Improving outcomes for older people in the emergency department: a review of reviews

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ABSTRACT

Background There has been a recognised trend of increasing use of emergency and urgent care and emergency departments (EDs) by older people, which is marked by a substantial evidence base reporting interventions for this population and guidance from key organisations. Despite this, outcomes for this population remain suboptimal. A plethora of reviews in this area provides challenges for clinicians and commissioners in determining which interventions and models of care best meet people's needs. The aim of this review was to identify effective ED interventions which have been reported for older people, and to provide a clear summary of the myriad reviews and numerous intervention types in this area.

Methods A review of reviews, reporting interventions for older people, either initiated or wholly delivered within the ED.

Results A total of 15 review articles describing 83 primary studies met our content and reporting standards criteria. The majority (n=13) were systematic reviews (four using meta-analysis.) Across the reviews, 26 different outcomes were reported with inconsistency. Follow-up duration varied within and across the reviews. Based on how authors had reported results, evidence clusters were developed: (1) staff-focused reviews, (2) discharge intervention reviews, (3) population-focused reviews and (4) intervention component reviews.

Conclusions The evidence base describing interventions is weak due to inconsistent reporting, differing emphasis placed on the key characteristics of primary studies (staff, location and outcome) by review authors and varying quality of reviews. No individual interventions have been found to be more promising, but interventions initiated in the ED and continued into other settings have tended to result in more favourable patient and health service outcomes. Despite many interventions reported within the reviews being holistic and patient focused, outcomes measured were largely service focused.

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Key messages

What is already known on this subject

- Emergency department (ED) care for older people can be complex. Those people living with frailty have poorer health outcomes.
- Caring for increasing numbers of older ED attendees is a critical health service issue.
- Numerous interventions have been trialled within emergency and urgent care.

What this study adds

- Description and appraisal of healthcare interventions is inconsistent and therefore difficult to synthesise.
- No individual intervention was found to be more beneficial for older people with emergency care needs.
- Interventions initiated in the ED and continued into other settings tended to result in improved outcomes.
- Most studies reported service metrics rather than person-centred outcomes.

INTRODUCTION

Background

Use of emergency and urgent care (EUC) and emergency departments (EDs) by older people is increasing. This has been variously attributed to the complex physical, social and mental health comorbidities that older people often live with, changes in the healthcare options available to patients, professional opinions on appropriate treatment and the capacity of individual care systems. Caring for those older people living with frailty presents an urgent national and international public health issue. Despite guidance developed by organisations such as the British Geriatrics Society, the Royal College of Emergency Medicine, the American College of Emergency Physicians, and the International Federation of Emergency Medicine, fast-flowing EUC systems are yet to fully integrate person-centred case management designed to best meet the needs of older people.[1] Existing reviews report a large body of evidence describing interventions for this population. However, there is a need to identify consistent messages around proposed approaches to older people's care in the ED, to ensure that care is sensitive, effective and efficient, encompassing individuals' clinical and wider social needs. This study aimed to review the evidence for ED interventions for older people and the characteristics of that evidence base, in particular, the overlap in primary study coverage between reviews, the outcomes reported within reviews and the consistency of intervention reporting. The study aimed to identify whether the literature demonstrated any evidence of intervention effectiveness and to identify which ED interventions best meet the needs of older people.

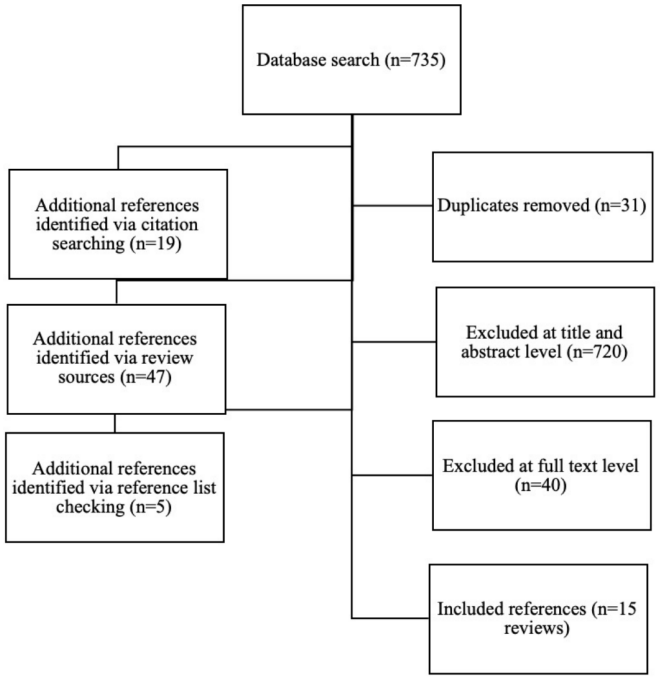

Figure 1 PRISMA-SR flow chart. PRISMA-SR, Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Scoping Reviews.

METHODS

A review of reviews ('overview') of systematic and non-systematic reviews was undertaken, including both qualitative and quantitative studies. This method was chosen due to the number of existing reviews in this field.[2 3] Reviews of reviews offer benefits in that they 'enable broader evidence synthesis questions to be addressed in a faster time frame'.[4] In October 2018, the protocol was published on the International Prospective Register of Systematic Reviews (PROSPERO) (CRD42018111461). The review was conducted and reported according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) standards.[5]

Inclusion criteria

Reviews were appraised for eligibility against pre-defined inclusion criteria. Criteria for reporting standards were based on the Cochrane Handbook definition of a systematic review and criteria developed by Brunton in Pollock.[6] Reviews which met all of the inclusion criteria and three or more reporting standards criteria were included. These criteria are included in online supplemental material 3.

Search approach

A comprehensive database search used existing strategies[7] combining terms for EUC and for older people, limited by publication type (reviews), language (English Language studies only) and date (2000–2018). The search strategy for Medline (OVID SP) was developed by an information specialist and is reproduced in online supplemental material. This was adapted for other databases: Embase (OVID SP), CINAHL (EBSCO), Cochrane Library (Wiley Interscience), Web of Science Core Collection (Clarivate), SCOPUS (Elsevier) and AgeINFO (http://www.cpa.org.uk/). Further review sources were searched using an adapted database strategy: Joanna Briggs Institute (https://journals.lww.com/jbisrir/Pages/default.aspx), the Campbell Collaboration (https://campbellcollaboration.org/), Epistemonikos (https://www.epistemonikos.org/) and PROSPERO (https://www.crd.york.ac.uk/PROSPERO/). In addition, we undertook forward and backward searching of included reviews using reference lists and Google Scholar for citation identification. Topic experts were consulted to identify missing reviews. A search alert was set up to identify additional reviews published following the database searches.

Study selection

References were managed in Endnote V.8. Duplicates were removed prior to screening for inclusion at title and abstract level. This was undertaken by one first reviewer (JDvO or LP), with 50% from each first reviewer also screened by a second reviewer (SA). All remaining potentially eligible reviews were double screened at full text by LP and SPC. Reasons for excluding reviews were recorded. Figure 1 presents a PRISMA for Scoping Reviews flow chart of searching and study selection.

Data extraction and quality assessment

A data extraction sheet was designed in Microsoft Excel by LP and iteratively refined following piloting by SA and JDvO. Data were single extracted by one reviewer (LP, SA or JDvO). LP subsequently checked all extractions and a random sample of 10% were also checked by SA. Data were extracted on review type, review methods, description of included studies, all reported outcomes (including whether they had been synthesised or reported as individual studies) and a headline message or conclusion. We used the AMSTAR2 checklist (online supplemental material 1) to assess the quality of reviews. AMSTAR2 allows the appraisal of reviews that include non-randomised studies of interventions, in addition to randomised controlled trials (RCTs).[8] The findings from our quality assessment are reported narratively.

Overlap within reviews

A citation matrix was drawn up.[9] This matrix assessed overlap in the evidence base by mapping each included review against all cited primary studies.

Data synthesis

Extracted data were summarised and presented in tables with a narrative synthesis. Due to the heterogeneity between reviews, no further statistical synthesis was undertaken.

Patient and public involvement

Public involvement in the review of reviews was managed through the overall research project, of which the review was one workpackage. Patient experience of the ED informed the overall research questions and design of the study and continue to be involved in the overall project, including dissemination plans.

RESULTS

Overview

A total of 806 articles were retrieved . From these, 15 eligible reviews were identified, published 2005–2019. These 15 reviews reported 83 unique primary studies (published 1994–2018). Of these 83 studies, 25 were included in more than one review, with the most frequently cited primary study included in 11 reviews.[10] The review characteristics are presented in table 1. Quality assessment is summarised in online supplemental material 2.

Table 1 Review characteristics

Author	Topic	Review methods	Evidence synthesis method	Study types included in the review	No of primary studies included in the review	Evidence cluster
Conroy *et al*[15]	Rapid-access nurse-led/geriatrician supported assessment with comprehensive geriatric assessment for patients post emergency department.	Systematic review	Quantitative synthesis including meta-analysis.	RCTs	5	Discharge intervention reviews
Fan *et al*[24]	Strategies for older people in the emergency department.	Literature review	Narrative synthesis of quantitative data.	Any experimental or observational study.	20	Intervention component reviews
Fealy *et al*[11]	Nursing assessment and referral interventions.	Systematic review	Narrative synthesis of quantitative data.	Clinical trials, before-and-after designs, and descriptive-evaluative studies.	11	Staff focused reviews
Graf *et al*[18]	Comprehensive geriatric assessment interventions delivered by nurses in the Emergency department.	Systematic review	Narrative synthesis of quantitative data.	RCTs or matched controlled trials (cohort, case control, case matched and cross-sectional).	8	Staff focused reviews
Hastings *et al*[16]	Discharge interventions (all staff).	Systematic review	Narrative synthesis of quantitative data.	RCTs, non-randomised CTs and observational studies.	14	Discharge intervention reviews
Hughes and Heflin[25]	Interventions according to strategy type, single or multi strategy, intervention components.	Systematic review	Narrative synthesis and meta-analysis.	Randomised or quasi-experimental study types.	15	Intervention component reviews
Jay *et al*[19]	Consultant led comprehensive geriatric assessment.	Systematic review	Narrative synthesis of quantitative data.	RCTs, non-RCTs and observational studies.	5	Staff-focused reviews
Karam *et al*[17]	Nurse/social worker/geriatrician led integrated (discharge) assessment interventions.	Systematic review	Narrative synthesis of quantitative data.	Studies with a comparison group.	9	Discharge intervention reviews
Lowthian *et al*[13]	Emergency department to community transition strategies.	Systematic review and meta-analysis	Quantitative synthesis of quantitative data including meta-analysis.	RCT and other quantitative studies.	11	Discharge intervention reviews
Malik *et al*[20]	Nurse-led emergency department based comprehensive geriatric assessment.	Systematic review	Quantitative synthesis of quantitative data including meta-analysis.	Quantitative research consisting of RCTs, multicentre and observational studies.	9	Staff focused reviews
McCusker and Verdon[12]	Comprehensive geriatric assessment.	Systematic review	Narrative synthesis of quantitative data.	RCTs, non-randomised trials, before and after studies and cross sectional studies.	8	Discharge intervention reviews
Parke *et al*[22]	Prevalence and identification of cognitive impairment in emergency department (comprehensive geriatric assessment, training).	Scoping review	Narrative synthesis of quantitative data.	Systematic review; meta-analysis; clinical trial; cohort study; evaluation study.	15	Population-focused reviews
Pearce *et al*[21]	Nursing interventions in the emergency department to enhance older peoples comfort.	Systematic review	Narrative synthesis of quantitative data and meta synthesis of qualitative data.	Quantitative research study designs as well as narrative opinion and text.	2	Staff-focused reviews
Schnitker *et al*[23]	Screening, preventing, and managing of cognitive impairment.	Systematic literature review	Narrative synthesis of quantitative data.	"Research based literature".	12	Population-focused reviews
Sinha *et al*[26]	Emergency department based case management models.	Systematic review	Narrative synthesis of quantitative data.	RCT, non-randomised trials, observational studies and programme descriptions.	20	Intervention component reviews

RCT, randomised controlled trial.

Table 2 Outcomes

Clinical outcomes	Cognition/cognitive decline Comfort Functional decline (Instrumental) Activities of Daily Living Medication adherence Mortality Use of advance directives
Other psychosocial outcomes	Quality of life Well-being
Operational outcomes	ED cost per patient ED length of stay ED readmission/return visit ED use ED utilisation ED visits per patient Hospital days (ED and inpatient) Inpatient admission Inpatient length of stay
Destinational outcomes	Care/nursing home admissions Community service referral rates Home care referral rates
Other outcomes	Carer satisfaction ED care provider satisfaction Patient satisfaction with care received Patient satisfaction with information received Primary care provider satisfaction

ED, emergency department.

Population definitions

Most reviews defined older people as being aged over 65, although some[11 12] included papers with populations aged 60 and older. Some reviews did not report a specific age, but rather reported interventions for participants who were 'older' or 'elderly'. The majority of reviews reported ED care for a general population of older people, who were not stratified by condition or severity. However, Lowthian *et al*[13] included a population of 'high risk' participants; this may indicate that there was some prior screening of patients before they were included in the intervention.

Outcome measures

Table 2 lists all outcomes reported in the 15 included reviews, organised according to Parker *et al*.[14] There was inconsistency in the reporting of outcomes between reviews. Some reviews synthesised papers by outcome measures. There was a clear preference to measure outcomes in terms of service delivery metrics as opposed to patient centred outcomes. Other reviews did not synthesise outcomes across included studies but reported these narratively on an article-by-article basis. There was a high level of variability in the length of patient follow-up from 0 days to 18 months. To some extent this depended on whether the intervention was wholly delivered in the ED or continued into other settings.

Intervention classification

Reviews of ED interventions were organised into four evidence clusters:(table 3) discharge intervention reviews,[12 13 15–17] staff-focused reviews,[11 18–21] population-focused reviews[22 23] and intervention component reviews.[23–25] Only 5 of the 15 reviews reported interventions delivered wholly within the ED—the remainder were continued into other settings.

Discharge intervention reviews

The reported discharge interventions included postdischarge follow-up of patients by ED or community-based care professionals, although these were often reported incompletely.

Conroy *et al*[15] reported interventions delivered within 72 hours of ED attendance. These were comprehensive geriatric assessment (CGA) interventions delivered either by nurses or geriatricians and were targeted at older people with frailty. The review by Hastings *et al*[16] looked at evidence for interventions to improve outcomes for older people discharged from the ED. Fourteen of the studies reported by Hastings and Heflin[16] were of interventions either initiated or concluded in the ED. A wide variety of interventions were reported, from CGA to single screening and assessment interventions, delivered by single practitioners or multidisciplinary teams. Karam *et al*[17] limited inclusion criteria to interventions delivered within the ED and including CGA and other intervention types. Lowthian *et al*[13] reported on discharge interventions in the form of Community Transition Strategies from the ED. All of these strategies included geriatric assessment, but this was undertaken by a variety of professional groups including nurses, allied health professionals, and health visitors. Follow-up interventions either consisted of referral to community services or direct linkages including telephone/general practitioner follow-up. Nine of the 18 primary studies included in the review of interventions to reduce ED visits by McCusker and Verdon[12] were delivered in the ED; all had an ED and post discharge component.

Outcomes were reported using meta-analysis[15 13] and narrative synthesis.[12 16 17] Conroy *et al*[15] found no clear evidence of benefit for CGA discharge interventions across all outcomes included in the review. Hastings and Heflin[16] reported at the level of individual studies only across a wide variety of outcomes. Karam *et al*[17] developed themes for intervention types (referral, follow-up, integrated model of care) and identification of study participants (risk screening or no risk screening). They found that the most effective interventions extended beyond referral and used a clinical risk prediction tool to identify those who would most benefit from the intervention. In the review by Lowthian *et al*,[13] four of the nine studies were included in a meta-analysis, which found no benefit of interventions in terms of ED reattendance, mortality and emergency hospitalisation. Individual studies were effective in reducing ED reattendance and nursing home admissions—Lowthian *et al*[13] attributed this potentially to the methods of telephone follow-up of discharged

Table 3 Intervention cluster characteristics

Cluster	Reviews included	Range of primary studies included	Total no of primary studies included	No of primary studies appearing in more than one review	Primary studies publication dates
Discharge intervention reviews	12 13 15–17*	5–14	25	9	1996–2013
Staff-focused reviews	11 18–21*	2–11	15	9	1996–2015
Population-focused reviews	22 23*	12–15	27	4	1994–2011
Intervention component reviews	24–26*	15–20	38	13	1994–2018

*A subset of papers in the following reviews were reported.[12 17 18 23 24]

patients. The review by McCusker and Verdon[12] found that there was limited evidence of benefit of discharge interventions (two studies of borderline statistical significance) on ED visits and there was evidence of short term only increase in ED visits as a result of the intervention.

Summary—Discharge interventions varied in their components but tended to employ improved linkages between the ED and the community, either through direct linkage or referral interventions. CGA was frequently used and involved a variety of professional groups. There was limited evidence for the effectiveness of these interventions—two meta-analyses found no benefit to these interventions, and narrative synthesis reported an increase in ED readmissions in the short term among patients who had received these interventions.

Staff-focused reviews

Interventions were generally delivered by ED physicians, geriatricians working within the ED, and nurses with or without an advanced role. There was also evidence of wider MDT led interventions in a number of reviews,[12 13 16–19 22 26] where professionals included research assistants, occupational therapists, discharge coordinators, social workers, physiotherapists and health visitors. Study outcomes were reported narratively and using meta-analysis. There was moderate but inconsistent agreement across the studies for the effectiveness of nurse led interventions.

Fealy *et al*[11] described 11 nurse-led interventions which included assessment, postdischarge referral, patient education and follow-up. Five studies reported reduction in service use and three studies reported functional improvements. Three studies found no effect. Findings were contradictory—there was evidence of reduced service use in the ED leading to increases in primary care service use. The suggested characteristics of effective interventions included preintervention screening and better links with home care.

Graf *et al*[18] described eight nurse-led CGA interventions which included follow-up. They reported that nurse-led CGA was effective in improving functional outcomes. There was varying evidence on ED readmissions (both reduced and increased admissions) and nursing home admissions. Three studies found no effect, attributed partly to study design limitations.

Malik *et al*[20] reported three different types of nurse intervention: assessment using risk screening, CGA, and nurse-led case and discharge management. This meta-analysis of nine studies found that nursing interventions did not have a significant statistical impact on any of four outcomes (hospitalisation, readmissions, length of hospital stay and ED revisits). This study did not examine functional decline. The researchers contrasted these findings with previous reviews[11 16 17] which had demonstrated reduced service use as a result of these interventions, and had also reported that ED risk screening led to reduced hospitalisation and nursing home admissions. These inconsistencies are attributed to methodological weaknesses in study designs, supporting an agenda for additional research on interventions that extend from the ED to the community.

Pearce *et al*[21] identified only two studies which evaluated patient focused outcomes. The interventions were related to physical equipment supplied by nurses. Findings indicated that both warming blankets and seating position had a positive impact on patient comfort and well-being. The researchers noted the paucity of research around patient-centred outcomes such as nutrition, hydration and communication.

Jay *et al*[19] reported reduced admissions rates (ranging between 2.6% and 9.7%). The evidence for length of stay and readmission rates was mixed. A number of their included studies also reported changes in admissions rates for the control groups, indicating that CGA may have altered culture and practices around the risks of admission versus discharge.

Summary—There was conflicting evidence around the benefits of nurse-led interventions for older people in the ED. Included reviews reported reduced service use and reduced functional decline, in contrast to evidence of increased service use as a result of interventions. The strongest evidence, in the form of meta-analysis, found no effect from nurse-led interventions. There was evidence of lowered admission rates following geriatrician led CGA interventions. There were common methodological limitations reported across studies.

Population-focused reviews

Schnitker *et al*[23] and Sinha *et al*[26] reported evidence for identification and management programmes which specifically targeted older people with cognitive impairment. Schnitker *et al*[23] also reported staffing interventions (team and individual changes to service delivery and staff training). Neither review reported patient or health service outcomes. Both reviews described intervention characteristics that report positive outcomes, but not the outcomes themselves. Both reviews summarised that interventions were poorly represented or described within the ED literature. There was more evidence from acute care settings, although transferability of these interventions to the ED is not well understood.

Summary—There was limited evidence for population-focused interventions. The reporting of evidence made any comparison between reviews challenging. It was not possible to summarise ED interventions for older people with cognitive impairment.

Intervention component reviews

Three reviews reported on the core components of successful interventions and their outcomes. Fan *et al*,[24] Hughes *et al*[25] and Sinha *et al*[26] considered the key components or elements of effective interventions in addition to the overall effectiveness:

- Core operational components of interventions and the role of these components in the success of interventions.[26]
- Key elements of effective interventions.[24]
- Intervention components and intervention strategies adopted.[25]

In terms of intervention effectiveness, the case management interventions reported by Sinha *et al*[26] were reported as having positive effects (not statistically significant) on satisfaction levels, ED reattendances, admission rates (immediate and longer term), and nursing home admissions. Negative results included a small but significant negative effect on ED reattendances[26] and higher ED use.[24] There was a statistically significant outcome of lowering ED use or length of stay in five of 20 studies.[24] Hughes *et al*[25] found a small positive effect of ED interventions on functional status.

Table 4 reports components that were associated with interventions found in reviews to be effective. There was considerable overlap between the three reviews, indicated by shading.

Summary—There was considerable agreement across three reviews for the components of successful interventions. Effective interventions: integrated strategies for social and medical care involvement; included screening and assessment; initiated care in the ED and bridged this with follow-up; monitored and evidenced successful practices. Care quality indicators tended to focus on care processes rather than structures or outcomes and were generally lacking in evidence and limited in testing.

Table 4 Effective components of interventions

Fan *et al*[24]	Hughes *et al*[25]	Sinha *et al*[26]
Multidisciplinary team and gerontological expertise	Interprofessional and capacity building work practices	
Integrated social and medical care		Multi strategy interventions
Risk screening and geriatric assessment	High-risk screening. Focused geriatric assessment	Assessment
Care planning and management		Case management
Discharge planning and referral coordination	Initiation of care and disposition planning in the ED	'Bridge' interventions (contact before and after discharge)
Follow-up and regular group visits	Post-ED discharge follow-up with patients	Referral plus follow-up
Evidence-based practice model	Establishment of evaluation and monitoring processes	
	Nursing clinical delivery involvement or leadership	

ED, emergency department.

DISCUSSION

This review of reviews summarised evidence on interventions to improve outcomes for older people (including those with frailty related conditions) attending an ED. Overall, the evidence base was inconsistent. Across the reviews, there was incomplete reporting of interventions—a feature of reviews in which data lose details through abstraction from primary studies. In addition, there was high variability in the standards to which reviews were conducted and reported. Our findings are limited to each review authors' interpretation of primary evidence. Some reviews reported primary studies by intervention type and others by their outcome, and this limits the potential for further synthesis of data. The evidence was broadly US focused and relatively old in terms of the studies included in the reviews. Summaries commonly featured calls for more primary research using rigorous evaluation methods, and also acknowledged the challenges of researching a vulnerable population in a fast moving and high pressured environment.

The evidence for CGA and related multidisciplinary interventions has been widely studied, but inconsistent reporting makes definitive conclusions difficult. Despite this, there was some evidence for effectiveness. In particular, geriatrician-led CGA appeared to have stronger effect on reducing admission rates than nurse-led interventions. Following CGA, however, ED reattendance rates may be unchanged or even increased, particularly in the short term. This may reflect the evidence for continuous rather than brief interventions: holistic, person-centred management plans take time to implement and to yield benefit, and there may be a short-term incidence of rebound problems for people while they adjust to change. Studies with a longer follow-up period may be required to understand whether this is the case.

There was a lack of evidence appraising targeted interventions for older people with cognitive impairment attending EDs. There was widespread evidence of holistic interventions being undertaken, including CGA. However, despite being a holistic and person-centred intervention, the effectiveness of CGA tended to be measured with service-related metrics (such as mortality and admissions) as opposed to patient centred metrics (such as pain and quality of life). Future research and quality improvement innovations should ensure that patients are consulted on the outcomes of importance.

Successful interventions integrated social and medical care, included screening and assessment, were initiated in the ED and bridged to other settings with follow-up, and monitored and evidenced successful practices. This has far reaching implications for service delivery and reconfiguration. There is a need for robust, multicentre controlled studies (eg, cluster RCT) that examine CGA-based interventions in the ED, focusing on patient-centred outcomes.

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Contributors SPC and SMM conceptualised the study, SPC, SMM and LP obtained research funding for the study. LP, SPC, SMM, JDvO, SA and HW developed the protocol. HW ran the literature searches. LP, SA, SPC and JDvO undertook screening of the included studies, data extraction and quality assessment. LP drafted the manuscript and all authors contributed.

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25 Hughes JM, Freiermuth CE, Shepherd-Banigan M, *et al*. Emergency department interventions for older adults: a systematic review. *J Am Geriatr Soc* 2019;67:1516–25.
26 Sinha SK, Bessman ES, Flomenbaum N, *et al*. A systematic review and qualitative analysis to inform the development of a new emergency department-based geriatric case management model. *Ann Emerg Med* 2011;57:672–82.

Supplementary Material 1 – AMSTAR2 – Narrative and Table

The methodological quality of the reviews reporting either randomised or non-randomised studies of interventions was assessed using AMSTAR2. The sixteen questions included are discussed below:

1. Did the research questions include the components of PICO? Nine of the 15 reviews were not judged to have met this question, largely due to incomplete reporting of comparator interventions (as these were not applicable for a number of reviews) and a priori outcomes.

2. Did the report contain a statement that review methods were 'a priori' and deviations explained? There was limited evidence of protocols being registered (3/15 reviews) and risk of bias plans were not described in 4/15 reviews. There was no evidence of deviations from protocol (either reported or not reported).

3. Study design selection decisions? Due to the heterogeneous study designs included in the reviews there was limited reporting of study design decisions, apart from in the case of the four reviews which included some form of either attempted or successful meta-analysis.

4. Literature search strategy? All of the reviews were either partial yes or no – this was due to the lack of searching of trial registries (which is an appropriate methodological decision in this topic area) and the limited evidence of grey literature searching.

5. Did the review authors perform study selection in duplicate? Nine of the 18 reviews demonstrated that they had used this approach to study selection, although this was inconsistently reported.

6. Duplicate data extraction? There was evidence of duplicate data extraction, particularly in the reviews that contained meta-analysis or numerical data synthesis. However, there was limited evidence of agreement between reviewers and how consensus was reached.

7. Evidence of reasons for excluded studies – reporting of excluded studies was limited – this is however unsurprising in a research area which is not clearly bounded and where there is limited consensus around the description of populations and interventions.

8. Description of included studies - the majority of reviews were assessed as either partial yes or no. The incomplete descriptions within the reviews however are as likely to reflect the reporting in the primary studies as the conduct and reporting of the reviews.

9. Use of satisfactory technique for risk of bias assessment – three of the reviews did not undertake risk of bias/quality assessment/critical appraisal and therefore were assessed as 'no'. A diverse selection of tools were used amongst the remaining reviews. These were chosen according to the study designs that were included in the reviews.

10. Reporting of source of funding – these were not reported and there was no evidence of authors looking for this information. This may be a reflection of the types of studies that are included in the reviews which are less likely to be at risk of bias from interference by funders.

11 and 12. Where meta-analysis was undertaken, this was generally not reported according to the standards required by AMSTAR2

13 and 14. Inclusion of studies at high risk of bias and discussion of heterogeneity – reviews tended to report that all studies were included – there was evidence from one review of high ROB studies being excluded and the use of meta-analysis in some studies determined the inclusion of RCTs only. Heterogeneity was not widely reported.

15 Reporting of publication bias – only three reviews included meta-analysis and of these three, only one (Conroy 2011) assessed the impact of publication bias on study findings.

16. Funding and conflicts of interest – these were inconsistently reported across the studies – this may have reflected journal submission requirements in addition to review methods and processes.

		Conroy (2011)	Fan (2015)	Fealy (2009)	Graf (2011)	Hastings (2005)	Hughes (2019)	Jay (2017)	Karam (2015)	Lowthian (2015)	Malik (2018)	McCuske (2006)	Parke (2011)	Pearce (2011)	Schmitker (2013)	Sinha (2011)
1. Did the research questions and inclusion criteria for the review include the components of PICO? For Yes, all should be ticked.	Population	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Intervention	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
	Comparator	Yes	Yes	No	Yes	No	Yes	No	Yes	No	No	Yes	No	No	No	No
	Outcome	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes
	Yes/No	**Yes**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**No**	**Yes**	**No**	**No**	**No**	**No**
2. Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol? For partial yes, criteria 1-4, for yes, criteria 1-8.	Review Question	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	Yes
	Search Strategy	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	Yes
	Inclusion/exclusion criteria	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	Yes
	ROB assessment	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
	Protocol registered	No	No	No	No	No	Yes	Yes	No	Yes	No	No	No	No	No	No
	Meta-analysis plan (if appropriate)	Yes	n/a	No	No	n/a	Yes	n/a	No	Yes	No	N/A	N/a	No	N/A	N/A
	Causes of heterogeneity plan	Yes	n/a	No	No	n/a	Yes	n/a	No	Yes	No	N/A	n/a	No	N/A	N/A

		Conroy (2011)	Fan (2015)	Fealy (2009)	Graf (2011)	Hastings (2005)	Hughes (2019)	Jay (2017)	Karam (2015)	Lowthian (2015)	Malik (2018)	McCuske (2006)	Parke (2011)	Pearce (2011)	Schmitker (2013)	Sinha (2011)
	Justification for protocol deviations	No	n/a	No	No	n/a	No	Yes	No	N/A	No	N/A	No	No	No	No
	Yes/Partial Yes/No	**Partial Yes**	**Partial yes**	**No**	**No**	**Partial yes**	**Yes**	**Partial yes**	**No**	**Yes**	**No**	**No**	**Partial yes**	**No**	**No**	**No**
3. Did the review authors explain their selection of the study designs for inclusion in the review? For yes, review should satisfy ONE of the following.	Explanation for including only RCTs	Yes	N/A	N/A	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A	N/A	
	Explanation for including only NRSI	N/A	Yes	N/A	N/A	N/A	N/A	Yes	N/A	N/A	N/A	N/A	No	N/A	N/A	Yes
	Explanation for including both RCTs and NRSI	Not applicable	Not applicable	No		??	Yes	n/a	No	Yes	No	Yes	No	No	N/A	
	Yes/No	**Yes**	**Yes**	**No**	**No**	**??**	**Yes**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**No**	**No**	**Yes**
4. Did the review authors use a comprehensive literature search strategy? For partial	Searched at least 2 databases (relevant to research question)	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

		Conroy (2011)	Fan (2015)	Fealy (2009)	Graf (2011)	Hastings (2005)	Hughes (2019)	Jay (2017)	Karam (2015)	Lowthian (2015)	Malik (2018)	McCuske (2006)	Parke (2011)	Pearce (2011)	Schmitker (2013)	Sinha (2011)
yes, criteria 1-3, for yes, criteria 1-8.	Provided key word and/or search strategy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Justified publication restrictions (e.g. language)	Yes	Yes	No	N/A	Yes	Yes	Yes	N/A	N/A	Yes	Yes	Yes	No	No	No
	Searched the reference lists / bibliographies of included studies	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Searched trial/study registries	No	No	Yes	No	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	No
	Included/consulted content experts in the field	No	No	No	No	Yes	No	No	Yes	Yes	No	Yes	Yes	No	No	No
	Where relevant, searched for grey literature	No	No	No	No	No	No	Yes	N/A	No	No	No	No	Yes	Yes	No
	Conducted search within 24 months of	Yes	Yes	Yes	Yes	Yes	Not reporter	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Not reported	Not reported

		Conroy (2011)	Fan (2015)	Fealy (2009)	Graf (2011)	Hastings (2005)	Hughes (2019)	Jay (2017)	Karam (2015)	Lowthian (2015)	Malik (2018)	McCuske (2006)	Parke (2011)	Pearce (2011)	Schnitker (2013)	Sinha (2011)
	completion of the review															
	Yes/Partial Yes/No	**Partial Yes**	**Partial yes**	**No**	**No**	**Partial yes**	**Partial yes**	**Partial yes**	**Partial yes**	**Partial yes**	**Partial yes**	**Partial yes**	**Partial yes**	**No**	**No**	**No**
5. Did the review authors perform study selection in duplicate? For yes, ONE of the following	At least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include	No	Not known	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No
	Two reviewers selected a sample of eligible studies and achieved good agreement (at least 80 percent), with the remainder selected by one reviewer.	No	Not known				Not reporter	No			No	No			No	No

		Conroy (2011)	Fan (2015)	Fealy (2009)	Graf (2011)	Hastings (2005)	Hughes (2019)	Jay (2017)	Karam (2015)	Lowthian (2015)	Malik (2018)	McCuske (2006)	Parke (2011)	Pearce (2011)	Schmitker (2013)	Sinha (2011)
	Yes/No	**No**	**Not known**	**Yes**	**No**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**Yes**	**Yes**	**No**	**No**
6. Did the review authors perform data extraction in duplicate? For yes, ONE of the following	At least two reviewers achieved consensus on which data to extract from included studies	No	Yes	Yes	No		Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No
	Two reviewers extracted data from a sample of eligible studies and achieved good agreement (at least 80 percent), with the remainder extracted by one reviewer.	No						No			No	No			No	
	Yes/No	**No**	**Yes**	**Yes**	**No**	**Not known**	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**Yes**	**Yes**	**Yes**	**No**	**No**

		Conroy (2011)	Fan (2015)	Fealy (2009)	Graf (2011)	Hastings (2005)	Hughes (2019)	Jay (2017)	Karam (2015)	Lowthian (2015)	Malik (2018)	McCuske (2006)	Parke (2011)	Pearce (2011)	Schmitker (2013)	Sinha (2011)
7. Did the review authors provide a list of excluded studies and justify the exclusions? For partial yes, criteria 1, for yes, criteria 1 and 2	Provided a list of all potentially relevant studies that were read in full-text form but excluded from the review	Yes	No	No	No	Yes	No	yes	No	No	No	No	Yes	No	No	No
	Justified the exclusion from the review of each potentially relevant study	Yes	Yes	No	No	Yes	No	yes	No	No	No	No	Yes	No	No	No
	Yes/Partial Yes/No	**Yes**	**Partial yes**	**No**	**No**	**Yes**	**No**	**yes**	**No**	**No**	**No**	**No**	**Yes**	**No**	**No**	**No**
8. Did the review authors describe the included studies in adequate detail? For partial yes, criteria 1-5, for yes, criteria 1-10.	Described populations	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes
	Described interventions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Described comparators	Yes	Yes	No	Yes	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes	No	No
	Described outcomes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

		Conroy (2011)	Fan (2015)	Fealy (2009)	Graf (2011)	Hastings (2005)	Hughes (2019)	Jay (2017)	Karam (2015)	Lowthian (2015)	Malik (2018)	McCuske (2006)	Parke (2011)	Pearce (2011)	Schmitker (2013)	Sinha (2011)
	Described research designs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	yes	Yes	No	Yes
	Described population in detail	Yes	??	No	No	No	Yes	yes	No	No	No	Yes	Yes	No	No	Yes
	Described intervention in detail (including doses where relevant)	Yes	??	No	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes
	Described comparator in detail (including doses where relevant)	Yes	??	No	No	No	Yes	No	No	No	No	Yes	Yes	Yes	No	Yes
	Described study's setting	Yes	??	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Timeframe for follow up	Yes	??	Yes	Yes	Sometimes	Yes	No	Yes	Yes	No	Yes	No	Yes	No	Yes
	Yes/Partial Yes/No	**Yes**	**??**	**No**	**No**	**Partial yes**	**Yes**	**No**	**No**	**No**	**No**	**Yes**	**Partial yes**	**Yes**	**No**	**Yes**

		Conroy (2011)	Fan (2015)	Fealy (2009)	Graf (2011)	Hastings (2005)	Hughes (2019)	Jay (2017)	Karam (2015)	Lowthian (2015)	Malik (2018)	McCuske (2006)	Parke (2011)	Pearce (2011)	Schmitker (2013)	Sinha (2011)
9. Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?	Name	Van Tulder	EPHPP	Grimshaw checklist	None	Bespoke tool	Cochrane ROB	RoBANS	None	Cochrane Risk of Bias & Newcastle-Ottawa	Cochrane Risk of Bias & EBL	None	CASP	JBI	NHMRC Levels of evidence	Cochrane Risk of Bias & MOOSE
RCTs, For partial yes, criteria 1 and 2, for yes, criteria 1-4.	Unconcealed allocation	No	N/A	Yes	No	N/A	Yes	n/a	No	Yes	Yes	No	??	No	n/a	n/a
	lack of blinding of patients and assessors when assessing outcomes (unnecessary for objective outcomes such as all cause mortality)	No	N/A	Yes	No	N/A	Yes	n/a	No	Yes	Yes	No	??	No	n/a	n/a
	allocation sequence that was not truly random,	No	N/A	Yes	No	N/A	Yes	n/a	No	Yes	Yes	No	??	No	n/a	n/a

		Conroy (2011)	Fan (2015)	Fealy (2009)	Graf (2011)	Hastings (2005)	Hughes (2019)	Jay (2017)	Karam (2015)	Lowthian (2015)	Malik (2018)	McCuske (2006)	Parke (2011)	Pearce (2011)	Schmitker (2013)	Sinha (2011)
	selection of the reported result from among multiple measurements or analyses of a specified outcome	No	N/A	No	No	N/A	Yes	n/a	No	Yes	Yes	No	??	No	n/a	n/a
	Yes/Partial Yes/No/Includes only NRSI	**No**	**No includes only NRSI**	**Partial yes**	**No**	**N/A**	**Yes**	**n/a**	**No**	**Yes**	**Yes**	**No**	**No**	**No**	**No**	**No**
NRSI For partial yes, criteria 1 and 2, for yes, criteria 1-4.	from confounding	Not applicable	No	N/A	N/A	??	??	Yes	N/A	N/A	N/A	N/A	N/A	N/A	n/a	n/a
	from selection bias	Not applicable	No	N/A	N/A	??	??	Yes	N/A	N/A	N/A	N/A	N/A	N/A	n/a	n/a
	methods used to ascertain exposures and outcomes	Not applicable	No	N/A	N/A	N/A		Yes	N/A	N/A	N/A	N/A	N/A	N/A	n/a	n/a

		Conroy (2011)	Fan (2015)	Fealy (2009)	Graf (2011)	Hastings (2005)	Hughes (2019)	Jay (2017)	Karam (2015)	Lowthian (2015)	Malik (2018)	McCuske (2006)	Parke (2011)	Pearce (2011)	Schmitker (2013)	Sinha (2011)
	selection of the reported result from among multiple measurements or analyses of a specified outcome	Not applicable	No	N/A	N/A	N/A	??	No	N/A	N/A	N/A	N/A	N/A	N/A	n/a	n/a
	Yes/Partial Yes/No/Includes only RCT	**No**	**No**	**No**	**No**	**No**	**No**	**Partial yes**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**
10. Did the review authors report on the sources of funding for the studies included in the review?	Must have reported on the sources of funding for individual studies included in the review. Note: Reporting that the reviewers looked for this information but it was not reported by study authors also qualifies	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
	Yes/No	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**

		Conroy (2011)	Fan (2015)	Fealy (2009)	Graf (2011)	Hastings (2005)	Hughes (2019)	Jay (2017)	Karam (2015)	Lowthian (2015)	Malik (2018)	McCuske (2006)	Parke (2011)	Pearce (2011)	Schmitker (2013)	Sinha (2011)
11. If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?																
RCTs, for yes, criteria 1-3	The authors justified combining the data in a meta-analysis	Yes	N/A	N/A	N/A	n/a	Yes	n/a	N/A	Yes	Yes	N/A	N/A	N/A	N/A	N/A
	AND they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present.	Yes	N/A	N/A	N/A	n/a		n/a	N/A	Yes	Yes	N/A	N/A	N/A	N/A	N/A
	AND investigated the causes of any heterogeneity	Yes	N/A	N/A	N/A	n/a	Yes	n/a	N/A	Yes	No	N/A	N/A	N/A	N/A	N/A
	Yes/No/No meta-analysis conducted	**Yes**	**No meta analysis con**	**No meta analysis con**	**No meta analysis con**	**No meta analysis con**	**Yes**	**No meta analysis con**	**No meta analysis con**	**Yes**	**No**	**No meta analysis con**	**No meta analysis con**	**No meta analysis con**	**No meta analysis con**	**No meta analysis con**

		Conroy (2011)	Fan (2015)	Fealy (2009)	Graf (2011)	Hastings (2005)	Hughes (2019)	Jay (2017)	Karam (2015)	Lowthian (2015)	Malik (2018)	McCuske (2006)	Parke (2011)	Pearce (2011)	Schnitker (2013)	Sinha (2011)
			ducted	**ducted**	**ducted**	**ducted**		**ducted**	**ducted**			**ducted**	**ducted**	**ducted**	**ducted**	**ducted**
NRSI, for yes, criteria 1-4	The authors justified combining the data in a meta-analysis	N/A	N/A	N/A	N/A	N/A	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	AND they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present.	N/A	N/A	N/A	N/A	N/A	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	AND they statistically combined effect estimates from NRSI that were adjusted for confounding, rather than combining raw data, or justified combining raw	N/A	N/A	N/A	N/A	N/A	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

		Conroy (2011)	Fan (2015)	Fealy (2009)	Graf (2011)	Hastings (2005)	Hughes (2019)	Jay (2017)	Karam (2015)	Lowthian (2015)	Malik (2018)	McCuske (2006)	Parke (2011)	Pearce (2011)	Schmitker (2013)	Sinha (2011)
	data when adjusted effect estimates were not available															
	AND they reported separate summary estimates for RCTs and NRSI separately when both were included in the review	N/A	N/A	N/A	N/A	N/A	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Yes/No/No meta-analysis conducted	**No**	**No**	**No**	**No**	**No**	**Yes**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**
12. If meta-analysis was performed, did the review authors assess	Included only low risk of bias RCTs	Yes	N/A	N/A	N/A	N/A	No	N/A	N/A	Yes	No	N/A	N/A	N/A	N/A	N/A

		Conroy (2011)	Fan (2015)	Fealy (2009)	Graf (2011)	Hastings (2005)	Hughes (2019)	Jay (2017)	Karam (2015)	Lowthian (2015)	Malik (2018)	McCuske (2006)	Parke (2011)	Pearce (2011)	Schnitker (2013)	Sinha (2011)
the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis? For yes, criteria 1 OR 2	OR, if the pooled estimate was based on RCTs and/or NRSI at variable RoB, the authors performed analyses to investigate possible impact of RoB on summary estimates of effect.	N/A	N/A	N/A	N/A	N/A	No	N/A	N/A	N/A	No	n/a	N/A	N/A	N/A	N/A
		Yes	No meta analysis	No meta analysis	No meta analysis	No meta analysis	No	Yes	No	No meta analysis	No meta analysis	No meta analysis	No meta analysis	No meta analysis	No meta analysis	No meta analysis
13. Did the review authors account for RoB in individual studies when interpreting/ discussing the results of the review? For yes, criteria 1 OR 2	included only low risk of bias RCTs	Yes	No	No	No	No	Yes	N/A	N/A	Yes	No	No	N/A	No	N/A	N/A
	OR, if RCTs with moderate or high RoB, or NRSI were included the	N/A	No	No	N/A	No	Yes	Yes	N/A	N/A	No	No	N/A	No	N/A	N/A

		Conroy (2011)	Fan (2015)	Fealy (2009)	Graf (2011)	Hastings (2005)	Hughes (2019)	Jay (2017)	Karam (2015)	Lowthian (2015)	Malik (2018)	McCuske (2006)	Parke (2011)	Pearce (2011)	Schnitker (2013)	Sinha (2011)
	review provided a discussion of the likely impact of RoB on the results															
	Yes/No	**Yes**	**No**	**No**	**No**	**No**	**Yes**	**Yes**	**No**	**Yes**	**No**	**No**	**No**	**No**		
14. Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review? For yes, criteria 1 or 2	There was no significant heterogeneity in the results	No	No			No	Yes	No			Yes	No	No		No	N/A
	OR if heterogeneity was present the authors performed an investigation of sources of any heterogeneity in the results and discussed the impact of this on the results of the review	No	No			No		No	Yes	Yes		No	No	No		N/A
	Yes/No	**No**	**No**	**No meta-**	**No**	**No**	**Yes**	**No**	**Yes**	**Yes**	**Yes**	**No**	**No**	**No**	**No**	

		Conroy (2011)	Fan (2015)	Fealy (2009)	Graf (2011)	Hastings (2005)	Hughes (2019)	Jay (2017)	Karam (2015)	Lowthian (2015)	Malik (2018)	McCuske (2006)	Parke (2011)	Pearce (2011)	Schmitker (2013)	Sinha (2011)
				analysis												
15. If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?	Performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias	Yes			No	No	No	No	No	No	No	No		No	No	No
	Yes/No/No meta-analysis conducted	**Yes**	**No meta-analysis**	**No meta-analysis**	**No**	**No meta-analysis**	**No**	**No meta-analysis**	**No meta-analysis**	**No**	**No**	**No meta-analysis**	**No meta-analysis**	**No meta-analysis**	**No meta-analysis**	**No meta-analysis**
16. Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review? For yes, criteria 1 OR 2	The authors reported no competing interests OR	No	Yes	Yes	No		No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
	The authors described their funding sources and how they managed potential	Yes		Yes	No		No	No	Yes	Yes	Yes	Yes		Yes		

	Yes/No	conflicts of interest	
	Yes		Conroy (2011)
	Yes		Fan (2015)
	Yes		Fealy (2009)
	No		Graf (2011)
	No information		Hastings (2005)
	No		Hughes (2019)
	Yes		Jay (2017)
	Yes		Karam (2015)
	Yes		Lowthian (2015)
	Yes		Malik (2018)
	Yes		McCuske (2006)
	Yes		Parke (2011)
	Yes		Pearce (2011)
	Yes		Schnitker (2013)
	Yes		Sinha (2011)

Supplementary Material 2 – Medline Search Strategy

1 *Emergency Service, Hospital/
2 *Emergency Medical Services/
3 *Emergency Medicine/
4 (emergency adj2 service$).ti,ab.
5 emergency care.ti,ab.
6 urgent care.ti,ab.
7 emergency department*.ti,ab.
8 (accident adj2 emergency).ti,ab.
9 casualty.ti,ab.
10 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9
11 *"Aged, 80 and over"/ or *Health Services for the Aged/
12 *Frail Elderly/
13 *Aged/ or *Aging/)
14 (ageing or elderly or geriatric or frail or aged or old or older).ti.
15 11 or 12 or 13 or 14
16 10 and 15
17 meta analysis.mp,pt. or review.pt. or search:.tw.
18 16 and 17
19 limit 18 to (english language and yr="2000 -Current")

Supplementary Material 3 – Inclusion and reporting standards criteria

- Publication details - Published 2000 onwards. At least 50% of primary studies published 2000 onwards. Peer reviewed journal articles. Published in English.
- Population - People aged 65 or older and/or people with frailty as defined by a published frailty scale or clinical judgement.
- Interventions - Any care, model of care or management strategy. Interventions focused on patient care or changes to the wider ED, targeted at older people or to a wider ED attending population. Interventions either initiated or completed within the ED.
  Reviews focusing solely on methods for identification of frail or high risk older people were excluded. Where studies focusing on identification were included as part of a larger review, the review was included but data relating to these identification studies was excluded.
- Outcomes - Any patient, health service or staff outcome.
- Study type - Evidence reviews, systematic reviews and meta-analyses including RCTs, observational studies, case-controlled or other quasi-experimental studies. Qualitative reviews and mixed method reviews.
- Other – comparators could be usual care, no intervention or other interventions. We did not include or exclude studies based on length of follow up.
- Reporting standards
  - Inclusion and exclusion criteria developed a priori and included studies screened against these criteria.
  - Systematic search, described in sufficient detail to identify studies that would have met the inclusion criteria.
  - Quality assessment of individual studies included in the review, using a named tool – to assess risk of bias or reporting standards.
  - List of included studies, linked to findings of the review and/or summary statements produced.