

## RESEARCH

# Comprehensive geriatric assessment for older adults admitted to hospital: meta-analysis of randomised controlled trials

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## Abstract

**Objective** To evaluate the effectiveness of comprehensive geriatric assessment in hospital for older adults admitted as an emergency.

**Search strategy** We searched the EPOC Register, Cochrane's Controlled Trials Register, the Database of Abstracts of Reviews of Effects (DARE), Medline, Embase, CINAHL, AARP Ageline, and handsearched high yield journals.

**Selection criteria** Randomised controlled trials of comprehensive geriatric assessment (whether by mobile teams or in designated wards) compared with usual care. Comprehensive geriatric assessment is a multidimensional interdisciplinary diagnostic process used to determine the medical, psychological, and functional capabilities of a frail elderly person to develop a coordinated and integrated plan for treatment and long term follow-up.

**Data collection and analysis** Three independent reviewers assessed eligibility and trial quality and extracted published data. Two additional reviewers moderated.

**Results** Twenty two trials evaluating 10 315 participants in six countries were identified. For the primary outcome "living at home," patients who underwent comprehensive geriatric assessment were more likely to be alive and in their own homes at the end of scheduled follow-up (odds ratio 1.16 (95% confidence interval 1.05 to 1.28; P=0.003; number needed to treat 33) at a median follow-up of 12 months versus 1.25 (1.11 to 1.42; P<0.001; number needed to treat 17) at a median follow-up of six months) compared with patients who received general medical care. In addition, patients were less likely to be living in residential care (0.78, 0.69 to 0.88; P<0.001). Subgroup interaction suggested differences

between the subgroups "wards" and "teams" in favour of wards. Patients were also less likely to die or experience deterioration (0.76, 0.64 to 0.90; P=0.001) and were more likely to experience improved cognition (standardised mean difference 0.08, 0.01 to 0.15; P=0.02) in the comprehensive geriatric assessment group.

**Conclusions** Comprehensive geriatric assessment increases patients' likelihood of being alive and in their own homes after an emergency admission to hospital. This seems to be especially true for trials of wards designated for comprehensive geriatric assessment and is associated with a potential cost reduction compared with general medical care.

## Introduction

Older people represent the fastest growing sector of society and account for the largest increase in hospital admissions.<sup>1 2</sup> They are at highest risk of acquired disability, cognitive decline, or admission to residential care, either as a consequence of illness or as an unfortunate consequence of treatment.<sup>3 4 5</sup> Older people's needs are more complex with potentially coexistent medical, functional, psychological, and social needs.<sup>6</sup> This can lead to an atypical presentation that can often be misunderstood and requires a different approach to care.

One of the cornerstones of modern geriatric care is comprehensive geriatric assessment (CGA). This is defined as a "multidimensional interdisciplinary diagnostic process focused on determining a frail older person's medical, psychological and functional capability in order to develop a coordinated and integrated plan for treatment and long term follow up."<sup>7</sup>

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Extra material supplied by the author (see <http://www.bmj.com/content/343/bmj.d6553/suppl/DC1>)

Appendix 1: Search strategy for Medline

Appendix 2: Full details of all included trials

Comprehensive geriatric assessment is therefore both a diagnostic and therapeutic process. It seeks to ensure that problems are identified, quantified, and managed appropriately. The likelihood of multiple overlapping problems necessitates assessment across several domains and therefore involves several disciplines. These assessments across medical, psychiatric, functional, and social domains are required to develop a broad or multifaceted therapeutic plan to enhance recovery and promote independence.

There are two broad models of inpatient comprehensive geriatric assessment.<sup>8</sup> The first is delivered in a discrete ward with a coordinated specialist multidisciplinary team. Patients are admitted into this facility and cared for by the specialist team, who provide the assessment and rehabilitation. There are several names for these wards, including acute care for elders (ACE units), geriatric evaluation and management units (GEMU), or rehabilitation wards. For the purposes of this review we have grouped these together as “wards.” In the second model, a mobile or peripatetic team visit appropriate patients wherever they are admitted in a general ward setting. The team will assess the patients and make recommendations to the physicians who care for the patients. These are sometimes referred to as interdisciplinary geriatric consultation services (grouped here under the heading of “teams”).<sup>9</sup>

Various reviews of comprehensive geriatric assessment already exist in the literature but have shortfalls in their comprehensiveness. One of the earliest reviews<sup>9</sup> included analysis of trials of stroke care as well as orthogeriatrics and has now been superseded by individual specialty reviews.<sup>10 11</sup> Others have looked at specific subgroups of comprehensive geriatric assessment based on timing of admission,<sup>12</sup> patient defined criteria,<sup>13</sup> or ward title<sup>14</sup> or have simply had inadequate analysis data.<sup>8</sup>

We determined whether inpatient comprehensive geriatric assessment for frail older adults admitted to hospital as an emergency is more effective than routine or general medical care in hospital.

## Methods

### Types of participants

Participants were adults aged 65 or older who were admitted to hospital care as an emergency, including all unplanned, unscheduled, or acute presentations.

### Intervention

We sought to evaluate only randomised controlled trials comparing comprehensive geriatric assessment with usual care, such as general medical ward care. We considered both discrete geriatric units (“wards”) and inpatient geriatric consultation service (“team”) models. Studies of organised care for specific conditions (such as stroke units, geriatric orthopaedic rehabilitation) were excluded.<sup>10 15</sup> Studies that did not evaluate comprehensive geriatric assessment in an inpatient setting were also excluded.

### Comparisons

Trials were included only where comparison was with usual care. Comparisons with other forms of comprehensive geriatric assessment were not included. Usual care generally involved admission to a general medical ward setting under the care of a non-specialist.

Pre-planned subgroup analyses included comparisons by wards and teams, admission criteria (such as age alone versus age plus

other criteria), the timing of admission to specialist care, analysis by geographical healthcare setting, and specialist outpatient follow-up versus none.

## Outcomes

The primary outcome measure—“living at home”—is the inverse of death or admission to residential care combined and describes the odds of someone being alive and in their own home at a point in time. (Patients admitted from and returned to residential care were not classified as living at home.)

Secondary outcome measures included death; residential care; dependence (defined as a dichotomous outcome from scales measuring activities of daily living); death or dependence; death or deterioration (defined as the number of patients who had died or deteriorated in functional ability); activities of daily living (a continuous outcome describing change in score); cognitive status (a continuous outcome describing change in score); readmissions; length of stay; and use of resources.

In April 2010 we searched the EPOC Register (including studies awaiting assessment), the Controlled Trials Register (CCTR), the Database of Abstracts of Reviews of Effects (DARE); the Cochrane Central Register of Controlled Trials (CENTRAL); Medline (from 1966); Embase (from 1980); CINAHL (from 1982); and AARP Ageline (from 1978). Other sources included the hand searching of high yield journals and conference proceedings and the reference lists of any relevant reviews identified. The Medline search strategy is shown in appendix 1 on bmj.com.

Three independent reviewers screened titles and abstracts of papers identified by the literature searches for their potential relevance or assessed the full text for inclusion in the review.

Three reviewers abstracted the data independently, including data on design characteristics, the study population, the intervention, outcome measures used, and length of follow-up. Classification of the intervention was determined by characteristics of the type of assessment used (such as discrete geographical unit versus mobile team) and the components of the interventions.

We assessed all relevant trials to evaluate and record potential sources of bias,<sup>16 17</sup> including assessment of randomisation procedure, concealment of treatment allocation, blinding of participants, and documentation or evidence of intention to treat analysis.<sup>18</sup>

We considered study characteristics such as population, time to enrolment, and length of follow-up in the analysis and grouped studies were according to these characteristics. We have presented results separately for wards and teams for each domain of outcome. Data were combined in analyses and the odds ratios and 95% confidence intervals for each study presented alongside the summary statistic for each subgroup. Studies were included in the analysis only when published data were available for each outcome. For this reason the number of studies reported for each outcome reflect the available data. We used the fixed effects model for analyses. When there was heterogeneity ( $I^2 > 30\%$ ), we used and compared both random effect and fixed effects models.<sup>16</sup> When continuous scales were used, we attempted meta-analysis using weighted mean differences.

For the purpose of the outcome of admission to residential care, we combined the presence of the patient in a care home, a hospital ward, or long term residential care.

## Results

We searched 28 843 titles and identified 22 relevant randomised controlled trials giving information on 10 315 participants across six countries (fig 1) (full details of all included studies are in appendix 2 on [bmj.com](http://bmj.com)).<sup>19-53</sup>

### Risk of bias in included studies

The studies identified were heterogeneous in quality.<sup>18</sup> All used some method of individual patient randomisation, though reporting of key issues such as allocation concealment varied. Outcome assessment was seldom blinded. Some trials noted attrition for functional or cognitive outcomes.<sup>25-29</sup> For these outcomes, analysis was conducted with and without inclusion of these trial results for comparison (table 1).

### Effects of interventions

The odds of a patient living at home at the end of scheduled follow-up (median 12 months, range six weeks to 12 months) were higher for those patients who had undergone comprehensive geriatric assessment (odds ratio 1.16, 95% confidence interval 1.05 to 1.28;  $P=0.003$ ; 18 trials, 7062 participants).

There was significant interaction between subgroups ( $\chi^2=9.06$ ,  $P=0.003$ ,  $I^2=89\%$ ), with a significant difference from the effect of comprehensive geriatric assessment wards (1.22, 1.10 to 1.35;  $P<0.001$ ; 14 trials, 6290 participants), whereas mobile comprehensive geriatric assessment teams were associated with a trend towards a worse outcome (0.75, 0.55 to 1.01;  $P=0.06$ ; four trials, 772 participants). The overall effect equates to a number needed to treat of 33 to prevent one unnecessary death or admission to residential care, compared with general medical care. This effect is most pronounced for comprehensive geriatric assessment wards where the number needed to treat would be 20 (fig 2).

This effect was more pronounced at analysis up to six months (median six months, range six weeks to six months; 1.25, 1.11 to 1.42;  $P<0.001$ ; 14 trials, 5117 participants) equating to a number needed to treat of 17. There was interaction between the subgroups: comprehensive geriatric assessment wards were associated with a significantly improved odds of being alive and at home at six months (1.31, 1.15 to 1.49;  $P<0.001$ ; 11 trials, 4624 participants), equating to a number needed to treat of 13 to avoid one unnecessary death or admission to residential care, compared with general medical care. By contrast, comprehensive geriatric assessment teams were not associated with a benefit (three trials, 493 participants, 0.84, 0.57 to 1.24,  $P=0.39$ ), though numbers were smaller in this subgroup.

Analysis of data for living in residential care at the end of scheduled follow-up (median 12 months) showed a significant reduction for patients who had undergone comprehensive geriatric assessment (0.78, 0.69 to 0.88;  $P<0.001$ ; 19 trials, 7137 participants). This equates to a number needed to treat of 25 to avoid one unnecessary admission to residential care, compared with general medical care. There was interaction between the subgroups, showing a difference between the benefits of comprehensive geriatric assessment wards (0.73, 0.64 to 0.84;  $P<0.001$ ; 14 trials, 6252 participants; number needed to treat 20) and teams (1.16, 0.83 to 1.63;  $P=0.39$ ; five trials, 485 participants). This suggests that the overall benefit results from trials of wards.

Analysis of data for the outcome of death or deterioration (a combined outcome of death or functional decline) showed a significant reduction in death or deterioration (0.76, 0.64 to

0.90;  $P=0.001$ ; five trials, 2622 participants). This equates to a number needed to treat of 17 to avoid one unnecessary death or deterioration compared with general medical care (fig 3). There was no interaction between subgroups.

Analysis of cognitive function showed an overall benefit on cognitive measures (five trials, 3317 participants, standardised mean difference 0.08, 0.01 to 0.15,  $P=0.02$ ) for patients who underwent comprehensive geriatric assessment. There was no subgroup interaction, though data were available from only one comprehensive geriatric assessment ward (375 participants).

Analysis of mortality at the end of scheduled follow-up showed no significant difference between intervention and control groups (odds ratio 0.99, 0.90 to 1.09;  $P=0.82$ ; 23 trial arms, 9963 participants). There was also no difference at up to six months' follow-up (0.91, 0.80 to 1.05;  $P=0.20$ ; 19 trials, 6787 participants).

Eight trials (4128 participants) reported data on dependence. All of the trials tested comprehensive geriatric assessment wards. No usable dependence data were recorded for teams. There was no significant difference between intervention and control groups (odds ratio 0.94, 0.81 to 1.10,  $P=0.44$ ) (table 1). Though attrition was marked in one trial, exclusion of this trial from analysis did not significantly alter the outcome (0.89, 0.76 to 1.06;  $P=0.19$ ; seven trials, 3669 participants). Similarly there was no significant difference for the outcome of death or dependence (0.98, 0.77 to 1.25;  $P=0.87$ ; three trials, 1212 participants) or activities of daily living (standardised mean difference 0.06, -0.06 to 0.17;  $P=0.33$ ; five trials, 1296 participants). There was no significant difference between the groups for the outcome of readmission to hospital (odds ratio 1.03, 0.89 to 1.18;  $P=0.72$ ; nine trials, 3822 participants).

Data on length of stay were analysed for 12 trials (4034 participants). As there was significant heterogeneity ( $P<0.001$ ,  $I^2=86\%$ ), we did not carry out a meta-analysis.

Trials reported the costs of comprehensive geriatric assessment differently and with differing outcome measures. For this reason, we did not attempt meta-analysis. Table 2 shows the costs quoted by the papers that reported resource use with a brief explanation of how they were reported. Most costs reported are those incurred by the trial hospital and only rarely have the costs of nursing home care been taken into consideration. Most of the differences in cost are attributed to differences in length of stay or differences in the type and number of investigations requested between the groups. Many of the hospital costs (although not exclusively) seem to show a reduction in costs associated with comprehensive geriatric assessment.<sup>21 22 25-27 35 40</sup> Some trials reported greater costs in the treatment group for hospitals.<sup>19 30</sup> If nursing home costs are taken into consideration, the potential benefit of comprehensive geriatric assessment might be greater. The few trials that reported these cost showed reduced costs in the comprehensive geriatric assessment group.<sup>19 22 41 45</sup>

## Discussion

In this review of specialist organised geriatric care (normally referred to as comprehensive geriatric assessment or CGA) we found a clear and significant improvement in the odds of a patient being alive and in their own home if they receive coordinated specialist services rather than conventional care in a hospital setting.



## Comparison with other studies

Most of the other reviews covering this issue have considered comprehensive geriatric assessment only in subgroups of inpatients<sup>12-14</sup> or have such assessment with care for specific conditions,<sup>9, 13</sup> in some cases making assumptions about what criteria differentiate one subgroup from another.<sup>13</sup> These have generally not reported costs or included comprehensive geriatric assessment teams. These reviews have concluded that there are benefits for these subgroups but because of decisions regarding inclusion criteria are limited in their recommendations and might be making premature conclusions about which aspects of comprehensive geriatric assessment are effective and why.

## Strengths and limitations

The quality and breadth of meta-analysis was limited by the availability and quality of data in individual studies. This was variable because of differences in reporting standards and formats, thus limiting the results for some outcome categories (such as activities of daily living). Reporting was generally high quality for the primary outcome (the inverse of death and admission to residential care combined).

As with other meta-analyses, trials that are combined might differ in important ways from each other (for example, acute and post-acute care). In this form of analysis, it is not possible to compare different forms of comprehensive geriatric assessment with each other nor to evaluate the benefit of combining different models. There remains a need for further trials that compare differing forms of comprehensive geriatric assessment. Wards that admit direct from the emergency department (sometimes called ACE units) show improved outcomes in patients compared with general medical settings<sup>12</sup>; so do trials admitting patients later in their hospital stay.<sup>13, 14</sup> Direct comparison between acute geriatric wards and post-acute wards is not possible from this analysis. Furthermore, the trials of acute geriatric wards and post-acute geriatric wards in this analysis differ in their admission criteria.

Trials evaluating direct admission from the emergency department all have admission criteria related to age, whereas trials evaluating post-acute care all have criteria related to needs (the exception being Shamian et al<sup>50</sup>). This makes comparison difficult. It could be that the optimal model of comprehensive geriatric assessment for hospitals includes both acute and post-acute models. Nevertheless, we did combine trials where key aspects of comprehensive geriatric assessment are carried out and have shown a distinct difference from general medical care.

Meta-analysis such as this can provide only limited guidance on which types of patients should undergo comprehensive geriatric assessment. In attempting to answer this question we dichotomised the data according to trials that admit patients primarily on the basis of age alone (for example, all those aged over 75) or those that included patients on the basis of need (defined as age plus several specific criteria). These needs related criteria are generally descriptive, including classic geriatric presentations (falls, delirium, immobility, etc) and some consideration of at risk criteria (such as functional impairment or risk of admission to nursing home). Both geriatric wards that admit patients on an age related basis and those that admit on a needs related basis seem to result in improved outcomes. Teams did not significantly benefit care of patients.

Analysis by healthcare setting and by the inclusion of specialist follow-up did not show a clear relation with outcomes, as had been previously suggested.<sup>7, 9</sup>

The decision to create subgroups by wards and teams as two forms of comprehensive geriatric assessment is based on similarities in both the staffing of teams and wards and the processes of care (see appendix 2 on [bmj.com](http://bmj.com)). In clinical practice the two are often considered to be equivalent, and, in some cases, comprehensive geriatric assessment teams are seen as a more expedient form of assessment as it does not require fixed beds. The only initially apparent differences between the interventions relate to the physical geography of the admission of patients.

While it is possible to conclude that comprehensive geriatric assessment is beneficial, the benefits seem to arise solely from trials of geriatric wards and are not seen for geriatric teams. This effect is similar to the differences observed between stroke wards and stroke teams<sup>10, 54</sup> and might have multiple explanations. Firstly, a dedicated ward with more time focused on the care of older people allows greater learning within the ward staff, fostering the development of greater skills and expertise. In addition, working in close proximity as a group allows more efficient and effective multidisciplinary working and team building. Secondly, mobile teams often find it difficult to modify the behaviour of other health professionals directly involved in the patient's care. As a consequence, recommendations for treatment and therapy are not always carried through,<sup>36</sup> and having control over this process seems to lead to a better outcome.

There is evidence that specialisation within the ward team (for example, medical, physiotherapy and occupational therapy) is critical to the successful multidisciplinary team outcome, and this might be especially true in relation to gerontological nursing.<sup>55</sup> As with stroke wards, the role of nursing in delivering direct care 24 hours a day might be critical to the success of care and can include both the avoidance of complications and the creation of an enabling therapeutic environment. In addition, communication with family members and patients might be key to goal setting or discharge planning.

Other factors that seem to benefit discrete units include the development of protocols of care for the management of key conditions, which can be implemented and acted on with a higher degree of consistency. A modified ward environment designed to be more suitable for frailer older adults is also important.

Several trials analysed costs. Most reported equitable or cost effective care from comprehensive geriatric assessment in a hospital setting. Further economic evaluation is worthwhile considering the demographic changes and potential societal costs from healthcare for an ageing population.

## Conclusions

Significantly more older patients are likely to survive admission to hospital and return home if they undergo comprehensive geriatric assessment while they are inpatients. Fewer will die or experience deterioration and more will have improved cognitive functioning. These effects of acute geriatric medicine programmes are consistently shown in trials of geriatric wards but are not replicated in trials of geriatric consultation teams on general wards. These benefits might be cost effective.

## Policy implications

All frail elderly patients admitted to hospital as an emergency should have access to comprehensive geriatric assessment beds. Compliance with best practice should be audited across healthcare providers, and the provision of geriatric services needs reviewed. Further evaluation (through additional research)

of the unanswered questions as to who should receive specialist services and which forms of comprehensive geriatric assessment are most appropriate to which inpatient setting (acute or post-acute) are a priority.

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Ethical approval: Not required.

Data sharing: Technical appendix, statistical code, and dataset available from the corresponding author. Consent was not obtained but the presented data are anonymised and risk of identification is low.

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**What is already known on this topic**

Older people represent a considerable proportion of hospital admissions and are at greatest risk of acquired disability, cognitive impairment, or admission to residential care

Some subgroups of in-hospital comprehensive geriatric assessment have been shown to be effective

**What this study adds**

Comprehensive geriatric assessment in hospital is effective and results in an increased likelihood of a patient returning home and avoiding admission to residential care or death and deterioration

The key features of successful comprehensive geriatric assessment seem to be treatment in discrete units, with expertise in the care of older people and control over the delivery of direct care

These benefits seem to be cost effective for hospitals and might be cost avoiding for society

## Tables

**Table 1 | Odds ratios (OR) or standardised mean differences (SMD) for secondary outcomes: comprehensive geriatric assessment versus usual care (fixed effects analysis)**

Outcome	Wards				Teams				Overall			
	Trials	No of patients	OR or SMD (95% CI)	P value	Trials	No of patients	OR or SMD (95% CI)	P value	Trials	No of patients	OR or SMD (95% CI)	P value
Mortality:												
Up to 6 months	14	6048	0.93 (0.81 to 1.08)	0.35	5	738	0.74 (0.47 to 1.17)	0.19	19	6786	0.91 (0.80 to 1.05)	0.20
End of follow-up	16	6593	0.98 (0.87 to 1.11)	0.75	7	3370	1.00 (0.86 to 1.18)	0.97	23	9963	0.99 (0.90 to 1.09)	0.82
Living in residential care:												
Up to 6 months	10	4319	0.72 (0.61 to 0.85)	<0.001	4	606	1.07 (0.73 to 1.57)	0.71	14	4925	0.76 (0.66 to 0.89)	<0.001*
End of follow-up	14	6252	0.73 (0.64 to 0.84)	<0.001	5	885	1.16 (0.83 to 1.63)	0.39	19	7137	0.78 (0.69 to 0.88)	<0.001*
Dependence	8	4128	0.94 (0.81 to 1.10)	0.44	0	0	Not estimable	—	8	4128	0.94 (0.81 to 1.10)	0.44
Death or dependence	4	1212	0.98 (0.77 to 1.25)	0.87	0	0	Not estimable	—	4	1212	0.98 (0.77 to 1.25)	0.87
Death or deterioration	3	2305	0.78 (0.65 to 0.93)	0.006	2	317	0.65 (0.41 to 1.03)	0.07	5	2622	0.76 (0.64 to 0.90)	0.001
Activities of daily living	4	967	0.11† (−0.03 to 0.24)	0.12	2	329	−0.08† (−0.30 to 0.14)	0.47	6	1296	0.06† (−0.06 to 0.17)	0.33
Cognitive function	1	375	0.06† (−0.14 to 0.27)	0.55	4	2942	0.09† (0.01 to 0.16)	0.02	5	3317	0.08† (0.01 to 0.15)	0.02
Readmissions	8	3543	1.01 (0.87 to 1.17)	0.94	1	279	1.25 (0.78 to 2.01)	0.35	9	3822	1.03 (0.89 to 1.18)	0.72

\*Subgroup interaction.

†Standardised mean difference.

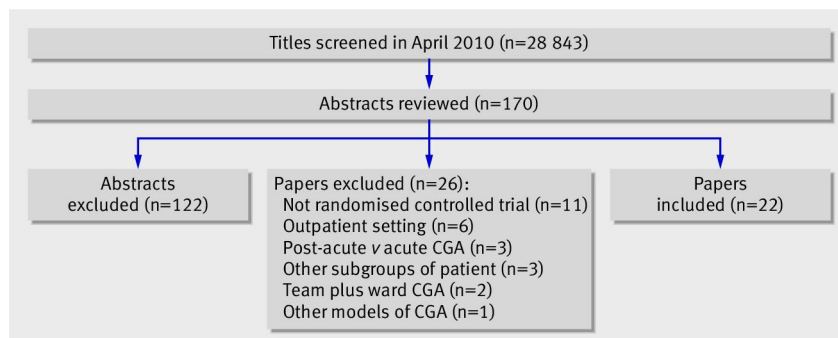
Table 2| Costs associated with comprehensive geriatric assessment (intervention) versus usual care (control)

	Costs		Comments
	Intervention	Control	
Cohen 2002, <sup>22</sup> US:			
Geriatric unit-usual care outpatient v usual care inpatient-usual care outpatient	\$36 592 (SD 1844)	\$38 624 (SD 2037)	Cost-cost analysis separated into institutional costs and costings estimated for nursing home admissions based on standardised HMO rates
Geriatric unit-geriatric outpatient v usual care inpatient-geriatric outpatient	\$35 935 (SD 1829)	\$35 951 (SD 1827)	
Collard 1985, <sup>25</sup> US:			
Choate	\$4015.17 (SE 0.03)	\$4545.13 (SE 0.03)	Cost-cost analysis (hospital costs only)
Symmes	\$3591.42 (SE 0.03)	\$4155.54 (SE 0.02)	
Fretwell 1990, <sup>27</sup> US	\$3148 (SD 7210)	\$4163 (SD 18 406)	Cost-cost analysis (hospital costs only)
Applegate 1990, <sup>19</sup> US:			
Geriatric unit (rehab diagnosis) v usual care (rehab diagnosis)	\$32 978 (SD 35 130)	\$18 409 (SD 16 555)	Health and social care costs up to 1 year after randomisation
Geriatric unit (medical/surgical diagnosis) v usual care (medical/surgical diagnosis)	\$25 846 (SD 29 628)	\$15 248 (SD 13 152)	
Asplund 2000, <sup>21</sup> Sweden (Swedish kroner)	10 800 (IQR 9300-12 300)	12 800 (IQR 11 500-14 100)	Cost-cost analysis (hospital costs only)
Counsell 2000, <sup>26</sup> US	\$5640	\$5754	Included in experimental group costs are costs of renovation of geriatric unit
Hogan 1987, <sup>30</sup> Canada	\$C98.36	\$C77.68	Monthly costings for physician services only
Landefeld 1995, <sup>35</sup> US	\$6608	\$7240	Cost-cost analysis (hospital costs only)
Nikolaus 1999, <sup>41</sup> Germany (deutschmark):			
Geriatric unit-early supported discharge	3 365 000 (\$1 922 400)	4 145 000 (\$2 368 300)	Costs for hospital care and nursing homes (estimated as costs per 100 people per year)
Geriatric unit only	3 983 000 (\$2 276 600)		
Rubenstein 1984, <sup>45</sup> US	\$22 597	\$27 826	Costs per year survived including hospital and nursing home costs
Naughton 1994, <sup>40</sup> US	\$4525 (SD 5087)	\$6474 (SD 7000)	Cost-cost analysis (hospital costs only)
White 1994, <sup>52</sup> US	\$23 906	\$45 189	Cost-cost analysis (hospital costs only)

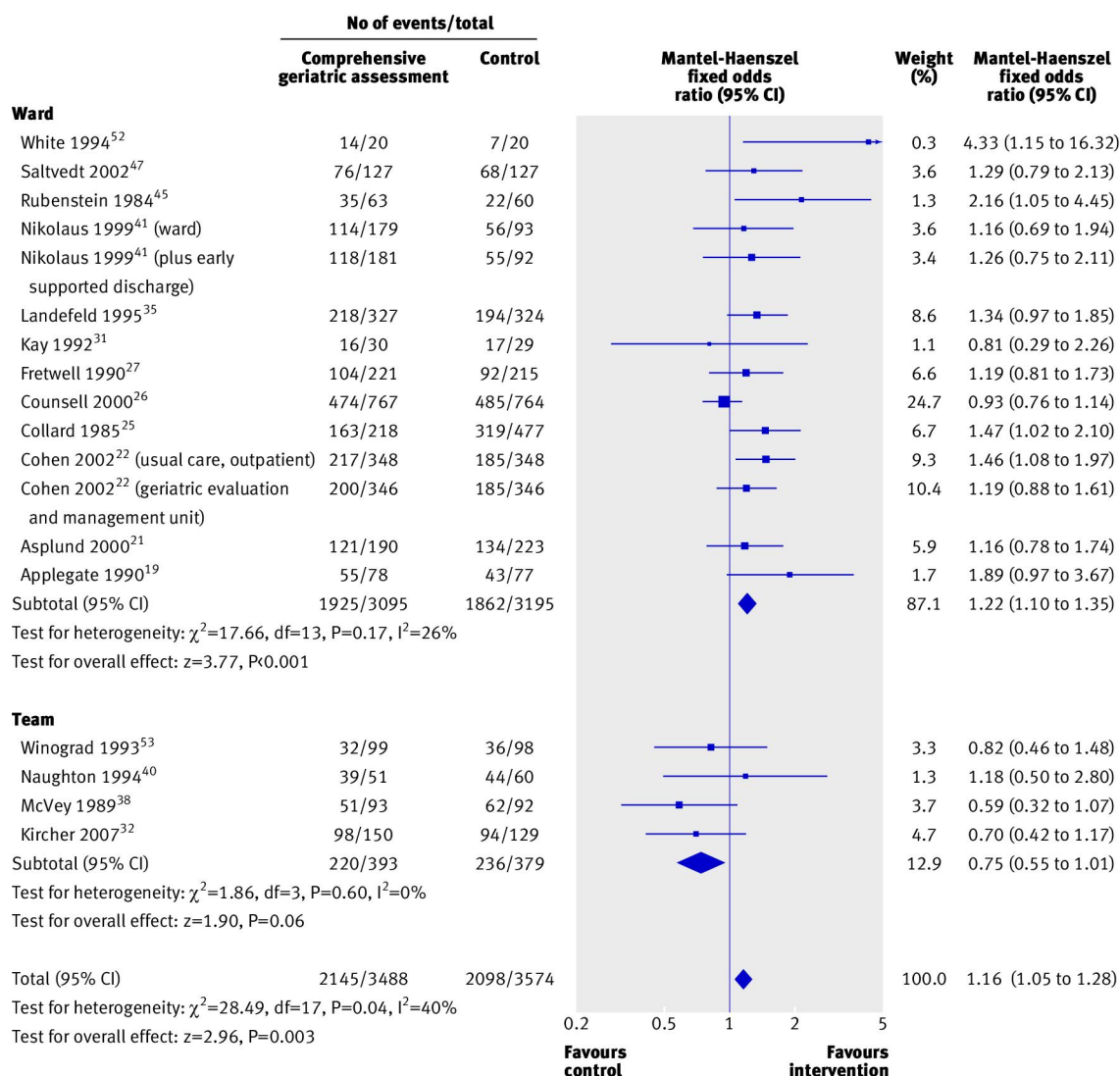
SD=standard deviation, IQR=interquartile range, SE=standard error.



## Figures

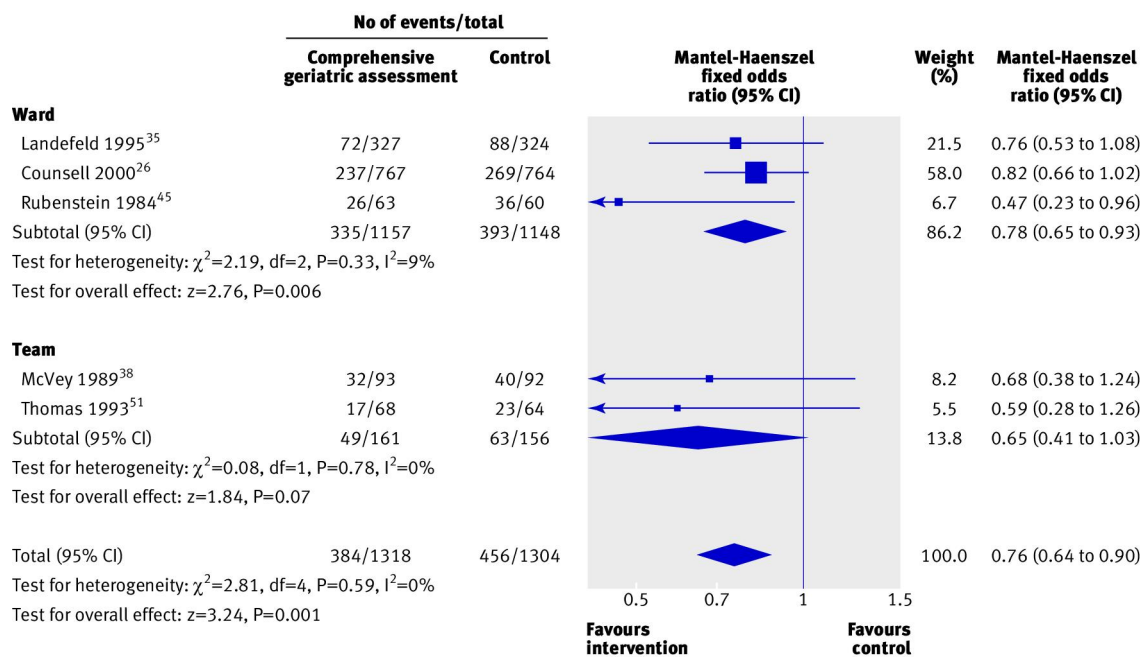


**Fig 1** Identification of studies for inclusion in analysis (CGA=comprehensive geriatric assessment)



Test for subgroup differences:  $\chi^2=9.06$ ,  $df=1$ ,  $P=0.003$ ,  $I^2=89\%$

**Fig 2** Odds ratios for living at home at end of follow-up (median 12 months) in elderly patients according to comprehensive geriatric assessment after emergency admission



Test for subgroup differences:  $\chi^2=0.54$ , df=1, P=0.46, I<sup>2</sup>=0%

**Fig 3** Odds ratios for death or deterioration at the end of follow-up (median 12 months) in elderly patients according to comprehensive geriatric assessment after emergency admission at baseline