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Chapter 25 Admission through elderly care assessment units

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25 Admission through Elderly Care Assessment Units

25.1 Introduction

Older patients are more likely to be admitted as an AME, and to stay longer in hospital. This is due to a higher proportion of multi-morbidity, frailty, and polypharmacy than in younger patients. Hospital services have adapted to the growing pressure from older patients, by introducing liaison services, such as Frail Older Persons' Assessment and Liaison (FOPAL) services. These are now widespread, and share characteristics such as medication review and the use of Comprehensive Geriatric Assessment.

However, it is not clear whether there are additional benefits from admitting patients to a specialised elderly care assessment unit (ECAU). Theoretical advantages could include better planning of investigation and diagnosis, multiprofessional working, and dedicated discharge teams. The question is important because of the potential for large reductions in length of stay, and quality of care.

25.2 Review question: Does admission or assessment through an elderly care assessment unit (ECAU) improve patient outcomes and hospital resource usage?

For full details see review protocol in Appendix A.

Table 1: PICO characteristics of review question

Population	Frail older people (65 years and over) with a suspected or confirmed AME.
Intervention	Assessment and management during admission (by GP referral, or via ED or community): • through an elderly care/frailty Assessment Unit. • through an elderly care Assessment Area (defined area within the AMU). • by a visiting elderly care team (geriatrician team) in AMU.
Comparison	Direct admission to generalist ward care from ED, community, or by GP referral (inpatient care only); direct admission to AMU without geriatric team involvement.
Outcomes	• Quality of life (CRITICAL) • Length of stay (CRITICAL) • Mortality (CRITICAL) • Readmissions up to 30 days (IMPORTANT) • Avoidable adverse events (CRITICAL) • Delayed transfers of care (IMPORTANT) • A&E 4 hour waiting target (IMPORTANT) • Patient and/or carer satisfaction (CRITICAL)
Study design	Systematic reviews (SRs) of RCTs, RCTs, observational studies only to be included if no relevant SRs or RCTs are identified.

25.3 Clinical evidence

Four before-after studies were identified,[17,24,37,110] where assessment and management during admission through an elderly care assessment unit, frailty unit, or by a geriatric team were compared with either direct admission to a generalist ward or management through an AMU without geriatric team involvement. Evidence from these studies is summarised in the clinical evidence summary below (Table 3, Table 4 and Table 5). See also the study selection flow chart in Appendix B, study

evidence tables in Appendix D, forest plots in Appendix C, GRADE tables in Appendix F and excluded studies list in Appendix G.

Table 2: Summary of studies included in the review

Study	Intervention and comparison	Population	Outcomes
Cardwell 2016[17] Before and after study UK setting: single centre ED	'Front door' assessment of all over 65s with frailty – multidisciplinary team at the front desk in the ED with access to 8 care-of-the-elderly inpatient beds and 2 23-hour beds in the clinical decisions unit adjacent to the ED; team used a frailty index to screen between 9am-5pm Monday to Friday, those identified as frail entered the frail elderly pathway developed in the hospital. Versus Usual care - no screening for frailty, ED processed the admissions in the same way as for all adult age groups – directed to the Acute Medical Receiving Unit as clinically appropriate.	n=16,061 patients >65 presenting to ED. Exclusion criteria: stroke, high level of care needed, on renal dialysis, obvious requirement for specialist care such as recent chemotherapy or a myocardial infarction.	Readmission (7-day and 28-day).
Conroy 2014[24] Before and after study UK setting: teaching hospital	Emergency frailty unit - embedded comprehensive geriatric assessment service within the ED. Versus Usual care – emergency decisions unit, no routine input from specialists trained in geriatric medicine.	n=4647 patients ≥65 years attending the ED.	Re-admission.
Ellis 2012[37] Before and after study	Acute Care for Elders (ACE) Unit situated adjacent to the emergency department	n=422 patients attending the ED. Inclusion criteria: >65 years	Length of stay. Re-admission.

Study	Intervention and comparison	Population	Outcomes
UK setting: district general hospital	and medical receiving unit, designed to deliver rapid assessment for patients deemed by non-specialists to require admission as a form of clinical decision unit. Versus Medical receiving unit – use of standardised screening and assessment tools, multidimensional assessment by a multidisciplinary team and proactive discharge planning.	with 1 or more of the following: - functional impairment (acute or chronic), - cognitive impairment (acute or chronic), - falls or other geriatric syndromes, - care home patients. Exclusion criteria: functionally independent patients or those with only single organ pathology requiring specialist input.	Mortality.
Taylor 2016[110] Before and after study UK Setting: Urban teaching hospital	Comprehensive older persons evaluation (COPE) zone within the emergency assessment unit, twice daily multidisciplinary team meetings, patients identified as potentially fit for discharge kept on COPE zone, otherwise transferred to geriatric medicine ward. Versus Admission to the emergency assessment unit after being referred from the ED or a GP, patients requiring geriatrician input seen by a daily in-reaching service.	n=811 medical patients >75 years admitted to the emergency assessment unit.	Mortality (in-patient and 30-day). Re-admission.

Table 3: Clinical evidence summary: admission through ECAU versus direct admission

Outcomes	No of Participants (studies) Follow up	Quality of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with direct admission	Risk difference with ECAU (95% CI)
Readmission no. of patients readmitted	5096 (2 studies) 30 days	⊕⊖⊖⊖ VERY LOW[a,b] due to risk of bias, imprecision	RR 0.78 (0.67 to 0.92)	Moderate	
				143 per 1000	31 fewer per 1000 (from 11 fewer to 47 fewer)
Mortality no. of patients dying	422 (1 study) 12 months	⊕⊖⊖⊖ VERY LOW[b,a] due to imprecision	RR 0.86 (0.68 to 1.1)	Moderate	
				420 per 1000	59 fewer per 1000 (from 134 fewer to 42 more)
Length of stay mean length of stay	422 (1 study)	⊕⊖⊖⊖ VERY LOW[a] due to risk of bias			The mean length of stay in the intervention groups was 0.5 higher (3.29 lower to 4.29 higher)

(a) All non-randomised studies automatically downgraded due to selection bias. Studies may be further downgraded by 1 increment if other factors suggest additional high risk of bias, or 2 increments if other factors suggest additional very high risk of bias.

(b) Downgraded by 1 increment if the confidence interval crossed 1 MID or by 2 increments if the confidence interval crossed both MIDs.

Table 4: Clinical evidence summary: admission through ECA area within AMU versus direct admission

Outcomes	No of Participants (studies) Follow up	Quality of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with direct admission	Risk difference with ECA area within AMU (95% CI)
In-patient mortality no. of patients dying in hospital	811 (1 study)	⊕⊖⊖⊖ VERY LOW[b] due to imprecision	RR 1.11 (0.71 to 1.75)	Moderate	
				80 per 1000	9 more per 1000 (from 23 fewer to 60 more)
30 day mortality no. of patients dying within 30 days of discharge	811 (1 study) 30 days	⊕⊖⊖⊖ VERY LOW[b] due to imprecision	RR 0.83 (0.46 to 1.51)	Moderate	
				55 per 1000	9 fewer per 1000 (from 30 fewer to 28 more)

Outcomes	No of Participants (studies) Follow up	Quality of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with direct admission	Risk difference with ECA area within AMU (95% CI)
Readmission no. of patients readmitted	742 (1 study) 30 days	⨁⊖⊖⊖ VERY LOW[a,b] due to risk of bias, imprecision	RR 0.96 (0.71 to 1.3)	Moderate	
				189 per 1000	8 fewer per 1000 (from 55 fewer to 57 more)

(a) All non-randomised studies automatically downgraded due to selection bias. Studies may be further downgraded by 1 increment if other factors suggest additional high risk of bias, or 2 increments if other factors suggest additional very high risk of bias.

(b) Downgraded by 1 increment if the confidence interval crossed 1 MID or by 2 increments if the confidence interval crossed both MIDs.

Table 5: Clinical evidence summary: admission by a visiting elderly care team versus direct admission

Outcomes	No of Participants (studies) Follow up	Quality of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with direct admission	Risk difference with ECA area within AMU (95% CI)
Readmission no. of patients readmitted to hospital	9293 (1 study) 28 days	⨁⊖⊖⊖ VERY LOW[a] due to risk of bias	RR 0.67 (0.61 to 0.74)	Moderate	
				195 per 1000	64 fewer per 1000 (from 51 fewer to 76 fewer)
Readmission no. of patients readmitted to hospital	9293 (1 study) 7 days	⨁⊖⊖⊖ VERY LOW[a] due to risk of bias	RR 0.33 (0.27 to 0.40)	Moderate	
				88 per 1000	59 fewer per 1000 (from 53 fewer to 64 fewer)

(a) All non-randomised studies automatically downgraded due to selection bias. Studies may be further downgraded by 1 increment if other factors suggest additional high risk of bias, or 2 increments if other factors suggest additional very high risk of bias.

25.4 Economic evidence

Published literature

One health economic study was identified with the relevant comparison and has been included in this review.[18] This is described in the health economic evidence profile below (Table 6) and the health economic evidence table in Appendix F.

The economic article selection protocol and flow chart for the whole guideline can found in the guideline's Appendix 41A and Appendix 41B.

Table 6: Health economic evidence profile: Elderly care assessment unit versus usual care

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost-effectiveness	Uncertainty
Cardwell 2016[18] (Scotland)	Partially applicable [(a)]	Potentially serious limitations [(b)]	Retrospective cohort study **Intervention 1:** Frail older people's pathway (FOPP) - Frailty MDT team 9am-5pm. Those assessed to be frail in the ED were put on the frail person's pathway. **Intervention 2:** No FOPP.	-£287	NA	NA	NR

Abbreviations: NA not applicable; NR not reported.

(a) Only cost comparison – only indicators of health were process outcomes like re-attendance and re-admission. Usual care was not described.

(b) The study was observational study, with no control for case-mix or time trend. No statistical or sensitivity analysis was undertaken. Only hospital costs included.

25.5 Evidence statements

Clinical

Four studies comprising 21,941 people evaluated the role of admission or assessment through an ECAU, frailty unit or by a geriatric team compared with either direct admission to a generalist ward or management through an AMU without geriatric team involvement for improving outcomes in secondary care in elderly people (65 years and over) with AMEs.

The evidence suggested that admission through ECAUs provides a benefit in reduction of readmissions (2 studies, very low quality) and mortality (1 study, very low quality). However, the evidence suggested there was no effect on length of stay (1 study, very low quality).

One study comprising 811 people evaluated the role of admission through an ECA area within the AMU compared to direct admission. The evidence suggested there was no difference in readmission, in-patient mortality or 30 day mortality (very low quality).

One study comprising 9293 people evaluated for assessment and management during admission by an elderly care team compared to direct admission. The evidence suggested a benefit in reduction of the number of readmissions at 7 days and 28 days (1 study, very low quality).

Economic

One cost comparison showed that an elderly care assessment unit was cost saving compared with usual care (cost difference: £287 per patient). This study was assessed to be partially applicable with potentially serious limitations.

25.6 Recommendations and link to evidence

Recommendations	-
Research recommendations	**RR13. What is the most clinically and cost-effective way to configure services to assess frail older people who present to hospital with a medical emergency?**
Relative values of different outcomes	The guideline committee considered 5 outcomes were critical for inclusion in this review: mortality, patient and/or carer satisfaction, quality of life, avoidable adverse events and length of hospital stay. Number of readmissions within 30 days, delayed transfers of care and compliance with the A&E 4 hour waiting target were all considered to be important outcomes.
Trade-off between benefits and harms	Four studies comprising 21,941 people evaluated the role of admission or assessment through an elderly care or frailty assessment unit (ECAU), an elderly care assessment area within the AMU or by an elderly care team, compared with either direct admission to a general medical ward or management through an AMU without elderly care team involvement, for improving outcomes in secondary care in frail older people (65 years and over) with an acute medical emergency. The evidence suggested that admission through ECAUs provides a benefit in reduction of readmissions and mortality. However, the evidence suggested there was no effect on length of stay. No evidence was identified for the outcomes of patient and/or carer satisfaction, quality of life, avoidable adverse events and delayed transfers of care or compliance with the A&E 4 hour waiting target. One study evaluated the role of admission through an ECA area within the AMU compared to direct admission. The evidence suggested there was no difference in readmission, in-patient mortality or 30 day mortality. The evidence suggested there was no effect on readmission. No evidence was identified for the outcomes patient and/or carer satisfaction, quality of life, length of stay, avoidable adverse events, delayed transfers of care or compliance with the ED 4-hour emergency access target. For assessment and management during admission by a multidisciplinary frail elderly team, evidence suggested a benefit in reduction of the number of readmissions at 7 and 28 days. No evidence was identified for mortality, patient and/or carer satisfaction, quality of life, avoidable adverse events, length of stay, delayed transfers of care or compliance with the ED 4-hour access target. It was agreed that the evidence was not strong enough to make a recommendation and the committee therefore opted to make a research recommendation. The committee noted a research recommendation would be particularly beneficial given that nationally, the development of older person care units/acute frailty units are being encouraged alongside acute medical assessment units.[86,104,106] Further research should consider whether the provision of these units in parallel to an acute medical unit (AMU) is beneficial, whether both services can be combined into 1 unit or whether the presence of a multidisciplinary frail older person team reviewing identified patients on the AMU is sufficient.
Trade-off between net effects and costs	One of the before and after studies referred to above, which evaluated assessment and management during admission by a multidisciplinary frail older person team, had estimated the cost impact. The cost of the staff per year (£300,000) was more than offset by cost savings from reduced length of stay, avoided admissions and reduced readmissions (£4.9 million). The net savings amounted to £287 per patient assessed. As there was only a single study, the comparator was not clearly described and the design was subject to a high risk of bias, the committee decided that a research recommendation was needed to provide more evidence on ECAUs before a

	practice recommendation could be made.
Quality of evidence	The evidence was graded very low quality for all outcomes due to risk of bias and imprecision. Nationally, patients who are admitted to hospitals with an ECAU often come directly from the community or from the community via the emergency department rather than via AMU. In many of the papers identified, the patients were admitted from another hospital ward in order to undergo discharge planning and therefore these papers were excluded as this was not considered relevant to the review question. The committee noted that these studies were heterogeneous models of care and their study design meant that case mix was not taken into consideration. The committee also noted the limitation of before and after study designs in this context, as the NHS evolves rapidly and outcomes were likely to be affected by a whole-system change rather than just the interventions themselves. One study was limited by a small population of included patients (less than 500 cases). The economic evaluation was only partially applicable because it did not evaluate health outcomes. It had potentially serious limitations because it was based on an observational before and after study, with no control for case-mix or time trend. Furthermore, no statistical or sensitivity analysis was undertaken and only hospital costs included.
Other considerations	ECAUs are diverse in structure, process and staff composition, and are often focused on discharge planning and rehabilitation with a prime aim of maintaining patients in their own environment. The committee noted that ECAU services are being developed and implemented, but they have not been well-evaluated. Research should concentrate on providing evidence for the optimal structure of care within the boundaries of funding available within the NHS. Research should also focus on the cost to the whole health economy. The key question is what is the optimal configuration for care for frail older people? The focus must be on the delivery of care required and important patient outcomes in the contexts of the financial constraints to the NHS. It may be more than 1 type of configuration is required and that depends on the local demographics and current infrastructure. As the number of frail older people is only going to increase, identifying this is crucial hence the reason for the research recommendation. The committee noted that there are 2 NICE guidelines which have recommendations on Comprehensive Geriatric Assessment (CGA): a multi-disciplinary process which can be conducted during admission but which focuses on discharge planning and long-term follow-up. The recommendations are as follows: • The guideline for transition between inpatient hospital settings and community or care home settings for adults with social care needs (NG27)[81] recommends 'start a comprehensive assessment of older people with complex needs at the point of admission and preferably in a specialist unit for older people'. • The guideline on Multimorbidity: clinical assessment and management (NG56)[82] refers to the recommendation above from NICE guideline SC712.

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Appendices

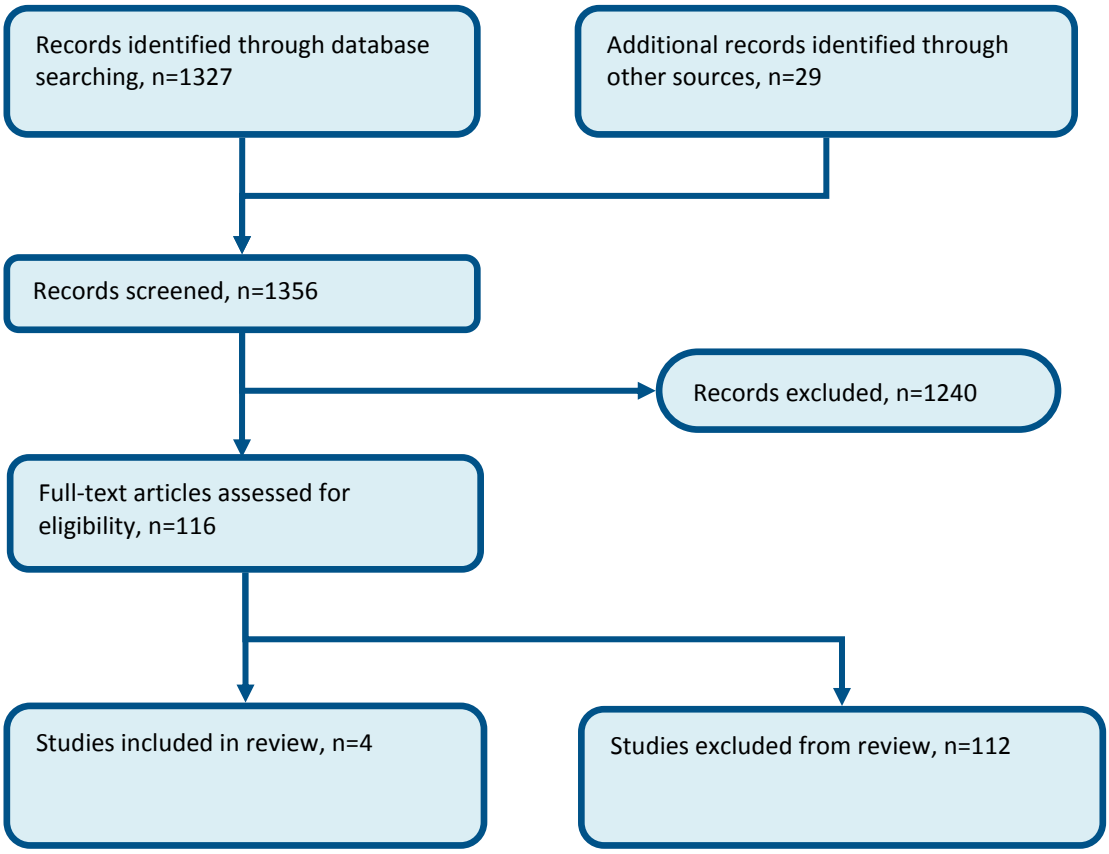
Appendix A: Review protocol

Table 7: Review protocol: Assessment through ECAU

Review question	Admission through ECAU
Guideline condition and its definition	Acute medical emergencies. Definition: people with suspected or confirmed acute medical emergencies or at risk of an acute medical emergency.
Review population	Elderly people (65 years and over) with a suspected or confirmed AME.
Interventions and comparators: generic/class; specific/drug	• Assessment and management during admission through an elderly care/frailty assessment unit. • Assessment and management during admission through an elderly care assessment area. • Assessment and management during admission by a geriatric team.
Comparison	• No assessment and management through the ECAU: o Direct admission to a general medical ward from ED or by community or GP referral (inpatient care only). o Admission through the AMU without geriatric team involvement.
Outcomes	- Mortality during the study period (Dichotomous) CRITICAL - Patient and/or carer satisfaction during the study period (Dichotomous) CRITICAL - Length of stay during the study period (Continuous) CRITICAL - Adverse event rates during the study period (Dichotomous) CRITICAL - Quality of life during the study period (Continuous) CRITICAL - Readmission (up to 30 days) during the study period (Dichotomous)IMPORTANT - A&E 4 hour waiting target met during the study period (Dichotomous) IMPORTANT - Delayed transfers of care during the study period (Dichotomous) IMPORTANT
Study design	Systematic reviews (SRs) of RCTs, RCTs, observational studies only to be included if no relevant SRs or RCTs are identified.
Unit of randomisation	Patient. Hospital. Ward.
Crossover study	Not permitted.
Minimum duration of study	Not defined.
Population stratification	None.
Reasons for stratification	Not applicable.
Subgroup analyses if there is heterogeneity	- Older than 85 years (85 years and younger; older than 85 years); effects may be different in this subgroup.
Search criteria	Databases: Medline, Embase, the Cochrane Library. Date limits for search: None. Language: English language only.

Appendix B: Clinical article selection

Figure 1: Flow chart of clinical article selection for the review of assessment through ECAU



Appendix C: Forest plots

C.1 Admission through ECAU versus direct admission

Figure 2: Readmission (30 days)

Figure 3: Mortality

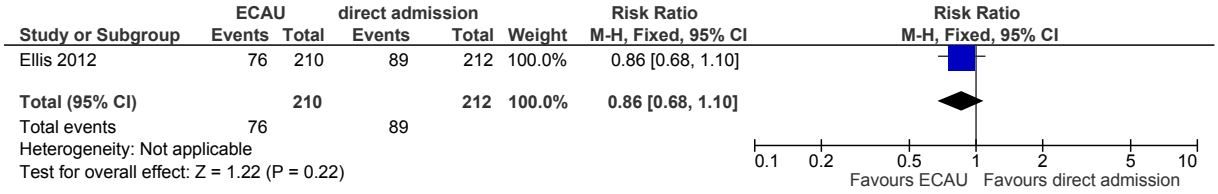
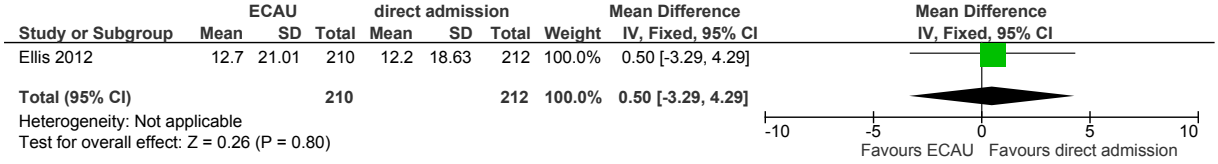


Figure 4: Length of stay



C.2 Admission through ECA area within AMU versus direct admission

Figure 5: Mortality (in-patient)

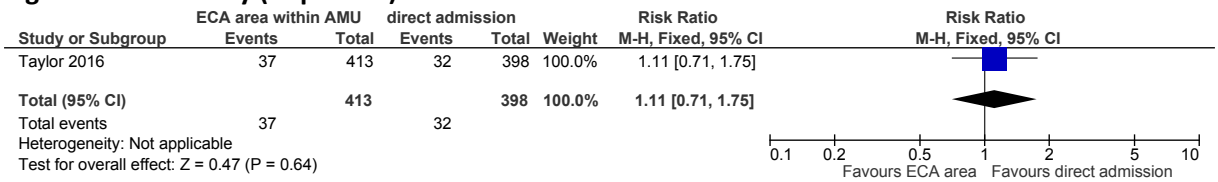


Figure 6: Mortality (30-day)

Figure 7: Readmission (30 days)

C.3 Admission by an elderly care team versus direct admission

Figure 8: Readmission (28-day)

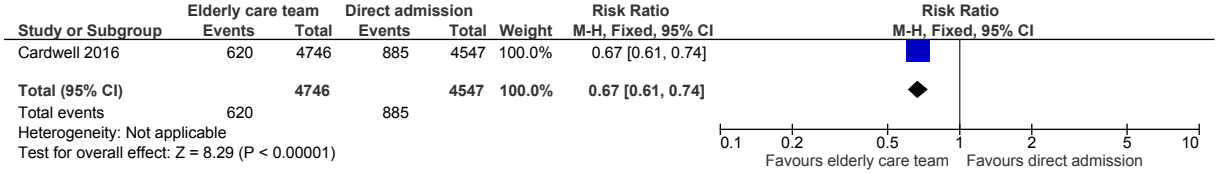
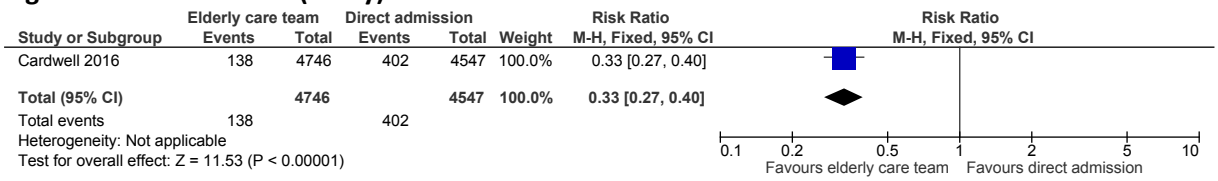


Figure 9: Readmission (7-day)



Appendix D: Clinical Evidence tables

Study	Cardwell 2016[17]
Study type	Before and after study
Number of studies (number of participants)	1 (n=16,061)
Countries and setting	Conducted in United Kingdom; setting: single centre ED
Line of therapy	Not applicable
Duration of study	Other: 6 months before the intervention and the same 6 months after
Method of assessment of guideline condition	Adequate method of assessment/diagnosis
Stratum	Admission through the AMU with care from a visiting elderly care team (geriatrician team): NA
Subgroup analysis within study	Not applicable
Inclusion criteria	Over 65 attending the ED between 9am and 5pm Monday - Friday
Exclusion criteria	Stroke, high level of care needed, on renal dialysis
Recruitment/selection of patients	Consecutive patients meeting the inclusion criteria during the study period
Age, gender and ethnicity	Age - Other: over 65s. Gender (M:F): not reported. Ethnicity: not reported
Further population details	1. Older than 85 years: Not applicable/Not stated/Unclear
Indirectness of population	No indirectness: n/a
Interventions	(n=8084) Intervention 1: Assessment and management through the ECAU at any part in the clinical pathway i.e. direct admission to EAU from GP, ED, or community referral. 'Front door' assessment of all over 65s with frailty - multidisciplinary team (consultant geriatrician, consultant in emergency medicine, emergency department nursing staff, specialist nurses from IC&ES, elderly mental health liaison nurse, local GP, pharmacist, physiotherapist, advanced nurse practitioner and admin staff) at the front desk in the ED with access to 8 care-of-the-elderly inpatient beds and 2 23-hour beds in the clinical decisions unit adjacent to the ED; team used a frailty index to screen between 9am-5pm Monday to Friday, those identified as frail entered the frail elderly pathway developed in the hospital. Duration: 6 months. Concurrent medication/care: n/a (n=7977) Intervention 2: No assessment and management through the ECAU at any part in the clinical pathway - Direct admission to a general medical ward from ED or by community or GP referral (inpatient care only). Usual care - no screening for frailty, ED processed the admissions in the same way as for all adult age groups – directed to the Acute Medical Receiving Unit as clinically appropriate. Duration: 6 months. Concurrent medication/care: NA

Study	Cardwell 2016[17]
Funding	-- (QuEST)
RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: ASSESSMENT AND MANAGEMENT THROUGH THE ECAU AT ANY PART IN THE CLINICAL PATHWAY I.E. DIRECT ADMISSION TO EAU FROM GP, ED, OR COMMUNITY REFERRAL versus DIRECT ADMISSION TO A GENERAL MEDICAL WARD FROM ED OR BY COMMUNITY OR GP REFERRAL (INPATIENT CARE ONLY) Protocol outcome 1: Readmission (up to 30 days) - Actual outcome for Admission through the AMU with care from a visiting elderly care team (geriatrician team): 28-day readmission at 28 days; Group 1: 620/4746, Group 2: 885/4547; Risk of bias: All domain - High, Selection - High, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low; Indirectness of outcome: No indirectness - Actual outcome for Admission through the AMU with care from a visiting elderly care team (geriatrician team): 7-day readmission at 7 days; Group 1: 138/4746, Group 2: 402/4547; Risk of bias: All domain - High, Selection - High, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low; Indirectness of outcome: No indirectness	
Protocol outcomes not reported by the study	Mortality; Patient and/or carer satisfaction; Length of stay; Adverse event rates; Quality of life; A&E 4 hour waiting target met; Delayed transfers of care

Study	Conroy 2014[24]
Study type	Before and after study
Number of studies (number of participants)	1 (n=4647)
Countries and setting	Conducted in United Kingdom; setting: ED East Midlands, UK
Line of therapy	Not applicable
Duration of study	Other: 2010-2012
Method of assessment of guideline condition	Adequate method of assessment/diagnosis
Stratum	Admission through an Elderly care/frailty Assessment Unit: n/a
Subgroup analysis within study	Not applicable: n/a
Inclusion criteria	All patients presenting to the ED
Exclusion criteria	Not reported
Recruitment/selection of patients	Consecutive patients presenting to the ED during the study period
Age, gender and ethnicity	Age - Other: 65+. Gender (M:F): Define. Ethnicity: not reported

Study	Conroy 2014[24]
Further population details	1. Older than 85 years: Not applicable/Not stated/Unclear (638 in the control group and 753 in the intervention group were over 85 years).
Indirectness of population	No indirectness: n/a
Interventions	(n=2490) Intervention 1: Assessment and management through the ECAU at any part in the clinical pathway i.e. direct admission to EAU from GP, ED, or community referral. Emergency frailty unit - embedded comprehensive geriatric assessment service within the ED. Duration: July 2011 - June 2012. Concurrent medication/care: not reported (n=2184) Intervention 2: No assessment and management through the ECAU at any part in the clinical pathway - Admission through the AMU. Emergency decisions unit - no routine input from specialists trained in geriatric medicine. Duration: 12 months (2010). Concurrent medication/care: not reported
Funding	Funding not stated
ESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: ASSESSMENT AND MANAGEMENT THROUGH THE ECAU AT ANY PART IN THE CLINICAL PATHWAY I.E. DIRECT ADMISSION TO EAU FROM GP, ED, OR COMMUNITY REFERRAL versus ADMISSION THROUGH THE AMU Protocol outcome 1: Readmission (up to 30 days) - Actual outcome for Admission through an Elderly care/frailty Assessment Unit: 30 day readmission rate at 30 days; Group 1: 221/2490, Group 2: 254/2184; Risk of bias: All domain - High, Selection - High, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low; Indirectness of outcome: No indirectness	
Protocol outcomes not reported by the study	Mortality; Patient and/or carer satisfaction; Length of stay; Adverse event rates; Quality of life; A&E 4 hour waiting target met; Delayed transfers of care

Study	Ellis 2012[37]
Study type	Before and after study
Number of studies (number of participants)	1 (n=422)
Countries and setting	Conducted in United Kingdom; setting: district general hospital, Scotland
Line of therapy	Not applicable
Duration of study	--: Oct 2009 - February 2010
Method of assessment of guideline condition	Adequate method of assessment/diagnosis
Stratum	Admission through an Elderly care/frailty Assessment Unit: n/a

Study	Ellis 2012[37]
Subgroup analysis within study	Not applicable: n/a
Inclusion criteria	Over 65 with 1 or more of the following: functional impairment (acute or chronic), cognitive impairment (acute or chronic), falls or other geriatric syndromes, care home patients
Exclusion criteria	Functionally independent patients or those with only single organ pathology requiring specialist input
Recruitment/selection of patients	Consecutive patients meeting the inclusion criteria during the study period
Age, gender and ethnicity	Age - Other: mean age 80.5 before ACE, mean age 81.1 after ACE. Gender (M:F): before ACE 59.4% female, after ACE 63.2% female. Ethnicity: not reported
Further population details	1. Older than 85 years: Not applicable/Not stated/Unclear (some patients were over 85 but unclear what proportion).
Indirectness of population	No indirectness: n/a
Interventions	(n=210) Intervention 1: Assessment and management through the ECAU at any part in the clinical pathway i.e. direct admission to EAU from GP, ED, or community referral. Acute care for elders unit - situated adjacent to the ED and medical receiving unit, designed to deliver rapid and thorough CGA for patients deemed by non-specialists to require admission as a form of clinical decision unit. Duration: December 2009 to February 2010. Concurrent medication/care: not reported (n=212) Intervention 2: No assessment and management through the ECAU at any part in the clinical pathway - Admission through the AMU. Medical receiving unit - use of standardised screening and assessment tools, multidimensional assessment by a multidisciplinary team and proactive discharge planning. Duration: October to December 2009. Concurrent medication/care: not reported
Funding	No funding
RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: ASSESSMENT AND MANAGEMENT THROUGH THE ECAU AT ANY PART IN THE CLINICAL PATHWAY I.E. DIRECT ADMISSION TO EAU FROM GP, ED, OR COMMUNITY REFERRAL versus ADMISSION THROUGH THE AMU Protocol outcome 1: Mortality - Actual outcome for Admission through an Elderly care/frailty Assessment Unit: mortality at 12 months; Group 1: 76/210, Group 2: 89/212; Risk of bias: All domain - Low, Selection - High, Blinding - Low, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low; Indirectness of outcome: No indirectness Protocol outcome 2: Length of stay - Actual outcome for Admission through an Elderly care/frailty Assessment Unit: mean total length of stay at hospital stay; Group 1: mean 12.7 days (SD 21.01); n=210, Risk of bias: All domain - High, Selection - High, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low; Indirectness of outcome: No indirectness	

Study	Ellis 2012[37]
Protocol outcome 3: Readmission (up to 30 days) - Actual outcome for Admission through an Elderly care/frailty Assessment Unit: 30 day readmissions at 30 days; Group 1: 33/210, Group 2: 36/212; Risk of bias: All domain - High, Selection - High, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low; Indirectness of outcome: No indirectness	
Protocol outcomes not reported by the study	Patient and/or carer satisfaction; Adverse event rates; Quality of life; A&E 4 hour waiting target met; Delayed transfers of care

Study	Taylor 2016[110]
Study type	Before and after study
Number of studies (number of participants)	1 (n=811)
Countries and setting	Conducted in United Kingdom; setting: large urban teaching hospital, UK
Line of therapy	Unclear
Duration of study	Intervention + follow up
Method of assessment of guideline condition	Adequate method of assessment/diagnosis
Stratum	Admission through an Elderly care Assessment Area (defined area) within the AMU: n/a
Subgroup analysis within study	Not applicable: n/a
Inclusion criteria	Patients over 75 years admitted to the emergency assessment unit
Exclusion criteria	Not reported
Recruitment/selection of patients	Consecutive patients meeting the inclusion criteria during the study period
Age, gender and ethnicity	Age - Median (range): pre-intervention 85(75-101), post-intervention 84 (75-101). Gender (M:F): M:F 293:518. Ethnicity: not reported
Further population details	1. Older than 85 years: Not applicable/Not stated/Unclear
Indirectness of population	No indirectness: n/a
Interventions	(n=413) Intervention 1: Assessment and management through the ECAU at any part in the clinical pathway i.e. direct admission to EAU from GP, ED, or community referral. Comprehensive older person's evaluation (COPE) zone - within the emergency assessment unit, twice daily MDT meeting, and patients identified as potentially fit for discharge kept on COPE zone, otherwise transferred to geriatric medicine ward. Duration: 1 month (September 2014). Concurrent medication/care: not reported

Study	Taylor 2016[110]
	(n=398) Intervention 2: No assessment and management through the ECAU at any part in the clinical pathway - Admission through the AMU. Medical patients admitted to the emergency assessment unit after being referred from the ED or a GP, patients requiring geriatrician input were seen by a daily in-reaching service. Duration: 1 month (September 2013). Concurrent medication/care: not reported
Funding	Funding not stated
RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: ASSESSMENT AND MANAGEMENT THROUGH THE ECAU AT ANY PART IN THE CLINICAL PATHWAY I.E. DIRECT ADMISSION TO EAU FROM GP, ED, OR COMMUNITY REFERRAL versus ADMISSION THROUGH THE AMU Protocol outcome 1: Mortality - Actual outcome for Admission through an Elderly care Assessment Area (defined area) within the AMU: in-patient deaths at admission; Group 1: 37/413, Group 2: 32/398; Risk of bias: Low; Indirectness of outcome: No indirectness - Actual outcome for Admission through an Elderly care Assessment Area (defined area) within the AMU: mortality at 30 days; Group 1: 19/413, Group 2: 22/398; Risk of bias: All domain - Low, Selection - High, Blinding - Low, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low; Indirectness of outcome: No indirectness, Comments: NA; Baseline details: greater proportion of males in intervention group Protocol outcome 2: Readmission (up to30 days) - Actual outcome for Admission through an Elderly care Assessment Area (defined area) within the AMU: readmission at 30 days; Group 1: 68/376, Group 2: 69/366; Risk of bias: All domain - High, Selection - High, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low; Indirectness of outcome: No indirectness, Comments: NA; Baseline details: greater proportion of males in intervention group	
Protocol outcomes not reported by the study	Patient and/or carer satisfaction; Length of stay; Adverse event rates; Quality of life; A&E 4 hour waiting target met; Delayed transfers of care

Appendix E: Economic evidence tables

Study	**Cardwell 2016[18]**			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost-effectiveness**
Economic analysis: CC **Study design: C**ohort study **Approach to analysis:** 6 months prospective cohort in 2014 compared with the same 6 months in previous year **Perspective:** NHS hospital **Time horizon/Follow-up** 28 days **Discounting:** No discounting.	**Population:** Patients age>65 attending the ED (excluding those with an obvious specialist pathway (stroke, renal dialysis, ITU). A large district general hospital located just outside Kilmarnock. Mean age: NR % male: NR **Intervention 1:** Frail older people's pathway (FOPP) - Frailty MDT team 9am-5pm. Those assessed to be frail in the ED were put on the frail person's pathway. (n=8,084) **Intervention 2:** No FOPP. (n=7,977)	**Incremental Costs (2-1) (mean per patient):** Intervention: +£19 LOS: -£67 Admission: -£63 Re-attendance -£11 Re-admission: -163 Total: -£287 (95% CI: NR; p=NR) **Currency & cost year:** 2014? UK pounds **Cost components incorporated:** Bed days, admissions, re-attendances, re-admissions	NA	NA **Analysis of uncertainty:** NR
Data sources				
Health outcomes: NA. **Quality-of-life weights:** NA **Cost sources:** Agenda for change pay scales and 'NHS bed-day cost for each ward'.				
Comments				
Source of funding: QuEST, NHS Scotland **Applicability and limitations:** Only cost comparison – only indicators of health were process outcomes like re-attendance and re-admission. Usual care was not described. The study was observational study, with no control for case-mix or time trend. No statistical or sensitivity analysis undertaken. Only hospital costs included. **Other:**				
Overall applicability:[(a)] Partially applicable **Overall quality**[(b)] Potentially serious limitations				

Abbreviations: CC: Comparative costs; 95% CI: 95% confidence interval; NA: not applicable; NR: not reported.

(a) Directly applicable/Partially applicable/Not applicable.

(b) Minor limitations/Potentially serious limitations/Very serious limitations.

Appendix F: GRADE tables

Table 8: Clinical evidence profile: admission through ECAU versus direct admission

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	ECAU	direct admission	Relative (95% CI)	Absolute		
Readmission (30-day) (follow-up 30 days; assessed with: no. of patients readmitted)												
2	observational studies	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	254/2700 (9.4%)	14.3%	RR 0.78 (0.67 to 0.92)	31 fewer per 1000 (from 11 fewer to 47 fewer)	⊕OOO VERY LOW	IMPORTANT
Mortality (12 months) (follow-up 12 months; assessed with: no. of patients dying)												
1	observational studies	no serious risk of bias[1]	no serious inconsistency	no serious indirectness	serious[2]	none	76/210 (36.2%)	42%	RR 0.86 (0.68 to 1.1)	59 fewer per 1000 (from 134 fewer to 42 more)	⊕OOO VERY LOW	CRITICAL
Length of stay (measured with: mean length of stay; Better indicated by lower values)												
1	observational studies	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	210	212	-	MD 0.5 higher (3.29 lower to 4.29 higher)	⊕OOO VERY LOW	CRITICAL

[1] All non-randomised studies automatically downgraded due to selection bias. Studies may be further downgraded by 1 increment if other factors suggest additional high risk of bias, or 2 increments if other factors suggest additional very high risk of bias.
[2] Downgraded by 1 increment if the confidence interval crossed 1 MID or by 2 increments if the confidence interval crossed both MIDs.

Table 9: Clinical evidence profile: admission through ECA area within AMU versus direct admission

Quality assessment							No of patients		Effect		Quality	Importance
No of	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	ECA area	direct	Relative	Absolute		

studies						considerations	within AMU	admission	(95% CI)			
In-patient mortality (assessed with: no. of patients dying in hospital)												
1	observational studies	no serious risk of bias[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	37/413 (9%)	8%	RR 1.11 (0.71 to 1.75)	9 more per 1000 (from 23 fewer to 60 more)	⊕OOO VERY LOW	CRITICAL
30 day mortality (follow-up 30 days; assessed with: no. of patients dying within 30 days of discharge)												
1	observational studies	no serious risk of bias[1]	no serious inconsistency	no serious indirectness	very serious	none	19/413 (4.6%)	5.5%	RR 0.83 (0.46 to 1.51)	9 fewer per 1000 (from 30 fewer to 28 more)	⊕OOO VERY LOW	CRITICAL
Readmission (30-day) (follow-up 30 days; assessed with: no. of patients readmitted)												
1	observational studies	Serious[1]	no serious inconsistency	no serious indirectness	very serious	none	68/376 (18.1%)	18.9%	RR 0.96 (0.71 to 1.3)	8 fewer per 1000 (from 55 fewer to 57 more)	⊕OOO VERY LOW	IMPORTANT

[1] All non-randomised studies automatically downgraded due to selection bias. Studies may be further downgraded by 1 increment if other factors suggest additional high risk of bias, or 2 increments if other factors suggest additional very high risk of bias.
[2] Downgraded by 1 increment if the confidence interval crossed 1 MID or by 2 increments if the confidence interval crossed both MIDs.

Table 10: Clinical evidence profile: admission by an elderly care team versus direct admission

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**ECA area within AMU**	**direct admission**	**Relative (95% CI)**	**Absolute**		
Readmission (assessed with: no. of patients readmitted within 28 days)												
1	observational studies	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	620/4746 (13.1%)	19.5%	RR 0.67 (0.61 to 0.74)	64 fewer per 1000 (from 51 fewer to 76 fewer)	⊕OOO VERY LOW	IMPORTANT
Readmission (assessed with: no. of patients readmitted within 7 days)												
1	observational studies	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	138/4746 (2.9%)	8.8%	RR 0.33 (0.27 to	59 fewer per 1000 (from 53 fewer to 64	⊕OOO VERY	IMPORTANT

									0.40)	fewer)	LOW	

[1] All non-randomised studies automatically downgraded due to selection bias. Studies may be further downgraded by 1 increment if other factors suggest additional high risk of bias, or 2 increments if other factors suggest additional very high risk of bias.

Appendix G: Excluded clinical studies

Table 11: Studies excluded from the clinical review

Study	Exclusion reason
Ahmed 2012A[1]	Incorrect intervention. Not focussed on admission
Aldeen 2014[2]	Incorrect comparison. Patients requiring intervention vs. patients not requiring intervention
Allen 2010[4]	n<250
Allen 2011B[3]	Incorrect intervention. Not focussed on admission
Applegate 1990[6]	Not guideline condition (inclusion – medically stable). CGA not focused on admission
Applegate 1991[5]	Literature review
Argento 2014[7]	Incorrect comparison. Intervention compared from year to year
Basic 2005[9]	Not guideline condition (inclusion – medically stable)
Barnes 2012[8]	Incorrect intervention. Not focussed on admission
Becker 1987[10]	Inappropriate comparison - multidimensional evaluation conducted by geriatric consultation team (GCT) for both intervention and control and treatment provided by GCT only for intervention group
Bloch 2013[11]	Incorrect interventions
Borenstein 2016[12]	Intervention not focused on admission (similar length of stay within the unit to a general medical ward)
Braude 2016[13]	Incorrect population –Surgical patients. Study assessed ward based geriatric liaison service for older urological surgical patients
Burke 2001[14]	No comparator
Campbell 1987[15]	Study design (literature review)
Cape 1994[16]	No comparator
Cavalieri 1993[19]	Incorrect interventions (nursing home)
Cefalu 1997[20]	No comparator
Clift 2012[21]	Incorrect comparison. No relevant outcomes
Cohen 2002[22]	Inappropriate intervention. Not focussed on admission
Collard 1985[23]	Incorrect interventions
Conroy 2011[25]	Systematic review: study designs inappropriate
Covinsky 1998[26]	Article on patients perspective on an acute care for elders unit
Dasgupta 1980[27]	Outcome reporting (data cannot be extracted)
Del giudice 2009[28]	Incorrect intervention -post-acute geriatric evaluation and management unit. Not focused on admission
Denewet 2016[29]	Incorrect population –oncology patients. Study evaluated CGA for predicting survival in geriatric oncology
Edmans 2011[32]	CGA not focused on admission (discharge)
Edmans 2013[30]	Study design (prognostic)
Edmans 2013[31]	CGA not focused on admission (discharge)
Ekdahl 2015[35]	Incorrect intervention (comprehensive geriatric assessment provided by an ambulatory geriatric care unit in outpatient setting)
Ekdahl 2015[35]	Outpatient setting- Comprehensive geriatric assessment (CGA) provided by an ambulatory geriatric care unit (AGU)

Study	Exclusion reason
Ekdahl 2015[33]	Systematic review is not relevant to review question or unclear PICO
Ekdahl 2016[34]	Incorrect intervention and setting- CGA in a geriatric ambulatory unit in a municipality
Elliott 2012[36]	Incorrect interventions (home care)
Ellis 2004[39]	Systematic review. Checked for relevant references
Ellis 2006[38]	Protocol for Cochrane review
Ellis 2011[41]	Systematic review: study designs inappropriate
Ellis 2011[42]	Systematic review. Ordered relevant references
Ellis 2014[40]	Descriptive literature review
Epstein 1990[43]	Incorrect interventions (ambulatory care)
Farber 2011[44]	Incorrect intervention. Not focussed on admission
Faul 2009[45]	Incorrect interventions (community-based)
Fletcher 2002[46]	Incorrect interventions (community-based)
Flood 2013[47]	Incorrect intervention. Not focussed on admission
Foo 2014[48]	Incorrect intervention. Intervention for patients who were planned for discharge from ED
Fox 2016A[49]	No comparator
Fretwell 1987[50]	Incorrect interventions (community-based)
Fretwell 1990[51]	Incorrect population (patients included when transferred out of intensive and coronary-care units). Included out-patient follow-up
Germain 1995[52]	Inappropriate comparison (ECAU compared to ECAU + team)
Gerritsen 1995[53]	No comparator
Gharacholou 2012[54]	Incorrect intervention. Not focussed on admission
Gladman 2012[55]	CGA not focused on admission (discharge)
Graf 2011[56]	Systematic review: study designs inappropriate
Gregersen 2012[57]	Incorrect comparison (geriatric department compared with general medical department)
Grudzen 2015[58]	No relevant outcomes
Harari 2007[60]	Not guideline condition (elective surgical admissions)
Harari 2007[59]	Observational study n<250
Harris 1991[61]	Geriatric assessment unit not focused on admission (similar length of stay within the unit to a general medical ward)
Heath 2005[62]	Incorrect interventions (home care)
Hernandez-vian 2007[63]	Non-English
Hogan 1984[65]	No comparator
Hogan 1990[64]	Literature review
Horgan 2012[66]	No comparator
Humphries 1992[67]	Incorrect interventions. No comparison
Hung 2013[68]	Incorrect intervention. Not focussed on admission
Jones 2004[69]	Incorrect interventions (community-based)
Kamel 2005[70]	Systematic review is not relevant to review question or unclear PICO
Karppi 1995[71]	Inappropriate comparison (home-care). CGA not focused on admission (discharge)
Karppi 1995[72]	Inappropriate comparison (home-care)
Kay 1992[73]	Not guideline condition (inclusion – medically stable)

Study	Exclusion reason
Kergoat 2012[74]	No comparator
Kircher 2007[75]	Incorrect intervention (not focussed on admission)
Landefeld 1995[76]	Inappropriate intervention. Not focussed on admission
Landi 2001[77]	Incorrect interventions (home-care)
Lightbody 2002[78]	Commentary on Cohen 2002
Mcdowell 1994[79]	Incorrect interventions (out-patient)
McVey 1989[80]	Not review population
Naughton 1994[83]	Incorrect interventions (not focussed on admission)
Nikolaus 1999[84]	Incorrect intervention (not focussed on admission); not review population (patients had to be stable)
Nipp 2012[85]	Not review population
Owen 2015[87]	No comparator
Parker 2000[88]	Systematic review: study designs inappropriate
Phibbs 2006[89]	CGA not focused on admission (in-patient, discharge, and out-patient)
Pitner 2004[90]	Incorrect intervention (not focussed on admission)
Popplewell 1983[91]	Geriatric assessment unit not focused on admission (similar length of stay within the unit to a general medical ward)
Reuben 1995[92]	CGA not focused on admission (patients included 24-72 after admission)
Riley 1974[93]	Descriptive
Rockwood 2003[94]	Incorrect interventions (community-based)
Rosenberg 2012[95]	Incorrect interventions (home-care)
Rubenstein 1984[98]	Not AME patients- patients still in the hospital 1 week after admission for acute care included in the study i.e. after stabilisation of their acute problems
Rubenstein 1987[96]	Not AME patients (sub-acute)
Rubenstein 1995[97]	Not AME patients- Only medically stable patients included
Saltvedt 2002[99]	Incorrect intervention (not focussed on admission)
Saltvedt 2004[100]	Incorrect interventions(not focussed on admission)
Saltvedt 2005[102]	Incorrect intervention (not focussed on admission)
Saltvedt 2006[101]	Incorrect intervention (not focussed on admission)
Saltz 1988[103]	Not review population
Silverman 1995[105]	Incorrect interventions (out-patient)
Soejono 2008[107]	Incorrect intervention (not focussed on admission)
Stewart 1999[108]	Incorrect intervention (not focussed on admission)
Stuck 1995[109]	Incorrect intervention (home-care)
Teasdale 1983[111]	Geriatric assessment unit not focused on admission (rehabilitation)
Toseland 1996[112]	Incorrect interventions (out-patient)
Trentini 2001[113]	Incorrect setting -outpatient. The study assessed effectiveness of outpatient elderly care based on CGA
Van Craen 2010[114]	Systematic review. Ordered relevant references
White 1994[115]	Inappropriate population- medically stable elderly patients at risk for function decline or with rehab potential
Williams 1987[116]	Incorrect interventions (out-patient)
Winograd 1993[117]	Incorrect intervention (not focussed on admission)
Wong 1996[118]	Inappropriate comparison (team compared to team + pharmacist)

Study	Exclusion reason
Wooldridge 1995[119]	Incorrect intervention (not focussed on admission)
Yoo 2013A[120]	Incorrect intervention. Not focussed on admission
Yoo 2014[121]	Incorrect intervention. Not focussed on admission

Appendix H: Excluded economic studies

No studies were excluded.