



The Medical Emergency Team: 12 month analysis of reasons for activation, immediate outcome and not-for-resuscitation orders

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Abstract

Objective: To describe the reasons for, and immediate outcome following Medical Emergency Team (MET) activation. **Methods:** Retrospective analysis of MET calls in 1998. **Results:** There were 713 MET calls to 559 in-patients. Of the 559 patients 252 (45%) were admitted to ICU and 49 (6.9%) died during the MET response. The three commonest criteria for calling the MET were a fall in GCS > 2 ($n = 155$); a systolic blood pressure < 90 mmHg ($n = 142$) and a respiratory rate > 35 ($n = 109$). Cardiac arrests accounted for 61 calls and had an immediate mortality of 59%. The most common MET criterion associated with admission to ICU was a respiratory rate > 35 . Of patients who received MET calls based only on the 'worried' criterion 16% were admitted to ICU. The MET felt that a not-for-resuscitation order would have been appropriate in 130 cases (23%). NFR orders were documented during 27 of the MET calls. **Conclusions:** The MET system provides objective and subjective criteria by which medical and nursing staff can identify patients who become acutely unwell. A high proportion of these patients will require admission to Intensive Care. The MET system also provides the opportunity to identify patients for whom an NFR order should be considered. © 2001 Elsevier Science Ireland Ltd. All rights reserved.

Keywords: Resuscitation; Medical emergency team; Cardiac arrest; Intensive care

Resumo

Objectivo: Descrever as razões para a activação de uma Equipa de Emergência Médica (EEM). **Métodos:** Análise retrospectiva das chamadas da EEM em 1998. **Resultados:** Houve 713 chamadas para 599 doentes internados. Dos 599 pacientes, 252 (45%) foram admitidos na UCI (Unidade de Cuidados Intensivos) e 49 (6.9%) morreram durante a resposta da EEM. Os três motivos mais comuns para activar a EEM foram diminuição na ECG (Escala de Coma de Glasgow) > 2 ($n = 155$); pressão arterial sistólica < 90 mmHg ($n = 142$) e frequência respiratória > 35 ($n = 109$). 61 das chamadas foram por paragem cardíaca e tiveram uma mortalidade imediata de 59%. O critério que mais vezes se associou a internamento na UCI foi uma frequência respiratória > 35 . Quando as chamadas da EEM foram ditadas apenas nos critérios de 'preocupação' só 16% dos doentes foram admitidos na UCI. A EEM sentiu que a Ordem de Não Reanimar (DNR) teria sido apropriada em 130 casos (22%). Existiam ordens DNR foram documentadas em 27 das chamadas da EEM. **Conclusão:** O sistema EEM define critérios objectivos e subjectivos através dos quais a equipa médica e de enfermagem podem identificar doentes agudizados. Uma proporção elevada destes doentes requerer admissão em Cuidados Intensivos. O sistema da EEM permite identificar doentes para quem a ordem DNR deve ser considerada. © 2001 Elsevier Science Ireland Ltd. All rights reserved.

Palavras chave: Reanimação; Equipa de Emergência Médica; Paragem Cardíaca; Cuidados Intensivos

1. Introduction

The mortality rate following in-hospital cardiac arrest is very high, with only 15% survival at 1 year [1]. The chances of survival are particularly low for those patients with non-ventricular fibrillation(VF)/ventricu-

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lar tachycardia (VT) arrest rhythms, i.e. asystole or pulseless electrical activity (PEA) [2]. In-hospital cardiac arrest, particularly non VF/VT arrest, is often predictable and preceded by easily recognised physical changes that are present for many hours before the arrest [3]. Intensive care medicine has been largely practised within the four walls of the ICU. However, outcome following intensive care is also determined by the level of care delivered before and after admission to the ICU [4]. The establishment of a hospital-wide system which rapidly detects and responds to the seriously ill in the early stages and which monitors and audits quality should result in improved patient care. One such system is based around the Medical Emergency Team [5]. The MET system was developed at Liverpool Hospital in Sydney, Australia and is an integral part of South Western Sydney Area Health Service (SWSAHS). Liverpool Hospital is a 580 bed tertiary referral centre for SWSAHS and teaching hospital affiliated to the University of New South Wales. The components of the MET system include:

- the identification of patients at risk based on simple criteria;
- an emergency response by the MET which replaces the hospital cardiac arrest team;
- an advanced resuscitation training programme;
- collecting outcome indicators which allow:
 - measurement of hospital quality;
 - assessment of what is potentially preventable;
 - assessment of end of life decisions;
- feedback through the Quality Improvement System to advance patient care.

The MET was introduced in 1990 and designed to provide early identification of and rapid response to seriously ill patients at risk of cardiorespiratory arrest or needing admission to the intensive care unit. The MET is lead by an intensive care registrar and includes the medical registrar, and a senior intensive care Nurse. The surgical registrar also attends MET calls to surgical patients. Activation of the MET occurs in response to previously validated and published criteria (Appendix A) [6]. These criteria represent the easily recognised changes in physical signs that may be present for many hours before arrest and can be used as the basis for what can be considered critical illness. The calling criteria are recognised throughout the hospital and the system provides a rapid response by a multi-disciplinary team trained in advanced resuscitation.

This paper is a retrospective analysis of MET calls during the 12 months of January to December 1998. We present the reasons for calling the MET, the immediate outcome following calls, the number of patients where a not-for-resuscitation order was thought to be appropriate by the MET at the time of the call and the

number of times a not-for-resuscitation order was documented by the MET team.

2. Methods

Data on MET calls is collected by means of a scan compatible 'tick box' form (Appendix B) completed by the intensive care registrar (MET leader) immediately following each MET. The data is then entered onto a database (Microsoft Access) by the MET coordinator and is updated and validated on a weekly basis. Any missing or incomplete data is followed up within 7 days to maximise data retrieval. A retrospective analysis of the MET database from January to December 1998 was performed. The analysis included all MET calls over the 12-month period but patients who were not in-patients (i.e. they were visitors and out-patients) and those in the Emergency Department were excluded from the study. The analysis has concentrated on the reasons for the MET calls, the immediate outcome for the patients following the call and the impact on not for resuscitation orders.

3. Results

During 1998 the MET was activated 800 times. Eighty-seven calls were excluded from the study (40 visitors, 16 out-patients and 31 emergency department patients) leaving a total of 713 MET calls to 559 in patients. Of the 559 patients, 55.2% were male. The mean age was 64.5 years (range 3–98 years). 252 (45%) were admitted to ICU and 49 (6.9%) died whilst the MET were present. More than one MET call was made to 102 patients. The reasons for activation of the MET are shown in Table 1. The commonest criterion was a fall in GCS > 2 ($n = 155$); the second most common was a systolic blood pressure < 90 mmHg ($n = 142$) and the third commonest a respiratory rate > 35 ($n = 109$).

'Worried' was recorded as the sole criteria for 83 (12%) MET calls. Reasons for the calls as a result of 'worried' criteria are shown in Table 2. Of the 83 patients who had 'worried' as the sole criteria for MET call 13 (16%) were transferred to ICU and none died.

The total number of cardiac arrests was 61 (8.6%) of whom 36 (59%) died representing the highest immediate mortality. The next highest mortality rate (20%) was seen for patients with respiratory arrest or HR < 40 .

No patient received a MET call with a documented 'not for resuscitation' (NFR) order in the medical chart. The MET felt that a prior NFR order would have been appropriate in 130 cases. Of these, 17 died following arrival of the MET team and a further 27 were recorded as NFR during the MET attendance following discussion with the primary care team.

Table 1
Reasons for activation of the MET with numbers and percentage of patients in each group who were admitted to ICU and who died during the MET call

MET activation criterion	Number (%) calls ^a	Number (%) admitted ICU	Number (%) died
Airway threatened	36 (5.1%)	17 (47%)	0
Respiratory arrest	10 (1.4%)	5 (50%)	2 (20%)
Respiratory rate <5	13 (1.8%)	4 (30%)	1 (7.7%)
Respiratory rate >35	109 (15.3%)	46 (42%)	3 (2.3%)
Cardiac arrest ^b	61 (8.6%)	8 (13%)	36 (59%)
Pulse <40	10 (1.4%)	1 (10%)	2 (20%)
Pulse >140	77 (10.8%)	25 (32%)	1 (1.3%)
Systolic blood pressure <90	142 (19.9%)	38 (27%)	8 (5.6%)
Fall in GCS >2	155 (21.7%)	30 (19%)	3 (1.9%)
Seizure	79 (11.1%)	12 (15%)	0
Worried + other criteria	193 (27.1%)	53 (27%)	4 (2.1%)
Worried alone	83 (11.6%)	13 (16%)	0

^a Single patient can have >1 call criteria.

^b Cardiac arrests include CCU/Cardiac Catheter/ICU.

4. Discussion

The MET system identifies a large number of patients who meet criteria suggestive of critical illness. Some (45%) of these patients require high dependency or intensive care whilst in others the potential for HDU/ICU admission is possibly reduced by the management initiated following the MET call. Some patients who initially respond to the interventions of the MET and who are left in a stable condition on the wards subsequently require another MET call for the same or different reasons, accounting for some patients receiving more than one MET call. As a marker of the effectiveness of the system further analysis of this group of patients is warranted and ongoing.

The 'worried alone' category of MET calls consists of those patients who triggered a MET call without fulfilling any of the other specific physiological criteria and constituted 83 (11.6%) of all calls. These patients had problems sufficiently worrying for staff to call the MET. Thirteen (16%) of these patients were admitted to ICU but none died. What is not clear from the data is whether this represents a subgroup of patients who are benefiting greatly by early intervention or whether they constitute an overuse of the MET system. The vast majority of the MET calls are nurse initiated (99%) and our experience suggests this subjective assessment is useful in identifying sick patients. Other established systems to allow the early identification of seriously ill patients on hospital wards have also identified physiological criteria similar to ours but without the subjective 'worried' criterion [7].

We know that the mortality rate from in-hospital cardiac arrest is extremely high so any system that reduces preventable cardiac arrests should have a significant impact on hospital mortality. There were 61 MET calls for cardiac arrests during the study period

which is less than we have previously reported in the early years of the MET system [5,6]. However any comparisons must be considered with caution. In the previous published data MET calls included a significant number of calls to the Emergency Department (ED) [5,6]. With improved ED staffing levels and experience the numbers of MET calls to the ED has been greatly reduced over the years. There has also been an increase in hospital bed numbers to the current 580, an expansion of services and increasing numbers of admissions to 48 353 in 1998. The cardiac arrest rate of 61 in 1998 no doubt reflects many improvements, including less futile resuscitation of out-of-hospital cardiac arrests, increased ED staffing, the MET system and better identification of patients where NFR orders are appropriate. The fact that we still have unexpected cardiac arrests suggests that the system still has potential to be improved. The introduction of the MET system is a

Table 2
Documented reasons for MET call in 'worried alone' category

Reason	Number	
Bleeding	Gastrointestinal	5
	Vascular access site	2
	Surgical wound	1
Cardiovascular	Chest pain	8
	Rhythm disturbance	4
	Hypertension	5
Neurological	Agitated/Confused	5
	Dizzy	3
	Drowsy	3
Respiratory	Fall in SaO ₂	10
	Respiratory distress	5
Febrile/Rigors		4
Hypoglycaemia		4
No reason stated		24

gradual process requiring education, training, implementation, audit and feedback, all of which takes time. While many factors impact on the incidence of cardiac arrest these figures and a multi-centre study provide encouragement that the MET system is an effective component [8].

The MET identified 252 (45%) patients who required admission to the ICU and who would have otherwise had a delay in ICU admission. The vast majority of these calls are initiated by nursing staff which suggests that using the criteria are effective at identifying patients in need of MET review and possible ICU admission.

Inappropriate resuscitation of terminally ill patients causes loss of patient dignity, distress to relatives and staff and is a waste of scarce resources. The MET system provides the opportunity to identify a subgroup of patients for whom an NFR order should be considered but where none is documented. Many of these patients will fulfil MET call criteria before they have their terminal cardiac arrest. This can be seen as an opportunity to document an NFR order document (as in 27 cases in the study period) or to initiate the process where an NFR order will result. Establishing a NFR directive often takes time and requires communication between the primary care team, the patients, relatives and significant others. Again, the MET system has facilitated this process to the extent that of the 677 in hospital deaths occurring in Liverpool Hospital between April 1999 and February 2000, 590 (87%) patients had documented NFR orders. The system can be seen as a driver of cultural change to help clinicians make an explicit diagnosis of dying where appropriate, and to discuss the withholding of a futile resuscitation attempt.

5. Conclusions

The MET system provides objective and subjective criteria by which medical and nursing staff can identify patients in need of urgent intervention. A high propor-

tion (45%) of the patients meeting the call criteria required admission to ICU/HDU. The overall immediate mortality of patients meeting the MET call criteria was 6.9%. The MET system also provides the opportunity to identify patients for whom an NFR order should be considered.

Acknowledgements

Carl Thebridge and Rachelle Starkey for their roles as MET coordinators. The data in this paper was presented in abstract form at the Resuscitation 2000 meeting of the European Resuscitation Council, Antwerp, June 2000.

Appendix A. The Medical Emergency Team is activated according to the following criteria

Acute change in:	Physiology
Airway	Threatened
Breathing	All respiratory arrests Respiratory rate < 5 Respiratory rate > 36
Circulation	All cardiac arrests Pulse rate < 40 Pulse rate > 140 Systolic blood pressure < 90 mmHg
Neurology	Sudden fall in level of consciousness Fall in GCS > 2 points Repeated or prolonged seizures
Other	Any patient who you are seriously worried about that does not fit into the above criteria

Appendix B. MET data collection sheet

Medical Emergency Team Call Record																																																																																																	
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References

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