Impact of Early Warning Score (EWS) in adult patients requiring a Medical Emergency Team (MET) call.

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1. INTRODUCTION

The outcome from in-hospital cardiac arrest is universally poor. However critical deterioration of patients in hospital is rarely sudden but preceded by spiralling physiological decline [1][2].

A variety of simple bed-side monitoring processes have been introduced in hospitals to identify patients at risk. The Medical Emergency Team (MET) system identifies at-risk patients by using a clearly defined threshold of physiological derangement for individual vital signs at a single point in time. If this threshold is crossed for any parameter a MET rapid response is triggered [2]. An alternative to this is the Early Warning Score (EWS). This is a composite score based on several physiological indices to give an overall score of a person's well-being, using a "traffic light" colour scheme to identify patient's grade of risk for each parameter.[3]

The MET system is used routinely at Waitakere Hospital (WH), Auckland, New Zealand. At the James Cook University Hospital (JCUH), Middlesbrough, UK an Early Warning Score (EWS) has been implemented. The purpose of this study was to assess the impact of the EWS in adult patients requiring an emergency MET-call.

2. METHODOLOGY

All adult emergency MET-calls at WH made between the February 2005 and October 2005 were identified from the emergency telephone log-book recorded at the hospital's switchboard. Criteria for staff to raise a MET-call are shown in Figure 1.

The medical notes including observation charts were reviewed retrospectively. The clinical parameter triggering each MET-call was noted.

CARDIAC or RESPIRATORY ARREST	
RESPIRATION	**Respiratory distress** **Respiratory rate < 8 or >30 per minute**
CARDIOVASCULAR	**Blood pressure <90 mm Hg** **Heart Rate < 40 or >130 per minute**
NEUROLOGY	**Sudden fall in level of consciousness** **Prolonged seizure**
URINE OUTPUT	**<100ml/3hrs (Unexplained)**
OTHER	**Any patient you are seriously concerned about**

Figure 1: Criteria for a MET-call response

Entries in the medical records and physiological observations in the 48-hours preceding the MET-call were recorded and from these an EWS score was retrospectively calculated using the JCUH EWS criteria (table 1*)*.

Table 1: Early Warning Score System – Version Used at the James Cook University Hospital

Score	3	2	1	0	1	2	3
HR (bpm)		<40	40-50	51-100	101-110	111-130	>130
BPsys (mmHg)	<70	70-80	81-100	101-180	181-200	>200	
Respiration Rate (min^{-1})		<10		10-14	15-20	21-30	>30
Central Nervous System			Confused	Alert	Voice	Pain	Unresponsive
Temperature (°C)		<35	35-36	36.1-37.5	37.6-38.5	>38.5	
Urine Output ($mls\ hr^{-1}$) (* if catheterised)	Nil	<20	<30		>100		

The total EWS is calculated by combining all physiological 'scores' – with 0 being 'normal'; a score of 3 prompting a medical review, and 5 being chosen as a trigger for immediate review by as senior doctor and possible intervention by the critical care team. The EWS at the time of a MET-call and over the preceding 48-hours were calculated. Comparisons between EWS scores at were made by paired t-test.

3. RESULTS

A total of 46 MET-calls were made between March and October 2005. 17 cases were excluded (2 maternity patients, 3 outpatients, 5 case-notes were unobtainable; the remainder were regarded as 'false' calls). The remaining 29 patients had the following demographic characteristics: They were predominantly elderly female (M:F 9:20), mean (range) age was 73.1 (37 – 91) years. Diagnoses included; chronic lung disease, cardiac failure, cancer, pneumonia, abdominal sepsis and frailty of old age. The mean (SD) number of observations recorded per patient in the 48-hours preceding the MET-call was 9 (3.3). The mean (range) interval from final observation to MET-call was 182 (10 – 840) minutes.

Reasons for MET-calls being raised were attributed to: Impaired consciousness (Glasgow coma score: GCS) 38%, hypotension (BP) 24 %, respiratory rate (RR) 14%, heart rate (HR) 10%, Cardiac Arrest 10%, and "Patient Unwell" 10% (see Figure 2.) – Note: more than one criterion may have triggered the MET response. In 41% of cases, the MET-criteria had not been fulfilled.

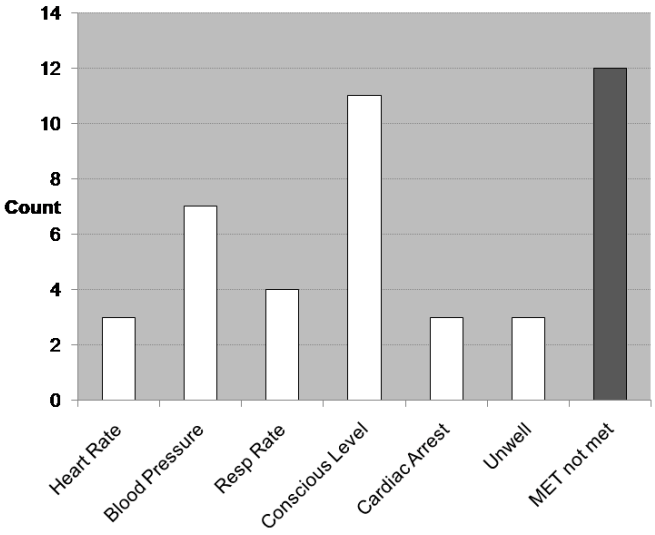


Figure 2: Abnormal Vital Signs triggering MET-calls

(> 1 sign may have abnormal at time of the MET-call)

There was marked variability in completeness of observation charts for vital signs:

(i) At the time of MET-call: HR and BP were 100% completed, RR 69% completed, GCS 83% completed, Temperature (T) 17.2%;

(ii) Over the preceding 48-hours: HR and BP 95% completed, RR 51%, GCS 6% and T 62%.

Figure 3 shows the EWS score at the time of a MET-call for all patients; the mean (range) EWS score at the time of MET-call was 5.0 (0-10) compared to 1.4 (0-5) for EWS at the observation immediately preceding this ($p<0.0005$).

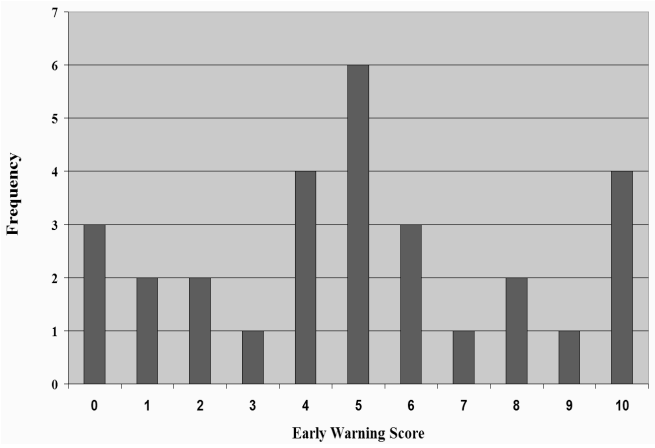


Figure 3: Frequency of each EWS at the time of the MET call

EWS varied widely, only 17 (59%) patients had an EWS score of 5 or more at the time of a MET-call. However from these 17-patients, there was evidence of worsening trend in only 5 (30%) patients prior to MET-call (see Figure 4.). Furthermore the trend only becomes clear at 2 or 3 observations prior to the MET call.

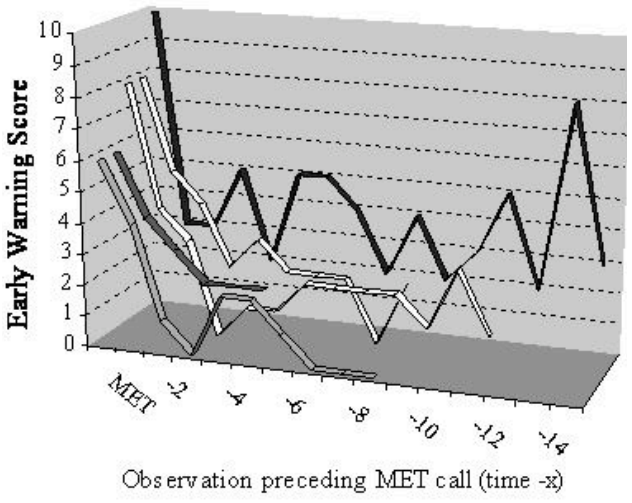


Figure 4: Trend in EWS in 5-patients at MET-call and preceding time intervals over 48-hours

4. DISCUSSION

Previous studies suggest that many in-hospital deaths are potentially preventable. [1] Deteriorating physiological

observations may be recorded by clinical staff for up to 24 hours prior to a serious adverse event but clinical signs are often missed, or not acted upon. [2] This has led to the development of physiological scores such as the EWS and the introduction of outreach teams such as the Medical Emergency Team (MET) system. In a single institution study, the introduction of a MET team was associated with 50% reduction in the incidence of in-hospital cardiac arrest calls [2] [4]. However the sensitivity and utility of such scores remains to be fully determined, and there is no consensus on the optimal system.

In clinical practice there is often a lack of consistency in the frequency and completeness of observations. In this study we observed a wide variation in both the numbers and timings of observations recorded preceding a MET call. This also hampered our ability to calculate the EWS.

A trend showing worsening EWS prior to a MET call was demonstrated in only 5 cases in this study. This may be partly explained by incompleteness of all physiological variables–most significantly the respiratory rate and conscious-level being infrequently recorded. Respiratory rate may be a more sensitive indicator of a patient's deteriorating state than other vital signs [5], yet it was only recorded in 51% of patients. Its omission is probably often due the difficulty and time it takes to 'manually' record. However there is also a lack of awareness of its importance. Similarly urine output was rarely recorded as the majority of patients are not catheterised.

In this study a MET call would not have been triggered in 41% of cases had the composite EWS been used rather than single physiological criteria. A high score for one parameter may be offset by lower scores for others. Furthermore missing component observations of composite scores will lead to underscoring.

A major limitation of this study is that the EWS was calculated retrospectively on historical data. Furthermore the impact of interventions patients received between observations has not been taken into consideration.

5. CONCLUSION

The trigger point for identification of patients at risk was no earlier with a composite EWS score compared to the MET system that relies on individual vital signs. The failure of a EWS to identify at-risk patients sooner may be partly attributable to incompleteness of observations in-particular the frequent omission of respiratory rate.

6. REFERENCES

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