

Best Clinical Evidence Feature

Medical emergency teams: is there M.E.R.I.T.?

CAN J ANESTH 2007 / 54: 5 / pp 389–391

Article appraised

Hillman K, Chen J, Cretikos M, et al.; MERIT Study Investigators. Introduction of the medical emergency team (MET) system: a cluster-randomised trial. *Lancet* 2005; 365: 2091–7.

Structured abstract

Background: Many deaths, cardiac arrests, and unplanned intensive care unit (ICU) admissions are preceded by failure to recognize deteriorating vital signs^{1,2} or trigger intervention.^{3,4} Furthermore, survival following cardiovascular collapse is low, whereas early response likely improves survival.^{5,6} As such, in-hospital medical emergency teams (MET) were proposed. Physiologic triggers (see below) lead to their activation.

Objective: The first multi-site prospective MET trial.

Design: Cluster randomized-control trial of 23 Australian hospitals.

Methods: Inclusion criteria were public hospitals with > 20,000 annual admissions, an ICU and emergency department, and no pre-existing MET. Exclusion criteria were patients under 14 yr, or not formally admitted. MET activation criteria were: 1) airway: if threatened; 2) breathing: respiratory arrests, respiratory rate < 5 or > 36 breaths·min⁻¹; 3) circulation: cardiac arrests, pulse rate < 40 or > 140, systolic blood pressure < 90 mmHg; 4) neurology: decrease of > 2 Glasgow coma scale points, repeated or extended seizures; 5) other: patients not meeting above criteria but ward staff seriously worried. Cardiac arrests were defined by absence of a palpable pulse; unplanned ICU admission as unscheduled transfer from the ward to the ICU; and unexpected deaths were those without a pre-existing not-for-resuscitation (NFR) order.

Intervention: Hospitals were randomized to no change in current functioning (maintenance of an arrest team) or initiation of MET. This followed four months of instruction for clinical staff in MET hospitals, before a six-month study period. Standardized MET instruction focused on reinforcing MET calling-

criteria, the importance of identifying at-risk patients and the need to promptly initiate the MET.

Primary endpoint: Composite outcome of the incidence (events divided by eligible patients admitted to hospital) for 1) cardiac arrests without a NFR; 2) unplanned ICU admission; and 3) unexpected deaths on general wards.

Results: MET initiation was associated with significantly more calls to resuscitation (cardiac arrest or medical emergency) teams (3.1 vs 8.7 per 1,000 admissions $P = 0.0001$). Only 30% of unplanned ICU admissions were preceded by MET activation, but this was significantly more than 9% for control hospitals ($P = 0.009$). There was no significant difference in primary outcome (5.86 control vs 5.31 MET per 1,000 admissions, $P = 0.640$). There also were no differences in the secondary outcomes: cardiac arrest (1.64 vs 1.31 per 1,000 admissions $P = 0.736$); unplanned ICU admission (4.68 vs 4.19 per 1,000 admissions $P = 0.599$) or unexpected death (1.18 vs 1.06 per 100 admissions $P = 0.752$). There was a decrease in the rate of cardiac arrests ($P = 0.03$) and unexpected deaths ($P = 0.01$) over six months for both the MET and control hospitals.

Conclusions: The MET system greatly increased the frequency of emergency team calling but did not decrease cardiac arrests, unplanned ICU admissions or unexpected death.

Commentary

In this study, while medical emergency teams (MET) significantly increased calls to the resuscitation team, this did not significantly alter the type of intensive care unit (ICU) admissions or ICU survival. Previous studies did suggest a benefit from MET, but were limited by before-and-after design, single-centre, and by small numbers.^{6–10} Medical Emergency Response Improvement Team (MERIT) is the first randomized controlled multi-centre MET trial, and was therefore eagerly anticipated. However, even its methodology is not without limitations. Firstly, implementation of any acute resuscitation team is complex, and arguably requires a change in culture and communication patterns. Culture change rarely occurs rapidly and

needs more than just didactic education. As such, four months may be an insufficient preparatory time, and six months an insufficient study period. This is probably another reason why staff only activated MET for 30% of patients who achieved the MET thresholds.

Interestingly, cardiac arrests and unplanned admissions decreased in both the study and control hospitals. Unfortunately, this meant the initial statistical power calculations were ultimately inadequate. The study was therefore underpowered, and did not really compare the status-quo against a new way of delivering care. This might mean that an adequate prospective MET study has yet to be performed, and therefore MET should not be “written-off”. The provocative question becomes whether equipoise still exists to repeat MERIT.

Why both groups significantly decreased cardiac arrests in only six months is also currently unanswered. It suggests either recognition improved and/or communication and admission patterns changed, but in *both* the study and control hospitals. Anything that decreases cardiac arrest and unplanned ICU admission is presumably good. However, “human factors” are unlikely to be discovered using traditional quantitative analysis, even though they may be key components of whether resuscitation teams improve outcome. Equally, if the benefit of MET is simply that people become more vigilant or communicative, then we need to expand traditional research to study all ways of achieving this goal. For example, after the study period, MET hospitals typically kept their MET service, and many control hospitals subsequently instituted one. This suggests that staff or administrators supported it. Clearly, this study is not designed to measure staff satisfaction or its impact upon the delivery of care. However, many other professions and industries feel this factor is central to success.

This study supports the notion that MET will likely further increase ICU consults and admissions. However, what also needs to be studied concomitantly is whether earlier admission via MET might shorten ICU stays. Equally, critical care outreach could involve not just early initial response (i.e., MET) but also follow-up for patients transferred from the ICU to the ward who have the potential to decompensate and require ICU readmission. Medical emergency teams may also help prevent inappropriate ICU admission for patients with irreversible terminal disease.¹⁰ If so, this could mitigate the overall impact upon resources. Again, however, this remains to be studied.

This study introduced a single type of MET when in fact different hospitals might need individualized METs. For example, this study focused solely on

nurse identification followed by physician resuscitation. In contrast, some hospitals might want to champion nurse-led teams and others physician-led teams. Equally, some hospitals, whether because of size or “culture”, may already possess adequate communication such that a formal MET is not needed. It may even be that larger academic centres, or public hospitals, or even Australian hospitals (such as were studied in MERIT) would show the greatest benefit from one type of MET and smaller, less hierarchical, private hospitals or those in other healthcare jurisdictions would prefer a different system. Perhaps the greatest mistake would be to force a particular model on a reluctant hospital. Regardless, the “one-size fits all” approach may be another reason why MERIT did not show an overall benefit. In addition, research is lacking regarding optimal physiologic MET thresholds. For example, calling either too early or too late is unlikely to significantly impact outcome. As is often the case in critical care, we need to find “Goldilocks”.

Proponents of MET argue that it is simply intuitive: early response is preferable, even if there was no demonstrable benefit from the only prospective randomized study of MET. One of the central tenets of acute illness is that early response, whether in myocardial infarction, stroke, or sepsis, is associated with improved outcome.^{5,6} In other words: “time is myocardium”, “time is brain” and “time is tissue”. Intensive care unit admissions are frequently preceded by failure to recognize deteriorating vital signs^{1,2} or if recognized, then by inadequate intervention.^{3,4} In other words, it is not so much that patients suddenly deteriorate, but rather that we suddenly recognize they need aggressive treatment. The medical emergency team was developed to facilitate early intervention, with the assumption that this represents the best chance for recovery. Critically ill patients presumably survive, largely because highly trained staff possess sophisticated skills and centralized equipment. Medical emergency team proponents argue that this expertise should be available to patients outside of the ICU. However, proponents are now forced to justify why MERIT did not bolster these assumptions. Overall, (like all good research), in attempting to answer one question MERIT has generated many others.

Resuscitating end-stage disease makes little sense for patients or resource allocation. We need a system that puts the patient’s needs first and responds when the best chance for survival exists. Whether MET will ultimately provide the answer has provoked considerable debate. However, few doubt that the question has “merit”.

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Accepted for publication January 9, 2007.
Revision accepted February 9, 2007.
Final revision accepted February 13, 2007.

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