

Table 3.1.3 Does assessment of certain vital signs and chief complaints in emergency department triage of adults have an impact on 30-day or in-hospital mortality?

Author Year Reference Country	Study design	Patient characteristics Sample Female/age Male/age Inclusion criteria Type of emergency department	Primary outcome	Outcome Frequency RR (relative risk), OR (odds ratio) P-value, 95% CI (confidence interval)	Missing data (%)	Study quality and relevance Comments
Goodacre S et al 2006 [5] United Kingdom	Observational cohort Retrospective database review	Emergency medical admissions, life threatening category A emergency calls N=5 583 Female: 2 350 (42.3%) Male: 3 233 (57.7%) Mean age: 63.4 years <u>Inclusion criteria</u> Any case where caller report chest pain, unconsciousness, not breathing and patient admitted to hospital or died in emergency department <u>Setting</u> Variables recorded on ambulance arrival	Mortality in hospital during the stay	Age, Glasgow Coma Scale (GCS) and oxygen saturation independent predictors of mortality in multivariate analysis, blood pressure is not useful <u>Glasgow Coma Scale (GCS)</u> OR 2.10 (95% CI 1.86–2.38) p<0.001 <u>Age</u> OR 1.74 (95% CI 1.52–1.98) p<0.001 <u>Saturation</u> OR 1.36 (95% CI 1.13–1.64) p=0.001	Rapid Acute Physiology Score (RAPS – blood pressure, pulse, GCS, RR, saturation and temp) in only 3 624 (64.9%). Missing in 35.1% Rapid Emergency Medicine Score (REMS – blood pressure, pulse, GCS, RR) in only 2 215 (39.7%). Missing in 60.3% New Score (GCS, saturation, age) in 2 743 (49.1%). Missing in 50.9%	Moderate Acceptable external validity. Good/acceptable internal validity Age, GCS and saturation independent predictors of mortality. Blood pressure is not a useful predictor

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Table 3.1.3 continued

Author Year Reference Country	Study design	Patient characteristics Sample Female/age Male/age Inclusion criteria Type of emergency department	Primary outcome	Outcome Frequency RR (relative risk), OR (odds ratio) P-value, 95% CI (confidence interval)	Missing data (%)	Study quality and relevance Comments
Olsson T et al 2004 [4] Sweden	Observational cohort Prospective	Non-surgical emergency department patients N=11 751 Female: 51.6% Male: 48.4% Mean age: 61.9 (SD ±20.7) <u>Inclusion criteria</u> Patients consecutively admitted to the emergency department over 12 months <u>Exclusion criteria</u> Patients with cardiac arrest that could not be resuscitated, patients with more than one parameter missing <u>Setting</u> 1 200 bed university hospital emergency department in Sweden	Mortality in hospital, within 48 hours	In-hospital mortality 2.4%, mortality within 48 hours 1.0% <u>Predictors for mortality</u> <u>Saturation OR</u> 1.70 (95% CI 1.36–2.11), p<0.0001 <u>Respiratory frequency OR</u> 1.93 (95% CI 1.37–2.72), p<0.0002 <u>Pulse frequency OR</u> 1.67 (95% CI 1.36–2.07), p<0.0002 <u>Coma OR</u> 1.68 (95% CI 1.38–2.06), p<0.0001 <u>Age OR</u> 1.34 (95% CI 1.10–1.63), p<0.004		Moderate Good internal validity

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Table 3.1.3 continued

Author Year Reference Country	Study design	Patient characteristics Sample Female/age Male/age Inclusion criteria Type of emergency department	Primary outcome	Outcome Frequency RR (relative risk), OR (odds ratio) P-value, 95% CI (confidence interval)	Missing data (%)	Study quality and relevance Comments
Han JH et al 2007 [7] USA, Singapore	Observational cohort Retrospective database review Comparison patients ≥/≤75 years	Suspected acute coronary syndrome (ACS) N=10 126 Female: 5 635 Male: 4 491 Mean age: Not shown 11.4% ≥75 years <i>Inclusion criteria</i> ≥18 year, suspected ACS verified by electrocardiogram (ECG), cardiac biomarkers, dyspnoea, light-headedness, dizziness and weakness <i>Exklusion criteria</i> Interhospital transfer, if missing data concerning gender, age or clinical presentation <i>Setting</i> 8 emergency departments (USA), 1 emergency depart- ment (Singapore)	Mortality in-hospital, within 30 days	2.7% in-hospital mortality for patients age ≥75 years, higher 30 day mortality (adjusted OR 2.6, 95% CI 1.6–4.3)	Missing data for ECG, symptoms or gender in 1 810 (15.2%)	Low Convenience sample-selection bias. Confoun- ders, such as co-morbidity not described Acceptable intern validity

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Table 3.1.3 continued

Author Year Reference Country	Study design	Patient characteristics Sample Female/age Male/age Inclusion criteria Type of emergency department	Primary outcome	Outcome Frequency RR (relative risk), OR (odds ratio) P-value, 95% CI (confidence interval)	Missing data (%)	Study quality and relevance Comments
Arboix A et al 1996 [6] Spain	Observational cohort	Stroke N=986 Female: 468 Male: 518 Mean age: Not shown <i>Inclusion criteria</i> First-ever stroke, admitted to hospital <i>Setting</i> Department of neurology, university hospital	Mortality in-hospital	Overall mortality 16.3% <i>Age OR</i> 1.05 (95% CI 1.03–1.07), previous or concomitant <i>Pathologic conditions OR</i> 1.83 (95% CI 1.19–2.82) <i>Deteriorated level of consciousness OR</i> 11.70 (95% CI 7.70–17.77) <i>Vomiting OR</i> 2.18 (95% CI 1.20–3.94) <i>Cranial nerve palsy OR</i> 2.61 (95% CI 1.34–5.09) <i>Seizures OR</i> 5.18 (95% CI 1.70–15.77) <i>Limb weakness OR</i> 3.79 (95% CI 1.96–7.32) were independent prognostic factors of in-hospital mortality	Not stated	Moderate

Table 3.2.5 Reliability of triage scales.

Author Year, reference Country	Triage system	Patient characteristics Age Gender Triageur: Amount, profession	Results: κ -values, percentage agreement (PA)/ triage level	Drop out (%)	Study quality and relevance
Considine J et al 2000 [3] Australia	ATS	10 scenarios 31 RNs	<i>Triage level</i> 1: 59.7% PA 2: 58% PA 3: 79% PA 4: 54.8% PA 5: 38.7% PA	0	Low External validity is uncertain, internal validity is good while sample size is of uncertain adequacy
Dong SL et al 2006 [5] Canada	eTriage (CTAS)	569 patients 49.4 years 49% female/51% male Unknown amount of RNs	0.40 (unweighted κ) <i>Triage level</i> 1: 62.5% PA 2: 49.5% PA 3: 59.7% PA 4: 68.5% PA 5: 43.5% PA	1	Low External validity can not be assessed, internal validity is excellent while sample size is of uncertain adequacy
Dong SL et al 2005 [6] Canada	eTriage (CTAS)	693 patients 48 years 51%female/49% male 73 RNs	0.202 (unweighted κ) <i>Triage level</i> 1: 50% PA 2: 9% PA 3: 53.5% PA 4: 73.3% PA 5: 7.2% PA	4	Low External validity can not be assessed, internal validity is excellent while sample size is of uncertain adequacy
Manos D et al 2002 [8] Canada	CTAS	42 scenarios 5 BLS 5 ALS 5 RNs 5 Drs	0.77 overall (weighted κ) BLS: 0.76 (weighted κ) ALS: 0.73 (weighted κ) RN: 0.80 (weighted κ) Drs: 0.82 (weighted κ) <i>Triage level</i> 1: 78% PA 2: 49% PA 3: 37% PA 4: 41% PA 5: 49% PA	0.2	Low External validity can not be assessed, internal validity is acceptable while sample size is of uncertain adequacy

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Table 3.2.5 continued

Author Year, reference Country	Triage system	Patient characteristics Age Gender Triageur: Amount, profession	Results: κ -values, percentage agreement (PA)/ triage level	Drop out (%)	Study quality and relevance
Beveridge R et al 1999 [4] Canada	CTAS	50 scenarios 10 RNs 10 Drs	0.80 overall (weighted κ) 0.84 RNs (weighted κ) 0.83 Drs (weighted κ) Weighted κ /triage level (RNs): <u>Triage level</u> 1: 0.73 2: 0.52 3: 0.57 4: 0.55 5: 0.66	15	Low External validity can not be assessed, internal validity is acceptable while sample size is of uncertain adequacy
Göransson K et al 2005 [7] Sweden	CTAS	18 scenarios 423 RNs	0.46 (unweighted κ) <u>Triage level</u> 1: 85.4% PA 2: 39.5% PA 3: 34.9% PA 4: 32.1% PA 5: 65.1% PA	0.8	Low External validity can not be assessed, internal validity is acceptable while sample size is of uncertain adequacy
van der Wulp I et al 2008 [9] The Netherlands	MTS	50 scenarios 55 RNs	0.48 (unweighted κ) <u>Triage level</u> 2: 9.8% PA 3: 35.5% PA 4: 22% PA	7.5–35.7	Low External validity is uncertain, internal validity is good while sample size is of uncertain adequacy
Maningas P et al 2006 [10] USA	SRTS	423 patients 29.7 years 56% female/44% male 16 RN pairs	0.87 (weighted κ) <u>Triage level</u> 1: 85.7% PA 2: 86.7% PA 3: 86.8% PA 4: 93.9% PA 5: 74.2% PA		Low External validity can not be assessed, internal validity is good while sample size is of uncertain adequacy

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Table 3.2.5 continued

Author Year, reference Country	Triage system	Patient characteristics Age Gender Triageur: Amount, profession	Results: κ -values, percentage agreement (PA)/ triage level	Drop out (%)	Study quality and relevance
Rutschmann OT et al 2006 [11] Switzerland	4-tier system	22 patient scenarios 45 RNs 8 Drs	RNs: 0.40 (weighted κ) Drs: 0.28 (weighted κ) <i>Triage level</i> 1: 61% PA 2: 49.6% PA 3: 74.2% PA 4: 75.5% PA	4% 0%	Low External validity is uncertain, internal validity is excellent while sample size is of uncertain adequacy
Brillman JC et al 1996 [12] USA	4-tier system	5 123 patients 64% <35 years 46% female/54% male Unknown amount of RNs and Drs	0.45 (unknown type of κ) <i>Triage level</i> 1: 0.13% PA 2: 5.2% PA 3: 37.9% PA 4: 24.6% PA	10%	Moderate External validity is clear, internal validity is good while sample size is of uncertain adequacy

ALS = Advanced life support; ATS = Australasian Triage Scale; BLS = Basic life support;
CTAS = Canadian Emergency Department Triage and Acuity Scale; Drs = Doctors; MTS
= Manchester Triage Scale; RNs = Registered nurses; SRTS = Soterion Rapid Triage Scale

Table 3.2.6 Studies on how the assessment of the urgency of need to see a physician according to different triage systems could predict hospital mortality. Mortality figures (%) are shown for each triage level for patients admitted to a hospital emergency department.

Author Year, reference Country	Triage system	Patient characteristics Age Gender	Outcome	Results (Mortality frequency per triage level)	Remarks	Study quality and relevance 1. Validity assessed 2. Safety assessed
Dong SL et al 2007 [22] Canada	eCTAS	29 346 patients 47 years 48% female/52% male	Mortality in ED	<u>Triage level</u> 1: 22% 2: 0.22% 3: 0.031% 4: 0.018% 5: 0% OR 664 (95% CI 357–1 233), 1 vs 2–5	– Not adjusted for age and sex – Low number of fatalities (70 cases)	1. Low 2. Moderate
Dent A et al 1999 [14] Australia	ATS	42 778 patients Age & sex not given	In-hospital mortality	<u>Triage level</u> 1: 16% 2: 5% 3: 2% 4: 1% 5: 0.1% p<0.0001	– Not adjusted for age and sex	1. Low 2. Moderate
Widgren BR et al 2008 [16] Sweden	METTS	8 695 patients 65 years 45% female/55% male	In-hospital mortality	<u>Triage level</u> 1: 14% 2: 6% 3: 3% 4: 3% 5: 0.5% p<0.001	– Not adjusted for age and sex – Only patients admitted to hospital evaluated	1. Low 2. Moderate
Doherty S et al 2003 [15] Australia	ATS	84 802 patients Age & sex not given	24 hours mortality	<u>Triage level</u> 1: 12% 2: 2.1% 3: 1.0% 4: 0.3% 5: 0.03% p<0.001	– Not adjusted for age and sex – Consecutive patients	1. Low 2. Moderate

ATS = Australasian Triage Scale; CI = Confidence interval; eCTAS = Electronic Canadian Emergency Department; ED = Emergency department; METTS = Medical Emergency and Treatment System; OR = Odds ratio

Table 3.2.7 Studies on how the assessment of the urgency of need to see a physician according to different triage systems could predict hospitalisation. Hospitalisation figures (%) are shown for each triage level for patients admitted to a hospital emergency department.

Author Year, reference Country	Triage system	Patient characteristics Age Gender	Outcome	Results (Hospital admission frequency per triage level)	Comments	Study quality and relevance 1. Validity assessed 2. Safety assessed
Van Gerven R et al 2001 [23] The Netherlands	ATS	3 650 patients, Age & sex not given	Hospital admission	<u>Triage level</u> 1: 85% 2: 71% 3: 48% 4: 18% 5: 17% p<0.0001	– Not adjusted for age and sex	1. Low 2. Moderate
Chi CH et al 2006 [2] Taiwan	ESI2	3 172 patients 47 years 47% female/53% male	Hospital admission	<u>Triage level</u> 1: 96% 2: 47% 3: 31% 4: 7% 5: 7% p<0.0001	– Not adjusted for age and sex – ESI scored in retrospect – Unclear inclusion criteria	1. Low 2. Moderate
Wuerz RC et al 2000 [20] USA	ESI	493 patients 40 years 52% female/48% male	Hospital admission	<u>Triage level</u> 1: 92% 2: 61% 3: 36% 4: 10% 5: 0% p<0.0001	– Not adjusted for age and sex – Unclear inclusion criteria	1. Low 2. Low
Dent A et al 1999 [14] Australia	ATS	42 778 patients Age & sex not given	Hospital admission	<u>Triage level</u> 1: 83% 2: 69% 3: 49% 4: 33% 5: 9% p<0.0001	– Not adjusted for age and sex	1. Low 2. Moderate

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Table 3.2.7 continued

Author Year, reference Country	Triage system	Patient characteristics Age Gender	Outcome	Results (Hospital admission frequency per triage level)	Comments	Study quality and relevance 1. Validity assessed 2. Safety assessed
Eitel DR et al 2003 [24] USA	ESI2	1 042 patients 7 different EDs 43 years 47% female/53% male	Hospital admission	<u>Triage level</u> 1: 83% 2: 67% 3: 42% 4: 8% 5: 4% p<0.001	– Not adjusted for age and sex – Not consecutive patients	1. Low 2. Moderate
Tanabe P et al 2004 [21] USA	ESI3	403 patients 45 years 49% female/51% male	Hospital admission	<u>Triage level</u> 1: 80% 2: 73% 3: 51% 4: 6% 5: 5% p<0.001	– Not adjusted for age and sex – Not consecutive patients – Retrospective triage	1. Low 2. Low
Wuerz RC et al 2001 [25] USA	ESI	8 251 patients Age & sex not given	Hospital admission	<u>Triage level</u> 1: 92% 2: 65% 3: 35% 4: 6% 5: 2% p<0.001	– Not adjusted for age and sex – Consecutive patients	1. Low 2. Moderate
Doherty S et al 2003 [15]	ATS	84 802 patients Age & sex not given	Hospital admission	<u>Triage level</u> 1: 79% 2: 60% 3: 41% 4: 18% 5: 3.1% p<0.001	– Not adjusted for age and sex – Consecutive patients	1. Low 2. Moderate
Maningas P et al 2006 [10]	SRTS	33 850 patients Age 30 56% female/44% male	Hospital admission	<u>Triage level</u> 1: 43% 2: 30% 3: 13% 4: 3.0% 5: 1.4% p<0.0001	– Not adjusted for age and sex – Consecutive patients	1. Low 2. Moderate

ATS = Australasian Triage Scale; ED = Emergency department; ESI = Emergency Severity Index; MTS = Manchester Triage Scale; SRTS = Soterion Rapid Triage Scale

Table 3.3.7 Fast track.

Author Year, reference Country	Study design and included patients	Size of emergency department Admission rate	Intervention (I) Control (C)	Outcome	Results Intervention (I) Control (C) Difference (D)	Study quality and relevance Comments
Rogers T et al 2004 [20] United Kingdom	Observational cohort Prospective vs retro- spective control (2–3 weeks before and after) Triage category 4 (not specified)	59 000/year	I: FT 8 am–6 pm Monday to Friday with senior house officer and nurse practitioners C: No FT	WT to see doctor or nurse practitioners LOS Discharge in 4 hours	I: 30 minutes C: 56 minutes D: 26 minutes I: 1 hour, 17 minutes C: 1 hour, 39 minutes D: 22 minutes I: 92% C: 87%	Low Shorter WT and LOS. No statistics. No numbers
Fernandes CM et al 1996 [2] Canada	Observational cohort 48 hours period (before and after)	54 000/year	I: Changing of FT (larger area, full- time nurse) N=106 C: FT without changes N=100	LOS (only FT) LOS (all patients)	I: 64 minutes C: 82 minutes D: 18 minutes p<0.05 I: 114 minutes C: 115 minutes D: 1 minute NS	Moderate Shorter LOS for FT-patients with- out effects on other patients. Low numbers
Darrab AA et al 2006 [19] Canada	Observational cohort 1 week of interven- tion vs same week in previous year CTAS 3/4/5	38 000/year Admission rate: 18%	I: FT during 1 pm–7 pm all days N=265 C: No FT N=248	LOS (CTAS 4/5) LOS (CTAS 3) LWBS (CTAS 4/5)	I: 110 minutes C: 170 minutes D: 60 minutes p=0.95 I: 60 minutes C: 66 minutes D: 6 minutes p<0.001 I: 2% C: 6% D: 4% p=0.043	Moderate Shorter LOS for CTAS 3. Lower LWBS for CTAS 4 and 5. Low numbers

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Table 3.3.7 continued

Author Year, reference Country	Study design and included patients	Size of emergency department Admission rate	Intervention (I) Control (C)	Outcome	Results Intervention (I) Control (C) Difference (D)	Study quality and relevance Comments
Kwa P et al 2008 [6] Australia	Observational cohort 6 months of inter- vention vs control (before and after) ATS 4 for FT	53 000/year Admission rate: 21%	I: FT (8 beds, 2 doctors, 2 nurses, open: 8 am–10 pm every day) N=20 460 (FT=3 047) C: No FT N=18 267	WT (% met target, ATS 4) WT (ATS 4) LOS (ATS 4) LWBS	I: 79.9% C: 77.8% p<0.001 I: 22 minutes C: 24 minutes D: 2 minutes p<0.001 I: 114 minutes C: 110 minutes D: –4 minutes p=0.06 I: 3.3% C: 3.5% D: 0.2% p=0.45	Moderate Shorter WT for ATS 4. High numbers

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Table 3.3.7 continued

Author Year, reference Country	Study design and included patients	Size of emergency department Admission rate	Intervention (I) Control (C)	Outcome	Results Intervention (I) Control (C) Difference (D)	Study quality and relevance Comments
Cooke MW et al 2002 [17] United Kingdom	Observational cohort Prospective vs retro- spective control 5 weeks (before and after) Patients with minor injury without need of bed or interven- tion to FT (=triage category 4 and 5)	73 000/year	I: FT with junior doctor open 9 am–11 pm N=6 801 C: No FT N=7 117	WT to <i>doctor</i> <30 minutes	I: 44% C: 35.4% p<0.0001	Moderate Only trauma. Shorter WT for triage category 3 and 4
				<60 minutes	I: 76.2% C: 65.1% p<0.0001	
				<i>Within target</i> Triage category 2	I: 32% C: 41% NS	
				Triage category 3	I: 78.6% C: 72.8% p<0.0001	
				Triage category 4	I: 94.1% C: 87.6% p<0.0001	
				Triage category 5	I: 100% C: 96.1% NS	
Bond PA 2001 [18] Saudi Arabia	Observational cohort analysis of 200 rando- mised cases 1 month before and 200 cases 1 month after Non urgent patients to FT	68 000/year	I: Physician and nurse staffed patient assess- ment room (PAR) for non urgent patients N=200 C: No PAR N=200	WT	I: 25 minutes C: 58 minutes D: 33 minutes p<0.05	Low Shorter WT for non-urgent patients with PAR. Low num- bers

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Table 3.3.7 continued

Author Year, reference Country	Study design and included patients	Size of emergency department Admission rate	Intervention (I) Control (C)	Outcome	Results Intervention (I) Control (C) Difference (D)	Study quality and relevance Comments
Ardagh MW et al 2002 [5] New Zealand	RCT 10 weeks: FT odd weeks and no FT even weeks All patients	65 000/year	I: Rapid assessment clinic (RAC) 9 am–5 pm Monday to Friday N=2 263 with 361 to RAC C: No RAC N=2 204 of which 349 likely to RAC	<u>WT to see doctor</u>		Moderate Shorter WT and LOS for ATC 4 and 5 with NS change for other patients
				ATC 2	I: 8.2 minutes C: 7.7 minutes D: –0.5 minutes NS	
				ATC 3	I: 29.7 minutes C: 28.4 minutes D: –1.3 minutes NS	
				ATC 4	I: 34.5 minutes C: 42.7 minutes D: 8.2 minutes p=0.004	
				ATC 5	I: 34.3 minutes C: 45.4 minutes D: 11.1 minutes p=0.02	
				<u>LOS</u>		
				ATC 2	I: 172 minutes C: 193 minutes D: 21 minutes NS	
				ATC 3	I: 190 minutes C: 191 minutes D: 1 minute NS	
ATC 4	I: 131 minutes C: 158 minutes D: 27 minutes p=0.03					
ATC 5	I: 65 minutes C: 85 minutes D: 20 minutes p=0.06					

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Table 3.3.7 continued

Author Year, reference Country	Study design and included patients	Size of emergency department Admission rate	Intervention (I) Control (C)	Outcome	Results Intervention (I) Control (C) Difference (D)	Study quality and relevance Comments
Kilic YA et al 1998 [3] Turkey	RCT Analysis during 1 month, FT every other day	30 000/year	I: FT open 8 am–5.30 pm, Monday to Friday N=143	LOS of FT-patients	I: 36 minutes C: 63 minutes D: 27 minutes p<0.001	Moderate
	Patients included according to FT criteria without life-threats		C: No FT but regi- stration of FT-cases N=126	Patient satisfaction	I: Improved	Shorter LOS for patients in FT process. Low numbers
O'Brien D et al 2006 [7] Australia	Observational cohort 12 weeks trial com- pared to same period previous year ATS 3, 4 and 5 likely to be dischar- ged (=21.6% of all patients)	43 000/year Admission rate: 48%	I: FT open 9 am–10 pm, Monday to Friday + 9.30 am–6 pm, Saturday and Sunday Junior doctor + nurse N=1 482	LOS of all discharged patients	I: 186.5 minutes C: 227.5 minutes D: 41 minutes Significant (95% CI 52–30)	Low
			C: No FT N=not specified	WT of all discharged patients	I: 59.4 minutes C: 74.4 minutes D: 15 minutes Significant (95% CI 26–10)	LOS and WT shorter for discharged patients with FT WT unchanged for admitted patients with FT
			<u>LWBS</u> In average, patients per week	I: 18.3% C: 29.3% D: 11% Significant (95% CI 13–9)		

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Table 3.3.7 continued

Author Year, reference Country	Study design and included patients	Size of emergency department Admission rate	Intervention (I) Control (C)	Outcome	Results Intervention (I) Control (C) Difference (D)	Study quality and relevance Comments
Sanchez M et al 2006 [16] Spain	Observational cohort 1 year of interven- tion vs 1 year before (control) Non-urgent patients selected by triage nurse (approximately 30% of all patients)	75 000/year Admission rate: 21%	I: FT with physician assistant and nurse practitioners Open: 8.30 am–11 pm N=71 000 (all pat) C: No FT N=75 000 (all pat)	WT (all patients)	I: 51 minutes C: 102 minutes D: 51 minutes p<0.001	Moderate Shorter WT and LOS for all patients with FT. Lower LWBS. No change in mortality and revisit rate
				LOS (all patients)	I: 258 minutes C: 286 minutes D: 28 minutes p<0.001	
				LWBS (all patients)	I: 3.72% C: 7.78% D: 4.06% p<0.001	
				Mortality (all patients)	I: 0.27% C: 0.28% NS	
				Revisit rate (all patients)	I: 4.51% C: 4.57% NS	
Rodi SW et al 2006 [4] USA	Observational cohort Prospective, retro- spective control CTAS 4+5	30 000/year	I: FT with physician assistant and emergency department technician Open: 9 am–7 pm N=91 C: No FT N=87	Patient satisfaction (excellent or very good)	I: 86% C: 61% p<0.001	Low Shorter LOS with FT. Increased patient satisfaction. Low number
				LOS	I: 53 minutes C: 127 minutes D: 74 minutes p<0.001	

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Table 3.3.7 continued

Author Year, reference Country	Study design and included patients	Size of emergency department Admission rate	Intervention (I) Control (C)	Outcome	Results Intervention (I) Control (C) Difference (D)	Study quality and relevance Comments
Ieraci S et al 2008 [14] Australia	Observational cohort Prospective analysis of 6 months before and 6 months after Patients not requiring a bed (approximately 30% of all patients) to FT All patients included in analysis	40 000/year	I: FT with senior doctor and nurse 16 hours/day C: No FT	WT Compliance with targets LWBS Revisit rate within 48 hours	I: 32 minutes C: 55 minutes D: 23 minutes p<0.001 I: 77% C: 60% p<0.001 I: 3.1% C: 6.2% D: 3.1% p<0.001 I: 4.0% C: 3.2% p<0.001	Moderate Shorter WT for all patients with FT. Lower LWBS for all patients with FT. Small increase of revisit rate with FT

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Table 3.3.7 continued

Author Year, reference Country	Study design and included patients	Size of emergency department Admission rate	Intervention (I) Control (C)	Outcome	Results Intervention (I) Control (C) Difference (D)	Study quality and relevance Comments	
Considine J et al 2008 [15] Australia	Observational cohort of matched case-control Before/after Non-urgent patients expected to be discharged and expected LOS <60 minutes to FT	70 000/year Admission rate: 25%	I: FT 10 am–2 am Nurse, junior doctor or nurse practitioners N=822 C: No FT N=822 (matched in pairs)	WT		Moderate Shorter LOS for discharged patients with FT. No change in WT for ATS 3–5 with FT	
				ATS 3			I: 13 minutes C: 12 minutes D: –1 minute NS
				ATS 4			I: 29 minutes C: 31 minutes D: 2 minutes NS
				ATS 5			I: 26 minutes C: 25 minutes D: –1 minute NS
				LOS Discharged patients			I: 116 minutes C: 132 minutes D: 16 minutes p<0.01
Admitted patients		I: 309 minutes C: 313 minutes D: 4 minutes NS					

ATC = Australasian Triage Category; ATS = Australasian Triage Scale; CTAS = Canadian Emergency Department Triage and Acuity Scale; FT = Fast track; LOS = Length of stay; LWBS = Left without being seen; NS = Not significant; RCT = Randomised controlled trial; WT = Waiting time

Table 3.3.8 Team triage (TT) and other similar interventions
(rapid assessment team, advanced triage, faculty triage, triage physician).

Author Year, reference Country	Study design	Size of emergency department Admission rate	Intervention (I) Control (C)	Outcome	Results Intervention (I) Control (C) Difference (D)	Study quality and relevance Comments
Holroyd BR et al 2007 [23] Canada	RCT Randomisation of shifts during 3 two-week periods. During each 2 week- period: 7 shifts (11 am–8 pm) with and 7 shifts without triage physician	55 000/year	I: Triage physician (initiate, assist triage, consult per telephone, discharge) N=2 831 C: No triage physician N=2 887	LOS LWBS Staff satisfaction	I: 4 hours 21 minutes C: 4 hours 57 minutes D: 36 minutes p<0.001 I: 5.4% C: 6.6% D: 1.2% p<0.02 80–90% positive	Moderate Shorter LOS and fewer LWBS with triage physician. High staff satisfaction
Subash F et al 2004 [24] Northern Ireland	RCT Selection of 8 days during 4 consecutive weeks. Randomisation of 4 shifts with and 4 shifts without team triage	50 000/year	I: Team triage 9 am– 12 am (physician + nurse in triage) N=530 C: No team triage N=498	LOS (during 9 am–12 am) Time to x-ray Time to analgesia	I: 37 minutes C: 82 minutes D: 45 minutes p<0.057 I: 11.5 minutes C: 44 minutes p<0.029 I: 13 minutes C: 37.5 minutes p<0.4	Low Shorter LOS and time to x-ray with team triage
Travers JP et al 2006 [25] Singapore	Observational cohort Prospective with retrospective control. 10 days with team triage and 10 days without team triage Only triage category 3	Size not described	I: Senior emergency physician in triage with nurse (10 am–4 pm) N=290 C: No emergency physician in triage N=286	WT to see doctor in treatment area (triage category 3)	I: 19 minutes C: 35.5 minutes D: 16.5 minutes p<0.05	Low Shorter WT with physician in triage. Low numbers

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Table 3.3.8 continued

Author Year, reference Country	Study design	Size of emergency department Admission rate	Intervention (I) Control (C)	Outcome	Results Intervention (I) Control (C) Difference (D)	Study quality and relevance Comments
Richardson JR et al 2004 [28] Australia	Observational cohort Prospective with retrospective control. 3 months before and 3 months after inter- vention	39 000/year	I: Senior emergency physician in triage (to initiate treatment, order x-ray and lab and sometimes discharge) N=2 193 C: No emergency physician in triage N=1 991	<u>WT to see doctor within thresholds</u> Triage category 3 Triage category 4 LWBS Staff satisfaction	I: 78% C: 67% p<0.0001 I: 73% C: 53% p<0.0001 I: 5.1% C: 6.3% D: 1.2% p<0.024 86% positive	Low Shorter WT with physician in triage
Partovi SN et al 2001 [26] USA	Prospective obser- vational cohort Eight Mondays 9 am to 9 pm with and 8 Mondays without team triage	52 000/year Admission rate: 16%	I: With additional senior physician in triage (to order diagnostic studies, fluid, discharge direct from triage) N=920 C: Without senior physician in triage N=841	LOS LWBS	I: 363 minutes C: 445 minutes D: 82 minutes Mean: -82 minutes (95% CI = -111 to -54 minutes) I: 7.9% C: 14.7% D: 6.8% p=0.068	Moderate Shorter LOS with team triage. Fewer LWBS with team triage

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Table 3.3.8 continued

Author Year, reference Country	Study design	Size of emergency department Admission rate	Intervention (I) Control (C)	Outcome	Results Intervention (I) Control (C) Difference (D)	Study quality and relevance Comments
Grant S et al 1999 [27] Australia	Observational cohort Prospective vith retrospective control 3 months before and 3 months after intervention	40 000/year	I: Rapid assessment team (physician and nurse). Initiating diagnostics and treatment N=10 691 C: Regular triage N=10 476	WT to see doctor (median) Seen in required time LWBS (numbers (%)) LOS (median)	I: 32 minutes C: 50 minutes D: 18 minutes p<0.001 I: 59% C: 39% p<0.001 I: 518 (4.9%) C: 685 (6.4%) D: 1.5% NS I: 3.2 hours C: 3.2 hours D: 0 NS	Moderate Shorter WT with rapid assessment team. Fewer LWBS. Same LOS

LOS = Length of stay; LWBS = Left without being seen; NS = Not significant; RCT = Randomised controlled trial; TT = Team triage; WT = Waiting time

Table 3.3.9 Dividing patients in separate processes (streaming).

Author Year, reference Country	Study design	Size of emergency department Admission rate	Intervention (I) Control (C)	Outcome	Results Intervention (I) Control (C) Difference (D)	Study quality and relevance Comments
Kelly AM et al 2007 [30] Australia	Observational cohort Prospective with retrospective control 1 year before and 1 year after intervention	32 000/year Admission rate: 23%	I: Streaming into two processes (admission and discharge). Separate teams with senior emergency physician in each N=31 500 C: No streaming and mixed patients N=31 500	WT (NTS 3)	I: 9 minutes C: 14 minutes D: 5 minutes p<0.005	Moderate Shorter WT for NTS 3 and 5 with streaming. Shorter LOS for NTS 4 and 5 with streaming. More patients to ward or discharged within 4 hours with streaming
				WT (NTS 5)	I: 45 minutes C: 56 minutes D: 11 minutes p<0.005	
				LOS (NTS 3)	I: 290 minutes C: 283 minutes D: -7 minutes p<0.02	
				LOS (NTS 4)	I: 199 minutes C: 213 minutes D: 14 minutes p<0.005	
				LOS (NTS 5)	I: 115 minutes C: 133 minutes D: 18 minutes p<0.005	
				Admitted within 4 hours	I: 73% C: 54%	
				Discharged within 4 hours	I: 92% C: 83%	

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Table 3.3.9 continued

Author Year, reference Country	Study design	Size of emergency department Admission rate	Intervention (I) Control (C)	Outcome	Results Intervention (I) Control (C) Difference (D)	Study quality and relevance Comments
King DL et al 2006 [31] Australia	Observational cohort Prospective with retrospective control 12 months before and 12 months after intervention All patients seen by triage nurse	50 000/year Admission rate: 43%	I: Streaming to discharge or admission A- and B-team + resuscitation team N=50 337 C: No streaming N=49 075	WT to see doctor (all)	I: 86 minutes C: 86 minutes D: 0 NS	Moderate Shorter LOS for admitted as well as discharged patients but no increase in patients seen within ATS threshold times with streaming
				LOS (all)	I: 5.0 hours C: 5.8 hours D: 0.8 hours (=48 min) p<0.001	
				LOS (admitted patients)	I: 7.0 hours C: 8.5 hours p<0.001	
				LOS (discharged patients)	I: 3.4 hours C: 3.7 hours p<0.001	
				Mortality	I: 0.11% C: 0.10% NS	
				LWBS	I: 3.2% C: 5.5% p<0.001	
				LOS <4 hours	I: 53% C: 48% p<0.001	

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Table 3.3.9 continued

Author Year, reference Country	Study design	Size of emergency department Admission rate	Intervention (I) Control (C)	Outcome	Results Intervention (I) Control (C) Difference (D)	Study quality and relevance Comments
Patel PB et al 2005 [32] USA	Observational cohort Prospective with retrospective control 1 year before and 1 year after intervention	39 000/year	I: Streaming to teams with 1 emergency physician, 2 nurses and 1 technician Same patients to all teams N=39 301 C: No streaming N=38 716	WT LWBS Patient satisfaction	I: 61.8 minutes C: 71.3 minutes D: 9.5 minutes 95% CI=5.8–13.5 minutes I: 1.6% C: 2.3% Difference=0.8 with 95% CI=0.4–1.1% I: Increase	Moderate Shorter WT and fewer LWBS with streaming. Increased patient satisfaction. Very high numbers

ATS = Australasian Triage System; CI = Confidence interval; LOS = Length of stay;
LWBS = Left without being seen; NS = Not significant; NTS = National Triage Scale;
WT = Waiting time

Table 3.3.10 Point of care testing (POCT).

Author Year, reference Country	Study design Patient population	Size of emergency department Admission rate	Intervention (I) Control (C)	Outcome	Results Intervention (I) Control (C) Difference (D)	Study quality and relevance Comments
Kendall J et al 1998 [33] England	RCT Random 8-hour periods during 1 year with and without POCT. Total of 210 periods All patients	50 000/year	I: POCT N=860 C: Central lab N=868	Change in management Mortality (in-hospital) LOS Admission rate	I: 6.9% (earlier decision) C: 5.3–8.8% p<0.0001 I: 6.4% C: 5.5% p=0.45 I: 188 minutes C: 193 minutes D: 5 minutes p=0.3 I: 85.2% C: 83.5% p=0.3	Moderate Significant change in management with POCT but no change in mortality, LOS or admission rate
Murray RP et al 1999 [34] Canada	RCT During 5 months with inclusion of those suitable for only POCT-analysis (5% of all patients)	41 000/year	I: POCT N=93 C: Central lab N=87	LOS (all) LOS (discharged)	I: 3 hours, 28 minutes C: 4 hours, 22 minutes D: 54 minutes p<0.02 I: 3 hours, 5 minutes C: 4 hours, 17 minutes D: 72 minutes p<0.001	Low Shorter LOS for all patients with POCT. Low numbers

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Table 3.3.10 continued

Author Year, reference Country	Study design Patient population	Size of emergency department Admission rate	Intervention (I) Control (C)	Outcome	Results Intervention (I) Control (C) Difference (D)	Study quality and relevance Comments
Lee-Lewandrowski E et al 2003 [35] USA	Observational cohort Prospective with retrospective control Before and after intervention	70 000/year	I: POCT (8 am–5 pm) N=316 C: Central lab N=271	TAT	I: 8 minutes C: 59.5 minutes D: 51.5 minutes p=0.02	Low Shorter TAT, LOS and increased clinician satis- faction with POCT. Low numbers
				LOS	I: 347 minutes C: 389 minutes D: 42 minutes p<0.006	
				Clinician satisfaction	I: 4.3 (of max 5) C: 1.95 p<0.001	
Parvin CA et al 1996 [37] USA	Observational cohort Prospective with 3 periods: control – intervention – control	57 000/year	I: POCT (handheld) during 5 weeks N=1 722 C: Central lab Retro and pro- spective during 5+3 weeks N=2 918	LOS	I: 209 minutes C: 201 minutes D: –8 minutes NS	Moderate No change in LOS with POCT. 95% of patients in intervention also needed central lab tests
Tsai WW et al 1994 [36] USA	Observational cohort Prospective analysis of 210 patients during 4 weeks (Monday to Friday) with split samples, one for POCT the other to central lab	Not described	I: POCT N=210 C: Central lab N=210 (same group as intervention group)	TAT	I: 8 minutes (SD 6) C: 59 minutes (SD 33) D: 51 minutes No other statistics	Moderate Shorter TAT and possible earlier intervention with POCT
Possible earlier intervention	I: 19% C: –					
Singer AJ et al 2008 [38] USA	Observational cohort Prospective with retrospective control 1 month before and 1 month after inter- vention	75 000/year Admission rate: 20%	I: Specified lab for emergency dept analysis located at central lab N=5 635 C: Regular central lab N=5 631	% TAT within 30 minutes	I: 83–98% C: 0.4–81% p<0.001	Moderate Shorter TAT and LOS with POCT
LOS	I: 185 minutes C: 206 minutes D: 21 minutes p<0.001					

LOS = Length of stay; NS = Not significant; POCT = Point of care testing; RCT = Randomised controlled trial; SD = Standard deviation; TAT = Turnaround-time

Table 3.3.11 Nurse-requested x-ray.

Author Year, reference Country	Study design	Size of emergency department Admission rate	Intervention (I) Control (C)	Outcome	Results Intervention (I) Control (C) Difference (D)	Study quality and relevance Comments
Lindley-Jones M et al 2000 [40] United Kingdom	RCT Two separate 2 week periods, 6 months apart. Limb injuries except elbow, knee and hip	59 000/year	I: X-ray requested by triage nurse if needed (68%) N=335 C: Regular triage and x-ray requested by nurse practitioners or emergency physician N=340	WT (time to finishing assessing injury)	I: 65.5 minutes C: 102.7 minutes D: 37.2 minutes p<0.0001	Moderate Shorter WT for patients with nurse-requested x-ray. Nurses requested 8% fewer x-rays than doctors
Parris W et al 1997 [41] Australia	RCT Intervention on odd dates. Isolated injury to wrist or ankle. Patients that did not need x-ray or that were admitted were excluded	35 000/year	I: X-ray requested by triage nurse N=87 C: X-ray requested by physician N=87	<u>LOS</u> No fracture N=121 Fracture N=55	I: 100 minutes C: 114 minutes D: 14 minutes p=0.14 I: 173 minutes C: 179 minutes D: 6 minutes p=0.37	Low No significant change in LOS if triage nurse initiated x-ray
Thurston J et al 1996 [12] United Kingdom	RCT, multicentre Triage nurse randomly allocated patients by random list to nurse or doctor. Only limb injuries below elbow and knee	43 000– 86 000/year (4 hospitals)	I: X-ray requested by nurse N=915 C: X-ray requested by doctor N=918	LOS (all) LOS (no x-ray) Proportion of patients referred to x-ray	I: 88.5 minutes C: 94 minutes D: 5.5 minutes p=0.1 I: 36 minutes C: 51 minutes D: 15 minutes p<0.001 I: 78% C: 74% p=0.05	Moderate 167 patients excluded because of incomplete protocols or missing data. No difference in LOS except for patients where nurses did not request x-ray. More x-rays requested by nurses. Doctors added x-rays requests in 24% of nurse non required group

LOS = Length of stay; RCT = Randomised controlled trial; WT = Waiting time

Table 3.3.12 Nurse practitioners.

Author Year, reference Country	Study design	Size of emergency department Admission rate	Intervention (I) Control (C)	Outcome	Results Intervention (I) Control (C) Difference (D)	Study quality and relevance Comments
Sakr M et al 2003 [42] England	Prospective observational with retrospective control An emergency department was replaced by a nurse led minor injury unit	As nurse led minor injury unit=13 600/year As emergency department= 37 000/year	I: Nurse practitioners instead of physicians. Only patients with minor injury N=1 447 C: Regular emergency department with all patients seen by physician N=1 315	Process errors	I: 9.6% C: 13.2% p=0.003	Moderate Shorter WT and LOS with nurse practitio- ners and safe care but greater costs because of increased use of outpatient services
				WT	I: 19 minutes C: 56.4 minutes D: 37.4 minutes p<0.0001	
				LOS	I: 51.5 minutes C: 95.4 minutes D: 43.9 minutes p<0.0001	
				Costs	I: £12.7/patient C: £9.7/patient	
Considine J et al 2006 [43] Australia	Prospective case-control Patients seen by nurse practitio- ners were matched to same kind of patients seen by physicians	60 000/year Admission rate: 29%	I: Nurse practitioners for patients with minor injury N=102 C: Matched controls seen by physicians N=623	WT (median)	I: 4 minutes C: 4 minutes D: 0 p=0.96	Low No significant difference in WT and LOS between nurse practitioners and physician treatment. Low numbers
				LOS (median)	I: 125.5 minutes C: 137 minutes D: 11.5 minutes p=0.28	

LOS = Length of stay; WT = Waiting time

Table 3.5.2 Economic aspects of triage.

Author Year, reference Country	Study design	Population Number Women/age Men/age	Intervention (I)	Control (C)	Results Intervention	Results Control	Significance	Study quality Comments
Carter AJ et al 2007 [1]	Systematic review	Included patients in studies of emergency care	Nurse practitioners	Physicians	Costs per patient somewhat higher for nurses, but in general shorter time of management, and higher patient satisfaction	NA	Not estimated	High Not possible to perform meta-analyses
Derksen RJ et al 2007 [2] The Netherlands	RCT with hospital costs in a piggy back study	Patients with ankle or foot injuries N=512 Gender and age in previously published study	Patients with nurse management	Patients with physician management	Costs per patient with nurse management 186 Euro or per avoided false or true positive case 27 Euro	Costs per patient 153 Euro	None presented	Limited

NA = Not available; RCT = Randomised controlled trial