

Improving the documentation of medical emergency team reviews

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Medical emergency team (MET) services have been introduced into hospitals in a number of countries around the world to identify and treat particularly unwell patients on the ward. They aim to prevent unexpected intensive care admissions, cardiac arrests and sudden death, by enabling a rapid medical and nursing response to pre-defined clinical signs.¹

Most publications on MET systems relate to the effect that introducing these systems has on patient outcomes.² Less information exists about the events surrounding a MET call.²

The MET service in our hospital has operated since 1998. To date, only information on the number and location of MET calls has been audited. We are currently undertaking a comprehensive quality improvement program to enhance the use of our MET service and to improve outcomes of patients receiving MET calls. A hospital-wide limitation-of-medical-treatment policy, which includes not-for-resuscitation orders, has also been active since 1998.

The purpose of this study was to change the structure of the MET and to improve the quality of documentation of the events surrounding the MET call. In addition, we assessed the effect of this intervention on aspects of hospital resource utilisation and the in-hospital death rate of patients subject to a MET call.

Methods

The study was approved by the Human Research and Ethics Committee, Northern Health, Victoria. The Institutional Review Board waived the need for informed consent.

The hospital

The study was conducted at the Northern Hospital, an urban hospital in the outer north of Melbourne, Victoria, Australia. The emergency department sees over 70 000 presentations a year, with an admission rate of 20%. The hospital provides all acute and elective medical services, including paediatrics, obstetrics and gynaecology, but excepting cardiac surgery, neurosurgery and organ transplantation. It has a 10-bed intensive care unit that is staffed by a senior hospital medical officer (HMO), intensive care registrar and consultant during the day, and a senior HMO at night. The unit also receives patients needing high dependency unit (HDU) care. The unit had 721 admissions in 2005.

ABSTRACT

Objectives: To improve the documentation of events surrounding medical emergency team (MET) calls and to audit the incidence of MET calls and subsequent patient outcomes.

Methods: Prospective audit and patient chart review before and after three simultaneous interventions: medical team education, addition of intensive care personnel to the MET and introduction of a dedicated medical documentation pro forma. Data collected included patient demographics (including outcomes), features of each MET call (criteria, timing and treatment) and the completeness of medical documentation using nine predetermined criteria. Baseline data were collected over 5 months, April to August 2005. Following a 2-week education period, data were collected for a further 4 months, September to December 2005. Apart from the principal investigators, medical and nursing staff were not aware of this research during either data collection period.

Results: There were 94 MET calls (10.3 per 1000 admissions) during the baseline period and 101 (14.2 per 1000 admissions) after the interventions. MET calls were more common in medical than surgical patients (34.9 v 12.9 calls per 1000 admissions; $P < 0.001$). Sixty of the 195 calls (30.7%) resulted in patients being transferred to a critical care area, and the overall in-hospital mortality following a MET call was 31.8%. The interventions resulted in a significant increase in the overall quantity and quality of medical documentation (in seven out of the nine criteria). The interventions were not associated with an increase in hospital resource utilisation, in particular hospital bed days or admissions to critical care areas.

Conclusions: Critical-care resource utilisation and in-hospital mortality risk following a MET call at our institution is high. Three simple interventions improved the quality of medical documentation but did not significantly increase overall resource utilisation or improve patient outcomes.

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Hospital rapid response systems

The hospital has two levels of rapid response systems. The first is a traditional cardiac arrest ("code blue") team. The

second rapid response system is the MET service, which responds to predefined clinical criteria (Table 1), and is intended to review all medical and surgical emergencies other than cardiac arrest. Before February 2005, the MET comprised the parent unit doctors and the on-call medical registrar. If this MET did not respond within 5 minutes, a secondary (back-up) MET was called, which included the ICU medical staff (registrar and/or senior HMO).

All emergency calls are made to the hospital communication centre, and details of the date, time and location of the MET call are kept. The communication centre log does not record identifying details of the patient subject to the MET call.

Study design

This study was conducted in four phases (see timeline, Table 2) with the aims of:

- changing the structure of the MET; and
- improving the documentation of the events surrounding the call.

With the exception of the study investigators, all hospital staff were unaware of the outcome measures assessed by the study.

In February 2005, a run-in phase was begun to collect data on MET calls in an additional log book kept in the ICU. The details included date and time of call, ward and bed number, patient name and unit record number, as well as the admitting unit.

From April 2005 until September 2005, there was a formal period of baseline data collection to assess the adequacy of documentation of events surrounding MET calls.

In late August 2005, there was a 2-week education period for ICU staff and medical registrars regarding the proposed change in composition of the MET and the introduction of a case report form to document the events surrounding a MET call (Figure 1).

From 12 September 2005, a number of changes were made to the MET service:

- The MET included the intensive care registrar and/or senior HMO plus an ICU nurse, in addition to the medical registrar and the parent unit doctors.
- The pro-forma document (Figure 1) was introduced, to be completed by a member of the medical team with the details of the patient receiving the MET call. This was subsequently included in the medical record.

Post-intervention data were collected from 12 September to 31 December 2005.

Data collection

We collected data on all MET calls recorded in the ICU log book during the formal baseline and post-intervention periods. The separate communication centre log (maintained by the switchboard operators) was used to verify capture of all MET calls.

For calls where the patient details were captured in the ICU log book, two of the authors (AJC and CD) assessed the patient records for adequacy of documentation of the events surrounding the MET call, including documentation of deterioration of the patient's condition before the call, the date and time of the call, the staff member making the call, details of the medical staff attending the call, the reason for the call,

Table 1. Criteria for calling the MET at the Northern Hospital, Melbourne

- Deterioration in conscious state (progressively drowsy or unrousable)
- Systolic blood pressure < 90 mmHg
- Heart rate < 40 or > 140 beats per min
- Respiratory rate < 10 or > 30 per min
- Difficulty breathing
- Multiple convulsions
- Ischaemic chest pain
- Nurse worried about patient's condition

MET = medical emergency team.

Table 2. Phases of the MET quality improvement project

Phase	Timing	Description of events
I: Planning	November 2004 to February 2005	Ethics approval Meetings to plan phases of project ICU log to record patients receiving MET review
II: Baseline	1 April to August 2005	April: ICU staff education to increase capture of patients receiving MET review July: Planning for MET review documentation and changes to MET composition
III: Intervention	Late August 2005	Education of ICU and medical registrars regarding changes to MET composition and an approach to managing a MET call
IV: Post-intervention	12 September to 31 December 2005	Changes to MET composition Medical and ICU registrars complete pro-forma document

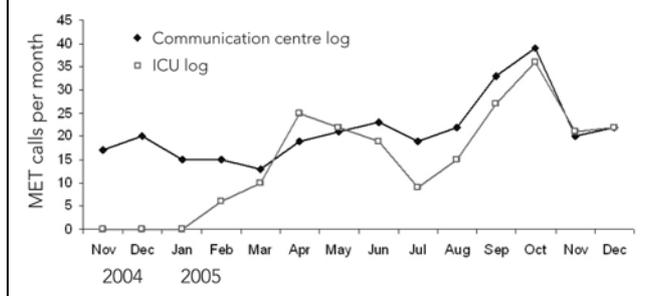
MET = medical emergency team.

Figure 1. Pro-forma document (case report form) used to record the events surrounding the MET call

HOSPITAL	MEDICAL EMERGENCY TEAM REVIEW		AFFIX PATIENT IDENTIFICATION LABEL HERE			
			U.R. NUMBER: _____			
			SURNAME: _____			
			GIVEN NAME: _____			
		DATE OF BIRTH: ____/____/____ SEX: _____				
NORTHERN	Ward/Area		MET location	Who attended MET call	Name	
	Call time				Med Register	
	Date				Med HMO	
	Who called the MET				Unit Registrar	
					Unit HMO	
					Unit Consultant	
	Nurse		Tick only, names not required		ICU HMO	
	CNS				ICU Registrar	
	ACN				ICU Consultant	
	HMO				Other	
Registrar						
Consultant						
Reason for the MET		Tick all criteria present		What do you think is wrong with the patient		
Cardiac arrest						
Difficult Breathing						
RR < 10						
RR > 30						
HR < 40		* deterioration in conscious state became very drowsy or unrousable **The patient was getting worse and needed medical assessment, but I am not quite sure what the problem was				
HR > 140						
BP < 90						
GCS fall *						
Worry **						
Initial Management		Tick all Rx given		Investigations		
CPR		Defib		CXR		
Hand ventilation		IV fluids		CT scan		
Oxygen		Adr		ECG		
Airway suction		Atropine		ABG		
Ventolin nebule		GTN		CU&E		
Intubated		Transfused		FBE		
Analgesia		Diuretic		Cardiac enzymes		
Anticonvulsant		Other Drug		Cultures		
Anti-emetic		No Rx change		IDC		
				IV canula		
Discussed with		Name		Follow up by		Pager
Other Reg						
Consultant						
ICU						
Patient Outcomes			Other Comments			
Immediate						
Transfer ICU						
Transfer CCU						
To GOT						
Transfer (other)						
Remain on Ward						
Died						
Other						
LMT order						
Doctor completing form						
Name		Position		Date		Signature
Last updated Aug 05 V1						MR 60 A

MEDICAL EMERGENCY TEAM REVIEW

Figure 2. MET calls per month recorded in the communication centre and intensive care unit logs



the differential diagnosis, initial management and investigations performed, as well as discussions undertaken and referrals made following the call. Documented follow-up by medical staff in the next 24 hours was also recorded. We were unable to assess this information for calls where patient details were not captured in the ICU log book.

Finally, we recorded the characteristics and outcomes of patients receiving a MET call, including the parent unit, time of day, whether the patient was admitted to an area of increased monitoring (ICU, HDU or coronary care unit [CCU]) and in-hospital deaths. A limitation-of-medical-treatment (LMT) order, including a not-for-resuscitation (NFR) order, before or after the MET call, was also identified.

All data were collected by AJC and CD, entered into a Microsoft Excel program and cross-checked to minimise errors.

Outcome measures and statistical analysis

The main outcome measure was the adequacy of documentation in relation to a MET call. Secondary outcome measures were changes in resource utilisation (including admission to monitored bed areas and hospital length of stay) and in-hospital deaths.

Proportions were compared using the χ^2 test. Length of stay data were compared using the Mann-Whitney U test. A *P* value <0.05 was taken to indicate statistical significance.

Results

During the study period, there were a total of 16 200 hospital admissions, including 5185 surgical admissions and 3461 medical admissions, with an overall in-hospital mortality of 1.9% (312 deaths).

MET call capture

Between 1 April and 31 December 2005, 218 MET calls were recorded in the communication centre log and, in 195 cases (89.4%), the details of the patient receiving the MET call were recorded in the ICU log (Figure 2).

Table 3. Comparison of documentation of the MET review before and after the intervention

	Total number of MET calls (%)			<i>P</i> *
	Entire study period (<i>n</i> = 195)	Before intervention (<i>n</i> = 94)	After intervention (<i>n</i> = 101)	
Deteriorating condition documented				
Nursing notes	142 (72.8%)	73 (78%)	69 (68%)	NS
Medical notes	96 (49.2%)	39 (42%)	57 (56%)	0.04
Occurrence of MET call documented				
Nursing notes	146 (74.9%)	77 (78%)	69 (74%)	NS
Medical notes	177 (90.8%)	82 (87%)	95 (94%)	NS
Documentation about MET call				
Date and time of MET	145 (74.4%)	58 (62%)	87 (86%)	<0.001
Staff member making the call	118 (60.5%)	41 (44%)	77 (76%)	<0.001
Who attended the call	98 (50.3%)	32 (34%)	66 (65%)	<0.001
Reason for the call	185 (94.9%)	86 (92%)	99 (98%)	NS
Differential diagnosis	146 (74.9%)	63 (67%)	83 (83%)	0.02
Initial management	179 (91.8%)	86 (92%)	93 (92%)	NS
Investigations performed	146 (74.9%)	61 (65%)	85 (84%)	0.002
Discussions and referrals	122 (62.6%)	47 (50%)	75 (74%)	0.005
Doctor's name	167 (85.6%)	74 (79%)	93 (92%)	0.007
Documented follow-up in next 24 hours	176 (90.3%)	83 (88%)	93 (92%)	NS

MET = medical emergency team. NS = not significant.

* The statistical analysis assessed differences in completeness of documentation between the periods before and after the intervention.

Documentation of MET calls

For the 195 MET calls where the patient details were known, clinical deterioration before the MET call was documented in 72.8% of nursing and 49.2% of medical notes, respectively (Table 3). Occurrence of the MET call was documented in 74.9% of nursing and 90.8% of medical notes, respectively. Adequacy of documentation of the events surrounding the MET call varied from 50.3% (staff attending the call) to 94.9% (the reason for the call). Medical follow-up in the next 24 hours was documented in 90.3% of calls.

Characteristics and outcomes of patients with MET review

In cases where the call details were known, MET calls were more likely to be made for patients admitted under a medical unit compared with a surgical unit (34.9 v 12.9 calls per 1000 admissions; $P < 0.001$). Half (50.2%) of calls occurred during working hours (08:00–17:00), with 29.7% of calls occurring between 21:00 and 08:00. Sixty of the 195 calls (30.7%) resulted in patients being admitted to a monitored area (ICU, HDU or CCU). Median hospital length of stay was 12 days. The in-hospital mortality was 31.8%. There was no significant change in mortality before or after the intervention, in cases where the call details were known.

Effect of intervention on MET review documentation

The addition of ICU staff to the MET and introduction of a standardised pro-forma document were associated with statistically significant improvements in a number of aspects of documentation of the MET call (Table 3), even though the pro-forma document was present in the records for only 64 of the 101 (63%) calls recorded after the intervention.

Before the intervention, the patient's deteriorating condition was objectively documented before the MET call in 78% of nursing and 42% of medical notes. The intervention resulted in a significant improvement in documentation of deterioration for medical (56%, $P = 0.04$), but not nursing, notes. Occurrence of the MET call was recorded in 74% of nursing and 94% of medical notes following the interventions (Table 3). Documented medical follow-up occurred in 88% of cases before, and 92% of cases after, the interventions (difference not significant).

Effect of intervention on outcome of patients with MET review

There were more MET calls in the post-intervention period compared with the baseline period (Table 4), but the difference was not statistically significant ($P = 0.09$).

A total of 37 of 195 (19%) patients had LMT orders before the MET call was made, and a further 26 patients (13%) had LMT orders initiated after the MET call. The apparent increase in the percentage of patients who had an

Table 4. Characteristics and outcomes of patients subject to a MET call*

	Before intervention	After intervention
Total number of MET calls (no. per 1000 admissions)	94 (10.3)	101 (14.2)
Number of hospital admissions		
Surgical	2924	2261
Medical	1945	1516
Other	4206	3348
Total	9075	7125
Number of calls (no. per 1000 admissions)		
Surgical	31 (10.5)	36 (15.9)
Medical	59 (30.3)	62 (40.9)
Other	4 (1.0)	3 (0.9)
Number of calls by time of day (%)		
Day (08:00–17:00)	49 (52%)	49 (49%)
Evening (17:00–21:00)	17 (18%)	22 (22%)
Night (21:00–08:00)	28 (30%)	30 (30%)
Number of calls (%) leading to admission to:		
Intensive care unit	17 (18%)	18 (18%)
High dependency unit	7 (8%)	7 (7%)
Coronary care unit	8 (9%)	3 (3%)
Hospital length of stay (days) [†]		
Total	1523	1643
Median	12	11
Interquartile range	5–24	4–23
Number of calls by LMT status (%)		
LMT before MET call	17 (18%)	20 (20%)
LMT after MET call	9 (10%)	15 (15%)
No LMT	68 (72%)	67 (66%)
In-hospital mortality after MET call: no. of deaths (% of total calls)		
Any MET call	28 (30%)	34 (34%)
MET call with no LMT	10 (15%)	10 (15%)

MET = medical emergency team.

LMT = limitation of medical treatment (including not for resuscitation).

* All comparisons showed no significant difference.

† Length of stay data analysed with the Mann–Whitney U test.

LMT order following the MET call in the post-intervention period was not significant (14.9% v 9.6%; $P = 0.26$). The intervention did not result in statistically significant changes in any of the measured MET call characteristics or in the outcome of patients subject to MET review (Table 4). The mortality of patients with no LMT (before or after the MET call) was 14.7% in the baseline period and 14.9% following the intervention (not significant).

Discussion

Summary of findings

We conducted a prospective before-and-after study to assess the effect of a multifaceted intervention on the quality of documentation of MET call reviews. We found that modification of the MET membership and introduction of a pro-forma document improved aspects of documentation of the MET review. Which aspect of our intervention was more important is not certain. We also found that half the MET calls occurred outside usual working hours, that medical patients were more likely to receive a MET call, and that the in-hospital mortality of patients subject to MET review was high (32%). Despite the trend towards increased number of MET calls after our intervention, there was no change in admission rate to the critical care areas (ICU, HDU or CCU) or hospital length of stay.

Significance of findings

Our intervention was associated with improved quality of documentation of the events surrounding a MET review. However, despite education and availability of the case report pro forma, completed forms were present in only 63% of patient files. Our study also identified some other areas of suboptimal medical and nursing documentation.

In addition, MET calls appear to identify a high-risk group — 31% of patients required admission to a monitored bed (ICU, HDU or CCU), and overall mortality risk of in-patients without an LMT order (before or after the MET call) was 15%, compared with overall in-hospital mortality of 1.9%.

Comparison with previous studies

The rate of MET calls overall at our institution (195 among 16 200 admissions, or 12.0 calls per 1000 admissions) was lower than that found in other institutions. Recent publications in Australia³ and the United States⁴ report call rates between 25.8 and 40.6 per 1000 admissions. These differences may relate to differences in casemix and illness acuity.

Of interest, patients admitted under a medical unit were more likely to receive a MET call than those admitted under a surgical unit. The reverse pattern is reported elsewhere,³ highlighting the value of the MET service as an audit and quality control mechanism in assessing aspects of casemix and system factors for each hospital. Our finding that almost half of all calls occur “out of hours” is similar to findings elsewhere⁵ and reinforces the need for the MET to be available 24 hours per day.⁶

Nineteen percent of patients subject to a MET call had an LMT order in place beforehand (compared with 8.6% in another recently published single-centre study⁷). A further 8.7% had LMT orders initiated following the MET call. This figure is similar to the findings of other investigators.^{7,8} The in-hospital mortality of 32% is higher than the 24% reported elsewhere.^{6,9}

Study strengths and limitations

Despite education and availability of the pro-forma document, completed forms were present in only 63% of cases. However, this represents the experience in a single centre and may not be reproducible elsewhere.

Our intervention did not reduce hospital mortality of patients receiving a MET call, nor did it identify the reason for their deteriorating condition. These questions will be the subject of further studies to be conducted in collaboration with the hospital's risk management department.

A difficulty in interpreting the results of our study was the combination of interventions used, any of which may have affected results (medical staff education about MET changes, the addition of ICU staff to the MET and introduction of the pro-forma document).

Conclusion

Using a simple intervention, we developed a system to improve documentation of the events surrounding MET calls. Further studies are required to determine how long the effect of our intervention will last, the reasons for the deterioration in patients' condition and strategies to reduce the high associated in-hospital mortality.

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