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Consultation

Chapter 19 Early versus late consultant review

Emergency and acute medical care in over 16s: service delivery and organisation

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Chapter 19 Early versus late consultant review

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19 Early versus late consultant review

19.1 Introduction

Traditional models of medicine have often relied on patients being admitted by one of the more junior members of the team, then reviewed by a middle grade member, and not being reviewed by a consultant until the next day (on the 'post take' round), or even later in the week. It is often thought that this can lead to delayed discharges (as a minimum), the patient having to stay overnight to see the consultant or, worse, delayed diagnosis and effective treatment. Therefore, in the last decade, there has been a move towards earlier consultant review and many specialist societies now recommend it takes place within hours of admission.

Earlier consultant review may allow the less sick patient to go home earlier, possibly even avoiding admission and also allowing earlier recognition of the sicker patient, with earlier institution of effective therapy and possibly decreased mortality. However, earlier discharge may lead to more re-admissions, and earlier reviews may not be effective if relevant tests results are not available. Equally, different age groups and different illnesses may have different results. However, it would seem reasonable that early review by a senior and more experienced doctor should improve the patient's experience of healthcare.

The guideline committee therefore wanted to know if there was a net patient benefit to having a consultant review patients early in their presentation to hospital, what this might be and whether there was a difference depending on how sick the patient was and what was wrong with them. This would need to be balanced against any potential harm that might occur and how much it might cost.

19.2 Review questions:

Is early consultant triage in the ED (RAT model) more clinically and cost effective than later consultant review?

Is early consultant review in the AMU, ICU, HDU, CCU or Stroke Unit more clinically and cost effective than later consultant review?

For full details see review protocols in Appendix A.

Table 1: PICO characteristics of review question

Population	Adults and young people (16 years and over) with a suspected or confirmed AME
Intervention	Early consultant review
Comparison	Later consultant review (any time point that is later than the intervention)
Outcomes	Patient outcomes: • Early diagnosis (IMPORTANT) • Hospital admission (IMPORTANT) • Quality of life (CRITICAL) • GP visits (IMPORTANT) • Mortality (CRITICAL) • Avoidable adverse events (CRITICAL) • Diagnostic test number (IMPORTANT) • Patient and/or carer satisfaction (CRITICAL) • Length of stay in ED (CRITICAL) • Readmission up to 30 days (IMPORTANT) • Discharge (IMPORTANT) • Referrals from admissions (IMPORTANT) Staff outcomes: • Staff satisfaction (IMPORTANT) • Trainee satisfaction (IMPORTANT)
Study design	Systematic reviews (SRs) of RCTs, RCTs, observational studies only to be included if no relevant SRs or RCTs are identified.

19.3 Clinical evidence

Eight studies were included in the review[12,32,41,67,77,110,132,151] and are summarised below. Evidence from these studies are summarised in the GRADE clinical evidence profile and clinical evidence summary below (Table 3, Table 4, Table 7). 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.

We searched for randomised controlled trials (RCTs) comparing the effect of early versus late consultant triage in 5 different settings (ED, ICU, AMU, CCU and stroke units) on patient outcomes.

One RCT[41] was included which was set in the ED and compared the effects of a model of care aiming to implement early senior work up assessment and treatment with no model of care.

Six observational studies[12,32,67,77,132,151] were included in the ED. Three of these studies[12,77,132] were similar in design to the RCT in that an intervention was implemented to facilitate early consultant review, which was then compared to days on which the intervention was not implemented; however, patients were not randomised to treatment. Two of these studies[77,132] were confounded by the addition of point of care testing to the intervention of early consultant review and were downgraded for risk of bias. One of these studies was confounded by the intervention being carried out on days of peak demand[12]; however this study did adjust for confounding variables.

Two of the 6 observational studies set in ED presented data from naturally occurring situations in which some patients were seen exclusively by consultants due to the absence or reduced availability of junior doctors[32,67]. Outcomes were compared with times when junior doctors were present. One of these studies[67] was confounded by different triage scores at baseline between the 2 groups and was therefore downgraded for risk of bias.

The final observational study[151] set in ED reported the proposed management of patients by junior trainees versus the subsequent effect of the senior review process on patient disposition.

No RCTs set in ICU, AMU, CCU and stroke units were found. One cohort study set in AMU[110] was identified.

As no studies reported patient and/or carer satisfaction, data relating to 'did not wait to be seen' patients were analysed as a surrogate marker, but downgraded for indirectness to the protocol.

Table 2: Summary of included studies

Study	Study design	Setting	Intervention and comparison	Population	Outcomes
Asha 2013[11]	Observational cohort study	ED	SAS (senior assessment and streaming). Following triage, appropriate patients were taken to a dedicated clinical area staffed by an emergency physician intern (additional to usual rota staff) and senior nurse; versus. Days when the model of care was not implemented.	Patients presenting to the ED of St George Hospital, a tertiary referral centre located in Sydney, Australia.	Length of stay, percent of patients achieving the National Emergency Access Target (NEAT), percent of discharged patients achieving NEAT, percent of admitted patients achieving NEAT, 'did not wait to be seen' rate.
Christmas 2013[30]	Observational study	ED	Consultant night shift versus. Middle grade doctor night shift.	Patients presenting to Barnsley District General Hospital emergency department, UK.	Length of stay, percent patients admitted, percent returning within 7 days.
Davis 2014[40]	RCT	ED	SWAT (senior work up assessment and treatment) model of care including emergency physician, junior medical officer and ED nurse versus control (standard care).	1737 patients admitted to the emergency department of an inner city tertiary level hospital in Sydney Australia.	Percent achieving NEAT; median length of stay; percent of admitted patients achieving NEAT, percent of discharged patients achieving NEAT, admissions, discharges.
Harvey 2008[66]	Observational study	ED	Junior doctors strike period versus. Non-strike period.	All patients presenting to ED of Waikato Hospital, a 650 bed university-affiliated teaching hospital.	Length of stay, number of clinical investigations, percent seen within recommended waiting time, admission rate, 30 day unscheduled readmissions, 'did not wait to

Study	Study design	Setting	Intervention and comparison	Population	Outcomes
					be seen' rate, mortality.
Jarvis 2014[76]	Observational cohort study	ED	Emergency Department Intervention Team 'EDIT' consisting of an additional consultant, senior nurse and health care assistant. The role of consultant was to sign off the investigation plan, order radiological investigations and perform a more thorough assessment of those patients deemed eligible for discharge. Point of care testing was available for full blood counts, renal function, blood gas analysis; versus Nurse-led triage using Manchester triage tool. Blood samples were analysed in the central hospital lab.	All patients (adults and children) presenting to the emergency department between 9am and 5pm were included unless deemed to be suffering from a minor injury at Calderdale Royal Hospital, Halifax, UK.	'Time to ED ready' (length of stay).
McNeill 2009[107]	Observational cohort study	AMU	Consultant present versus. Consultant absent.	2928 treated at AMU, Ipswich Hospital, UK.	Length of stay, percent discharged on day of admission, percent of patients discharged within 24 hours and readmitted within 1 week for same clinical problem, mortality during admission.
Shetty 2012[131]	Before and after study	ED	SAFE-T zone model of care (multiple interventions including	All patients presenting to ED at Westmead Hospital, a tertiary adult hospital	Length of stay, 'did not wait to be seen' rate.

Study	Study design	Setting	Intervention and comparison	Population	Outcomes
			early senior ED physician review, point-of-care testing) versus no model of care.	with 650 emergency beds in western Sydney metropolitan area.	
White 2010[149]	Before and after study	ED	Proposed management of patients by junior trainees versus the subsequent effect of the senior review process on patient disposition.	All patients who had a change of disposition from admission to discharge by the senior doctor (consultant) in the ED, Ninewells Hospital, Dundee, UK.	Admissions.

Table 3: Clinical evidence summary: Early versus late consultant review in ED: RCT evidence (SWAT versus control)

Outcomes	No of Participants (studies) Follow up	Quality of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with late consultant review	Risk difference with Early (95% CI)
Proportion of patients who met NEAT (National Emergency Access Target, seen and discharged from ED within 240 minutes of triage)	1169 (1 study)	⨁⨁⨁⊖ MODERATE[a] due to risk of bias	RR 1.04 (0.92 to 1.18)	Moderate	
				456 per 1000	18 more per 1000 (from 36 fewer to 82 more)
Proportion of admitted patients who met NEAT	448 (1 study)	⨁⨁⊖⊖ LOW[a,b] due to risk of bias, imprecision	RR 1.26 (0.86 to 1.83)	Moderate	
				178 per 1000	46 more per 1000 (from 25 fewer to 148 more)
Proportion of discharged patients who met NEAT	721 (1 study)	⨁⨁⨁⊖ MODERATE[a] due to risk of bias	RR 1.02 (0.91 to 1.14)	Moderate	
				625 per 1000	12 more per 1000 (from 56 fewer to 87 more)
Number of patients admitted	1169 (1 study)	⨁⨁⨁⊖ MODERATE[a] due to risk of bias	RR 1.03 (0.89 to 1.19)	Moderate	
				377 per 1000	11 more per 1000 (from 41 fewer to 72 more)
Number of patients discharged	1169 (1 study)	⨁⨁⨁⊖ MODERATE[a] due to risk of bias	RR 0.98 (0.9 to 1.08)	Moderate	
				623 per 1000	12 fewer per 1000 (from 62 fewer to 50 more)

(a) Downgraded by 1 increment if the majority of the evidence was at high risk of bias, and downgraded by 2 increments if the majority of the evidence was at 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.

Other outcomes that were unable to be analysed in Revman included: length of stay (for all patients): median 261 minutes (IQR 171, 386) in the SWAT group and median 255 minutes (IQR 177,376) in the control (standard care) group. For discharged patients length of stay was median 206 minutes (IQR 140, 294) in the SWAT group and 208 (IQR 147, 283) in control. For admitted patients length of stay was median 374 minutes (IQR 273-494) in the SWAT group and 381 minutes (IQR 274, 478) in control.

Table 4: Clinical evidence summary: Early versus late consultant review in ED: observational evidence

Outcomes	No of Participants (studies) Follow up	Quality of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with late consultant triage	Risk difference with Early consultant triage (95% CI)
Length of stay (minutes)	1291 (1 study)	⨁⊖⊖⊖ VERY LOW[a,b] due to risk of bias, imprecision	-	-	The mean length of stay (minutes) in the intervention groups was 68.3 lower (84.76 to 51.84 lower)
Mortality	1291 (1 study)	⨁⊖⊖⊖ VERY LOW[a,b] due to risk of bias, imprecision	Peto OR 2.20 (0.23, 21.23)	Moderate	
				2 per 1000	2 more per 1000 (from 2 fewer to 39 more)
30 day unscheduled readmissions	1291 (1 study)	⨁⊖⊖⊖ VERY LOW[a,b] due to risk of bias, imprecision	RR 0.75 (0.52 to 1.09)	Moderate	
				94 per 1000	23 fewer per 1000 (from 45 fewer to 8 more)
Admitted	1446 (1 study)	⨁⊖⊖⊖ VERY LOW[a] due to risk of bias	RR 0.34 (0.28 to 0.41)	Moderate	
				424 per 1000	280 fewer per 1000 (from 250 fewer to 305 fewer)
Percent achieving NEAT	18962 (1 study)	⨁⊖⊖⊖ VERY LOW[a] due to risk of bias	OR 1.15 (1.07 to 1.24)	Moderate	
					140 more per 1000 (from 70 more to 210 more)
Percent achieving NEAT of those	12225	⨁⊖⊖⊖	OR 1.17	Moderate	

Outcomes	No of Participants (studies) Follow up	Quality of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with late consultant triage	Risk difference with Early consultant triage (95% CI)
discharged	(1 study)	VERY LOW[a,b] due to risk of bias, imprecision	(1.07 to 1.28)		160 more per 1000 (from 70 more to 250 more)
Percent achieving NEAT of those admitted	6737 (1 study)	⊕⊖⊖⊖ VERY LOW[a] due to risk of bias	OR 1.1 (0.98 to 1.23)	Moderate	
					100 more per 1000 (from 20 fewer to 210 more)
Percent seen within recommended waiting times	1291 (1 study)	⊕⊖⊖⊖ VERY LOW[a,b] due to risk of bias, imprecision	RR 1.26 (1.13 to 1.4)	Moderate	
				460 per 1000	120 more per 1000 (from 60 more to 184 more)
'Did not wait to be seen' patients (Harvey 2008)	1291 (1 study)	⊕⊖⊖⊖ VERY LOW[a,b,c] due to risk of bias, indirectness, imprecision	RR 0.73 (0.34 to 1.54)	25 per 1000	7 fewer per 1000 (from 16 fewer to 13 more)
'Did not wait to be seen' patients (Asha 2013)	18962 (1 study)	⊕⊖⊖⊖ VERY LOW[a,b,c] due to risk of bias, indirectness, imprecision	OR 0.72 (0.58 to 0.89)	Moderate	
				0 per 1000	330 fewer (from 540 fewer to 110 fewer)
'Did not wait to be seen' patients (Shetty 2012)	23, 253 (1 study)	⊕⊖⊖⊖ VERY LOW[a,b] due to risk of bias, indirectness	RR 0.9 (0.83 to 0.97)	Moderate	
				107 per 1000	11 fewer per 1000 (from 3 fewer to 18 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.

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

(c) Indirect outcome.

19.3.1 Other outcomes that could not be analysed in Revman:

Table 5: Clinical evidence summary: Early versus late consultant review in ED: observational evidence

ED length of stay (hour) (Median IQR)	Early consultant review	Late consultant review
Asha 2013[12]	3.72 (2.28-5.6)	3.76 (2.37-5.7)
Christmas 2013[32]	2.065 (1.878-2.252)	2.395 (2.305-2.487)
Jarvis 2014[77]	1.26	2.15
AST 3	6.5 (4.2-9.4)	7.5 (5.3-10.5)
AST 4	4.9 (2.8-7.6)	5.7 (3.6-8.4)
AST 5	3.1 (1.7-5.0)	3.5 (1.9-5.4)

19.3.2 Clinical investigations

One study[67] reported the number of clinical investigations per patient.

Table 6: Clinical evidence summary: Early versus late consultant review in ED: observational evidence

	Early consultant review		Late consultant review	
ED length of stay (hour) (Median IQR)	Tests/patient	Total number	Tests/patient	Total number
Haematology	0.54	331	0.58	398
Biochemistry	0.54	326	0.58	395
Plain film XR	0.45	272	0.48	328
Ultrasound	0.025	15	0.034	23
CT	0.066	40	0.06	41
MRI	0.0016	1	0.0088	6

19.3.3 Unplanned readmissions

One study[32] reported that 7.9% (6.5-9.3%) of patients who had been seen during the consultant shift returned to ED within 7 days versus 8.1% (7.4-8.9%) of those seen during the middle grade doctor shift. This paper did not give the number for each group so this data could not be analysed in Revman.

19.3.4 Admissions

One study[32] reported that 27.1% (24.2-30.1%) of patients who had been seen during the consultant shift were admitted versus 31.0% (29.6-32.5%) of those seen during the middle grade doctor shift. This paper did not give the number for each group so this data could not be analysed in Revman.

Table 7: Clinical evidence summary: Early versus late consultant review in AMU (Consultant absent versus Consultant present): Cohort study evidence.

Outcomes	No of Participants (studies) Follow up	Quality of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with consultant absent	Risk difference with Consultant present (95% CI)
Length of stay – days	2928 (1 study)	⊕⊖⊖⊖ VERY LOW[a,b] due to risk of bias, indirectness		The mean length of stay - days in the control groups was 9.06 days	The mean length of stay - days in the intervention groups was 1.34 lower (2.67 to 0.01 lower)
Percent of patients discharged on day of admission	2928 (1 study)	⊕⊖⊖⊖ VERY LOW[a,b] due to risk of bias, indirectness, imprecision	RR 1.4 (1.22 to 1.6)	Moderate	
				322 per 1000	129 more per 1000 (from 71 more to 193 more)
Percent patients discharged within 24 hours and readmitted within 1 week for same clinical problem	2928 (1 study)	⊕⊖⊖⊖ VERY LOW[a,b,c] due to risk of bias, indirectness, imprecision	RR 1.19 (0.64 to 2.23)	Moderate	
				15 per 1000	3 more per 1000 (from 5 fewer to 18 more)
Mortality during admission	2928 (1 study)	⊕⊖⊖⊖ VERY LOW[a,b,c] due to risk of bias, indirectness, imprecision	RR 0.93 (0.73 to 1.19)	Moderate	
				101 per 1000	7 fewer per 1000 (from 27 fewer to 19 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) The evidence is indirect as the exact time of consultant review was not reported.

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

19.4 Economic evidence

Published literature

No relevant economic evaluations were identified.

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

New cost-effectiveness analysis

An original cost-effectiveness analysis was conducted for this topic – see the economic profile table below (Table 8) and Chapter 41 for details.

Table 8: Economic evidence profile: Earlier versus later consultant assessment

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
NGC 2017 UK	Directly applicable	Potentially serious limitations [(a)]	Study design: **Lifetable model** Evaluation type: Cost-utility Intervention: **Rapid Assessment and Treatment in the ED** Population: Patients presenting to ED	+£6.20	+0 QALYs	RAT was dominated by usual catre	With more optimistic treatment effect assumptions, RAT cost £87,463 per QALY gained. Otherwise RAT was dominated
NGC 2017 UK	Directly applicable	Potentially serious limitations [(a)]	Study design: **Lifetable model** Evaluation type: Cost-utility Intervention: **Extended consultant hours in the AMU (6pm-10pm)** Population: Patients admitted to the Acute Medical Unit	+£9.34	+0.00024 QALYs	£39,222 per QALY gained	With more optimistic treatment effect assumptions, the ICER dropped to £22,098 per QALY. Otherwise the ICER remained above £30k per QALY gained

Abbreviations: CCA: cost-consequences analysis; ED: Emergency Department ICER: incremental cost-effectiveness ratio; n/a: not applicable; QALY: quality-adjusted life-year; RAT=Rapid assessment and treatment.

(a) Treatment effects were elicited by experts.

19.5 Evidence statements

Clinical

Emergency departments

Seven papers were identified that assessed early versus late consultant reviews in the emergency department. Six of these studies were observation studies and 1 study was a randomised controlled trial.

One randomised controlled trial comprising 1737 participants evaluated senior work up assessment treatment (SWAT) with non-SWAT treatment and standard care for improving outcomes, in adults and young people at risk of an AME, or with a suspected or confirmed AME. The evidence suggested that SWAT may provide a benefit in increased proportion of patients achieving the National Emergency Access Target (NEAT) (1 study, moderate quality), proportion of admitted patients who met NEAT (1 study, low quality), and proportion of discharged patients who met NEAT (1 study, moderate quality). However, there were more patients admitted (1 study, moderate quality) and fewer patients discharged with early consultant review (1 study, moderate quality).

Six observational studies evaluated early versus late consultant reviews for improving outcomes, in adults and young people at risk of an AME, or with a suspected or confirmed AME. The evidence suggested that early consultant reviews may provide a benefit in reduced length of ED stay, 30 day unscheduled re-admissions , admissions, patients achieving NEAT, discharged patients achieving NEAT, admitted patients achieving NEAT, patients seen within the recommended time and patients who did not wait to be seen (1 study, very low quality). However, there was a possible increase in mortality (1 study, very low quality).

Acute medical units

One observational study comprising 2928 participants evaluated consultant presence versus when the consultant was absent for improving outcomes, in adults and young people at risk of an AME, or with a suspected or confirmed AME. The evidence suggested that consultant reviews may provide a benefit in reduced length of stay and proportion of patients discharged on the same day. There was no effect on mortality during admission. However, there was a possible increase in the proportion of patients discharged within 24 hours and readmitted within 1 week for the same clinical problem. The evidence was graded very low quality for all outcomes.

Economic

An original cost-utility analysis found that Rapid Assessment and Treatment in the Emergency Department (RAT) was not cost-effective (increased costs with no quality-adjusted life-years gained). This analysis was assessed as directly applicable with potentially serious limitations.

An original cost-utility analysis found that extended consultant hours on the Acute Medical Unit were not cost-effective (ICER: £39,200 per QALY). This analysis was assessed as directly applicable with minor limitations. This analysis was assessed as directly applicable with potentially serious limitations.

19.6 Recommendations and link to evidence

Recommendations	**10. For people admitted to hospital with a medical emergency, consider providing the following:** • **Consultant assessment within 12 hours of admission to determine the person's care pathway** • **Daily consultant review, including weekends and bank holidays** • **More frequent (for example, twice daily) consultant review based on clinical need.** **Evaluate each of these options locally, taking into account current staffing models, case mix and severity of illness.**
Research recommendation	**-**
Relative values of different outcomes	Mortality, quality of life, avoidable adverse events and patient and/or carer satisfaction were considered by the committee to be critical outcomes. Early diagnosis, hospital admission, number of diagnostic tests, length of stay, GP visits, referrals from admission, unplanned readmission, discharge and staff satisfaction were considered to be important outcomes. The committee considered that avoiding readmission was likely to be particularly important for people who have a chronic condition as this has an impact on mortality and also could have an impact upon psychological wellbeing and the ability to maintain independence.
Trade-off between clinical benefits and harms	**Emergency Department** A single RCT was identified. The committee decided that the Senior Work up Assessment and Treatment (SWAT) intervention had most similarities to current systems in the NHS (Rapid Assessment and Treatment [RAT]) compared to the non-SWAT intervention because for consultants to work effectively, they need the support of a team and therefore seeing patients alone would not be productive. Indeed, in the UK, consultants do not normally see patients in isolation. The comparison of SWAT versus control data suggested that SWAT may provide a benefit in increased proportion of patients achieving the National Emergency Access Target (NEAT), which is to be seen and discharged from the ED within 240 minutes of triage; proportion of admitted patients who met NEAT; and proportion of discharged patients who met NEAT. However, there were more patients admitted and fewer discharged with early consultant review. The committee surmised that early consultant review might, in some circumstances, be disadvantageous if it took place before definitive investigations were available which might have permitted safe discharge on later review. Therefore, review prior to all the relevant information being present may result in a greater number of patients admitted. However, the fact that more patients were admitted, although increasing demand, may be a positive step as it may ensure that certain patients receive the inpatient care their condition requires. The presence of a senior decision maker may identify these patients. The committee discussed their experience of the Rapid Assessment and Treatment system (the UK system of immediate consultant triage at presentation to ED). Perceived benefits included more rapid diagnosis, earlier administration of antibiotics and analgesics, and more appropriate triage. However, such outcomes are not normally measured in trials whereas admission, discharge and length of stay are affected by a wide variety of factors, and therefore may not accurately capture

the whole effects of early consultant triage.

Six observational studies suggested that early consultant review may provide a benefit in reduced length of ED stay, 30 day unscheduled re-admissions, admissions, patients achieving NEAT, discharged patients achieving NEAT, admitted patients achieving NEAT, patients seen within the recommended time and patients who did not wait to be seen. There was a possible increase in mortality but this was discounted by the committee as there was only a difference of 1 case between the 2 groups.

No evidence was identified for early diagnosis, quality of life, GP visits, avoidable adverse events, diagnostic test number, patient and/or carer satisfaction, referral from admissions and staff or trainee satisfaction.

Acute Medical Unit

A single observational study was identified suggesting that early consultant review may provide a benefit in reduced length of stay, and the proportion of patients discharged on the day of admission. There was no effect on mortality during admission; there was a possible increase in the proportion of patients discharged within 24 hours and readmitted within 1 week for the same clinical problem.

No evidence was identified for hospital admission, readmission, early diagnosis, quality of life, GP visits, avoidable adverse events, diagnostic test number, patient and/or carer satisfaction, referral from admissions and staff or trainee satisfaction.

Stroke patients:

No evidence was identified in a stroke care setting. The committee felt that the results from ED and AMU could be extrapolated to stroke patients.

Intensive (or critical) care unit:

No evidence was identified in an intensive care unit (critical care unit) setting. Studies of resident versus non-resident intensive care specialists were considered too indirect to be employed as substitutes for early consultant review. Given the lack of evidence, the committee felt that the results from ED and AMU patients could be extrapolated to the ICU.

Overall

The committee noted that the effect of early consultant involvement is dependent upon the staffing model, the case mix presenting and the disease process. For example, conditions with a well-defined treatment pathway may benefit more from early consultant involvement if this results in earlier diagnosis and entry to the pathway. In settings where patients are presenting with often unclear disease processes (for example, in an emergency department), the benefit of early consultant involvement might be realised if consultants' greater knowledge results in earlier diagnosis, or diminished if the diagnostic process is complex. The committee noted that a range of models for early consultant involvement were used in the studies examined, and that the model used within a UK context may differ from those included in the studies. For example, the Rapid Assessment and Treatment model implemented within some emergency department settings in the UK was a model containing a range of interventions, including early consultant involvement. It was felt to be similar but not identical to the SWAT model in the RCT for EDs.

Overall, the evidence was mixed but suggested some benefit in outcomes over usual care for the ED and AMU. No evidence was identified to suggest harm in early consultant involvement and the committee were not aware of any negative outcomes that might occur. They therefore chose to make a consensus recommendation to consider early consultant involvement in care of a patient with

	an acute medical emergency.
Trade-off between net effects and costs	No relevant economic evaluations were identified. Unit costs of staff time, emergency department visits and relevant hospital admissions and stays were presented to the committee. One RCT, described above, set in the emergency department showed that the SWAT arm of the trial was associated with a trend for more patients meeting the 4-hour target; however, there was also a trend for more admissions and less discharges compared to the control arm. The committee felt that without information on the appropriateness of the decisions to admit or discharge, it would be difficult to fully assess the impact of the SWAT model. Anecdotally, the committee felt that the equivalent model in the UK (Rapid Assessment and Treatment or RAT) had shown some clinical benefit in terms of timely diagnosis and treatment. These benefits might be expected to result in saving in downstream costs. For the AMU, the observational study included in the clinical review suggested that there was a reduction in length of stay, which would translate into possible cost saving. The committee noted that the economic impact of early consultant assessment would be dependent on how it could be achieved or implemented in practice. Possible scenarios discussed included increasing the number of consultants, increasing their contracted hours (which might include working out-of-hours or being on-call) or accommodating the required changes in the consultants' current rotas by prioritising early patient assessments over other duties, which can be undertaken by other staff members. The committee commented that the most likely scenario in large hospitals is that consultant rotas could be tailored to accommodate prioritising assessing patients given current capacity levels and the limited number of NHS consultants, which precludes the possibility of recruiting more consultants. However, this may not be feasible in smaller hospitals. New cost-effectiveness analyses were conducted for 2 areas of early consultant assessment with the results presented to the committee. A cohort model was built to assess the cost-effectiveness of early consultant assessment. . Both models used inputs from bespoke data analysis, national data and treatment effects (primarily length of stay reduction and modest reductions in adverse events) that were informed by the above review but elicited from the committee members. The full model write up can be found in Chapter 41. The guideline technical team are developing a hospital simulation model. Work on this is ongoing but the methods are described in Chapter 41. **Rapid Assessment and Treatment in the Emergency Department (RAT)** The model compared RAT in the ED with no RAT. RAT involves an immediate assessment by a consultant in the ED, using additional resources in terms of consultant time at an incremental cost to normal care. The model found that RAT was cost increasing with assumed no impact on quality of life, hence no gain in quality-adjusted life-years. The committee noted that RAT is a costly intervention with a large cohort, with additional consultant time for all ED major patients. An optimistic sensitivity analysis found RAT to cost £87,500 per QALY gained – far from being cost effective. The main impact of RAT is likely to be on hospital flow, not taken into account by the cohort model. The committee concluded that RAT is a costly intervention although it might still have a positive impact on hospital flow in hospitals operating at sub-optimal levels of efficiency within the emergency department. **Extended hours for consultants in Acute Medical Units (AMU)** The model compared consultant assessment available in the AMU 08:00-18:00 with consultant assessment available in the AMU 08:00-22:00. Therefore, the intervention involves the presence of a consultant to assess and treat on the AMU

	for an additional 4 hours in the evenings, 7 days a week. This uses additional resources in terms of consultant time at an incremental cost to normal care. The results of the cohort model found that extended hours on the AMU was cost increasing with a small impact on quality-adjusted life-years. However, the QALYs gained were not large enough in the base case or optimistic sensitivity analysis to allow an incremental cost-effectiveness ratio under the £20,000 threshold, £39,200 per QALY gained in the base case and £22,100 in the optimistic treatment effects sensitivity analysis. The committee noted the results of the cohort model with an ICER close to the £20,000 threshold in the sensitivity analysis. However, they also noted that extended hours in the AMU was likely to have an impact on hospital flow, not taken into account by the cohort model. The committee noted that the intervention allows earlier decision making, potentially avoiding an overnight admission or facilitating earlier discharge. They also noted that extended hours in the AMU could have a positive impact on the hospital flow and patient outcomes, and therefore may be cost-effective at local level. However, extended hours to the AMU should only be implemented alongside local evaluation. **Conclusion** The committee felt that early consultant assessment could be cost effective in some settings. It is associated with some clinical benefit and, in some settings, the cost might be completely offset by savings from increased efficiencies in the hospital pathway. However, it was agreed that this would not be the case nationwide and any intervention should only be implemented at the local level alongside evaluation. For some Trusts, the resource impact of this recommendation will be more hours of consultant time in the AMU and other high care units. This should be partially offset by reduced length of stay and fewer complications. Some Trusts might want to disinvest in RAT, which would mean savings in terms of ED consultant staff time.There are benefits of early consultant assessment that were not captured in the model and are difficult to quantify, including impact on quality of life from quicker diagnosis and more appropriate location of/better quality of death. Overall, the evidence was not very strong and therefore the committee felt that immediate consultant assessment, such as RAT, could not be recommended. However, they concluded that assessment within 12 hours would be reasonable, but still should be subjected to local evaluation.
Quality of evidence	**Emergency department:** One RCT was identified which was based in Australia and was graded low to moderate quality due to risk of bias and imprecision. The committee considered whether the study was applicable to a UK setting as in a non-UK setting, patients may present more frequently to secondary care as a first contact. However, the committee chose not to downgrade this study for indirectness as the model was applicable. The observational evidence was all graded as very low quality due to lack of randomisation and the presence of additional confounders, such as the intervention group also receiving point of care testing in addition to early consultant review. **Acute medical unit:** One observational study was identified and the outcomes were graded as very low quality due to risk of bias, imprecision and indirectness. There were some baseline differences in the conditions for which patients in both groups were being assessed and multivariate analysis had not been carried out. No evidence was identified for stroke care, intensive care or critical care units. Original health economic modelling was assessed to be directly applicable but still

	had potentially serious limitations due to the treatment effects being based on expert opinion, albeit conservative and informed by the guideline's systematic review. Due to the quality of the evidence the committee decided to make a more cautious recommendation for providers to consider early consultant review.
Other considerations	The committee noted that, in practice, many of the competencies required to implement a model of early consultant review may be delivered by other members of healthcare staff. However, it is the knowledge or expertise that the consultant brings to the assessment that is crucial. Consultants do not work in isolation and need support of other staff; therefore to implement, this will require reconfiguration of rotas and changes in the availability of healthcare professionals. The committee were aware of observational evidence across a range of healthcare settings which was not included in the review because of either the availability of higher quality evidence or because it did not meet the inclusion criteria for the review. The committee noted that this observational evidence supported their recommendations for early consultant involvement in these settings. Although no evidence was found on patient and/or carer satisfaction, the committee noted that it was probably the preference of patients to be seen quickly, spend minimal time in ED and AMU and receive an accurate assessment of their condition with appropriate admission and discharge decisions. The committee was interested in how early the consultant review should be to demonstrate an improvement in clinical outcome. The definitions for an early consultant review as presented in the evidence was highly variable, most of which were unclear and vague. For example, 1 study defined an early consultant review as a review within 24 hours. Whereas another study defined an early consultant review as when a consultant was present 4 days out of 5 during the working week from 9am-5pm. The committee referred to the RCP's Acute care toolkit 4 and the Society for Acute Medicine clinical quality standards: Delivering a 12-hour, 7-day consultant presence on the acute medical unit which includes the following 2 key recommendations: 1. During the period of consultant presence on AMU, all newly admitted patients should be seen within 6 to 8 hours, with the provision for immediate review as required according to illness severity. 2. A newly admitted patient must be seen by a consultant within 14 hours after arrival on AMU. The committee also noted that national standards published by the Faculty of Intensive Care Medicine and UK Intensive Care Society (Guidance on the Provision of Intensive Care Services[50]) recommend that all patients receiving intensive care should be reviewed in person by an intensive care consultant within 12 hours of admission. It was felt by the committee that, although there was no evidence from other acute care units such as the CCU, HASU or ICU, this way of working could be extrapolated to those centres. Indeed, in some of these units it is already occurring, that is, PCI in ST elevation MI which is often performed by a consultant cardiologist, or the delivery of thrombolysis in patients with stroke being covered by a consultant stroke thrombolysis rota. The Academy of Royal Colleges provided a report called the benefits of consultant delivered care[2]. In this report they highlighted the benefits of consultant delivered care:

	• Rapid and appropriate decision making • Improved outcomes • More efficient use of resources • GPs access to the opinion of a fully trained doctor • Patient expectation of access to appropriate and skilled clinicians and information • Benefits for the training of junior doctors. Achieving the benefits of consultant-delivered care for all patients requires greater consultant presence in hospitals than at present, and therefore changes to models of service delivery and the working patterns and practices of consultants will be required. The Academy of Medical Royal Colleges also produced a report in 2013, Seven Day Consultant Present Care Implementation Considerations. This report reaffirmed the findings of the previous report but also looked at daily consultant review. It also reaffirmed the important financial impact and the reconfiguration of rotas that would be required. As part of the implementation of 7 day services, hospital trusts are expected to meet 10 clinical standards produced by NHS England. The standards were drawn up by the national medical director, Bruce Keogh, and his colleagues at NHS England in 2013, informed by an Academy of Medical Royal Colleges report published in 2012. Trusts are expected to meet 4 priority standards by the end of this financial year. The standards are: • Time to first consultant review–patients should be seen as soon as possible but within at least 14 hours • Inpatients should have 7 day access to a range of diagnostics • Inpatients should have access to a range of key interventions • All acute patients must be seen and reviewed by a consultant twice daily. Therefore, the natural progression of the NHS in England is to deliver earlier and consistent consultant input into the patient journey.

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References

1 Reducing interns' consecutive and weekly working hours significantly reduces medical errors made in intensive care units. Evidence-Based Healthcare and Public Health. 2005; 9(3):209-210

2 Academy of Medical Royal Colleges. The benefits of consultant-delivered care, 2012. Available from: https://www.aomrc.org.uk/wp-content/uploads/2016/05/Benefits_consultant_delivered_care_1112.pdf

3 Adams BD, Zeiler K, Jackson WO, Hughes B. Emergency medicine residents effectively direct inhospital cardiac arrest teams. American Journal of Emergency Medicine. 2005; 23(3):304-310

4 Adiguzel N, Karakurt Z, Mocin OY, Takir HB, Salturk C, Kargin F et al. Full-time ICU staff in the intensive care unit: does it improve the outcome? Turk Toraks Dergisi. 2015; 16(1):28-32

5 Aga H, Readhead D, Maccoll G, Thompson A. Fall in peptic ulcer mortality associated with increased consultant input, prompt surgery and use of high dependency care identified through peer-review audit. BMJ Open. 2012; 2(1):e000271

6 Agrawal S, Battula N, Barraclough L, Durkin D, Cheruvu CVN. Early laparoscopic cholecystectomy service provision is feasible and safe in the current UK National Health Service. Annals of the Royal College of Surgeons of England. 2009; 91(8):660-664

7 Ahmed RM, Green T, Halmagyi GM, Lewis SJG. A new model for neurology care in the emergency department. Medical Journal of Australia. 2010; 192(1):30-32

8 Ali E, Chaila E, Hutchinson M, Tubridy N. The 'hidden work' of a hospital neurologist: 1000 consults later. European Journal of Neurology. 2010; 17(4):e28-e32

9 Anderson D, Golden B, Silberholz J, Harrington M, Hirshon JM. An empirical analysis of the effect of residents on emergency department treatment times. IIE Transactions on Healthcare Systems Engineering. 2013; 3(3):171-180

10 Anderson ID, Woodford M, de Dombal FT, Irving M. Retrospective study of 1000 deaths from injury in England and Wales. BMJ. 1988; 296(6632):1305-1308

11 Angus DC, Kelley MA, Schmitz RJ, White A, Popovich JJ, Committee on Manpower for Pulmonary and Critical Care Societies (COMPACCS). Caring for the critically ill patient. Current and projected workforce requirements for care of the critically ill and patients with pulmonary disease: can we meet the requirements of an aging population? JAMA - Journal of the American Medical Association. 2000; 284(21):2762-2770

12 Asha SE, Ajami A. Improvement in emergency department length of stay using an early senior medical assessment and streaming model of care: a cohort study. EMA - Emergency Medicine Australasia. 2013; 25(5):445-451

13 Audit Commission for Local Authorities and the National Health Service in England and Wales. By accident or design: improving A & E services in England and Wales: national study. London. H.M.S.O., 1996. Available from: http://archive.audit-commission.gov.uk/auditcommission/subwebs/publications/studies/studyPDF/1151.pdf

14 Barnes ML, Hussain SSM. Consultant-based otolaryngology emergency service: a five-year experience. Journal of Laryngology and Otology. 2011; 125(12):1225-1231

15 Beiri A, Alani A, Ibrahim T, Taylor GJS. Trauma rapid review process: efficient out-patient fracture management. Annals of the Royal College of Surgeons of England. 2006; 88(4):408-411

16 Bell D, Lambourne A, Percival F, Laverty AA, Ward DK. Consultant input in acute medical admissions and patient outcomes in hospitals in England: a multivariate analysis. PloS One. 2013; 8(4):e61476

17 Bewick T, Cooper VJ, Lim WS. Does early review by a respiratory physician lead to a shorter length of stay for patients with non-severe community-acquired pneumonia? Thorax. 2009; 64(8):709-712

18 Blunt MC, Burchett KR. Out-of-hours consultant cover and case-mix-adjusted mortality in intensive care. The Lancet. 2000; 356(9231):735-736

19 Bray BD, Ayis S, Campbell J, Hoffman A, Roughton M, Tyrrell PJ et al. Associations between the organisation of stroke services, process of care, and mortality in England: prospective cohort study. BMJ. 2013; 346:f2827

20 Brodie FG, Sprigg N. Current evidence for the management and early treatment of transient ischaemic attack. Primary Care Cardiovascular Journal. 2012; 5(1):37-39

21 Brown JJ, Sullivan G. Effect on ICU mortality of a full-time critical care specialist. Chest. 1989; 96(1):127-129

22 CADTH. Intensivist response time to a closed intensive care unit: patient benefits and harms and guidelines. Canadian Agency for Drugs and Technologies in Health (CADTH), 2014. Available from: https://www.cadth.ca/media/pdf/htis/feb-2014/RB0645%20Closed%20ICUs%20Final.pdf

23 Calder FR, Jadhav V, Hale JE. The effect of a dedicated emergency theatre facility on emergency operating patterns. Journal of the Royal College of Surgeons of Edinburgh. 1998; 43(1):17-19

24 Capp R, Soremekun OA, Biddinger PD, White BA, Sweeney LM, Chang Y et al. Impact of physician-assisted triage on timing of antibiotic delivery in patients admitted to the hospital with community-acquired pneumonia (CAP). Journal of Emergency Medicine. 2012; 43(3):502-508

25 Carberry M. Hospital emergency care teams: our solution to out of hours emergency care. Nursing in Critical Care. 2006; 11(4):177-187

26 Cariga P, Huang WHC, Ranta A. Safety and efficiency of non-contact first specialist assessment in neurology. New Zealand Medical Journal. 2011; 124(1347):48-52

27 Carroll C, Zajicek J. Provision of 24 hour acute neurology care by neurologists: manpower requirements in the UK. Journal of Neurology, Neurosurgery and Psychiatry. 2004; 75(3):406-409

28 Casalino E, Wargon M, Peroziello A, Choquet C, Leroy C, Beaune S et al. Predictive factors for longer length of stay in an emergency department: a prospective multicentre study evaluating the impact of age, patient's clinical acuity and complexity, and care pathways. Emergency Medicine Journal. 2014; 31(5):361-368

29 Cha WC, Shin SD, Song KJ, Jung SK, Suh GJ. Effect of an independent-capacity protocol on overcrowding in an urban emergency department. Academic Emergency Medicine. 2009; 16(12):1277-1283

30 Chen J, Bellomo R, Flabouris A, Hillman K, Assareh H, Ou L. Delayed emergency team calls and associated hospital mortality: a multicenter study. Critical Care Medicine. 2015; 43(10):2059-2065

31 Christmas AB, Reynolds J, Hodges S, Franklin GA, Miller FB, Richardson JD et al. Physician extenders impact trauma systems. Journal of Trauma. 2005; 58(5):917-920

32 Christmas E, Johnson I, Locker T. The impact of 24 h consultant shop floor presence on emergency department performance: a natural experiment. Emergency Medicine Journal. 2013; 30(5):360-362

33 Clarke CE, Edwards J, Nicholl DJ, Sivaguru A, Davies P, Wiskin C. Ability of a nurse specialist to diagnose simple headache disorders compared with consultant neurologists. Journal of Neurology, Neurosurgery and Psychiatry. 2005; 76(8):1170-1172

34 Cohee BM, Hartzell JD, Shimeall WT. Achieving balance on the inpatient internal medicine wards: a performance improvement project to restructure resident work hours at a tertiary care center. Academic Medicine. 2014; 89(5):740-744

35 Cohen A, Bodenham A, Webster N. A review of 2000 consecutive ICU admissions. Anaesthesia. 1993; 48(2):106-110

36 Cooke M. Employing general practitioners in accident and emergency departments. Better to increase number of consultants in accident and emergency medicine. BMJ. 1996; 313(7057):628

37 Cooke MW, Kelly C, Khattab A, Lendrum K, Morrell R, Rubython EJ. Accident and emergency 24 hour senior cover--a necessity or a luxury? Journal of Accident and Emergency Medicine. 1998; 15(3):181-184

38 Cutler LR, Hayter M, Ryan T. A critical review and synthesis of qualitative research on patient experiences of critical illness. Intensive and Critical Care Nursing. 2013; 29(3):147-157

39 Dale J, Green J, Reid F, Glucksman E. Primary care in the accident and emergency department: I. Prospective identification of patients. BMJ. 1995; 311(7002):423-426

40 Daoust R, Paquet J, Lavigne G, Sanogo K, Chauny JM. Senior patients with moderate to severe pain wait longer for analgesic medication in EDs. American Journal of Emergency Medicine. 2014; 32(4):315-319

41 Davis RA, Dinh MM, Bein KJ, Veillard AS, Green TC. Senior work-up assessment and treatment team in an emergency department: a randomised control trial. EMA - Emergency Medicine Australasia. 2014; 26(4):343-349

42 Day CJ, Bellamy MC. Paracetamol poisoning. Care of the Critically Ill. 2005; 21(2):51-56

43 Denman-Johnson M, Bingham P, George S. A confidential enquiry into emergency hospital admissions on the Isle of Wight, UK. Journal of Epidemiology and Community Health. 1997; 51(4):386-390

44 Dhrampal A. Time to first review of new admissions to critical care by the consultant intensivist. Critical Care. 2015; 14:157

45 Edkins RE, Cairns BA, Hultman CS. A systematic review of advance practice providers in acute care: options for a new model in a burn intensive care unit. Annals of Plastic Surgery. 2014; 72(3):285-288

46 Edwards T. How rapid assessment at triage can improve care outcomes. Emergency Nurse. 2011; 19(6):27-30

47 el Gaylani N, Weston CF, Shandall A, Penny WJ, Buchalter. Experience of a rapid access acute chest pain clinic. Irish Medical Journal. 1997; 90(4):139-140

48 Elmstahl S, Wahlfrid C. Increased medical attention needed for frail elderly initially admitted to the emergency department for lack of community support. Aging. 1999; 11(1):56-60

49 Evans K, Fulton B. Meeting the challenges of Acute Care Quality Indicators. Acute Medicine. 2011; 10(2):91-94

50 Faculty of Intensive Care Medicine and Intensive Care Society. Guidelines for the provision of intensive care services, 2015. Available from: http://members.ics.ac.uk/ICS/guidelines-and-standards.aspx

51 Fisher EW, Moffat DA, Quinn SJ, Wareing MJ, Von Blumenthal H, Morris DP. Reduction in junior doctors' hours in an otolaryngology unit: effects on the 'out of hours' working patterns of all grades. Annals of the Royal College of Surgeons of England. 1994; 76(Suppl 5):232-235

52 FitzPatrick MK, Reilly PM, Laborde A, Braslow B, Pryor JP, Blount A et al. Maintaining patient throughput on an evolving trauma/emergency surgery service. Journal of Trauma. 2006; 60(3):481-488

53 Foster PW, Ritchie AWS, Jones DJ. Prospective analysis of scrotal pathology referrals - are referrals appropriate and accurate? Annals of the Royal College of Surgeons of England. 2006; 88(4):363-366

54 Gambier N, Simoneau G, Bihry N, Delcey V, Champion K, Sellier P et al. Efficacy of early clinical evaluation in predicting direct home discharge of elderly patients after hospitalization in internal medicine. Southern Medical Journal. 2012; 105(2):63-67

55 Garland A, Roberts D, Graff L. Twenty-four-hour intensivist presence: a pilot study of effects on intensive care unit patients, families, doctors, and nurses. American Journal of Respiratory and Critical Care Medicine. 2012; 185(7):738-743

56 Garner JP, Prytherch D, Senapati A, O'Leary D, Thompson MR. Sub-specialization in general surgery: the problem of providing a safe emergency general surgical service. Colorectal Disease. 2006; 8(4):273-277

57 Gaskell DJ, Lewis PA, Crosby DL, Roberts CJ, Fenn N, Roberts SM. Improving the primary management of emergency surgical admissions: a controlled trial. Annals of the Royal College of Surgeons of England. 1995; 77(Suppl 5):239-241

58 Gershengorn HB, Wunsch H, Wahab R, Leaf DE, Brodie D, Li G et al. Impact of nonphysician staffing on outcomes in a medical ICU. Chest. 2011; 139(6):1347-1353

59 Gibbs RG, Newson R, Lawrenson R, Greenhalgh RM, Davies AH. Diagnosis and initial management of stroke and transient ischemic attack across UK health regions from 1992 to 1996: experience of a national primary care database. Stroke. 2001; 32(5):1085-1090

60 Gilligan SG, Walters MW. Quality improvements in hospital flow may lead to a reduction in mortality. Clinical Governance. 2008; 13(1):26-34

61 Glasser JS, Zacher LL, Thompson JC, Murray CK. Determination of the internal medicine service's role in emergency department length of stay at a military medical center. Military Medicine. 2009; 174(11):1163-1166

62 Gomez MA, Anderson JL, Karagounis LA, Muhlestein JB, Mooers FB. An emergency department-based protocol for rapidly ruling out myocardial ischemia reduces hospital time and expense: results of a randomized study (ROMIO). Journal of the American College of Cardiology. 1996; 28(1):25-33

63 Gomez-Soto FM, Puerto JL, Andrey JL, Fernandez FJ, Escobar MA, Garcia-Egido AA et al. Consultation between specialists in Internal Medicine and Family Medicine improves management and prognosis of heart failure. European Journal of Internal Medicine. 2008; 19(7):548-554

64 Gulli G, Peron E, Ricci G, Formaglio E, Micheletti N, Tomelleri G et al. Yield of ultra-rapid carotid ultrasound and stroke specialist assessment in patients with TIA and minor stroke: an Italian TIA service audit. Neurological Sciences. 2014; 35(12):1969-1975

65 Halfdanarson TR, Hogan WJ, Moynihan TJ. Oncologic emergencies: diagnosis and treatment. Mayo Clinic Proceedings. 2006; 81(6):835-848

66 Harrison J. The work patterns of consultant psychiatrists: revisiting... how consultants manage their time. Advances in Psychiatric Treatment. 2007; 13(6):470-475

67 Harvey M, Al Shaar M, Cave G, Wallace M, Brydon P. Correlation of physician seniority with increased emergency department efficiency during a resident doctors' strike. New Zealand Medical Journal. 2008; 121(1272):59-68

68 Hellawell GO, Kahn L, Mumtaz F. The European working time directive: implications for subspecialty acute care. International Journal of Clinical Practice. 2005; 59(5):508-510

69 Helling TS, Kaswan S, Boccardo J, Bost JE. The effect of resident duty hour restriction on trauma center outcomes in teaching hospitals in the state of Pennsylvania. Journal of Trauma - Injury, Infection and Critical Care. 2010; 69(3):607-612

70 Hoffman LA, Miller TH, Zullo TG, Donahoe MP. Comparison of 2 models for managing tracheotomized patients in a subacute medical intensive care unit. Respiratory Care. 2006; 51(11):1230-1236

71 Hoffman LA, Tasota FJ, Scharfenberg C, Zullo TG, Donahoe MP. Management of patients in the intensive care unit: comparison via work sampling analysis of an acute care nurse practitioner and physicians in training. American Journal of Critical Care. 2003; 12(5):436-443

72 Hoffman LA, Tasota FJ, Zullo TG, Scharfenberg C, Donahoe MP. Outcomes of care managed by an acute care nurse practitioner/attending physician team in a subacute medical intensive care unit. American Journal of Critical Care. 2005; 14(2):121-130

73 Holzman MD, Elkins CC, Neuzil DF, Williams LFJ. Expanding the physician care team: its effect on patient care, resident function, and education. Journal of Surgical Research. 1994; 56(6):636-640

74 Hopkins A, Worboys F. Establishing community wound prevalence within an inner London borough: exploring the complexities. Journal of Tissue Viability. 2014; 23(4):121-128

75 Horwitz LI, Kosiborod M, Lin Z, Krumholz HM. Changes in outcomes for internal medicine inpatients after work-hour regulations. Annals of Internal Medicine. 2007; 147(2):97-103

76 Imperato J, Morris DS, Binder D, Fischer C, Patrick J, Sanchez LD et al. Physician in triage improves emergency department patient throughput. Internal and Emergency Medicine. 2012; 7(5):457-462

77 Jarvis P, Davies T, Mitchell K, Taylor I, Baker M. Does rapid assessment shorten the amount of time patients spend in the emergency department? British Journal of Hospital Medicine. 2014; 75(11):648-651

78 Jeune IL, Masterton-Smith C, Subbe CP, Ward D. 'State of the nation' - the society for acute medicine's benchmarking audit 2013 (SAMBA '13). Acute Medicine. 2013; 12(4):214-219

79 Jimenez JG, Murray MJ, Beveridge R, Pons JP, Cortes EA, Garrigos JB et al. Implementation of the Canadian Emergency Department Triage and Acuity Scale (CTAS) in the Principality of Andorra: can triage parameters serve as emergency department quality indicators? CJEM. 2003; 5(5):315-322

80 Johansson B, Holmberg L, Berglund G, Brandberg Y, Hellbom M, Persson C et al. Reduced utilisation of specialist care among elderly cancer patients: a randomised study of a primary healthcare intervention. European Journal of Cancer. 2001; 37(17):2161-2168

81 Johnstone C, Harwood R, Gilliam A, Mitchell A. A clinical decisions unit improves emergency general surgery care delivery. Clinical Governance. 2015; 20(4):191-198

82 Jung B, Daurat A, De Jong A, Chanques G, Mahul M, Monnin M et al. Rapid response team and hospital mortality in hospitalized patients. Intensive Care Medicine. 2016; 42(4):494-504

83 Kapur N, House A, Creed F, Feldman E, Friedman T, Guthrie E. General hospital services for deliberate self-poisoning: an expensive road to nowhere? Postgraduate Medical Journal. 1999; 75(888):599-602

84 Kawar E, DiGiovine B. MICU care delivered by PAs versus residents: do PAs measure up? JAAPA : Official Journal of the American Academy of Physician Assistants. 2011; 24(1):36-41

85 Kendrick AS, Ciraulo DL, Radeker TS, Lewis PL, Richart CM, Maxwell RA et al. Trauma nurse specialists' performance of advanced skills positively impacts surgical residency time constraints. American Surgeon. 2006; 72(3):224-227

86 Kennelly SP, Drumm B, Coughlan T, Collins R, O'Neill D, Romero-Ortuno R. Characteristics and outcomes of older persons attending the emergency department: a retrospective cohort study. QJM. 2014; 107(12):977-987

87 Kent BD, Nadarajan P, Akasheh NB, Sulaiman I, Karim S, Cooney S et al. Improving venous thromboembolic disease prophylaxis in medical inpatients: a role for education and audit. Irish Journal of Medical Science. 2011; 180(1):163-166

88 Kerr E, Arulraj N, Scott M, McDowall M, van Dijke M, Keir S et al. A telephone hotline for transient ischaemic attack and stroke: prospective audit of a model to improve rapid access to specialist stroke care. BMJ. 2010; 341:c3265

89 Khadjooi K, Dimopoulos C, Paterson J. The acute physicians unit in scarborough hospital. Acute Medicine. 2009; 8(3):132-135

90 Kirton OC, Folcik MA, Ivy ME, Calabrese R, Dobkin E, Pepe J et al. Midlevel practitioner workforce analysis at a university-affiliated teaching hospital. Archives of Surgery. 2007; 142(4):336-341

91 Kmietowicz Z. Patients admitted as emergencies should see consultant in 12 hours, NCEPOD recommends. BMJ. 2007; 335(7623):738-739

92 Laine C, Goldman L, Soukup JR, Hayes JG. The impact of a regulation restricting medical house staff working hours on the quality of patient care. JAMA - Journal of the American Medical Association. 1993; 269(3):374-378

93 Lal NR, Murray UM, Petter EO, Desmond JS. Clinical consequences of misinterpretations of neuroradiologic CT scans by on-call radiology residents. American Journal of Neuroradiology. 2000; 21(1):124-129

94 Lammers RL, Roiger M, Rice L, Overton DT, Cucos D. The effect of a new emergency medicine residency program on patient length of stay in a community hospital emergency department. Academic Emergency Medicine. 2003; 10(7):725-730

95 Langhorne P, Williams BO, Gilchrist W, Dennis MS, Slattery J. A formal overview of stroke unit trials. Revista De Neurologia. 1995; 23(120):394-398

96 Laupland KB. Admission to hospital with community-onset bloodstream infection during the 'after hours' is not associated with an increased risk for death. Scandinavian Journal of Infectious Diseases. 2010; 42(11-12):862-865

97 Laurens N, Dwyer T. The impact of medical emergency teams on ICU admission rates, cardiopulmonary arrests and mortality in a regional hospital. Resuscitation. 2011; 82(6):707-712

98 Levy MM. Intensivists at night: putting resources in the right place. Critical Care. 2013; 17(5):1008

99 Lewis H, Purdie G. The blocked bed: a prospective study. New Zealand Medical Journal. 1988; 101(853):575-577

100 Lilly CM, McLaughlin JM, Zhao H, Baker SP, Cody S, Irwin RS et al. A multicenter study of ICU telemedicine reengineering of adult critical care. Chest. 2014; 145(3):500-507

101 Londero LS, Norgaard B, Houlind K. Patient delay is the main cause of treatment delay in acute limb ischemia: an investigation of pre- and in-hospital time delay. World Journal of Emergency Surgery. 2014; 9(1):56

102 Longsworth FG. Casualty transit time for 100 adult walk-in patients at the University Hospital of the West Indies. West Indian Medical Journal. 1990; 39(3):166-169

103 Magin P, Lasserson D, Parsons M, Spratt N, Evans M, Russell M et al. Referral and triage of patients with transient ischemic attacks to an acute access clinic: risk stratification in an Australian setting. International Journal of Stroke. 2013; 8(Suppl A100):81-89

104 Mahmood A, Sharif MA, Ali UZ, Khan MN. Time to hospital evaluation in patients of acute stroke for alteplase therapy. Rawal Medical Journal. 2009; 34(1):43-46

105 Manawadu D, Choyi J, Kalra L. The impact of early specialist management on outcomes of patients with in-hospital stroke. PloS One. 2014; 9(8):e104758

106 Marriott R, Horrocks J, House A, Owens D. Assessment and management of self-harm in older adults attending accident and emergency: a comparative cross-sectional study. International Journal of Geriatric Psychiatry. 2003; 18(7):645-652

107 Martin I, Mason D, Stewart J, Mason M, Smith N, and Gill K. Emergency admissions: a journey in the right direction? London. National Confidential Enquiry into Patient Outcome and Death, 2015

108 Martin PJ, Young G, Enevoldson TP, Humphrey PR. Overdiagnosis of TIA and minor stroke: experience at a regional neurovascular clinic. QJM. 1997; 90(12):759-763

109 McManus RJ, Mant J, Davies MK, Davis RC, Deeks JJ, Oakes RAL et al. A systematic review of the evidence for rapid access chest pain clinics. International Journal of Clinical Practice. 2002; 56(1):29-33

110 McNeill G, Brahmbhatt DH, Prevost AT, Trepte NJB. What is the effect of a consultant presence in an acute medical unit? Clinical Medicine. 2009; 9(3):214-218

111 Meyer SC, Miers LJ. Cardiovascular surgeon and acute care nurse practitioner: collaboration on postoperative outcomes. AACN Clinical Issues. 2005; 16(2):149-158

112 Meynaar IA, van der Spoel JI, Rommes JH, van Spreuwel-Verheijen M, Bosman RJ, Spronk PE. Off hour admission to an intensivist-led ICU is not associated with increased mortality. Critical Care. 2009; 13(3):R84

113 Mirza A, McClelland L, Daniel M, Jones N. The ENT emergency clinic: does senior input matter? Journal of Laryngology and Otology. 2013; 127(1):15-19

114 Morris LL, Pfeifer P, Catalano R, Fortney R, Nelson G, Rabito R et al. Outcome evaluation of a new model of critical care orientation. American Journal of Critical Care. 2009; 18(3):252-260

115 Mullen P, Dawson A, White J, Anthony-Pillai M. Timing of first review of new ICU admissions by consultant intensivists in a UK district general hospital. Critical Care. 2009; 13(191):192

116 Munro J, Mason S, Nicholl J. Effectiveness of measures to reduce emergency department waiting times: a natural experiment. Emergency Medicine Journal. 2006; 23:35-39

117 Murphy AW, Bury G, Plunkett PK, Gibney D, Smith M, Mullan E et al. Randomised controlled trial of general practitioner versus usual medical care in an urban accident and emergency department: process, outcome, and comparative cost. BMJ. 1996; 312(7039):1135-1142

118 Murrell KL, Offerman SR, Kauffman MB. Applying lean: implementation of a rapid triage and treatment system. Western Journal of Emergency Medicine. 2011; 12:184-191

119 Newby DE, Fox KA, Flint LL, Boon NA. A 'same day' direct-access chest pain clinic: improved management and reduced hospitalization. QJM. 1998; 91(5):333-337

120 O'Connor PM, Steele JA, Dearden CH, Rocke LG, Fisher RB. The accident and emergency department as a single portal of entry for the reassessment of all trauma patients transferred to specialist units. Journal of Accident and Emergency Medicine. 1996; 13(1):9-10

121 O'Keeffe F, Cronin S, Gilligan P, O'Kelly P, Gleeson A, Houlihan P et al. Did not wait patient management strategy (DNW PMS) study. Emergency Medicine Journal. 2012; 29(7):550-553

122 Patel MS, Volpp KG, Small DS, Hill AS, Even-Shoshan O, Rosenbaum L et al. Association of the 2011 ACGME resident duty hour reforms with mortality and readmissions among hospitalized Medicare patients. JAMA - Journal of the American Medical Association. 2014; 312(22):2364-2373

123 Pourmand A, Lucas R, Pines JM, Shokoohi H, Yadav K. Bedside teaching on time to disposition improves length of stay for critically-ill emergency departments patients. Western Journal of Emergency Medicine. 2013; 14(2):137-140

124 Rafman H, Lim SN, Quek SC, Mahadevan M, Lim C, Lim A. Using systematic change management to improve emergency patients' access to specialist care: the Big Squeeze. Emergency Medicine Journal. 2013; 30(6):447-453

125 Redmond AD, Buxton N. Consultant triage of minor cases in an accident and emergency department. Archives of Emergency Medicine. 1993; 10(4):328-330

126 Rothen HU, Stricker K, Einfalt J, Bauer P, Metnitz PGH, Moreno RP et al. Variability in outcome and resource use in intensive care units. Intensive Care Medicine. 2007; 33(8):1329-1336

127 Rothwell PM, Giles MF, Chandratheva A, Marquardt L, Geraghty O, Redgrave JN et al. Effect of urgent treatment of transient ischaemic attack and minor stroke on early recurrent stroke (EXPRESS study): a prospective population-based sequential comparison. The Lancet. 2007; 370(9596):1432-1442

128 Sakr Y, Moreira CL, Rhodes A, Ferguson ND, Kleinpell R, Pickkers P et al. The impact of hospital and ICU organizational factors on outcome in critically ill patients: results from the extended prevalence of infection in intensive care study. Critical Care Medicine. 2015; 43(3):519-526

129 Salazar A, Corbella X, Onaga H, Ramon R, Pallares R, Escarrabill J. Impact of a resident strike on emergency department quality indicators at an urban teaching hospital. Academic Emergency Medicine. 2001; 8(8):804-808

130 Schultz H, Mogensen CB, Pedersen BD, Qvist N. Front-end specialists reduce time to a treatment plan for patients with acute abdomen. Danish Medical Journal. 2013; 60(9):A4703

131 Secor RM. Rapid triage assessment of low back pain. Journal of Emergency Nursing. 1983; 9(1):17-20

132 Shetty A, Gunja N, Byth K, Vukasovic M. Senior streaming assessment further evaluation after triage zone: a novel model of care encompassing various emergency department throughput measures. EMA - Emergency Medicine Australasia. 2012; 24(4):374-382

133 Showkathali R, Davies JR, Sayer JW, Kelly PA, Aggarwal RK, Clesham GJ. The advantages of a consultant led primary percutaneous coronary intervention service on patient outcome. QJM. 2013; 106(11):989-994

134 Silber JH, Rosenbaum PR, Rosen AK, Romano PS, Itani KMF, Cen L et al. Prolonged hospital stay and the resident duty hour rules of 2003. Medical Care. 2009; 47(12):1191-1200

135 Soong C, High S, Morgan MW, Ovens H. A novel approach to improving emergency department consultant response times. BMJ Quality & Safety. 2013; 22(4):299-305

136 Spigos D, Freedy L, Mueller C. 24-hour coverage by attending physicians: a new paradigm. AJR American Journal of Roentgenology. 1996; 167(5):1089-1090

137 Stevens PE, Tamimi NA, Al-Hasani MK, Mikhail AI, Kearney E, Lapworth R et al. Non-specialist management of acute renal failure. QJM. 2001; 94(10):533-540

138 Svirsky I, Stoneking LR, Grall K, Berkman M, Stolz U, Shirazi F. Resident-initiated advanced triage effect on emergency department patient flow. Journal of Emergency Medicine. 2013; 45(5):746-751

139 Ting HH, Lee TH, Soukup JR, Cook EF, Tosteson AN, Brand DA et al. Impact of physician experience on triage of emergency room patients with acute chest pain at three teaching hospitals. American Journal of Medicine. 1991; 91(4):401-408

140 Traub SJ, Wood JP, Kelley J, Nestler DM, Chang YH, Saghafian S et al. Emergency department rapid medical assessment: overall effect and mechanistic considerations. Journal of Emergency Medicine. 2015; 48(5):620-627

141 Travers JP, Lee FC. Avoiding prolonged waiting time during busy periods in the emergency department: is there a role for the senior emergency physician in triage? European Journal of Emergency Medicine. 2006; 13(6):342-348

142 Vaghasiya MR, Murphy M, O'Flynn D, Shetty A. The emergency department prediction of disposition (EPOD) study. Australasian Emergency Nursing Journal. 2014; 17(4):161-166

143 Volpp KG, Rosen AK, Rosenbaum PR, Romano PS, Even-Shoshan O, Canamucio A et al. Mortality among patients in VA hospitals in the first 2 years following ACGME resident duty hour reform. JAMA - Journal of the American Medical Association. 2007; 298(9):984-992

144 Volpp KG, Rosen AK, Rosenbaum PR, Romano PS, Itani KMF, Bellini L et al. Did duty hour reform lead to better outcomes among the highest risk patients? Journal of General Internal Medicine. 2009; 24(10):1149-1155

145 Volpp KG, Small DS, Romano PS, Itani KMF, Rosen AK, Even-Shoshan O et al. Teaching hospital five-year mortality trends in the wake of duty hour reforms. Journal of General Internal Medicine. 2013; 28(8):1048-1055

146 Vosk A. Response of consultants to the emergency department: a preliminary report. Annals of Emergency Medicine. 1998; 32(5):574-577

147 Walls J, Hunter N, Brasher PMA, Ho SGF. The DePICTORS study: discrepancies in preliminary interpretation of CT scans between on-call residents and staff. Emergency Radiology. 2009; 16(4):303-308

148 Wanklyn P, Hosker H, Pearson S, Belfield P. Slowing the rate of acute medical admissions. Journal of the Royal College of Physicians of London. 1997; 31(2):173-176

149 Ward D, Potter J, Ingham J, Percival F, Bell D. Acute medical care. The right person, in the right setting--first time: how does practice match the report recommendations? Clinical Medicine. 2009; 9(6):553-556

150 Ward NS, Afessa B, Kleinpell R, Tisherman S, Ries M, Howell M et al. Intensivist/patient ratios in closed ICUs: a statement from the Society of Critical Care Medicine Taskforce on ICU Staffing. Critical Care Medicine. 2013; 41(2):638-645

151 White AL, Armstrong PAR, Thakore S. Impact of senior clinical review on patient disposition from the emergency department. Emergency Medicine Journal. 2010; 27(4):262-296

152 Wilcox ME, Chong CA, Niven DJ, Rubenfeld GD, Rowan KM, Wunsch H et al. Do intensivist staffing patterns influence hospital mortality following ICU admission? A systematic review and meta-analyses. Critical Care Medicine. 2013; 41(10):2253-2274

153 Wilcox ME, Harrison DA, Short A, Jonas M, Rowan KM. Comparing mortality among adult, general intensive care units in England with varying intensivist cover patterns: a retrospective cohort study. Critical Care. 2014; 18(4):491

154 Woods RA, Lee R, Ospina MB, Blitz S, Lari H, Bullard MJ et al. Consultation outcomes in the emergency department: exploring rates and complexity. CJEM. 2008; 10(1):25-31

Appendices

Appendix A: Review protocols

Table 9: Review protocol: Early versus late consultant review

Review question: Is early consultant triage in the ED (RAT model) more clinically and cost effective than later consultant review?	
Objective	To determine if early consultant review at acute presentation improves patient outcomes and reduces rate of admission.
Rationale	Specialists ensure that patients are on the correct treatment pathway, moving along the pathway in a timely manner, and not subject to unexpected delays or complications. The first step in the process, determining the correct diagnosis and initial treatment, needs to be taken in a timely manner, as delays can compromise patient outcomes. The question is at what point is specialist involvement essential? At the point of admission, or following initial review and stabilisation by the other members of the clinical team?
Population	Adults and young people (16 years and over) with a suspected or confirmed AME
Intervention	Early consultant review
Comparison	Later consultant review (any time point that is later than the intervention)
Outcomes	Patient outcomes; • Early diagnosis (IMPORTANT) • Hospital admission (IMPORTANT) • Quality of life (CRITICAL) • GP visits (IMPORTANT) • Mortality (CRITICAL) • Avoidable adverse events (CRITICAL) • Diagnostic test number (IMPORTANT) • Patient satisfaction (CRITICAL) • Length of stay in ED (CRITICAL) • Readmission up to 30 days (IMPORTANT) • Discharge (IMPORTANT) • Referrals from admissions (IMPORTANT) Staff outcomes; • Staff satisfaction (IMPORTANT) • Trainee satisfaction (IMPORTANT) Carer outcome; • Carer satisfaction (IMPORTANT)
Exclusion	
Search criteria	The databases to be searched are: Medline, Embase, the Cochrane Library Date limits for search: None Language: English only
The review strategy	Systematic reviews (SRs) of RCTs, RCTs, observational studies only to be included if no relevant SRs or RCTs are identified.
Analysis	Data synthesis of RCT data. Meta-analysis where appropriate will be conducted.

Review question: Is early consultant triage in the ED (RAT model) more clinically and cost effective than later consultant review?	
	Studies in the following subgroup populations will be included: • Frail elderly • People with serious mental illness • Being seen by consultant prior AMU in diagnosed patients. In addition, if studies have pre-specified in their protocols that results for any of these subgroup populations will be analysed separately, then they will be included. The methodological quality of each study will be assessed using the Evibase checklist and GRADE.
Key papers	
Number of clinical questions	Max occupancy 85%, often at 95% ED / RAT model in ED, note time points (not enough staff at moments to implement) (PD ideal world seen within 1 hour by consultant).
HE questions	Crucial to conceptual. RF does diagnostic reviews (out of 10) for HE.

1

Review question: Is early consultant review in the AMU, ICU, HDU, CCU or Stroke Unit more clinically and cost effective than later consultant review?	
Objective	To determine if early consultant review at acute presentation improves patient outcomes and reduces rate of admission.
Rationale	Specialists ensure that patients are on the correct treatment pathway, moving along the pathway in a timely manner, and not subject to unexpected delays or complications. The first step in the process, determining the correct diagnosis and initial treatment, needs to be taken in a timely manner, as delays can compromise patient outcomes. The question is at what point is specialist involvement essential? At the point of admission, or following initial review and stabilisation by the other members of the clinical team?
Population	Adults and young people (16 years and over) with a suspected or confirmed AME - presenting to GP
Intervention	Early consultant review
Comparison	Later consultant review (any time point that is later than the intervention)
Outcomes	Patient outcomes; • Early diagnosis • Hospital admission • Quality of life • GP visits • Mortality • Avoidable adverse events • Number of diagnostic tests • Patient and/or carer satisfaction • Length of stay in ED • Length of stay in hospital • Readmission up to 30 days • Discharge • Referrals from admissions Staff outcomes; • Staff satisfaction

Review question: Is early consultant review in the AMU, ICU, HDU, CCU or Stroke Unit more clinically and cost effective than later consultant review?	
	• Trainee satisfaction
Exclusion	None
Search criteria	The databases to be searched are: Medline, Embase, the Cochrane Library Date limits for search: None Language: English only
The review strategy	Systematic reviews (SRs) of RCTs, RCTs, observational studies only to be included if no relevant SRs or RCTs are identified.
Analysis	Data synthesis of RCT data. Meta-analysis where appropriate will be conducted. Studies in the following subgroup populations will be included: • Frail elderly • People with serious mental illness • Being seen by consultant prior AMU in diagnosed patients In addition, if studies have pre-specified in their protocols that results for any of these subgroup populations will be analysed separately, then they will be included. The methodological quality of each study will be assessed using the Evibase checklist and GRADE.

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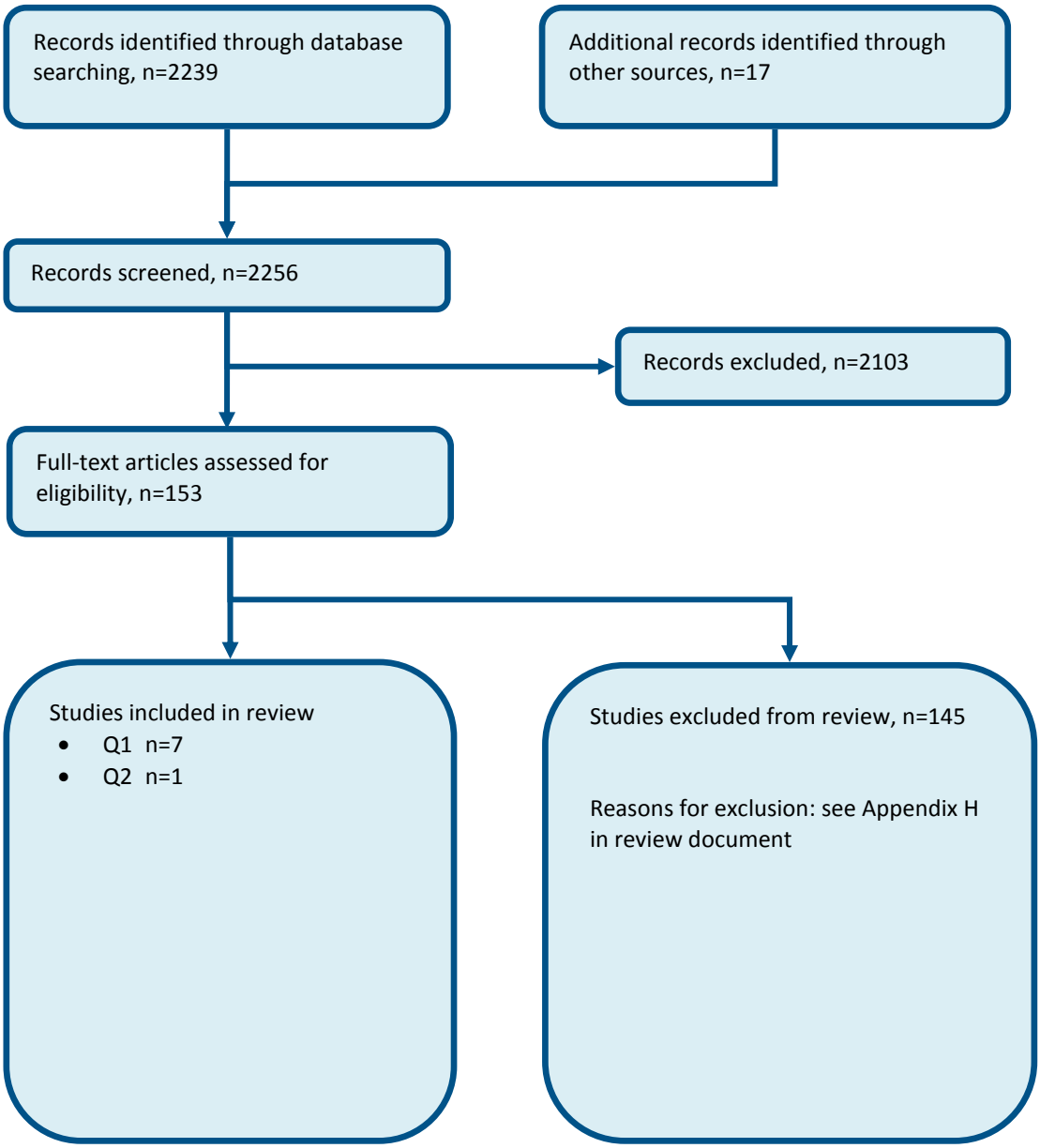
1 # Appendix B: Clinical article selection

Figure 1: Clinical article selection



Appendix C: Forest plots

Emergency Department – RCT evidence

Figure 2: Early (SWAT) versus late (standard care): Proportion of patients who met NEAT

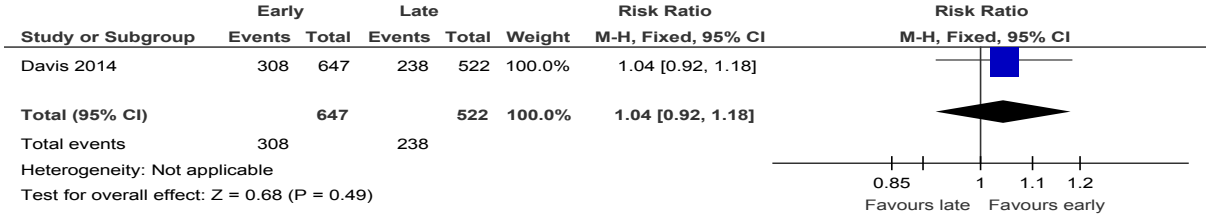


Figure 3: Early (SWAT) versus late (standard care): Proportion of admitted patients who met NEAT

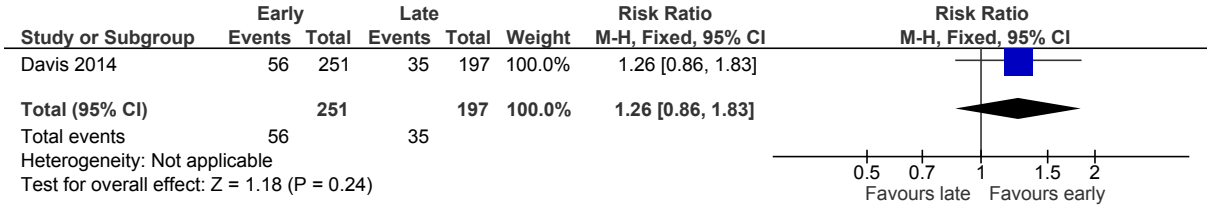


Figure 4: Early (SWAT) versus late (standard care): Proportion of discharged patients who met NEAT

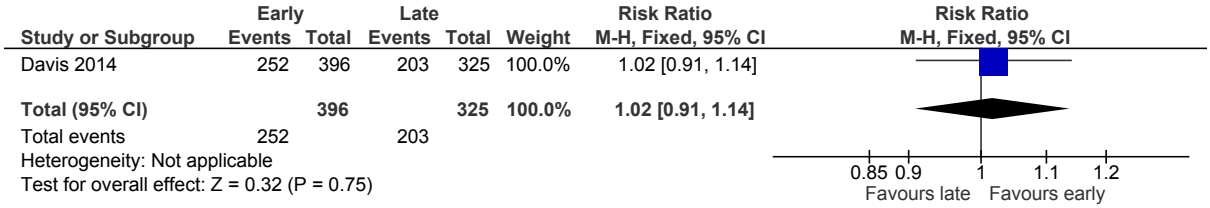


Figure 5: Early (SWAT) versus late (standard care): Admissions.

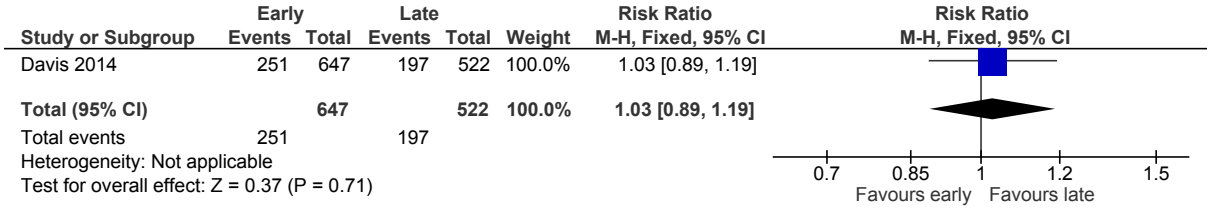
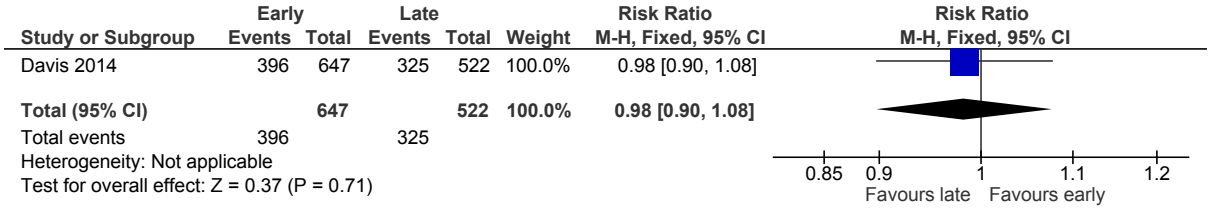


Figure 6: Early (SWAT) versus late (standard care): Discharged



Emergency Department – Observational evidence

Figure 7: Mortality

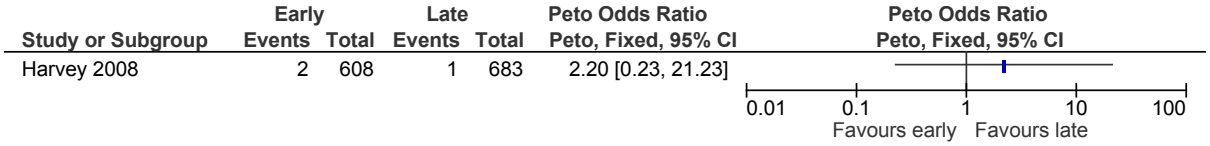


Figure 8: ED length of stay (minutes)

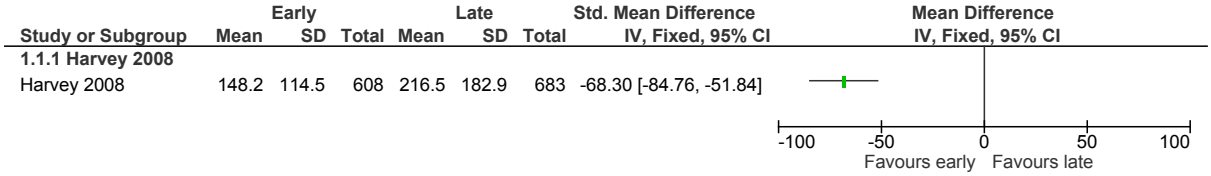


Figure 9: 30 day unscheduled re-admissions

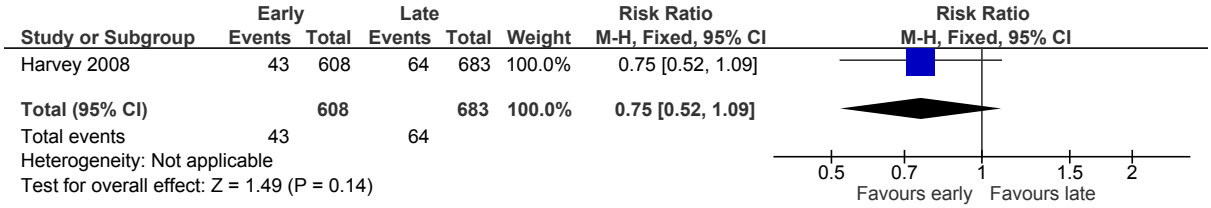


Figure 10: Admissions

Figure 11: Patients achieving NEAT

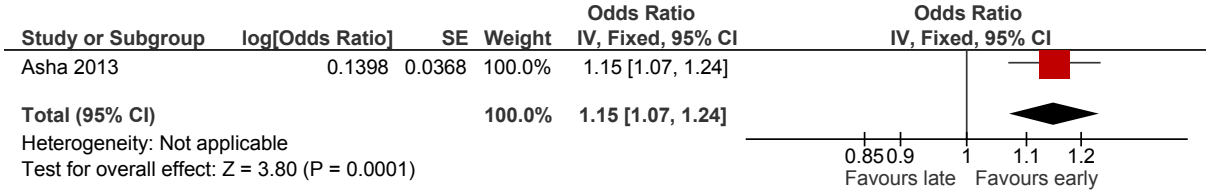


Figure 12: Discharged patients achieving NEAT

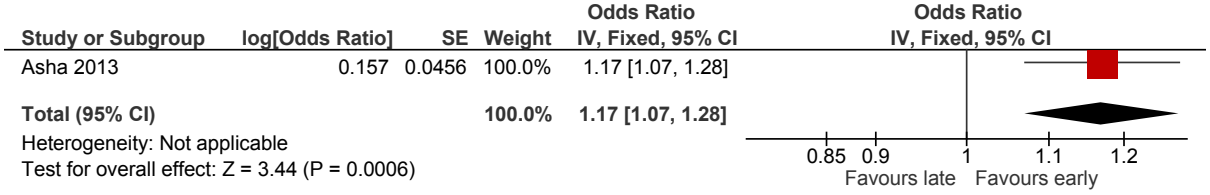


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Figure 13: Admitted patients achieving NEAT

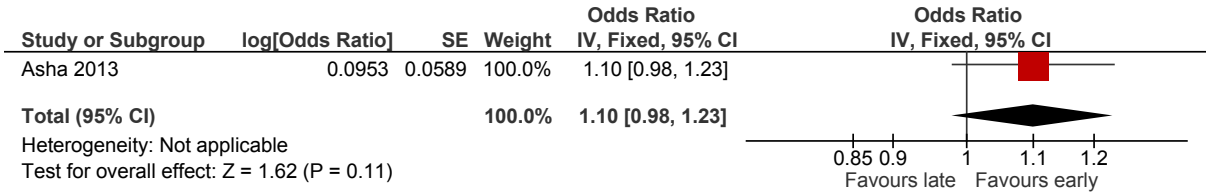

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Figure 14: Patients seen within the recommended time

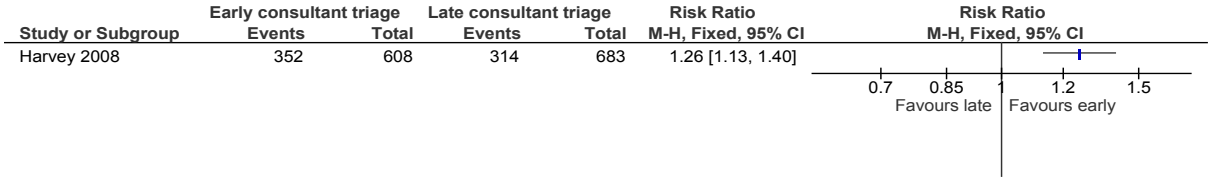

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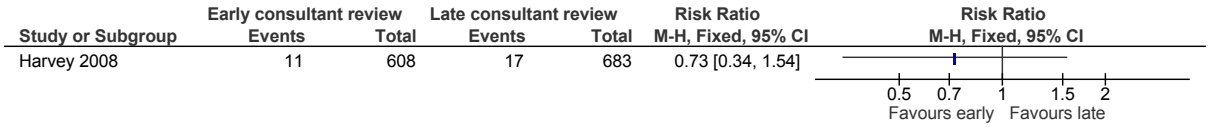
Figure 15: Patients who did not wait to be seen



4

Figure 16: Patients who did not wait to be seen

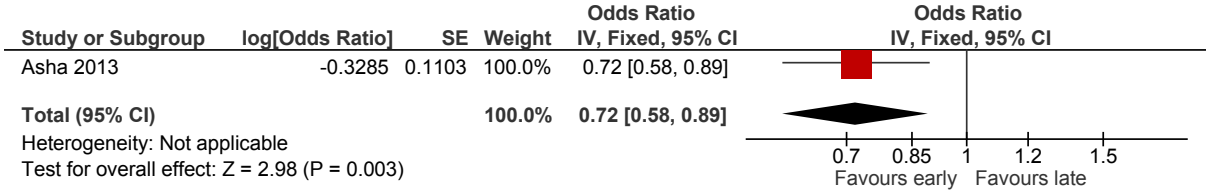


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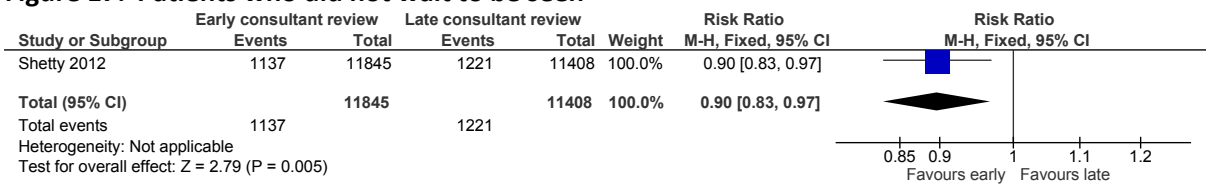
Figure 17: Patients who did not wait to be seen



6

AMU – observational evidence

Figure 18: Early versus late (Consultant present versus consultant absent) in AMU: length of stay (days)

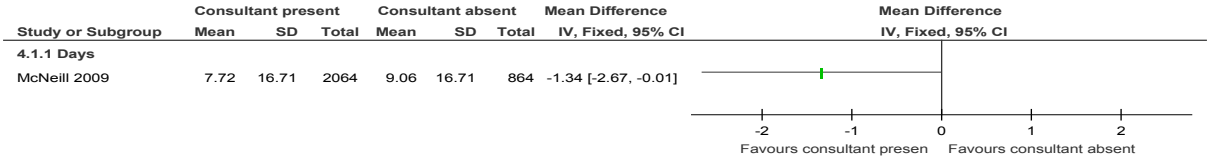


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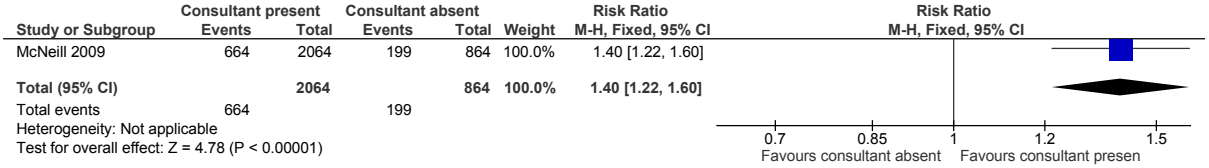
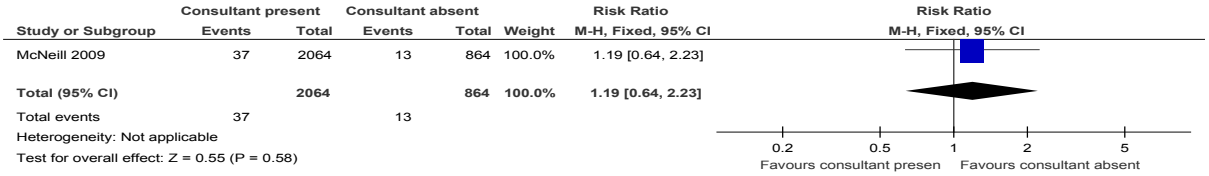
Figure 19: Early versus late (Consultant present versus consultant absent) in AMU: percent discharged on day of admission



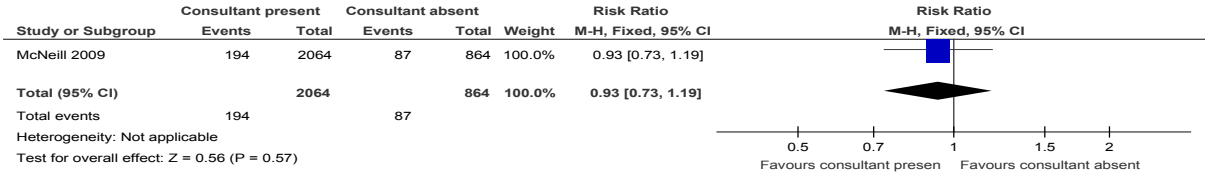
2

Figure 20: Early versus late (Consultant present versus consultant absent) in AMU: percent of patients discharged within 24 hours and readmitted within 1 week for same clinical problem



3

Figure 21: Early versus late (Consultant present versus consultant absent) in AMU :mortality during admission



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5

Appendix D: Clinical evidence tables

Study	ASHA 2013{ ASHA 2013 }
Study type	Prospective cohort study
Number of studies (number of participants)	18,962
Countries and setting	ED of St George Hospital, a tertiary referral centre located in Sydney, Australia.
Duration of study	November 2012-February 2013, Friday-Monday 12 noon-6pm Number of SAS study days = 36, number of control days = 66
Stratum	n/a
Subgroup analysis within study	n/a
Inclusion criteria	Australasian triage categories 3, 4, 5 ambulant patients, 16+ years of age.
Exclusion criteria	Sepsis, intermediate or high risk coronary syndrome, mental health patients.
Recruitment/selection of patients	All patients who presented to ED during the study period were included. Patients suitable for assessment via SAS were identified by the triage nurse and an identifying icon created adjacent to the patients name on the ED computer management system.
Age, gender and ethnicity	SAS: age (median, IQR) 41 (21-66), male 50.7%; control: age (median, IQR) 41 (21-67), male 50.7%
Further population details	Not reported
Extra comments	n/a
Indirectness of population	n/a
Interventions	SAS (senior assessment and streaming) compared to days when the model of care was not implemented. Following triage, appropriate patients were taken to a dedicated clinical area staffed by an emergency physician intern (additional to usual rota staff) and senior nurse. The patient was assessed by the emergency physician, a diagnostic and treatment plan commenced and documented and the patient transferred out of the SAS area (including transfer to inpatient team, discharge or transfer to a clinical area in ED with management completed by a junior doctor). The intervention occurred on days of peak demand which is an important confounder.

Study	ASHA 2013{ ASHA 2013 }	
Funding	Not reported	
Results (unadjusted for confounders)		
	SAS	Control
ED length of stay (hour) median (IQR)	3.72 (2.28-5.6)	3.76 (2.37-5.7)
Arrival to first seen by doctor (hour) median (IQR)	0.43 (0.23-0.93)	0.42 (0.22-0.8)
% of patients admitted from ED transferred to ward bed within 8 hour, mean (SD)	79.4 (9.0)	81.7 (7.6)
NEAT achieved, n (%)	4039 (59.15)	7107 (58.57)
Did not wait to be seen, n (%)	171 (2.5)	345 (2.8)
OR for achieving the outcome variable after controlling for confounders on days when SAS was operating		
NEAT (all participants)	OR 1.15 (1.07-1.24)	
NEAT (participants discharged from ED)	OR 1.17 (1.07-1.28)	
NEAT (participants admitted from ED)	OR 1.1 (0.98-1.23)	
NEAT (12 noon-6pm)	OR 1.19 (1.06-1.35)	
NEAT (triage category 3,4,5)	OR 1.17 (1.08-1.27)	
DNW	OR 0.72 (0.58-0.9)	
Risk of bias: All domain – high, Selection – high, Blinding - Low, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low; Indirectness of outcome: No indirectness; other-intervention occurred on days of peak demand		

1

Study	Christmas 2013 {Christmas 2013}
Study type	Prospective observation
Number of studies (number of participants)	Total mean number of patients in the department at start of night shift: middle grade night: 21.7 (20.7-22.8), consultant night: 20.4 (17.4-23.3). There were no significant differences in terms of case mix (age groups and ambulance/non-ambulance arrivals) between the 2 groups.
Countries and setting	Barnsley District General Hospital emergency department
Duration of study	6 month period from 1st Feb 2010-2nd August 2010

Study	**Christmas 2013 {Christmas 2013}**
Stratum	n/a
Subgroup analysis within study	n/a
Inclusion criteria	Not reported
Exclusion criteria	Not reported
Recruitment/selection of patients	Not reported
Age, gender and ethnicity	Middle grade night: 55% male, 16.8% <16 years, 16.8% >65 years, 28.7% ambulance arrivals age 16-65 years, 37.7% non-ambulance arrivals age 16-65 years, 14.3% ambulance arrivals >65 years, 2.5% non-ambulance arrivals over 65 years. Consultant shift: 55.1% male, 18.5% <16 years, 14.5% >65 years, 29.1% ambulance arrivals age 16-65 years, 37.9% non-ambulance arrivals age 16-65 years, 12.0% ambulance arrivals >65 years, 2.5% non-ambulance arrivals over 65 years.
Further population details	Not reported
Extra comments	n/a
Indirectness of population	Includes some under 16
Interventions	Consultants working night shifts compared to middle grade doctor only shifts (no consultant)
Funding	Not reported

Results

No significant differences between number of patients present in the department at the start of the shift or case mix. No significant difference in staffing variables between shifts.

	Middle grade night shift	Consultant night shift
Median waiting time (min)	80.0 (73.0-86.9)	60.4 (46.9-73.9)
Median ED length of stay (min)	143.7 (138.3-149.2)	123.9 (112.7-135.1)
Proportion of patients treated within 4 hours (%)	98.4 (97.7-99.0)	98.4 (96.9-100.0)
Proportion of patients admitted (%)	31.0 (29.6-32.5)	27.1 (24.2-30.1)
Proportion returning to ED within 7 days (%)	8.1 (7.4-8.9)	7.9 (6.5-9.3)

Risk of bias: All domain – high, Selection – high, Blinding - Low, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low,

Study	Christmas 2013 {Christmas 2013}
Subgroups - Low; Indirectness of outcome: No indirectness	

Study	DAVIS 2014[41]
Study type	Single blind RCT
Number of studies (number of participants)	1737
Countries and setting	ED, Royal Prince Alfred Hospital, NHMRC Clinical Trials Centre, University of Sydney, Australia. Inner city tertiary level hospital.
Duration of study	13 days allocated to SWAT intervention, 12 days allocated to non-SWAT, 11 days allocated to standard care control
Stratum	Discharged, admitted
Subgroup analysis within study	High volume days
Inclusion criteria	All adult patients presenting between 10am and 5pm to acute, sub-acute or waiting room area of ED irrespective of whether they were streamed through the early treatment area.
Exclusion criteria	Patients were excluded after randomisation if there was an immediate need for resuscitation (moved to resuscitation bay within 30 minutes of arrival), mental health presentations, triage category 1, dead on arrival or streamed directly to ED track area. Paediatric patients.
Recruitment/selection of patients	There were no significant differences in individual covariates such as age, triage category and presenting problem between the 3 treatment groups.
Age, gender and ethnicity	Mean age (SD): control: 50 (21), non-SWAT: 49 (21), SWAT: 50 (22) Mean % male (SD): control: 253 (48), non-SWAT: 264 (46), SWAT: 306 (47)
Further population details	No significant differences in individual co-variants such as triage category and presenting problem categories between treatment groups.
Extra comments	Not applicable
Indirectness of population	Some obstetrics patients included
Interventions	Day of presentation was the unit of randomisation for subjects. Study days were randomised to: SWAT (senior work up assessment and treatment) model of care to facilitate senior early assessment and decision-making. A team comprising an emergency physician, junior medical officer and ED nurse were used to see patients as soon as possible after triage in a dedicated part of ED on weekdays between 10 am and 5pm. An extra emergency physician worked between 10am and 2pm. The triage

Study	DAVIS 2014[41]
	nurse could stream any patient without immediate life-threatening conditions and thought to benefit from early assessment, to the SWAT area. The SWAT model continued from 2pm-5pm using normally consultants on the rota during the overlap of day and evening shifts. Brief assessment and management occurred in a pre-specified area called the early treatment area. Non-SWAT (extra emergency physician without model of care): an extra emergency physician working 10am-2pm in ED, assisting and treating patients as required. Control (standard care) – no additional emergency physician between 10am and 2pm.
Funding	Internally funded.

Results

No significant differences in individual covariates such as age, triage category and presenting problem.

No adverse events or complaints were reported during the study period.

NEAT = National Emergency Access Target (seen and discharged from ED within 240 minutes of triage time)

	Control (n=522)	Non-SWAT control (n=568)	SWAT (n=647)
NEAT (n, %, 95% CI)			
Overall	238 (46) (41,50)	235 (41) (37,45)	308 (48) (44,51)
Discharged	203/325 (62) (57, 68)	193/366 (53) (48,58)	252/396 (64) (59,68)
Admitted	35/197 (18) (13,24)	42/202 (21) (16,27)	56/251 (22) (18,28)
Median length of stay (IQR) (min)			
Overall	255 (177, 376)	269 (189,376)	261 (171, 386)
Discharged	208 (147, 283)	234 (167, 309)	206 (140, 294)
Admitted	381 (274, 478)	367 (253, 490)	374 (273, 494)
Time to admission decision (minutes)		232 (158-310)	209 (131-301)
High volume (>200 presentations/day) versus. non-high volume days			
NEAT %	37	37	47

A decrease in overall ED LOS was observed in the intervention group on high volume versus. Non-high volume days.

Study	DAVIS 2014[41]
Overall quality rating Risk of bias: All domain – high, Selection – low, Blinding - high, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low; Indirectness of outcome: No indirectness	

Study	Harvey 2008[67]
Study type	Prospective observational study
Number of studies (number of participants)	1291
Countries and setting	ED of Waikato Hospital, a 650 bed university-affiliated teaching hospital.
Duration of study	Strike period 15/06/2006 – 19/06/2006 versus. A corresponding 5 day period in the subsequent week with normal staffing.
Stratum	Outcomes by Australian Triage Scale (5 categories denoting the clinical urgency of presentation).
Subgroup analysis within study	n/a
Inclusion criteria	Not reported
Exclusion criteria	Not reported
Recruitment/selection of patients	All patient presentations during the 5 day strike and the corresponding normally staffed days of the subsequent calendar week were examined.
Age, gender and ethnicity	Strike period: age (median: 35, 0-91), male/female ratio: (1.06:1) Non-strike period: age (median: 32, 0-97), male/female ratio: (1.01:1) Ethnicity: Not reported
Further population details	Not reported
Extra comments	n/a
Indirectness of population	Includes children.
Interventions	Five day junior doctors strike. During this period, service delivery by all hospital departments was provided by consultant specialists, career medical officers and non-striking junior doctors. Usual ED staffing is 9 consultant emergency physicians, 13 registrar level doctors and 4 SHOs (daily average 111.2 clinical hours). Total hours during non-strike period: consultant 216, registrar: 323, SHO: 75). During the strike period ED medical staffing was via 10 consultant emergency physicians, 1 career medical offer (CMO) and 3 non-striking

Study	Harvey 2008[67]
	registrars providing an daily average of 98.6 clinical hours (Total hours: consultant 359, CMO 20, registrar 114). During the strike the elective admission and surgeries were cancelled and returned to normal hospital function in the non-strike period.
Funding	Not reported

Results

Waiting time until medical assessment per ATS in minutes

	Strike period		Non-strike period	
	Mean (SD)	Number	Mean (SD)	Number
ATS1	8.0 (12.1)	3	4.0 (6.7)	4
ATS2	15.6 (25.9)	76	23.5 (38.0)	96
ATS3	43.8 (46.2)	298	73.6 (85.9)	301
ATS4	53.7 (48.3)	203	82.0 (74.5)	247
ATS5	47.6 (42.4)	28	50.6 (43.6)	35

Time seen to disposition (time seen by doctor until time of exit from the ED) minutes by ATS

	Strike period		Non-strike period	
	Mean (SD)	Number	Mean (SD)	Number
ATS1	57.7 (38.5)	3	165.0 (90.0)	4
ATS2	147.9 (129.3)	76	255.1 (246.8)	96
ATS3	119.9 (124.3)	298	165.0 (176.4)	301
ATS4	85.5 (78.3)	203	99.7 (115.9)	247
ATS5	28.9 (35.6)	28	79.8 (125.9)	35

ED department length of stay (time from registration to exit) in minutes by ATS score

	Strike period		Non-strike period	
	Mean (SD)	Number	Mean (SD)	Number

Study	Harvey 2008[67]			
ATS1	65.7 (42.3)	3	169.0 (90.9)	4
ATS2	162.6 (128.8)	76	278.6 (247.5)	96
ATS3	161.9 (127.2)	298	238.4 (190.6)	301
ATS4	134.1 (86.6)	203	179.2 (131.0)	247
ATS5	74.9 (51.9)	28	126.1 (133.0)	35
Clinical investigations				
	Strike period		Non-strike period	
	Tests/patient	Total number	Tests/patient	Total number
Haematology	0.54	331	0.58	398
Biochemistry	0.54	326	0.58	395
Plain film XR	0.45	272	0.48	328
Ultrasound	0.025	15	0.034	23
CT	0.066	40	0.06	41
MRI	0.0016	1	0.0088	6
	Strike period		Non-strike period	
ED mortality	2		1	
48 hour mortality	2		4	
Patient walkout	11		17	
30 day unscheduled representations	43		64	
Percentage of patients seen within recommended waiting times (ATS1: 0 minutes, ATS 2: 10 minutes, ATS 3: 30 minutes, ATS 4: 60 minutes, ATS5: 120 minutes)				
	Strike period		Non-strike period	
ATS1	0%		25%	
ATS2	63%		53%	
ATS3	48%		38%	
ATS4	66%		47%	
ATS5	96%		91%	

Study	Harvey 2008[67]	
Admission rate		
	Strike period	Non-strike period
ATS1	100%	100%
ATS2	81.6%	89.6%
ATS3	56.4%	65.1%
ATS4	34.8%	38.5%
ATS5	10.7%	11.4%
Risk of bias: All domain – high, Selection – high, Blinding - Low, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low; Indirectness of outcome: No indirectness; other- triage scores significantly different at BL for 1 group		

Study	JARVIS 2014 {JARVIS 2014}
Study type	Prospective non-randomised observational
Number of studies (number of participants)	4,622
Countries and setting	ED, Calderdale Royal Hospital, Halifax, West Yorkshire, UK.
Duration of study	Phase 1: 1st April – 24th May 2013. Phase 2: 30th September – 18th October 2013
Stratum	n/a
Subgroup analysis within study	n/a
Inclusion criteria	Not reported
Exclusion criteria	Minor injuries.
Recruitment/selection of patients	All patients (adults and children) presenting to the emergency department between 9am and 5pm were included unless deemed to be suffering from a minor injury.
Age, gender and ethnicity	Mean age: 42 years (group 1), 45 years (group 2), % male : 51.8 group 1, 50.2 group 2, ethnicity: not reported
Further population details	Not reported
Extra comments	n/a
Indirectness of population	Consultant-supported rapid assessment model intervention also included point-of-care blood testing therefore perhaps difficult to attribute study results just to consultant intervention.

Study	JARVIS 2014 {JARVIS 2014}
	Includes children.
Interventions	Group 1: Nurse-led triage using Manchester triage tool. Blood samples were analysed in the central hospital laboratory. Group 2: Emergency Department Intervention Team 'EDIT' consisting of an additional consultant, senior nurse and health care assistant. The role of consultant was to sign off the investigation plan, order radiological investigations and perform a more thorough assessment of those patients deemed eligible for discharge. Point of care testing was available for full blood counts, renal function, and blood gas analysis.
Funding	Not reported though blood testing kits donated by manufacturers.
Results Primary outcome: time from arrival in ED to point when all emergency care is complete and the patient is deemed ready to move to the next destination of care ('time to emergency department ready' Group 1 (n=3835) time to ED ready = 129 minutes, time to ED physician assessment= 96 minutes Group 2 (n=787) time to ED ready = 76 minutes, time to ED physician assessment = 24 minutes	
Risk of bias: All domain – high, Selection – high, Blinding - Low, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low; Indirectness of outcome: No indirectness; other- intervention group also having point of care testing	

Study	McNeill 2009{McNeill 2009}
Study type	Observational
Number of studies (number of participants)	2928. 2064 assessed on a day when consultant present, 864 assessed when there were not.
Countries and setting	AMU, Ipswich hospital
Duration of study	1st Jan 2005 – 31st August 2005
Stratum	None reported
Subgroup analysis within study	None reported
Inclusion criteria	Not reported
Exclusion criteria	Not reported
Recruitment/selection of patients	Not reported

Study	McNeill 2009{McNeill 2009}
Age, gender and ethnicity	All over 16 years. Consultant present: 42% male, age: 19% 16-49, 9% 50-59, 13% 60-69, 23% 70-79, 36% 80+ Consultant absent: 44% male, age: 18% 16-49, 9% 50-59, 15% 60-69, 22% 70-79, 36% 80+
Further population details	Not reported
Extra comments	Not applicable
Indirectness of population	Indirect due to exact time of consultant review not reported in either group.
Interventions	A single consultant would be present 4 days out of 5 during the working week from 9am-5pm. On days when the consultant was not on duty, there would be no routine consultant presence until a post-take ward round commenced at 7pm. Data from weekends and bank holidays was excluded.
Funding	Not reported

Results

Mean LOS (excluding inpatient deaths) was significantly lower when the consultant was present on the AMU: 7.72 versus. 9.06 days with a reduction of 1.34 (0.01-2.67) days. The greatest effect was seen in those who had shorter admission durations. Although the percentage discharged in less than 3 days was very similar between the 2 groups (46.6% consultant absent and 46.9% consultant present), the results suggest that the presence of a consultant increases those discharged immediately and reduces those admitted for 1 to 2 days.

	Consultant absent (n=864)	Consultant present (n=2,064)
Length of stay (days) (mean, sd)	9.06 (14.46)	7.72 (14.46)
% discharged on day of admission (total)	23	32
% patients readmitted (excluding deaths)	17.6	19.2
% patients readmitted within 30 days of discharge	10.2	10.5
% patients readmitted within 60 days of discharge	20.3	18.9
% patients discharged within 24 hours and readmitted within 1 week for same clinical problem	1.5	1.8
Mortality during admission	10.1%	9.4%
Mortality within 48 hours of admission	1.4%	1.9%
Mortality among patients who had been discharged within 24 hours	2.0%	2.1%

Risk of bias: All domain – high, Selection – high, Blinding - Low, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low; Indirectness of outcome: No indirectness

Study	Shetty 2012{Shetty 2012}
Study type	Prospective interventional study
Number of studies (number of participants)	23,253
Countries and setting	ED at Westmead Hospital, a tertiary adult hospital with 650 emergency beds in western Sydney metropolitan area.
Duration of study	Comparing 77 days during 21st February -8th May in 2010 with the same period in 2011.
Stratum	By AST (Australasian triage strategy) grade
Subgroup analysis within study	n/a
Inclusion criteria	Not reported
Exclusion criteria	LOS data for DNW patients was excluded in both groups
Recruitment/selection of patients	All patients presenting during the study period were included in the analysis.
Age, gender and ethnicity	Age: Control group: 47.7±21.6 years (53.1% male) Intervention: 47.6±21.6 (52.2% male).
Further population details	n/a
Extra comments	n/a
Indirectness of population	n/a
Interventions	The SAFE-T zone model of care was implemented during the intervention phase on all days between 10am and 6pm. An amalgamation of front-of-house initiatives, such as physician at triage, team triage, dynamic waiting room and acuity and time based queuing concepts lead to the development of the SAFE-T zone model of care. The principle was to maintain patient flow through ED despite hospital access block and ED overcrowding. This involved developing a dynamic assessment zone around triage to facilitate early senior ED physician review, disposition decision-making, streaming to bypass the ED acute care zone and value-added interventions. Dynamic transition waiting room concept and use of waiting room for patient disposition after initial assessment and treatment in the SAFE-T zone. Early senior ED physician review (modified physician at triage, team triage approach and advance triage protocols) and in all areas of ED. Direct-to-bed protocol for ATS scale category 3, 4 and 5 into the SAFE-T zone. Use of point-of-care testing methods. Urgent care centre initiative to manage low-acuity patients. ED acute-care bed quarantining.

Study	Shetty 2012{Shetty 2012}
	Early streaming of patients from the SAFE-T zone to areas bypassing the ED acute care area. Development and implementation of observational units. The SAFE-T zone consisted of a 2 bed Assess Stream Initiate Zone and a 5 treatment space Early Treatment Zone. Patients were initially reviewed in the Assess-Stream-Initiate area where they underwent a team assessment (senior doctor, nursing and junior medical staff) and initiation of treatment within a 10 minute time frame. The end point was a disposition decision made by senior ED clinicians. Existing staff were realigned for the SAFE-T zone, including a senior ED physician.
Funding	Not reported
Results DNW rates: intervention 9.6%, control 10.7% Time to first seen key performance indicator ATS 1 ATS2 ATS3 ATS 4 ATS 5 Control (%) 100.0 81.4 49.5 54.8 76.8 Intervention (%) 99.6 92.3 69.1 73.4 86.3 ED LOS by category In SAFE-T hours Control (median, IQR) Intervention (median, IQR) AST 3 7.5 (5.3-10.5) 6.5 (4.2-9.4) AST 4 5.7 (3.6-8.4) 4.9 (2.8-7.6) AST 5 3.5 (1.9-5.4) 3.1 (1.7-5.0)	
Overall quality rating Risk of bias: All domain – high, Selection – high, Blinding - Low, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low; Indirectness of outcome: No indirectness; other- intervention group also having point of care testing	

1

Study	White 2010{White 2010}
Study type	Observational
Number of studies (number of participants)	556 patients seen by junior clinicians were subject to review by a senior clinician.
Countries and setting	ED, Ninewells Hospital, Dundee, UK
Duration of study	Twice weekly between February 2008 and August 2008.

Study	White 2010{White 2010}
Stratum	None reported
Subgroup analysis within study	n/a
Inclusion criteria	Not reported
Exclusion criteria	Not reported
Recruitment/selection of patients	All patients who had a change of disposition from admission to discharge by the senior doctor (consultant) were reviewed.
Age, gender and ethnicity	Not reported
Further population details	Not reported
Extra comments	n/a
Indirectness of population	n/a
Interventions	Treatment decision made by a junior doctor only versus change in treatment plan made by a senior doctor.
Funding	Not reported

Results

1500 patients attended during 46 data collection periods. Senior doctors were solely involved in the care of 1057 patients. 389 were seen just by junior doctors and the senior doctor changed the primary outcome plan in 155 patients (27.98%) who were first seen by junior doctors.

Following senior review, 26 of the proposed 165 patients to be admitted were immediately discharged with no follow-up (15.8% reduced admissions). Of these, 2 were readmitted within a week. Of the 85 proposed admissions to AMU, 25 were prevented (29.4% reduction). Some of the patients initially recommended for discharge were identified by a senior reviewer as requiring inpatient admission or short term observation (22 inappropriate discharge recommendations identified by consultants, 9.4% prevention).

Senior review prevented unnecessary specialty referral for review or opinion in 64 patients (61.5% referral reduction).

	Junior decision	Senior decision	Net difference	Percentage change	95% CI
All admission (including ED observation)	165	153	-12	-7.3	-4 to -12
Inpatient admission	135	119	-16	-11.9	-7.2 to -18.2
AMU admission	85	67	-18	-21.2	-13.5 to -30.8
Discharge with no follow up	233	285	+52	+22.3	17.3 to 28.0
Discharged with outpatient follow up	52	70	+18	+34.6	22.7 to

Study	White 2010{White 2010}
48.2	
Risk of bias: All domain – high, Selection – high, Blinding - Low, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low; Indirectness of outcome: No indirectness	

Appendix E: Economic evidence tables

No studies were included.

Appendix F: GRADE tables

Table 10: Clinical evidence profile: Early versus late consultant review in ED (SWAT versus standard care control): RCT evidence

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Early (SWAT)	late consultant review (control)	Relative (95% CI)	Absolute		
Proportion of patients who met NEAT												
1	randomised trials	Serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	308/647 (47.6%)	45.6%	RR 1.04 (0.92 to 1.18)	18 more per 1000 (from 36 fewer to 82 more)	⊕⊕⊕O MODERATE	IMPORTANT
Proportion of admitted patients who met NEAT												
1	randomised trials	Serious[1]	no serious inconsistency	no serious indirectness	Serious[2]	none	56/251 (22.3%)	17.8%	RR 1.26 (0.86 to 1.83)	46 more per 1000 (from 25 fewer to 148 more)	⊕⊕OO LOW	IMPORTANT
Proportion of discharged patients who met NEAT												
1	randomised trials	Serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	252/396 (63.6%)	62.5%	RR 1.02 (0.91 to 1.14)	12 more per 1000 (from 56 fewer to 87 more)	⊕⊕⊕O MODERATE	IMPORTANT
Number of patients admitted												
1	randomised trials	Serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	251/647 (38.8%)	37.7%	RR 1.03 (0.89 to 1.19)	11 more per 1000 (from 41 fewer to 72 more)	⊕⊕⊕O MODERATE	IMPORTANT
Number of patients discharged												
1	randomised trials	Serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	396/647 (61.2%)	62.3%	RR 0.98 (0.9 to 1.08)	12 fewer per 1000 (from 62 fewer to 50 more)	⊕⊕⊕O MODERATE	IMPORTANT

[1] Downgraded by 1 increment if the majority of the evidence was at high risk of bias, and downgraded by 2 increments if the majority of the evidence was at very high risk of bias.
[2] Downgraded by 1 increment if the confidence interval crossed one MID or by 2 increments if the confidence interval crossed both MIDs.

Table 11: Clinical evidence profile: Early versus late consultant review in ED: observational evidence

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Early consultant triage	late consultant triage	Relative (95% CI)	Absolute		
Length of stay (minutes) (Better indicated by lower values)												
1	observational studies	serious[1]	no serious inconsistency	no serious indirectness	Serious[3]	none	608	683	-	MD 68.3 lower (84.76 to 51.84 lower)	⊕OOO VERY LOW	CRITICAL
Mortality												
1	observational studies	serious[2]	no serious inconsistency	no serious indirectness	very serious[3]	none	2/608 (0.33%)	0.2%	Peto OR 2.20 (0.23, 21.23)	2 more per 1000 (from 2 fewer to 39 more)	⊕OOO VERY LOW	CRITICAL
30 day unscheduled readmissions												
1	observational studies	serious[1]	no serious inconsistency	no serious indirectness	Serious[3]	none	43/608 (7.1%)	9.4%	RR 0.75 (0.52 to 1.09)	23 fewer per 1000 (from 45 fewer to 8 more)	⊕OOO VERY LOW	IMPORTANT
Admitted												
1	observational studies	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	153/1057 (14.5%)	42.4%	RR 0.34 (0.28 to 0.41)	280 fewer per 1000 (from 250 fewer to 305 fewer)	⊕OOO VERY LOW	IMPORTANT
% achieving NEAT												
1	observational	serious[1]	no serious	no serious	no serious	none	-		OR 1.15	140 more per 1000 (from 70 more to 210	⊕OOO	

	studies		inconsistency	indirectness	imprecision				(1.07 to 1.24)	more)	VERY LOW	
% achieving NEAT of those discharged												
1	observational studies	serious[1]	no serious inconsistency	no serious indirectness	Serious[3]	none	-		OR 1.17 (1.07 to 1.28)	160 more per 1000 (from 70 more to 250 more)	⊕OOO VERY LOW	
% achieving NEAT of those admitted												
1	observational studies	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	-		OR 1.1 (0.98 to 1.23)	100 more per 1000 (from 20 fewer to 210 more)	⊕OOO VERY LOW	
% seen within recommended waiting times - Harvey 2008												
1	observational studies	serious[1]	no serious inconsistency	no serious indirectness	Serious[3]	none	352/608 (57.9%)	46%	RR 1.26 (1.13 to 1.4)	120 more per 1000 (from 60 more to 184 more))	⊕OOO VERY LOW	IMPORTANT
Did not wait to be seen patients (Harvey 2008)												
1	observational studies	serious[1]	no serious inconsistency	Serious[2]	Very serious[3]	none	11/608 (1.8%)	2.5%	RR 0.73 (0.34-1.54)	7 fewer per 1000 (from 16 fewer to 13 more)	⊕OOO VERY LOW	IMPORTANT
Did not wait to be seen patients (Asha 2013)												
1	observational studies	serious[1]	no serious inconsistency	Serious[2]	Serious[3]	none	-		OR 0.72 (0.58 to 0.89)	330 fewer (from 540 fewer to 110 fewer)	⊕OOO VERY LOW	
Did not wait to be seen patients (Shetty 2012)												
1	observational studies	serious[1]	no serious inconsistency	Serious[2]	no serious imprecision	none	1137/11845 (9.6%)	10.7%	RR 0.9 (0.83 to 0.97)	11 fewer per 1000 (from 3 fewer to 18 fewer)	⊕OOO VERY 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.

[2] Downgraded by 1 increment if the confidence interval crossed one MID or by 2 increments if the confidence interval crossed both MIDs.

Table 12: Clinical evidence profile: Early versus late consultant review in AMU (consultant present versus consultant absent): cohort study evidence

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Early (Consultant present)	Late (Consultant absent)	Relative (95% CI)	Absolute		
Length of stay - Days (Better indicated by lower values)												
1	observational studies	Serious[1]	no serious inconsistency	Serious[2]	no serious imprecision	none	2064	864	-	MD 1.34 lower (2.67 to 0.01 lower)	⊕OOO VERY LOW	CRITICAL
% discharged on day of admission												
1	observational studies	Serious[1]	no serious inconsistency	Serious[2]	Serious[3]	none	664/2064 (32.2%)	23.0%	RR 1.4 (1.22-1.6)	129 more per 1000 (from 71 more to 193 more)	⊕OOO VERY LOW	IMPORTANT
% patients discharged within 24 hours and readmitted within 1 week for same clinical problem												
1	observational studies	Serious[1]	no serious inconsistency	Serious[2]	very serious[3]	none	37/2064 (1.8%)	1.5%	RR 1.19 (0.64 to 2.23)	3 more per 1000 (from 5 fewer to 18 more)	⊕OOO VERY LOW	IMPORTANT
Mortality during admission												
1	observational studies	Serious[1]	no serious inconsistency	Serious[2]	Serious[3]	none	194/2064 (9.4%)	10.1%	RR 0.93 (0.73 to 1.19)	7 fewer per 1000 (from 27 fewer to 19 more)	⊕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] The evidence is indirect as the exact time of consultant review was not reported.

[3] Downgraded by 1 increment if the confidence interval crossed one MID or by 2 increments if the confidence interval crossed both MIDs.

Appendix G: Excluded clinical studies

Table 13: Studies excluded from the clinical review

Study	Exclusion reason
ADAMS 2005[3]	Incorrect setting and population (in-hospital cardiac arrests occurring hospital-wide).
ADIGUEZL 2015[4]	Incorrect comparison (pulmonary specialist versus intensivist).
AGA 2012[5]	Incorrect setting (surgical care).
AGRAWAL 2009[6]	Incorrect setting (general surgery).
AHMED 2010[7]	Incorrect setting (outpatient clinic).
ALI 2010[8]	Before and after study. Time to consultant review not measured. Insufficient data provided to make a comparison.
ANDERSON 1988[10]	Time to consultant review not measured. No outcomes of interest.
ANDERSON 2013[9]	Time to consultant review not measured. Observational study set in USA.
ANGUS 2000[11]	Does not fit protocol. Observational study set in USA.
ANON 2005[1]	Incorrect intervention. Summary paper only.
AUDIT 1996[13]	Contains no relevant outcome data.
BARNES 2011[14]	Incorrect setting (head and neck surgery).
BEIRI 2006[15]	Incorrect setting (orthopaedic and trauma surgery).
BELL 2013[16]	No data reported.
BEWICK 2009[17]	Incorrect comparison (generalist versus specialist).
BRAY 2013[19]	Does not fit with current practice
BLUNT 2000[18]	Incorrect comparison (intensivist versus non-specialist).
BRODIE 2012[20]	Review paper checked for references.
BROWN 1989[21]	Incorrect comparison (consultant versus critical care specialist).
CADTH 2014[22]	Review paper checked for references
CALDER 1998[23]	Incorrect setting (surgical care).
CAPP 2012[24]	No outcomes of interest.
CARBERRY 2006[25]	Narrative paper.
CARIGA 2011[26]	Incorrect setting (neurology clinic).
CARROLL 2004[27]	Incorrect setting (neurology).
CASALINO 2014[28]	Incorrect comparison (specialist advice versus no specialist advice).
CHA 2009[29]	Incorrect intervention.
CHEN 2015A [30]	Incorrect intervention with no extractable outcomes
CHRISTMAS 2005[31]	Incorrect setting (trauma service).
CLARKE 2005[33]	Diagnosis of role players.
COHEE 2014[34]	Incorrect setting (inpatient internal medical wards).
COHEN 1993[35]	Time to consultant review not measured. Observational study published < 2005.
COOKE 1996[36]	Narrative/letter to editor.

COOKE 1998[37]	Review paper checked for references.
CAPP 2012[24]	No outcomes of interest
CUTLER 2003[38]	Qualitative review.
DALE 1995[39]	Time to consultant review not measured. Observational study published < 2005.
DAOUST 2014[40]	Incorrect intervention.
DAY 2005[42]	Narrative.
DENMANJOHNSON 1997[43]	Time to consultant review not measured. Observational study published < 2005 and n<200.
DHRAMPAL 2010[44]	Conference abstract
EDKINS 2014[45]	Review paper checked for references.
EDWARDS 2011[46]	Incorrect intervention (registered nurse in triage team)
ELGAYLANI 1997[47]	Incorrect setting (chest pain clinic).
ELMSTAHL 1999[48]	Observational study published < 2005.
EVANS 2011[49]	Time to consultant review not measured.
FISHER 1994[51]	No outcomes of interest. Incorrect setting: otolaryngology unit.
FITZPATRICK 2006B[52]	Incorrect population (trauma patients).
FOSTER 2006[53]	Incorrect setting (oncology referrals).
GAMBIER 2012[54]	Incorrect setting – internal medicine department. Timing of consultant review not measured.
GARLAND 2012[55]	Incorrect comparison (consultant present versus consultant on call)
GARNER 2006[56]	Incorrect setting (surgery).
GASKELL 1995[57]	Incorrect setting (general surgical ward).
GERSHENGORN 2011[58]	Incorrect comparison (nurses/physicians assistant's versus junior doctors).
GIBBS 2001[59]	No outcomes of interest.
GILLIGAN 2008[60]	Incorrect setting (hospital-wide).
GLASSER 2009[61]	Incorrect setting (military medical centre).
GOMEZ 1996[62]	Unclear which health professionals delivered intervention.
GOMEZ-SOTO 2008[63]	Incorrect setting (internal medicine and family medicine).
GULLI 2014[64]	No outcomes of interest.
HALFDANARSON 2006[65]	Narrative.
HARRISON 2007[66]	Narrative.
HELLAWELL 2005[68]	Time to consultant review not linked to outcomes.
HELLING 2010A[69]	Incorrect setting (trauma centres).
HOFFMAN 2003[71]	No outcomes of interest.
HOFFMAN 2005[72]	Incorrect comparison (consultants present in both interventions).
HOFFMAN 2006[70]	Incorrect comparison (consultants present in both interventions).
HOLZMAN 1994[73]	Incorrect setting (surgery)
HOPKINS 2014[74]	Time to consultant review not measured.
HORWITZ 2007[75]	Time to consultant review not measured. Observational study set in USA.
IMPERATO 2012[76]	Before and after study set in USA.

JEUNE 2013[78]	Time to consultant review not linked to outcomes.
JIMENEZ 2003[79]	Not a comparative study
JOHANSSON 2001[80]	Does not match protocol
JOHNSTONE 2015 [81]	Incorrect population
JUNG 2016 [82]	Incorrect intervention
KAPUR 1999[83]	Time to consultant review not measured.
KAWAR 2011[84]	Incorrect intervention.
KENDRICK 2006[85]	No outcomes of interest.
KENNELLY 2014[86]	No outcomes of interest
KENT 2011[87]	Incorrect intervention.
KERR 2010[88]	No outcomes of interest.
KHADJOOI 2009[89]	Not a comparative study.
KIRTON 2007[90]	No outcomes of interest.
KMIETOWICZ 2007[91]	News article checked for references.
LAINE 1993[92]	Time to consultant review not measured.
LAL 2000[93]	Time to consultant review not measured.
LAMMERS 2003[94]	Time to consultant review not measured.
LANGHORNE 1995[95]	Meta-analysis comparing stroke units to normal wards. Time to consultant review not measured.
LAUPLAND 2010[96]	Time to consultant review not measured.
LAURENS 2011[97]	Incorrect setting (hospital-wide intervention).
LEVY 2013[98]	Narrative paper.
LEWIS 1988[99]	Timing of consultant review not reported.
LILLY 2014[100]	Incorrect intervention (telemedicine).
LONDERO 2014[101]	Time to consultant review not linked to outcomes.
LONGSWORTH 1990[102]	Time to consultant review not linked to outcomes.
MAGIN 2013[103]	Incorrect setting (secondary referral clinic).
MAHMOOD 2009[104]	Time to consultant review not linked to outcomes.
MANAWADU 2014A[105]	Incorrect population (in-hospital stroke).
MARRIOTT 2003[106]	Time to consultant review not measured.
MARTIN 1997[108]	No outcomes of interest.
MCMANUS 2002[109]	Review paper checked for references.
MEYER 2005[111]	Incorrect intervention.
MEYNAAR 2009[112]	Incorrect intervention (intensivists versus junior doctors).
MIRZA 2013[113]	Incorrect setting (ENT clinic).
MORRIS 2009[114]	Time to consultant review not measured.
MULLEN 2009[115]	Conference abstract
MUNRO 2006[116]	Poor quality data source (survey)
MURPHY 1996[117]	Unclear intervention.
MURRELL 2011[118]	Observational study set in USA.
NCEPOD 2007[107]	Time to consultant review not linked to outcomes.

NEWBY 1998[119]	Incorrect setting (chest pain clinic).
O'CONNOR 1996A[120]	Incorrect population (trauma patients).
O'KEEFFE 2012[121]	Incorrect populations ('did not wait' patients).
PATEL 2014[122]	Time to consultant review not measured.
POURMAND 2013[123]	Incorrect comparison (junior doctors with input from consultant versus junior doctors alone).
RAFMAN 2013[124]	Observational study set in Singapore
REDMOND 1993[125]	Short article, insufficient information.
ROTHEN 2007[126]	Time to consultant review not measured.
ROTHWELL 2007[127]	Incorrect intervention (referral to outpatient clinic).
SAKR 2015[128]	Timing of consultant review not measured.
SALAZAR 2001[129]	Observational study published < 2005
SCHULTZ 2013[130]	Time to consultant review not linked to outcomes.
SECOR 1983[131]	Does not match protocol
SHOWKATHALI 2013[133]	Incorrect setting (cardiothoracic centre). Time to consultant review not measured.
SILBER 2009[134]	Time to consultant review not measured. Observational study set in USA.
SOONG 2013[135]	Incorrect intervention.
SPIGOS 1996[136]	Observational study set in USA and published <2005.
STEVENS 2001[137]	Time to consultant review not measured.
SVIRSKY 2013[138]	Incorrect intervention (early triage by junior doctors).
TING 1991[139]	Observational study set in USA and published <2005.
TRAUB 2015[140]	Observational study set in USA.
TRAVERS 2006[141]	Non-randomised study set in Singapore.
VAGHASIYA 2014[142]	No outcomes of interest.
VOLPP 2007[143]	Observational study set in USA.
VOLPP 2009[144]	Observational study set in USA.
VOLPP 2013[145]	Observational study set in USA.
VOSK 1998[146]	No outcomes of interest.
WALLS 2009[147]	No outcomes of interest.
WANKLYN 1997[148]	Incorrect comparison (SHOs and registrars).
WARD 2009[149]	Does not link consultant working patterns to clinical outcomes.
WARD 2013[150]	Does not match protocol
WILCOX 2013[152]	Incorrect comparison (high versus low intensity staffing).
WILCOX 2014[153]	Timing of consultant review not measured.
WOODS 2008[154]	No outcomes of interest.

Appendix H: Excluded economic studies

No studies were excluded.