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## Hospital at home admission avoidance (Review)

Shepperd S, Doll H, Angus RM, Clarke MJ, Iliffe S, Kalra L, Ricauda NA, Wilson AD

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Hospital at home admission avoidance (Review)

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**[Intervention Review]**

# Hospital at home admission avoidance

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## ABSTRACT

### Background

Admission avoidance hospital at home is a service that provides active treatment by health care professionals in the patient's home for a condition that otherwise would require acute hospital in-patient 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 health care professionals to take an active part in the patients' care. If hospital at home were not available then the patient would be admitted to an acute hospital ward. Many countries are adopting this type of care in an attempt to reduce the demand for acute hospital admission.

### Objectives

To determine, in the context of a systematic review and meta analysis, the effectiveness and cost of managing patients with admission avoidance hospital at home compared with in-patient hospital care.

### Search methods

The following databases were searched through to January 2008: MEDLINE, EMBASE, CINAHL, EconLit and the Cochrane Effective Practice and Organisation of Care Group (EPOC) register. We checked the reference lists of articles identified electronically for evaluations of hospital at home and obtained potentially relevant articles. Unpublished studies were sought by contacting providers and researchers who were known to be involved in this field.

### Selection criteria

Randomised controlled trials recruiting patients aged 18 years and over. Studies comparing admission avoidance hospital at home with acute hospital in-patient care. The admission avoidance hospital at home interventions may admit patients directly from the community thereby avoiding physical contact with the hospital, or may admit from the emergency room.

### Data collection and analysis

Two authors independently extracted data and assessed study quality. Our statistical analyses sought to include all randomised patients and were done on an intention to treat basis. We requested individual patient data (IPD) from trialists, and relied on published data when we did not receive trial data sets or the IPD did not include the relevant outcomes. When combining outcome data was not possible because of differences in the reporting of outcomes we have presented the data in narrative summary tables.

For the IPD meta-analysis, where at least one event was reported in both study groups in a trial, Cox regression models were used to calculate the log hazard ratio and its standard error for mortality and readmission separately for each data set (where both outcomes were available). We included randomisation group (admission avoidance hospital at home versus control), age (above or below the median), and gender in the models. The calculated log hazard ratios were combined using fixed effects inverse variance meta analysis. If there were no events in one group we used the Peto odds ratio method to calculate a log odds ratio from the sum of the log-rank test 'O-E' statistics from a Kaplan Meier survival analysis. Statistical significance throughout was taken at the two-sided 5% level ( $p < 0.05$ ) and data are presented as the estimated effect with 95% confidence intervals. For each comparison using published data for dichotomous outcomes we calculated risk ratios using a fixed effects model to combine data.

## Main results

We included 10 RCTs ( $n=1333$ ), seven of which were eligible for the IPD. Five out of these seven trials contributed to the IPD meta-analysis ( $n=850/975$ ; 87%). There was a non significant reduction in mortality at three months for the admission avoidance hospital at home group (adjusted HR 0.77, 95% CI 0.54 to 1.09;  $p=0.15$ ), which reached significance at six months follow-up (adjusted HR 0.62, 95% CI 0.45 to 0.87;  $p=0.005$ ). A non significant increase in admissions was observed for patients allocated to hospital at home (adjusted HR 1.49, 95% CI 0.96 to 2.33;  $p=0.08$ ). Few differences were reported for functional ability, quality of life or cognitive ability. Patients reported increased satisfaction with admission avoidance hospital at home. Two trials conducted a full economic analysis, when the costs of informal care were excluded admission avoidance hospital at home was less expensive than admission to an acute hospital ward.

## Authors' conclusions

We performed meta-analyses where there was sufficient similarity among the trials and where common outcomes had been measured. There is no evidence from the analysis to suggest that admission avoidance hospital at home leads to outcomes that differ from inpatient hospital care.

## PLAIN LANGUAGE SUMMARY

### 'Hospital at home' services to avoid admission to hospital

There continues to be, in some countries, more demand for acute care hospital beds than there are beds. One way to decrease or avoid admissions to hospital is to provide people with acute care treatment at home.

Special services have been developed which provide people with hospital care in their homes. Typically, these people would require treatment in an acute care hospital for a period of time. Instead, a team of health care professionals, such as doctors, nurses and physiotherapists, provide them with their treatment while they are at home. Many times, if the service is available, people can avoid the hospital altogether and be referred by their family doctor to receive the service, or be referred after visiting the emergency room. The key is that if the hospital at home service was not available, then the patient would need to be admitted to an acute hospital ward.

A review of the effect of hospital at home services to avoid admission was conducted. After searching for all relevant studies, 10 studies were found. The evidence shows that when compared to in-hospital care, hospital at home services may reduce the chances of dying. However, later on, admissions to hospital may increase. Admission avoidance hospital at home may not reduce or improve quality of life, function, or cognitive abilities (such as mental alertness and thinking) more than in hospital care. And while it may improve satisfaction in people at home, it is not known how it affects the carers of the people at home. With respect to costs, hospital at home services may be less expensive than in hospital care.

From this review however, it is not known which people would most benefit from hospital at home services. Although in these studies, most people were on average 70 to 80 years old. It is also not clear how the current state of the health system in a country would modify the effect of a hospital at home service.

## BACKGROUND

Hospital at home continues to be a popular response in many countries to the increasing demand for acute hospital beds. Patients treated by hospital at home may avoid admission to an acute hospital ward after assessment in the community by their primary care physician or in the emergency department. Alternatively, patients may be discharged early from hospital to receive hospital at home care (we have conducted a parallel systematic review and individual patient data meta-analysis of early discharge hospital at home, this will be published in the Cochrane Library issue 1 2009, and will be an update of [Shepperd 2005](#)). Recently the emphasis has been on avoiding admission to hospital, reflecting the relatively limited gain from discharging patients early after a stay in hospital, given the universal trend for shorter hospital lengths of stay. Cutting costs by avoiding admission to hospital in the first instance is the central goal of such schemes. Other perceived benefits include reducing the risk of adverse events associated with time in hospital ([Brennan 2004](#)) and the potential benefit of receiving rehabilitation within the home environment. However, it is not known if patients admitted to admission avoidance hospital at home have better or equivalent health outcomes compared with patients receiving in-patient hospital care. Nor is it known if the provision of hospital at home results in a reduction or increase in costs to the health service.

The type of patient treated in hospital at home services varies between schemes, as does the use of technology in hospital at home. Some schemes are designed to care for specific conditions, such as chronic obstructive pulmonary disease, or provide specific skills such as parenteral nutrition ([Mughal 1986](#)). These schemes usually have close ties with acute hospitals and may be encouraged by the different structure of incentives in insurance-based systems of health care. However, many other hospital at home schemes lack such a clear function and have an "open door" policy covering a large range of conditions.

## OBJECTIVES

To determine, in the context of a systematic review and meta analysis using individual patient data (IPD) and published data, the effectiveness and cost of managing patients with admission avoidance hospital at home compared with in-patient hospital care.

We address the following questions:

1. Do patients treated by hospital at home services in order to avoid admission to an acute ward have different health outcomes than patients managed as hospital in-patients?
2. Do re-admission rates, or transfers to hospital, differ for patients treated in admission avoidance hospital at home compared with patients who are treated in hospital and are discharged at the standard time?
3. Does patient satisfaction differ between admission avoidance hospital at home care and in-patient hospital care?
4. Do the costs to the health service alter as a result of providing admission avoidance hospital at home care?
5. Does the workload of doctors working in primary care change as a result of admission avoidance hospital at home?

## METHODS

### Criteria for considering studies for this review

#### Types of studies

Randomised controlled trials.

#### Types of participants

The review includes evaluations of admission avoidance hospital at home schemes that include patients aged 18 years and over. Patients with long term care needs are not included unless they required admission to hospital for an acute episode of care. Evaluations of obstetric, paediatric and mental health hospital at home schemes are excluded from the review since our preliminary literature searches suggested that separate reviews would be justified for each of these groups. For the purpose of this review, elderly patients were defined as those older than 65.

#### Types of interventions

Studies comparing admission avoidance hospital at home with acute hospital in-patient care. The admission avoidance hospital at home studies may admit patients directly from the community thereby avoiding physical contact with the hospital, or may admit from the emergency room. We used the following definition to determine if 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 health care professionals in the patient's home for a condition that otherwise would require acute hospital in-patient 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 health care professionals to take an active part in the patients' care. If hospital at home were not available then the patient would be admitted to an acute hospital ward. Therefore, the following services are excluded from this review:

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

#### Types of outcome measures

- Mortality
- Re-admissions or transfers to hospital for those requiring inpatient care during their stay in admission avoidance hospital at home
- General and disease specific health status
- Functional status
- Psychological well-being
- Clinical complications
- Patient satisfaction
- Carer satisfaction
- Carer burden
- Staff views (including general practitioners' satisfaction)
- Discharge destination from hospital at home
- Length of stay in hospital and hospital at home



- Cost: this includes the costs to the patient and their family, to general practice (including workload), to the hospital and to the community.

## Search methods for identification of studies

The following databases were searched through to January 2008: MEDLINE, EMBASE, CINAHL, EconLit and the Cochrane Effective Practice and Organisation of Care Group (EPOC) register. For the first three databases the search terms used were hospital adj2 home, home-based versus hospital-based, home hospitalisation, home care services, hospitalisation. The terms hospital near home, home care services and early discharge, home near hospital\*, home near in-patient\* were used to search EconLit. The EPOC register was searched using the terms home-based and in-patient\*, homecare and in-patient\*, hospital-at-home and in-patient\*, home-based and hospital\*, homecare and hospital\*, home-care and hospital\* (see [Appendix 1](#) for more detail). The EPOC register is compiled with monthly searches of MEDLINE, EMBASE and CINAHL. CENTRAL is searched at least once yearly for additional studies relevant to EPOC that have been submitted by other Cochrane review groups.

We checked the reference lists of articles identified electronically for evaluations of hospital at home and obtained potentially relevant articles. Unpublished studies were sought by contacting providers and researchers who were known to be involved in this field. A list of contacts was developed using the existing literature and following discussion with the UK Collaborative R&D Hospital at Home Group.

## Data collection and analysis

One author (SS) read all the abstracts in the records retrieved by the electronic searches to identify publications that appeared to be eligible for this review. These publications were independently read by two authors (SS and SI) who selected studies for the review according to the pre-specified inclusion criteria. Disagreements were resolved by discussion. The quality of eligible trials was assessed using the criteria described by the EPOC group (see ADDITIONAL INFORMATION, ASSESSMENT OF METHODOLOGICAL QUALITY under GROUP DETAILS). Data extraction was completed independently by two authors (SS and SI) using a checklist developed by EPOC, modified and amended for the purposes of this review (see METHODS USED IN REVIEWS under GROUP DETAILS). We conducted an IPD meta-analysis in a subgroup of trials evaluating specific outcomes in the more homogeneous populations described below.

### Individual patient data (IPD)

We contacted the investigators of seven of the included trials by email or telephone, inviting them to contribute data to the hospital at home admission avoidance collaborative review. We had to send up to four reminders before receiving data. We excluded three trials from the IPD meta-analysis (n=358 participants), though included these trials in the review, as they were considered to have recruited participants who differed substantially from the populations in the other trials in terms of having an acute short term condition or having significant cognitive impairment. The participants in these excluded trials had community acquired pneumonia ([Richards 2005](#)), cellulitis ([Corwin 2005](#)) or were frail elderly people with dementia ([Tibaldi 2004](#)).

## Statistical analysis

Our statistical analyses sought to include all randomised patients and were done on an intention-to-treat-basis. We relied on published data when the IPD did not include the relevant outcomes. When combining outcome data was not possible because of differences in the reporting of outcomes we have presented the data in narrative summary tables.

For the individual patient data meta-analysis, where at least one event was reported in both study groups in a trial, Cox regression models were used to calculate the log hazard ratio and its standard error for mortality and readmission separately for each data set (where both outcomes were available). We included randomisation group (admission avoidance hospital at home versus control), age (above or below the median), and gender in the models. The calculated log hazard ratios were combined using fixed effects inverse variance meta analysis ([Deeks 2001](#)). The pooled effect is expressed as the hazard ratio for hospital at home compared with usual hospital care. Heterogeneity was quantified by Cochran's Q ([Cochran 1954](#)) and the  $I^2$  statistic, 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. If there were no events in one group we used the Peto odds ratio method to calculate a log odds ratio from the sum of the log-rank test 'O-E' statistics from a Kaplan Meier survival analysis. This method does not require corrections for zero cell counts and thus it performs well when events are rare ([Deeks 1998](#)). Statistical significance throughout was taken at the two-sided 5% level ( $p < 0.05$ ) and data are presented as the estimated effect with 95% confidence intervals. All analyses were undertaken in SPSS version 14.0 ([SPSS 2006](#)) and STATA ([STATA](#)) with the meta-analysis being undertaken in Review Manager 4.2. For each comparison using published data for dichotomous outcomes we calculated risk ratios using a fixed effects model to combine data.

Comparison between health outcomes was restricted by the different measurement tools used in the included trials. A direct comparison of costs, although planned, was not attempted because the trials used different methods to calculate costs.

### Missing data

In two data sets ([Davies 2000](#); [Kalra 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](#)). We also set the time to event as 45 days for 31 cases in the admission avoidance hospital at home group and for 15 cases in control group where we knew a patient had been readmitted but did not have a date for the event ([Davies 2000](#)). For the other trial, we gave a time to event of 14 days if the patient was known to have died at some time between randomisation and one month follow-up, and at 59 days if they were known to have died between one and three months follow-up ([Kalra 2000](#)).



## Sensitivity analyses

Sensitivity analyses were used to assess the impact of the increased 'exposure' time to readmission for the hospital at home group compared with the hospital group. We calculated a pooled estimate both including and excluding transfers or readmissions to hospital occurring within the first 14 days, as this was the average duration that hospital patients spent in hospital. For the two studies in which missing data was imputed, sensitivity analyses were undertaken (assigning best and worse case scenarios to the intervention and comparison group) to assess the likely effect of such imputation.

## RESULTS

### Description of studies

Electronic searching yielded a total of 2187 citations from the different databases. After checking all of these, we had 10 eligible trials recruiting a total of 1333 participants. The 10 trials came from four countries, Australia, Italy, New Zealand and the UK. Investigators from seven of these trials, recruiting 975 participants, were invited to contribute data to the IPD meta-analysis (Caplan 1999; Davies 2000; Harris 2005; Kalra 2000; Nicholson 2001; Ricauda 2004; Wilson 1999). One of these trials was a three armed trial comparing 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.

### Study populations

Two trials recruited patients with chronic obstructive pulmonary disease (COPD) (Davies 2000; Nicholson 2001), two trials recruited patients recovering from a moderately severe stroke who were clinically stable (Kalra 2000; Ricauda 2004), and three trials recruited patients with an acute medical condition who were mainly elderly (Caplan 1999; Harris 2005; Wilson 1999). As noted above, there was one trial each for patients with cellulitis (Corwin 2005), patients with community acquired pneumonia (Richards 2005), and frail elderly patients with dementia (Tibaldi 2004).

### Interventions

There is variation in the way admission avoidance hospital at home is organised and how it relates to local health care providers. In the trials included in this review, seven transferred patients to hospital at home care from the emergency room (Caplan 1999; Corwin 2005; Davies 2000; Nicholson 2001; Ricauda 2004; Richards 2005; Tibaldi 2004) and three directly from the community following referral by their primary care physician (Harris 2005; Kalra 2000; Wilson 1999). Care was provided by a hospital outreach team (Caplan 1999; Harris 2005; Ricauda 2004; Tibaldi 2004), by a mix of outreach and community staff (Davies 2000; Kalra 2000; Nicholson 2001) or by the general practitioner (GP) and community nursing staff (Corwin 2005; Richards 2005; Wilson 1999). In two trials, the intervention was provided by Pegasus Health, an independent association of GPs (Corwin 2005; Richards 2005).

Physiotherapy care was provided in six of the interventions (Harris 2005; Kalra 2000; Nicholson 2001; Ricauda 2004; Tibaldi 2004; Wilson 1999) and occupational therapist care in four of the interventions (Harris 2005; Kalra 2000; Nicholson 2001; Wilson 1999). A social worker was part of the hospital at home team in six of the interventions (Davies 2000; Harris 2005; Kalra 2000; Ricauda

2004; Tibaldi 2004; Wilson 1999). Access to a speech therapist was described in three of the interventions (Kalra 2000; Ricauda 2004; Wilson 1999). One trial described access to a cultural link worker (Wilson 1999).

### Risk of bias in included studies

Seven criteria are recommended by EPOC to judge the quality of randomised trials, these are described elsewhere (see ADDITIONAL INFORMATION, ASSESSMENT OF METHODOLOGICAL QUALITY under GROUP DETAILS). One of the criteria, follow-up of professionals, was not relevant to the trials included in this review; the other six criteria were used. In six trials (Caplan 1999; Corwin 2005; Harris 2005; Kalra 2000; Richards 2005; Wilson 1999) the method of randomisation and concealment of allocation was adequate (see Characteristics of included studies). Nine trials collected baseline data, and in one trial which focused exclusively on comparing the costs of the interventions, this was not relevant (Nicholson 2001). All the trials used reliable measures of outcome; blinded assessment of outcome was not possible. The type of care provided for the control group was only partially described by the majority of the trials.

### Effects of interventions

Ten trials were included in this review [n=1333], and five of the seven trials eligible for the individual patient data meta-analyses contributed data [n=850/975; 87%] (Davies 2000; Harris 2005; Kalra 2000; Ricauda 2004; Wilson 1999). One trialist could not be contacted (Nicholson 2001) [n=25], and another declined to participate (Caplan 1999) [n=100]. We used published data when we did not have access to IPD. Follow-up times varied across the different trials, ranging from 1 week to 12 months. The main analysis is based on individual patient data. However we have included tables using the published data for comparison, and included forest plots with the number of events from the trial data sets (see Analysis 1.13 to Analysis 1.19).

### Mortality

We combined IPD for five trials recording the time to death at three months follow-up (n= 836) (Davies 2000; Harris 2005; Kalra 2000; Ricauda 2004; Wilson 1999) (see Analysis 4.3), and for three trials (n=683) (Kalra 2000; Ricauda 2004; Wilson 1999) with six months follow-up, adjusted for age and sex. There was a non significant reduction in mortality at three months for the admission avoidance hospital at home group (HR 0.77, 95% CI 0.54 to 1.09; p=0.15), which reached significance at six months follow-up (HR 0.62, 95% CI 0.45 to 0.87; p=0.005) (see Analysis 4.4). A sensitivity analysis of the effect of imputing missing dates, in which we assigned the best and worse case scenarios to the intervention (see Analysis 6.7 to Analysis 6.12) and comparison group (see Analysis 5.7 to Analysis 5.12), made little difference to the overall effect. A significant reduction in mortality at three months was reported for those allocated to stroke unit care compared with admission avoidance hospital at home in the trial comparing inpatient stroke unit care, inpatient stroke team care and admission avoidance hospital at home care (OR 0.41; 95% CI 0.17 to 0.98) with a non significant reduction at six months (OR 0.50; 95% CI 0.25 to 1.02) (Kalra 2000).

### Transfer to hospital

We combined data from three trials (n= 423) (Davies 2000; Harris 2005; Wilson 1999) recording a transfer to hospital from hospital

at home or a readmission during three months follow-up, and adjusted for age and sex. A non significant increase in admissions was observed for patients allocated to hospital at home (HR 1.49, 95% CI 0.96 to 2.33) (see [Analysis 4.1](#)). This increase remained when we removed admissions occurring within 14 days of randomisation (HR 1.42, 95% CI 0.87 to 2.30) (see [Analysis 4.2](#)). The direction of effect was similar in a pooled analysis of published data ([Analysis 1.14](#)).

### Functional ability

Five trials measuring functional ability reported non significant differences for most measures at 3, 6 and 12 months. Two of these trials recruited patients recovering from a stroke ([Kalra 2000](#); [Ricauda 2004](#)), two recruited patients with a mix of medical conditions, ([Harris 2005](#); [Wilson 1999](#)) and one trial was for patients with chronic obstructive airways disease ([Davies 2000](#)) ([Analysis 1.1](#)). [Caplan 1999](#) reported a significant improvement on the Instrumental Activities of Daily Living score between admission and discharge for those allocated to hospital at home (mean difference 0.57  $p=0.04$ ), but no changes were detected on the Barthel Index. The trial which recruited patients with dementia found that fewer patients 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](#)).

### Quality of life

Three trials assessed quality of life using different measures ([Corwin 2005](#); [Richards 2005](#); [Wilson 1999](#)) ([Analysis 1.2](#)). No significant differences were observed for the physical or mental component score of the SF-36 at two and six weeks follow-up ([Richards 2005](#)), or on the physical functioning and pain dimensions at day three or day six ([Corwin 2005](#)). Small non significant differences were reported for the Sickness Impact Profile at two weeks and three months follow-up, and for the Nottingham Health Profile at one year ([Corwin 2005](#); [Richards 2005](#); [Wilson 1999](#)).

### Cognitive function and psychological well being

Three trials measured cognitive function, one of which recruited patients recovering from a stroke ([Ricauda 2004](#)) and reported a significant difference on the Geriatric Depression Scale favouring those allocated to hospital at home (median difference 7 points, on a scale of 0 to 30,  $p<0.001$ ) ([Analysis 1.3](#)). Two trials recruiting patients with a mix of conditions, reported no differences between groups ([Caplan 1999](#); [Wilson 1999](#)), but one of these trials reported that fewer patients allocated to hospital at home were assessed as experiencing short term confusion during their episode of care (difference -20.4%, 95% CI -32% to -9%) ([Caplan 1999](#)).

### Patient satisfaction

Patients allocated to hospital at home care reported significantly higher levels of patient satisfaction across a range of different conditions ([Analysis 1.4](#)). For patients with cellulitis, 27% ( $p<0.0001$ ) more patients in the hospital at home group reported increased satisfaction with their location of care compared with those admitted to hospital ([Corwin 2005](#)); 40% ( $p<0.001$ ) more patients with community acquired pneumonia allocated to hospital at home reported that they were happy with their care ([Richards 2005](#)). Two trials (recruiting mainly elderly patients 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 a mean difference of 0.9 on a 4 point scale ( $p<0.0001$ ) ([Caplan 1999](#)). However, there was a low response rate for the control group in this last trial at 40% compared with 78% in the hospital at home group. In one trial, a small proportion (6/101; 6%) of patients refused hospital at home care and were admitted to hospital, and a greater proportion allocated to hospital care (23/97; 24%) were not admitted because of refusal by the patient, carer, or general practitioner.

### Clinical outcomes

One trial measured adverse events and medical complications, with fewer patients 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 the trial recruiting patients with dementia, fewer patients in the hospital at home group were prescribed antipsychotic drugs at discharge (difference -14%, 95% CI -28% to 0.3%) ([Tibaldi 2004](#)). No difference was reported in the advancement of cellulitis by the one trial recruiting patients with this condition ([Corwin 2005](#)). One trial, recruiting patients with COPD ([Davies 2000](#)) reported that significantly more patients were prescribed an antibiotic if they were allocated to hospital at home (difference 18%, 95% CI 1.4% to 34.6%) ([Analysis 1.5](#)).

### Cost

#### Elderly patients with a medical condition

One trial ([Wilson 1999](#)) reported a cost minimisation analysis, finding a significant increase in the mean cost per day for hospital at home (difference £99.71,  $p<0.001$ ), though there was no difference in cost at three months follow-up. When patients refusing their allocated place of care (hospital at home  $n=6/101$ ; inpatient admission  $n=23/97$ ) were removed from the analysis, there was a significant reduction in costs for those receiving hospital at home for the initial episode of care (difference -£1070.53, 95% CI -£1843.2 to -£245.73), and at three months follow-up (difference -£1063.45, 95% CI -£2043 to -£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 (£206.68 versus £133.7, mean difference £72.98,  $p<0.001$ ). Another trial, recruiting mainly elderly patients with a mix of conditions, examined costs to the health service ([Brennan 2004](#); [Caplan 1999](#)) using average costs and reported reduced health service costs for the intervention group (mean difference per episode -\$2011 95% CI -\$2800 to -\$1222; mean difference per day -\$293, 95% CI -\$318 to -\$268). Costs of the nurse co-ordinator and hospital doctor involved were excluded (see [Analysis 1.6](#)).

#### Patients recovering from a stroke

A trial recruiting patients recovering from a stroke compared stroke unit care, inpatient stroke team care and hospital at home. In terms of immediate care, hospital at home care was less costly than inpatient stroke team care (mean difference: -£2096, 95% CI -£3272 to -£920). The inclusion of costs of informal care, based on the minimum wage, results in a non significant difference (mean difference -£2216, 95% CI -£4771 to £339) ([Patel 2004](#)). In another trial recruiting patients with a stroke, a small non significant reduction in mean cost per patient was reported for those allocated to hospital at home (US\$ 6413.5 versus US\$ 6504.8) ([Ricauda 2004](#)),

this translated to a significant reduction in the cost per day (US\$ 163.0, sd 20.5 versus. US\$ 275.6, sd 27.7;  $p < 0.001$ ).

### **Chronic obstructive pulmonary disease and community acquired pneumonia**

One trial recruiting patients with COPD reported a lower mean health service cost for patients 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 mean difference -£1798,  $P < 0.01$ ) (Nicholson 2001). Another trial recruiting patients with community acquired pneumonia, again using DRG costs for the control and actual resource use for costing the intervention, reports a reduced cost for those allocated to hospital at home (mean cost per patient NZ\$ Treatment (T) = \$1157.9 versus Control (C) = \$1556.28) (Richards 2005).

### **Length of stay**

Hospital length of stay varied between trials, ranging from a mean reduction in hospital length of stay of -13.40 days (95% CI -17.92 to -8.88) (Wilson 1999) to -5 days (mean difference -5.06, 95% CI -9.23 to -0.89) (Harris 2005); in one trial 51/153 were admitted to hospital from hospital at home, with a mean length of stay of 48.6 days (sd 26.7), compared with the control group length of stay of 29.50 days (sd 40.10). When all days of care are accounted for (hospital at home plus any inpatient days) total length of stay for patients is lower for those allocated to hospital at home in one trial (difference -14.13 days,  $p < 0.02$ , 95% CI -20.18 to -7.08) (Wilson 1999), and increased in another trial (difference 15.90, 95% CI 8.10 to 23.70) (Ricauda 2004).

One trial, recruiting patients recovering from a stroke, reported that 51/153 (33%) of the patients allocated to hospital at home received inpatient care within two weeks of randomisation, with a mean length of stay of 49 days. This exceeded the mean length of stay of those allocated to an inpatient hospital stroke team by 17 days (95% CI 7.9 to 25.3) (Kalra 2000).

### **Use of other health services and informal care**

Davies 2000 reported an increase in referrals for social support for patients 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 1.6). One of the trials, recruiting patients 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 1.6).

### **General practitioner's (GPs) views**

One trial examined the views of GPs regarding their satisfaction with the service and reported no significant difference between GPs for the hospital at home versus hospital group. However, the response rate was poor, 63% in the hospital at home group and 37% in the control group (Caplan 1999).

### **Place of residence following discharge**

Three trials reported the number of patients living in an institutional setting at follow-up. One trial, recruiting elderly patients with dementia, reported that more patients allocated

to inpatient hospital care were living in an institutional setting compared with those allocated to hospital at home (RR 0.11; 95% CI 0.03 to 0.46) (Tibaldi 2004). Data from two trials recruiting patients recovering from a stroke showed a non significant reduced risk of living in an institutional setting for patients receiving hospital at home care at six months follow up (RR 0.66; 95% CI 0.37 to 1.15) (Kalra 2000; Ricauda 2004) (Analysis 1.22 and Analysis 1.23).

### **Carer outcomes**

One trial reported that carers 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,  $p < 0.0001$ ) (Caplan 1999). However, there was a poor response rate of 27% in the hospital group and 55% in the hospital at home group. A second trial assessed carer satisfaction through semi-structured interviews; carers 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).

## **DISCUSSION**

We included 10 trials in this systematic review recruiting elderly patients with a medical condition, five of which contributed 87% of the data eligible for the IPD meta-analysis (Davies 2000; Harris 2005; Kalra 2000; Ricauda 2004; Wilson 1999). We performed meta-analyses where there was sufficient similarity among the trials and where common outcomes had been measured. Although there were no differences between groups for most measures of functional ability or quality of life, patients allocated to hospital at home had a significantly reduced risk of death at six months follow-up. This reduction was not significant at three months, possibly reflecting the lower number of events by that time point. However the direction of effect is consistent between trials and for each follow-up period.

The results of our IPD meta-analysis should not be taken as evidence that hospital care is hazardous. Rather, we believe it shows that there is no evidence from the analysis to suggest that admission avoidance hospital at home leads to outcomes that differ from inpatient hospital care. There was some variation in the way the admission avoidance hospital at home schemes operated, with three admission avoidance hospital at home schemes admitting patients directly from the community (Harris 2005; Kalra 2000; Wilson 1999). In the other seven trials the services operated from an accident and emergency department (Caplan 1999; Corwin 2005; Davies 2000; Nicholson 2001; Ricauda 2004; Richards 2005; Tibaldi 2004). Three trials evaluated interventions where the patient could be living alone, five trials required a caregiver to be either living with the patient or nearby and for two trials this was not clear. Nonetheless there were some important common features which included care being coordinated in each of the schemes by a multi-disciplinary team, the provision of 24 hour cover if required, with access to a doctor, and a safe home environment.

Which groups of patients are eligible for admission avoidance hospital at home and to which groups of patients can these results be applied? The applicability of these results are restricted less by difficulties in defining the intervention, which is a common problem in other studies of complex interventions, than by the identification of the populations eligible for this type of care.

The patients recruited to the included trials were elderly with a medical event, which included stroke and chronic obstructive pulmonary disease, requiring admission to hospital. Their average age ranged from 70 years old to over 80 years old. The entry criteria required patients to be clinically stable and not requiring specialist diagnostic investigation or emergency interventions.

The total costs for the initial episode of care were estimated at 3 and 12 months after randomisation. We were not able to combine cost data due to the different ways costs had been calculated, but in most instances estimated costs were lower in the admission avoidance hospital at home scheme. Only two trials conducted a full economic evaluation (Jones 1999; Patel 2004). In one of these, hospital at home was less expensive with an on treatment analysis, but became more expensive with an intention to treat analysis. In the other trial hospital at home care was less costly than inpatient stroke team care if the costs of informal care were excluded.

The increased satisfaction reported by patients allocated to hospital at home must be balanced against the lack of evidence on the views of carers. However the increase in patient satisfaction is uniform across all trials reporting this, despite being assessed with a variety of different questions. Interviews with patients reveal that the aspects of hospital at home care valued most are the quality of communication and personal care they received in hospital at home (Wilson 1999).

It should be noted that admission avoidance hospital at home does not totally substitute for hospital, in that admission to hospital remains an option if required. One trial, recruiting patients recovering from a stroke, reported that 51/153 (33%) of the patients allocated to hospital at home received inpatient care within two weeks of randomisation (Kalra 2000). In another trial, a small proportion (6/101; 6%) refused hospital at home care and were admitted to hospital (Wilson 1999). Furthermore, patients in seven of the ten trials were admitted to admission avoidance hospital at home from a hospital emergency room.

Problems can arise when comparisons are made between countries. The 10 trials included in this review came from Australia, Italy, New Zealand and the UK. Although the health systems in these countries vary with respect to the way health care 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 (Naik 2006). The level of existing primary care in a country will determine the degree to which admission avoidance hospital at home operates as an outreach model, or is run by supplementing existing primary care services. In addition, the way care for the control group is organised will have an impact on outcome. In one trial (Kalra 2000) admission avoidance hospital at home was compared with inpatient stroke team care or admission to a stroke unit. We compared inpatient stroke team care with admission avoidance hospital at home. However mortality or institutional care at one year were lower for those allocated to stroke unit care compared with these other two strategies.

## Reviewers' conclusions

Admission avoidance hospital at home can provide an effective alternative to inpatient care for a selected group of elderly patients requiring hospital admission. However, determining which groups of patients are most likely to benefit and to which other groups

the results apply is not simple. 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 unexpectedly deteriorated, or who could no longer be managed at home, had access to hospital admission. In one trial this was up to 33% of patients within two weeks of randomisation. The degree of patient selection may also reflect the high levels of satisfaction reported, with patients participating in the trials preferring to be treated at home. Interestingly fewer behavioural problems were reported for those allocated to admission avoidance hospital at home in the trial recruiting patients with dementia, despite experiencing serious cognitive and functional decline.

## AUTHORS' CONCLUSIONS

### Implications for practice

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 is low and some of these patients will require access to hospital services, thus making the closure of a ward or hospital in favour of hospital at home an unrealistic option. Furthermore, the effectiveness of admission avoidance hospital at home may be reduced if hospital admission incorporates aspects of care known to be effective for these groups of patients, such as stroke unit care (Stroke Unit Trialist) or comprehensive geriatric assessment (Stuck 1993). Instead, admission avoidance hospital at home may be provided to supplement existing services, which could be an acceptable policy option for some groups of patients.

### Implications for research

Over the last 10 years the randomised evidence has grown substantially from 1 to 10 trials, despite the practical difficulties of conducting randomised controlled trials of service innovations, which is encouraging. Although each of these trials was underpowered, combined there was adequate power to address important differences in mortality. In addition obtaining individual patient data allowed us to conduct a time to event analysis. Future primary research of admission avoidance hospital at home should continue to measure mortality and readmission, with particular attention to the transfer of patients between admission avoidance hospital at home and inpatient care. In addition, clinical and dependency data of recruited patients should be collected using standardised measures to facilitate the application of evidence. Trials should also include a formal, planned economic analysis using costs that are sensitive to the different resources used during an episode of care. Comparisons with other ways of organising inpatient care, for example incorporating aspects of case management and comprehensive assessment, would also improve the evidence supporting decisions about how services should be organised to maximise health outcomes. Finally the role of advanced portable medical devices and communication technologies in admission avoidance hospital at home should be explored in pilot studies.

## ACKNOWLEDGEMENTS

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\* Indicates the major publication for the study

## CHARACTERISTICS OF STUDIES

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

#### Caplan 1999

Methods	RCT
Participants	Setting: Australia
	Variety of acute conditions requiring admission to hospital - patients recruited from casualty.
	Treatment = 51

#### Hospital at home admission avoidance (Review)

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## Caplan 1999 (Continued)

Control = 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 carer satisfaction GP views
Notes	Follow-up: 1 and 6 months

### Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment (selection bias)	Low risk	A - Adequate  Computer generated random numbers, sealed envelope

## Corwin 2005

Methods	RCT
Participants	Setting: New Zealand  Patients with cellulitis  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 & community care nursing staff. Patients required IV antibiotics for cellulitis
Outcomes	Advancement of cellulitis Reamission Days on IV antibiotics Functional outcomes (SF 36)

### Hospital at home admission avoidance (Review)



## Corwin 2005 (Continued)

Continued

	Patient satisfaction	
Notes	Follow up: 3 and 6 days	
<b>Risk of bias</b>		
<b>Bias</b>	<b>Authors' judgement</b>	<b>Support for judgement</b>
Allocation concealment (selection bias)	Low risk	A - Adequate Telephone randomisation service

## Davies 2000

[SEARCH](#)

Methods	RCT	
Participants	Setting: UK  Patients with chronic obstructive airways disease  Treatment = 100 Control = 50	
Interventions	Hospital at home  Type of service: admission avoidance from accident and emergency department. 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	
<b>Risk of bias</b>		
<b>Bias</b>	<b>Authors' judgement</b>	<b>Support for judgement</b>
Allocation concealment (selection bias)	Unclear risk	B - Unclear

## Harris 2005

Methods	RCT	
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%).	
Interventions	Operated as a hospital outreach programme under the management of Auckland Hospital from the Emergency Department or Acute Assessment Ward. A nurse led multi-disciplinary team (physiothera-	

## Hospital at home admission avoidance (Review)

**Harris 2005** (Continued)

py, 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 nursing care a day available, and a 24 hour live in home carer if required. There was a daily nursing review, and a discharge hand over to ongoing support services.

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Outcomes

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Notes

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**Risk of bias**


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Bias	Authors' judgement	Support for judgement
Allocation concealment (selection bias)	Low risk	A - Adequate Telephone randomisation service

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**Kalra 2000**


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Methods	RCT	
Participants	Setting: UK  Patients recovering from a moderately severe stroke  Median (IQR) T=75 (72-84) C=77.7 (67-83)  Living alone T=50/148 (34%) C=50/149 (34%)	
Interventions	Hospital outreach admission avoidance multi-disciplinary with joint care from community services	
Outcomes	Mortality Institutionalised Rankin scale for level of independence Barthel Treatment inputs Readmission Hospital length of stay Cost	
Notes	Follow up: 3, 6 and 12 months	
Risk of bias		
Bias	Authors' judgement	Support for judgement
Allocation concealment (selection bias)	Low risk	A - Adequate  Block randomisation, telephone randomisation

**Hospital at home admission avoidance (Review)**

## Nicholson 2001

Methods	RCT
Participants	<p>Setting: Australia</p> <p>Patients with chronic obstructive pulmonary disease</p> <p>Inclusion criteria: age &gt; 45 years, COPD, current or ex smoker, FEV1 &lt; 60% predicted, admission requested by GP or OPD clinic staff or ED staff, telephone at home</p> <p>treatment = 13 control = 12</p>
Interventions	<p>Hospital at home (discharge from Emergency Department)</p> <p>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.</p>
Outcomes	Cost to the health service
Notes	Follow up: duration of care in hospital at home or inpatient care

### *Risk of bias*

Bias	Authors' judgement	Support for judgement
Allocation concealment (selection bias)	Unclear risk	B - Unclear

## Ricauda 2004

Methods	RCT
Participants	<p>Setting: San Giovanni Battista Hospital, Turin, Italy. A teaching &amp; tertiary care hospital.</p> <p>Patients recovering from a stroke</p>
Interventions	<p>Hospital outreach admission avoidance.</p> <p>24 hour care available multi-disciplinary team: physiotherapist, occupational therapist, nursing, hospital geriatrician, social worker, speech therapist, psychologist.</p>
Outcomes	<p>Length of treatment</p> <p>Mortality</p> <p>Activities of daily living</p> <p>Functional impairment</p> <p>Depression</p> <p>Cost</p>
Notes	Follow up: 6 months

### *Risk of bias*

Bias	Authors' judgement	Support for judgement
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## Hospital at home admission avoidance (Review)

### Ricauda 2004 (Continued)

Allocation concealment (selection bias)	Unclear risk	B - Unclear
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### Richards 2005

Methods	RCT
Participants	<p>Setting: Christchurch, New Zealand</p> <p>Patients with community acquired pneumonia</p> <p>T=50.1 years C=49.8 years</p> <p>Number recruited: T=24 C=25</p> <p>Recruitment from July 2002 to October 2003.</p>
Interventions	<p>Hospital at home: admission avoidance from emergency room. Run by Pegasus Health, an independent practitioner's association for 230 GPs in Christchurch, New Zealand.</p> <p>Care provided by GP &amp; community care nursing staff.</p>
Outcomes	<p>Median number of days to discharge</p> <p>Days of IV antibiotics</p> <p>SF 12</p> <p>Mortality</p> <p>Readmission</p> <p>Patient satisfaction</p> <p>Cost</p>
Notes	Follow up: 2 and 6 weeks

### Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment (selection bias)	Low risk	<p>A - Adequate</p> <p>Telephone randomisation</p>

### Tibaldi 2004

Methods	RCT
Participants	<p>Setting: San Giovanni Battista Hospital, Turin, Italy.</p> <p>Patients: elderly with advanced dementia</p> <p>Mean age (sd) T=82.9 (7.9) C=84.1 (7.5)</p> <p>Number recruited T=56 C=53</p>

### Hospital at home admission avoidance (Review)

**Tibaldi 2004** (Continued)

Interventions	Hospital at home run by S. Giovanni Battista Hospital, Turin, Italy: Geriatric Home Hospitalisation Service (GHHS), patients referred from emergency department.  24 hour a day care available, home nursing multi-disciplinary care, rapid access to equipment
Outcomes	Behavioural disturbances Patients treated with antipsychotic drugs on admission and on discharge Mortality Length of stay Discharged home or to a nursing home
Notes	Follow up: to discharge from service

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Allocation concealment (selection bias)	Unclear risk	B - Unclear

**Wilson 1999**

Methods	RCT
Participants	Setting: Leicester, UK. Patients with a mix of conditions (majority elderly) referred by GP to Bed Bureau  treatment = 102 control = 97
Interventions	Hospital at home (admission avoidance)  Type of service: multi-disciplinary team (nurses, therapy, generic health workers, cultural link worker)  Maximum of 5 patients at a time  Control group: in patient hospital care
Outcomes	Mortality Re-admission Functional status Quality of life Patient satisfaction
Notes	Follow-up: 3 days, 2 weeks, 3 months

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Allocation concealment (selection bias)	Low risk	A - Adequate  Block randomisation, consecutively numbered sealed envelopes

**Hospital at home admission avoidance (Review)**

RCT: Randomised controlled trial  
 GP: General practitioner  
 sd: standard deviation  
 T: Treatment  
 C: Control  
 IV: Intra-venous  
 SF 12: the SF 12 health survey  
 IQR: Inter-quartile range  
 GHHS: Geriatric home hospitalisation service  
 ED: Emergency department  
 FEV1: Forced expiratory volume at 1 second  
 COPD: Chronic obstructive pulmonary disease

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

Study	Reason for exclusion
<a href="#">Wade 1985</a>	CCT Compared two districts - one with a domiciliary stroke service and one without.
<a href="#">Wolfe 2000</a>	Intervention does not substitute for inpatient care

CCT: Clinical controlled trial

## 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
<a href="#">1 Functional ability</a>			Other data	No numeric data
1.1 Admission avoidance patients recovering from a stroke functional ability			Other data	No numeric data
1.2 Admission avoidance patients with a medical condition - functional ability			Other data	No numeric data
<a href="#">2 Quality of life</a>			Other data	No numeric data
2.1 Admission avoidance quality of life			Other data	No numeric data
<a href="#">3 Cognitive function</a>			Other data	No numeric data
3.1 admission avoidance - cognitive function/psychological well being			Other data	No numeric data
<a href="#">4 Patient satisfaction</a>			Other data	No numeric data
<a href="#">5 Clinical outcomes</a>			Other data	No numeric data
5.1 clinical outcomes			Other data	No numeric data

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
5.2 Use of antipsychotic drugs			Other data	No numeric data
6 Cost			Other data	No numeric data
6.1 health service costs			Other data	No numeric data
6.2 informal care inputs			Other data	No numeric data
6.3 use of other health services			Other data	No numeric data
7 Length of stay			Other data	No numeric data
7.1 Trials reporting length of stay			Other data	No numeric data
8 Treatment inputs			Other data	No numeric data
9 Carer outcomes			Other data	No numeric data
9.1 Carer satisfaction			Other data	No numeric data
10 GPs views			Other data	No numeric data
11 Anxiety and depression			Other data	No numeric data
12 Readmission for hospital at home group within 2 weeks of randomisation			Other data	No numeric data
13 Re admission to hospital for patients with a medical condition at 3 months	3	416	Risk Ratio (M-H, Fixed, 95% CI)	1.48 [1.02, 2.15]
13.1 Readmission for patients with a medical condition using number of events from trial databases	3	416	Risk Ratio (M-H, Fixed, 95% CI)	1.48 [1.02, 2.15]
14 Readmissions at 3 months using published data	5	690	Risk Ratio (M-H, Fixed, 95% CI)	1.35 [0.97, 1.87]
14.1 Elderly medical patients readmission using published data (Caplan follow-up at 28 days)	3	447	Risk Ratio (M-H, Fixed, 95% CI)	1.18 [0.83, 1.67]
14.2 Patients with cellulitis or pneumonia - published data	2	243	Risk Ratio (M-H, Fixed, 95% CI)	3.22 [1.08, 9.63]
15 Mortality during treatment	1	120	Risk Ratio (M-H, Fixed, 95% CI)	0.81 [0.43, 1.54]
16 Mortality at 3 months elderly patients with a medical condition (using data from trialists)	5	833	Odds Ratio (M-H, Fixed, 95% CI)	0.83 [0.56, 1.23]
17 Mortality at 3 months using published data	3	644	Risk Ratio (M-H, Fixed, 95% CI)	0.85 [0.60, 1.21]
18 Mortality at 6 months follow up (using data from trialists, apart from Caplan)	4	707	Risk Ratio (M-H, Fixed, 95% CI)	0.76 [0.58, 0.99]



Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
19 Mortality at 6 months using published data	2	413	Risk Ratio (M-H, Fixed, 95% CI)	0.83 [0.58, 1.19]
20 Mortality at 1 year follow up	1	293	Risk Ratio (M-H, Fixed, 95% CI)	0.64 [0.39, 1.05]
21 Total length of stay to include hospital transfers for the hospital at home group	1	171	Mean Difference (IV, Fixed, 95% CI)	-14.13 [-21.11, -7.15]
22 Living in an institutional setting at follow up - patients recovering from a stroke	2	413	Risk Ratio (M-H, Fixed, 95% CI)	0.66 [0.37, 1.15]
22.1 Recovering from a stroke at 6 months follow up	2	413	Risk Ratio (M-H, Fixed, 95% CI)	0.66 [0.37, 1.15]
23 Living in a nursing home at follow up - patients with dementia	1	109	Risk Ratio (M-H, Fixed, 95% CI)	0.11 [0.03, 0.46]

### Analysis 1.1. Comparison 1 Admission avoidance hospital at home versus inpatient care, Outcome 1 Functional ability.

Functional ability			
Study	Functional ability	Results	Notes
Admission avoidance patients recovering from a stroke functional ability			
Kalra 2000	<p>Modified Rankin scale 0-3 (measure of dependence: 0=independent and 3=dependent). Number independent and require minor assistance for day to day activities.</p> <p>Barthel 0-20 (higher score=greater independence)</p>	<p>Modified Rankin</p> <p>At 3 months</p> <p>T=107/145 (74%)</p> <p>C=111/151 (74%)</p> <p>RR 1.00 (0.86, 1.15)</p> <p>P=0.96</p> <p>At 12 months</p> <p>T=102/144 (71%)</p> <p>C=99/149 (66%)</p> <p>RR 0.94 (0.81, 1.09)</p> <p>P=0.42</p> <p>Barthel 15-20 (number with favourable outcome)</p> <p>At 3 months</p> <p>T=106/145 (73%)</p> <p>C=106/151 (70%)</p> <p>RR 0.96 (0.83, 1.11)</p> <p>P=0.58</p> <p>At 12 months</p> <p>T=102/144 (71%)</p> <p>C=102/149 (69%)</p> <p>RR 0.97 (0.85, 1.11)</p> <p>P=0.65</p>	
Ricauda 2004	<p>Activities of daily living (number of functions lost, score 0 to 6).</p> <p>Functional impairment measure (level of independence, range 28 to 126 with high score =greater independence).</p> <p>Canadian Neurological Scale Score (higher score=improvement, range 0-10)</p>	<p>Activities of daily living (scale 0 to 6)</p> <p>At 6 months</p> <p>Median IQR</p> <p>T=4 (2-5)</p> <p>C=4 (2-6)</p> <p>P=0.57 (Mann Whitney)</p> <p>Functional impairment measure (range 28 to 126)</p> <p>At 6 months</p> <p>Median IQR</p>	

Functional ability			
Study	Functional ability	Results	Notes
	National Institute of Health Stroke Scale Score (low score =improvement; range 0-36)	T=106 (67.5-121.5) C=96.5 (56.5-116.5) P=0.26 (Mann Whitney)	
		Canadian Neurological Scale Score (range 0-10) At 6 months Median IQR T=10 (8.5-10.0) C=9.5 (7.0-10.0) P=0.39 (Mann Whitney)	
		National Institute of Health Stroke Scale Score (range 0-36) At 6 months Median IQR T=8 (4-26) C=8 (6-24) P=0.37 (Mann Whitney)	
<b>Admission avoidance patients with a medical condition - functional ability</b>			
Caplan 1999	Change in Barthel score from admission to discharge (high score=greater independence)	Mean (SEM) T= 0.37 (0.27) C= -0.04 (0.27) NS	
	Instrumental activities of daily living score from admission to discharge (higher score=greater independence)	Mean (SEM) T=0.65 (0.23) C=-0.88 (0.26) P=0.037	
Davies 2000	St Georges' respiratory questionnaire: high score indicates poorer health related quality of life	Baseline scores Treatment: 71.5 (43.4 to 99.6) Control: 71 (43.4 to 98.6)	
	Forced expiratory volume in one second (FEV1):	Mean change at 3 months [mean (sd) difference, 95% CI] Treatment: 0.48 (16.92) Control: 3.13 (14.02)	
		Forced expiratory volume in 1 second (FEV1) At 3 months: Treatment: 41.5% (95% CI 8.2% to 74.8%) Control: 41.9% (95% CI 6.2% to 77.6%)	
Tibaldi 2004	Behavioural disturbances	Sleeping disorders T= 5/56 (9%) C= 23/53 (43%) difference -34%, 95% CI -50% to -19% P<0.001	
		Agitation/aggressiveness T= 5 /56 (9%) c= 22/53 (41.5%) difference -33% 95% CI -48% to -17% P<0.001	
		Feeding disorders T= 5 /56 (9%) C= 21/53 (40%) difference -31% 95% CI -46% to -16% P<0.001	
Wilson 1999	Barthel Index:At 3 months, median (IQR) Treatment: 16 (13-19)Control: 16 (12-20)[0, -1.1 to 2.1]Sickness Impact Profile:At 3 months, median (IQR) Treatment: 24 (20-31)Control: 26 (20-31)[-2, -4.1 to 4.0]	Barthel Index - no (%) not assessed: treatment 21 (28%), control 18 (28%)Sickness Impact Profile - no (%) not assessed: treatment 31 (41%), control 30 (46%)	

## Analysis 1.2. Comparison 1 Admission avoidance hospital at home versus inpatient care, Outcome 2 Quality of life.

Study	Outcomes	Quality of life		Notes
		Results		
Admission avoidance quality of life				
Corwin 2005	SF 36 Physical functioning Role physical Pain (high score=better health)	SF 36		Differences calculated on absolute differences between day 0 & day 3, or day 0 & day 6.  Numbers vary due to missing data
		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				
Richards 2005	Mean physical component score SF-12, higher score=better health	At 2 weeks		
		T=38.1 [n=24]		
		C=40.2 [p=25]		
		P=0.45		
		At 6 weeks		
		T=42.2 [n=24]		
		C=45.8 [n=25]		
		P=0.18		
		Mean mental component score SF-12		
		At 2 weeks		
		T=48.3 [n=24]		
		C=48.6 [n=25]		
		P=0.91		
		At 6 weeks		
		T=50.4 [n=24]		
C=51.0 [n=25]				
P=0.81				
Wilson 1999	Sickness Impact Profile  Euroqol	Median (IQR) at 2 weeks		
		T=29 (22-34) n=69		
		C=30 (20-34) n=57		
		difference -1 (95% CI -4.0 to 3.0) p=0.82		
		At 3 months		
		T=24 (20-31) n=70		
		C=26 (20-31) n=66		
		difference -2 (95% CI -4 to 4) p=0.73		
		Euroqol		
		Median (IQR) at 2 weeks		
T=0.59 (0.15 to 0.78) n=76				
C=0.56 (0.19 0.73) n=62				

Study	Outcomes	Quality of life	Notes
		Results	
		difference 0.03 (95% CI -0.11 to 0.11) p=0.95	
		At 3 months T=0.64 n=73 C=0.63 n=68 difference 0.01 (95% CI -0.12 to 0.09) p=0.94	

### Analysis 1.3. Comparison 1 Admission avoidance hospital at home versus inpatient care, Outcome 3 Cognitive function.

Study	Cognitive function		Notes
	Outcomes	Results	
admission avoidance - cognitive function/psychological 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	
Ricauda 2004	Geriatric Depression Scale score (range 0-30) higher scores indicate depression	At 6 months Median IQR T=10 (5-15) C=17 (13-20) P=<0.001 (Mann Whitney)	
Wilson 1999	Philadelphia Geriatric Morale Scale:	At 3 months: median (IQR) Treatment: 37 (30-42) Control: 37 (31-43) [0, -4.1 to 4.1]	

### Analysis 1.4. Comparison 1 Admission avoidance hospital at home versus inpatient care, Outcome 4 Patient satisfaction.

Study	Outcomes	Patient satisfaction	Notes
		Results	
Caplan 1999	Patient satisfaction: satisfaction rated on a 4 point scale: 1=excellent, 2=good, 3=fair, 4=poor.	Mean score Treatment:1.1 Control: 2.0 P<0.0001	Response rates were 78% for the treatment group, and 40% for the control.
Corwin 2005	Overall satisfaction	Very satisfied or quite satisfied T=87/91 (96%) C=87/96 (96%) P=0.12  Satisfaction with location of care, very satisfied or quite satisfied T=85/91 (93%) C=59/88 (66%) P<0.0001  Preferable to provide this type of care: In the hospital T=5/91 (5%) C=27/88 (31%) P<0.0001  In the community T=78/91 (86%) C=31/88 (35%)  No preference T=8/91 (9%)	Numbers for control group vary between 88 and 91 due to missing data

Study	Outcomes	Patient satisfaction		Notes
		Results		
Richards 2005	Reporting very happy with care	C=30/88 (34%) T=24/24 (100%) C=14/24 (60%) P=0.001		
Wilson 1999	Patient satisfaction, scale 0 to 18	At 2 weeks, or discharge, median (IQR) Treatment: 15 (13 to 16.5) Control: 12 (11 to 14) P<0.0002		

### Analysis 1.5. Comparison 1 Admission avoidance hospital at home versus inpatient care, Outcome 5 Clinical outcomes.

Study	Outcomes	Clinical outcomes		Notes
		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 (95% CI) HR 0.98 (0.73 to 1.32) p=0.90  Days on intravenous antibiotics HR 0.84 (0.63 to 1.12) p=0.23  Days to discharge HR 0.93 (0.70 to 1.23) p=0.60  Days on oral antibiotics 1.09 (0.82 to 1.45) p=0.56		
Davies 2000				
Use of antipsychotic drugs				
Tibaldi 2004	Use of antipsychotic drugs	On admission T= 26/56 (46.4%) C= 18/56 (32%)  On discharge T= 6/56 (11%) C = 13/53 (25%) difference 14%, 95% CI -28% to 0.3%		

### Analysis 1.6. Comparison 1 Admission avoidance hospital at home versus inpatient care, Outcome 6 Cost.

Study	Outcomes	Cost		Notes
		Results		
health service costs				
Caplan 1999	Cost	Average cost per episode: Treatment: \$1,764 (sd \$1,253) (n=50)  Control: \$3,775 (sd \$2,496) (n=47) Mean difference per episode \$-2011 95% CI -\$2800 to -\$1222  Cost per day: Treatment: \$191 (sd \$58) (n=50) Control: \$484 (sd \$67.23) (n=47) mean difference per day -\$293, 95% CI -\$318 to -\$268	Cost data financial year 1995/1996	
Kalra 2000	Resources and cost	Physiotherapy Mean PIU (1 PIU=30 minutes) t=64.2 [n=140]		

Study	Outcomes	Cost	Results	Notes
		c= 60 [n=147]		
		Occupational therapy Mean PIU (1 PIU=30 minutes) t=9.8 [n=140] c=7.3 [n=147]		
		Speech and language therapy Mean PIU (1 PIU=30 minutes) t=261.3 [n=140] c=240.7 [n=147]		
		Mean costs Immediate care mean £ (sd) T=3856 (5062) [n=140] C=5952 (5054) [n=147] Mean difference: -£2096, 95% CI -£3272 to -£920		
		12 month follow up mean £ (sd) t=2984 (5749) [n=140] c=3575 (5705) [n=147] Mean difference: -£591 95% CI -£1922 to £740		
		Total cost excluding informal care T=6840 (9353) [n=140] C=9527 (8664) [n=147] Mean difference: £-2687, 95% CI £-4781 to £-593		
		Total cost including informal care based on minimum wage rate T= 10 296 (11,613) [n=140] C=12,512 (10,369) [n=147] Mean difference £-2216, 95% CI £-4771 to £339		
		Total cost including informal care based on home help rate T= 17 226 (21,442) [n=140] C=18 498 (18,785) [n=147] mean difference £-1272, 95% CI £-5950 to £3406		
Nicholson 2001	Costs	Treatment Mean cost per episode \$745; n=13 95% CI \$595 to \$895 Control Mean \$2543; n=12 95% CI \$1766 to \$3321 Difference \$1798  P<0.01  Hah costs 29% of the average hospital managed patient episode. Reported cost effec- tiveness ratio of 3:1  Hospital + HAH costs GP 10% of costs, Domiciliary allied health 21% of costs, community nurs- ing 28% of costs = 59% of costs and hos- pital care 41% of costs. If hospital costs=\$895 then HAH costs = \$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 modeled costs for OPD clinic visits.  HAH care costed individually, 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 T=\$163 (20.5) C=\$275.6 (27.7) P<0.001		

Study	Outcomes	Cost	Results	Notes
Richards 2005	Costs based on DRGs for control and actual cost for intervention	Cost	Mean cost per patient NZ\$ T=\$1157.9 C=\$1556.28	
Wilson 1999	Cost	Cost	<p>Cost of initial episode: Treatment mean: £2,568.9 (2,089.3 to 2,972.1) Control mean: £2,880.6 (2,316.1 to 3,547.8) difference -311.7, p&gt;0.43</p> <p>bootstrap difference using 1000 sub-samples: -304.72 (-1,112.4 to 447.9).</p> <p>Mean cost per day: Treatment: £204.6 (91.5 to 118.4) Control: £104.9 £ (181.1 to 228.22) Mean difference £99.71 p&lt;0.001</p> <p>Cost at 3 months: Treatment mean: £3,671.3 (3,140.5 to 4,231.3) Control mean: £3,876.9 (3,224.51 to 4,559.6) difference -205.7, p&gt;0.65</p> <p>Bootstrap difference using 1000 sub-samples: -210.9 (-1,025 to 635.5)</p> <p><b>COSTS EXCLUDING REFUSERS</b> Cost of initial episode Mean (95% CI) Treatment: £2,594.4 (95% CI £2,170.36 to £3,143.5) Control: £3,659.20 (£3,140.46 to £4,231.28) Mean difference -£1,064.79, p&lt;0.01.</p> <p>Bootstrap mean difference £1070.53, (95% CI -£1843.2 to -£245.73) 95% CI derived using bootstrap method with 1000 subsamples</p> <p>Mean cost per day (95% CI) Treatment: £206.68 (£183.21 to £230.14) Control: £133.7 (£124.6 to £142.8) Mean difference £72.98, p&lt;0.001</p> <p>Mean cost at 3 months: Treatment: £3,697.5 (£3136.13 to £4330.66) Control: £4,761.3 (£4105.6 to £5476.6) Mean difference -£1,063.8, p&lt;0.025</p> <p>Bootstrap mean difference: £1,063.45 (95% CI -£2043.8 to -£162.7)</p>	Cost data financial year 1995/1996 BNF for medicines 1995
<b>informal care inputs</b>				
Kalra 2000	Informal care inputs	Cost	<p>Received informal care: T=100/140 (71%) C=98/147 (67%)</p> <p>Total from co residents over 12 months (hours) T=899.18 (1760) [n=140] C=718 (6778) [n=147]</p> <p>Total hours per average week from co residents T=46.38 (48.15) [n=140] C=33.71 (44.35) [n=147]</p> <p>Total hours from nonresidents over 12 months T=79.7 (283) [n=140] C=127.44 (348) [n=147]</p>	



Study	Outcomes	Cost	Results	Notes
			Total average hours per week from non residents T=4.79 (16.51) [n=140] C=5.03 (11.54) [n=147]  Total hours over 12 months: T=979 (1749) C=846 (1549)	
<b>use of other health services</b>				
Davies 2000	Referred for increased social support: Treatment: 24/100 (24%)Control: 3/50 (6%)Difference 18%, 95%CI 7.3% to 28.6%		While receiving hospital at home care, or on discharge from hospital	0

### Analysis 1.7. Comparison 1 Admission avoidance hospital at home versus inpatient care, Outcome 7 Length of stay.

Length of stay				
Study	Results	Outcomes	Notes	
Trials reporting length of stay				
Davies 2000	Hospital length of stay	Control group: median 5 days (IQR 4 to 7 days)  Control group: mean 6.72 (sd 4.3) n=50		
Richards 2005	Median number of days to discharge	T=4 days (range 1-14) C=2 days (range 0-10) P=0.004		
Wilson 1999	Length of stay	Hospital or hospital at home LOS  Treatment median: 8 days Control median: 14.5 days P=0.026  Total days of care (hospital plus hospital at home): Treatment (n=100) median: 9 days Control (n=71) median:16 days; p=0.031  Mean difference: T mean:12.8 days (17.39) n=100 C mean: 26.93 (26.17) n=71 Difference -14.3, 95% CI -20.18 to -7.08	Hospital length of stay, and total days of care (hospital plus hospital at home) - Mean (sd) unless stated otherwise	

### Analysis 1.8. Comparison 1 Admission avoidance hospital at home versus inpatient care, Outcome 8 Treatment inputs.

Study	Outcomes	Treatment inputs	Results	Notes
Corwin 2005	Days on oral antibiotics		HR 1.09 (0.82 to 1.45) p=0.56	
Kalra 2000	Physiotherapy (number treated) T=148/153 (98%) C=151/152 (99%)  Occupational therapy (number treated) T=151/153 (99%) C=151/152 (99%)  Speech therapy (number treated) T=75/153 (49%) C=106/152 (70%)			

### Analysis 1.9. Comparison 1 Admission avoidance hospital at home versus inpatient care, Outcome 9 Carer outcomes.

Carer outcomes			
Study	Outcomes	Results	Notes
Carer satisfaction			
Caplan 1999	Carer satisfaction:	Mean score Treatment: 1.1 Control: 1.9 P<0.0001	Satisfaction rated on a 4 point scale: 1=excellent, 2=good, 3=fair, 4=poor

### Analysis 1.10. Comparison 1 Admission avoidance hospital at home versus inpatient care, Outcome 10 GPs views.

GPs views			
Study	Outcomes	Results	Notes
Caplan 1999	GP satisfaction:	Mean score Treatment: 1.7 Control: 1.8 Non significant	Satisfaction rated on a 4 point scale: 1=excellent, 2=good, 3=fair, 4=poor


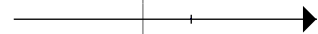

### Analysis 1.11. Comparison 1 Admission avoidance hospital at home versus inpatient care, Outcome 11 Anxiety and depression.

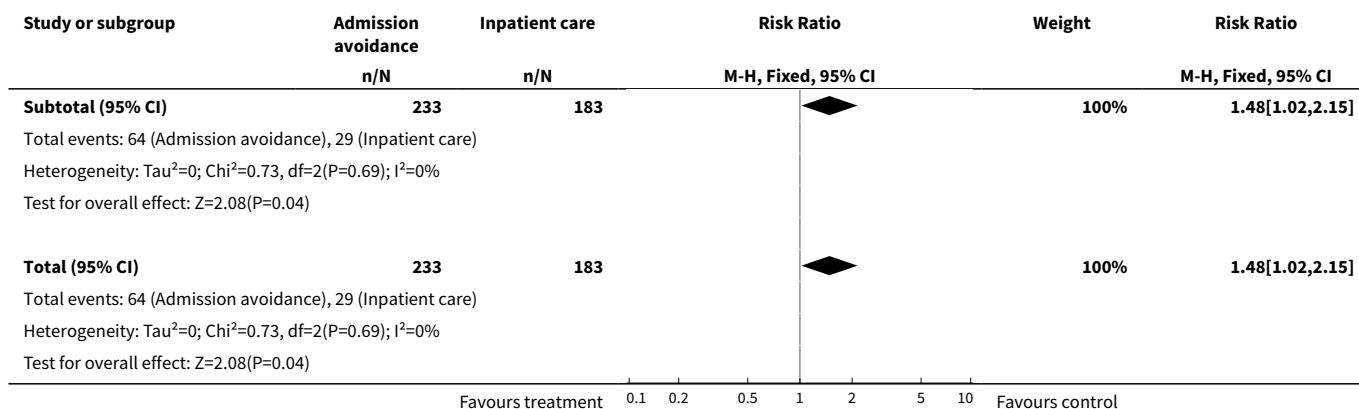
Anxiety and depression			
Study	Outcomes	Results	Notes
Ricauda 2004	Geriatric Depression Scale score (range 0-30) higher scores indicate depression	Geriatric Depression At 6 months Median IQR T=10 (5-15) C=17 (13-20) P<0.001 (Mann Whitney)	

### Analysis 1.12. Comparison 1 Admission avoidance hospital at home versus inpatient care, Outcome 12 Readmission for hospital at home group within 2 weeks of randomisation.

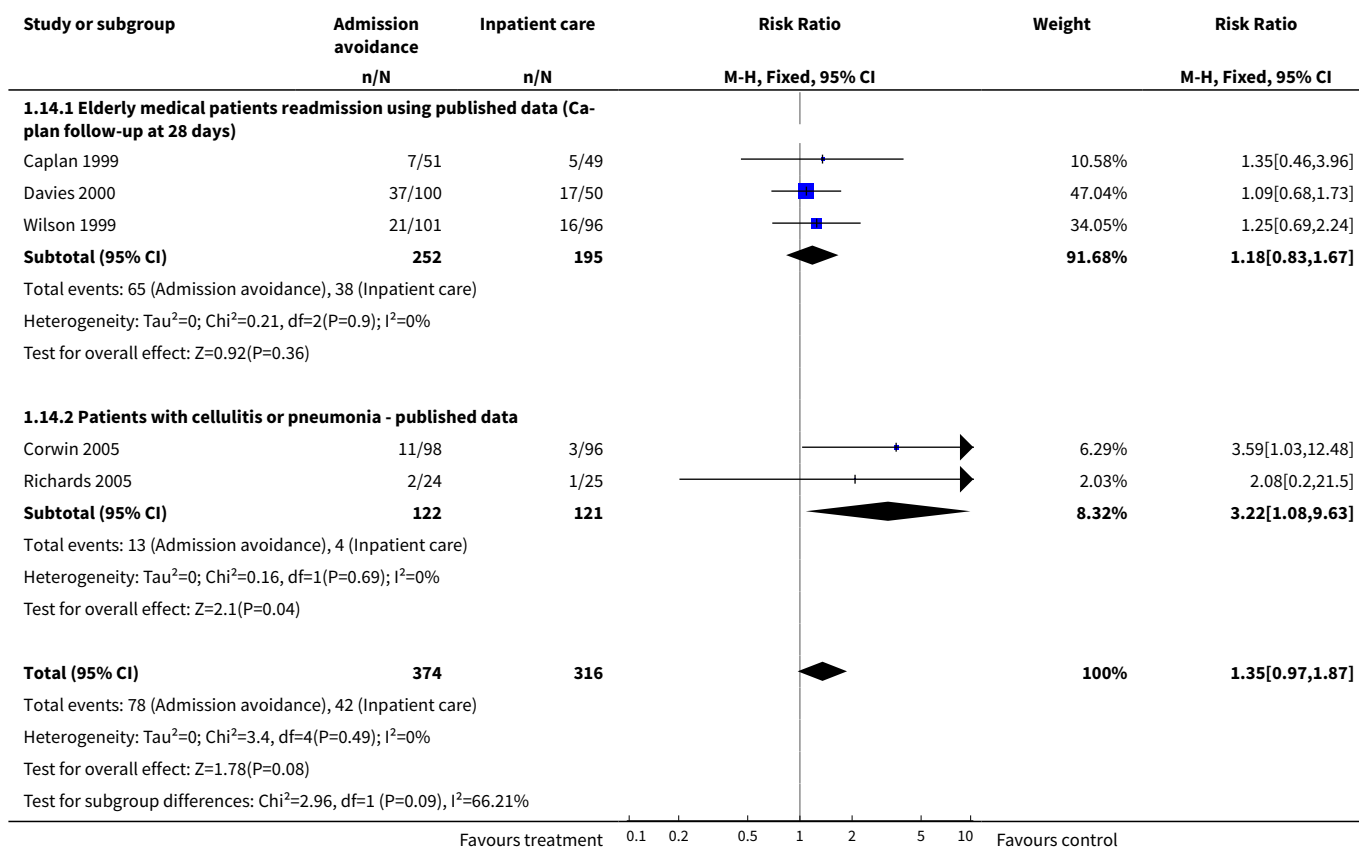
Readmission for hospital at home group within 2 weeks of randomisation			
Study	Outcomes	Results	Notes
Kalra 2000	Readmission within 2 weeks of randomisation	T=51/149	

### Analysis 1.13. Comparison 1 Admission avoidance hospital at home versus inpatient care, Outcome 13 Re admission to hospital for patients with a medical condition at 3 months.

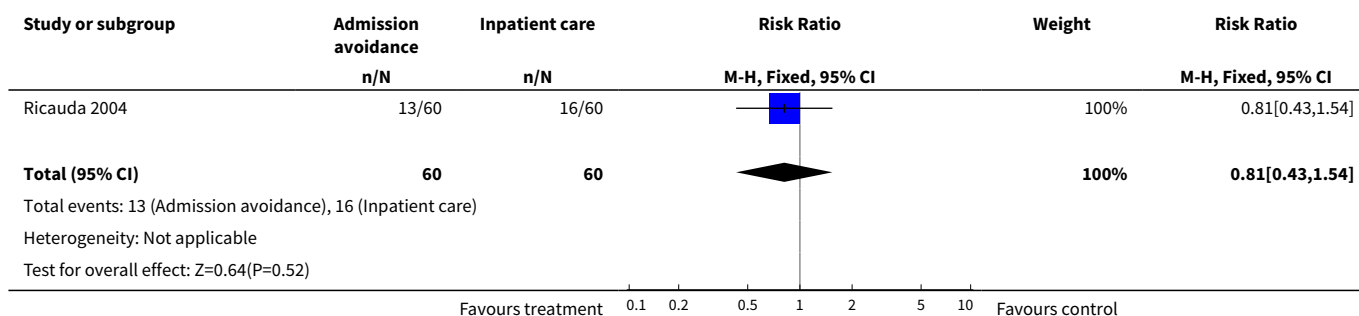
Study or subgroup	Admission avoidance n/N	Inpatient care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
<b>1.13.1 Readmission for patients with a medical condition using number of events from trial databases</b>					
Davies 2000	41/93	17/50		64.25%	1.3[0.83,2.03]
Harris 2005	2/39	1/37		2.98%	1.9[0.18,20.05]
Wilson 1999	21/101	11/96		32.77%	1.81[0.92,3.56]
			Favours treatment 0.1 0.2 0.5 1 2 5 10 Favours control		



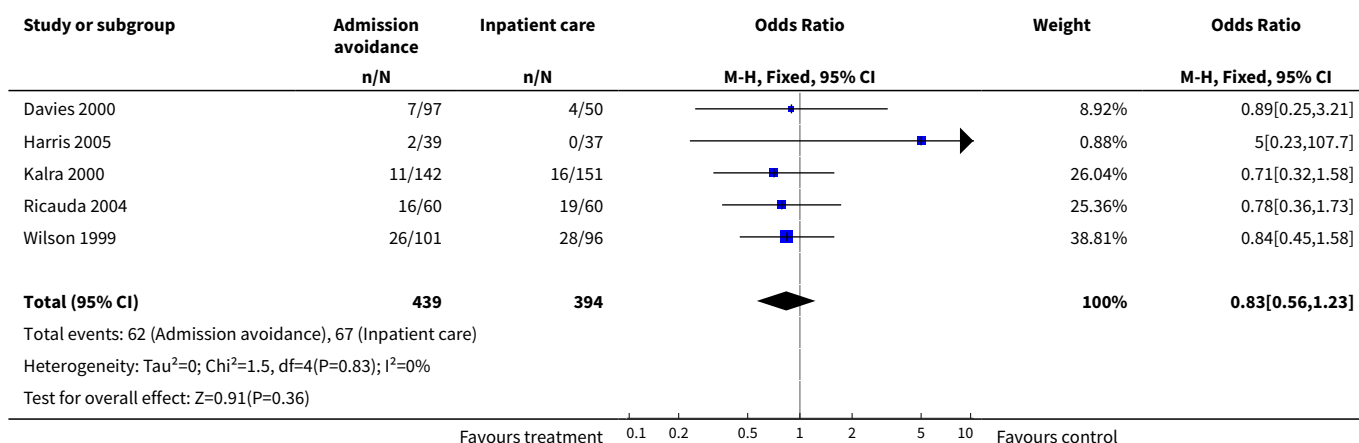
### Analysis 1.14. Comparison 1 Admission avoidance hospital at home versus inpatient care, Outcome 14 Readmissions at 3 months using published data.



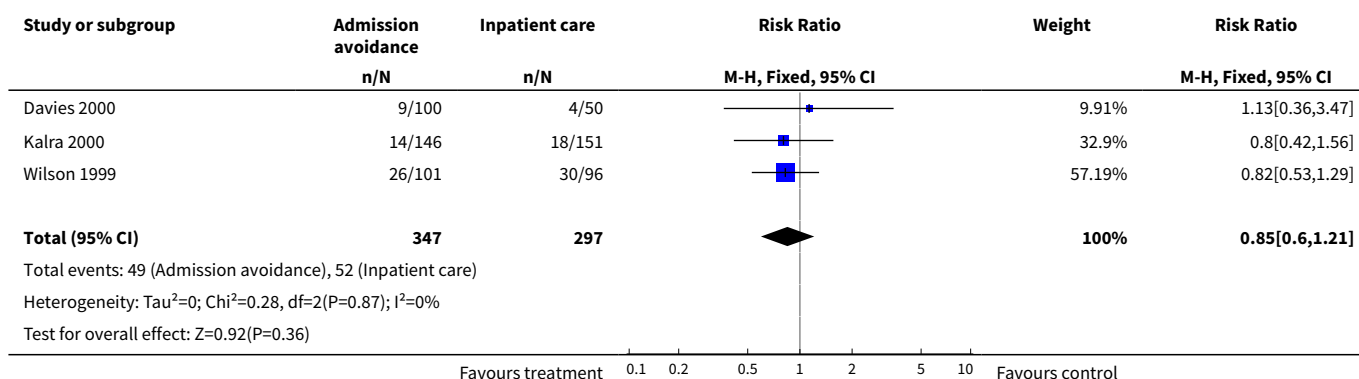
### Analysis 1.15. Comparison 1 Admission avoidance hospital at home versus inpatient care, Outcome 15 Mortality during treatment.



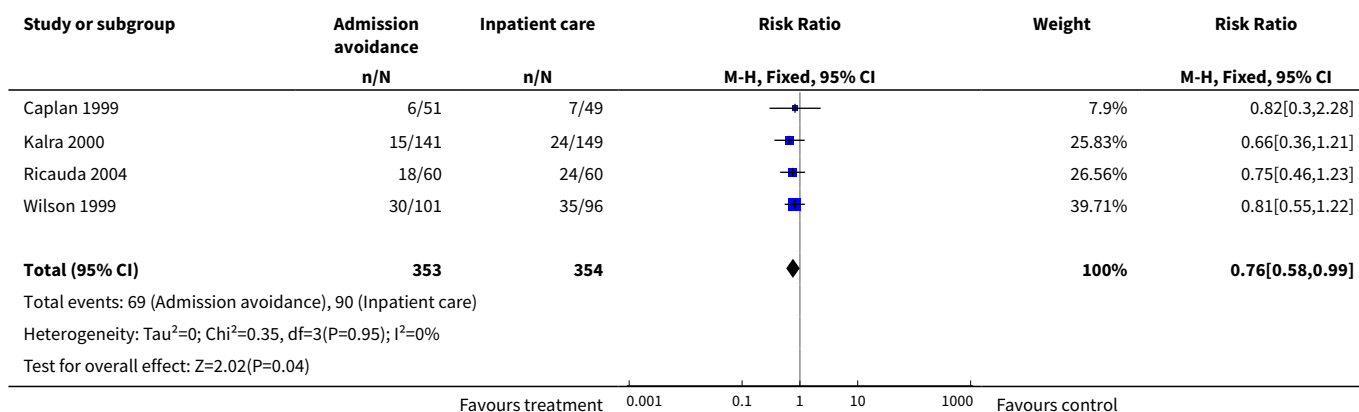
### Analysis 1.16. Comparison 1 Admission avoidance hospital at home versus inpatient care, Outcome 16 Mortality at 3 months elderly patients with a medical condition (using data from trialists).



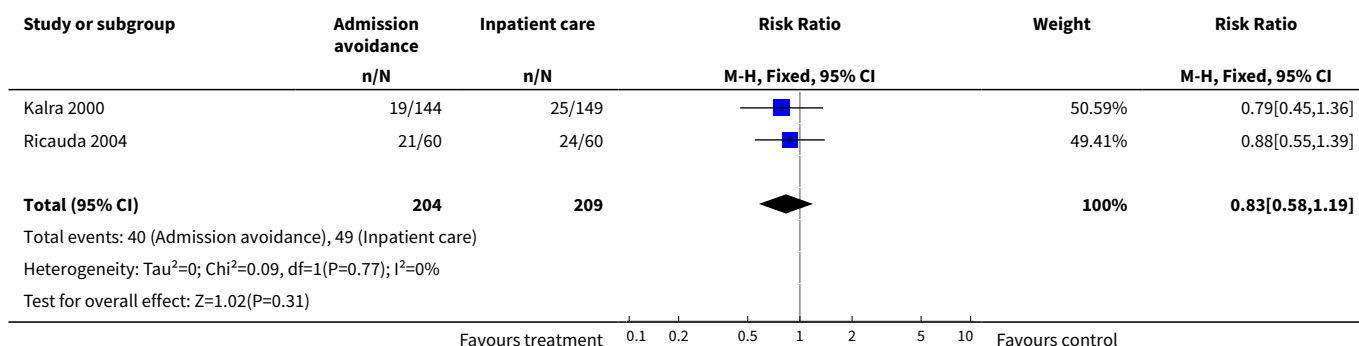
### Analysis 1.17. Comparison 1 Admission avoidance hospital at home versus inpatient care, Outcome 17 Mortality at 3 months using published data.



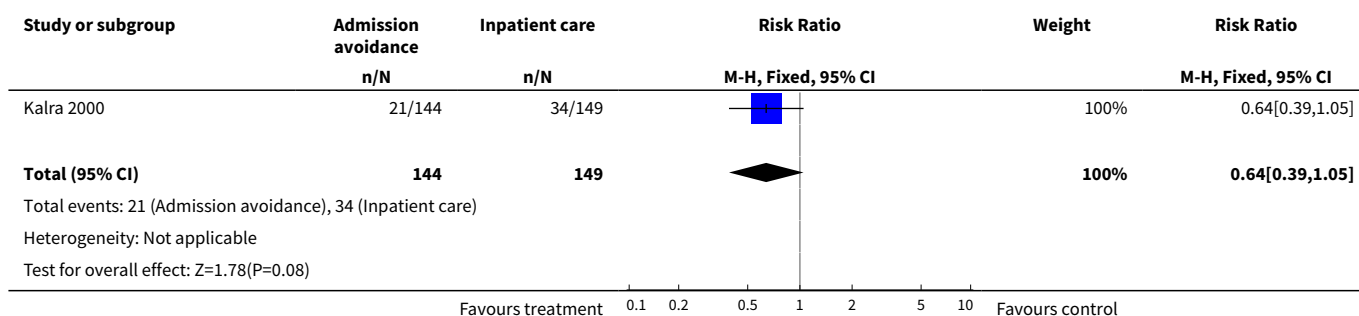
### Analysis 1.18. Comparison 1 Admission avoidance hospital at home versus inpatient care, Outcome 18 Mortality at 6 months follow up (using data from trialists, apart from Caplan).



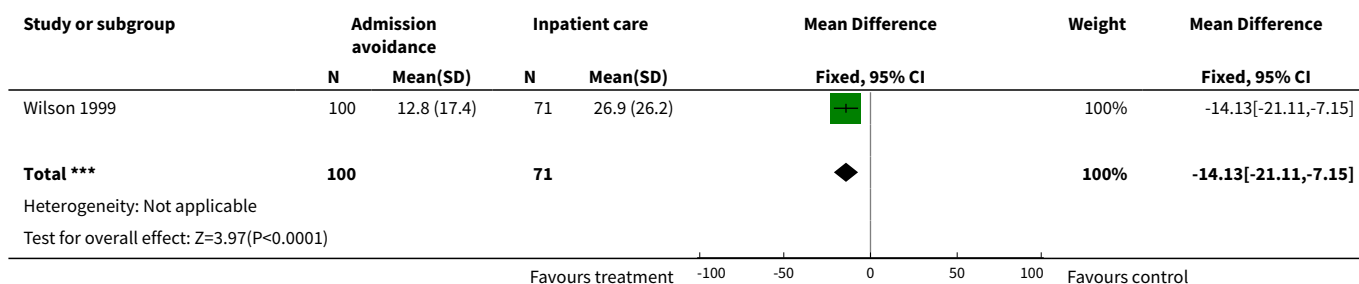
### Analysis 1.19. Comparison 1 Admission avoidance hospital at home versus inpatient care, Outcome 19 Mortality at 6 months using published data.



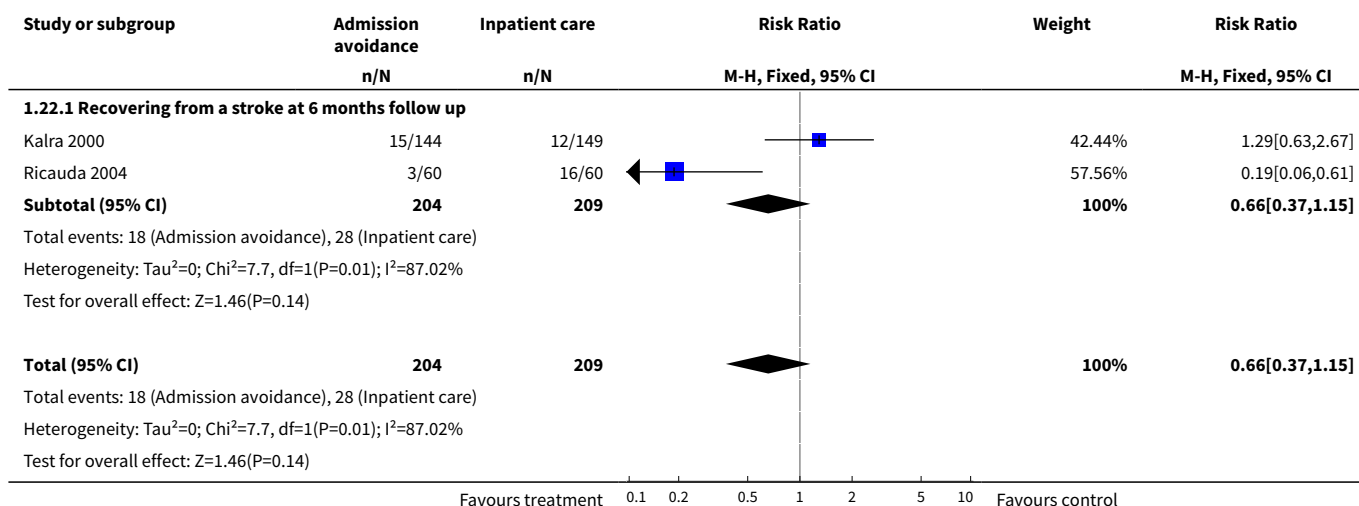
### Analysis 1.20. Comparison 1 Admission avoidance hospital at home versus inpatient care, Outcome 20 Mortality at 1 year follow up.



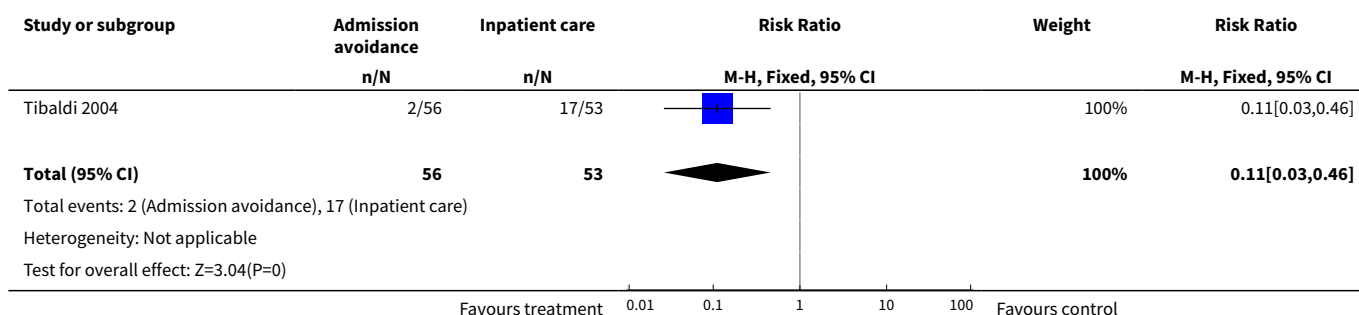
### Analysis 1.21. Comparison 1 Admission avoidance hospital at home versus inpatient care, Outcome 21 Total length of stay to include hospital transfers for the hospital at home group.



### Analysis 1.22. Comparison 1 Admission avoidance hospital at home versus inpatient care, Outcome 22 Living in an institutional setting at follow up - patients recovering from a stroke.



### Analysis 1.23. Comparison 1 Admission avoidance hospital at home versus inpatient care, Outcome 23 Living in a nursing home at follow up - patients with dementia.



## Comparison 2. Individual patient data meta-analysis

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Readmission at 3 months	3		Readmission (Fixed, 95% CI)	1.48 [0.95, 2.30]
2 Readmission 3 months (excluding readmissions in the first 14 days)	3		Readmission (Fixed, 95% CI)	1.41 [0.87, 2.30]
3 Mortality 3 months	5		Mortality (Fixed, 95% CI)	0.82 [0.58, 1.17]
4 Mortality 6 months	3		Mortality (Fixed, 95% CI)	0.68 [0.49, 0.95]

### Analysis 2.1. Comparison 2 Individual patient data meta-analysis, Outcome 1 Readmission at 3 months.

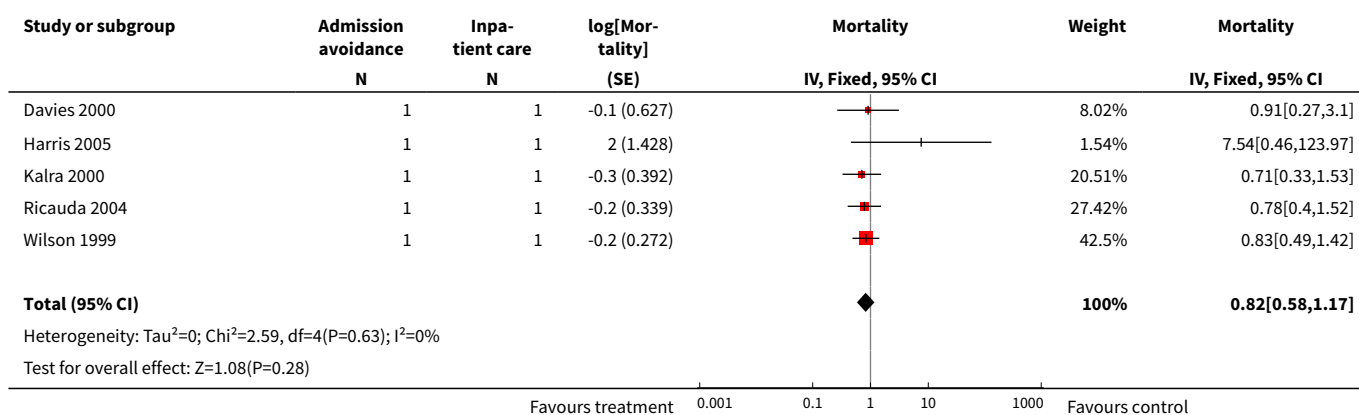


### Analysis 2.2. Comparison 2 Individual patient data meta-analysis, Outcome 2 Readmission 3 months (excluding readmissions in the first 14 days).

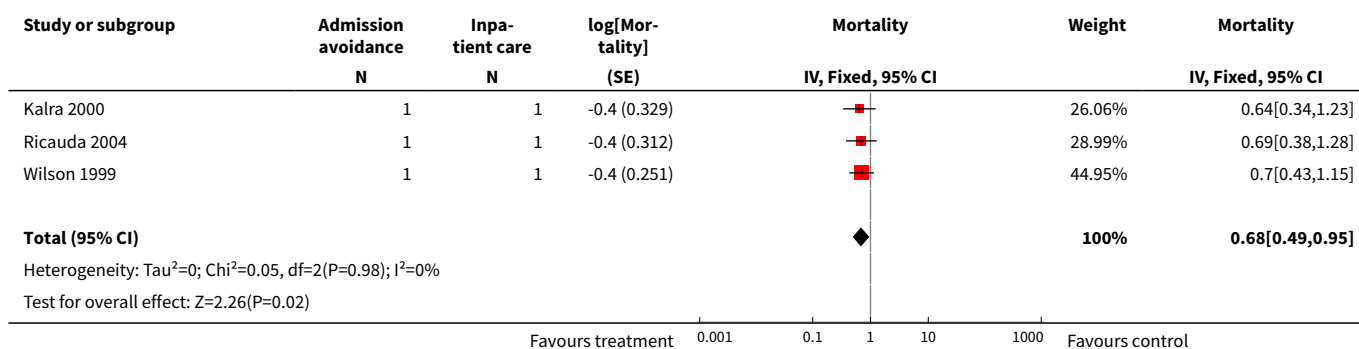




### Analysis 2.3. Comparison 2 Individual patient data meta-analysis, Outcome 3 Mortality 3 months.



### Analysis 2.4. Comparison 2 Individual patient data meta-analysis, Outcome 4 Mortality 6 months.



### Comparison 3. Individual patient data meta-analysis adjusted for age only

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Readmission 3 months	3		Readmission (Fixed, 95% CI)	1.49 [0.96, 2.32]
2 Readmission 3 months (without readmission in the first 14 days)	3		Readmission (Fixed, 95% CI)	1.42 [0.87, 2.30]
3 Mortality 3 months	5		mortality (Fixed, 95% CI)	0.77 [0.54, 1.09]
4 Mortality 6 months	3		mortality (Fixed, 95% CI)	0.62 [0.44, 0.86]

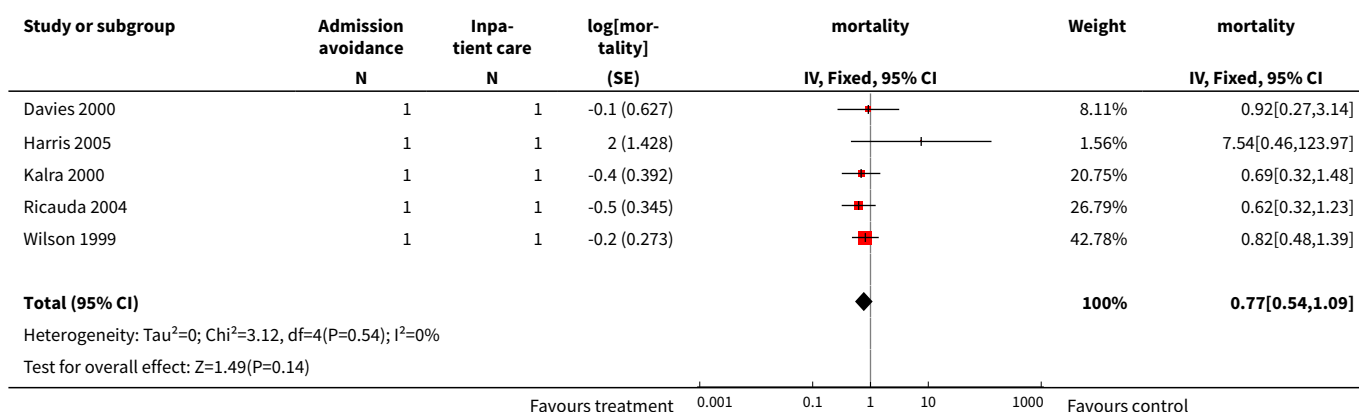
### Analysis 3.1. Comparison 3 Individual patient data meta-analysis adjusted for age only, Outcome 1 Readmission 3 months.



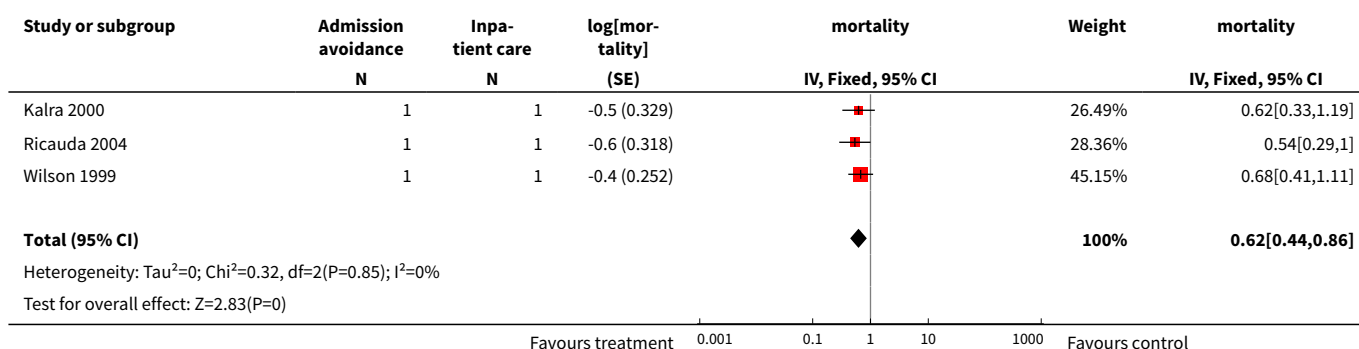
### Analysis 3.2. Comparison 3 Individual patient data meta-analysis adjusted for age only, Outcome 2 Readmission 3 months (without readmission in the first 14 days).



### Analysis 3.3. Comparison 3 Individual patient data meta-analysis adjusted for age only, Outcome 3 Mortality 3 months.



### Analysis 3.4. Comparison 3 Individual patient data meta-analysis adjusted for age only, Outcome 4 Mortality 6 months.



### Comparison 4. Individual patient data meta-analysis adjusted for age and sex

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Readmissions 3 months	3		Readmission (Fixed, 95% CI)	1.49 [0.96, 2.33]
2 Readmission 3 months (without readmission in the first 14 days)	3		Readmission (Fixed, 95% CI)	1.42 [0.87, 2.30]
3 Mortality at 3 months	5		mortality (Fixed, 95% CI)	0.77 [0.54, 1.09]
4 Mortality at 6 months	3		Mortality (Fixed, 95% CI)	0.62 [0.45, 0.87]

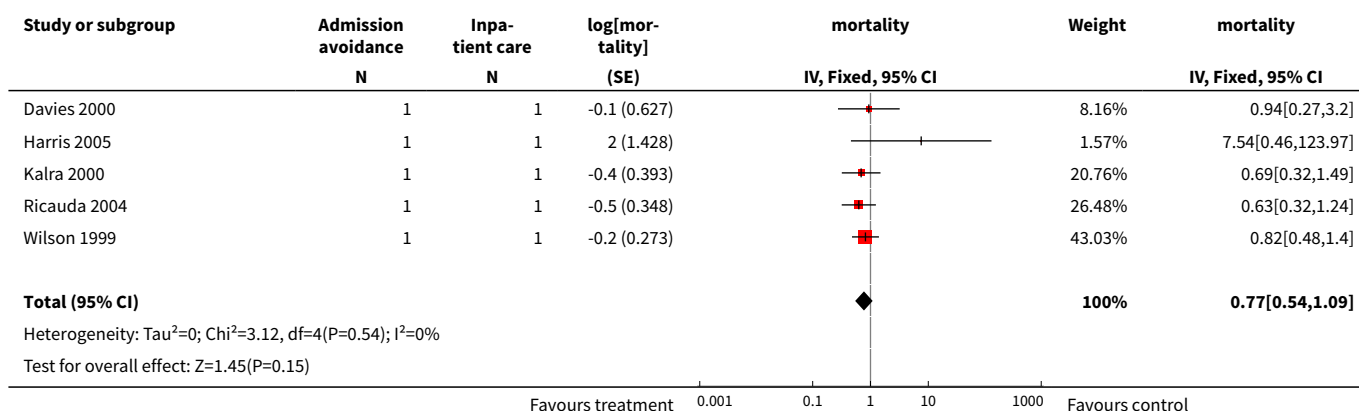
### Analysis 4.1. Comparison 4 Individual patient data meta-analysis adjusted for age and sex, Outcome 1 Readmissions 3 months.



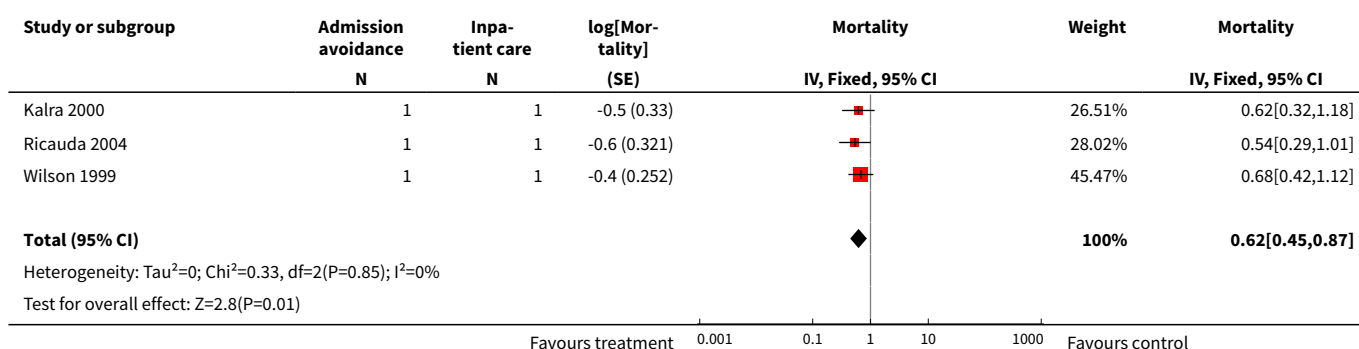
### Analysis 4.2. Comparison 4 Individual patient data meta-analysis adjusted for age and sex, Outcome 2 Readmission 3 months (without readmission in the first 14 days).



### Analysis 4.3. Comparison 4 Individual patient data meta-analysis adjusted for age and sex, Outcome 3 Mortality at 3 months.



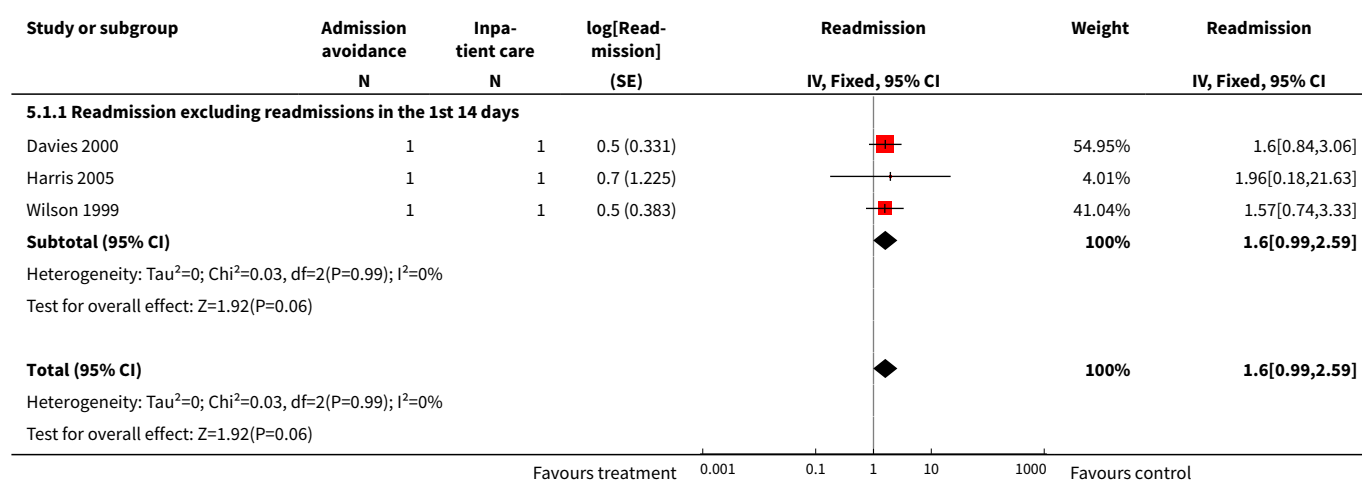
### Analysis 4.4. Comparison 4 Individual patient data meta-analysis adjusted for age and sex, Outcome 4 Mortality at 6 months.



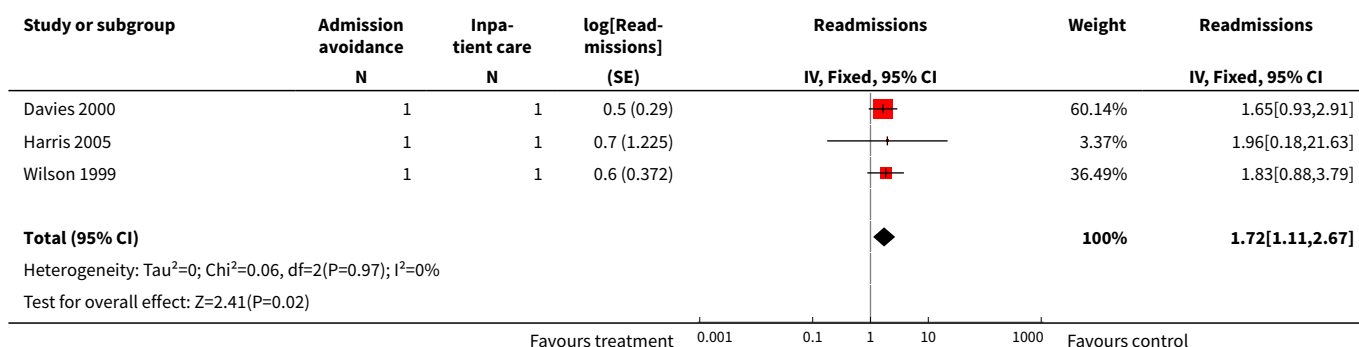
## Comparison 5. IPD sensitivity analysis in favour of hospital

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Excluding readmissions in the 1st 14 days	3		Readmission (Fixed, 95% CI)	1.60 [0.99, 2.59]
1.1 Readmission excluding readmissions in the 1st 14 days	3		Readmission (Fixed, 95% CI)	1.60 [0.99, 2.59]
2 All readmissions	3		Readmissions (Fixed, 95% CI)	1.72 [1.11, 2.67]
3 Excluding readmissions in the 1st 14 days adjusted for age	3		Readmissions (Fixed, 95% CI)	1.62 [1.00, 2.62]
4 All readmissions adjusted for age	3		Readmissions (Fixed, 95% CI)	1.77 [1.14, 2.75]
5 Readmissions excluding readmissions in the 1st 14 days adjusted for age and sex	3		Readmissions (Fixed, 95% CI)	1.62 [1.00, 2.63]
6 All readmissions adjusted for age and sex	3		Readmissions (Fixed, 95% CI)	1.77 [1.14, 2.76]
7 Mortality at 3 months	5		Mortality (Fixed, 95% CI)	0.83 [0.59, 1.17]
8 Mortality at 3 months adjusted for age	5		Mortality (Fixed, 95% CI)	0.77 [0.54, 1.09]
9 Mortality at 3 months adjusted for age and sex	5		Mortality (Fixed, 95% CI)	0.78 [0.55, 1.10]
10 Mortality at 6 months	3		Mortality (Fixed, 95% CI)	0.69 [0.49, 0.96]
11 Mortality at 6 months adjusted for age	3		Mortality (Fixed, 95% CI)	0.62 [0.45, 0.87]
12 Mortality at 6 months adjusted for age and sex	3		Mortality (Fixed, 95% CI)	0.63 [0.45, 0.87]

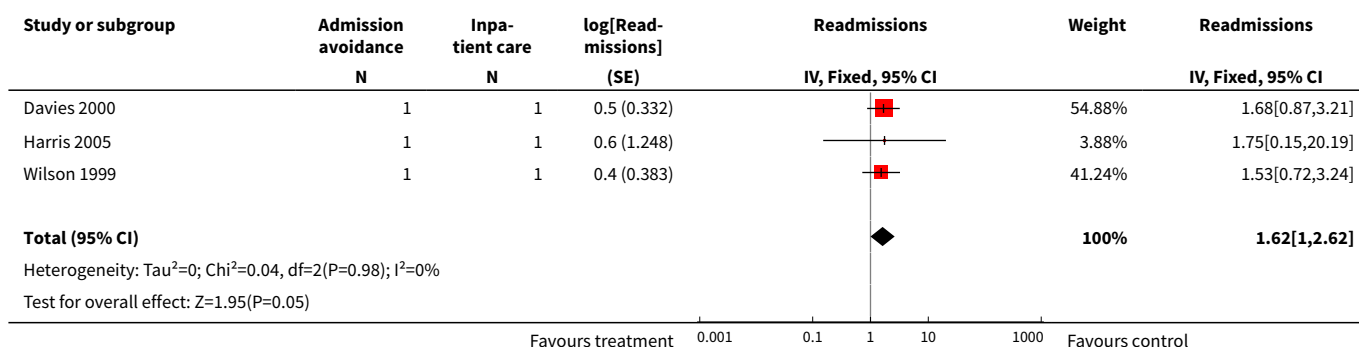
### Analysis 5.1. Comparison 5 IPD sensitivity analysis in favour of hospital, Outcome 1 Excluding readmissions in the 1st 14 days.



### Analysis 5.2. Comparison 5 IPD sensitivity analysis in favour of hospital, Outcome 2 All readmissions.



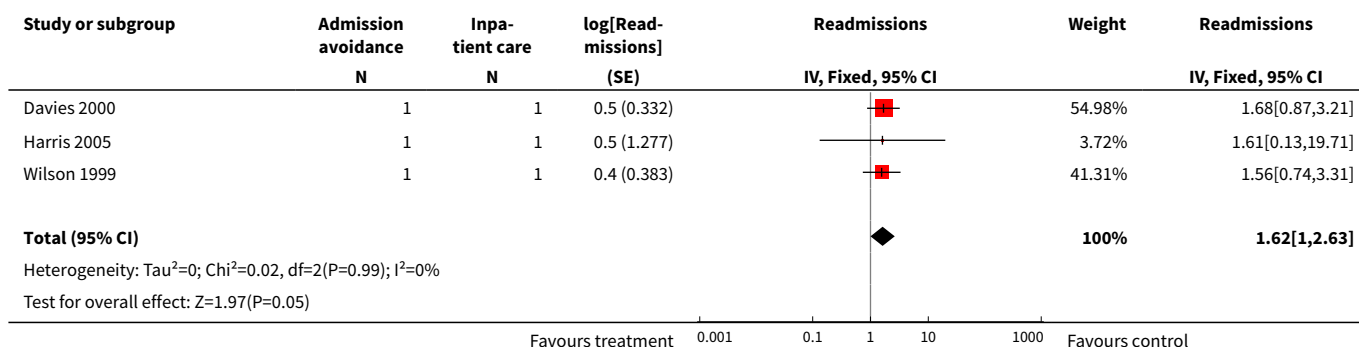
### Analysis 5.3. Comparison 5 IPD sensitivity analysis in favour of hospital, Outcome 3 Excluding readmissions in the 1st 14 days adjusted for age.



### Analysis 5.4. Comparison 5 IPD sensitivity analysis in favour of hospital, Outcome 4 All readmissions adjusted for age.



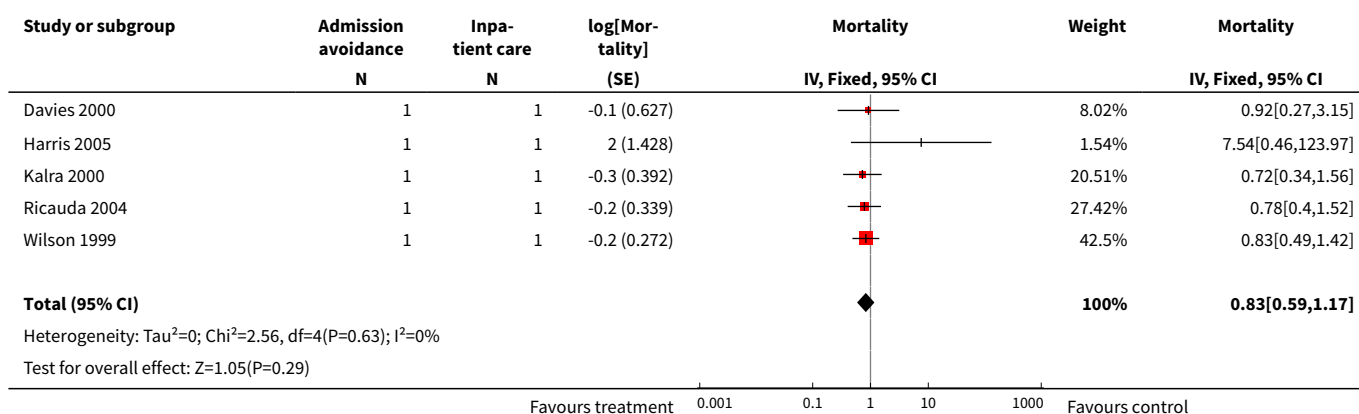
### Analysis 5.5. Comparison 5 IPD sensitivity analysis in favour of hospital, Outcome 5 Readmissions excluding readmissions in the 1st 14 days adjusted for age and sex.



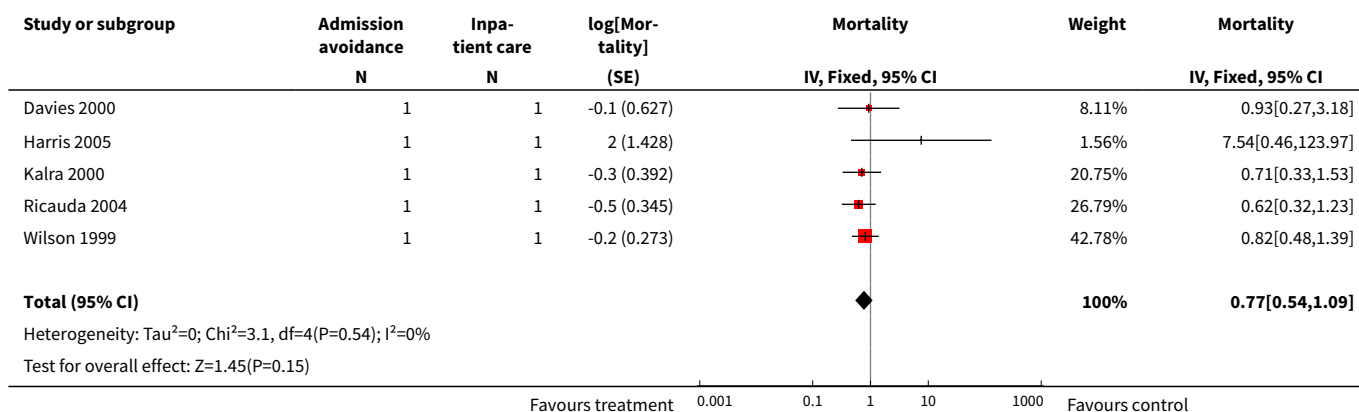
### Analysis 5.6. Comparison 5 IPD sensitivity analysis in favour of hospital, Outcome 6 All readmissions adjusted for age and sex.



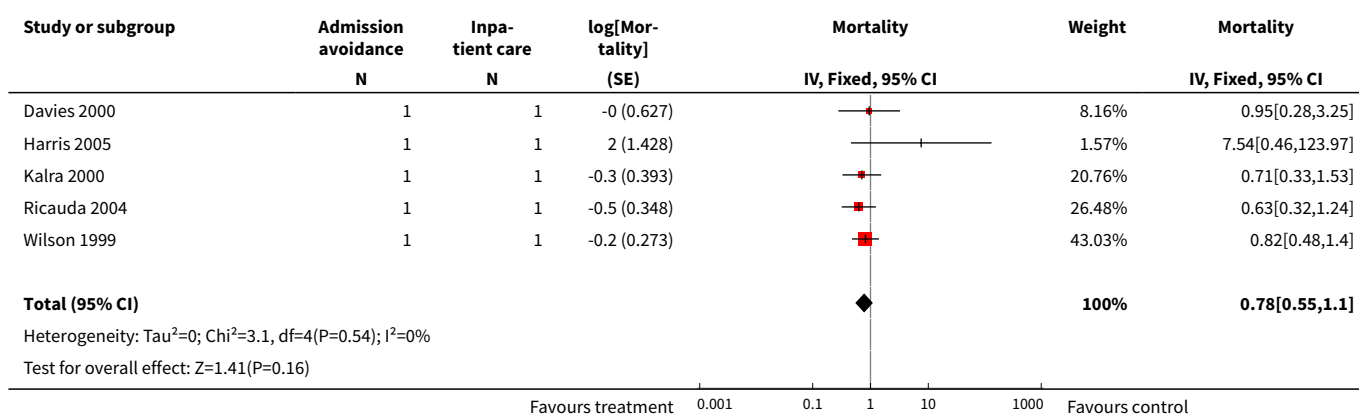
### Analysis 5.7. Comparison 5 IPD sensitivity analysis in favour of hospital, Outcome 7 Mortality at 3 months.



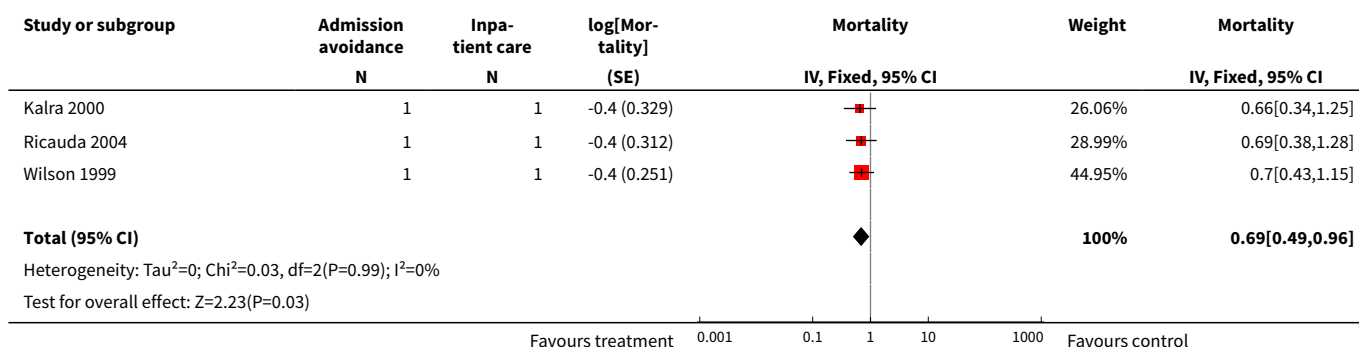
### Analysis 5.8. Comparison 5 IPD sensitivity analysis in favour of hospital, Outcome 8 Mortality at 3 months adjusted for age.



### Analysis 5.9. Comparison 5 IPD sensitivity analysis in favour of hospital, Outcome 9 Mortality at 3 months adjusted for age and sex.

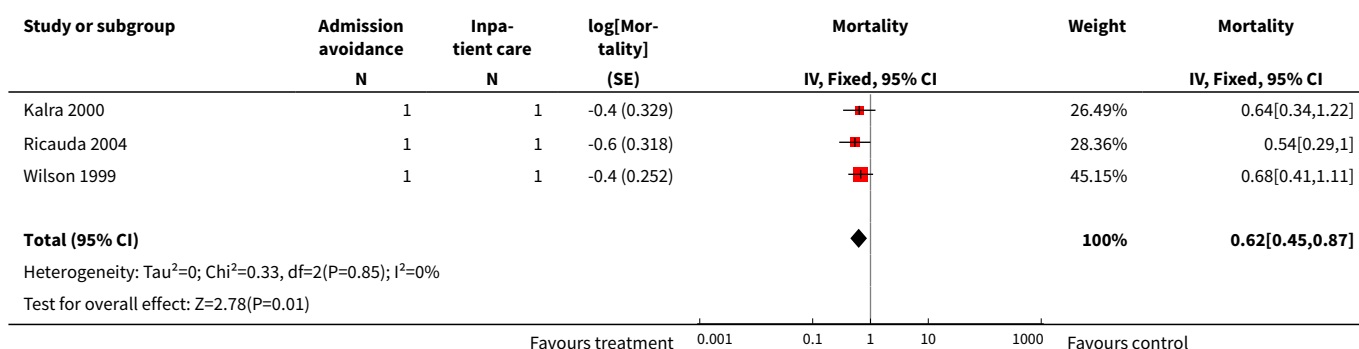


### Analysis 5.10. Comparison 5 IPD sensitivity analysis in favour of hospital, Outcome 10 Mortality at 6 months.

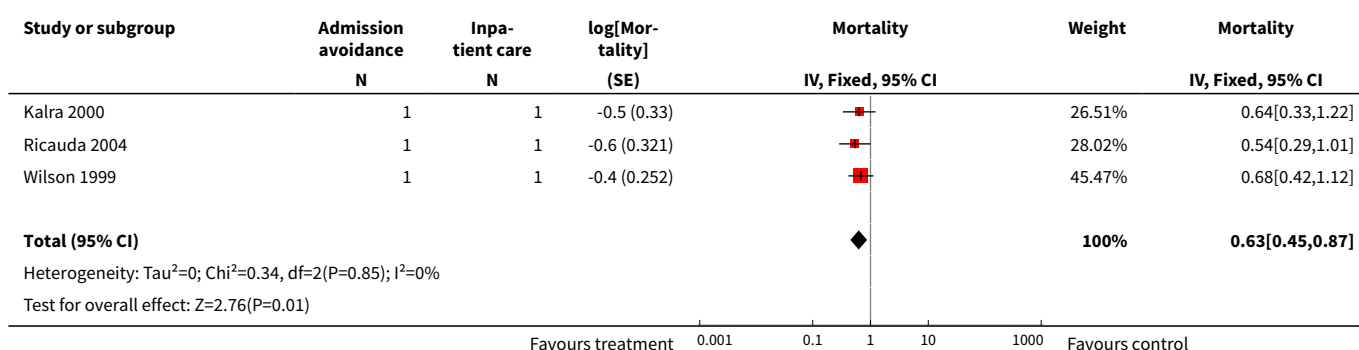




### Analysis 5.11. Comparison 5 IPD sensitivity analysis in favour of hospital, Outcome 11 Mortality at 6 months adjusted for age.



### Analysis 5.12. Comparison 5 IPD sensitivity analysis in favour of hospital, Outcome 12 Mortality at 6 months adjusted for age and sex.



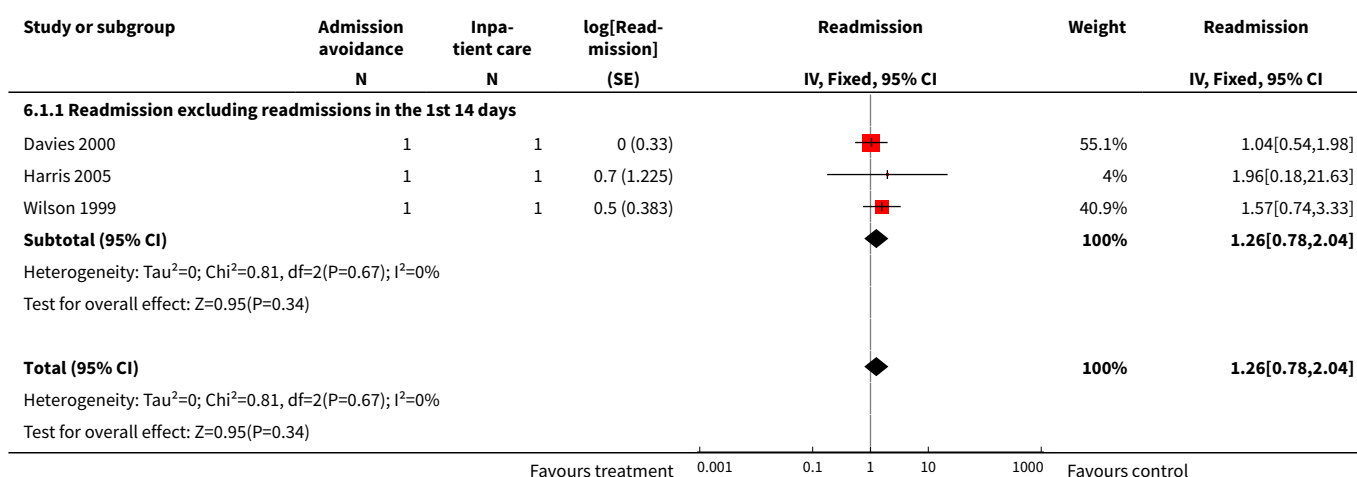
## Comparison 6. IPD Sensitivity analysis in favour of hospital at home

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Excluding readmissions in the 1st 14 days	3		Readmission (Fixed, 95% CI)	1.26 [0.78, 2.04]
1.1 Readmission excluding readmissions in the 1st 14 days	3		Readmission (Fixed, 95% CI)	1.26 [0.78, 2.04]
2 All readmissions	3		Readmissions (Fixed, 95% CI)	1.29 [0.83, 2.00]
3 Excluding readmissions in the 1st 14 days adjusted for age	3		Readmissions (Fixed, 95% CI)	1.25 [0.77, 2.02]
4 All readmissions adjusted for age	3		Readmissions (Fixed, 95% CI)	1.29 [0.83, 2.00]
5 Readmissions excluding readmissions in the 1st 14 days adjusted for age and sex	3		Readmissions (Fixed, 95% CI)	1.26 [0.78, 2.04]
6 All readmissions adjusted for age and sex	3		Readmissions (Fixed, 95% CI)	1.30 [0.83, 2.01]

### Hospital at home admission avoidance (Review)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
7 Mortality at 3 months	5		Mortality (Fixed, 95% CI)	0.82 [0.58, 1.16]
8 Mortality at 3 months adjusted for age	5		Mortality (Fixed, 95% CI)	0.76 [0.54, 1.08]
9 Mortality at 3 months adjusted for age and sex	5		Mortality (Fixed, 95% CI)	0.76 [0.54, 1.09]
10 Mortality at 6 months	3		Mortality (Fixed, 95% CI)	0.68 [0.49, 0.95]
11 Mortality at 6 months adjusted for age	3		Mortality (Fixed, 95% CI)	0.62 [0.44, 0.86]
12 Mortality at 6 months adjusted for age and sex	3		Mortality (Fixed, 95% CI)	0.62 [0.44, 0.86]

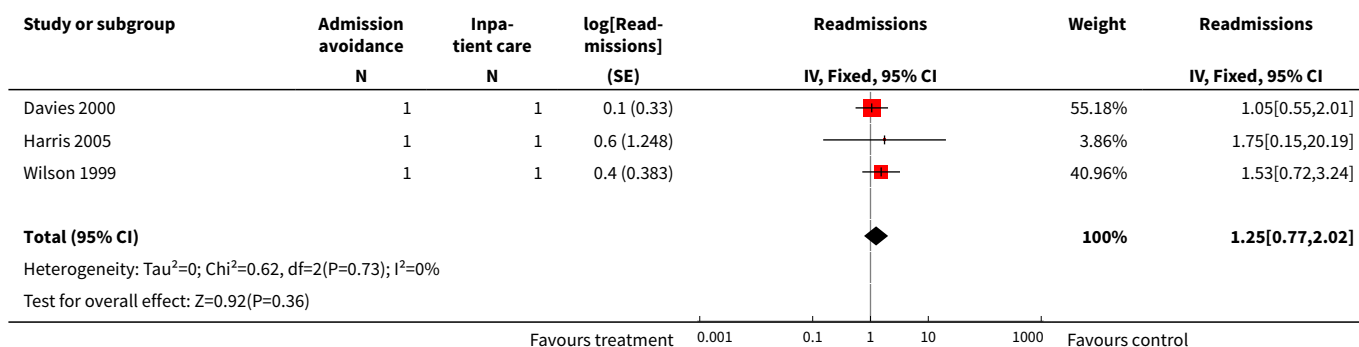
### Analysis 6.1. Comparison 6 IPD Sensitivity analysis in favour of hospital at home, Outcome 1 Excluding readmissions in the 1st 14 days.



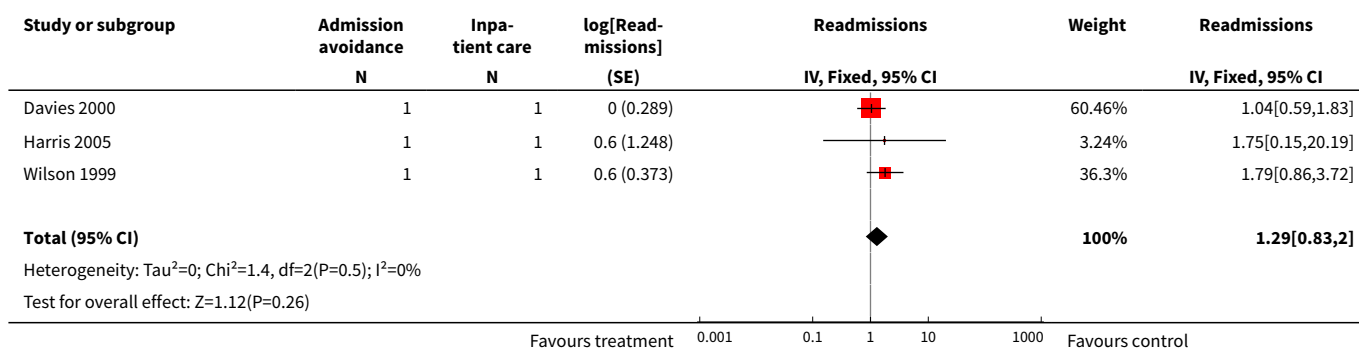
### Analysis 6.2. Comparison 6 IPD Sensitivity analysis in favour of hospital at home, Outcome 2 All readmissions.



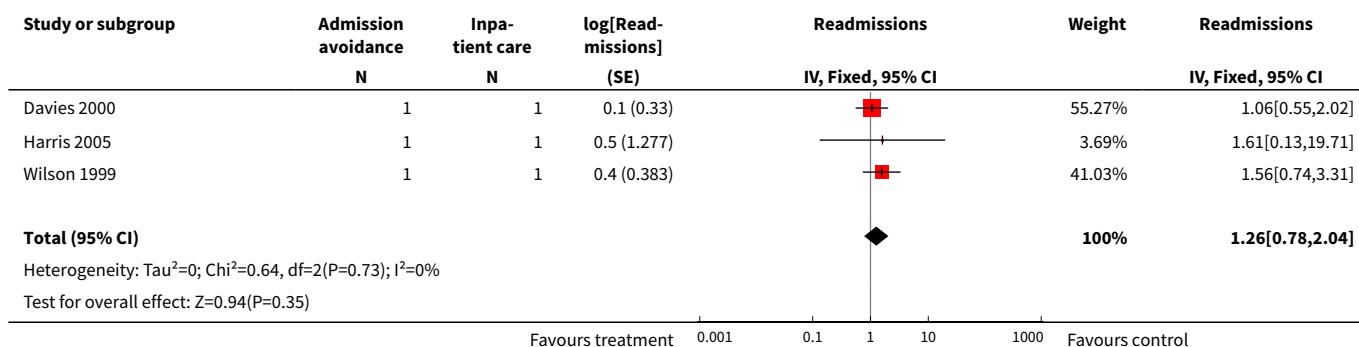
### Analysis 6.3. Comparison 6 IPD Sensitivity analysis in favour of hospital at home, Outcome 3 Excluding readmissions in the 1st 14 days adjusted for age.



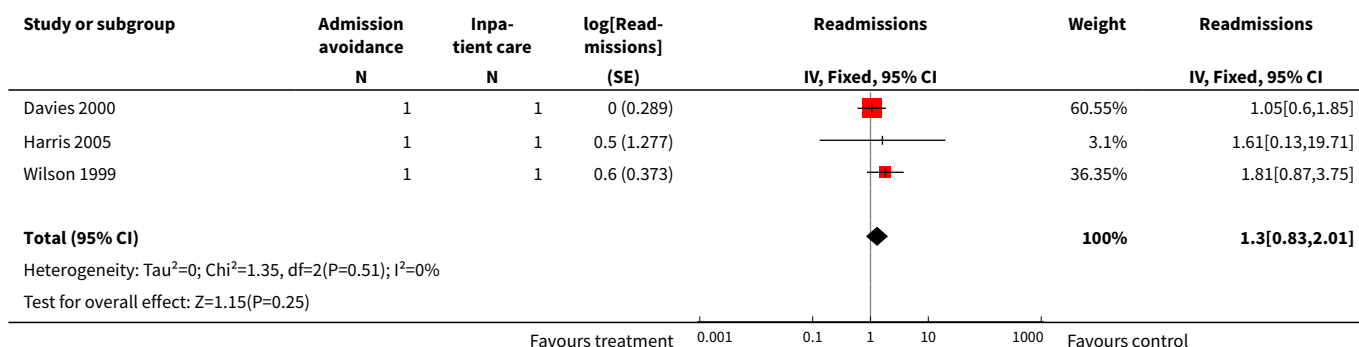
### Analysis 6.4. Comparison 6 IPD Sensitivity analysis in favour of hospital at home, Outcome 4 All readmissions adjusted for age.



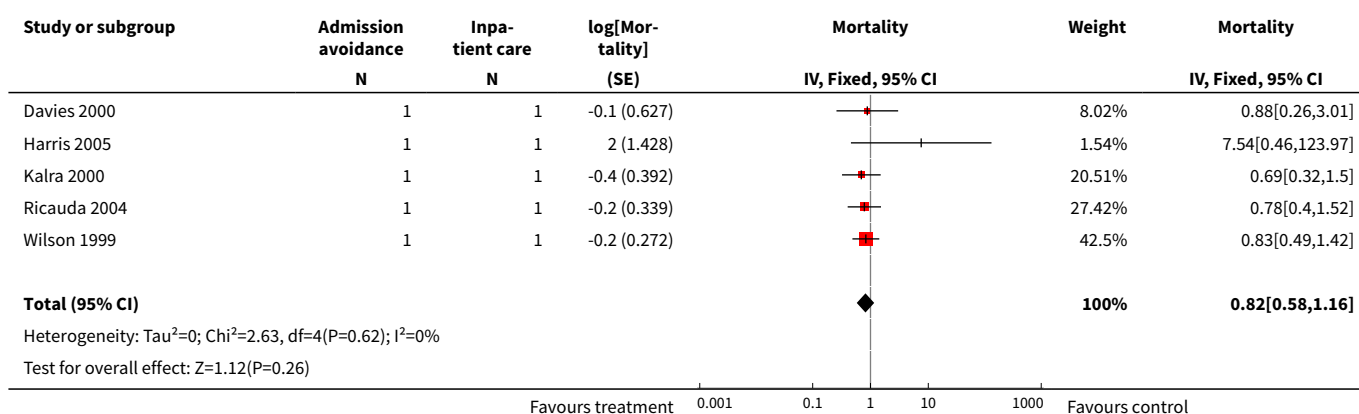
### Analysis 6.5. Comparison 6 IPD Sensitivity analysis in favour of hospital at home, Outcome 5 Readmissions excluding readmissions in the 1st 14 days adjusted for age and sex.



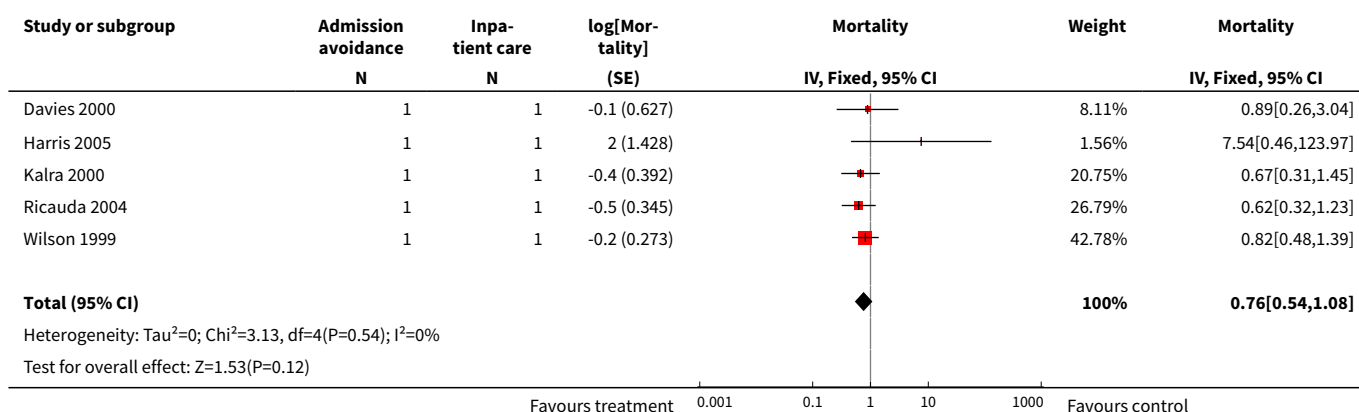
### Analysis 6.6. Comparison 6 IPD Sensitivity analysis in favour of hospital at home, Outcome 6 All readmissions adjusted for age and sex.



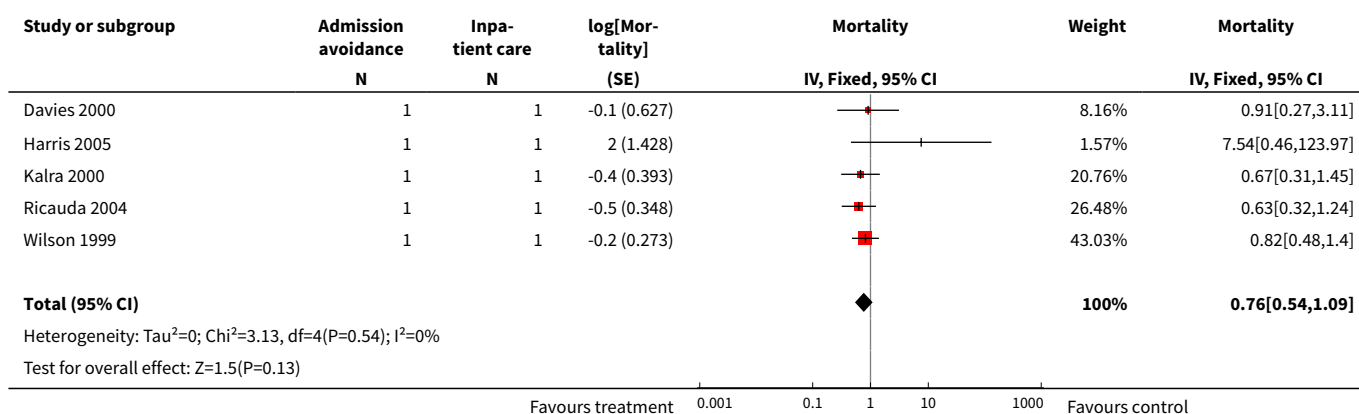
### Analysis 6.7. Comparison 6 IPD Sensitivity analysis in favour of hospital at home, Outcome 7 Mortality at 3 months.



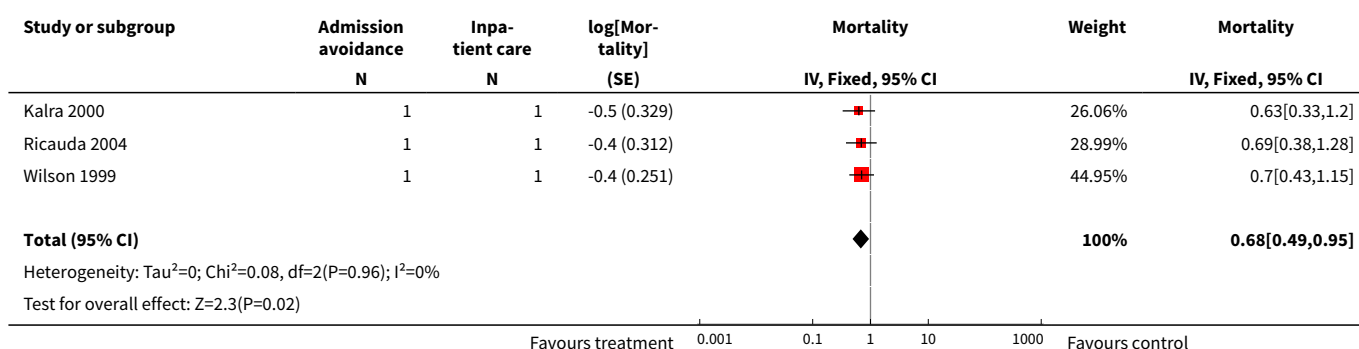
### Analysis 6.8. Comparison 6 IPD Sensitivity analysis in favour of hospital at home, Outcome 8 Mortality at 3 months adjusted for age.



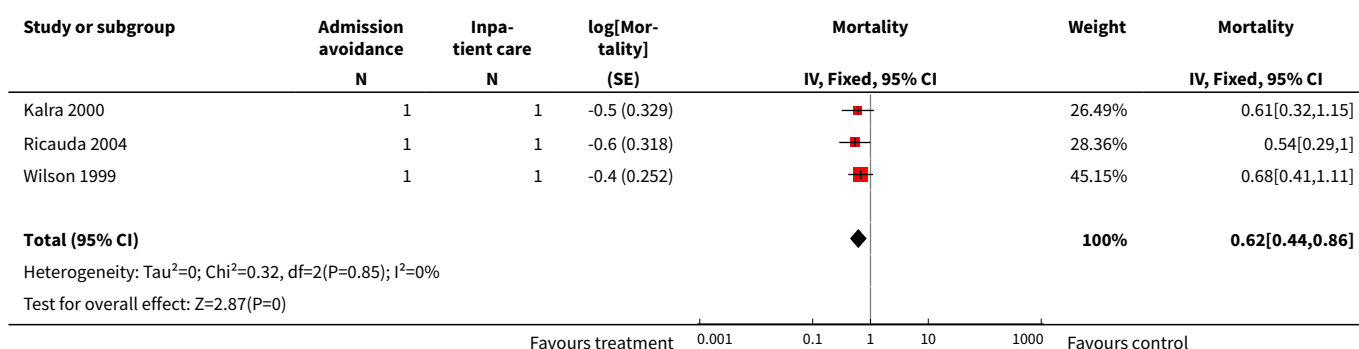
### Analysis 6.9. Comparison 6 IPD Sensitivity analysis in favour of hospital at home, Outcome 9 Mortality at 3 months adjusted for age and sex.



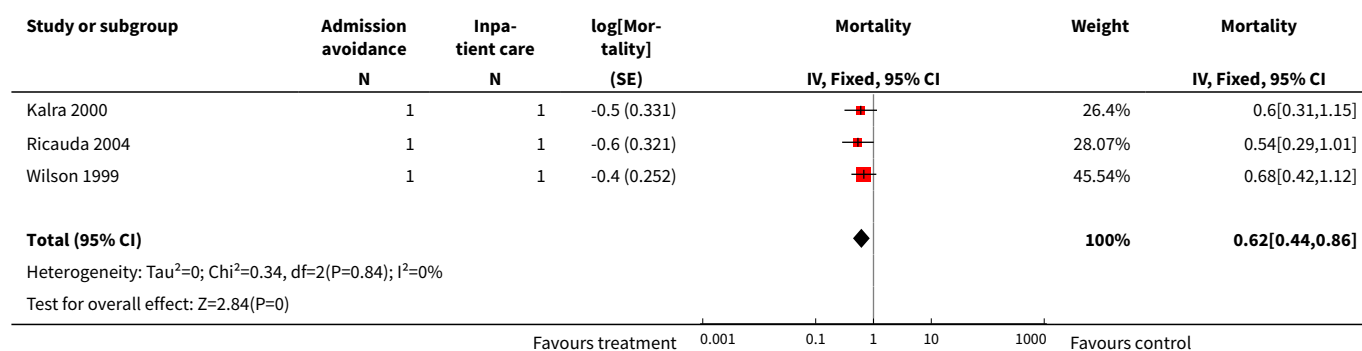
### Analysis 6.10. Comparison 6 IPD Sensitivity analysis in favour of hospital at home, Outcome 10 Mortality at 6 months.



### Analysis 6.11. Comparison 6 IPD Sensitivity analysis in favour of hospital at home, Outcome 11 Mortality at 6 months adjusted for age.



### Analysis 6.12. Comparison 6 IPD Sensitivity analysis in favour of hospital at home, Outcome 12 Mortality at 6 months adjusted for age and sex.



## APPENDICES

### Appendix 1. Search Strategy

Database: Ovid MEDLINE(R) <1950 to January Week 3 2008>

Search Strategy:

- 1 (hospital adj2 home).tw. (1933)
- 2 Home-based versus hospital-based.tw. (9)
- 3 Home hospitalization.tw. (89)
- 4 or/1-3
- 5 exp Home Care Services/
- 6 exp Hospitalization/
- 7 5 and 6
- 8 4 or 7
- 9 randomized controlled trial.pt.
- 10 controlled clinical trial.pt.
- 11 randomized controlled trials/
- 12 random allocation/
- 13 double blind method/
- 14 single blind method/
- 15 or/9-14
- 16 animal/
- 17 human/
- 18 16 not (16 and 17)
- 19 15 not 18

- 20 8 and 19
- 21 limit 20 to review
- 22 20 not 21
- 23 meta-analysis.pt.
- 24 22 not 23

Database: EMBASE <1980 to 2008 Week 11>

Search Strategy:

- 
- 1 (hospital adj2 home).tw.
  - 2 Home-based versus hospital-based.tw.
  - 3 Home hospitalization.tw.
  - 4 or/1-3
  - 5 exp Home Care Services/
  - 6 exp Hospitalization/
  - 7 5 and 6
  - 8 4 or 7
  - 9 clinical trial/
  - 10 randomization/
  - 11 randomized controlled trial/
  - 12 crossover procedure/
  - 13 double blind procedure/
  - 14 single blind procedure/
  - 15 (randomised or randomized).tw.
  - 16 placebo/
  - 17 (controlled adj study).tw.
  - 18 or/9-17
  - 19 nonhuman/
  - 20 18 not 19
  - 21 8 and 20

\*\*\*\*\*

Database: CINAHL - Cumulative Index to Nursing & Allied Health Literature <1982 to February Week 5 2008>

Search Strategy:

**Hospital at home admission avoidance (Review)**

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- 
- 1 (hospital adj2 home).tw.
  - 2 Home-based versus hospital-based.tw.
  - 3 Home hospitalization.tw.
  - 4 or/1-3
  - 5 exp Home Care Services/
  - 6 exp Hospitalization/
  - 7 5 and 6
  - 8 4 or 7
  - 9 exp clinical trials/
  - 10 clinical trial.pt.
  - 11 (controlled adj (study or trial)).tw.
  - 12 randomized controlled trial/
  - 13 (randomised or randomized).tw.
  - 14 (random\$ adj1 (allocat\$ or assign\$)).tw.
  - 15 or/9-14
  - 16 8 and 15

\*\*\*\*\*

#### **Search strategy for EPOC Register 21 February 2007**

home-based near in-patient\*

homecare near in-patient\*

hospital-at-home near in-patient\*

home-based near hospital\*

homecare or home-care near hospital\*

home hospital\* and in-patient\*

#### **21 January 2008 revision**

#### **Hospital at home admission avoidance (Review)**

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home-based and in-patient\*

homecare and in-patient\*

hospital-at-home and in-patient\*

home-based and hospital\*

homecare and hospital\*

home-care and hospital\*

home hospital\* and in-patient\*

## WHAT'S NEW

Date	Event	Description
6 July 2011	Amended	Reference revised to published review

## HISTORY

Review first published: Issue 4, 2008

Date	Event	Description
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 ( <a href="#">Shepperd 2005</a> ). ( <a href="#">Shepperd 2005</a> has been split into three reviews of which this is one).
10 July 2008	Amended	Converted to new review format.

## DECLARATIONS OF INTEREST

Four of the authors contributed trial data to the IPD meta-analysis

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## SOURCES OF SUPPORT

### Internal sources

- No sources of support supplied

### External sources

- NIHR Research Scientist in Evidence Synthesis Award to Sasha Shepperd supported this work, Not specified.

## NOTES

This review is an update; the original review was first published in Issue 1, 1998 of The Cochrane Library ([Shepperd 2005](#)). 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 ([Shepperd 2009](#)) and Hospital at home: home-based end of life care ([Shepperd 2011](#)) 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