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		

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	

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	