Resuscitation 84 (2013) 179–183

Contents lists available at SciVerse ScienceDirect

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

Clinical paper

Responding to medical emergencies: System characteristics under examination (RESCUE). A prospective multi-site point prevalence study☆

Tracey K. Bucknall[a,*], Daryl Jones[b], Rinaldo Bellomo[c], Margaret Staples[d], The RESCUE Investigators[e]

[a] Cabrini Health & Deakin University, Cabrini-Deakin Centre for Nursing Research, 183 Wattletree Road, Malvern 3144, Victoria, Australia
[b] Austin Health & Monash University, Austin Hospital, 145 Studley Road, P.O. Box 5555, Heidelberg 3084, Victoria, Australia
[c] Austin Health, Austin Hospital, 145 Studley Road, P.O. Box 5555, Heidelberg 3084, Victoria, Australia
[d] Cabrini Health & Monash University, Department of Epidemiology and Preventive Medicine, 183 Wattletree Road, Malvern 3144, Victoria, Australia

ARTICLE INFO

Article history:
Received 30 January 2012
Received in revised form 23 April 2012
Accepted 24 June 2012

Keywords:
Medical Emergency Team
Patient safety
Vital signs
Prevention
Decision making
Limitations of Medical Treatment
Rapid response system

ABSTRACT

Aim: To determine the point-prevalence of patients fulfilling hospital-specific Medical Emergency Team (MET) criteria and their subsequent outcomes.
Method: Inpatients from 10 hospitals with established METs were enrolled for a prospective, point-prevalence study. If MET criteria were present during a set of vital signs, the ward manager was notified. MET activations, unplanned Intensive Care Unit (ICU) admissions, cardiac arrests, Limitations of Medical Treatment (LOMT), hospital discharge and follow-up mortality data were collected.
Results: Of 1688 patients recruited, 3.26% ($n = 55$) fulfilled MET criteria in a single set of vital signs. None of the 55 received MET review within 30 min of notification, 2 (3.6%) had MET review within the next 24 h, none experienced cardiac arrests or unplanned ICU admissions during the follow-up period, and 13 (23.6%) had a LOMT order prior to fulfilling MET criteria. In-hospital mortality was significantly higher for patients fulfilling MET activation criteria (9.1%) compared to those that did not (2.6%; $p = 0.005$, RR = 2.95; 95% confidence interval (CI) 1.22–7.15), as was mortality at 30 days (RR = 2.64; 95% CI 1.37–5.11) and 60 days (RR = 1.94; 95% CI 1.11–3.40). The 30 day mortality in patients without an LOMT order was similar to patients without MET criteria (RR = 0.94; 95% CI 0.24–3.7).
Conclusions: Approximately 1 in 30 hospitalised patients fulfilled MET criteria during data collection. The presence of MET criteria was associated with increased hospital, 30 and 60 day mortality, although much of this increased mortality seemed to be due to issues around end-of-life care. Despite ward manager notification, subsequent MET activation occurred infrequently in these hospitals with established METs. Further research is needed to assess factors that influence staff initiation of a MET call.

1. Introduction

Rapid Response Systems (RRS) are now widely implemented for the detection and management of deteriorating hospital ward patients.[1] Unfortunately, delay and failure to activate a response continues to be widespread.[2] There is evidence to suggest that failure to identify deteriorating patients contributes to adverse events and patient morbidity.[3–6] Importantly, delayed activation of the RRS is associated with a doubling of in-hospital mortality.[7,8]

A recent consensus conference focusing on identifying the deteriorating hospital patient [9] acknowledged the limitations of the evidence surrounding detection and recognition of 'at risk' patients. In particular, it highlighted the absence of denominator data to estimate the real frequency of patient deterioration. It also expressed the need to accurately determine the outcome of such patients.

Such information is critical to understand the number of at-risk patients in order to plan resources and strategies required to rectify the issue. Yet, to date, no prospective multi-site studies have been published reporting the prevalence of hospitalised patients who fulfil Medical Emergency Team (MET) activation criteria, and compared this with the actual number of activations.

Accordingly, we conducted a prospective multi-centre study in metropolitan and regional Victoria, Australia, to assess the prevalence of hospitalised patients who fulfilled MET activation criteria. In addition, we documented the frequency of failed MET activation by relating the number of cases where MET criteria were reached to the number of actual MET activations in the 24 h following

☆ A Spanish translated version of the abstract of this article appears as Appendix in the final online version at http://dx.doi.org/10.1016/j.resuscitation.2012.06.015.

* Corresponding author at: Deakin University, Cabrini-Deakin Centre for Nursing Research, Cabrini Health, 183 Wattletree Road, Malvern 3144, Victoria, Australia. Tel.: +61 3 95081426/9244 6529; fax: +61 3 95081368/9244 6159.
E-mail address: tracey.bucknall@deakin.edu.au (T.K. Bucknall).
[e] See Appendix A for the RESCUE Investigators.

0300-9572/$ – see front matter © 2012 Elsevier Ireland Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.resuscitation.2012.06.015

Table 1
Baseline hospital characteristics prior to study ($N = 10$).

ID	Hospital sector	Beds	Admissions (July 08 → June 09)	MET calls (July 08 → June 09)	MET call % of admissions
1	Private	387	57,325	335	0.58
2	Public	251	48,763	1235	2.5
3	Public	309	88,894	1558	1.7
4	Public	191	32,818	234	0.71
5	Public	163	23,773	105	0.44
6	Public	296	42,807	1511	3.5
7	Public	267	65,120	1556	2.3
8	Private	330	47,131	125	0.26
9	Private	149	37,945	24	0.06
10	Private	145	49,021	17	0.03
	Total	2488	493,597	6700	1.35

observation. Finally, we determined whether the presence of MET criteria was associated with unplanned ICU admissions and cardiac arrests, hospital, 30 and 60 day mortality.

2. Method

2.1. Study design and ethics considerations

We performed a prospective multi-centre observational study. A detailed description of the study methods has been previously published.[10]

In brief, all acute care inpatients from 10 Victorian hospitals were eligible for inclusion. Inpatients located in Intensive Care Units (ICU) or psychiatric wards were excluded. Study hospitals were ICU equipped and operated physician-led Medical Emergency Teams (METs). Following ethics approval at each hospital, we undertook data collection in each hospital on a single day. Data collectors informed each patient of the study purpose and sought consent to take a set of vital signs when required to do so by the Human Research Ethics Committees.

2.2. Details of data collected

Patient identification number, ward location, admission date and hospital were recorded. A standard set of vital signs (blood pressure, heart rate, respiratory rate and oxygen saturation) was obtained by student nurses.

2.3. Data collectors' response to presence of MET criteria

If the patient fulfilled one or more of the hospital-specific MET calling criteria, the data collector informed the nurse unit manager/nurse in charge of the shift and responsible for the ward. The data collectors undertook no further action in relation to patient care.

2.4. Outcome measures and statistical analysis

Hospital data on MET activation, unplanned ICU admissions, cardiac arrests, Limitations of Medical Treatment (LOMT), hospital mortality and discharge date were obtained from hospital records and electronic databases. LOMT was the term used to describe any documented medical treatment restrictions such as limited ICU care, not for ICU admission, not for cardio-pulmonary resuscitation and not for DC-shock. Follow-up mortality data were later obtained from the Australian National Death Index. All data were de-identified, entered into a specifically designed database and analysed using the statistical program Stata.[11] Analysis included calculation of the overall prevalence of the presence of MET activation criteria, the prevalence at each site, prevalence by age group, gender, patient type (surgical or non-surgical), hospital, and hospital type. Differences between groups fulfilling/not fulfilling MET activation criteria at the time of observation were compared using Chi-squared tests.

We obtained data on survival to at least 200 days from the Australian National Death Index. The relative risk (RR) of death within 30 or 60 days was assessed using log linear models with presence/absence of MET activation criteria as the main predictor and adjustment for age and parent unit. Hazard ratios (HR) were obtained from Cox regression models adjusted for age and parent unit to compare mortality between patients fulfilling/not fulfilling MET criteria at the time of observation. Kaplan–Meier survival plots were constructed to illustrate mortality differences for patients with/without MET criteria as well as with/without LOMT designation prior to vital sign acquisition. In all analyses, a p-value of <0.05 was taken to indicate statistical significance.

3. Results

3.1. Details of participating hospitals

The hospitals ranged in size, location across metropolitan and regional Victoria, and in both private and public health sectors. Hospital admissions ranged from 23,773 to 88,894 per year, and annual MET calls ranged from 17 to 1558. The baseline frequency of MET review varied from 0.03 to 3.5% (0.3–35 calls/1000 admissions). There were 6700 MET calls in the 10 hospitals in the preceding year (Table 1).

3.2. Details of patient cohort

Of the 2199 eligible patients, 1688 were enrolled and consented to vital sign acquisition (Fig. 1). Patient demographics for those enrolled in the point prevalence study are presented in Table 2.

Table 2
Total patient demographic characteristics ($N = 1688$).

Patient characteristics	n (%)	M (SD)
Age		64.99 (21.37)
Gender		
Male	810 (48.1%)	
Female	878 (51.9%)	
Parent unit		
Medical	816 (48.3%)	
Surgical	713 (42.2%)	
Other	159 (9.4%)	
Admission type		
Elective	714 (42.3%)	
Non elective	837 (49.6%)	
Unknown	137 (8.1%)	
Hospital sector		
Public	1042 (61.7%)	
Private	645 (38.0%)	

M, mean; SD, standard deviation.