

A meta-analysis of Early Warning Scores in sepsis: Do they predict anything?

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Table 1 Study details and individual study results

Study and Country	How sepsis diagnosed?	EWS	Threshold	Setting	n	Mean/median age	% male	Mortality prevalence (%)	AUC (95% CI)	Sensitivity (%) (95% CI)	Specificity (%) (95% CI)	LR+ (95% CI)	LR- (95% CI)
Cildir (2013) ²⁸ Turkey	Prospective, clinician identification	MEWS	≥6	ED	230	NR	NP	32.2	0.61 (NR)	43 (32, 55)	75 (67, 81)	1.73 (1.19, 2.52)	0.76 (0.62, 0.93)
Corfield (2014) ²³ Scotland	Retrospective case note review	NEWS	≥5	ED	2003	72 (IQR 59, 81)	47%	14.8	0.70 (0.67, 0.74)	89 (85, 92)	30 (28, 32)	1.27 (1.22, 1.34)	0.33 (0.24, 0.47)
Geler (2013) ²⁵ Germany	Prospective clinician identification and retrospective case note review	MEWS	≥5	ED	151	68.3 (SD 18)	54	14.6	0.64 (0.55, 0.73)	43 (22, 67)	74 (63, 81)	1.64 (0.90, 3.00)	0.77 (0.50, 1.15)
Ghanem-Zoubi (2011) ²⁶ Israel	Prospective Electronic Identification	MEWS	≥5	IM	1072	74.7 (SD 16.1)	54%	19.4	0.67 (0.63, 0.71)	60 (51, 69)	68 (64, 71)	1.88 (1.58, 2.23)	0.59 (0.47, 0.73)
La Regina (2014) ²⁷ Italy	Unknown	MEWS	≥4	IM	535	73	49%	14.4	0.59 (0.51, 0.66)	34 (27, 45)	84 (80, 87)	2.06 (1.42, 3.0)	0.79 (0.67, 0.93)
Vonwerk (2008) ²⁴ UK	Retrospective, case note review	MEWS	≥5	ED	307	69.7 (IQR 67.5, 71.8)	51%	23.4	0.72 (0.67, 0.77)	72 (60, 82)	59 (53, 65)	1.76 (1.43, 2.18)	0.47 (0.32, 0.69)

(n = number of participants, AUC = area under curve, Prevalence = prevalence of mortality, NR = not reported, ED = emergency department, IM = internal medicine, MEWS = modified early warning score, NEWS = National early warning score)

Objectives

Early Warning scores are used to evaluate patients in many hospital settings. It is not clear if these are accurate in predicting mortality in sepsis. We performed a systematic review and meta-analysis of multiple studies in sepsis. Our aim was to estimate the accuracy of EWS for mortality in this setting.

Table 2 Results of the QUADAS-2 assessment

Study	RISK OF BIAS				APPLICABILITY CONCERNS		
	PATIENT SELECTION	INDEX TEST	REFERENCE STANDARD	FLOW AND TIMING	PATIENT SELECTION	INDEX TEST	REFERENCE STANDARD
Cildir (2013) ²⁸	Low Risk	Low Risk	Low Risk	High Risk	Low Risk	Unclear Risk	Low Risk
Corfield (2014) ²³	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk
Geler (2013) ²⁵	Low Risk	Low Risk	Low Risk	High Risk	Low Risk	Unclear Risk	Low Risk
Ghanem-Zoubi (2011) ²⁶	Low Risk	Low Risk	Low Risk	High Risk	Low Risk	Low Risk	Low Risk
La Regina (2014) ²⁷	Unclear Risk	Unclear Risk	Low Risk	Unclear Risk	Unclear Risk	Unclear Risk	Unclear Risk
Vonwerk (2008) ²⁴	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Unclear Risk	Low Risk

Methods

PubMed, CINAHL, Cochrane, Web of Science and EMBASE were searched to October 2016.

Studies of adults with sepsis who had EWS calculated using any appropriate tool (e.g. NEWS, MEWS) were eligible for inclusion. Study quality was assessed using QUADAS-2. Summary estimates were derived using HSROC analysis.

Results

Six studies (4,298 participants) were included. Results suggest that EWS cannot be used to predict which patients with sepsis will (positive likelihood ratio 1.79, 95% CI 1.53 to 2.11) or will not die (negative likelihood ratio 0.59, 95% CI 0.45 to 0.78). Two studies were rated as low risk of bias and one as unclear risk of bias on all domains. The other three studies were judged at high risk of bias in one domain.

Conclusion

Early Warning Scores are not sufficiently accurate to rule in or rule out mortality in patients with sepsis, based on the evidence available.

Figure 2: Flow diagram showing the results that would be obtained if EWS were used in a hypothetical population of 1000 patients presenting with sepsis where 150 (15%) will die.

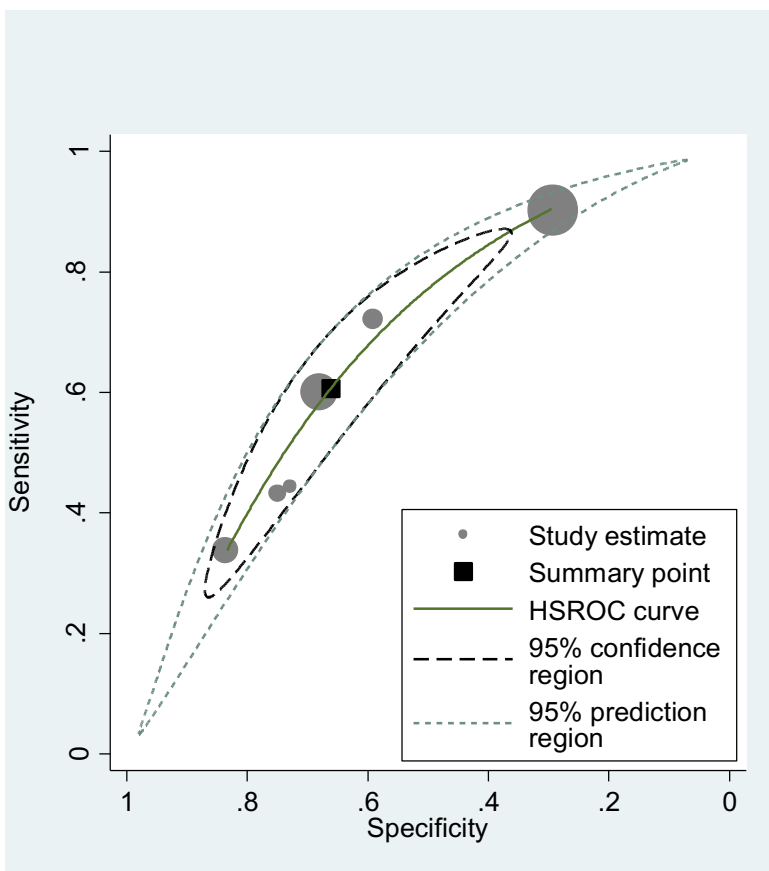
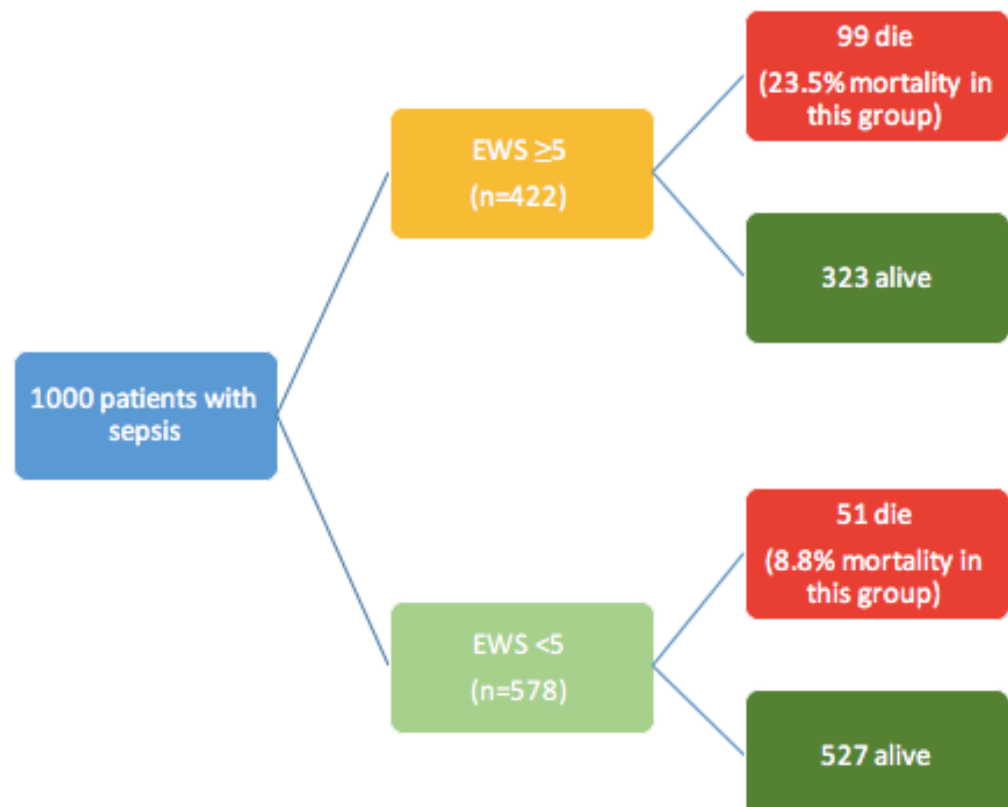


Figure 1: Summary receiver operating characteristic plot for all studies

Circles indicate individual study estimates; the green line shows the hierarchical summary receiver operating characteristic curve, the black square denotes the summary estimate and the dashed line its 95% confidence region, while the dotted line shows a 95% prediction region

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Thanks for reading.
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