National Institute for Health and Care Excellence

Final

Chapter 21 Standardised criteria for hospital admission

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

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Chapter 21 Standardised criteria for hospital admission

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21 Standardised criteria for hospital admission

21.1 Introduction

Many standardised tools for aiding decisions relating to admission to hospital already exist and can apply to a wide variety of the acute medical emergency spectrum of illness:

- Community acquired pneumonia can be assessed via the "CURB 65" score, and provides a risk of mortality according to the variables; an adapted version exists for primary care (CRB65).

- The "Blatchford" score calculates a risk of major Gastro-intestinal haemorrhage requiring in-patient treatment and investigation.

- The "Grace/ Heart" score gives a risk of major adverse cardiac event. These risk scores are generally used at the first point of contact in secondary care (ED/ AMU). It is important to highlight that these scores are intended to act as an aid to decision making once clinical assessment and diagnosis as been carried out, and should be used to supplement clinical judgment and not replace it.

The use of these scores is varied across the NHS. This protocol seeks to further explore and evaluate the effect of these standardised admission criteria at their point of use, on the acute medical emergency pathway; whether they can provide an improvement on clinical outcomes, whilst utilising resources efficiently, and potentially lead to a shorter length of stay/ admission rates, compared to no use of such standardised admission criteria.

21.2 Review question: Do standardised criteria for hospital admission facilitate appropriate admission?

For full details see review protocol 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 before admission.
Intervention(s)	Standardised criteria for admission including risk stratification at presentation. Validated risk stratification for the following conditions: • Acute upper GI bleed (BLATCHFORD); • Community acquired pneumonia (CAP) (CURB 65); • Acute coronary syndrome (ACS) (GRACE, HEART Score); • Multimorbidity (Q-admissions, frailty scores), Syncope (San Francisco Score), Pulmonary Embolism (sPESI Score). We will only include tools recommended by the above guidelines. These guidelines have undertaken prognostic or diagnostic reviews in order to assess the accuracy of the risk tools, whereas we shall be looking at these tools against no standardised criteria or no risk stratification to establish the time to discharge. Evidence reviews from the previous guidelines will not be updated. We will cross refer to the guidelines above.
Comparison(s)	No standardised criteria for admission. No risk stratification at admission.
Outcomes	• Mortality (CRITICAL) • Avoidable adverse events (CRITICAL)

	• Quality of life (CRITICAL) • Length of stay/time to discharge (IMPORTANT) • Patient and/or carer satisfaction (CRITICAL) • Discharge destination (IMPORTANT) • Admissions (CRITICAL)
Study design	Systematic reviews (SRs) of RCTs, RCTs, observational studies only to be included if no relevant SRs or RCTs are identified.

21.3 Clinical evidence

Five studies were included in the review; 1 RCT,[23] 1 before-after study[33] and 3 cohort studies;[15,20,21] these are summarised in Table 2 below. Evidence from these studies is summarised in the clinical evidence summary below (Table 3). See also the study selection flow chart in Appendix B, forest plots in Appendix C, study evidence tables in Appendix D, GRADE tables in Appendix F and excluded studies list in Appendix G.

Table 2: Summary of studies included in the review

Study	Intervention and comparison	Population	Outcomes	Comments
Girardin 2014[15] (Observational - before and after)	Standardised criteria for admission including risk stratification at presentation for upper-gastrointestinal haemorrhage (Glasgow-Blatchford bleeding score). Versus No standardised criteria/risk stratification for admission.	n=208 patients admitted to the ED with UGI bleeding. Inclusion criteria: >18 years of age with UGI bleeding defined as hematemesis or coffee ground emesis or with melena. Exclusion criteria: pregnancy and haematochezia.	Mortality. Length of stay/time to discharge.	Phase 1: all patients received proton pump inhibitor therapy and underwent an UGI endoscopy in the endoscopy unit or the ED during the 12 hours following hospital admission. The ED physician decided whether to admit or discharge patients. Phase 2: patients with a GBS of 0 were not admitted to hospital and received an appointment for an ambulatory UGI endoscopy during the following 48 hours.
Jones 2014A[20] (Observational – retrospective cohort)	Standardised criteria for admission including risk stratification at presentation for community acquired pneumonia (CURB-65). Versus	n=2,002 CAP patients. Inclusion criteria: >18 years of age evaluated in the ED with a primary diagnosis of pneumonia or a secondary diagnosis of pneumonia and primary diagnosis of respiratory failure or sepsis. Exclusion criteria: patients diagnosed with aspiration	Admissions. Avoidable adverse events (outpatient failure defined as 7-day secondary hospitalisation or 30-day outpatient death).	CURB-65 scoring as a decision support tool was available to ED physicians, but was rarely utilised. Researchers calculated CURB-65 scores for all study patients and compared actual versus expected outcomes (had the tool been used in all cases).

Study	Intervention and comparison	Population	Outcomes	Comments
	No standardised criteria/risk stratification for admission.	pneumonia or immune-compromised conditions including AIDs or receipt of antiretroviral therapy, solid organ transplants or hematologic malignancies; patients lacking radiographic evidence for pneumonia.		
Kabundji 2014[21] (Observational – prospective cohort)	Standardised criteria for admission including risk stratification at presentation for community acquired pneumonia (CRB-65) Versus No standardised criteria/risk stratification for admission.	n=152 CAP patients (73 males, 79 females; age range 20-87 years, median 36.5 years). Inclusion criteria: ≥18 years of age seen in the ED. Exclusion criteria: cases of suspected or confirmed aspiration pneumonitis, Pneumocystis jirovecii pneumonia and pulmonary tuberculosis; patients with any acute or active comorbid illness such as diabetes mellitus, renal failure, cardiac failure or end stage AIDs.	Admissions (number managed in hospital).	CRB-65 scores were actually used in 1.6% of cases. Researchers calculated CRB-65 scores for all study patients and compared actual versus expected outcomes (had the tool been used in all cases).
Mahler 2015[23] (RCT)	Standardised criteria for admission including risk stratification at presentation for acute coronary syndrome (HEART). Versus No standardised criteria/risk stratification for admission.	n=282 (141 randomised to each arm). Inclusion criteria: ≥21 years of age, presenting with symptoms suggestive of ACS, provider having ordered an ECG and troponin for the evaluation of ACS. Exclusion criteria: new ST-segment elevation ≥1mm, hypotension, life expectancy <1 year, a non-cardiac medical, surgical or psychiatric illness determined by the provider to require admission, previous enrolment, non-English speaking, incapacity or unwillingness to consent.	Mortality. Avoidable adverse events (recurrent hospital care, MACE). Length of stay/time to discharge. Admissions.	Usual care arm: providers were encouraged to follow American College of Cardiology/American Heart Association guidelines. HEART score was used as a decision aid rather than a substitute for clinical judgement. Non-adherence occurred in 29% of low-risk cases and 13% of high-risk cases.
Stanley	Standardised	n=906 patients presenting	Admissions.	Phase 1: data collected

Study	Intervention and comparison	Population	Outcomes	Comments
2009[33] (Observational – before and after)	criteria for admission including risk stratification at presentation for upper-gastrointestinal haemorrhage (Glasgow-Blatchford bleeding score). Versus No standardised criteria/risk stratification for admission.	with upper-GI haemorrhage. Phase 1: 334 patients. Phase 2: 572 patients. Exclusion criteria: inpatients with the disorder.	Length of stay/time to discharge.	over 12 months in Cornwall, 6 months in Glasgow, 3 months in Dundee, 3 months in Stockton. Phase 2: data collected over 12 months in Glasgow and 3 months in Stockton.

Table 3: Clinical evidence summary: standardised criteria for admission versus no standardised criteria for admission

Outcomes	No of Participants (studies) Follow up	Quality of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with Control	Risk difference with Standardised criteria versus no standardised criteria (95% CI)
Mortality cardiovascular death	282 (1 study) 30 days	⊕⊕⊕⊕ HIGH	RR 0.0 (-0.01 to 0.01)	Moderate	
				0 per 1000	Not calculable
Mortality number of patients dying	208 (1 study) 30 days	⊕⊖⊖⊖ VERY LOW[a] due to imprecision	RR 0.4 (0.08 to 2.02)	Moderate	
				48 per 1000	29 fewer per 1000 (from 44 fewer to 49 more)
Avoidable adverse events major adverse cardiac events	282 (1 study) 30 days	⊕⊕⊖⊖ LOW[a] due to imprecision	RR 0.78 (0.3 to 2.03)	Moderate	
				64 per 1000	14 fewer per 1000 (from 45 fewer to 66 more)
Avoidable adverse events (repeat cardiac ED visit) repeat cardiac related ED visit	282 (1 study) 30 days	⊕⊕⊖⊖ LOW[a] due to imprecision	RR 0.67 (0.19 to 2.31)	Moderate	
				43 per 1000	14 fewer per 1000 (from 35 fewer to 56 more)
Avoidable adverse events repeat cardiac related non-index hospitalisation	282 (1 study) 30 days	⊕⊕⊖⊖ LOW[a] due to imprecision	RR 1.25 (0.34 to 4.56)	Moderate	
				28 per 1000	7 more per 1000 (from 18 fewer to 100 more)
Avoidable adverse events (outpatient failure) 7-day secondary hospitalisation or 30-day outpatient death	1614 (1 study) 30 days	⊕⊖⊖⊖ VERY LOW[a,c] due to imprecision	RR 0.89 (0.58 to 1.35)	Moderate	
				55 per 1000	6 fewer per 1000 (from 23 fewer to 19 more)
Length of stay	282	⊕⊕⊕⊕	RR 2.15	Moderate	

Outcomes	No of Participants (studies) Follow up	Quality of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with Control	Risk difference with Standardised criteria versus no standardised criteria (95% CI)
early discharge	(1 study)	HIGH	(1.44 to 3.22)	184 per 1000	212 more per 1000 (from 81 more to 408 more)
Length of stay mean bed-days per patient	724 (1 study) 3-12 months	⨁⨁⊖⊖ LOW [c]	-	-	The mean length of stay (mean bed-days) in the intervention groups was 1.2 lower (2.69 lower to 0.29 higher)
Admissions number of patients admitted to an inpatient ward	282 (1 study) 17 months	⨁⨁⨁⊖ MODERATE [a] due to imprecision	RR 0.88 (0.62 to 1.23)	Moderate	
				340 per 1000	41 fewer per 1000 (from 129 fewer to 78 more)
Admissions number of patients admitted to hospital	5214 (3 studies) 2-12 months	⨁⊖⊖⊖ VERY LOW[b,c] due to inconsistency	RR 0.77 (0.68 to 0.87)	Moderate	
				549 per 1000	126 fewer per 1000 (from 71 fewer to 176 fewer)

(a) Downgraded by 1 increment if the confidence interval crossed 1 MID or by 2 increments if the confidence interval crossed both MIDs.
(b) Downgraded by 1 increment if heterogeneity, I2=50%, p=0.04, unexplained by subgroup analysis.
(c) 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.

Table 4: Narrative findings for the outcome of length of stay

Study	Standardised criteria	No standardised criteria
Girardin 2014[15]	Median hospital stay duration in hours (range) GBS=0: 6 (1-13); GBS>0:207 (7-1035)	Median hospital stay duration in hours (range) GBS=0: 19 (5-148); GBS>0:189 (5-816)
Mahler 2015[23]	Median index length of stay in hours (interquartile range) Low-risk: 6.4 (5.6-8.8); High-risk: 25.9 (11.4-46.7); Total (all	Median index length of stay in hours (interquartile range) Total (all patients): 21.9 (8.4-28.2)

Study	Standardised criteria	No standardised criteria
	patients): 9.9 (6.3-26.4)	

21.4 Economic evidence

Published literature

One economic study was identified with the relevant comparison and has been included in this review.[15] This is summarised in the economic evidence profile below (Table 5) and the economic evidence table in Appendix E.

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

Table 5: Economic evidence profile: standardised criteria for admission versus no standardised criteria for admission

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost-effectiveness	Uncertainty
Girardin 2014 (Switzerland)	Partially applicable[a]	Potentially serious limitations[b]	Before-and-after study **Population:** Consecutive adult patients (>18 years) presenting to the ED with upper GI bleeding. **Comparators:** Intervention 1: The ED physician decided whether to admit or discharge patients. Intervention 2: Standardised criteria for admission including risk stratification at presentation for upper-gastrointestinal haemorrhage (Glasgow-Blatchford bleeding score) **Follow-up:** 30 days	2 versus 1[c]: Saves £216	2 versus 1[c]: **Mortality at 30 days:** No difference **Need for clinical interventions:** 9%	N/A (cost-consequences analysis)	No sensitivity analysis was reported

Abbreviations: ED: emergency department; GBS: Glasgow-Blatchford bleeding score; N/A: not applicable.

(a) QALYs were not used as an outcome. Uncertainty regarding the applicability of resource use and costs from the Swiss health care system to the NHS context.

(b) Baseline and relative treatment effects are based on a single study, so by definition, does not reflect all evidence in the area. No sensitivity analysis is reported. Short follow-up period (30 days), so may not capture all relevant costs and outcomes. The only costs included were those of hospitalisation for patients with GBS of 0 and not all patients in the study.

(c) Outcomes reported here are for the subgroup of patients who had a GBS score of 0.

21.5 Evidence statements

Clinical

- Five studies comprising 3550 people evaluated the role of standardised criteria for hospital admission for improving outcomes in secondary care in adults and young people at risk of an AME, or with a suspected or confirmed AME. Two studies were based on acute upper gastrointestinal bleed patients, 2 studies were based on community acquired pneumonia patients and 1 study was based on patients presenting with chest pain.
- Two observational studies comprising 1114 upper GI bleed patients evaluated the role of standardised criteria for hospital admission for improving outcomes in secondary care in adults and young people. Evidence suggested there may be a benefit of standardised criteria for reduced mortality (1 study, very low quality) and hospital admissions (1 study, very low quality). Evidence suggested no difference in length of stay (1 study, low quality).
- Two observational studies comprising 2154 community acquired pneumonia patients evaluated the role of standardised criteria for hospital admission for improving outcomes in secondary care in adults and young people at risk of an AME, or with a suspected or confirmed AME. Evidence suggested there may be a benefit for reduced the number of hospital admissions (2 studies, very low quality). However, the evidence suggested there was no effect on avoidable adverse events defined as outpatient failure 7-day hospitalisation or 30-day mortality (1 study, very low quality).
- One randomised controlled trial comprising 282 people presenting with chest pain evaluated the role of standardised criteria for hospital admission for improving outcomes in secondary care, in adults and young people at risk of an AME or with a suspected or confirmed AME. Evidence showed a benefit of standardised criteria for reduced length of stay (1 study, high quality). There was no effect on mortality (1 study, high quality), major adverse cardiac events (1 study, low quality), number of admissions (1 study, moderate quality), avoidable adverse events defined as repeat cardiac non-index hospitalisations (which is a subsequent hospital admission following the initial ED visit) and avoidable adverse events defined as repeat cardiac related emergency department visits for standardised criteria (1 study, low quality).

Economic

- One cost-consequences analysis found that using standardised criteria for admission (Glasgow Blatchford Scale) was less costly (£216 less per patient) than not using standardised criteria, had same number of deaths (none per patient) but higher need for clinical interventions (0.09 per patient) in patients with GBS score of 0.

21.6 Recommendations and link to evidence

Recommendations	11. Use validated risk stratification tools to inform clinical decisions about hospital admission for people with medical emergencies.
Research recommendation	-
Relative values of different outcomes	Mortality, avoidable adverse events, patient and/or carer satisfaction, quality of life and hospital admission were considered to be critical outcomes. Length of stay/time to discharge and discharge destination were considered to be important outcomes.
Trade-off between benefits and harms	There were 5 studies included in this review, 2 concerning acute upper gastrointestinal bleeds, 2 on community acquired pneumonia and 1 study involved patients presenting with chest pain being investigated for acute coronary syndrome (ACS). **Acute upper gastrointestinal bleeds** Two observational studies comprising 1114 people suggested there may be a benefit of standardised criteria for reduced mortality or hospital admissions. Evidence suggested no difference in length of stay. The guideline committee were also presented with a narrative finding which showed an overall benefit for length of stay, with a longer length of stay for higher risk patients and a lower length of stay for lower risk patients. The committee considered that this effect may explain the finding of no difference, which used the mean length of stay for all patients. No evidence was identified for avoidable adverse events, patient and/or carer satisfaction, quality of life or discharge destination. **Community acquired pneumonia** Two observational studies comprising 2154 people suggested there may be a benefit in reduced the number of hospital admissions. However, the evidence suggested there was no effect on avoidable adverse events defined as outpatient failure (7-day hospitalisation or 30-day mortality). No evidence was identified for mortality, patient and/or carer satisfaction, quality of life, length of stay/time to discharge or discharge destination. **Chest pain** One randomised controlled trial comprising 282 people showed a benefit of standardised admission criteria for reducing length of stay. There was no effect on mortality, major adverse cardiac events, number of admissions, avoidable adverse events defined as repeat cardiac non-index hospitalisations (which is a subsequent hospital admission following the initial ED visit) and avoidable adverse events defined as repeat cardiac related emergency department visits for standardised criteria. No evidence was identified for patient and/or carer satisfaction, quality of life or discharge destination. The committee were also presented with a narrative finding which showed an overall benefit for length of stay, with a longer length of stay for higher risk patients and a lower length of stay for lower risk patients. The narrative findings from 1 randomised controlled trial in chest pain patients and 1 observational study in patients with upper GI haemorrhage suggested that average length of stay for low risk patients was 6 hours. The committee discussed the feasibility of discharge within 4 hours (the A&E 4 hour waiting target); in this patient group it was noted that some tools such as the sPESI score can take longer to complete. However, it was agreed by the committee that discharging a patient after 6 hours in the ED is a more favourable outcome than an unnecessary admission and that the emphasis should be on safety rather than speed. Also systems can be put in place to account for patients who require a longer period of assessment with a high probability of discharge for example, clinical decision unit or ambulatory emergency care clinic.

Recommendations	11. Use validated risk stratification tools to inform clinical decisions about hospital admission for people with medical emergencies.
Research recommendation	-
	Overall Overall, the committee agreed that standardised criteria for admission are likely to be beneficial. Other condition-specific NICE guidelines have undertaken reviews to evaluate such tools and have made recommendations for their adoption and use. The NICE guideline on acute upper gastrointestinal bleeding in over 16s[25] recommends using the Glasgow Blatchford score at first assessment and considering early discharge for patients with a pre-endoscopy Glasgow Blatchford score of 0. The NICE guideline on pneumonia in adults[26] recommends using clinical judgement in conjunction with the CURB-65 score to guide the management of community acquired pneumonia. The NICE guideline on unstable angina and NSTEMI[24] recommends formal assessment of individual risk of future adverse cardiovascular events using an established risk scoring system that predicts 6-month mortality (for example, Global Registry of Acute Cardiac Events [GRACE]), as soon as the diagnosis of unstable angina or NSTEMI is made and aspirin and antithrombin therapy have been offered. The committee considered that a recommendation for the use of validated, risk stratification scores in the decision making process is one that is generalisable to other populations and therefore decided to make a recommendation for their use.
Trade-off between net effects and costs	One economic evaluation was included. This study was a cost-consequences analysis that found the use of Glasgow Blatchford Score (GBS) as a criterion for admission of patients with upper GI bleeding was associated with cost saving (£216 per patient) compared to not using it. Mortality was 0 in each arm. However, in this study both outcomes were reported only for patients with GBS of 0. Other studies included in the clinical review showed that the use of standardised criteria resulted in fewer admissions, shorter hospital length of stay, lower incidence of adverse events and lower mortality all of which are likely to reduce costs. The committee noted that the use of validated admission criteria should help to ensure that patients are not unnecessarily admitted and should reduce the adverse consequences of admission such as hospital-acquired infections. This will ensure that NHS resources would be used more efficiently. The committee noted that implementing these criteria is unlikely to require more staff time or increase in the number of investigations as these are usually part of the assessment process. There will be a need to educate staff to apply the scoring systems appropriately. It is likely that benefits would be associated with an overall reduction in cost or be cost neutral. It was also noted that these scores are already commonly used in practice, however, there is a need to standardise this across the NHS. In summary, therefore, the committee felt that the use of such validated measures as criteria for admission was likely to be cost-effective and improve patient outcomes.
Quality of evidence	Evidence for the outcome of mortality was a mixture of high quality and very low quality due to observational study design and imprecision. Evidence for avoidable adverse events was a mixture of low quality due to imprecision, and very low quality due to observational study design and imprecision. Evidence for length of stay was a mixture of high quality and low quality due to observational study design. Evidence for admissions was a mixture of moderate quality due to imprecision and very low quality due to observational study design and inconsistency. The economic evidence was assessed to be partially applicable with potentially serious limitations. QALYs were not used as an outcome. There is uncertainty regarding the applicability of resource use and costs from the Swiss health care

Recommendations	11. Use validated risk stratification tools to inform clinical decisions about hospital admission for people with medical emergencies.
Research recommendation	-
	system to the NHS context. Baseline and relative treatment effects are based on a single study, so by definition, does not reflect all evidence in the area. No sensitivity analysis is reported. The study also had short follow-up period (30 days), so may not capture all relevant costs and outcomes. The only costs included were those of hospitalisation for patients with GBS of 0 and not all patients in the study and the size of this subsample was small (n=26).
Other considerations	There are several condition specific risk stratification tools recommended by NICE. These tools are used in the emergency department (ED) and the acute medical unit (AMU) to enable discharge of low risk patients. They are intended to supplement clinical judgement rather than to replace it. The committee highlighted that the use of these condition specific scores is contingent on accurate clinical diagnosis. The committee noted that in practice when deciding whether to admit a patient, local service availability is sometimes taken in to consideration. However, services should be designed to allow compliance with NICE guidelines and this should lead to standardisation of care throughout the country. The evidence informing this recommendation is based in secondary care; however, several risk stratification tools can also be used in primary care settings in order to aid decisions on the best way to manage a patient.

References

1 Early data suggest new protocol to risk-stratify chest pain patients, potentially preserving resources without compromising safety. ED Management. 2015; 27(5):49-52

2 Albrich WC, Ruegger K, Dusemund F, Bossart R, Regez K, Schild U et al. Optimised patient transfer using an innovative multidisciplinary assessment in Kanton Aargau (OPTIMA I): an observational survey in lower respiratory tract infections. Swiss Medical Weekly. 2011; 141:w13237

3 Albrich WC, Dusemund F, Ruegger K, Christ-Crain M, Zimmerli W, Bregenzer T et al. Enhancement of CURB65 score with proadrenomedullin (CURB65-A) for outcome prediction in lower respiratory tract infections: derivation of a clinical algorithm. BMC Infectious Diseases. 2011; 11:112

4 Ali H, Lang E, Barkan A. Emergency department risk stratification in upper gastrointestinal bleeding. Canadian Journal of Emergency Medicine. 2012; 14(1):45-49

5 Attar A, Sebbagh V, Vicaut E, Le Toumelin P, Bouhnik Y. Urgent endoscopy in severe non-variceal upper gastrointestinal hemorrhage: does the Glasgow-Blatchford score help endoscopists? Scandinavian Journal of Gastroenterology. 2012; 47(8-9):1086-1093

6 Backus BE, Six AJ, Kelder JH, Gibler WB, Moll FL, Doevendans PA. Risk scores for patients with chest pain: evaluation in the emergency department. Current Cardiology Reviews. 2011; 7(1):2-8

7 Bajaj RR, Goodman SG, Yan RT, Bagnall AJ, Gyenes G, Welsh RC et al. Treatment and outcomes of patients with suspected acute coronary syndromes in relation to initial diagnostic impressions (insights from the Canadian Global Registry of Acute Coronary Events [GRACE] and Canadian Registry of Acute Coronary Events [CANRACE]). American Journal of Cardiology. 2013; 111(2):202-207

8 Baugh CW, Greenberg JO, Mahler SA, Kosowsky JM, Schuur JD, Parmar S et al. Implementation of a risk stratification and management pathway for acute chest pain in the emergency department. Critical Pathways in Cardiology. 2016; 15(4):131-137

9 Callus R, Micallef J, Mamo J, Montefort S. Hospital management of community-acquired pneumonia in Malta. Malta Medical Journal. 2012; 24(2):6-10

10 Chalmers JD, Rutherford J. Can we use severity assessment tools to increase outpatient management of community-acquired pneumonia? European Journal of Internal Medicine. 2012; 23(5):398-406

11 Chalmers JD, Singanayagam A, Akram AR, Choudhury G, Mandal P, Hill AT. Safety and efficacy of CURB65-guided antibiotic therapy in community-acquired pneumonia. Journal of Antimicrobial Chemotherapy. 2011; 66(2):416-423

12 Choudhury G, Chalmers JD, Mandal P, Akram AR, Murray MP, Short P et al. Physician judgement is a crucial adjunct to pneumonia severity scores in low-risk patients. European Respiratory Journal. 2011; 38(3):643-648

13 Dean NC, Jones JP, Aronsky D, Brown S, Vines CG, Jones BE et al. Hospital admission decision for patients with community-acquired pneumonia: variability among physicians in an emergency department. Annals of Emergency Medicine. 2012; 59(1):35-41

14 Du H, Liu WJ, Zhou LH. Study on application of GRACE scoring system on nursing of ACS patients. European Review for Medical and Pharmacological Sciences. 2016; 20(7):1333-1338

15 Girardin M, Bertolini D, Ditisheim S, Frossard JL, Giostra E, Goossens N et al. Use of Glasgow-Blatchford bleeding score reduces hospital stay duration and costs for patients with low-risk upper GI bleeding. Endoscopy International Open. Switzerland 2014; 2(2):E74-E79

16 Guenancia C, Stamboul K, Hachet O, Yameogo V, Garnier F, Gudjoncik A et al. Clinical effectiveness of the systematic use of the GRACE scoring system (in addition to clinical assessment) for ischaemic outcomes and bleeding complications in the management of NSTEMI compared with clinical assessment alone: a prospective study. Heart and Vessels. 2016; 31(6):897-906

17 Guo Q, Li HY, Zhou YP, Li M, Chen XK, Liu H et al. Compliance with the CURB-65 score and the consequences of non-implementation. International Journal of Tuberculosis and Lung Disease. 2011; 15(12):1697-1702

18 Hortmann M, Heppner HJ, Popp S, Lad T, Christ M. Reduction of mortality in community-acquired pneumonia after implementing standardized care bundles in the emergency department. European Journal of Emergency Medicine. 2014; 21(6):429-435

19 Huijts SM, van Werkhoven CH, Boersma WG, Buijs J, Buunk G, Compaijen CJ et al. Guideline adherence for empirical treatment of pneumonia and patient outcome. Treating pneumonia in the Netherlands. Netherlands Journal of Medicine. 2013; 71(10):502-507

20 Jones BE, Jones JP, Vines CG, Dean NC. Validating hospital admission criteria for decision support in pneumonia. BMC Pulmonary Medicine. 2014; 14:149

21 Kabundji DM, Musekiwa A, Mukansi M, Feldman C. Determining need for hospitalisation: evaluation of the utility of the CRB-65 score in patients with community-acquired pneumonia presenting to an emergency department. South African Medical Journal. 2014; 104(11):769-772

22 Karmakar G, Wilsher M. Use of the 'CURB 65' score in hospital practice. Internal Medicine Journal. 2010; 40(12):828-832

23 Mahler SA, Riley RF, Hiestand BC, Russell GB, Hoekstra JW, Lefebvre CW et al. The HEART Pathway randomized trial: identifying emergency department patients with acute chest pain for early discharge. Circulation: Cardiovascular Quality and Outcomes. 2015; 8(2):195-203

24 National Clinical Guideline Centre. Unstable angina and NSTEMI: the early management of unstable angina and non-ST-segment-elevation myocardial infarction. NICE clinical guideline 94. London. National Clinical Guideline Centre, 2009. Available from: http://guidance.nice.org.uk/CG94

25 National Clinical Guideline Centre. Gastrointestinal bleeding: the management of acute upper gastrointestinal bleeding. NICE clinical guideline 141. London. National Clinical Guideline Centre, 2012. Available from: http://guidance.nice.org.uk/CG141

26 National Clinical Guideline Centre. Pneumonia: Diagnosis and management of community- and hospital-acquired pneumonia in adults. NICE clinical guideline CG191. London. National Clinical Guideline Centre, 2014. Available from: http://guidance.nice.org.uk/CG191

27 Nieuwets A, Poldervaart JM, Reitsma JB, Buitendijk S, Six AJ, Backus BE et al. Medical consumption compared for TIMI and HEART score in chest pain patients at the emergency department: a retrospective cost analysis. BMJ Open. 2016; 6(6):e010694

28 Organisation for Economic Co-operation and Development (OECD). Purchasing power parities (PPP), 2007. Available from: http://www.oecd.org/std/ppp

29 Poldervaart JM, Reitsma JB, Koffijberg H, Backus BE, Six AJ, Doevendans PA et al. The impact of the HEART risk score in the early assessment of patients with acute chest pain: design of a stepped wedge, cluster randomised trial. BMC Cardiovascular Disorders. 2013; 13:77

30 Santi L, Farina G, Gramenzi A, Trevisani F, Baccini M, Bernardi M et al. The HEART score with high-sensitive troponin T at presentation: ruling out patients with chest pain in the emergency room. Internal and Emergency Medicine. 2016;

31 Silveira CD, Ferreira CS, Correa RdA. Adherence to guidelines and its impact on outcomes in patients hospitalized with community-acquired pneumonia at a university hospital. Jornal Brasileiro De Pneumologia. 2012; 38(2):148-157

32 Six AJ, Backus BE, Kingma A, Kaandorp SI. Consumption of diagnostic procedures and other cardiology care in chest pain patients after presentation at the emergency department. Netherlands Heart Journal. 2012; 20(12):499-504

33 Stanley AJ, Ashley D, Dalton HR, Mowat C, Gaya DR, Thompson E et al. Outpatient management of patients with low-risk upper-gastrointestinal haemorrhage: multicentre validation and prospective evaluation. The Lancet. 2009; 373(9657):42-47

34 Sung JJY, Tang RSY, Ching JYL, Rainer TH, Lau JYW. Use of capsule endoscopy in the emergency department as a triage of patients with GI bleeding. Gastrointestinal Endoscopy. 2016; 84(6):907-913

35 Wang H, Watson K, Robinson RD, Domanski KH, Umejiego J, Hamblin L et al. Chest pain risk scores can reduce emergent cardiac imaging test needs with low major adverse cardiac events occurrence in an emergency department observation unit. Critical Pathways in Cardiology. 2016; 15(4):145-151

36 Widmer CC, Bachli EB. Quality of care in patients with community acquired pneumonia and sepsis in a Swiss hospital. Swiss Medical Weekly. 2012; 142:w13510

Appendices

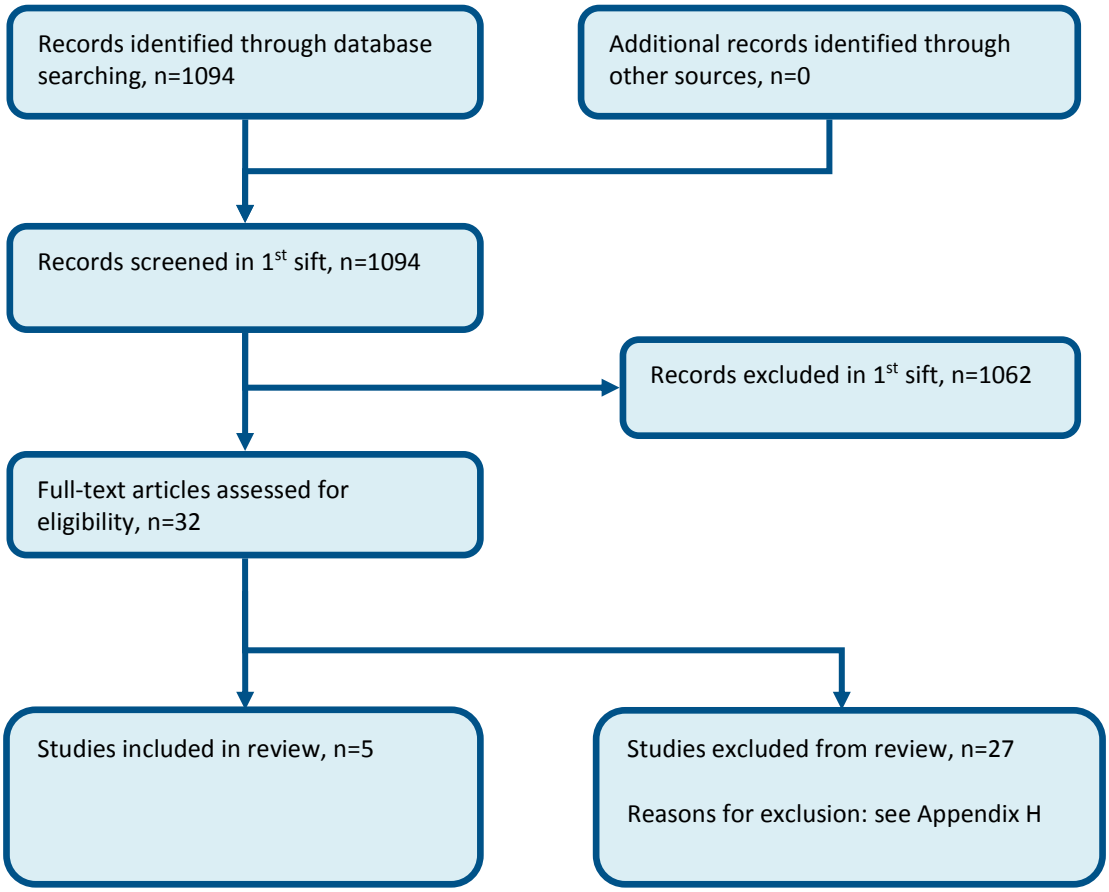
Appendix A: Review protocol

Table 6: Review protocol: Standardised criteria for hospital admission

Review question	Do standardised criteria for hospital admission facilitate appropriate admission?
Guideline condition	Acute medical emergencies.
Review population	Adults and young people (16 years and over) with a suspected or confirmed AME before admission
	Adults
	Line of therapy not an inclusion criterion
Interventions and comparators: generic/class; specific/drug (All interventions will be compared with each other, unless otherwise stated)	Standardised criteria for admission including risk stratification at presentation; Validated risk stratification scores Standardised criteria for admission including risk stratification at presentation; Blatchford - Upper GI Bleed Standardised criteria for admission including risk stratification at presentation; CAP/CURB 65 - Community acquired pneumonia Standardised criteria for admission including risk stratification at presentation; GRACE, HEART Score - Acute Coronary Syndrome Standardised criteria for admission including risk stratification at presentation; Q-admissions - Multimorbidity No standardised criteria for admission; As defined by study No risk stratification at admission; As defined by study
Outcomes	- Quality of life (Continuous) CRITICAL - Mortality (Dichotomous) CRITICAL - Avoidable adverse effects (Dichotomous) CRITICAL - Length of stay (Continuous) IMPORTANT - Patient/Carer satisfaction (Dichotomous) CRITICAL - Discharge destination (Dichotomous) IMPORTANT - Admissions (Dichotomous) CRITICAL
Study design	RCT Quasi-RCT Retrospective cohort study Prospective cohort study Before and after study Non randomised study Systematic Review
Unit of randomisation	Patient Hospital Ward
Crossover study	Not permitted
Minimum duration of study	Not defined
Subgroup analyses if there is heterogeneity	None specified
Search criteria	Databases: Medline, Embase, the Cochrane Library Date limits for search: None Language: English

Appendix B: Clinical article selection

Figure 1: Flow chart of clinical article selection for the review of standardised criteria for hospital admission



Appendix C: Forest plots

C.1 Standardised criteria for hospital admission versus no standardised criteria for hospital admission

Figure 2: Mortality (cardiovascular deaths)

Study or Subgroup	Standardised criteria Events	Total	No standardised criteria Events	Total	Weight	Risk Difference M-H, Fixed, 95% CI
Mahler 2015	0	141	0	141	100.0%	0.00 [-0.01, 0.01]
Total (95% CI)		**141**		**141**	**100.0%**	**0.00 [-0.01, 0.01]**
Total events	0		0			
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.00 (P = 1.00)						

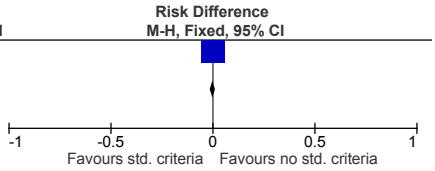


Figure 3: Mortality

Study or Subgroup	Standardised criteria Events	Total	No standardised criteria Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Girardin 2014	2	104	5	104	100.0%	0.40 [0.08, 2.02]
Total (95% CI)		**104**		**104**	**100.0%**	**0.40 [0.08, 2.02]**
Total events	2		5			
Heterogeneity: Not applicable						
Test for overall effect: Z = 1.11 (P = 0.27)						

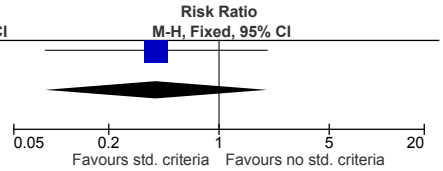


Figure 4: Avoidable adverse events (MACE)

Study or Subgroup	Standardised criteria Events	Total	No standardised criteria Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Mahler 2015	7	141	9	141	100.0%	0.78 [0.30, 2.03]
Total (95% CI)		**141**		**141**	**100.0%**	**0.78 [0.30, 2.03]**
Total events	7		9			
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.51 (P = 0.61)						

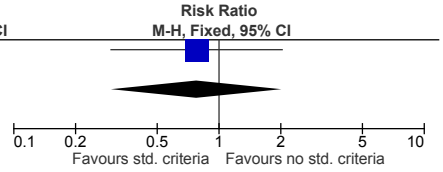


Figure 5: Avoidable adverse events (repeat cardiac ED visits)

Study or Subgroup	Standardised criteria Events	Total	No standardised criteria Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Mahler 2015	4	141	6	141	100.0%	0.67 [0.19, 2.31]
Total (95% CI)		**141**		**141**	**100.0%**	**0.67 [0.19, 2.31]**
Total events	4		6			
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.64 (P = 0.52)						

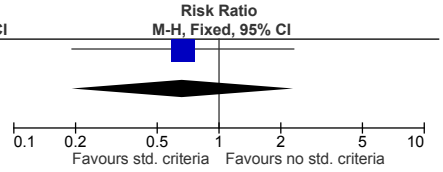


Figure 6: Avoidable adverse events (repeat cardiac non-index hospitalisations)

Study or Subgroup	Standardised criteria Events	Total	No standardised criteria Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Mahler 2015	5	141	4	141	100.0%	1.25 [0.34, 4.56]
Total (95% CI)		**141**		**141**	**100.0%**	**1.25 [0.34, 4.56]**
Total events	5		4			
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.34 (P = 0.74)						

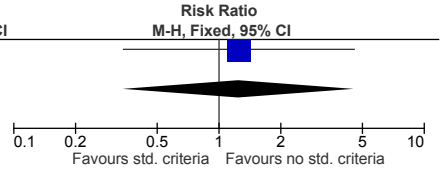


Figure 7: Avoidable adverse events (outpatient failures)

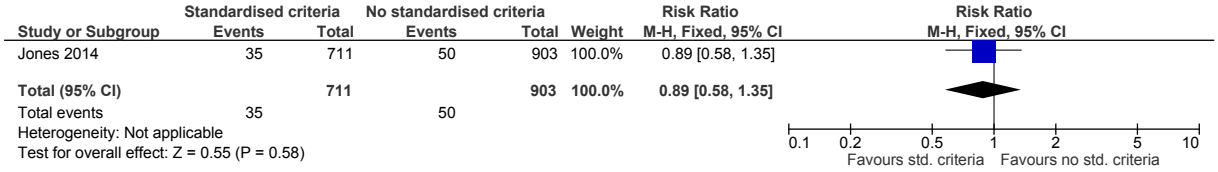


Figure 8: Length of stay (early discharge)

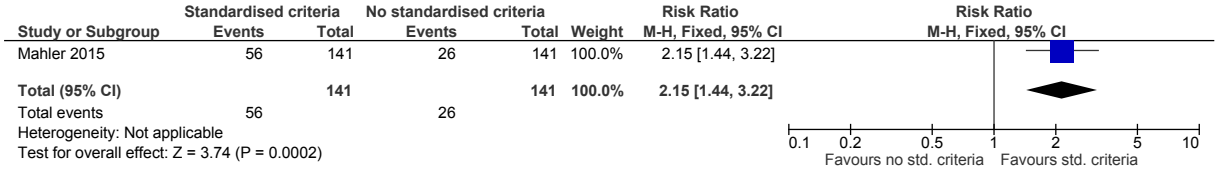


Figure 9: Length of stay (mean bed-days)

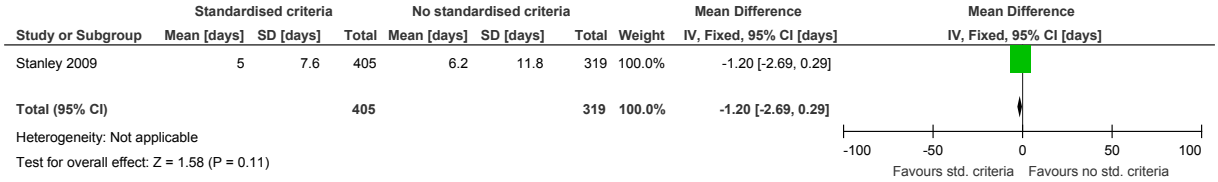


Figure 10: Admissions (number admitted to inpatient ward)

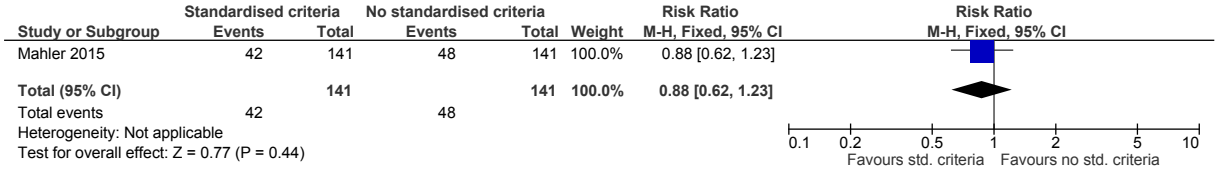
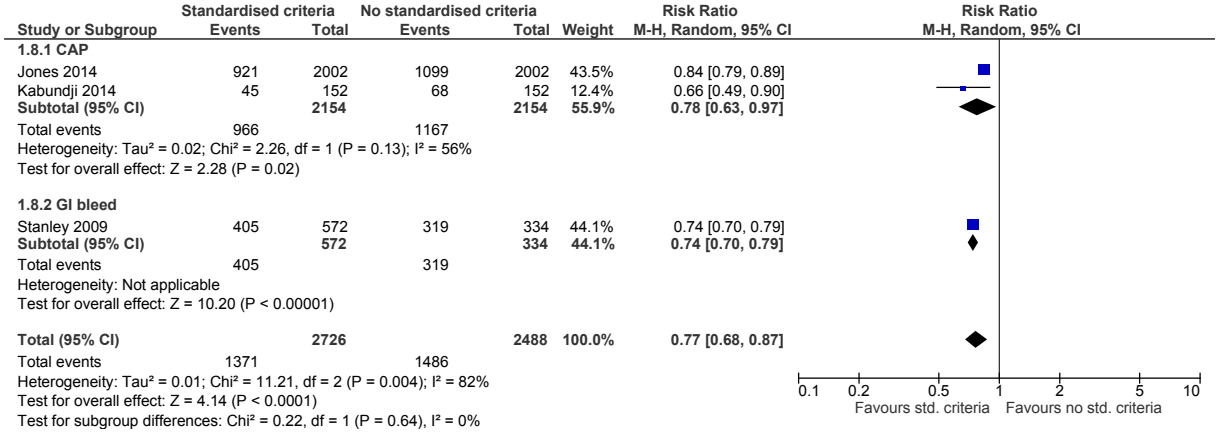


Figure 11: Admissions



Appendix D: Clinical evidence tables

Study	**Girardin 2014[15]**
Study type	Before and after study
Number of studies (number of participants)	1 (n=208)
Countries and setting	Conducted in Switzerland; setting: ED of the University Hospital of Geneva, Switzerland
Line of therapy	Not applicable
Duration of study	Observational phase: Oct 2009-Aug 2010 Intervention phase: Jan 2011-Jan 2012
Method of assessment of guideline condition	Adequate method of assessment/diagnosis: outpatients admitted to the ED with UGI bleeding
Stratum	Overall: not applicable
Subgroup analysis within study	Not applicable
Inclusion criteria	>18 years; UGI bleeding
Exclusion criteria	Pregnancy; haematochezia
Recruitment/selection of patients	Consecutive patients admitted to the ED during recruitment phases
Age, gender and ethnicity	Age - Range: 20-99 years. Gender (M: F): 147:61. Ethnicity: Not reported
Further population details	Not applicable
Indirectness of population	No indirectness: not applicable
Interventions	(n=104) Intervention 1: Standardised criteria for admission including risk stratification at presentation - Validated risk stratification scores. Glasgow-Blatchford Bleeding Score. Duration: 1 year. Concurrent medication/care: not applicable (n=104) Intervention 2: No standardised criteria for admission - As defined by study. Routine local clinical practice: all patients received proton pump inhibitor therapy and underwent an UGI endoscopy in the endoscopy unit or in the ED during the 12 hours following hospital admission. Responsible physician in the ED decided whether to discharge or admit the patient. Duration: 9/10 months. Concurrent medication/care: not applicable
Funding	Funding not stated
RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: VALIDATED RISK STRATIFICATION SCORES versus AS DEFINED BY STUDY Protocol outcome 1: Mortality at 30 days - Actual outcome: number of patients dying at 30 days; Group 1: 2/104, Group 2: 5/104; Risk of bias: All domain - Low, Selection - High, Blinding - Low, Incomplete	

Study	Girardin 2014[15]
outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low; Indirectness of outcome: No indirectness, Comments: not applicable	
Protocol outcomes not reported by the study	Quality of life; Patient/Carer satisfaction; Discharge destination; Admission

Study	Jones 2014[20]
Study type	Retrospective cohort study
Number of studies (number of participants)	1 (n=2002)
Countries and setting	Conducted in USA; setting: 7 hospital EDs within the Intermountain Healthcare system in the urban regions of Utah, USA
Line of therapy	Not applicable
Duration of study	Other: retrospective analysis
Method of assessment of guideline condition	Adequate method of assessment/diagnosis: patients with a primary diagnosis of pneumonia/secondary diagnosis of pneumonia and primary diagnosis of respiratory failure or sepsis defined by ICD-9 codes
Stratum	Overall: not applicable
Subgroup analysis within study	Not applicable: not applicable
Inclusion criteria	>18 years of age; evaluated in the ED; primary diagnosis of pneumonia or secondary diagnosis of pneumonia and primary diagnosis of respiratory failure or sepsis
Exclusion criteria	Patients diagnosed with aspiration pneumonia or immunocompromised conditions including AIDs or receipt of antiretroviral therapy, solid organ transplants or hematologic malignancies; patients lacking radiographic evidence for pneumonia
Recruitment/selection of patients	Consecutive patients >18 years evaluated in the ED from 1 December 2009 to 1 December 2010 with the relevant diagnoses were included
Age, gender and ethnicity	Age - Other: >18 years. Gender (M:F): not reported. Ethnicity: not reported
Further population details	Not applicable
Indirectness of population	No indirectness
Interventions	(n=2002) Intervention 1: Standardised criteria for admission including risk stratification at presentation - CAP/CURB 65 - Community acquired pneumonia. CURB-65 scores applied retrospectively. Duration: 1 year. Concurrent medication/care: not applicable.

	(n=2002) Intervention 2: No standardised criteria for admission - As defined by study. Paper guideline with CURB-65 scoring and antibiotic recommendations was available to ED physicians, but was rarely utilised. Duration 1 year. Concurrent medication/care: not applicable.
Funding	Academic or government funding (Intermountain Medical Research Foundation)
RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: CAP/CURB 65 - COMMUNITY ACQUIRED PNEUMONIA versus AS DEFINED BY STUDY Protocol outcome 1: Avoidable adverse effects - Actual outcome: outpatient failure defined as 7-day secondary hospitalisation or 30-day outpatient death at 1 year; Group 1: 35/711, Group 2: 50/903; Risk of bias: All domain - Low, Selection - High, Blinding - Low, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - High; Indirectness of outcome: No indirectness ; Key confounders: the same group of patients was used in both analyses; reasons for lack of adherence to CURB-65 were not reported Protocol outcome 2: Admission - Actual outcome: number of admissions at 1 year; Group 1: 921/2002, Group 2: 1099/2002; Risk of bias: All domain - Low, Selection - High, Blinding - Low, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low; Indirectness of outcome: No indirectness ; Key confounders: the same group of patients was used in both analyses; reasons for lack of adherence to CURB-65 were not reported	
Protocol outcomes not reported by the study	Quality of life; Mortality; Length of stay; Patient/Carer satisfaction; Discharge destination

Study	Kabundji 2014[21]
Study type	Prospective cohort study
Number of studies (number of participants)	1 (n=152)
Countries and setting	Conducted in South Africa; setting: ED at Helen Joseph Hospital, Johannesburg, South Africa
Line of therapy	Not applicable
Duration of study	Other: retrospective analysis
Method of assessment of guideline condition	Adequate method of assessment/diagnosis: chest radiograph and diagnosed by ED doctor as having CAP
Stratum	Overall: not applicable
Subgroup analysis within study	Not applicable
Inclusion criteria	>18 years with CAP seen in the ED
Exclusion criteria	Cases of suspected or confirmed aspiration pneumonitis, Pneumocystis jirovecii pneumonia and pulmonary tuberculosis; patients with any acute or active comorbid illness such as diabetes mellitus, renal failure, cardiac failure or end stage AIDs
Recruitment/selection of patients	Consecutive patients meeting the inclusion criteria between February 2011 and April 2011
Age, gender and ethnicity	Age - Median (range): 36.5 years (20-87 years). Gender (M:F): 73/79. Ethnicity: not reported
Further population details	Not applicable
Indirectness of population	No indirectness
Interventions	(n=152) Intervention 1: Standardised criteria for admission including risk stratification at presentation - Validated risk stratification scores. CRB-65 scores applied retrospectively. Duration: 2 months. Concurrent medication/care: not applicable. (n=152) Intervention 2: No standardised criteria for admission - As defined by study. ED doctors determined whether the patient needed to be admitted to hospital or not using various criteria (for example, chest radiograph; fever; haemodynamic parameters). Duration: 2 months. Concurrent medication/care: not applicable.
Funding	Academic or government funding (National Research Foundation of South Africa)
RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: VALIDATED RISK STRATIFICATION SCORES versus AS DEFINED BY STUDY Protocol outcome 1: Admission - Actual outcome: number managed in hospital at 2 months; Group 1: 45/152, Group 2: 68/152; Risk of bias: All domain - High, Selection - High, Blinding - Low, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - High, Crossover - Low, Subgroups - Low; Indirectness of outcome: No indirectness, Comments: not applicable; Key confounders: same group was used; reasons for lack of aherence to CRB-65 not reported	

Protocol outcomes not reported by the study	Quality of life; Mortality; Avoidable adverse effects; Length of stay; Patient/Carer satisfaction; Discharge destination

Study	Stanley 2009[33]
Study type	Prospective cohort study
Number of studies (number of participants)	1 (n=906)
Countries and setting	Conducted in United Kingdom; setting: Royal Cornwall Hospital, Truro; Glasgow Royal Infirmary, Glasgow; Ninewells Hospital, Dundee; University Hospital of North-Tees, Stockton
Line of therapy	Not applicable
Duration of study	Intervention + follow up
Method of assessment of guideline condition	Adequate method of assessment/diagnosis: presenting with upper-gastrointestinal haemorrhage defined as haematemesis, coffee-ground vomit, or melaena
Stratum	Overall: not applicable
Subgroup analysis within study	Not applicable
Inclusion criteria	Patients presenting with upper-gastrointestinal haemorrhage
Exclusion criteria	Inpatients with the disorder
Recruitment/selection of patients	Consecutive patients meeting the inclusion criteria
Age, gender and ethnicity	Age - Median (IQR): phase 1: 54 years (37-72); phase 2 52 years (35-68). Gender (M:F): not reported. Ethnicity: not reported
Further population details	Not applicable
Extra comments	Phase 1: 12 months at Truro; 6 months at Glasgow; 3 months at Dundee; 3 months at Stockton. Phase 2: 12 months at Glasgow; 3 months at Stockton.
Indirectness of population	No indirectness
Interventions	(n=572) Intervention 1: Standardised criteria for admission including risk stratification at presentation - Validated risk stratification scores. Glasgow-Blatchford bleeding score. Duration: 12 months (Glasgow) and 3 months (Stockton). Concurrent medication/care: not applicable. (n=334) Intervention 2: No standardised criteria for admission - As defined by study. No details given. Duration: 6 months (Glasgow) and 3 months (Stockton). Concurrent medication/care: not applicable.
Funding	No funding
RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: VALIDATED RISK STRATIFICATION SCORES versus AS DEFINED BY STUDY Protocol outcome 1: Length of stay	

- Actual outcome: mean bed days per patient at 12 months and 3 months; Group 1: mean 5 days (SD 7.6); n=405, Group 2: mean 6.2 days (SD 11.8); n=319; Risk of bias: All domain - Low, Selection - High, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low; Indirectness of outcome: No indirectness Protocol outcome 2: Admission - Actual outcome: admissions at 12 months and 3 months; Group 1: 405/572, Group 2: 319/334; Risk of bias: All domain - High, Selection - High, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low; Indirectness of outcome: No indirectness	
Protocol outcomes not reported by the study	Quality of life; Mortality; Avoidable adverse effects; Patient/Carer satisfaction; Discharge destination

Study	The HEART Pathway Randomized Trial: Mahler 2015[23]
Study type	RCT (Patient randomised; Parallel)
Number of studies (number of participants)	1 (n=282)
Countries and setting	Conducted in USA; setting: ED of a tertiary care academic medical centre in North Carolina, serving urban, suburban and rural populations
Line of therapy	Not applicable
Duration of study	Intervention + follow up
Method of assessment of guideline condition	Adequate method of assessment/diagnosis: symptoms of ACS; provider ordered an ECG and troponin
Stratum	Overall: not applicable
Subgroup analysis within study	Not applicable
Inclusion criteria	>21 years of age; presenting with symptoms of ACS, provider having ordered an ECG and troponin for the evaluation of ACS
Exclusion criteria	New ST-segment elevation >1mm; hypotension; life expectancy <1 year; non-cardiac medical, surgical or psychiatric illness determined by the provider to require admission; previous enrolment; non-English speaking; incapacity or unwillingness to consent
Recruitment/selection of patients	Consecutive patients meeting the inclusion criteria during enrolment hours (6 days excluding Saturday, 80 hours per week
Age, gender and ethnicity	Age - Mean (SD): 53 years (12 years). Gender (M:F): 120/162. Ethnicity: not reported
Further population details	Not applicable
Indirectness of population	No indirectness
Interventions	(n=141) Intervention 1: Standardised criteria for admission including risk stratification at presentation - GRACE, HEART Score - Acute Coronary Syndrome. HEART score used as a decision aid rather than a substitute for clinical judgement. Duration: 17 months. Concurrent medication/care: not applicable. (n=141) Intervention 2: No standardised criteria for admission - As defined by study. Care providers were encouraged to follow American College of Cardiology/American Heart Association guidelines which recommended serial cardiac biomarkers and objective cardiac testing before discharge. Duration: 17 months. Concurrent medication/care: not applicable.
Funding	Other (American Heart Association Clinical Research Program)
RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: GRACE, HEART SCORE - ACUTE CORONARY SYNDROME versus AS DEFINED BY STUDY	

Protocol outcome 1: Mortality - Actual outcome: cardiovascular death at 30 days; Group 1: 0/141, Group 2: 0/141; Risk of bias: All domain - Low, Selection - Low, Blinding - Low, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - High; Indirectness of outcome: No indirectness, Comments: not applicable Protocol outcome 2: Avoidable adverse effects - Actual outcome: repeat cardiac related ED visit at 30 days; Group 1: 10/141, Group 2: 18/141; Risk of bias: All domain - Low, Selection - Low, Blinding - Low, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - High; Indirectness of outcome: No indirectness, Comments: not applicable - Actual outcome: recurrent cardiac related non-index hospitalisation at 30 days; Group 1: 5/141, Group 2: 4/141; Risk of bias: All domain - Low, Selection - Low, Blinding - Low, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - High; Indirectness of outcome: No indirectness- Actual outcome: major adverse cardiac event at 30 days; Group 1: 7/141, Group 2: 9/141; Risk of bias: All domain - Low, Selection - Low, Blinding - Low, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - High; Indirectness of outcome: No indirectness Protocol outcome 3: Length of stay - Actual outcome: index length of stay (median) over 17 months; risk of bias: All domain - Low, Selection - Low, Blinding - Low, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - High; Indirectness of outcome: No indirectness - Actual outcome: early discharges over 17 months; Group 1: 56/141, Group 2: 26/141; Risk of bias: All domain - Low, Selection - Low, Blinding - Low, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - High; Indirectness of outcome: No indirectness Protocol outcome 4: Admission - Actual outcome: inpatient ward (admissions) over 17 months; Group 1: 42/141, Group 2: 48/141; Risk of bias: All domain - Low, Selection - Low, Blinding - Low, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - High; Indirectness of outcome: No indirectness	
Protocol outcomes not reported by the study	Quality of life; Patient/Carer satisfaction; Discharge destination

Appendix E: Economic evidence tables

Study	Girardin 2014[15]			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost effectiveness**
Economic analysis: CCA (health outcome: Mortality, need for clinical interventions including transfusion, surgery or haemostasis) **Study design:** before-and-after study **Approach to analysis:** **Perspective:** Swiss healthcare system **Follow-up:** up to 30 days **Treatment effect duration:**[(a)] 30 days **Discounting:** n/a	**Population:** Consecutive adult patients (>18 years) presenting to the ED with upper GI bleeding. **Cohort settings: (n=208)** Mean age: NR, Male: NR **Intervention 1: [n=104 (15 with GBS of 0)]** No standardised criteria/risk stratification for admission. All patients received proton pump inhibitor therapy and underwent an UGI endoscopy in the endoscopy unit or the ED during the 12 hours following hospital admission. The ED physician decided whether to admit or discharge patients. **Intervention 2: [n=104 (11 with GBS of 0)]** Standardised criteria for admission including risk stratification at presentation for upper-gastrointestinal haemorrhage (Glasgow-Blatchford bleeding score) Patients with a GBS of 0 were not admitted to hospital and received an appointment for an ambulatory UGI endoscopy during the following 48 hours.	**Total costs (mean per patient with GBS of 0):** Intervention 1: £644 Intervention 2: £428 Incremental (2−1): -£216 (95% CI: NR; p=0.002) **Currency & cost year:** Euros (presented here as 2013 UK pounds[(b)])] **Cost components incorporated:** hospitalisation	**Mortality at 30 days:** *Patients with GBS of 0* Intervention 1: 0% (0/15) Intervention 2: 0% (0/11) Incremental (2−1): 0% (95% CI: NR; p=NS) **Need for clinical interventions:** *Patients with GBS of 0* Intervention 1: 0% (0/15) Intervention 2: 9% (1/11) Incremental (2−1): 9% (95% CI: NR; p=NS)	**ICER:** Not applicable **Analysis of uncertainty:** None reported
Data sources				
Health outcomes: data collected during an initial observational phase on patient characteristics, clinical condition, adverse events and mortality. These were compared with the data collected during the interventional phase. **Quality-of-life weights:** n/a. **Cost sources:** hospital costs were calculated using the Swiss public healthcare tariff. Cost calculations included all real costs for the first 24 hours using 2013 TARMED reimbursement rates plus a daily package of 686 Euro (£347) in case of a hospital stay longer than 24 hours.				
Comments				
Source of funding: NR. **Applicability and limitations:** QALYs were not used as an outcome. Uncertainty regarding the applicability of resource use and costs from the Swiss health care system to the NHS context. Baseline and relative treatment effects are based on a single study, so by definition, does not reflect all evidence in the area. No sensitivity analysis is reported. Short follow-up period (30 days), so may not capture all relevant costs and outcomes. The only costs included were those of hospitalisation for patients with GBS of 0 and not all patients in the study.				

Overall applicability:[c] Partially applicable **Overall quality:**[d] Potentially serious limitations

Abbreviations: CCA: cost-consequence analysis; 95% CI: 95% confidence interval; ED: emergency department; GBS: Glasgow Blatchford Scale; ICER: incremental cost-effectiveness ratio; n/a: not applicable; NR: not reported; NS: not significant; QALYs: quality-adjusted life years; UGI: upper gastrointestinal.

(a) For studies where the time horizon is longer than the treatment duration, an assumption needs to be made about the continuation of the study effect. For example, does a difference in utility between groups during treatment continue beyond the end of treatment and if so for how long?

(b) Converted using 2013 purchasing power parities.[28]

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

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

Appendix F: GRADE tables

Table 7: Clinical evidence profile: standardised criteria for hospital admission versus no standardised criteria for hospital admission

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Standardised criteria versus no standardised criteria	Control	Relative (95% CI)	Absolute		
Mortality (follow-up 30 days; assessed with: cardiovascular death)												
1	randomised trials	no serious risk of bias	no serious inconsistency	no serious indirectness	no serious imprecision	none	0/141 (0%)	0%	RR 0.0 (-0.01 to 0.01)	Not calculable	⊕⊕⊕⊕ HIGH	CRITICAL
Mortality (follow-up 30 days; assessed with: number of patients dying)												
1	observational studies	no serious risk of bias[3]	no serious inconsistency	no serious indirectness	very serious[1]	none	2/104 (1.9%)	4.8%	RR 0.4 (0.08 to 2.02)	29 fewer per 1000 (from 44 fewer to 49 more)	⊕OOO VERY LOW	CRITICAL
Avoidable adverse events (MACE) (follow-up 30 days; assessed with: major adverse cardiac events)												
1	randomised trials	no serious risk of bias	no serious inconsistency	no serious indirectness	very serious[1]	none	7/141 (5%)	6.4%	RR 0.78 (0.3 to 2.03)	14 fewer per 1000 (from 45 fewer to 66 more)	⊕⊕OO LOW	CRITICAL
Avoidable adverse events (repeat cardiac ED visit) (follow-up 30 days; assessed with: repeat cardiac related ED visit)												

1	randomised trials	no serious risk of bias	no serious inconsistency	no serious indirectness	very serious[1]	none	4/141 (2.8%)	4.3%	RR 0.67 (0.19 to 2.31)	14 fewer per 1000 (from 35 fewer to 56 more)	⊕⊕OO LOW	CRITICAL
Avoidable adverse events (repeat cardiac non-index hospitalisation) (follow-up 30 days; assessed with: repeat cardiac related non-index hospitalisation)												
1	randomised trials	no serious risk of bias	no serious inconsistency	no serious indirectness	very serious[1]	none	5/141 (3.5%)	2.8%	RR 1.25 (0.34 to 4.56)	7 more per 1000 (from 18 fewer to 100 more)	⊕⊕OO LOW	CRITICAL
Avoidable adverse events (outpatient failure) (follow-up 30 days; assessed with: 7-day secondary hospitalisation or 30-day outpatient death)												
1	observational studies	no serious risk of bias[3]	no serious inconsistency	no serious indirectness	very serious[1]	none	35/711 (4.9%)	5.5%	RR 0.89 (0.58 to 1.35)	6 fewer per 1000 (from 23 fewer to 19 more)	⊕OOO VERY LOW	CRITICAL
Length of stay (early discharge) (assessed with: early discharge)												
1	randomised trials	no serious risk of bias	no serious inconsistency	no serious indirectness	no serious imprecision	none	56/141 (39.7%)	18.4%	RR 2.15 (1.44 to 3.22)	212 more per 1000 (from 81 more to 408 more)	⊕⊕⊕⊕ HIGH	IMPORTANT
Length of stay (mean bed-days) (follow-up 3-12 months; measured with: mean bed-days per patients; Better indicated by lower values)												
1	observational studies	no serious risk of bias[3]	no serious inconsistency	no serious indirectness	no serious imprecision	none	405	319	-	MD 1.2 lower (2.69 lower to 0.29 higher)	⊕⊕OO LOW	IMPORTANT
Admissions (follow-up 17 months; assessed with: number of patients admitted to an inpatient ward)												

1	randomised trials	no serious risk of bias	no serious inconsistency	no serious indirectness	serious[1]	none	42/141 (29.8%)	34%	RR 0.88 (0.62 to 1.23)	41 fewer per 1000 (from 129 fewer to 78 more)	⊕⊕⊕O MODERATE	CRITICAL
Admissions (follow-up 2-12 months; assessed with: number of patients admitted to hospital)												
3	observational studies	no serious risk of bias[3]	serious[2]	no serious indirectness	no serious imprecision	none	1371/2726 (50.3%)	54.9%	RR 0.77 (0.68 to 0.87)	126 fewer per 1000 (from 71 fewer to 176 fewer)	⊕OOO VERY LOW	CRITICAL

[1] Downgraded by 1 increment if the confidence interval crossed 1 MID or by 2 increments if the confidence interval crossed both MIDs.
[2] Downgraded by 1 increment if heterogeneity, I2=50%, p=0.04, unexplained by subgroup analysis.
[3] All non-randomised studies automatically downgraded due to selection bias. Studies may be further downgraded by 1 increment if other factors suggest additional high risk of bias, or 2 increments if other factors suggest additional very high risk of bias.

Appendix G: Excluded clinical studies

Table 8: Studies excluded from the clinical review

Study	Exclusion reason
Albrich 2011[2]	Inappropriate comparison (CURB65 versus CURB65-A)
Albrich 2011[3]	Inappropriate comparison (CURB65 versus CURB65-A)
Ali 2012[4]	Inappropriate comparison (all patients had several risk scores calculated and predictive accuracy was compared)
Anon 2015[1]	Article on Mahler 2015. No extractable data.
Attar 2012[5]	No relevant outcomes
Backus 2011[6]	No relevant outcomes
Bajaj 2013[7]	Inappropriate comparison. GRACE scores were applied to all patients (no comparator)
Baugh 2016[8]	Incorrect comparison (high versus low risk patients)
Callus 2012[9]	Inappropriate comparison. CURB-65 scores were applied to all patients (no comparator)
Chalmers 2011[11]	Inappropriate intervention (CURB65-guided antibiotic therapy)
Chalmers 2012[10]	Review article
Choudhury 2011[12]	Inappropriate comparison (CURB-65 scores were applied to all patients; study compared low-risk patients who were admitted and were not admitted)
Dean 2012[13]	Intervention unclear (calculation of illness severity)
Du 2016[14]	Incorrect intervention (GRACE scoring to determine type of nursing rather than admission)
Guenancia 2016[16]	Incorrect intervention (GRACE score calculated after admission)
Guo 2011[17]	Inappropriate comparison. CURB-65 scores were applied to all patients retrospectively (no comparator)
Hortmann 2014[18]	Incorrect interventions (CAP care bundle)
Huijts 2013[19]	No relevant outcomes
Karmakar 2010[22]	Inappropriate comparison. CURB-65 scores were applied to all patients (no comparator)
Nieuwets 2016[27]	Incorrect intervention (HEART score not used for admission)
Poldervaart 2013[29]	Description of a trial design
Santi 2016[30]	Retrospective analysis of HEART score; not used as criteria for admission
Silveira 2012[31]	Inappropriate comparison. CURB-65 scores were applied to all patients retrospectively (no comparator)
Six 2012[32]	Inappropriate comparison. HEART scores were applied to all patients retrospectively (no comparator)
Sung 2016[34]	Incorrect intervention (capsule endoscopy)
Wang 2016B[35]	All included patients were low risk; Scores were not used for admission decisions
Widmer 2012[36]	Inappropriate comparison. CRB-65 scores were applied to all patients retrospectively (no comparator)

Appendix H: Excluded health economic studies

No studies were excluded.