

Modified Early Warning Scores

To support paramedics' decision making to transport or treat at home.

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Background

Modified Early Warning Scores (MEWS) are used in hospital to identify patients who may benefit from admission or intensive care. They are calculated from physiological measures (systolic blood pressure, heart and respiratory rate); the higher the MEWS the greater the clinical risk of mortality. There has been increasing interest in their use in the pre-hospital ambulance setting,^{1,2} although there remains a paucity of evidence of their use from prospective studies.

Our aim

To evaluate the use of MEWS to support paramedics' decisions to transport patients to hospital, or treat and leave them safely at home.

1 Assess patient



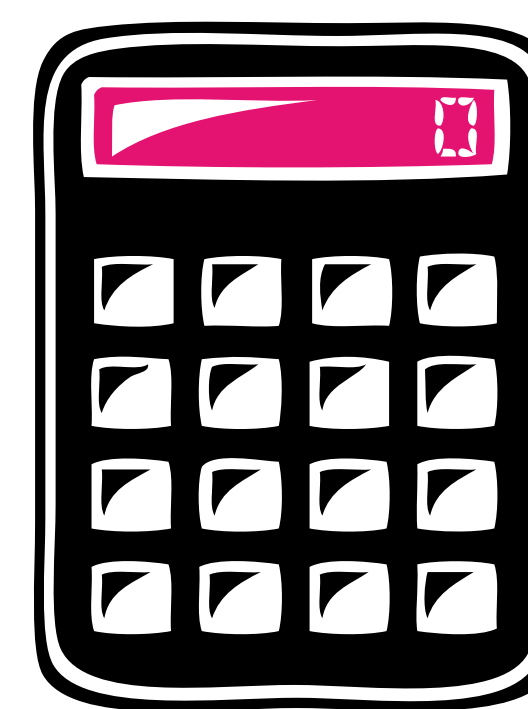
Resps	20
Oxygen Sats	96
Heart Rate	108
Systolic BP	102
Temp	38
Neuro	Alert

2 Note scores



Resps	20	1
Oxygen Sats	96	1
Heart Rate	108	1
Systolic BP	102	0
Temp	38	1
Neuro	Alert	0

3 Calculate MEWS



Resps	20	1
Oxygen Sats	96	1
Heart Rate	108	1
Systolic BP	102	0
Temp	38	1
Neuro	Alert	0
MEWS		4

4 Clinical decision



MEWS 0 or 1 consider treating or referring closer to home.

Method

We used an interrupted time series design. We trained nineteen paramedics how to use MEWS (figure 1). Using their existing clinical skills, they were encouraged to carefully consider all cases where the MEWS was 0 or 1, and decide whether their patient needed to be transported to hospital or whether they could be treated and left safely at home.

	3	2	1	0	1	2	3
Respiratory Rate	<8	9-18	19-25	26-29	≥30		
O ₂ Sats	<89	90-93	94-96	>96			
Heart Rate	≤40	41-50	51-100	101-110	111-129	≥130	
SBP (mm Hg)	<70	71-90	91-100	>100			
Temperature (°C)	≤35.0	35.1-36	36.1-37.9	38-38.9	≥39		
Neuro			Alert	Confused Agitated	Voice	Pain Unconscious	

Figure 1 MEWS Matrix

Analysis

We used linear regression to evaluate differences in weekly transportation rates (percentage of patients attended and transported to hospital) and revisit rates (Percentage of patients attended, treated at home and subsequently revisited within 7 days), comparing trends in rates 17 weeks prior (pre-MEWS) and 17 weeks post implementation of MEWS.

Auto-calculated scores retrospectively applied to all data provided pre-MEWS and were compared, using a Chi square test, with paramedic calculated scores post-MEWS.

Results

Participating paramedics attended 4140 emergencies. Of the data, 2208 were excluded owing to missing values (n=1897), recording errors (n=21) or excluded clinical complaints (n=290).

From the remaining data (n=1932) we found no significant difference in transportation rates (pre MEWS: 55±6% to post MEWS: 63±11%) by catering for existing trends where the confidence intervals of the regression overlap. Likewise, there was no significant difference in revisit rates (pre MEWS: 4±4% to post MEWS: 2±4%) catering for similar trends (table 1.)

		Coefficient	R ²	Sig	95% Confidence Interval	
					Lower	Upper
Transportation	Pre	0.15	.065	0.322	-0.51	0.80
	Post	-0.58			-0.58	1.66
Revisit	Pre	0.08	.033	0.487	-0.33	0.49
	Post	-0.13			-0.53	0.26

Table 1: Linear Regression Analysis

Where paramedics had recorded MEWS (n=622), we found 39% were incorrect; $\chi^2(1) = 213.878$, $p < 0.001$, 0.613 (phi).

Discussion

Transportation and revisit rates were unaffected by the introduction of MEWS and were comparable to those found nationally; 70% (range 52% to 83%) and 6% (range: 12% to 10%) respectively.³ We therefore deduce MEWS had little influence on clinical-decision making.

Of the 622 recorded MEWS, more than a third were incorrect. Previous studies have reported similar findings.^{4,5} We believe omissions and errors were owing to time-factors, misunderstandings regarding the application of MEWS and confusion with the matrix itself. Mathematical symbols (\geq \leq $>$ $<$) were often misconceived, for example, oxygen saturation of 96 was often incorrectly scored as 0.

Strengths & limitations

This was one of the first prospective studies evaluating an early warning score system used by paramedics. Our findings will be of value to other

ambulance services who may be considering adopting such a system.

Time to provide support, clinical feedback and motivation was limited. Although others found extensive training, regular feedback and reminders made little difference to errors or uptake.⁶

Recommendation

If adopted, early warning score systems should be computer based; auto-calculated using the physiological measures entered on the patient record.⁷ This will save paramedics' time and ensure clinical decisions are based on correct measurement of risk.

Conclusion

MEWS had no effect on transport or revisit rates. Scores were frequently not calculated or recorded, or calculated incorrectly. Opportunities for on-going training, clinical support and feedback were limited, although evidence suggests this may have made little difference.

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