Is case management effective in reducing the risk of unplanned hospital admissions for older people? A systematic review and meta-analysis

Alyson L Huntley, Rebecca Thomas, Mala Mann, Dyfed Huws, Glyn Elwyn, Shantini Paranjothy and Sarah Purdy

Background. Case management is a collaborative practice involving coordination of care by a range of health professionals, both within the community and at the interface of primary and secondary care. It has been promoted as a way of reducing unplanned admissions in older people.

Objective. The objective was to systematically review evidence from randomized controlled trials regarding the effectiveness of case management in reducing the risk of unplanned hospital admissions in older people.

Methods. Eighteen databases were searched from inception to June 2010. Relevant websites were searched with key words and reference lists of included studies checked. A risk-of-bias tool was used to assess included studies and data extraction performed using customized tables. The primary outcome of interest was enumeration of unplanned hospital admission or readmissions.

Results. Eleven trials of case management in the older population were included. Risk of bias was generally low. Six were trials of hospital-initiated case management. Three were suitable for meta-analysis, of which two showed a reduction in unplanned admissions. Overall, there was no statistically significant reduction in unplanned admissions [relative rate: 0.71 (95% confidence interval, CI: 0.49 to 1.03)]. Three trials reported reduced length of stay. Five trials were of community-initiated case management. None showed a reduction in unplanned admissions. Three were suitable for meta-analysis [mean difference in unplanned admissions: 0.05 (95% CI: −0.04 to 0.15)].

Conclusions. The identified trials included a range of case management interventions. Nine of the 11 trials showed no reduction of unplanned hospital admissions with case management compared with the same with usual care.

Keywords. Case management, hospital admissions, meta-analysis, older people, randomized controlled trial, systematic review.

Introduction

The use of case management has been advocated as a way of reducing unplanned admissions in older people but there is no clear evidence supporting the effectiveness of case management. Approximately 35% of hospital admissions in England are unplanned admissions, costing 11 billion pounds per annum (2010–11). Unplanned hospital admissions are a problem for health systems internationally as they are costly and disruptive to elective health care and increase waiting lists. Equally, they are a far–from-ideal scenario for patients and can lead to additional morbidity from hospital-acquired complications. Recent policy in the UK and elsewhere has focused on reducing unplanned admissions. Various interventions, including case management, have been introduced to address this problem.

Case management can take on a number of forms and tends to be implemented in different ways in different health systems. The National Health Service (NHS) has used less-intensive approaches than the traditional US model, for example, through the use of health visitors or community matrons to support...
older people and those with long-term conditions at home. The older population is increasing throughout the world. In the UK, presently, there are 10 million people older than 65 years of age. UK projections are that there will be 5.5 million more elderly people in 20 years’ time and the number will have nearly doubled to ~19 million by 2050.

Previous effectiveness reviews of case management have either focused on specific diseases and conditions or have included a wide range of other community interventions and have not necessarily included unplanned admissions as an outcome. The aim of this study was to conduct a systematic review of the randomized controlled trial (RCT) evidence for the effectiveness of case management in reducing unplanned hospital admissions for older people.

Methods

Definitions

Case management is the process of planning, coordinating and reviewing the care of an individual. A case management definition cited by the King’s Fund in the UK and originating from the Case Management Society of America was used:

A collaborative process of assessment, planning, facilitation, care coordination, evaluation, and advocacy for options and services to meet an individual’s and family’s comprehensive health needs through communication and available resources to promote quality cost-effective outcomes.

The older population were defined as people aged 65 years and more.

Unplanned, emergency or unscheduled hospital admissions were defined as ‘admission or readmission with an overnight stay that was not previously planned or scheduled or “elective”’.

Inclusion and exclusion (selection) criteria

Inclusion criteria were as follows: RCTs of case management initiated either in or after discharge from acute care hospitals, including the emergency department, or in the community for the older population in which one of the outcomes was number of unplanned hospital admissions or readmissions; that were either published in English or had an English abstract; and that were carried out in an Organisation for Economic Co-operation and Development (OECD) country. This latter criterion was chosen so that the results could be broadly applicable to the UK and other similar health systems.

RCTs were excluded if unplanned admissions could not be separated from planned or elective admissions using the data provided in the article or by the authors.

Data sources and search strategy

The review was conducted using Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) standards. A literature search was carried out across 18 electronic databases, including ASSIA, CINAHL, Cochrane Central Register of Controlled Trials, Embase and Medline (Supplementary material online, Appendix 1), to identify studies of interventions used to reduce unplanned hospital admissions.

The search strategy (Supplementary material online, Appendix 2) was designed in OVID Medline using a combination of text words and Medical Subject Headings. For the remaining databases, search terms were adapted according to the search capabilities of each particular database. Searches were from inception to June 2010.

The following websites were searched using the key term ‘hospital admissions’:

- Agency for Healthcare Research and Quality (AHRQ), http://www.ahrq.gov/;
- Centre for Reviews and Dissemination (CRD), http://www.york.ac.uk/inst/crd/;
- EPPI Centre (http://epi.ioc.ac.uk/EPPIWeb/home.aspx);
- and The King’s Fund (http://www.kingsfund.org.uk/).

In addition, experts in the field were consulted; reference lists of all included studies and previous systematic reviews were checked for additional relevant publications.

Selection of studies

Two reviewers independently screened each reference title and abstract (if available) for relevance to this review. Where there was disagreement, a third clinical reviewer made the final decision. Studies were included if they stated that the intervention was case management or if they fitted the criteria of case management as listed earlier. If this was unclear, the decision was made by a third clinical reviewer.

For citations that were included from the first round of screening, the full article was obtained. The second round of screening involved one of two reviewers assessing full articles based on the agreed inclusion/exclusion criteria. Exclusions were checked by a third reviewer at this second screening. Data were extracted by one reviewer into Cochrane Review Manager software version 5.1 and then checked by a second reviewer.

Risk of bias

The risk of bias was assessed in each included study using the Cochrane risk-of-bias tool.

Data synthesis

The outcome of number of patients with an admission or readmission was treated as dichotomous and using
Review Manager version 5.1, individual risk ratios were calculated. Total numbers of admissions were treated as count data and relative rates calculated. Mean number of people or admissions was used to calculate mean differences. All were presented with their 95% confidence intervals (95% CI).

If there were at least three studies in which admissions or readmissions were measured, a meta-analysis was performed with a fixed- or random-effects model depending on the level of between-study heterogeneity estimated using the $I^2$ statistic. A random-effects model was used if heterogeneity was $>50\%$.14

**Economic data**

To supplement the main systematic review of effects, cost data published with the RCTs of case management for older people were identified and extracted and are described below.

**Results**

The search found 14 papers describing RCTs of case management for the older population (Table 1).15–25 Three were excluded for reasons listed in the PRISMA diagram (Fig. 1).26–28 Of the 11 included studies, one RCT was identified after initial searches.16 Risk of bias is summarized in Figure 2. Any bias specific to included studies is detailed in the following section.

**Case management initiated in hospital or on discharge**

There were two RCTs, among the total six, describing case management initiated in hospital, of which one was an intensive advanced practitioner nurse (APN) intervention involving 363 patients (mean age: 75 years) and showed a significant decrease in hospital readmissions compared with the same at 6 months after usual care [relative rate: 0.45 (95% CI: 0.29 to 0.69)].16

The other RCT involved a team of specialized geriatric health professionals who were providing case management to 345 older patients (no ages given) and showed no difference in hospital readmissions compared with the same at 12 months after usual care (relative rate: 0.99 [95% CI: 0.66 to 1.49]).17 It is important to note that the clinicians in the hospital received extra training and undertook comprehensive geriatric assessment in both intervention and control groups. This may have influenced outcomes by affecting care in the control group, biasing the result towards the null.

Four RCTs evaluated case management initiated on discharge from hospital. Three out of the four studies showed no significant difference in unplanned hospital admissions between case management and usual care.16,20,21 One study showed a significant effect on hospital admissions at 18 months.19 Two of these RCTs expressed unplanned hospital admissions as percentage of patients readmitted, with the actual numbers being incalculable.18,21 The third study reported the number of people experiencing readmissions in a period of 6 months. This study of 645 patients (mean age: 77 years) found no reduction in admissions [relative risk: 0.95 (95% CI: 0.72 to 1.26); $P = 0.73$.20

The remaining study involving 739 people (mean age: 82 years) discharged from the emergency department reported a small non-significant reduction in readmissions at 1 month but a significant reduction at 18 months [relative rates: 0.76 (95% CI: 0.53 to 1.24) and 0.76 (95% CI: 0.62 to 0.93), respectively].19

Three of the six studies could be combined in a random-model meta-analysis using the relative rate data.16,17,29 Individually, two of the three studies showed a reduction in hospital readmissions, and one showed no effect on readmissions; however, when combined in meta-analysis, it gave an overall non-significant relative rate of readmissions of 0.71 [95% CI: 0.49 to 1.03], $P = 0.07$: Fig. 3a. It is of note that this result was dominated by the study of Naylor et al., which included 50% elective patients.16 If the Naylor data were removed, the non-significant effect became smaller again [relative rate: 0.81 (95% CI: 0.65 to 1.02), $P = 0.08$]. The remaining three hospital-initiated studies not included in the meta-analysis showed no reduction in hospital admissions.18,20,21

It is important to point out that three of the six RCTs showed a significantly reduced length of stay during the study period (see the section Economic evaluations).16,20 The remaining three studies did not provide these data although one study showed a significant increase in the number of days before first readmission with case management compared with the same with usual care.19

**Community-initiated case management**

There were five RCTs that described case management initiated in the community versus usual care.15,22–25 Data were expressed as total number and mean number of unplanned admissions. None of these RCTs showed reduced admissions with case management.

The first study involved 850 people (mean age: 78 years) at high risk of using health care services.15 Case management was coordinated for 6–8 months by guided care nurses with the support of a multidisciplinary team, with a 12-month follow-up (mean number of admissions: 0.7 ± 1.06 versus 0.72 ± 1.19, respectively).

The second RCT described case management compared with usual care for 200 home-dwelling people (mean age: 81 years), who after an initial assessment were visited every 2 months for 1 year led by a GP and supported by a multidisciplinary team. This study showed a small non-significant reduction in unplanned hospital admissions at 12 months with
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<tr>
<th>Author; date; country</th>
<th>Population; “Age; gender; ethic group; living alone</th>
<th>Intervention; n = number randomized</th>
<th>Control; n = number randomized</th>
<th>Outcome measure;(^+) (follow-up time in months) intervention versus control; CL for relative rates; 95% CI for RR; SD for MD</th>
<th>Cost data; If available</th>
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<td><strong>Case management initiated in hospital or on discharge</strong></td>
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<td>Naylor;(^\text{16}) 1999; USA</td>
<td>363 older people discharged from hospital (home dwelling); mean age: 75 years; 50% women; 55% white (45% black); 44% have spouse</td>
<td>n = 177 patients; APN visits patient every 48 hours while in hospital, twice during the first 48 hours post discharge and visits 7–10 days post discharge, followed by as many visits as required with no limits 4 weeks of intervention; care focused on medication, symptom management, diet, activity, sleep, medical follow-up and emotional status.</td>
<td>n = 186 patients; discharge planning that was routine for adult patients at study hospitals. If referred, they received standard home care consistent with Medicare regulations.</td>
<td>Authors—Total no. of index-related hospital readmissions (6 months); 30 versus 64; RR: 0.49 (0.34 to 0.72); (P = 0.0003); Calculated—R rate: 0.45 (0.29 to 0.69)</td>
<td>Total &amp; per-patient imputed reimbursements for post index acute health services group; control versus intervention; ($1 238 928 versus $64 259; (P = 0.001)) versus ($666 1 versus $363 928 per patient; (P = 0.001)) respectively</td>
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<td>Nikolaus;(^\text{17}) 1999; Germany</td>
<td>545 older people discharged from hospital (home dwelling) but recruited both on admission and in the community; no details given; ‘baseline characteristics were similar’</td>
<td>n = 181 patients; comprehensive geriatric assessment in hospital. While the patient was in hospital, the team gave them additional treatment. One home visit was performed while the patient was still in hospital. After discharge, the team provided treatment, which could not be provided by home services for the required time and intensity. At least one home visit was carried out in the first 3 days after discharge, plus a follow-up visit at 3 months, to check whether everything was running smoothly including home care. Then follow-up by telephone was carried out at 12 months.</td>
<td>(i) n = 179 patients; comprehensive geriatric assessment &amp; recommendations, followed by usual care at home; (ii) n = 185 patients; assessment of activities of daily living and cognition, followed by usual care in hospital and at home.</td>
<td>Authors—(i) Total no. of people experiencing hospital readmissions (12 months); 43 versus 45; RR: 0.96 (0.68 to 1.36); (P = 0.83). (ii) no. of readmissions to acute care hospital in surviving participants: 59 versus 65; Calculated—R rate: 0.99 (0.66 to 1.49)</td>
<td>Total costs were lower in intervention group than in control group (US$ 4000 per person per year)</td>
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<td>Avulund;(^\text{18}) 2002; Denmark</td>
<td>149 patients who were discharged to go home from geriatric and medical wards; no details given. ‘No significant differences between groups for age &amp; gender.’</td>
<td>n = 90 patients; existing norms for discharge planning were applied to all control patients.</td>
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<td>Authors—Total no. of readmissions (3 months); data are not reported in numbers except as % of those that were in the medical ward (selected population): no differences found between groups</td>
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<td>Caplan;(^\text{19}) 2004; Australia</td>
<td>739 older people sent home from the emergency department; mean age: 82 years; 60% women; 39% living alone</td>
<td>n =370 patients; visit within 24 hours of being at home; care plan devised by team member. This was discussed at weekly interdisciplinary meetings. Any interventions needed were provided within 4 weeks and referrals were made to the patients’ GP, specialist physicians or surgeons, community health nurses or other community services.</td>
<td>n =399 patients; usual care: no alteration to the discharge plan formulated by the medical officer in the emergency department.</td>
<td>Authors—Total no. of emergency readmissions to hospital: (i) 1 month: 42 versus 51; (ii) 18 months: 164 versus 201; Calculated—(i) 1 month: R rate: 0.76 (0.53 to 1.24); (ii) 18 month: R rate: 0.76 (0.62 to 0.93)</td>
<td>20% decrease in total hospital costs; ($1154 vs $1439).</td>
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\[\text{Table 1: Included RCTs of case management for the older population}\]
Table 1  
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<th>Author; date; country</th>
<th>Population; Age; gender; ethnic group; living alone</th>
<th>Intervention; ( n = ) number randomized</th>
<th>Control; ( n = ) number randomized</th>
<th>Outcome measure; ( ^a, ^b, ^c ) (follow-up time in months) intervention versus control; CL for relative rates; 95% CI for RR; SD for MD</th>
<th>Cost data; If available</th>
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<td>Lim; Australia 2003</td>
<td>654 older people discharged from hospital (home dwelling); mean age: 77 years; 68% women</td>
<td>( n = 340 ) patients; staff assessed patient, devised discharge plan as normal but with extra time &amp; expertise. Short-term CM comprising of: telephone follow-up if required, availability to patients in event of crisis, liaison with service providers, coordination of service provision and ensuring adequate referral before discharge.</td>
<td>( n = 341 ) patients; received usual hospital discharge planning, provided by nursing staff and social work department. Services were typically several nursing visits as well as community services.</td>
<td>Authors—(i) Mean no. of unplanned admissions: 0.4 (0.3 to 0.5) versus 0.5 (0.4 to 0.6); ( P = 0.19 ); (ii) no. of people experiencing hospital admissions (both at 6 months): 75 versus 79; Calculated—RR: 0.95 (0.72 to 1.26); ( P = 0.73 )</td>
<td>Costs of community services NS between groups; hospital utilization costs: significantly lower in the intervention group (MD: $1770; 95% CI: $237 to $3304); total costs: significantly lower in the intervention group (MD: $1545; 95% CI: $11 to $3078).</td>
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| Melin; Sweden 1992 | 249 frail older patients at discharge from hospital; mean age 80 years; 72% women; 74% living alone | \( n = 110 \) patients; patients’ district nurse and home service assistant called on patients on day of discharge. Team physicians assessed medical and functional status and initiated treatment plan. There were weekly interdiscipli

ary care planning conferences. The physician was available for routine and emergency visits and was available at the end of the phone for the primary care staff. 24-hour telephone service was an ‘add on’ to the service. | \( n = 73 \) patients; usual care and discharge procedure. Care at home and home assistance but without either the intervention program or the 24-hour service. | Authors—% (no. could not be calculated) of people experiencing readmissions or multiple readmissions (6 months): no difference between groups (46% versus 44%) | – |
| Case management based in the community Bernabei; USA 1998 | 200 home-dwelling older people; identified through home health services or home assistance programs; mean age: 81 years; 70% women; 50% living alone | \( n = 99 \) participants; initial assessment: physical function, cognitive function, mood, diagnosis, drug treatments, number of home visits by GP and then every 2 months. Initial assessment was fed back to the geriatric unit. They were constantly available to deal with problems, monitor provision of services and to guarantee extra help as requested by patients and GPs after examinations. The multidisciplinary team discussed problems emerging from home visits at weekly meetings. | \( n = 100 \) participants; received primary and community care within the conventional and fragmented organization of services including visits to GP, home visits, nursing and social services, home aids and meals on wheels. | Authors—Total no. of acute hospital admissions (12 months): 36 versus 51; hazard ratio: 0.74 (0.56 to 0.97); \( P < 0.05 \); Calculated—R rate: 0.71 (0.45 to 1.07) | Estimated financial savings were $1800 per capita per year of follow-up in the intervention compared with the control group. |
| Boult; USA 2011 | 850 older community-based patients at high risk for using health care services; mean age: 78 years; 55% women; 18% living alone | \( n = 485 \) participants; for 6-8 months trained ‘guided care’ nurses established a caseload of 50-60 patients. Intervention in partnership with primary care physician comprised comprehensive assessment, evidence-based care, monthly monitoring of symptoms, adherence, transitional care, coordination of health care professionals, support for self-management, support for care givers and enhanced access to community services. | \( n = 419 \) participants; usual care from primary care physician | Authors—Mean no. of: (i) hospital admissions; (follow-up at 12 months): (a) all patients: 0.7 ± 1.06; 0.72 ± 1.19; ratio of service use: 1.01 (0.83 to 1.23); (b) very high-risk patients: 0.99 versus 1.02; ratio of service use: 1.0 (0.78 to 1.26); (ii) 30-day readmissions; (follow-up at 12 months); (a) all patients: 0.13 ± 0.4 versus 0.17 ± 0.52; ratio of service use: 0.7 (0.53 to 1.16); (b) very high-risk patients: 0.21 versus 0.27; ratio of service use: 0.8 (0.53 to 1.26) | – |
### Table 1

<table>
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<tr>
<th>Author; date; country</th>
<th>Population; Age; gender; ethic group; living alone</th>
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<td>Dalby; Canada 2000</td>
<td>142 frail older people living in the community identified through a postal screening questionnaire; mean age: 79 years; 75% women; 39% living alone</td>
<td>n = 73 participants; visited by nurse, who reviewed each medical record and completed a comprehensive assessment addressing physical, cognitive, emotional and social function, medication use and home environment. A care plan was developed together with the primary care physician, the patient, the family, the caregivers and other health professionals. Follow-up visits and phone calls were conducted during the 14-month period.</td>
<td>n = 69 participants; usual care; participants were allowed to go home after randomization, with no alteration to the discharge plan formulated by the medical officer in the emergency department.</td>
<td>Authors — Mean number of hospital admissions (14 month): 0.4 ± 0.7; versus 0.3 ± 0.8; MD: 0.1 (−0.3 to 0.2); P = 0.33</td>
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<td>Gagnon; USA 1999</td>
<td>427 older people discharged from hospital (home-dwelling within 12 months of being discharged from emergency department); mean age 81 years; 69% women; 56% living alone</td>
<td>n = 212 patients; NCM coordinates the work of all health care providers. Patients were assessed for all needs in a series of early visits: health history, care giver data, community services used, current health status (physical, functional, social and environmental) as a review of the needs/concerns of caregivers. NCMs were expected to support patients in transition, e.g. from hospital to home.</td>
<td>n = 215 patients; usual care in which hospital and community services were provided separately. Hospital care varied due to variety of health care providers, and community care was determined by whether the person was known to the community centre.</td>
<td>Authors — Mean no of hospital admissions (10 month): 0.5 ± 0.8; versus 0.4 ± 0.7; MD: 0.09 (−0.05 to 0.23); NS</td>
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<td>Vass; Denmark 2008</td>
<td>Home-dwelling older people aged 75 years and above; (randomization was on the municipality level as opposed to the participant level)</td>
<td>n = 17 municipalities; home visitors (intervention municipality employees) were then expected to focus and react to early signs of disability while respecting individual variation and endeavouring to provide an interdisciplinary coordinated follow-up in the local setting in cooperation with the GP.</td>
<td>n = 17 municipalities; no education or training was provided. Home visitors carried out home visits as usual.</td>
<td>Authors — (i) Total no. of people experiencing hospital admissions: 985 versus 935; RR: 0.96 (0.93 to 0.98); (ii) mean no. of admissions; (both at 36 months) 2.5 (95% CI: 1 to 15); versus 2.4 (95% CI: 1 to 19); P = 0.65</td>
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| APN, advanced practitioner nurse; CM, case management; CI, confidence interval; CL, confidence limits; MD, mean difference; NCM, nurse community manager; NS, not significant; RR, risk ratios; SD, standard deviations. |
| These values are reported if available and are given as the means in the total population unless there were significant differences between the groups. |
| The follow-up time of the studies is the same as the duration of the intervention in the studies (any variation on this is reported). |
| Values described as ‘Calculated’ are performed by the review authors. Other results presented in the primary papers were checked by us if possible. |
GP-led case management [relative rate: 0.71 (95% CI: 0.45 to 1.07)]. All participants in this study were already in the home care system, so recruitment was from a selected population and the control group was already receiving support within their home.

In the third study, 142 older people (mean age: 79 years), identified through a postal screening questionnaire, were randomized into either nurse-led case management or usual care for a 14-month period (mean numbers of admissions were 0.4 ± 0.7 versus 0.3 ± 0.8, respectively). It is important to note that they did not exclude participants with serious, chronic, debilitating diseases.

In the fourth study, 427 home-dwelling people (mean age: 81 years) having been admitted to hospital in the previous year were identified via hospital records. Nurse-led case management was compared with usual care for a 10-month period (mean number of hospital admissions: 0.5 ± 0.8 versus 0.4 ± 0.7, respectively). It is important to note that participation in this study depended on whether the participants were known to the community centre and centres used different criteria to assess fragility and needs.

The fifth study was randomized at the municipal level, focusing on home-dwelling older people aged 75 years and older. Home visitors with extra training provided case management compared with usual care from home visitors over a 3-year period. The number of people experiencing admissions was slightly reduced [risk ratio: 0.96 (95% CI: 0.93 to 0.98) respectively]. However, the mean number of admissions was not reduced [2.5 (95% CI: 1 to 15) versus 2.4 (95% CI: 1 to 19); \( P = 0.65 \)].

Data expressed as mean number of patients experiencing admissions were combined in a fixed-model meta-analysis from three of these five studies\(^{15,23,24}\) to give an overall mean difference of 0.05 [(95% CI: −0.04 to 0.15); \( P = 0.29 \); *Figure 3b*].

Other outcome measures associated with unplanned hospital admissions in these community-based studies were noted. These outcomes were emergency department visits, GP visits, specialist clinic/outpatient visits and, to a lesser extent, length of stay. Overall, these outcomes were not improved by case management, with the exception of the Bernabei study (GP-led case management), in which there was a significant reduction in admissions to the emergency department as well as admissions to nursing homes and non-acute hospitals.\(^{22}\) (see the following section).
Economic evaluations

Five of the 11 RCTs (Table 1) presented cost–outcome descriptions (partial evaluations) as opposed to full economic evaluations.\textsuperscript{16,17,19,20,22} However, there was a significant difference in the length of hospital stay between case management and usual care in the Nikolaus study at 12 months [33.5 days (95\% CI: 30.4 to 36.5) versus 42.7 days (95\% CI: 39.8 to 45.6); \( P < 0.05 \)]\textsuperscript{17} and the Lim study at 6 months [3.0 days (95\% CI: 2.1 to 3.9) versus 5.2 days (95\% CI: 3.8–6.7); \( P < 0.05 \)].\textsuperscript{20} There was a significant difference in the number of days until first admission between case management and usual care in the Caplan study (382 days with a standard error of 12 days versus 348 days with a standard error of 11 days, \( P = 0.011 \)).\textsuperscript{19} In the Bernabei study, there was a significant reduction in admissions to the emergency department [6 versus 17, hazard ratio: 0.64 (95\% CI: 0.48 to 0.85); \( P < 0.025 \)].\textsuperscript{22}

Discussion

This systematic review provides evidence that case management does not reduce unplanned hospital admissions in older people. Nine of the 11 RCTs showed no significant benefit in terms of reduction of unplanned hospital admissions with case management compared with usual care. The Naylor study, which showed a significant reduction in hospital readmissions, recruited >50\% electively admitted patients. These are likely to have been a different patient group from the other studies and this, possibly in combination with high-intensity care during the 4 weeks of case management, may have affected the rate of readmission.\textsuperscript{16} The strengths of this review are that it was conducted using Cochrane methodology following PRISMA guidance, had a focus on RCTs and included all studies with a primary outcome of unplanned hospital admission.

In terms of limitations, the comprehensive definition of case management used in this review\textsuperscript{4} means we have included a range of case management interventions, which has added heterogeneity, e.g. the studies of Naylor and Bernabei. In spite of this, it has not influenced the main finding of the review, namely that case management does not reduce admissions. While the effects of the included trials on other outcomes are discussed, additional trials of case management that did not include unplanned admissions were excluded.

A further limitation is publication bias.\textsuperscript{14} In the light of writing a review of predominantly non-supportive trials for case management, a funnel plot was not performed as it is unlikely that high-quality supportive trials would remain unpublished or not be in the public domain.

Two previous, related systematic reviews were found.\textsuperscript{8,9} The first review is a systematic review of complex interventions aimed at improving physical function and independent living in older people.\textsuperscript{9} This review did not provide data on unplanned hospital admissions with case management specifically, and the searches

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**Figure 2** Risk of bias table

<table>
<thead>
<tr>
<th>Study</th>
<th>Random sequence generation (selection bias)</th>
<th>Allocation concealment (selection bias)</th>
<th>Blinding (performance bias and detection bias)</th>
<th>Incomplete outcome data (attrition bias)</th>
<th>Selective reporting (reporting bias)</th>
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were performed nearly 6 years ago. The present review included four extra studies and combined only case management data by meta-analysis. The systematic review by Batty et al. was of a lower methodological standard and did not focus on case management or provide any data on unplanned hospital admissions. Its focus was narrative and looked at complex, multifactorial community interventions intended to reduce hospital admissions in older people.

Thus, previous effectiveness reviews of case management have included a wide range of other community interventions, as described in the preceding text, or have focused on specific diseases and conditions. This systematic review and meta-analysis of RCTs is the first to be conducted to the authors’ knowledge which focuses on the effectiveness of case management for reducing unplanned hospital admissions in the general older population.

Given that case management is trying to reach a small proportion of the population, often from deprived backgrounds and with poor quality of life and who account for a large proportion of the health care budget, it is disappointing that this systematic review provides evidence that case management does not reduce unplanned admissions for older people.

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Given that case management is trying to reach a small proportion of the population, often from deprived backgrounds and with poor quality of life and who account for a large proportion of the health care budget, it is disappointing that this systematic review provides evidence that case management does not reduce unplanned admissions for older people. However, there are limited data to suggest that the related outcomes of length of stay and emergency department visits are reduced and are most probably contributing to the reduced costs reported. It is not possible to accurately assess the cost–benefit outcome of case management without appropriate data.

It may be that patients offered case management are not at sufficiently high risk of unplanned admission. The authors of a before–and-after study of a case management intervention, Evercare, have suggested that the reason why this approach with the case management of frail older population did not show reduced rates of unplanned admissions was that patients were at insufficiently high risk. This finding reinforces the need for accurate case management tools such as the patients at risk for re-hospitalization (PARR) algorithm tool developed for the NHS in England. Another possibility is that some high-risk patients are not amenable to case management. Impactibility modelling might be expected to improve the efficacy of case management.

A further scenario is that case management itself may be ineffective. If this is true, how the efficacy of case management might be improved needs to be considered, e.g. changing the intensity of intervention. It may be that there are alternatives to case management. It is also possible that the effectiveness of an intervention is related to the profile of the recruited population, as argued in the above paragraph, and as highlighted by the Naylor study, in which 50% of the patients were elective. Finally, it may be that the control groups in the studies showing no effect may have received excellent care; hence, the capacity for improvement by case management was minimal.

Despite these findings, case management continues to be promoted as a mechanism for reducing unplanned hospital admissions. The results of this review now provide robust research evidence that does not underpin current policy or practice. However, benefits in terms of reduced length of stay and other resource utilization may be evident. Taking a more holistic approach, there is evidence that case management improves the experiences of patients and carers and may result in better outcomes, such as quality of life and satisfaction with care.
multiple strategies are employed to integrate care. However; no RCTs were found to support this suggestion in older people.

Supplementary material
Supplementary material is available at Family Practice online.

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