3 November 2023).

CNN Philippines 2021

CNN Philippines. Healthcare firm offers home services for patients; April 2021. www.cnnphilippines.com/news/2021/4/23/Healthcare-firm-offers-home-services-for-patients.html.

Cochran 1954

Cochran WG. The combination of estimates from different experiments. *Biometrics* 1954;**10**:101-29. [PsycINFO: 1955-00087-001]

Covinsky 2003

Covinsky KE, Palmer RM, Fortinsky RH, Counsell SR, Stewart AL, Kresevic DM, et al. Loss of independence in activities of daily living in older adults hospitalised with medical illness: increased vulnerability with age. *Journal of the American Geriatrics Society* 2003;**51**:51-8.

de Sousa Vale 2020

de Sousa Vale J, Franco AI, Oliveira CV, Araújo I, Sousa D. Hospital at home: an overview of literature. *Home Health Care Management & Practice* 2020;**32**(2):118-23.

Deeks 2001

Deeks JJ, Altman D, Bradburn MJ. Chapter 15. Statistical methods for examining heterogeneity and combining results from several studies in meta-analysis. In: Egger M, Davey Smith G, Altman DG, editors(s). Systematic Reviews in Health Care:

Copyright © 2024 The Authors. Cochrane Database of Systematic Reviews published by John Wiley & Sons, Ltd. on behalf of The Cochrane Collaboration.

Meta-Analysis in Context. 2nd edition. Wiley, 2001:285-312. [DOI: 10.1002/9780470693926.ch15]

Ellis 2017

Ellis G, Gardner M, Tsiachristas A, Langhorne P, Burke O, Harwood RH, et al. Comprehensive geriatric assessment for older adults admitted to hospital. *Cochrane Database of Systematic Reviews* 2017, Issue 9. Art. No: CD006211. [DOI: 10.1002/14651858.CD006211.pub3]

EndNote [Computer program]

EndNote 20. Philadelphia, PA: Clarivate, 2013.

EPOC 2015a

Effective Practice and Organisation of Care (EPOC). Oslo: Norwegian Knowledge Centre for the Health Services. Data collection form. EPOC Resources for review authors. epoc.cochrane.org/epoc-specific-resources-review-authors (accessed September 2015).

EPOC 2015b

Effective Practice and Organisation of Care (EPOC). Oslo: Norwegian Knowledge Centre for the Health Services. Suggested risk of bias criteria for EPOC reviews. EPOC Resources for review authors. epoc.cochrane.org/epoc-specific-resources-review-authors (accessed September 2015).

EPOC 2017

Effective Practice and Organisation of Care (EPOC). Oslo: Norwegian Knowledge Centre for the Health Services. EPOC worksheets for preparing a Summary of Findings (SoF) table using GRADE. EPOC Resources for review authors. epoc.cochrane.org/epoc-specific-resources-review-authors (accessed July 2022).

Gonçalves-Bradley 2017

Gonçalves-Bradley DC, Iliffe S, Doll HA, Broad J, Gladman J, Langhorne P, et al. Early discharge hospital at home. *Cochrane Database of Systematic Reviews* 2017, Issue 6. Art. No: CD000356. [DOI: 10.1002/14651858.CD000356.pub4]

GRADEpro GDT 2022 [Computer program]

GRADEpro GDT. Version accessed 29 December 2023. Hamilton (ON): McMaster University (developed by Evidence Prime), 2022. Available at gradepro.org.

Guyatt 2008

Guyatt GH, Oxman AD, Kunz R, Vist GE, Falck-Ytter Y, Schunemann HJ, the GRADE Working Group. What is 'quality of evidence' and why is it important to clinicians? *BMJ* 2008;**336**:995-8.

Hernandez 2003

Hernandez C, Casas A, Escarrabill J, Alonso J, Puig-Junoy J, Farrero E, et al. Home hospitalisation of exacerbated chronic obstructive pulmonary disease patients. *European Respiratory Journal* 2003;**21**(1):58-67. [DOI: 10.1183/09031936.03.00015603]

Higgins 2003

Higgins JP, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta-analyses. *BMJ* 2003;**327**(7414):557-60. [PMID: 12958120]

Higgins 2019

Higgins JPT, Thomas J, Chandler J, Compston M, Li T, Page MJ, Welch VA (editors). Cochrane Handbook for Systematic Reviews of Interventions. 2nd edition. Chichester (UK): John Wiley & Sons, 2019.

Jeppesen 2012

Jeppesen E, Bruberg KG, Vist GE, Wedzicha JA, Wright JJ, Greenstone M, et al. Hospital at home for acute exacerbations of chronic obstructive pulmonary disease. *Cochrane Database of Systematic Reviews* 2012, Issue 5. Art. No: CD003573. [DOI: 10.1002/14651858.CD003573.pub2]

Jones 1999

Jones J, Wilson A, Parker H, Wynn A, Jagger C, Spiers N, et al. Economic evaluation of hospital at home versus hospital care: cost minimisation analysis of data from randomised controlled trial. *BMJ* 1999;**319**(7224):1547-50. [PMID: 10591720]

Karacaoglu 2021

Karacaoglu K. Staff views of a hospital at home model implemented in a Scottish care setting. *AIMS Public Health* 2021;**8**(3):467.

Kimmel 2020

Kimmel LA, Burge A, Watterson D, Wolters C, Holland A, Reed M, et al. Substituting inpatient rehabilitation beds for home-based multidisciplinary rehabilitation: a qualitative study of patient perceptions. *Australasian Journal on Ageing* 2021;**40**(3):275-82. [DOI: 10.1111/ajag.12883]

Kumpf 2019

Kumpf VJ. Challenges and obstacles of long-term home parenteral nutrition. *Nutrition in Clinical Practice* 2019;**34**(2):196-203. [DOI: 10.1002/ncp.10258]

Langhorne 2020

Langhorne P, Ramachandra S. Organised inpatient (stroke unit) care for stroke: network meta-analysis. *Cochrane Database of Systematic Reviews* 2020, Issue 4. Art. No: CD000197. [DOI: 10.1002/14651858.CD000197.pub4]

Langhorne 2021

Langhorne P. The Stroke Unit Story: where have we been and where are we going? *Cerebrovascular Diseases* 2021;**50**(6):636-43. [DOI: 10.1159/000518934]

Leary 2022

Leary A. Saved bed days: the ultimate currency. *BMJ* 2022;**378**:o1686. [DOI: 10.1136/bmj.o1686]

Lefebvre 2021

Lefebvre C, Glanville J, Briscoe S, Littlewood A, Marshall C, Metzendorf M-I, et al. Technical Supplement to Chapter 4: Searching for and selecting studies. In: Higgins JP, Thomas J, Chandler J, Cumpston MS, Li T, Page MJ, et al, editor(s).

Copyright © 2024 The Authors. Cochrane Database of Systematic Reviews published by John Wiley & Sons, Ltd. on behalf of The Cochrane Collaboration.

Cochrane Handbook for Systematic Reviews of Interventions Version 6.2 (updated February 2021). Cochrane, 2021. Available from training.cochrane.org/handbook/archive/v6.2.

Leff 2006

Leff B, Burton L, Mader S, Naughton B, Burl J, Clark R, et al. Satisfaction with hospital at home care. *Journal of the American Geriatrics Society* 2006;**54**(9):1355-63. [DOI: 10.1111/j.1532-5415.2006.00855.x]

Leff 2009

Leff B. Defining and disseminating the hospital-at-home model. *CMAJ: Canadian Medical Association Journal* 2009;**180**(2):156-7.

Leff 2022

Leff B, DeCherrie LV, Montalto M, Levine DM. A research agenda for hospital at home. *Journal of the American Geriatrics Society* 2022;**70**(4):1060-9. [DOI: 10.1111/jgs.17715]

Leong 2021

Leong MQ, Lim CW, Lai YF. Comparison of Hospital-at-Home models: a systematic review of reviews. *BMJ Open* 2021;**11**(1):e043285. [DOI: 10.1136/bmjopen-2020-043285]

Levine 2021

Levine DM, Pian J, Mahendrakumar K, Patel A, Saenz A, Schnipper JL. Hospital-level care at home for acutely ill adults: a qualitative evaluation of a randomized controlled trial. *Journal of General Internal Medicine* 2021;**36**(7):1965-73. [DOI: 10.1007/s11606-020-06416-7]

Loyd 2020

Loyd C, Larkland AD, Zhang Y, Fowler M, Harper S, Wright NC, et al. Prevalence of hospital-associated disability in older adults: a meta-analysis. *Journal of the American Medical Directors Association* 2020;**21**(4):455-461.e5. [DOI: 10.1016/j.jamda.2019.09.015]

Mackay 2023

Mackay I, France M, McAuley D, Wing S, Wheeldon M, Britton S, et al. COVID-19 (Omicron strain) hospital admissions from a virtual ward – who required further care? *Influenza and Other Respiratory Viruses* 2023;**17**(3):e13108. [DOI: 10.1111/irv.13108]

Makela 2020

Mäkelä P, Stott D, Godfrey M, Ellis G, Schiff R, Shepperd S. The work of older people and their informal caregivers in managing an acute health event in a hospital at home or hospital inpatient setting. *Age and Ageing* 2020;**49**(5):856-64. [DOI: 10.1093/ageing/afaa085]

MECIR 2012

Standards for the reporting of new Cochrane Intervention Reviews. web.archive.org/web/20230328142021/https://community.cochrane.org/mecir-manual/standards-reporting-new-cochrane-intervention-reviews-r1-r109 (accessed 19 February 2016).

Mernin 2021

Mernin A. 'Hospital at home' technology to expand care capacity in India; November 2021. www.htworld.co.uk/news/hospital-at-home-india/#:~:text=The%20'hospital%20at%20home'%20system,deteriorating%20and%20high%2Drisk%20patients (accessed prior to 3 November 2023).

Monitor 2015

Monitor: Making the health sector work for patients. Moving healthcare closer to home: Literature review of clinical impacts. www.gov.uk/government/uploads/system/uploads/attachment_data/file/459268/Moving_healthcare_closer_to_home_clinical_review.pdf (accesed 17 August 2015).

Montalto 2020

Montalto M, McElduff P, Hardy K. Home ward bound: features of hospital in the home use by major Australian hospitals, 2011–2017. *Medical Journal of Australia* 2020;**213**(1):22-7. [DOI: 10.5694/mja2.50599]

Mudge 2019

Mudge AM, McRae P, Hubbard RE, Peel NM, Lim WK, Barnett AG, et al. Hospital-associated complications of older people: a proposed multicomponent outcome for acute care. *Journal of the American Geriatrics Society* 2019;**67**(2):352-6.

Naik 2006

Naik G. Portland hospital gives acutely ill a homecare option; 19 April 2006. www.wsj.com/articles/SB114540442717929396 (accessed prior to 3 November 2023).

NCT04330378

NCT04330378. A hospital-at-home pilot in Singapore: a prospective quasi-experimental cohort study. clinicaltrials.gov/study/NCT04330378 (first received 31 March 2020).

NHS Digital 2019

NHS Digital. Hospital admitted patient care and adult critical care activity. digital.nhs.uk/data-and-information/publications/statistical/hospital-admitted-patient-care-activity/2018-19#summary (accessed 22 February 2021).

NHS England 2021

NHS England. Guidance note: Frailty virtual ward (Hospital at Home for those living with frailty); December 2021. www.england.nhs.uk/publication/guidance-note-frailty-virtual-ward-hospital-at-home-for-those-living-with-frailty/ (accessed prior to 3 November 2023).

NICE 2019

National Institute for Health and Care Excellence. Stroke and transient ischaemic attack in over 16s: diagnosis and initial management NICE guideline NG128; May 2019. www.nice.org.uk/guidance/ng128/chapter/recommendations#specialist-care-for-people-with-acute-stroke (accessed prior to 3 November 2023).

Nogues 2021

Nogués X, Sánchez-Martinez F, Castells X, Díez-Pérez A, Sabaté RA, Petit I, et al. Hospital-at-Home expands hospital capacity during COVID-19 pandemic. *Journal of the American Medical Directors Association* 2021;**22**(5):939-42.

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Nolte 2008

Nolte E, McKee M. Caring for People With Chronic Conditions: A Health System Perspective. Maidenhead: McGraw Hill Open University Press, 2008.

Nundy 2020

Nundy S, Patel KK. Hospital-at-home to support COVID-19 surge – time to bring down the walls? *JAMA Health Forum* 2020;**1**(5):e200504. [DOI: 10.1001/jamahealthforum.2020.0504]

Oliver 2021

Oliver D. David Oliver: the pandemic has delivered clinical service innovations worth keeping. *BMJ* 2021;**373**:n1306. [DOI: 10.1136/bmj.n1306]

Patel 2004

Patel A, Knapp M, Perez I, Evans A, Kalra L. Alternative strategies for stroke care: cost effectiveness and cost utility analysis from a prospective randomised controlled trial. *Stroke* 2004;**35**(1):196-203. [PMID: 14684783]

Qaddoura 2015

Qaddoura A, Yazdan-Ashoori P, Kabali C, Thabane L, Haynes RB, Connolly SJ, et al. Efficacy of hospital at home in patients with heart failure: a systematic review and meta-analysis. *PLOS One* 2015;**10**(6):e0129282. [DOI: 10.1371/journal.pone.0129282]

Queensland Government 2022

Queensland Government. Hospital in the home. www.health.qld.gov.au/system-governance/policies-standards/guidelines/hospital-in-the-home (accessed prior to 3 November 2023).

Rafter 2015

Rafter N, Hickey A, Condell S, Conroy R, O'Connor P, Vaughan D, et al. Adverse events in healthcare: learning from mistakes. *QJM* 2015;**108**(4):273-7.

RCP 2017

Royal College of Physicians. Delivering the future hospital: full report. www.rcplondon.ac.uk/projects/outputs/future-hospital-programme-delivering-future-hospital (accessed 22 February 2021).

Review Manager 2020 [Computer program]

Review Manager (RevMan). Version 5.4. Copenhagen: The Cochrane Collaboration, 2020.

Shepperd 2016b

Shepperd S, Gonçalves-Bradley DC, Wee B, Straus SE. Hospital at home: home-based end of life care. *Cochrane Database of Systematic Reviews* 2021, Issue 3. Art. No: CD009231. [DOI: 10.1002/14651858.CD009231.pub3]

Simon 2022

Simon DA, Cohen IG, Balatbat C, Offodile AC 2nd. The hospital-at-home presents novel liabilities for physicians, hospitals, caregivers, and patients. *Nature Medicine* 2022;**28**(3):438-41. [DOI: 10.1038/s41591-022-01697-3]

Singh 2022

Singh S, Gray A, Shepperd S, Stott DJ, Ellis G, Hemsley A, et al. Is comprehensive geriatric assessment hospital at home a cost-effective alternative to hospital admission for older people? *Age and Ageing* 2022;**51**(1):afab220. [DOI: 10.1093/ageing/afab220]

Stata 16.1 [Computer program]

Stata Statistical Software: Release 16.. StataCorp. College Station, TX: StataCorp LLC., 2019.

Steventon 2018

Steventon A, Deeny S, Friebel R, Gardner T, Thorlby R. Emergency hospital admissions in England: Which may be avoidable and how? www.health.org.uk/publications/emergency-hospital-admissions-in-england-which-may-be-avoidable-and-how (accessed 22 February 2021).

Thornton 2020

Thornton J. The 'virtual wards' supporting patients with covid-19 in the community. *BMJ* 2020;**369**:m2119. [DOI: 10.1136/bmj.m2119]

Vindrola-Padros 2021

Vindrola-Padros C, Singh KE, Sidhu MS, Georghiou T, Sherlaw-Johnson C, Tomini SM, et al. Remote home monitoring (virtual wards) for confirmed or suspected COVID-19 patients: a rapid systematic review. *EClinicalMedicine* 2021;**37**:100965. [DOI: 10.1016/j.eclinm.2021.100965]

Virtual Wards 2022

NHS England. Bringing hospital care home: Virtual Wards and Hospital at Home for older people. www.england.nhs.uk/virtual-wards/ (accessed 2 December 2022).

Vlachantoni 2012

Vlachantoni A. Financial inequality and gender in older people. *Maturitas* 2012;**72**(2):104-7. [DOI: 10.1016/j.maturitas.2012.02.015]

Wallis 2024

Wallis JA, Shepperd S, Makela P, Han JX, Tripp EM, Gearon E, et al. Factors influencing the implementation of early discharge hospital at home and admission avoidance hospital at home: a qualitative evidence synthesis. *Cochrane Database of Systematic Reviews* 2024, Issue 3. Art. No: CD014765. [DOI: 10.1002/14651858.CD014765.pub2]

WHO 2021 to 2030

World Health Organization. WHO's work on the UN Decade of Healthy Ageing (2021-2030). www.who.int/initiatives/decade-of-healthy-ageing (accessed 3 May 2023).

Young 2005

Young H, Grundy E, Kalogirou S. Who cares? Geographic variation in unpaid caregiving in England and Wales: evidence from the 2001 census. *Population Trends* 2005;**120**:23-34.

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References to other published versions of this review

Shepperd 1998

Shepperd S, Iliffe S. Effectiveness of hospital at home compared to in-patient hospital care. *Cochrane Database of Systematic Reviews* 1998, Issue 1. Art. No: CD000356. [DOI: 10.1002/14651858.CD000356]

Shepperd 2005

Shepperd S, Iliffe S. Hospital at home versus in-patient hospital care. *Cochrane Database of Systematic Reviews* 2005, Issue 3. Art. No: CD000356. [DOI: 10.1002/14651858.CD000356.pub2] [PMID: 16034853]

Shepperd 2008

Shepperd S, Doll H, Angus RM, Clarke MJ, Illife S, Kalra L, et al. Hospital at home admission avoidance. *Cochrane Database of Systematic Reviews* 2008, Issue 4. Art. No: CD007491. [DOI: 10.1002/14651858.CD007491]

Shepperd 2016a

Shepperd S, Iliffe S, Doll HA, Clarke MJ, Karla L, Wilson AD, et al. Admission avoidance hospital at home. *Cochrane Database of Systematic Reviews* 2016, Issue 9. Art. No: CD007491. [DOI: 10.1002/14651858.CD007491.pub2]

* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Andrei 2011

Study characteristics	
Methods	Parallel randomised trial
Participants	Setting: Romania People with chronic heart failure who had deteriorated at a minimum of 1 week prior to recruitment. Number of participants in each group was not reported, a total of 45 participants recruited.
Interventions	Admission avoidance hospital at home; the first 48 hours of treatment was in the emergency department
Outcomes	Mortality, biological measures, and cost
Notes	Follow-up at 1, 3, 6, and 12 months Funding: the study was published as an abstract, details not reported Conflicts of interest: details not reported Ethical approval: details not reported

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	The study was published as an abstract, details not reported
Allocation concealment (selection bias)	Unclear risk	The study was published as an abstract, details not reported
Baseline outcome measurements (selection bias)	Unclear risk	The study was published as an abstract, details not reported
Baseline characteristics (selection bias)	Unclear risk	The study was published as an abstract, details not reported

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Andrei 2011 *(Continued)*

Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Blinding of participants and personnel not possible
Blinding of outcome assessment (detection bias) Subjective outcomes	Unclear risk	Not reported
Blinding of outcome assessment (detection bias) Objective outcomes	Unclear risk	Methods not reported
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	The study was published as an abstract, details not reported
Selective reporting (reporting bias)	Unclear risk	The study was published as an abstract, details not reported

Caplan 1999

Study characteristics	
Methods	Parallel randomised trial Study conducted between October 1995 and February 1997.
Participants	Setting: Australia Range of acute conditions requiring admission to hospital; participants recruited from casualty Number recruited: hospital at home: 51; hospital: 49
Interventions	Hospital community outreach team Type of service: hospital community outreach team. Clinical responsibility by GP, or hospital doctor if GP declined
Outcomes	Functional status, mental status, clinical complications, patient and caregiver satisfaction, GP views
Notes	Follow-up: 1 and 6 months Funding: not reported Conflicts of interest: not reported Ethical approval: hospital ethical committee

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated random numbers, stratified by participant's residence and if they had a deep vein thrombosis

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Caplan 1999 *(Continued)*

Allocation concealment (selection bias)	Low risk	Sealed envelope
Baseline outcome measurements (selection bias)	Low risk	Baseline outcome measurements done prior to intervention for functional and mental status, and diagnoses; no relevant differences found
Baseline characteristics (selection bias)	Low risk	Baseline characteristics of treatment and control groups are reported and are similar
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Blinding of participants and personnel not possible
Blinding of outcome assessment (detection bias) Subjective outcomes	Unclear risk	Unclear risk for functional status, mental status, clinical complications, patient and caregiver satisfaction, GP view
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	Low risk for mortality, readmission
Incomplete outcome data (attrition bias) All outcomes	Low risk	No loss to follow-up reported
Selective reporting (reporting bias)	Unclear risk	Insufficient information to allocate low or high risk

Corwin 2005

Study characteristics	
Methods	Parallel randomised trial Study conducted between July 2002 and June 2003.
Participants	Setting: New Zealand Patients with cellulitis Number recruited: treatment: 98, control: 96 Ages, mean (SD): T: 54.6 (20.6), C: 48.4 (19) European: T: 77/98 (79%), C: 78/96 (81%) Maori: T: 10/98 (10%), C: 5/96 (5%) Pacific: T: 2/98 (2%), C: 1/96 (1%) Other: T: 9/98 (9%), C: 13/96 (12%)
Interventions	Hospital at home admission avoidance from the emergency department. Run by Pegasus Health, an independent practitioner's association for 230 GPs in Christchurch, New Zealand. Care provided by GP and community care nursing staff. Patients required IV antibiotics for cellulitis.

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Corwin 2005 *(Continued)*

Outcomes	Advancement of cellulitis, readmission, days on IV antibiotics, functional outcomes (SF-36), patient satisfaction
Notes	Follow up: 3 and 6 days Funding: Pegasus Health Conflicts of interest: none declared Ethical approval: local ethical committee

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomisation list produced by SAS code
Allocation concealment (selection bias)	Low risk	Telephone randomisation service
Baseline outcome measurements (selection bias)	Low risk	Baseline outcome measurements done prior to intervention for functional outcomes; no relevant differences found
Baseline characteristics (selection bias)	Low risk	Baseline characteristics of treatment and control groups are reported and similar for main characteristics
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Blinding of participants and personnel not possible
Blinding of outcome assessment (detection bias) Subjective outcomes	Unclear risk	Unclear risk for pain, functional and physical health (SF-36), and satisfaction
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	Low risk for advancement of cellulitis
Incomplete outcome data (attrition bias) All outcomes	Low risk	3 from each group excluded at follow-up
Selective reporting (reporting bias)	Unclear risk	Insufficient information to allocate low or high risk

Davies 2000

Study characteristics

Methods	Parallel randomised trial Study conducted between February 1998 and August 1999.
Participants	Setting: UK

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Davies 2000 *(Continued)*

	Patients with chronic obstructive airways disease Number recruited: hospital at home: 100, hospital: 50
Interventions	Hospital at home Type of service: admission avoidance from A&E. Care provided by outreach specialist nurses and GP and community nurses if required.
Outcomes	Respiratory function, readmission, quality of life
Notes	Few details on measure of quality of life Follow up: 2 weeks and 3 months Funding: North Mersey Community (NHS) Trust and University of Liverpool (UK) Conflicts of interest: none declared Ethical approval: district ethical committee This author contributed IPD for a previous update of this review (Shepperd 2016a).

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Ratio of 2:1 (hospital at home: hospital)
Allocation concealment (selection bias)	Low risk	Opaque, sealed envelopes
Baseline outcome measurements (selection bias)	Low risk	Baseline outcome measurements done prior to intervention for respiratory function; no relevant differences found
Baseline characteristics (selection bias)	Low risk	Baseline characteristics of the study and control groups are reported and are similar
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Blinding of participants and personnel not possible Hospital readmission was a primary outcome, with decision to admit made by hospital staff
Blinding of outcome assessment (detection bias) Subjective outcomes	Unclear risk	A small group of participants completed the St George's Respiratory Questionnaire
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	Low risk for admission to hospital, changes in FEV1 score
Incomplete outcome data (attrition bias) All outcomes	Low risk	Loss to follow-up: hospital at home: 7/100; hospital: 5/50
Selective reporting (reporting bias)	Low risk	All outcomes reported (received trial data set)

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Echevarria 2018

Study characteristics	
Methods	Parallel randomised trial Study conducted between June 2014 and January 2016.
Participants	Setting: UK Patients aged >= 35 years, admitted to hospital with COPD exacerbation and low mortality risk. Those with life expectancy < 1 year due to illness other than COPD, long-term ventilation, and coexistent secondary diagnosis necessitating admission were excluded. Number recruited: hospital at home: 62; usual care: 58 (analysed: hospital at home: 60; usual care: 58) Mean age (SD): T: 71 (9.6), C: 68.7 (10.5) Female: T: 32/60 (53%), C: 30/58 (52%) Approximately 1/5 of participants also had ischaemic heart disease and depression.
Interventions	The intervention consisted of once- or twice-daily visits from a respiratory specialist nurse, under remote supervision from a respiratory consultant. An emergency contact number allowed patients to contact the team 24/7. Patients were monitored daily, and blood sampling was taken as required. Other available services included oral and IV therapies, acute controlled oxygen therapy, physiotherapy, psychology, occupational therapy, and formal social care. Comparison: usual hospital care
Outcomes	Main outcomes: health and social care costs over 90 days (non-inferiority analysis) Other outcomes: survival; all-cause and respiratory readmission rates; bed days over a) acute period of care, and b) postdischarge to 90 days; caregiver and patient preference; COPD exacerbations; unplanned health resource use; HADS score; quality of life; caregiver burden; perceptions of health care of patients and their caregivers and health professionals regarding the use of the clinical score for group allocation
Notes	Follow-up: 90 days Trial registry: ISRCTN29082260 Funding: National Institute for Health Research (NIHR, UK) Conflicts of interest: "SCB reports grants from NIHR: Research for Patient Benefit Programme, during the conduct of the study; HTA funding, grants from Philips Respironics and Pfizer Open Air, personal fees from Pfizer and AstraZeneca, outside the submitted work. JG reports grants from NIHR Research for Patient Benefit, during the conduct of the study. CE, GJG, TH, AJS and JS have no competing interests to declare." Ethical approval: local ethics committee

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: “Allocation to HAH or UC was based on 1:1 randomisation, performed by minimisation undertaken by an external, independent agency (sealedenvelope. com)”

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Echevarria 2018 *(Continued)*

Allocation concealment (selection bias)	Low risk	Quote: “The researchers were blind to the method of allocation for individual patients. For the primary cost analysis, the health economist was blinded to group allocation”
Baseline outcome measurements (selection bias)	Low risk	Comment: similar proportion of ECOPD treatment prior to admissions, Hospital Anxiety and Depression score, COPD assessment tool, and utility scores (EQ-5D-5L)
Baseline characteristics (selection bias)	Low risk	Quote: “Groups were well matched with respect to minimisation indices”
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Quote: “For the primary cost analysis, the health economist was blinded to group allocation.”
Blinding of outcome assessment (detection bias) Subjective outcomes	Low risk	Comment: subjective outcome was 'stated preference for HAH care day 14' (subjective to patient, did not require subjective judgement by researcher) Quote: “Patients in both arms maintained a diary of all health and social care visits and attendances, and were phoned every 2 weeks to prompt completion and collect data.”
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	Quote: “For the primary cost analysis, the health economist was blinded to group allocation.”
Incomplete outcome data (attrition bias) All outcomes	Low risk	Comment: sensitivity analysis carried out for missing data
Selective reporting (reporting bias)	Low risk	Comment: outcomes are consistent between trial registry and published results.

Harris 2005

Study characteristics	
Methods	Parallel randomised trial Dates of study not reported.
Participants	Setting: New Zealand Patients had a broad range of diagnoses: fractures (28%); miscellaneous medical problems (18%); respiratory problems (16%); stroke and neurological diagnoses (14%); falls and injuries (11%); cardiac diagnoses (8%); and rehabilitation and other problems (5%). Number recruited: hospital at home: 39, hospital: 37
Interventions	Operated as a hospital outreach programme under the management of Auckland Hospital from the emergency department or acute assessment ward. A nurse-led multidisciplinary team (physiotherapy, occupational therapy, social work) co-ordinated care and rehabilitation for the patient within the patient's own home. There was a daily nursing review. Clinical responsibility was held by a dedicated hospital at home registrar, a consultant geriatrician, and in some cases the patient's GP, with 24-hour on-call medical cover. The service provided care 7 days a week with 10 hours of nursing care a day

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Harris 2005 *(Continued)*

	available, and a 24-hour live-in home caregiver if required. There was a daily nursing review, and a discharge handover to ongoing support services. The study included 2 treatment groups and a control (hospital) group. 1 treatment group was an "admission prevention" group and the other an "early discharge" group. We received IPD for the admission prevention and control groups only from the trialist.
Outcomes	Activities of daily living, cognitive function, instrumental activities of daily living
Notes	Follow-up: 90 days Funding: Northern Regional Health Authority (New Zealand) Conflicts of interest: not reported Ethical approval: local ethics committee This author contributed IPD for a previous update of this review (Shepperd 2016a).

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated randomisation service
Allocation concealment (selection bias)	Low risk	Telephone randomisation service
Baseline outcome measurements (selection bias)	Low risk	Baseline outcome measurements done prior to intervention for activities of daily living, instrumental activities of daily living, and cognitive functioning; no relevant differences found
Baseline characteristics (selection bias)	Low risk	Baseline characteristics of the study and control groups are reported and are similar
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Blinding of participants and personnel not possible Research staff did not make decision to admit to hospital
Blinding of outcome assessment (detection bias) Subjective outcomes	Low risk	Trained researchers not involved in patient care assessed participants for functional independence (FIM), cognitive function (MMSE), and instrumental activities of daily living (OARS)
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	Low risk for mortality, readmission, and measurement and valuation of costs
Incomplete outcome data (attrition bias) All outcomes	Low risk	Participants withdrawing: hospital at home: 4/143; hospital: 10/124
Selective reporting (reporting bias)	Low risk	All outcomes reported (received trial data set)

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Kalra 2000

Study characteristics	
Methods	Parallel randomised trial Study conducted between April 1995 and October 1999.
Participants	Setting: UK Patients recovering from a moderately severe stroke Number recruited: hospital at home: 153; stroke unit care: 152; hospital care: 152 Median age (IQR): T: 75 (72 to 84), C: 77.7 (67 to 83) Living alone: T: 50/148 (34%), C: 50/149 (34%)
Interventions	Hospital outreach admission avoidance multidisciplinary with joint care from community services
Outcomes	Mortality, institutionalisation, level of independence, activities of daily living, treatment inputs, readmission, hospital length of stay, cost
Notes	Follow-up: 3, 6, and 12 months Funding: NHS R&D Executive's Health Technology Assessment Programme; Stroke Association; Bromley Health Authority (UK) Conflicts of interest: not reported Ethical approval: local ethics committee

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Block randomisation, computer-generated random numbers
Allocation concealment (selection bias)	Low risk	Telephone randomisation
Baseline outcome measurements (selection bias)	Low risk	Baseline outcome measurements done prior to intervention for level of independence and activities of daily living; no relevant differences found
Baseline characteristics (selection bias)	Low risk	Baseline characteristics of the study and control groups are reported and are similar
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Blinding of participants and personnel not possible Primary outcome: death
Blinding of outcome assessment (detection bias) Subjective outcomes	Low risk	A trained researcher, independent of the health care provided and unaware of treatment allocation, assessed functional status (Barthel and Rankin scale)
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	Low risk for mortality, institutionalisation, resource use and cost

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Kalra 2000 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	Low risk	Loss to follow-up: hospital at home: 9/144; hospital: 3/152
Selective reporting (reporting bias)	Low risk	All outcomes reported (received trial data set)

Levine 2018

Study characteristics	
Methods	Parallel pilot randomised trial Study conducted between September and November 2016.
Participants	Setting: USA Patients aged >= 18 years, attending the emergency department with a primary diagnosis of any infection, heart failure exacerbation, COPD exacerbation, or asthma exacerbation. Those residing in a facility that provided on-site medical care or who were at high risk for clinical deterioration were excluded. Number recruited: hospital at home: 9; usual care: 11 Median age (IQR): T: 65 (28), C: 60 (29) Female: T: 2/9 (22%), C: 8/11 (73%) Participants had on average 6 comorbidities and took 9 medications.
Interventions	The intervention was tailored to the patient's needs. There was at least 1 daily visit from an attending general internist and 2 daily visits from a home health registered nurse; additional services included medical meals and the services of a home health aide, social worker, physical therapist, and/or occupational therapist. Home services included oxygen and respiratory therapies, radiology, and point-of-care blood diagnostics; patients were remotely monitored for heart rate, respiratory rate, telemetry, movement, falls, and sleep via a small skin patch. Control group: usual hospital care; patients were also monitored using the same skin patch.
Outcomes	Main outcome: total cost of the hospitalisation Other outcomes: length of stay, readmissions, healthcare use, quality of life, activities of daily living, satisfaction with care
Notes	Follow-up: 30 days Funding: Partners HealthCare Population Health Management; Institutional National Research Service Award; Ryoichi Sasakawa Fellowship Fund (USA) Conflicts of interest: none reported Ethical approval: approved by local ethical committee Trial registry: NCT02864420
Risk of bias	
Bias	**Authors' judgement** **Support for judgement**

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Levine 2018 *(Continued)*

Random sequence generation (selection bias)	Low risk	Quote: "stratified by condition with randomly selected block sizes between 4 and 6"
Allocation concealment (selection bias)	Low risk	Quote: "allocation concealment via sealed envelopes"
Baseline outcome measurements (selection bias)	Unclear risk	Comment: participants allocated to the control group reported more depression symptoms and lower self-assessed quality of life. There was little or no difference between groups for hospital admission and ED visits in the past 6 months
Baseline characteristics (selection bias)	Unclear risk	Comment: participants allocated to the control group were younger, more likely to be female and speak English, more educated and less likely to be privately insured. Although these were sub-threshold values, the sample is very small.
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Blinding of participants and personnel not possible.
Blinding of outcome assessment (detection bias) Subjective outcomes	Low risk	No subjective outcomes.
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	Quote: "All measures were derived from the EHR, except falls, physical activity, and sleep, which were observed via the skin patch."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Comment: very low attrition.
Selective reporting (reporting bias)	Unclear risk	Comment: primary and secondary outcomes are the same as per trial registry. There are other outcomes mentioned in the trial registry but not in the publication.

Levine 2020

Study characteristics	
Methods	Parallel pilot randomised trial Study conducted between June 2017 and January 2018; follow-up ended on 17 February 2018.
Participants	Setting: USA Patients aged >= 18 years, attending the emergency department with a primary diagnosis of any infection, heart failure exacerbation, COPD exacerbation, or asthma exacerbation. Those residing in a residential or rehabilitation facility or who were at high risk for clinical deterioration were excluded. Number recruited: hospital at home: 43; usual care: 48 (all randomised) Median age (IQR): T: 80 (19), C: 72 (23) Female: T: 15/43 (35%), C: 18/48 (38%)

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Levine 2020 *(Continued)*

	Patients were generally frail and chronically ill and used hospital care frequently.
Interventions	The intervention was tailored to the patient's needs. There was at least 1 daily visit from an attending general internist and 2 daily visits from a home health registered nurse; additional services included medical meals and the services of a home health aide, social worker, physical therapist, and/or occupational therapist. Home services included oxygen and respiratory therapies, radiology, and point-of-care blood diagnostics; patients were remotely monitored for heart rate, respiratory rate, telemetry, movement, falls, and sleep via a small skin patch. Care was available 24/7 from the attending physician. Control group: usual hospital care; sleep was monitored using the same skin patch as the intervention group.
Outcomes	Main outcome: total cost of the hospitalisation Other outcomes: length of stay, readmissions, healthcare use, quality of life, activities of daily living, satisfaction with care
Notes	Follow-up: 30 days Funding: Partners HealthCare Center for Population Health and internal departmental funds (USA) Conflicts of interest: "Dr. Levine reports grants from Biofourmis outside the submitted work. Dr. Blanchfield reports consulting income from Verily, GreyBird Ventures, and Atlas5D outside the submitted work. Dr. Schnipper reports grants from Mallinckrodt Pharmaceuticals and Portola Pharmaceuticals outside the submitted work." Ethical approval: approved by local ethical committee Trial registry: NCT03203759 The study was stopped early after enrolling 91 patients (76% of intended sample) "in light of local operational needs to quickly increase home hospital capacity after positive interim outcomes were presented to hospital leadership". 63% of patients approached and possibly eligible refused to participate.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	An outside statistician generated the randomization using SAS (SAS Institute). Randomization was stratified by infection, heart failure, chronic obstructive pulmonary disease or asthma, and other diagnosis; block sizes between 4 and 6 were randomly selected,
Allocation concealment (selection bias)	Low risk	Comment: allocation was concealed via sealed opaque envelopes.
Baseline outcome measurements (selection bias)	Low risk	Comment: the primary outcome was the direct cost of an acute care episode, data were obtained from the electronic record
Baseline characteristics (selection bias)	Unclear risk	Comment: a few differences between groups, with the largest difference being for the numbers who recorded having a home health aide at baseline: HAH 17/43 (40%) vs control 10/48 (21%)
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Comment: patients, study staff and physicians were not blinded to allocation status.

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Levine 2020 *(Continued)*

Blinding of outcome assessment (detection bias) Subjective outcomes	Unclear risk	Comment: unclear risk of bias for unblinded assessment of physical activity, patient experience, and quality during the acute care episode
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	Comment: the primary outcome was the direct cost of an acute care episode; secondary outcomes were health care use, physical activity, patient experience, safety (medication and delirium), and quality of care during the acute care episode
Incomplete outcome data (attrition bias) All outcomes	Low risk	Comment: "If patients could not be reached 30 days after discharge (8 total patients, 1 in the home group and 7 in the control group), we used EHR data alone to estimate health care use and readmission rates and did not measure patient experience." (page 79)
Selective reporting (reporting bias)	Low risk	Comment: outcomes are consistent between trial registry and published results.

Mendoza 2009

Study characteristics	
Methods	Parallel randomised trial Study conducted between May 2006 and March 2007.
Participants	Setting: Spain Patients in A&E with acute decompensation of chronic heart failure Inclusion criteria: > 65 years of age, with heart failure for at least 12 months prior to study, NYHA functional class II or III prior to acute episode, all-day supervision available, telephone, < 10 kilometres from hospital Age > 65 years, mean age 79. 29% female in hospital arm, 51% female in hospital at home arm Number recruited (between May 2006 and March 2007): hospital at home: 37; hospital: 34
Interventions	Admission avoidance hospital at home; patients admitted from emergency departments, hospital outreach model. Hospital at home nurse visited within 12 to 24 hours of admission to hospital at home and then daily visits. Care available between 8 a.m. and 9 p.m.; patients called emergency services outside these hours. Hospital specialist visited daily or every other day, depending on patient's condition. Control group: admitted to hospital
Outcomes	Mortality, readmission, functional status, general health status, length of stay, costs
Notes	Follow-up: 1 year after discharge Funding: Caja Vital Kutxa (Spain) Conflicts of interest: none declared Ethical approval: approved by the hospital ethical committee This author contributed IPD for a previous update of this review (Shepperd 2016a).
Risk of bias	

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Mendoza 2009 *(Continued)*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Randomisation described as "externally generated sequence."
Allocation concealment (selection bias)	Low risk	Random sequence hidden from the physician until patient had consented to participate
Baseline outcome measurements (selection bias)	Low risk	Baseline outcome measurements done prior to intervention for functional status and general health status; no relevant differences found
Baseline characteristics (selection bias)	Low risk	Baseline characteristics of the study and control groups are reported and are similar
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Blinding of participants and personnel not possible
Blinding of outcome assessment (detection bias) Subjective outcomes	Unclear risk	A trained researcher, independent of the health care provided, assessed functional status (Barthel Index), health-related quality of life (SF-36)
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	Low risk for death, readmission
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	9 of 80 did not complete the study (2 in hospital at home group, 7 in hospital group)
Selective reporting (reporting bias)	Unclear risk	Insufficient information to allocate low or high risk

Nicholson 2001

Study characteristics	
Methods	Parallel randomised trial Study conducted between October 1999 and October 2000.
Participants	Setting: Australia Patients with COPD Inclusion criteria: age > 45 years, COPD, current or ex-smoker, FEV1 < 60% predicted, admission requested by GP or OPD clinic staff or ED staff, telephone at home Number recruited: hospital at home: 13; hospital: 12
Interventions	Hospital at home (discharge from emergency department) Patients retained in patient status and received clinical supervision from hospital specialist, and hospital had legal and financial responsibility; also received care from GP, community nursing, and domiciliary care. Hospital medical staff provided 24-hour telephone support.

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Nicholson 2001 *(Continued)*

Outcomes	Cost to the health service
Notes	Follow-up: duration of care in hospital at home or inpatient care Funding: the Commonwealth Department of Health and Aged Care, National Demonstration Hospitals Program Phase 3 Conflicts of interest: not reported Ethical approval: not reported

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Random sequence generation not described
Allocation concealment (selection bias)	Unclear risk	Allocation concealment not described
Baseline outcome measurements (selection bias)	Unclear risk	Baseline outcome measurements not reported
Baseline characteristics (selection bias)	Unclear risk	Baseline characteristics of the study and control groups not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Blinding of participants and personnel not possible
Blinding of outcome assessment (detection bias) Subjective outcomes	Unclear risk	None reported
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	Low risk for resource use and cost
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information to allocate low or high risk
Selective reporting (reporting bias)	Unclear risk	Insufficient information to allocate low or high risk

Ricauda 2004

Study characteristics

Methods	Parallel randomised trial Participants recruited from January 1997 to February 1998.
Participants	Setting: Italy

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Ricauda 2004 *(Continued)*

	Patients recovering from a stroke Eligibility criteria: patients admitted to hospital within 24 hours of the onset of symptoms and evaluated for at least 24 hours Age (IQR): 76 to 88, median 82 Number recruited: hospital at home: 60; hospital: 60
Interventions	Hospital outreach admission avoidance. 24-hour care available from a multidisciplinary team: physiotherapist, occupational therapist, nursing, hospital geriatrician, social worker, speech therapist, psychologist
Outcomes	Length of treatment, mortality, activities of daily living, functional impairment, depression, costs
Notes	Follow-up: 6 months External funding not reported. Conflicts of interest: not reported Ethical approval: obtained from the San Giovanni Battista Hospital ethics committee

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Block randomisation
Allocation concealment (selection bias)	Unclear risk	Not described
Baseline outcome measurements (selection bias)	Low risk	Baseline outcome measurements done prior to intervention for activities of daily living, functional impairment, and depression; no relevant differences found
Baseline characteristics (selection bias)	Low risk	Baseline characteristics of the study and control groups are reported and are similar
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Blinding of participants and personnel not possible
Blinding of outcome assessment (detection bias) Subjective outcomes	Low risk	Outcomes assessor blinded to the study allocation, and used validated measures of outcome
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	Outcomes assessor blinded to the study allocation
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Withdrawals not reported
Selective reporting (reporting bias)	Unclear risk	Insufficient information to allocate low or high risk

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Ricauda 2008

Study characteristics	
Methods	Parallel randomised trial Study conducted between April 2004 and April 2005.
Participants	Setting: Italy Patients requiring acute hospitalisation for acute exacerbation of COPD; care supervision at home; telephone connection; living in the catchment area; family or social support Age (SD): T: 80.1 (3.2), C: 79.2 (3.1) Number recruited: hospital at home: 52; inpatient: 52
Interventions	Physician-led admission avoidance hospital outreach service; GHHS of a regional hospital. The home care programme emphasised patient and caregiver education about the disease, advice about smoking cessation, nutrition, management of activities of daily living and energy conservation, understanding and use of drugs, health maintenance, and early recognition of triggers of exacerbation that require medical intervention. In the first days after admission to GHHS, physicians and nurses visited each patient at home daily, then daily visits by the nurse and visits by the doctor every 2 to 3 days or less. Blood tests, electrocardiogram, spirometry, pulse oximetry, oxygen, IV fluids, antimicrobials and other medications, blood transfusions, surgical treatment for pressure ulcers were available. Control group: inpatient hospital care
Outcomes	Mortality, readmission, health status, satisfaction, residential care, length of stay, resource use and cost, caregiver outcomes
Notes	Follow-up: 6 months Funding: S. Giovanni Battista Hospital of Torino Conflict of interest: public funds of S. Giovanni Battista Hospital of Torino were used in this study. The editor-in-chief has reviewed the conflict of interest checklists provided by the authors and determined that none of the authors have any financial or any other kind of personal conflicts with this manuscript. Ethical approval: ethical approval was obtained from the hospital ethics committee.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated random numbers
Allocation concealment (selection bias)	Low risk	The project manager randomly allocated participants using a numbered set of sealed envelopes
Baseline outcome measurements (selection bias)	Low risk	Baseline outcome measurements done prior to intervention for health status; no relevant differences found
Baseline characteristics (selection bias)	Low risk	Baseline characteristics of the study and control groups are reported and are similar

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Ricauda 2008 *(Continued)*

Blinding of participants and personnel (performance bias) All outcomes	Low risk	Data collected by independent postgraduate physicians who were not involved in the care of patients or the research team
Blinding of outcome assessment (detection bias) Subjective outcomes	Low risk	Outcomes assessed by a postgraduate doctor not involved with delivery of health care, and blinded to the study allocation
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	Outcomes assessed by a postgraduate doctor not involved with delivery of health care, and blinded to the study allocation
Incomplete outcome data (attrition bias) All outcomes	Low risk	No loss to follow-up
Selective reporting (reporting bias)	Low risk	Standard set of outcomes reported

Richards 2005

Study characteristics	
Methods	Parallel randomised trial Study conducted between July 2002 and October 2003.
Participants	Setting: New Zealand Patients with community-acquired pneumonia Age: T: 50.1, C: 49.8 Number recruited: hospital at home: 24; hospital: 25
Interventions	Hospital at home: admission avoidance from emergency room. Run by Pegasus Health, an independent practitioner's association for 230 GPs in Christchurch, New Zealand. Care provided by GP and community care nursing staff.
Outcomes	Median number of days to discharge, days of IV antibiotics, functional outcomes, mortality, readmission, patient satisfaction, costs
Notes	Follow-up: 2 and 6 weeks Funding: not reported Conflicts of interest: none reported Ethical approval: local ethics committee Canterbury Ethics Committee, Christchurch, New Zealand

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer-generated random numbers

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Richards 2005 *(Continued)*

Allocation concealment (selection bias)	Low risk	Telephone randomisation
Baseline outcome measurements (selection bias)	Low risk	Baseline outcome measurements done prior to intervention for functional outcomes; no relevant differences found
Baseline characteristics (selection bias)	Low risk	Baseline characteristics of the study and control groups are reported and are similar
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Blinding of participants and personnel not possible
Blinding of outcome assessment (detection bias) Subjective outcomes	Unclear risk	Patient-rated symptoms, satisfaction
Blinding of outcome assessment (detection bias) Objective outcomes	Unclear risk	Days on IV antibiotics, admissions extracted from clinical records
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	6 exclusions after randomisation, no loss to follow-up
Selective reporting (reporting bias)	Unclear risk	Insufficient information to allocate low or high risk

Shepperd 2021

Study characteristics	
Methods	Parallel randomised trial First participant was recruited 14 March 2015, last participant was recruited 18 June 2018.
Participants	Setting: UK Patients aged >= 65 years, who have been referred to the geriatrician-led admission avoidance hospital at home service and would otherwise require hospital admission for an acute medical event. Patients were excluded if they had acute coronary syndrome, suspected stroke, lived in residential settings, required palliative care, or were assessed as high risk. Age: T: 83.3 (7.0), C: 83.3 (6.9) Number recruited: hospital at home: 700; hospital: 355
Interventions	Intervention is geriatrician-led co-ordinated, multidisciplinary health care in the home, delivered by a team including nurses, physiotherapists, occupational therapists, and social workers who are either part of the primary healthcare team or dedicated staff and can refer the patient to other services as needed (e.g. mental health or social work services, pharmacy support). Health care was provided 7 days per week, and emergency medical cover was available 24 hours/day. Control group: hospital-based inpatient, with comprehensive geriatric assessment when available
Outcomes	Main outcome: living at home

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Shepperd 2021 *(Continued)*

	Other outcomes: activities of daily living, cognitive impairment, delirium, mortality, new long-term residential care, quality of life, resource use, transfer to hospital
Notes	Follow-up: 6 and 12 months Trial registry: ISRCTN60477865 Funding: NIHR Health Services and Delivery Research Programme (UK) Conflicts of interest: none declared Ethical approval: Research Ethics Committee England, Wales and Northern Ireland, and Scotland Primary reference is *Annals of Internal Medicine* article.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Randomization was stratified by site, sex, and cognitive status measured before randomization using the Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE)"
Allocation concealment (selection bias)	Low risk	Quote: " Eligible participants who provided informed consent were randomly allocated to either CGA HAH or hospital admission using Sortition, a validated, secure online randomization system developed by the University of Oxford's Primary Care Clinical Trials Unit."
Baseline outcome measurements (selection bias)	Low risk	Comment: Patients had similar mean MoCA scores, Barthel scores, comorbidity, delirium, and EQ-5D-5L.
Baseline characteristics (selection bias)	Low risk	Comment: Patients had similar proportions of the presenting problems, diagnoses.
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Comment: Main outcome (inverse of death or new admission to long-term residential care) is objective
Blinding of outcome assessment (detection bias) Subjective outcomes	Unclear risk	Comment: Questionnaire outcomes collected by study staff aware of allocation.
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	Comment: Main outcome (inverse of death or new admission to long-term residential care) is objective
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "Sensitivity analyses showed little or no change when missing data were imputed with different outcomes."
Selective reporting (reporting bias)	Low risk	Comment: Primary outcome was changed to be measured at 6 months not 12 months, agreed on by trial steering committee.

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Talcott 2011

Study characteristics	
Methods	Parallel randomised trial Study conducted between September 1994 and January 1999.
Participants	Setting: USA Participants: recruited from outpatients with postchemotherapy febrile neutropenia and assessed as low risk if there was no indication for hospitalisation other than fever and neutropenia (such as systemic hypotension, altered mental status, respiratory failure, or inadequate oral fluid intake during 24-hour observation; and had adequately controlled cancer) Age 20 to 81 years, median 47 years Number recruited: hospital at home: 47; inpatient: 66
Interventions	Admission avoidance hospital at home, patients recruited from outpatient clinic. Provided by commercial home care provider who agreed to provide protocol care for patients without out-of-pocket charges; daily visits by a home care nurse who followed a protocol/standard checklist and contacted the primary care physician if there were abnormal findings. Daily blood tests. 24-hour care available. Hospital specialist examined the patient 2 to 4 days following discharge and then at least weekly. Home IV available. Control group received care in oncology units in general hospitals.
Outcomes	Major medical complications, readmission to hospital, quality of life
Notes	Folllow-up time for each episode was the resolution of fever, neutropenia, and any complications arising during the episode. Quality of life data were collected at the time of consent to join the study and as soon as possible after resolution of the episode. Funding: National Cancer Institute (USA) Conflicts of interest: authors indicated no potential conflicts of interest. Ethical approval: not reported

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated blocks of random numbers stratified by colony-stimulating factors, institution, and whether random assignment occurred on weekends, holidays, or after hours
Allocation concealment (selection bias)	Low risk	Sealed envelopes
Baseline outcome measurements (selection bias)	Low risk	Baseline outcome measurements done prior to intervention for clinical characteristics and quality of life; no relevant differences found
Baseline characteristics (selection bias)	Low risk	Baseline characteristics of the study and control groups are reported and are similar for all main characteristics
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Any medical event requiring urgent diagnostic or therapeutic intervention. Predefined complications included systemic hypotension (systolic blood pressure > 90 mmHg), respiratory failure (partial pressure of oxygen < 60 torr adjusted for hyperventilation)

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Talcott 2011 *(Continued)*

Blinding of outcome assessment (detection bias) Subjective outcomes	Low risk	Predefined medical complications using blinded review
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	Low risk for mortality and cost
Incomplete outcome data (attrition bias) All outcomes	Low risk	No participants lost to follow-up, 5 withdrawn/excluded (3 withdrew consent, 2 excluded as neutropenia had resolved at recruitment)
Selective reporting (reporting bias)	Unclear risk	Insufficient information to allocate low or high risk

Tibaldi 2004

Study characteristics	
Methods	Parallel randomised trial Study conducted between February 1999 and April 2002.
Participants	Setting: Italy Patients: elderly with advanced dementia Mean age (SD): T: 82.9 (7.9), C: 84.1 (7.5) Number recruited: hospital at home: 56; inpatient: 53
Interventions	Hospital at home run by S. Giovanni Battista Hospital, Turin, Italy: GHHS, patients referred from emergency department. 24-hour-a-day care available, home nursing multidisciplinary care, rapid access to equipment.
Outcomes	Behavioural disturbances, number of patients treated with antipsychotic drugs on admission and on discharge, mortality, length of stay, place of discharge (home or to a nursing home)
Notes	Follow-up: to discharge from service 4 participants admitted from hospital at home to hospital for new medical problems. Funding: not reported Conflicts of interest: not reported Ethical approval: not reported

Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Random sequence generation not described

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Tibaldi 2004 *(Continued)*

Allocation concealment (selection bias)	Unclear risk	Allocation concealment not described
Baseline outcome measurements (selection bias)	Low risk	Baseline outcome measurements done prior to intervention for cognitive status, severity of disease, and activities of daily living; no relevant differences found
Baseline characteristics (selection bias)	Low risk	Baseline characteristics of the study and control groups are reported and are similar
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Blinding of participants and personnel not possible
Blinding of outcome assessment (detection bias) Subjective outcomes	Unclear risk	Assessment method not reported
Blinding of outcome assessment (detection bias) Objective outcomes	Unclear risk	Low risk for mortality
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Withdrawals not reported
Selective reporting (reporting bias)	Unclear risk	Insufficient information to allocate low or high risk

Tibaldi 2009

Study characteristics	
Methods	Parallel randomised trial Study conducted between April 2004 and April 2005.
Participants	Setting: Italy People with acute decompensation of chronic heart failure recruited within 12 to 24 hours of admission to the emergency department. Care supervision possible at home, telephone at home, need for IV infusions, living in catchment area, at least 1 previous admission for chronic heart failure Age: 75 years and over, mean age 81 Number recruited: hospital at home: 48; hospital: 53
Interventions	Admission avoidance hospital at home, hospital outreach (hospital maintains legal and financial responsibility); 24-hour care available 7 days a week; 4 specialist geriatricians, home care nurses, physiotherapist, social worker, counsellor, IV infusions available. Control group: admission to San Giovanni Battista Hospital, Turin, Italy
Outcomes	Mortality, readmission, length of stay, residential care, health status, psychological well-being
Notes	Funding: not reported

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Tibaldi 2009 *(Continued)*

	Conflicts of interest: none reported Ethical approval: hospital ethics committee

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Computer-generated random sequence
Allocation concealment (selection bias)	Low risk	Numbered, sealed envelopes
Baseline outcome measurements (selection bias)	Low risk	Baseline outcome measurements done prior to intervention for health status and psychological well-being; no relevant differences found
Baseline characteristics (selection bias)	Low risk	Baseline characteristics of the study and control groups are reported and are similar
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Blinding of participants and personnel not possible
Blinding of outcome assessment (detection bias) Subjective outcomes	Low risk	Outcomes assessed by a postgraduate doctor not involved with delivery of health care, and blinded to the study allocation
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	Outcomes assessed by a postgraduate doctor not involved with delivery of health care, and blinded to the study allocation
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	4% loss to follow-up
Selective reporting (reporting bias)	Low risk	Standard set of outcomes reported

Vianello 2013

Study characteristics

Methods	Parallel randomised trial Study conducted between January 2009 and December 2011.
Participants	Setting: Italy Patients with neuromuscular disease and who had an acute respiratory tract infection and required hospital admission; recruited between January 2009 and December 2011. Number recruited: hospital at home: 26; inpatient hospital: 27
Interventions	The use of a portable ventilator; a respiratory therapist made daily visits for the first 3 days of home care, and district nurses and caregivers were trained in the application of the device and on assisting

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Vianello 2013 *(Continued)*

	with coughing. District nurses visited daily until recovery from the respiratory tract infection, participants also had telephone access to pulmonary specialists.
Outcomes	Recovery from exacerbation, defined as relief of respiratory distress and return of SpO_2 level
Notes	Follow-up: 3 months Funding: Associazione Distrofia Muscolare, Associazione Sclerosi Laterale Amiotrofica, and Unione Italiana Lotta Alla Distrofia Muscolare (Italy) Conflicts of interest: none reported Ethical approval: institutional review board ethics committee

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Method not reported
Allocation concealment (selection bias)	Unclear risk	Not reported
Baseline outcome measurements (selection bias)	Low risk	Baseline outcome measurements done prior to intervention for respiratory distress and SpO_2 level; no relevant differences found
Baseline characteristics (selection bias)	Low risk	Baseline characteristics of the study and control groups are reported and are similar
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Blinding of participants and personnel not possible
Blinding of outcome assessment (detection bias) Subjective outcomes	Unclear risk	Subjective outcomes not reported
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	Low risk for mortality, need for intubation, and cost
Incomplete outcome data (attrition bias) All outcomes	Low risk	Follow-up data reported in Table 3, page 2066; the authors did not report loss to follow-up
Selective reporting (reporting bias)	Unclear risk	Insufficient information to allocate low or high risk

Wilson 1999

Study characteristics	
Methods	Parallel randomised trial

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Wilson 1999 *(Continued)*

	Study conducted between November 1995 and May 1997.
Participants	Setting: UK Patients with a mix of conditions (majority elderly) referred by GP to Bed Bureau Number recruited: hospital at home: 102; inpatient: 97 6 patients refused hospital at home care and were admitted to hospital.
Interventions	Hospital at home (admission avoidance) Type of service: multidisciplinary team (nurses, therapy, generic health workers, cultural link worker) Referred by a GP, who maintains medical responsibility Maximum of 5 patients at a time Control group: inpatient hospital care
Outcomes	Mortality, readmission, functional status, quality of life, patient satisfaction
Notes	Follow-up: 3 days, 2 weeks, 3 months Funding: National R&D Programme, Primary-Secondary Care Interface, NHS Executive, North Thames (UK) Conflicts of interest: none reported Ethical approval: local ethics committee This author contributed IPD for a previous update of this review (Shepperd 2016a).

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Block randomisation
Allocation concealment (selection bias)	Low risk	Consecutively numbered, sealed envelopes
Baseline outcome measurements (selection bias)	Low risk	Baseline outcome measurements done prior to intervention for functional status and quality of life; no relevant differences found
Baseline characteristics (selection bias)	Low risk	Baseline characteristics of the study and control groups are reported and are similar
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Outcome assessments by independent research staff, decision to admit made by hospital staff, not research team
Blinding of outcome assessment (detection bias) Subjective outcomes	Low risk	Low risk for health status (Sickness Impact Profile 68), cognitive function (Clifton Assessment Procedures for the Elderly), functional status (Barthel Index), and quality of life (EuroQol)
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	Low risk for mortality, readmission, resource use and cost

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Wilson 1999 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	Low risk	Loss to follow-up: hospital at home: 8/87; hospital: 5/80
Selective reporting (reporting bias)	Low risk	All outcomes reported (received trial data set)

A&E: accident & emergency department
C: control
COPD: chronic obstructive pulmonary disease
ED: emergency department
FEV1: forced expiratory volume in 1 second
GHHS: geriatric home hospitalisation service
GP: general practitioner
HADS: Hospital Anxiety and Depression Scale
IPD: individual patient data
IQR: interquartile range
IV: intravenous
MMSE: Mini-Mental State Examination
NIHR: National Institute for Health and Care Research
NYHA: New York Heart Association
OPD: outpatient department
SD: standard deviation
SF-12: 12-Item Short Form Health Survey
SF-36: 36-Item Short Form Health Survey
SpO_2: oxygen saturation
T: treatment

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Cabrol 2000	Compares inpatient and outpatient (ambulatory) treatment
Duiverman 2019	Tests the feasibility of home initiation of chronic non-invasive ventilation to ameliorate chronic respiratory failure at home, using telemedicine
Hazenberg 2014	Tests the feasibility of introducing technologies that ameliorate chronic respiratory failure, at home. For such patients initiation of the treatment has normally been in hospital, but may be feasible and safe at home.
Hill 1978	Patients with myocardial infarction are not suitable to be treated at home because they require urgent treatment (www.nhs.uk/conditions/heart-attack/treatment/).
King 2000	Cross-over randomised controlled trial evaluating chemotherapy provided in a home setting versus an outpatient clinic setting
Levine 2021	Remote physician care versus daily in-person physician hospital at home, with no hospital comparison
Mascardi 2016	Tests the feasibility of introducing technologies that ameliorate chronic respiratory failure, at home. For such patients initiation of the treatment has normally been in hospital, but may be feasible and safe at home.
Mather 1976	Patients with myocardial infarction are not suitable to be treated at home because they require urgent treatment (www.nhs.uk/conditions/heart-attack/treatment/).

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Study	Reason for exclusion
NCT02363413	Tests the feasibility of introducing technologies that ameliorate chronic respiratory failure, at home. For such patients initiation of the treatment has normally been in hospital, but may be feasible and safe at home.
NCT03490084	Not randomised
Wade 1985	Clinical controlled trial Compared 2 districts, 1 with a domiciliary stroke service and 1 without
Wolfe 2000	Intervention does not substitute for inpatient care.

Characteristics of ongoing studies *[ordered by study ID]*

NCT03156686

Study name	SAFEty and Efficacy of HOME-based hospitalization versus inpatient care for patients with acute heart failure in chronic heart failure. (SAFE-HOME)
Methods	Parallel randomised trial
Participants	Inclusion: adults aged >= 18 years diagnosed with acute heart failure, eligible for hospital home within 4 days of hospitalisation, affiliated with social security and complementary health insurance Exclusion: severe cognitive or behavioural disorders, no caregiver, other chronic conditions
Interventions	Intervention: home-based hospitalisation with intravenous diuretics Comparison: usual hospital care
Outcomes	Main outcome: time to rehospitalisation (3 months) Other outcomes: adverse events, quality of life, nutritional status, mortality, cost-effectiveness, time to rehospitalisation (12 months) Follow-up: 3 and 12 months
Starting date	June 2017
Contact information	Thibaud Damy, Hôpital Henri Mondor, France
Notes	

Pouw 2018

Study name	Hospital at home care for older patients with cognitive impairment and an acute medical illness
Methods	Parallel randomised trial
Participants	Inclusion: adults aged >= 65 who present to the emergency department with a defined acute illness; diagnosed with dementia, delirium, or other cause of cognitive impairment; caregiver present, living within the catchment area, and with adequate living arrangements

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Pouw 2018 *(Continued)*	
	Exclusion: hospitalised during the previous 7 days, nursing home residents or awaiting a placement, need for palliative care, other acute or chronic conditions
Interventions	Intervention: hospital-level care provided at the patient's own home Comparison: usual hospital care
Outcomes	Main outcomes: mortality, institutionalisation, ADL-functioning, prevalence of hospital-associated geriatric syndromes, length of stay in hospital or in hospital at home care programme, contact with healthcare professionals Other outcomes: time spent at home (home-time), total number of days alive and out of the hospital or a skilled nursing facility, costs Follow-up: 6 months
Starting date	December 2017
Contact information	Maaike A Pouw Department of Geriatrics, University Medical Center Groningen, University of Groningen, Groningen, the Netherlands
Notes	Trial registry: NTR6581

ADL: activities of daily living

DATA AND ANALYSES

Comparison 1. Admission avoidance hospital at home versus inpatient care

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1.1 Mortality at 3 months using IPD	3	420	mortality (IV, Fixed, 95% CI)	0.89 [0.55, 1.45]
1.2 Mortality at 6 months' follow-up (using published data, and IPD from Wilson and Shepperd)	5	1502	Risk Ratio (IV, Fixed, 95% CI)	0.88 [0.68, 1.13]
1.3 Readmission to hospital after discharge from hospital at home or inpatient care (3 to 12 months' follow-up)	8	1757	Risk Ratio (IV, Fixed, 95% CI)	1.14 [0.97, 1.34]
1.3.1 Readmission for older patients with a medical condition using IPD and published data. N=1856	8	1757	Risk Ratio (IV, Fixed, 95% CI)	1.14 [0.97, 1.34]
1.4 Transfer to hospital while receiving hospital at home	0		Other data	No numeric data
1.5 Living in residential care at follow-up	4	1271	Risk Ratio (IV, Fixed, 95% CI)	0.53 [0.41, 0.69]

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Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1.5.1 With a medical condition (6 months' follow-up)	4	1271	Risk Ratio (IV, Fixed, 95% CI)	0.53 [0.41, 0.69]
1.6 Quality of life/health status	9		Other data	No numeric data
1.6.1 Admission avoidance quality of life	9		Other data	No numeric data
1.7 Functional status	10		Other data	No numeric data
1.7.2 Admission avoidance patients with a medical condition - functional ability	10		Other data	No numeric data
1.8 Psychological health	7		Other data	No numeric data
1.8.1 admission avoidance - cognitive function/well being	7		Other data	No numeric data
1.9 Patient satisfaction	0		Other data	No numeric data
1.10 Caregiver satisfaction	2		Other data	No numeric data
1.10.1 Care giver satisfaction	2		Other data	No numeric data
1.11 Health professional satisfaction	0		Other data	No numeric data
1.12 Length of stay	11		Other data	No numeric data
1.12.1 Hospital and hospital at home length of stay	11		Other data	No numeric data
1.13 Cost and resource use	14		Other data	No numeric data
1.13.1 Health service resources and costs	12		Other data	No numeric data
1.13.2 Use of other social services	2		Other data	No numeric data
1.13.3 Informal care inputs	2		Other data	No numeric data
1.14 Clinical outcomes	7		Other data	No numeric data
1.14.1 Clinical outcomes	7		Other data	No numeric data

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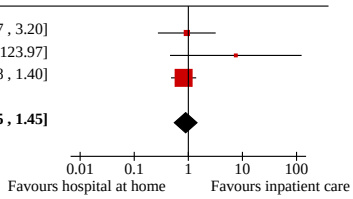
Analysis 1.1. Comparison 1: Admission avoidance hospital at home versus inpatient care, Outcome 1: Mortality at 3 months using IPD

Study or Subgroup	log[mortality]	SE	Admission avoidance Total	Inpatient care Total	Weight	mortality IV, Fixed, 95% CI
Davies 2000	-0.066	0.627	97	50	15.5%	0.94 [0.27 , 3.20]
Harris 2005	2.0202	1.4284999999999999	39	37	3.0%	7.54 [0.46 , 123.97]
Wilson 1999	-0.201	0.273	101	96	81.6%	0.82 [0.48 , 1.40]
Total (95% CI)			**237**	**183**	**100.0%**	**0.89 [0.55 , 1.45]**

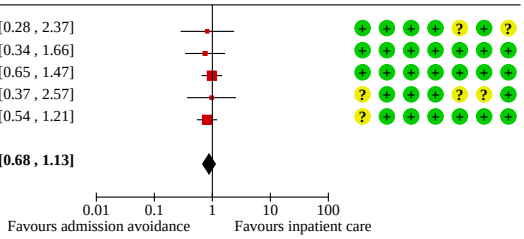
Heterogeneity: Chi² = 2.34, df = 2 (P = 0.31); I² = 15%
Test for overall effect: Z = 0.46 (P = 0.64)
Test for subgroup differences: Not applicable



Analysis 1.2. Comparison 1: Admission avoidance hospital at home versus inpatient care, Outcome 2: Mortality at 6 months' follow-up (using published data, and IPD from Wilson and Shepperd)

Study or Subgroup	log[Risk Ratio]	SE	Admission avoidance Total	Inpatient care Total	Weight	Risk Ratio IV, Fixed, 95% CI	Risk of Bias A B C D E F G
Caplan 1999	-0.198	0.5416	51	49	5.6%	0.82 [0.28 , 2.37]	+ + + + ? + ?
Ricauda 2008	-0.288	0.4044	52	52	10.1%	0.75 [0.34 , 1.66]	+ + + + + + +
Shepperd 2021 (1)	-0.02	0.2075	672	328	38.5%	0.98 [0.65 , 1.47]	+ + + + + + +
Tibaldi 2009	-0.03	0.496	48	53	6.7%	0.97 [0.37 , 2.57]	? + + + ? ? +
Wilson 1999	-0.211	0.206	101	96	39.0%	0.81 [0.54 , 1.21]	? + + + + + +
Total (95% CI)			**924**	**578**	**100.0%**	**0.88 [0.68 , 1.13]**	

Heterogeneity: Chi² = 0.64, df = 4 (P = 0.96); I² = 0%
Test for overall effect: Z = 1.03 (P = 0.30)
Test for subgroup differences: Not applicable



Footnotes
(1) Adjusted estimate (all others unadjusted, SEs calculated from raw data)

Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Baseline outcome measurements (selection bias)
(D) Baseline characteristics (selection bias)
(E) Blinding of participants and personnel (performance bias)
(F) Incomplete outcome data (attrition bias)
(G) Selective reporting (reporting bias)

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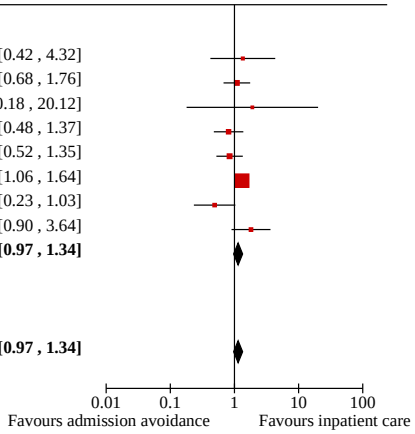
Analysis 1.3. Comparison 1: Admission avoidance hospital at home versus inpatient care, Outcome 3: Readmission to hospital after discharge from hospital at home or inpatient care (3 to 12 months' follow-up)

Study or Subgroup	log[Risk Ratio]	SE	Admission avoidance Total	Inpatient care Total	Weight	Risk Ratio IV, Fixed, 95% CI
1.3.1 Readmission for older patients with a medical condition using IPD and published data. N=1856						
Caplan 1999	0.3	0.594	51	49	1.9%	1.35 [0.42 , 4.32]
Davies 2000	0.0862	0.244	100	50	11.3%	1.09 [0.68 , 1.76]
Harris 2005	0.642	1.204	39	37	0.5%	1.90 [0.18 , 20.12]
Mendoza 2009	-0.211	0.27	37	34	9.2%	0.81 [0.48 , 1.37]
Ricauda 2008	-0.1744	0.2417	52	87	11.5%	0.84 [0.52 , 1.35]
Shepperd 2021 (1)	0.278	0.11	621	302	55.6%	1.32 [1.06 , 1.64]
Tibaldi 2009	-0.713	0.3796	48	53	4.7%	0.49 [0.23 , 1.03]
Wilson 1999	0.5933	0.3567	101	96	5.3%	1.81 [0.90 , 3.64]
Subtotal (95% CI)			**1049**	**708**	**100.0%**	**1.14 [0.97 , 1.34]**
Heterogeneity: Chi² = 11.90, df = 7 (P = 0.10); I² = 41%						
Test for overall effect: Z = 1.60 (P = 0.11)						
Total (95% CI)			**1049**	**708**	**100.0%**	**1.14 [0.97 , 1.34]**
Heterogeneity: Chi² = 11.90, df = 7 (P = 0.10); I² = 41%						
Test for overall effect: Z = 1.60 (P = 0.11)						
Test for subgroup differences: Not applicable						



Footnotes

(1) Adjusted estimate, 1 month (all others unadjusted, SEs calculated from raw data)

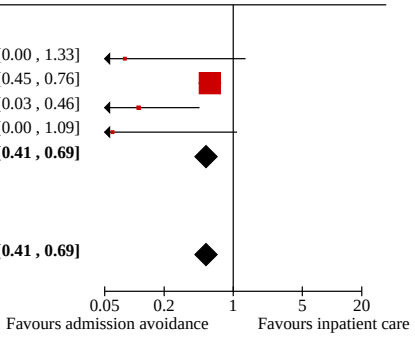
Analysis 1.4. Comparison 1: Admission avoidance hospital at home versus inpatient care, Outcome 4: Transfer to hospital while receiving hospital at home

Transfer to hospital while receiving hospital at home

Study	Outcomes	Results
Corwin 2005	Transfer to hospital	T= 11/98
Ricauda 2008	Transfer to acute hospital	T= 3/52
Richards 2005	Transfer to hospital	T= 2/24
Talcott 2011	Readmission to hospital while receiving hospital at home	T= 4/47

Analysis 1.5. Comparison 1: Admission avoidance hospital at home versus inpatient care, Outcome 5: Living in residential care at follow-up

Study or Subgroup	log[Risk Ratio]	SE	Admission avoidance Total	Inpatient care Total	Weight	Risk Ratio IV, Fixed, 95% CI
1.5.1 With a medical condition (6 months' follow-up)						
Ricauda 2008	-2.526	1.435	52	52	0.8%	0.08 [0.00 , 1.33]
Shepperd 2021 (1)	-0.545	0.135	646	311	95.1%	0.58 [0.45 , 0.76]
Tibaldi 2004	-2.207	0.7251	56	53	3.3%	0.11 [0.03 , 0.46]
Tibaldi 2009	-2.8134	1.48	48	53	0.8%	0.06 [0.00 , 1.09]
Subtotal (95% CI)			**802**	**469**	**100.0%**	**0.53 [0.41 , 0.69]**
Heterogeneity: Chi² = 9.05, df = 3 (P = 0.03); I² = 67%						
Test for overall effect: Z = 4.82 (P < 0.00001)						
Total (95% CI)			**802**	**469**	**100.0%**	**0.53 [0.41 , 0.69]**
Heterogeneity: Chi² = 9.05, df = 3 (P = 0.03); I² = 67%						
Test for overall effect: Z = 4.82 (P < 0.00001)						
Test for subgroup differences: Not applicable						



Footnotes

(1) Adjusted estimate

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Analysis 1.6. Comparison 1: Admission avoidance hospital at home versus inpatient care, Outcome 6: Quality of life/health status

Quality of life/health status

Study	Outcomes	Results	Notes
Admission avoidance quality of life			
Corwin 2005	SF 36 Physical functioning Role physical Pain	**SF 36** Physical functioning Day 3 T= 37 (29.1), C= 41 (28.3) Mean difference -1.9, 95% CI -10.7 to 6.9 Day 6 T=50.7 (33.7), C=50.9 (31.6) Mean difference -5.2, 95% CI -13.7 to 3.2 **Role physical** Day 3 T= 5.4 (18.8), C=5.5 (19.7) Mean difference -1.8 95% CI -13.1 to 9.4 Day 6 T=21.1 (36.9), C=18.4 (36.5) Mean difference 2.2, 95% CI -10.7 to 15.1 **Pain** Day 3 T=57 (28.8), C=55.9 (25.4) Mean difference -2.5 95% CI -10.1 to 5.1 Day 6 T=69.8 (26.4), C=64.8 (25.6) Mean difference -3.8 95% CI -10.6 to 3.0	Differences calculated on absolute differences between day 0 & day 3, or day 0 & day 6. Numbers vary due to missing data (high score=better health)
Echevarria 2018	EQ-5D-5L utility 14 day EQ-5D-5L utility 90 day	**EQ-5D-5L utility (SD), mean 14 day unit change from baseline** T = 0.091 (0.249) C = 0.055 (0.316) **EQ-5D-5L utility (SD), mean 90 day unit change from baseline** T = 0.003 (0.287) C = 0.007 (0.338)	
Mendoza 2009	SF 36 Physical component Mental component	**Physical component** T= 3.6 (-0.5 to 7.7), C= 2.2 (-1.9 to 6.4), P = 0.47 **Mental component** T= 4.0 (-0.9 to 8.9), C= 2.8 (-2.4 to 8.0), P = 0.38	Score at 1 year (adjusted for baseline differences)
Ricauda 2008	Nottingham Health Profile	6 months, mean (SD) T= 3.6 (7.9), C= 0.8 (4.5), P = 0.04	Changes at 6 months
Richards 2005	SF-12 Mean physical and mental component score	**Physical component** At 2 weeks T= 38.1, C= 40.2, P = 0.45 At 6 weeks T= 42.2, C=45.8, P = 0.18 **Mental component** At 2 weeks T=48.3, C=48.6, P = 0.91 At 6 weeks T = 50.4, C=51.0, P = 0.81	higher score=better health
Shepperd 2021	Health status EQ-5D-5L utility Barthel Index	**Mean EQ-5D-5L utility 6 months (SD)** T = 0.451 (0.324) C = 0.457 (0.340) **Difference in means (95% CI)** -0.006 (-0.053, 0.041) Mean (SD) Barthel Index at 6 months T = 15.8 (4.4) C = 15.6 (4.9) Adjusted mean difference (95% CI) 0.24 (-0.33, 0.80) P=0.41	
Talcott 2011	Quality of life EORTC QLQ C-30	**Role Function** T= 0.58, C= 0.78, P = 0.05 **Emotional Function** T= 3.27, C= -6.94, P = 0.04	Quality of life data were collected at the time of consent to join the study, as soon as possible after the resolution of the episode. Data were collected for the first study episode.

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			Change score
Tibaldi 2009	Nottingham Health Profile	6 months, mean (SD) T= +1.09 (2.57), C= +0.18 (1.94), P = 0.046	
Wilson 1999	Sickness Impact Profile (SIP) Euroqol	**SIP**, median (IQR) T= 24 (20-31), C= 26 (20-31) Difference -2 (95% CI -4 to 4), P = 0.73 **Euroqol**, median T= 0.64, C= 0.63 Difference 0.01 (95% CI -0.12 to 0.09), P = 0.94	At 3 months follow-up

Analysis 1.7. Comparison 1: Admission avoidance hospital at home versus inpatient care, Outcome 7: Functional status

Functional status

Study	Functional ability	Results
Admission avoidance patients with a medical condition - functional ability		
Caplan 1999	Change in Barthel score from admission to discharge (high score=greater independence) Instrumental activities of daily living score from admission to discharge (higher score=greater independence)	Mean (SEM) T= 0.37 (0.27), C= -0.04 (0.27), NS Mean (SEM) T= 0.65 (0.23), C= -0.88 (0.26), P = 0.037
Davies 2000	St Georges' respiratory questionnaire (to a random sub-group of 90 participants). High score indicates poorer health related quality of life. A minimum change in score of 4 units is clinically relevant. Forced expiratory volume in one second (FEV1)	**Baseline scores** T= 71.5 (43.4 to 99.6), C= 71.0 (43.4 to 98.6) Mean (SD) change at 3 months T= 0.48 (16.92) C= 3.13 (14.02) **Forced expiratory volume in 1 second (FEV1)** At 3 months: T= 41.5% (95% CI 8.2% to 74.8%) C= 41.9% (95% CI 6.2% to 77.6%)
Levine 2018	Activities of daily living Instrumental activities of daily living	ADLs worse at discharge T = 9 (0%) C = 11 (9%) IADLs worse at discharge T = 9 (0%) C = 11 (18%)
Levine 2020	Instrumental activities of daily living Activities of daily living	IADLs worse: admission to discharge (%) T = 11 (26) N=42 C = 14 (31) N=45 IADLs worse: admission to 30d after discharge (%) T = 14 (37) N=42 C = 13 (34) N=38 ADLs worse: admission to discharge (%) T = 6 (14) N=42 C = 6 (13) N=45 ADLs worse: admission to 30d after discharge (%) T = 4 (11) N=42 C = 6 (16) N=38
Mendoza 2009	Activities of daily living	**Mean score Barthel Index at 1 year** (adjusted for baseline differences) T= 4.0 (-0.9 to 8.9) C= 4.7 (-2.2 to 11.5) P = 0.21
Ricauda 2008	Change in ADL (score 0 to 6)	At 6 months, mean (SD) T= 0.12 (0.64), C= 0.08 (0.73), P = 0.81
Shepperd 2021	Activities of daily living	Mean score Barthel Index at 6 months (SD) T = 15.8 (4.4) C = 15.6 (4.9) Adjusted mean difference (95% CI) 0.24 (-0.33, 0.80) P=0.41
Tibaldi 2004	Behavioural disturbances	**Sleeping disorders** T= 5/56 (9%), C= 23/53 (43%), MD: -34%, 95% CI -50% to -19%, P < 0.001 **Agitation/aggressiveness** T= 5 /56 (9%), C= 22/53 (41.5%), MD -33% 95% CI -48% to -17%, P<0.001

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		Feeding disorders T= 5 /56 (9%), C= 21/53 (40%), MD -31% 95% CI -46% to -16%, P < 0.001
Tibaldi 2009	Activities of daily living Barthel Index	ADL at 6 months mean change T= -1.95 (9.61) N=48, C= -0.30 (10.12) N=53,
Wilson 1999	Barthel Index	**Barthel Index** At 3 months (Median (IQR)) T= 16 (13-19), C= 16 (12-20) **Barthel Index** - number (%) not assessed: T= 21 (28%), C= 18 (28%) **Sickness Impact Profile**: At 3 months (Median (IQR)) T= 24 (20-31), C= 26 (20-31) **Sickness Impact Profile** - no (%) not assessed T= 31 (41%), C= 30 (46%)

Analysis 1.8. Comparison 1: Admission avoidance hospital at home versus inpatient care, Outcome 8: Psychological health

Psychological health

Study	Outcomes	Results
admission avoidance - cognitive function/well being		
Caplan 1999	Mental status questionnaire score from admission to discharge (maximum score 10); Number with confusion	Mean (SEM) T= 0.43 (0.12), C= 0.27 (0.12), NS Number with confusion T=0/51, C=10/49
Echevarria 2018	Hospital Anxiety and Depression Scale score (HADS)	Number analysed: T=60; C=58 HADS - Anxiety, 14 day (IQR), median unit change from baseline T = -1.0 (-3 to 1.75) C = 0.5 (-3 to 2) HADS - Anxiety, 90 day (IQR), median unit change from baseline T = 0 (-2 to 3) C = 0 (-3 to 2) HADS - Depression, 14 day (IQR), median unit change from baseline T = -1.0 (-3 to 1) C = 0 (-2 to 3) HADS - Depression, 90 day (IQR), median unit change from baseline T = -0.5 (-3 to 1.25) C = 0 (-2 to 3)
Ricauda 2004	Change in geriatric Depression Scale score (range 0-30) higher scores indicate depression (people recovering from a stroke)	At 6 months, median IQR T=10 (5 to 15), C=17 (13 to 20) p<0.001
Ricauda 2008	Change in geriatric Depression Scale score (range 0-30) higher scores indicate depression (people with COPD)	At 6 months, mean (SD) T= -3.1 (4.7), C=0.7 (3.2), P < 0.001
Shepperd 2021	Montreal Cognitive Assessment (MoCA) score (range 0-30) Confusion Assessment Method (CAM) (Y/N for delirium)	At 6 months (%) T: Abnormal (score of <26): 273/407 (67.1) Normal (score of >=26): 134/183 (32.9) C: Abnormal: 115 (62.8) Normal: 68 (37.2) Adjusted RR (95% CI): 1.06 (0.93, 1.21) P = 0.36 CAM (presence/absence of delirium) (%) 3 days T = 25/645 (3.9) C = 11/312 (3.5) RR: 1.12 (0.54, 2.29) P=0.76 5 days T = 17/638 (2.7) C = 9/308 (3.0) RR: 0.93 (0.34, 2.47) P=0.87 1 month T = 10/602 (1.7) C = 13/297 (4.4)

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		Relative risk: 0.38 (0.19, 0.76) P=0.006
Tibaldi 2009	Mini Mental State Exam (MMSE) Geriatric Depression Scale	At 6 months, mean change (SD) T= +0.07 (1.38), C= +0.08 (1.36), P = 0.97 At 6 months, mean change (SD) T= +1.48 (1.86), C= +0.12 (3.36), P = 0.02
Wilson 1999	Philadelphia Geriatric Morale Scale	At 3 months, median (IQR) T= 37 (30-42), C= 37 (31-43), Difference 0, 95% CI -4.1 to 4.1

Analysis 1.9. Comparison 1: Admission avoidance hospital at home versus inpatient care, Outcome 9: Patient satisfaction

Patient satisfaction

Study	Outcomes	Results	Notes
Caplan 1999	Satisfaction rated on a 4 point scale: 1=excellent, 2=good, 3=fair, 4=poor.	Mean score T= 1.1, C= 2.0, P < 0.0001	Response rates were 78% for the treatment group, and 40% for the control.
Corwin 2005	Patient satisfaction questionnaire (not described)	**Overall** T= 87/91 (96%), C=87/96 (96%), P = 0.12 **Satisfaction with location of care** T= 85/91 (93%), C= 59/88 (66%), P < 0.0001 **Location preference** In the hospital T= 5/91 (5%), C= 27/88 (31%) In the community T= 78/91 (86%), C= 31/88 (35%) No preference T= 8/91 (9%), C= 30/88 (34%) P < 0.0001	Numbers for control group vary between 88 and 91 due to missing data Proportion of participants satisfied or very satisfied
Levine 2018	Global satisfaction score;	Median global satisfaction score (IQR) T = 10 (1) C = 10 (2) P=0.67	
Levine 2020	Global satisfaction score; range of scores from 0 to 10, high scores equal high satisfaction	Median global satisfaction score (IQR) T = 10 (1) N=42 C = 9 (1) N=38	
Ricauda 2008	Patient satisfaction questionnaire (not described)	T= 49/52 (94%), C= 46/52 (88%), P = 0.83	Proportion of participants rating satisfaction as very good/excellent at discharge
Richards 2005	Outcome not described	T= 24/24 (100%), C= 14/24 (60%), P = 0.001	Proportion of patients very happy with care
Shepperd 2021	Patient-reported experience questionnaire at 1 month, developed by the Picker Institute Europe (Oxford, UK)	Patient satisfaction in favour of CGA HAH	
Wilson 1999	Patient satisfaction, scale 0 to 18	Median (IQR) T= 15 (13 to 16.5), C= 12 (11 to 14), P < 0.0001	At 2 weeks, or discharge Reported in # Wilson 2002

Analysis 1.10. Comparison 1: Admission avoidance hospital at home versus inpatient care, Outcome 10: Caregiver satisfaction

Caregiver satisfaction

Study	Outcomes	Results	Notes
Care giver satisfaction			
Caplan 1999	Carer satisfaction	Mean score T= 1.1, C= 1.9, P < 0.0001	Satisfaction rated on a 4 point scale: 1=excellent, 2=good, 3=fair, 4=poor
Ricauda 2008	Change in Relative's Stress Scale Score	At 6 months, mean (SD) T= 4.6 (5.6), C= 2.6 (6.1), P = 0.16	

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Analysis 1.11. Comparison 1: Admission avoidance hospital at home versus inpatient care, Outcome 11: Health professional satisfaction

Health professional satisfaction

Study	Outcomes	Results	Notes
Caplan 1999	GP satisfaction	Mean score (95% CI) T= 1.7 (1.4 to 2.0), C= 1.8 (1.4 to 2.2), Difference: NS	Higher scores indicate higher satisfaction Response rate: T: 63%, C: 37%

Analysis 1.12. Comparison 1: Admission avoidance hospital at home versus inpatient care, Outcome 12: Length of stay

Length of stay

Study	Results	Outcomes	Notes
Hospital and hospital at home length of stay			
Davies 2000	Hospital length of stay	Median (IQR) 5 days (4 to 7) N=100 Mean (SD) 6.72 days (4.3) N=100	Data for the control group only
Echevarria 2018	Length of hospital stay at 90 days Length of hospital stay (index admission) Length of stay within HAH	Mean length of hospital stay (index admission) T = 1.2 (2.1) C = 4.1 (4.6) Mean length of hospital stay at 90 days (SD) T = 6.1 (9.7) C = 10.3 (15.8) Median length of stay within HAH (IQR) T = 4 (2-5) C = NA	
Harris 2005	Average length of stay for the index episode until discharge from hospital or hospital at home (days)	T= 11.33 days (SD 11.14) N=39 C= 7.83 days (7.35) N=37 Mean difference 3.5 95% CI -0.80 to 7.80	IPD
Levine 2018	Length of stay during acute care episode	Median length of stay during acute care episode (IQR) T = 3 (1) C = 3 (3) P=0.79	
Levine 2020	Length of stay during acute care episode	Mean length of stay (95% CI) (days) T = 4.5 (3.9, 5.0) C = 3.8 (3.3, 4.4)	
Mendoza 2009	Average length of stay for the index episode (days)	T= 10.9 (SD 5.9) N=37 C= 7.9 (SD 3.0), P = 0.01 N=34	
Ricauda 2008	Hospital at home and hospital length of stay (days) Total length of stay to include hospital transfers for the hospital at home group	Total days of care (hospital plus hospital at home), mean (SD) T= 15.5 (SD 9.5) N=52 C= 52 (SD 7.9) Difference 4.50, 95% CI 1.14, 7.86	
Richards 2005	Median number of days to discharge	T=4 (range 1-14) N=24 C= 2 (range 0-10) N=25	
Shepperd 2021	Average length of hospital stay	Mean length of initial stay (SD) (complete cases) T = 1.43 (4.84) N=563 C = 4.92 (7.64) N=274 Mean length of hospital length of stay at six months follow-up T=9.47 (18.41) N=563 C=10.58 (19.49) N=274	
Tibaldi 2009	Time in the emergency department (hours) Length of stay (days)	Time in ED, mean (SD) T= 14.6 (3.4), C= 16.3 (3.0) Length of treatment, mean (SD) T= 20.7 (6.9) N=48, C= 11.6 (10.7) N=53, P = 0.001	
Wilson 1999	Length of stay	Treatment N=102 Control N=97	

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		Length of hospital stay in days, median T= 5.1 (13.53), C= 18.5 (18.51) days, P = 0.026 Total days of care (hospital plus hospital at home), median T= 9, C= 16 days; P = 0.031 Total days of care (hospital plus hospital at home and readmission days), mean (SD) T= 13.33 (17.26), C= 21.42 (25.46) Difference -8.09 95% CI -14.34 to -1.85	

Analysis 1.13. Comparison 1: Admission avoidance hospital at home versus inpatient care, Outcome 13: Cost and resource use

Cost and resource use

Study	Outcomes	Results	Notes
Health service resources and costs			
Caplan 1999	Cost	Average cost per episode, mean (SD) T= $1,764 ($1,253), C= $3,775 ($2,496) Mean difference per episode $-2011 Cost per day, mean (SD) T= $191 ($58), C= $484 ($67.23) Mean difference per day -$293	Cost data financial year 1995/1996
Corwin 2005	Days on oral antibiotics	HR 1.09 (0.82 to 1.45), P = 0.56	
Echevarria 2018	Health and formal social care costs	Mean health and formal social care costs (SD) T = 3857.8 (3199.6) C = 4873.5 (5631.1) Bootstrapped mean difference (95% CI) -1015.7 (-2735.5, 644.8)	
Levine 2018	Relative cost reduction of acute care episode Relative cost reduction of acute care episode and 30 days after acute care episode	Relative cost reduction of acute care episode, % 52% (IQR, 28%; p = 0.05) Relative cost reduction of acute care episode and 30 days after, % 67% (IQR, 77%; p<0.01)	% lower than for control patients Change in median cost
Levine 2020	Relative cost reduction of acute care episode (including physician cost, Appendix Table 7 (Levine 2020) Relative cost reduction of acute care episode and 30 days after acute care episode	**With physician labour** Adjusted relative reduction in cost of acute care episode, % (95% CI) 19 (4, 31) P=0.017 Adjusted relative reduction in cost of acute care episode and 30 days after, % (95% CI) 25 (10,38) P<0.001	Positive means home group costs less Relative reduction in mean cost (%)
Mendoza 2009	Cost	Mean (SD) T= €2,541 (1,334), C= €4,502 (2,153) Difference €1,961 P < 0.0001	Difference attributed to fewer investigations. Costs include health service costs used during follow-up period of 1 year, excludes informal care.
Nicholson 2001	Costs	Cost per episode, mean (95% C) T= $745 ($595 to $895),C= $2543 ($1766 to $3321) Difference $1798, P < 0.01 Hospital at home costs 29% of the average hospital managed patient episode. Reported cost effectiveness ratio of 3:1 T + C costs GP 10% of costs, Domiciliary allied health 21% of costs, community nursing 28% of costs = 59% of costs and hospital care 41% of costs. If C=$895 then T= $1287 (59% of costs) Total costs=$2182 per patient episode of care	Costs based on financial year 99/00; Used average DRG costs (Australian $), patient data for ED costs, and modelled costs for OPD clinic visits. HAH care individual costs, included direct and non direct costs. GP costs at $91.00 per hour.
Ricauda 2004	Mean total cost (EUR converted to US$ 1 Euro=$1.3)	T= $6 413.5 per patient, C= $6 504.8 per patient Cost per patient per day (SD) T= $163 (20.5), C= $275.6 (27.7)	

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		P < 0.001	
Ricauda 2008	Hospital at home resources Total costs	Nursing visits (range) T= 14.1 (3 to 38) Physician visits T= 9.9 (2 to 28) Visits to hospital for diagnosis T= 11 Total mean cost per patient T=$1,175.9, C= $1,390.9, P = 0.38 Total mean cost per day (SD) T= $101.4 (61.3), C= 151.7 (96.4)	
Richards 2005	Cost based on DRGs for control and actual cost for intervention	Mean cost per patient NZ$ T= $1157.9, C= $1556.28	
Shepperd 2021	Health and social care costs	Mean cost of initial admission (SD) T = 1742 (3234) C = 3723 (5095) Mean difference: -1981 (-2551, -1411) Mean Health and Social care cost (adjusted), baseline to 6 months follow up T = 15,124 C = 17,390 Mean difference: -2265 (-4279, -252) Mean Societal costs (adjusted), baseline to 6 month follow up T = 19,067 C = 21,907 Mean difference: -2,840 (-5,495, -185)	
Wilson 1999	Cost	Cost of initial episode (95% CI) T= £2,568.9 (2,089.3 to 2,972.1) C= £2,880.6 (2,316.1 to 3,547.8) Difference -311.7, P > 0.43 Bootstrap difference using 1000 subsamples: -304.72 (-1,112.4 to 447.9). Mean cost per day (95% CI) T= £204.6 (91.5 to 118.4) C= £104.9 £ (181.1 to 228.22) Mean difference £99.71 P < 0.001 Cost at 3 months (95% CI) T= £3,671.3 (3,140.5 to 4,231.3) C= £3,876.9 (3,224.51 to 4,559.6) Difference -205.7, P > 0.65 Bootstrap difference using 1000 subsamples: -210.9 (-1,025 to 635.5) COSTS EXCLUDING REFUSERS Cost of initial episode, mean (95% CI) T= £2,594.4 (£2,170.36 to £3,143.5) C= £3,659.20 (£3,140.46 to £4,231.28) Mean difference -£1,064.79, P < 0.01. Bootstrap mean difference £1070.53, (95% CI-£1843.2 to -£245.73) 95% CI derived using bootstrap method with 1000 subsamples Cost per day, mean (95% CI) T= £206.68 (£183.21 to £230.14) C= £133.7 (£124.6 to £142.8) Mean difference £72.98, P < 0.001 Cost at 3 months, mean (95% CI) T= £3,697.5 (£3136.13 to £4330.66) C= £4,761.3 (£4105.6 to £5476.6) Mean difference -£1,063.8, p = 0.025 Bootstrap mean difference: £1,063.45 (95% CI -£2043.8 to -£162.7)	Cost data financial year 1995/1996 BNF for medicines 1995
Use of other social services			
Davies 2000	While receiving hospital at home care, or on discharge from hospital	Referred for increased social support T= 24/100 (24%), C= 3/50 (6%) Difference 18%, 95% CI 7.3% to 28.6%	
Echevarria 2018	Patients with a social care package post discharge	Patients with a social care package post discharge (%) T = 7 (11.7) C = 5 (8.6)	
Informal care inputs			
Kalra 2000	Informal care inputs	Received informal care: T= 100/140 (71%), C= 98/147 (67%), Difference 4.8%, 95% CI -5.9% to 15.3% Total from co residents over 12 months, hours (SD)	

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		T= 899.18 (1760), C= 718 (6778), P = 0.75 Total hours per average week from co residents (SD) T=46.38 (48.15), C= 33.71 (44.35), P = 0.02 Total hours from nonresidents over 12 months (SD) T= 79.7 (283), C= 127.44 (348), P = 0.27 Total average hours per week from non residents T= 4.79 (16.51), C= 5.03 (11.54), P = 0.88 Total hours over 12 months (SD) T= 979 (1749), C= 846 (1549), P = 0.49
Shepperd 2021	Informal care	Mean total number of hours of unpaid help over the last 6 months (SD) T = 594.89 (1093.63) C = 657.64 (1170.87) Difference in means (95% CI): -62.76 (-224.61, 99.09)

Analysis 1.14. Comparison 1: Admission avoidance hospital at home versus inpatient care, Outcome 14: Clinical outcomes

Clinical outcomes

Study	Outcomes	Results
Clinical outcomes		
Corwin 2005	No advancement of cellulitis (indelible line drawn around peripheral margin of the cellulitis and dated)	Mean (SD) days T= 1.5 (0.11), C= 1.49 (0.10), Mean difference 0.01 days, 95% CI -0.3 to 0.28 Days of no advancement of cellulites HR 0.98, 95% CI 0.73 to 1.32, P = 0.90 Days on intravenous antibiotics HR 0.84, 95% CI 0.63 to 1.12, P = 0.23 Days to discharge HR 0.93, 95% CI 0.70 to 1.23, P = 0.60 Days on oral antibiotics HR 1.09, 95% CI 0.82 to 1.45, P = 0.56
Davies 2000	Proportion of patients prescribed an antibiotic at 3 months	T= 56/100 (56%), C= 19/50 (38%), Difference 18%, 95% CI 1.4 to 34.6%
Echevarria 2018	COPD Assessment Tool (CAT) at 14 and 90 days	CAT, 14-day (IQR) T = -4.0 (-9.5, 0) C = -3.0 (-7, 1) CAT, 90 day (IQR) T = -3.0 (-8, 1) C = -1.0 (-6, 1)
Levine 2020	Any safety event Median pain score Inappropriate medication use Urinary catheter use Restraint use	Any safety event (%) T = 4 (9) C = 7 (15) Median pain score (IQR) T = 0 (1) C = 0 (3) Inappropriate medication use T = 0 (0) C = 5 (10) Urinary catheter use T = 0 (0) C = 2 (4) Restraint use T = 0 (0) C = 0 (0)
Shepperd 2021	Charlson Comorbidity Index score	Mean at 6 months (SD) T = 6.17 (1.94) C = 6.00 (1.93) Adjusted mean difference (95% CI): 0.0002 (-0.1452 to 0.1455)
Talcott 2011	Major medical complications during care in hospital at home or hospital	T= 4/47 (9%), C= 5/66 (8%), Difference 1%, 95% CI -10 to13%
Tibaldi 2004	Use of antipsychotic drugs	On admission T= 26/56 (46.4%), C= 18/56 (32%), Difference 14.3%, 95% CI -3.7% to 31.1% On discharge

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	T= 6/56 (11%), C = 13/53 (25%), Difference 14%, 95% CI -28% to 0.3%

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ADDITIONAL TABLES

Table 1. Details of each hospital at home study

	N	Length of follow-up	Population	Conditions	Intervention	Control	Location	Mean age (SD)	24-hour care provision
Andrei 2011	45	12 months	Patients with chronic heart failure that had deteriorated at a minimum of 1 week prior to recruitment	Chronic heart failure	Admission avoidance hospital at home; the first 48 hours of treatment was in the ED	Unknown	Romania	Unknown	Not reported
Caplan 1999	T: 51 C: 49	6 months	Patients attended casualty	Range of acute conditions	Hospital community outreach team	Hospital care	Australia	T: 73 (median) C: 79 (median)	Not reported
Corwin 2005	T: 98 C: 96	6 days	Patients attended emergency department	Cellulitis	Hospital at home admission avoidance from the ED by GP and community care nursing staff	Hospital care	New Zealand	T: 54.6 (20.6) C: 48.4 (19.0)	Not reported
Davies 2000	T: 100 C: 50	3 months	Patients attended A&E with chronic obstructive airways disease	COPD	Admission avoidance hospital at home by outreach specialist nurses and GP/community nurses	Hospital care	UK	Unknown	District nurses
Echevarria 2018	T: 62 C: 58	90 days	Patients over 35 years of age admitted to hospital with COPD	COPD	Once- or twice-daily vists from respiratory specialist nurse under remote supervision from consultant	Hospital care	UK	T: 71.0 (9.6) C: 68.7 (10.5)	24/7 contact with HAH team available
Harris 2005	T: 39 C: 37	90 days	Patients attended emergency department or acute assessment ward	Range of acute conditions	Hospital outreach programme; nurse-led team provided care and rehab in patients' homes	Hospital care	New Zealand	80.0	24-hour on-call geriatrician
Kalra 2000	T: 153 C: 152	12 months	Patients within 72 hours of stroke onset	Moderately severe stroke	Hospital outreach admission avoidance multidisciplinary care	Hospital care, stroke unit care	UK	T: 77.7 C: 77.3 (medians)	Not reported

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Table 1. Details of each hospital at home study *(Continued)*

Levine 2018	T: 9 C: 11	30 days	Patients over 18 years of age attending emergency department	Infection, heart failure, COPD, asthma exacerbation	Hospital at home; at least 1 daily visit from general internist, 2 daily visits from nurse	Hospital care	USA	T: 65 (28) C: 60 (29) median (IQR)	Attending physician available 24/7
Levine 2020	T: 43 C: 48	30 days	Patients over 18 years of age attending emergency department	Infection, heart failure, COPD, asthma exacerbation	Hospital at home; at least 1 daily visit from general internist, 2 daily visits from nurse	Hospital care	USA	T: 80 (19) C: 72 (23) median (IQR)	Attending physician available 24/7
Mendoza 2009	T: 37 C: 34	1 year	Patients in A&E with acute decompensation of chronic heart failure	Heart failure	Admission avoidance hospital at home; hospital outreach model	Hospital care	Spain	79	Emergency services
Nicholson 2001	T: 13 C: 12	Duration of treatment	Patients over 45 years of age with COPD referred by GP or emergency staff	COPD	Hospital at home	Hospital care	Australia	Unknown	24-hour telephone support by hospital staff
Ricauda 2004	T: 60 C: 60	6 months	Patients admitted to hospital within 24 hours of onset of stroke symptoms	Stroke	Hospital outreach admission avoidance	Hospital care	Italy	T: 82.5 (8.6) C: 79.5 (6.7)	Physician and nurse available 24 hours
Ricauda 2008	T: 52 C: 52	6 months	Patients admitted to hospital for acute exacerbation of COPD	COPD	Physician-led admission avoidance hospital outreach service	Hospital care	Italy	T: 80.1 (3.2) C: 79.2 (3.1)	HAH staff available 24 hours
Richards 2005	T: 24 C: 25	6 weeks	Patients presented to emergency room with pneumonia	Community-acquired pneumonia	Hospital at home: admission avoidance from emergency room	Hospital care	New Zealand	T: 50.1 C: 49.8	24-hour emergency contact number
Shepperd 2021	T: 687 C: 345	12 months	Patients over 65 years of age referred to HAH	Range of acute conditions	Admission avoidance hospital at home; geriatrician-led multidisciplinary team	Hospital care	UK	T: 83.3 (7.0)	NHS telephone out-of-hours service, plus site-spe-

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Table 1. Details of each hospital at home study *(Continued)*

								C: 83.3 (6.9)	cific arrangements for overnight care
Talcott 2011	T: 47 C: 66	Duration of acute episode	Patients who had chemotherapy	Febrile neutropenia	Admission avoidance hospital at home; commercial home care provider	Hospital care	USA	47 (median) 20 to 81 (range)	Not reported
Tibaldi 2004	T: 56 C: 53	Until discharge	Patients with advanced dementia	Range of acute conditions	Hospital at home; geriatric home hospitalisation service	Hospital care	Italy	T: 82.9 (7.9) C: 84.1 (7.5)	Not reported
Tibaldi 2009	T: 48 C: 53	6 months	Patients presented to emergency department	Chronic heart failure	Admission avoidance hospital at home; hospital outreach	Hospital care	Italy	81	HAH staff available 24 hours
Vianello 2013	T: 26 C: 27	3 months	Patients with neuromuscular disease	Acute respiratory tract infection	Hospital at home; portable ventilator, respiratory therapist daily visits	Hospital care	Italy	T: 44.6 (20.4) C: 46.7 (20.2)	Pulmonologist available by telephone
Wilson 1999	T: 102 C: 97	3 months	Majority elderly, referred by GP to Bed Bureau	Range of acute conditions	Admission avoidance hospital at home	Hospital care	UK	84 (median)	24-hour care available

A&E: accident & emergency department
C: control
COPD: chronic obstructive pulmonary disease
ED: emergency department
GP: general practitioner
HAH: hospital at home
IQR: interquartile range
SD: standard deviation
T: treatment

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Table 2. Referral, hospital at home provision, and types of care in the included studies

	Andrei 2011	Caplan 1999	Corwin 2005	Davies 2000	Echeverria 2018	Harris 2005	Kalra 2000	Levine 2018	Levine 2020	Mendoza 2009	Nicholson 2001	Ricauda 2004	Ricauda 2008	Richards 2005	Shepperd 2021	Talcott 2011	Tibaldi 2004	Tibaldi 2009	Vianello 2013	Wilson 1999
Mode of referral																				
Emergency room	X	X	X	X				X	X	X	X	X	X	X			X	X	X	
Community (by primary care physician)						X	X													X
Outpatient department																X				
From admission < 24 hours					X															
Acute assessment unit/home															X					
Hospital at home provision																				
Hospital outreach team		X			X	X		X	X	X		X	X			X	X	X		
Mix of outreach/community staff				X			X				X				X				X	
GP/community nursing staff			X											X						X
Unclear	X																			
Types of care																				
Physiotherapy					X	X	X				X	X	X		X		X			X
Social worker				X		X	X	X	X			X				X	X			X
Occupational therapy					X	X	X	X	X		X				X					X
Counsellor																X				
Speech therapist							X					X								
Cultural link worker																				X

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Table 2. Referral, hospital at home provision, and types of care in the included studies *(Continued)*

Portable ventilator	X

GP: general practitioner

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APPENDICES

Appendix 1. Search strategies

Medline, OVID (MEDALL)

Search date: 24 February 2022

No.	Search terms	Results
1	home care services, hospital-based/	1882
2	home care services/ and (hospital* or unit? or ward? or institution*).ti,ab,kf.	7847
3	home health nursing/	329
4	(hospital* adj2 home).ti,ab,kf.	5192
5	virtual ward?.ti,ab,kf.	36
6	((early or earlier or supported or assisted) adj2 discharge?).ti,ab,kf.	5380
7	((hospice* or terminal or end of life or palliative) adj3 home).ti,ab,kf.	3217
8	or/1-7	21053
9	exp randomized controlled trial/	503167
10	controlled clinical trial.pt.	93583
11	randomi#ed.ti,ab.	611437
12	placebo.ab.	206278
13	randomly.ti,ab.	330738
14	Clinical Trials as topic.sh.	190496
15	trial.ti.	215710
16	or/9-15	1321613
17	exp animals/ not humans/	4681451
18	16 not 17	1218072
19	8 and 18	2721
20	(2015* or 2016* or 2017* or 2018* or 2019* or 2020* or 2021* or 2022*).dt,dp,ed,ep,yr.	7140476
21	19 and 20	873

Embase, OVID (1974 -)

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Search date: 24 February 2022

No.	Search terms	Results
1	exp *home care/	35966
2	(hospital* or unit? or ward? or institution*).ti,ab,kw.	2899467
3	1 and 2	8758
4	(hospital* adj2 home).ti,ab,kw.	7434
5	virtual ward?.ti,ab,kw.	65
6	((early or earlier or supported or assisted) adj2 discharge?).ti,ab,kw.	8645
7	((hospice* or terminal or end of life or palliative) adj3 home).ti,ab,kw.	4892
8	or/3-7	26968
9	random*.ti,ab.	1515492
10	factorial*.ti,ab.	37539
11	(crossover* or cross over*).ti,ab.	105414
12	((doubl* or singl*) adj blind*).ti,ab.	230030
13	(assign* or allocat* or volunteer* or placebo*).ti,ab.	1023714
14	crossover procedure/	62570
15	single blind procedure/	38333
16	randomized controlled trial/	596110
17	double blind procedure/	170759
18	or/9-17	2297858
19	exp animal/ not human/	4747743
20	18 not 19	2068138
21	8 and 20	3938
22	limit 21 to yr="2015 -Current"	1376
23	limit 22 to embase	687

CENTRAL, Wiley

Search date: 24 February 2022

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No.	Search terms	Results
#1	[mh "home care services, hospital-based"]	237
#2	[mh ^"home care services"] and (hospital* or unit? or ward? or institution*):ti,ab,kw	770
#3	[mh "home health nursing"]	7
#4	(hospital* near/2 home):ti,ab,kw	1634
#5	(virtual next ward?):ti,ab,kw	7
#6	((early or earlier or supported or assisted) next discharge*):ti,ab,kw	1035
#7	((hospice* or terminal* or "end of life" or palliative) near/3 home*):ti,ab,kw	304
#8	{or #1-#7}	3564
#9	{or #1-#7} with Cochrane Library publication date Between Jan 2015 and Feb 2022	1879

CINAHL, EBSCO

Search date: 24 February 2022

No.	Search terms	Results
S1	(MH "Home Health Care+")	47,909
S2	(hospital* or unit? or ward? or institution*)	770,406
S3	S1 AND S2	9,381
S4	TI (hospital* N2 home) OR AB (hospital* N2 home)	6,432
S5	TI (virtual ward?) OR AB (virtual ward?)	52
S6	TI ((early or earlier or supported or assisted) N2 discharge?) OR AB ((early or earlier or supported or assisted) N2 discharge?)	2,507
S7	TI ((hospice* or terminal or end of life or palliative) N3 home) OR AB ((hospice* or terminal or end of life or palliative) N3 home)	3,957
S8	S3 OR S4 OR S5 OR S6 OR S7	19,369
S9	PT randomized controlled trial	129,461
S10	PT clinical trial	108,609
S11	TI (randomis* or randomiz* or randomly) OR AB (randomis* or randomiz* or randomly)	317,084

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(Continued)

S12	(MH "Clinical Trials+")	314,688
S13	(MH "Random Assignment")	67,288
S14	S9 OR S10 OR S11 OR S12 OR S13	490,912
S15	S8 AND S14	2,149
S16	S15	772
S17	S16 Limiters - Published Date: 20150101-20221231	378

ClinicalTrials.gov

Search date: 14 November 2022

Search terms	Results
Interventional Studies | (intervention/treatment) early supported discharge OR "hospital at home" OR virtual ward	20
Interventional Studies | (title) home AND hospital	88
Total =	108

WHO ICTRP

Search date: 14 November 2022

Search terms	Results
hospital at home	91
early supported discharge	25
virtual ward*	3
TITLE (advanced search): hospital AND home	75
Total =	194

WHAT'S NEW

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Date	Event	Description
24 February 2022	New citation required but conclusions have not changed	We identified four new trials in this update (Echevarria 2018; Levine 2018; Levine 2020; Shepperd 2021).
24 February 2022	New search has been performed	New searches performed, four new trials added to the review. The review now includes 20 trials. In this update we removed data reported by Kalra 2000 and Ricauda 2004 from the meta-analysis, as evidence recommends that people with a suspected stroke be directly admitted to a specialist acute stroke unit after initial assessment (Langhorne 2020; Langhorne 2021). An acute stroke unit is a discrete area in the hospital that is staffed by a specialist stroke multidisciplinary team, with access to equipment for monitoring and rehabilitating patients (NICE 2019).

HISTORY

Review first published: Issue 4, 2008

Date	Event	Description
6 July 2011	Amended	Reference revised to published review.
8 June 2011	Amended	Title changed for consistency and changes to published notes.
17 February 2010	Amended	Change to published notes.
1 August 2008	New search has been performed	This review is an updated search and partial update from the original review (Shepperd 1998). Shepperd 1998 has been split into three reviews, of which this is one.
10 July 2008	Amended	Converted to new review format.

CONTRIBUTIONS OF AUTHORS

KE screened records, extracted data, assessed risk of bias, analysed the results for this update, and contributed to the writing of the review.

SI screened records, extracted data, and commented on each draft of the review.

HD and MJC contributed to the interpretation of data and writing of the review for the 2008 update.

DGB screened records, extracted data, and contributed to the writing of the review.

EW commented on the drafts and final draft of the review.

SS co-ordinated the review, screened records, extracted data, analysed the results (with HD) for the 2008 update with individual patient data, and led the writing of the review. SS did not assess risk of bias or extract data from the Shepperd 2021 study.

DECLARATIONS OF INTEREST

KE: none known.

SI: none known.

HD: none known.

MC: is a Cochrane Editor, but was not involved in the editorial process of this review.

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DGB: is a Cochrane Editor, but was not involved in the editorial process of this review.

EW: no declarations of interest.

SS is author of one of the included studies (Shepperd 2021); she did not perform risk of bias assessment, data extraction, or GRADE assessment for that study. SS is a Cochrane Editor, but was not involved in the editorial process of this review.

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  Sasha Shepperd

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- The Healthcare Improvement Studies Institute (THIS), UK

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DIFFERENCES BETWEEN PROTOCOL AND REVIEW

We updated the methods to align with current Cochrane guidance (MECIR 2012).

NOTES

This review is the fourth update; the original review was first published in Issue 1, 1998 of the Cochrane Library (Shepperd 1998). The original review has been separated into three distinct reviews: Hospital at home admission avoidance, Hospital at home early discharge, and Hospital at home: home-based end-of-life care. The titles have been changed for consistency. Hospital at home early discharge, Gonçalves-Bradley 2017, and Hospital at home: home-based end-of-life care, Shepperd 2016b, are published in the Cochrane Library.

INDEX TERMS

Medical Subject Headings (MeSH)

Home Care Services [economics] [*organization & administration]; Home Care Services, Hospital-Based [economics] [*organization & administration]; Hospitalization; Outcome and Process Assessment, Health Care; Randomized Controlled Trials as Topic

MeSH check words

Humans

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