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Case Report

Are All MET Calls Required? Patient Characteristics Who Have MET Calls in General Medical Wards

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Abstract

Aim: The aim of the study is to attempt to identify patient groups where Medical Emergency Team (MET) calls could have been potentially avoided / prevented.

Design: 100 randomly selected MET calls occurring during August - December 2015 were identified within our institution. Retrospective database review of each patient's electronic medical record (eMR) was performed for patient characteristics and clinical outcomes.

Results: 35 MET calls amongst 100 MET calls (involving a total of 29 patients; 37%) appear to have been preventable.

Conclusions: Improved education to staff and more proactive planning of end of life cares for patients in palliative stages of illness, or, alternatively, escalation of treatment regimens for those failing to respond to conventional treatments, may help reduce the incidence of MET calls by a third, thus saving time and resources.

Keywords: Preventable MET Calls

List of Abbreviations

MET calls	:	Medical Emergency Team
RRT	:	Rapid Response Teams

Introduction

Rapid Response Teams (RRT) were first introduced in Australia [1] in the year 2000. The terms MET call and RRT are used interchangeably in this article. They help identify patients with abnormal physiological variables prior to the development of cardio-pulmonary arrest, in the hope to identify reversible causes at an early stage to help prevent cardio-pulmonary arrest. Jones et al. concluded that introduction of the MET into their centre had allowed improved analysis and characterization of 'at-risk' patients and their needs, besides reduction in cardiac arrests by almost 70% [1]. However, many studies evaluating RRTs have not sought to describe the patient characteristics or outcomes of the patients seen by RRTs and, although RRTs are now employed in many hospitals, there is limited information about the characteristics and outcomes of patients they review [2]. We focussed on clinical outcomes of patients who had experienced MET calls, looking for any reasons why some MET calls could have been potentially avoided.

Methods

This is a retrospective study. 100 MET calls were randomly extracted from the patient register of the annual database for MET

calls in our institution. The MET calls had occurred between August 2015 - December 2015, and the data set included patients from both hospitals within our health service district, namely Gold Coast University Hospital and Robina Hospital. Gold Coast University Hospital is a large tertiary level hospital, while Robina Hospital, also located within the Gold Coast, is a medium sized metropolitan hospital. Internal Medicine in-patients are admitted similarly across both sites, from an Emergency Department (ED) to the Medical Assessment Unit (MAU), en route to medical wards thereafter, if a hospital admission is deemed necessary. Robina Hospital contains 84 general medicine in-patients and Gold Coast University Hospital contains approximately 70 in-patients at any given time. The catchment area for Gold Coast Health service district numbers a population of 576,000, as revealed in the latest 2016 Australian census, making it the sixth largest city in Australia.

The 100 MET calls were subsequently traced to 77 in-patients by means of their unique patient identifier numbers. Ethics approval was obtained from our Ethics Department [HREC/15/QGC/319]. Using our electronic patient record (eMR), all 77 patient's in-patient notes were individually perused for pre-defined data items. Individual patient's age, gender, number of MET calls during the study period, co-morbidities, reasons for MET calls, diagnosis during admission, physiological variables, hierarchy and duration when last seen by any doctor prior to MET call, recent surgery recorded in hours preceding MET call, Documentation of Acute Resuscitation plan prior to MET call, average length of Stay (LOS), history of falls preceding MET call, repeated MET calls during same admission, Inter-Hospital transfer status, Physiological variables ordered more frequently than usual for any particular patients before MET call, transfers to Intensive Care Units following MET calls, Mortality or discharge disposition of cohort, 28 day readmission status, adverse observations noted in Emergency Department prior to transfer to Medical Assessment Unit, and time of day of occurrence of MET call (measured as either of occurring within or outside of business hours 8 am to 4 am regardless of day of the week).

There were no matched controls used in our study. Our institution utilises a system of scoring of physiological variables for nursing staff to be informed of the need to escalate patients at risk of cardiopulmonary arrest, called the Q-ADDS score (Figures 1,2) in our institution, which is similar to the Early Warning scores utilised in other institutions around the world. Those patients who score high on the Q-ADDS score and/or have any physiological parameter within the blue coloured range of abnormal range or an abnormal Glasgow Coma Scale, typically get escalated for more urgent review by an RRT by means of a MET call. In contrast to usual international practice, our institution does not differentiate a Code Blue (Cardio-pulmonary arrest) from a MET call on the basis of Q-ADDS scoring.

Actions Required for Tertiary and Secondary Facilities

Q-ADDS Score	Observations (minimum frequency)	Notify	Escalate (if no review)	Intra-hospital Escort
0	8 hourly			
1–3	4 hourly	• Team Leader		
4–5	1 hourly	• Team Leader • Resident review within 30 minutes	• If no review after 30 minutes call Registrar	Nurse
6–7	½ hourly	• Team Leader • Registrar review within 30 minutes	• If no review after 30 minutes, or if concerned, initiate Emergency Call, notify Consultant and Nurse Manager	Nurse
≥8 or E	10 minutely	• Initiate Emergency Call • Registrar to ensure Consultant is notified	• Registrar to ensure Consultant is notified	Nurse and Medical Officer

Figure 1: Actions required for tertiary and secondary facilities in Q-ADDS.

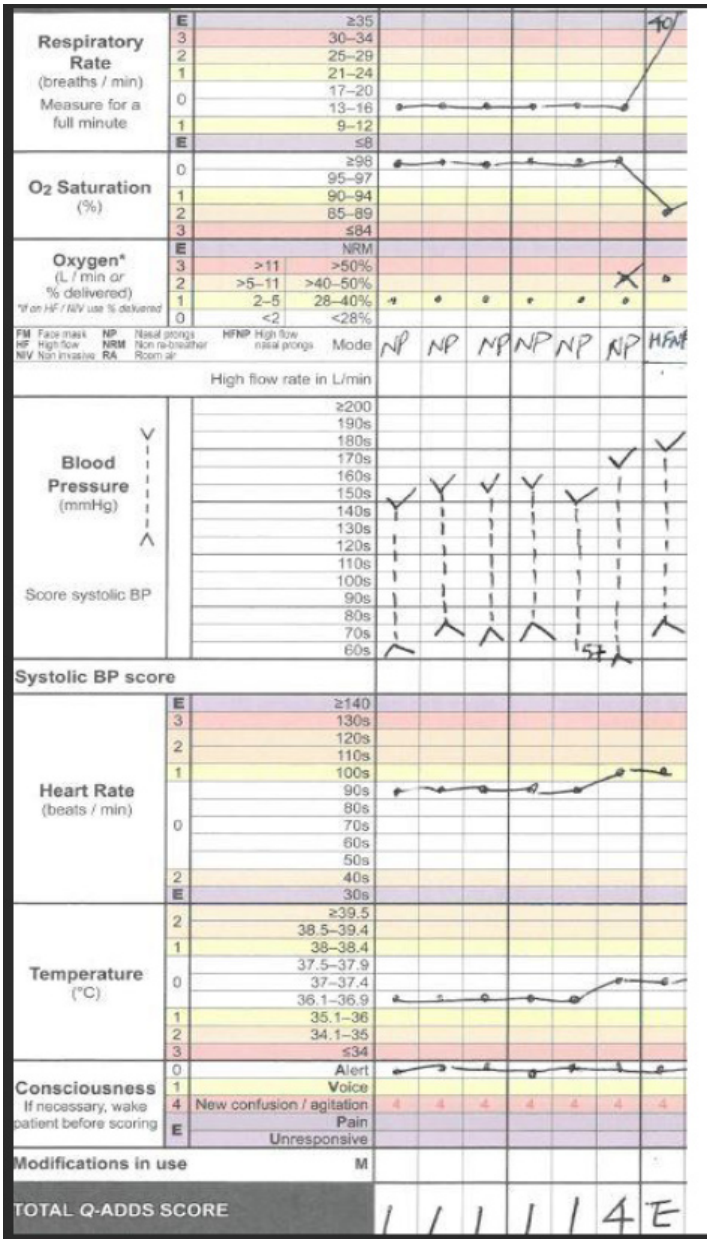

Figure 2: Color Coded.

Results

The median age of the patients was 70.96 years. Of the 77 patients who had experienced a total of 100 randomly selected MET calls, 80% were from Robina Hospital, while 20% were from Gold Coast University Hospital. 19 patients had recurrent MET calls, defined as more than 1 MET call episode during an admission. The highest occurrence was 5 MET calls within 5 days in one particular patient, occurring due to hypotension. The remaining 58 patients had each experienced only one MET call during their admission. 16 patients (20.77%) suffered in-patient mortality; the rest were discharged to Residential aged care facilities or to their own homes. The reasons for the MET calls are summarised in (Table 1). Chest infections comprised primary diagnosis in 16 subjects, whilst septicaemia was the second commonest diagnosis in 9 subjects. Heart failure decompensation and arrhythmias comprised admission diagnoses in 4 patients each.

Reason for MET call (actual terminology used in patient's notes reveals the varied documentation amongst different health professionals)	Number of MET calls
Low GCS	9
Hypotension	26
High Q-ADDS score	24
Hypertension	1
Malignant arrhythmia / Tachyarrhythmia	5
Seizure	6
Bradycardia	4
Tachypnoea	5
Breathlessness/Hypoxia/Low Oxygen saturations/ Dyspnoea/Oxygen Desaturation	16
Pseudoseizure	1
Presyncope/Syncope	2
Cyanosis of one hand	1

Table 1: The reasons for the MET calls.

Table 2 highlights preventable MET calls in our institution as recognised by the main author. The total of 34 amongst 100 MET calls comprises a third of all MET calls amongst this dataset. The authors have conducted a thorough literature search and could not find any publications to base a framework into deciding criteria for preventable MET calls. In 41 cases of MET calls, patient neither had a Consultant Physician nor a Medical Registrar review within the preceding 24 hours of the MET call occurring. However, in 23 instances of MET calls, a Consultant physician did review the patient, and in 36 cases a medical Registrar did review the patient within 24 hours of occurrence of MET call.

Preventable MET calls	Number of such MET calls
Lack of timely recognition of patient scoring MET call criteria in either of Emergency Department (patient subsequently sent to Medical Assessment Unit) or Medical wards	6
Delayed ICU takeover when Q-ADDS score high	3
Inappropriate MET calls occurring in either of Palliative Care patients / High Care Nursing Home residents who are poorly functioning	6

False alarm	5
Pathological cause for hypotension	12
Malignant Hypertension	1
Physiological hypotension (thin lean female individuals)	2

Table 2: Highlights preventable MET calls in our institution as recognised by the main author.

4 instances of MET calls had occurred in patients who had undergone surgery. Despite our data set being confined to medical in-patients who had experienced MET calls, our random selection has revealed 4 patients primarily admitted for Surgical and Orthopaedic teams, because our Orthopaedic and Surgical wards lack cardiac telemetry monitoring devices, and as such these patients who develop post-operative cardiac arrhythmias were transferred under the care of the physicians to medical wards, which possess these monitoring facilities. An Acute Resuscitation order was done for 31 patients amongst 77 (40%); the remaining 46 patients (60%) did not have any such order done. 25 patients amongst 77 (approximately a third) had suffered from falls prior to the subsequent MET call episode. Some of these falls had occurred at home as the presenting diagnosis, whilst the MET call subsequently occurred whilst in hospital.

None of the 77 patients in this study had physiological parameters recorded more frequently than usual prior to the occurrence of a MET call. 6 MET call episodes were noted to be in patients who were documented to have had abnormal physiological parameters warranting a MET call in the emergency department prior to subsequent transfer to Medical Assessment Unit. Without taking into account weekdays from weekends, 55 MET calls (55%) had occurred during after-hours (defined empirically as 1600 hours - 0800 hours), whilst 45 MET call episodes had occurred during business hours (0800 hours - 1600 hours). Amongst the 34 preventable MET calls subset as highlighted in (Table 2), 21 (61%) of those MET calls occurred after-hours, while 13 MET calls occurred during business hours (39%).

16 of 77 subjects subsequently died from their illness (20.77%). 45 subjects were discharged home, 7 patients transferred to another hospital and 6 subjects were placed into Residential aged care facilities. 27 subjects were re-admitted to hospital within 4 weeks of discharge (35%). 29 MET calls occurred less than 24 hours from admission into hospital, defined in our study as Early MET calls. As the data set involves 77 patients, this compute to 37.66% of our in-patients experiencing early MET calls. Amongst this subgroup of early MET calls, 9 patients were admitted to ICU following the MET call, and 1 patient to the CCU (Coronary Care Unit) for management of bradyarrhythmia. The remaining 19 patients remained on the medical wards for their ongoing management following the MET call. Death had occurred on 2 occasions of those experiencing early MET calls (both patients had suffered from chest infections), whilst the remaining 27 patients were discharged from hospital eventually. The most common reasons for those experiencing early MET calls was deteriorations in physiological parameters for those suffering from: chest infection (11 subjects), followed by loss of consciousness (2 subjects), septicaemia (3 subjects), cardiac arrhythmias (4), falls (2), diarrhoea (1), seizures (2), Stroke (1), sudden onset rash (1) and abdominal pains (1) and heart failure (1). The average length of stay of these patients who had experienced early MET calls was 15.1 in-patient days.

Amongst the 19 patients who had experienced recurrent MET calls, the average length of stay was 23.47 days. 6 patients required subsequent ICU admission whilst the remaining 13 patients remained on the medical wards for their ongoing management following the MET call. Death had occurred in 4 of these patients, of which respiratory failure was the cause in 2 patients, myocardial infarction in 1 patient and progressive hepatic failure and encephalopathy in the fourth patient. Palliative measures were initiated in one of the four cases of death. Amongst the 58 patients who had experienced only 1 MET call during their admission, the average length of stay was 16.55 days. 9 patients required subsequent ICU admission whilst the remaining 47 patients remained on the medical wards for their ongoing management following the MET call. Death had occurred in 9 subjects, the causes varied amongst septicaemia, heart failure, metastatic malignancy and encephalopathy and myocardial events.

Discussion

The MERIT Study [3] was a cluster-randomised controlled trial across 23 Australian Hospitals, studying the effects of the introduction of a MET system on the composite incidence of unexpected deaths, cardiac arrests, and unplanned ICU admissions. Introduction of a MET call system greatly increases emergency team calling but does not substantially affect the incidence of cardiac arrest, unplanned ICU admissions, or unexpected death. However, other studies, which did not randomize subjects, demonstrated reductions in unplanned ICU admissions, cardiac arrests and deaths [4,5]. In any case, RRT are widely used across most hospitals in the developed world.

The major finding from our dataset was that 35 MET calls in our dataset (35% of all MET calls) were preventable, as highlighted in (Table 2). Amongst this subset, was a high incidence of delays in recognition of a deterioration patient, delays in recognition of pathological causes of hypotension, such as septicaemia, or inappropriate MET calls. There was also an underappreciation of physiological hypotension. All of this leads to time pressures upon the workload of the MET call team, who are often from Internal Medicine and the Intensive Care Units, who in turn are in the

process of doing their own daily ward rounds and day to day in-patient work, leading to wastage of resources.

Our institution has taken up the global initiative for early recognition of septicaemia in the Emergency Department, which will help reduce this number of preventable MET calls. Improved recognition of end of life for appropriate patients may help prevent unnecessary MET calls from becoming recurrent. Researchers at the Liverpool Hospital, Australia, studied a two-tier system for activating MET calls [6]. Outcomes of MET calls using ordinary scoring criteria during 2006-2009 were compared to outcomes of MET calls using both ordinary scoring criteria as well as less stringent criteria (for which the day team caring for the patient were to review the patient as opposed to the full MET call team). This led to greater detection of physiological abnormalities prior to MET call activation and thus more admissions into the Intensive Care Unit specifically for abnormalities in cardiorespiratory criteria. The overall ICU mortality for patients admitted following MET review decreased, suggesting that the two-tier system led to earlier recognition of reversible pathology or a decision not to escalate the level of care [6] This two-tier system may well be the solution to reducing the problem of preventable MET calls.

DeVita and colleagues [7] hypothesised that the relative paucity of MET calls occurring overnight and on weekends may be due to the fact that the more care givers visit a patient, the more likely they are to detect patient deteriorations. In contrast, our data found more numbers of MET calls overall (55%) and more numbers of preventable MET calls (21 of 34 MET calls, ie, 61%) occurring during after-hours as opposed to business hours, for which we have no particular explanation. Conjoining this fact with the large numbers of preventable MET calls as the major finding of this study, applying better clinical judgement allied with more training to junior doctors for pre-empting a MET call situation may be prudent.

Pronovost and Litvak have suggested that RRT calls occurring early in a patient's admission may represent sub-optimal triage and disposition. They specifically advocated the need for better identification of at risk patients and their appropriate disposition to an adequate setting such as a critical care area [8]. Further, a large data set of MET calls occurring at a large urban hospital studied by Consideine et al. [9] suggested that a quarter of those had occurred within 24 hours of admission. 6 MET call (6 %) episodes in our dataset were noted to be in patients who were documented to have had abnormal physiological parameters warranting a MET call in the emergency department prior to subsequent transfer to Medical Assessment Unit where these 6 patients subsequently each had MET calls. This would suggest the need for Internal Medicine teams to review such physiologically unstable patients in the Emergency Department, to ensure their clinical stability, prior to transfer to Medical wards. There is therefore the need for more training and better detection of deterioration in the Emergency Department prior to transfer to Medical wards. Allied to this would be the need for stricter individual hospital guidelines as to the criterion of clinical stability for transfer of patients from the Emergency Department to the wards, as well as improved communication between Emergency Department doctors and Internal Medicine physicians.

Considine et al. [9] expressed concern in whether shorter Emergency Department length of stay as mandated by the Australian Government implemented national emergency access target (NEAT) ("4-hour rule") [10] will result in increased numbers of physiologically unstable patients in general wards, which may lead to increased adverse events such as cardiac arrests and RRT activations during the early stage of hospital admission. In our institution, our patients do not receive a Medical Registrar review during the time the patients were in the Emergency Department prior to transfer to the medical assessment unit / medical wards. Our recommendations are for better education of all health professionals regardless of department, to recognise potential for deterioration and/or abnormal physiological variables in the Emergency Department, and for timely recognition and treatment of the underlying cause thereof, prior to transfer to medical wards. We particularly recommend a representative from the Internal Medicine team such as the Medical Registrar, to oversee all physiologically unstable patients in the Emergency Department prior to transfer to medical wards, as patient safety takes precedence over NEAT targets.

In a multicentre international study involving 652 RRT calls occurring over 1 month in seven hospitals and three countries, about one-quarter of all RRT calls occurred on the day of, or on the day after admission [11]. Our data set revealed 37.66% of all in-patients experiencing MET calls occurring within the first 24 hours of admission. Late MET calls may represent suboptimal end-of-life care planning [11]. Our data set was not able to evaluate MET calls occurring later into the course of admission, as several patients with several co-morbidities were given a trial of treatment for reversible causes, and some patients did recover whilst others were considered for end-of-life cares when treatments proved futile. In a large Australian study, 20% of patients who receive a MET call die in-hospital [12]. A recent multicentre study reported 21.7% mortality in patients reviewed by RRT services [13]. The overall mortality is 20% in our data set, consistent with that of other centres. The mortality associated with MET calls is still higher than the general figure of in-hospital overall mortality of in-patients of 2.5% [14].

Recurrent clinical deterioration and repeat medical emergency team activation are associated with a statistically significant increased risk of subsequent ICU admission, increased length of hospital stay, and increased hospital mortality [15] In

our data set, 6 of the 19 subjects (31.5%) who had experienced recurrent MET calls required Intensive care admissions, while 9 subjects amongst 58 (15.5%) who had experienced only one MET call during their admission required Intensive care admissions. This suggests that clinicians would need to be mindful of the increased risk of mortality and need for Intensive Care unit admission with recurrent MET calls in any particular patient. 42 MET calls (42%) had occurred in patients who had not received a senior clinician's review in the 24 hours preceding the MET call. This suggests the recommendation for 100% reviews of all in-patients either by a Medical Registrar or Medical Consultant on a daily basis, to help identify abnormalities in physiological variables or potential for deterioration at an early stage.

Our data set was limited by lack of control subjects. Clinician's prerogative for determining preventable MET calls was by the main author; the main author acknowledges that opinions as to what constitutes a preventable MET call after perusing through patient's notes, might differ if clinical notes were reviewed by another clinician. The strengths of this study were the relatively large sample size, the precise data for each MET call extracted from each patient's record, and random sample selection. In summary, a third of MET calls occurring in our institution were potentially preventable, highlighting the need for better education of staff and practitioners. Three criteria stand out as those requiring consideration to improve our patient care and reduce MET calls. The first is the need for all patients to be seen daily by at least a Consultant physician or a Medical Registrar. The larger numbers of both MET calls and preventable MET calls during after-hours suggest the need for better senior clinician supervision for after-hours. The second being that all patients experiencing recurrent MET calls are at risk for a poorer clinical outcome, thus clinical thought must be put into these patients into deciding the need for early intensive care involvement, modification of physiological variables in the appropriate clinical context, or palliative measures if further treatment is deemed futile. Thirdly, we recommend Physicians to review those patients with abnormal physiological parameters in the Emergency Department prior to transfer to medical wards. Further research is required to match those patients who have experienced MET calls to those who have not experienced MET calls, so that statistically significant values may be obtained to further strengthen MET call and RRT research, to enable it to evolve into a mature and robust system, that can help all our patients benefit from the best that 21st century medical care can offer.

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Dedication: Main author wishes to dedicate the manuscript in memory of his late father who passed away during the midst of conducting this research (November 21st, 2016)

Conflicts of Interest: N/A.

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