Triggers and Interventions of Patients Who Require **Medical Emergency Team** Reviews: A Cross-Sectional Analysis of Single Versus Multiple Reviews

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BACKGROUND Medical emergency teams constitute part of the escalation protocol of early warning systems in many hospitals. The literature indicates that medical emergency teams may reduce hospital mortality and cardiac arrest. A greater understanding of pathways of patients who experience multiple medical emergency team reviews will inform clinical decision-making.

OBJECTIVES To explore differences between patients who require a single medical emergency team review and those who require multiple reviews, and to identify any differences between patients who were reviewed only once during admission and patients who required multiple reviews.

METHODS Data for this retrospective cross-sectional review, including demographic data, call triggers, outcomes, and interventions, were routinely collected from January 2013 through December 2015. The study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) collaborative's cross-sectional studies checklist (version 4).

RESULTS Of 54 787 admitted patients, 1274 (2%) required a call to a medical emergency team; of those, 260 patients (20%) needed multiple calls. Patients requiring multiple calls demonstrated higher mortality (odds ratio, 1.49 [95% CI, 1.12-1.98]). A logistic regression model identified surgical patients and those receiving antibiotics and respiratory interventions at the first medical emergency team review as being more likely to require multiple reviews. Patients transferred to a higher level of care after the first review were less likely to require another review.

CONCLUSIONS Patients requiring multiple medical emergency team reviews have higher mortality. Surgical patients have a higher risk of requiring multiple reviews. Hospitals need to include more details on surgical patients when auditing medical emergency team activation. (*Critical Care Nurse*. 2021;41[4]:e1-e10)

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Failure to rescue inpatients experiencing acute clinical deterioration has been extensively reported in the literature.[1-3] Track and trigger systems have been widely introduced to enable skilled staff to recognize patient deterioration early and provide a timely response.[4,5] The National Clinical Effectiveness Committee in the Republic of Ireland developed national guidelines for early recognition of the deteriorating adult patient,[6] a maternity version for pregnant women (Maternity Early Warning System),[7] and one specifically for children (Paediatric Early Warning System).[8] Nurses generate an Early Warning Score (EWS) for all adult patients within acute care hospitals, and when a patient's vital signs fall outside of the acceptable range, an associated escalation protocol prompts staff to seek a medical review and increase monitoring on the basis of the score.[6] During the implementation of the EWS, each hospital independently developed its own escalation protocol, and some hospitals opted to have the primary medical team respond to events (conventional care). A few hospitals in Ireland introduced a medical emergency team (MET) as part of the escalation protocol; this team would respond to cases of an elevated EWS.[9,10] *Medical emergency teams* are known as critical care outreach in the United Kingdom and rapid response teams in the United States.

Patients with repeat calls had a longer length of hospital stay and higher overall mortality than patients who had a single MET call during admission.

Internationally, METs have been widely adopted to respond to acute deterioration of patients in clinical wards.[2,11,12] In many cases, METs reduce the incidence of hospital mortality and of cardiac arrest among inpatients.[12,13] Medical emergency teams can be a multidisciplinary team or be made up of physicians or nurses, depending on the context.[12,14] The composition of the team does not seem to affect its effectiveness.[1,13] Although overall these teams lead to improved patient outcomes, few research studies have examined the pathways of patients who require multiple reviews by a MET.

Background

One of the first evaluations of METs identified that 17% (21 of 124) of patients reviewed by a MET required more than 1 review during a hospital admission.[15] In a larger Australian study of 8203 MET calls, this figure was higher: 26%.[16] This variance continues in different contexts. For example, investigators in a Danish study showed that METs performed multiple reviews of 17% (34 of 206) of patients.[17] One New Zealand study reported a much lower proportion of multiple MET reviews (11%),[18] whereas another New Zealand study identified a higher percentage: 19% (120 of 630 MET reviews).[19] Fernando et al[20] analyzed all MET calls in 2 Canadian hospitals between 2012 and 2016; they found that the percentage of multiple MET activations was 20% (1183 of 5995) of calls. Thus, the prevalence of multiple MET reviews varies from 11% to 26%.

In an Australian study of 308 MET reviews, researchers found that 80% of patients who were reviewed by a MET did not require transfer to a higher level of care.[16] Of patients who remained on the ward, 13% received a second review by a MET within 24 hours of the initial call, suggesting that this subgroup of patients required additional care. Stelfox et al[21] compared outcomes of Canadian patients with a single MET call and those with multiple MET calls (excluding patients who were admitted to an intensive care unit [ICU] or patients who had limitations on medical treatment, such as no admission to an ICU after the initial MET call). Stelfox et al categorized 10% (337 of 3200) of calls as repeat MET calls. Patients with repeat calls had a longer length of hospital stay and higher overall mortality than patients who had

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Table 1 Indicators comprising the Early Warning Score

	Early Warning Score						
Indicators	**3**	**2**	**1**	**0**	**1**	**2**	**3**
Respiratory rate, breaths/min	≤8		9-11	12-20		21-24	≥25
Spo_2, %	≤91	92-93	94-95	≥96			
Fraction of inspired oxygen				Air			Any O_2
Systolic BP, mm Hg	≤90	91-100	101-110	11-249	≥250		
Heart rate, beats/min		≤40	41-50	51-90	91-110	11-130	≥131
AVPU scale				A			V, P, U
Temperature, °C	≥35.0		35.1-36.0	36.1-38.0	38.1-39.0	≥39.1	

Abbreviations: AVPU, alert, verbal, pain, unresponsive; BP, blood pressure; O_2, oxygen.

a single MET call during admission.[21] The same outcome was observed in other studies.[20] In a similar single-site comparison study, patients who had multiple MET reviews (23%, n = 374) were more likely to be surgical patients with gastrointestinal disease and to have higher mortality and a longer hospital stay than patients with a single MET call (77%, n = 1290).[22] In contrast, a recent study indicated that patients admitted via the surgical service were less likely than patients admitted via nonsurgical services to require multiple MET reviews.[20]

As these studies indicate, findings are mixed regarding patients at greatest risk of requiring multiple reviews by a MET. In this article, we ascertain the prevalence of patients who have multiple MET reviews during their admission in an acute care hospital in Ireland and identify the key characteristics of patients requiring multiple reviews during their hospital stay.

Methods

In this study, we performed a retrospective cross-sectional review of hospital data. Anonymized data are routinely collected as part of the hospital's MET system; we analyzed the data collected during the period January 2013 through December 2015. To minimize sample bias, we included all cases in which patients experienced at least 1 MET call during an admission and were discharged before January 2016. The ethics committee at the study site provided ethical approval. This ethics committee is approved by the Department of Health in Ireland and provides ethical review of clinical trials of medicinal products as required under European Communities Regulations (S.I. number 190/2004). The study adhered to the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) checklist for cross-sectional studies.[23]

This study was conducted throughout the adult services of an Irish acute care teaching hospital, with 500 adult inpatient beds and 14 higher-level care beds (HLCBs). Approximately 50 000 patients presented to this hospital's emergency department during 2016; the hospital had 18 359 admissions. The hospital has used a track and trigger system and the EWS since July 2012, and its escalation protocol has included activation of a MET when a patient's EWS reaches 7 (or a score of 3 for a single vital sign[6]; Tables 1 and 2). Respiratory rate, heart rate, and temperature measurements are incorporated into the EWS. Staff are encouraged to contact the MET if a patient meets criteria for a diagnosis of sepsis or if they have a "clinical concern" about a patient in the absence of a specific trigger. The MET team has a specific pager number and is available 24 hours per day. At the time of the study, members of the MET included a medical/cardiology registrar (fellow), an anesthetist, and a critical care/anesthetic nurse. All nursing and medical staff received education (including role-playing during simulated situations) about recognizing and managing acutely ill adults using the EWS, and about using noninvasive ventilation.

We requested anonymized data from the MET data manager for the study period (January 2013 through December 2015). We considered patient data from all MET calls during this period to minimize bias. The data had been collected by the MET team as part of routine care. The MET was well established in the hospital by January 2013, and the process of initiating a MET call was embedded in clinical practice. We excluded data

Table 2 Observation and next steps required for each Early Warning Score[a]

Total EWS	Minimum observation frequency	Alert	Response
1	Every 12 h	Nurse in charge	Nurse in charge reviews if new score = 1
2	Every 6 h	Nurse in charge	Nurse in charge reviews
3	Every 4 h	Nurse in charge and team/on-call SHO (junior physician)	SHO (junior physician) reviews within 1 h
4-6	Every hour	Nurse in charge and clinical team/on-call SHO (junior physician)	SHO reviews within the hour; if no response to treatment within 1 h, contact registrar (fellow) Consider continuous patient monitoring Consider transfer to HLC
≥7	Every 30 min	Nurse in charge, clinical team, and MET	Registrar (fellow) reviews immediately; MET reviews Plan to transfer to HLC (continuous patient monitoring is recommended)

Abbreviations: EWS, Early Warning Score; HLC, higher level of care; MET, medical emergency team; SHO, senior house officer.

[a] The EWS is determined by adding the indicator-specific scores described in Table 1. The MET is called if a single parameter score equals 3 or the nurse uses their clinical judgement to determine that a MET review is required.

for patients who were still inpatients in January 2016 and those who were inpatients in the mental health unit or in the children's ward. We also excluded cases missing data for specific variables for analysis.

Each admission during which at least 1 MET call occurred was identified as a case in the database. The database contained the following data: age, sex, length of hospital stay until first MET call, triggers (6 physiological measurements considered in the EWS) leading to the MET call, outcome of the MET call, patient type (ie, medical or surgical), interventions during the MET call, and length of time the MET spent with the patient. Diagnosis and comorbidities at admission, surgery type, and complications were not included in the anonymized database. Because of general data protection regulations, we could not link this database with patient records to obtain this information. We considered the immediate outcome for the patient—whether the patient stayed on the ward or was transferred to an HLCB, an operating theater, or another hospital—to be the outcome of a MET call. The interventions were classified as oxygen therapy, advanced respiratory therapy (noninvasive ventilation, intubation, arterial blood gas), respiratory therapy (nebulizer, chest drain, suctioning, chest radiography), electrocardiography, telemetry, antibiotic therapy, intravenous fluids, blood transfusion, and blood tests, among other investigations (Table 3).

Because our goal in this study was to compare patients who had a single MET call with those who had multiple calls, we used only data from the initial MET call and final outcome data to compare these 2 groups. We categorized patients as having a "limitation on medical treatment" (LOMT) if they had such a limitation documented, such as "not for ventilation," "not for resuscitation," or "not for MET call."

We analyzed the data using SPSS software (version 22), and for this large sample we used statistics appropriate for bivariate analysis (χ^2 and Student t tests). For logistic regression, the sample size criteria are determined by the number of predictors to the smallest outcome category.[24] In this study, we coded the outcome category as 1 (>1 MET call during an admission) or 0 (1 MET call during an admission). Logistic regression is not done if the number of responses in the 2 outcome categories (a single review vs multiple reviews) is less than 10 times the predictor variables.[25] Our final model included 4 predictors, and the predictor for the smallest outcome category was 1:65, which is greater than 1:10. Thus we performed logistic regression to determine the significant predictor variables associated with patients who had more than 1 MET call during an admission.

We created 2 logistic regression models: one that included all patients who had an MET call, and one that excluded patients who were categorized as having an LOMT after the first MET call. The 2 models contained 3 significant predictor variables (Tables 4 and 5). The variable medical/surgical specialty was retained in the models because it was important to control for specialty in determining what factors predict who will have more than 1 MET call.

Table 3 Interventions after the first call to the medical emergency team among patients with 1 call and patients with multiple calls (N = 1252)

Intervention	Patients with 1 MET call (n = 992)	Patients with multiple MET calls (n = 260)	Test score	*P*
Oxygen therapy	911 (92)	239 (92)	0.002[a]	.96
Blood tests	460 (46)	125 (48)	0.18[a]	.67
Antibiotics	148 (15)	58 (22)	7.70[a]	<.01[b]
ECG or telemetry	273 (28)	74 (29)	0.05[a]	.82
Arterial catheter or other advanced respiratory therapy	137 (14)	40 (15)	0.30[a]	.58
Respiratory therapy (nebulizer, chest drain, suctioning, chest radiography)	331 (33)	109 (42)	6.30[a]	<.05[b]
Computed tomography	87 (9)	22 (9)	0.001[a]	.97
Modification of vital signs in EWS	16 (2)	1 (0.4)	1.50c	.22
Intravenous fluids	265 (27)	67 (26)	0.05[a]	.82
Nasogastric tube	5 (1)	3 (1)	0.54[c]	.37
Urinary catheter	43 (4)	14 (5)	0.31[a]	.58
Central catheter	33 (3)	10 (4)	0.05[a]	.83
Physical therapy	12 (1)	8 (3)	3.50[c]	.05

Abbreviations: ECG, electrocardiography; EWS, Early Warning Score; MET, medical emergency team.

[a] χ^2 test.
[b] Significant.
[c] Fisher exact test.

Table 4 Logistic regression predicting the likelihood of multiple calls to the medical emergency team during a single admission

	Model 1[a]			Model 2[b]		
	OR	95% CI	*P*	OR	95% CI	*P*
Medical vs surgical patients	0.78	0.58-1.04	.09	0.77	0.57-1.05	.10
Transferred to an HLCB at first MET call, yes vs no	0.48	0.32-0.72	<.001	0.51	0.33-0.77	.001
Antibiotic intervention at first MET call, yes vs no	1.45	1.02-2.05	.04	1.56	1.08-2.24	.02
Chest drain/nebulizers, chest radiography, or suctioning intervention, yes vs no	1.45	1.09-1.93	.01	1.443	1.07-1.95	.02

Abbreviations: HLCB, higher level of care bed; MET, medical emergency team; OR, odds ratio.

[a] Model 1 included all patients. The Constant was 0.28.
[b] Model 2 excludes patients who were classified as having a limitation on medical treatment. The Constant was 0.281.

Table 5 Goodness of fit statistics of the logistic regression models

	Model				Hosmer-Lemeshow			
	χ^2	*df*	*P*	Nagelkere R^2	χ^2	*df*	*P*	*P*
Model 1[a]	29.58	4	<.001	.036	1.9	6	.93	<.001
Model 2[b]	27.6	4	<.001	.037	4.23	5	.52	<.001

[a] Model 1 included all patients.
[b] Model 2 included patients who did not have a limitation on medical treatment after the first call to the medical emergency team.

Table 6 Patients' demographic characteristics (N = 1252)[a]

Characteristic	Patients with 1 MET review (n = 992)	Patients with multiple MET reviews (n = 260)	Test score	*P*
Age, mean (SD), y	68.8 (16.4)	67.5 (16.5)	1.2[b]	.23
Sex			0.007[c]	.93
Male	516 (52)	136 (52)		
Female	476 (48)	124 (48)		
Outcome of admission			7.13[c]	<.01
Discharge	695 (70)	159 (61)		
Death	297 (30)	101 (39)		
Specialty type			3.3[c]	.07
Medical	683 (69)	163 (63)		
Surgical	309 (31)	97 (37)		
Time between admission and first call to the MET			0.002[c]	.97
≤24 hours	146 (15)	38 (15)		
>24 hours	846 (85)	222 (85)		
Service period			0.07[c]	.80
In service[d]	252 (25)	64 (25)		
Out of hours	740 (75)	196 (75)		
LOMT at first call to the MET			0.03[c]	.86
Yes	86 (9)	21 (8)		
No	906 (91)	239 (92)		
Transfer to HLCB			12.01[c]	<.005[e]
Yes	216 (22)	31 (12)		
No	776 (78)	229 (88)		
Flu season			0.011[c]	.92
Yes	551 (55)	146 (56)		
No	441 (45)	114 (44)		

Abbreviations: HLCB, higher-level care bed; LOMT, limitation on medical treatment; MET, medical emergency team.

[a] Data are presented as No. (%) unless otherwise stated.
[b] Student *t* test.
[c] χ^2 test
[d] Monday through Friday, 9 AM to 5 PM.
[e] Significant.

Results

We examined data from the period January 1, 2013, through December 31, 2015. During this period, there were 54 787 admissions, of which 1274 (2%) involved at least 1 MET call; however, 1675 MET calls were recorded because some patients required multiple reviews during a single admission. Data were excluded from analysis for patients who required a MET call: 8 patients had not been inpatients at the time of the MET call; and 14 patients had cardiac arrests, and the initial MET call evolved rapidly to a cardiac arrest call. Thus, 1252 admissions triggered at least 1 MET call and were examined in this study. Of these, 992 (79%) patients were reviewed once, and 260 (21%) patients warranted more than 1 MET review during a single admission.

Analysis of patient flow from admission to final outcome (ie, discharge home, transfer to another hospital and thus outcome unknown, or death) identified that among the 992 patients who were reviewed once by the MET, 216 (22%) were transferred to an HLCB. Only 31 (12%) patients who experienced multiple MET calls were transferred, and more than one-third of those patients (35%) required readmission to an HLCB following the second MET call.

Table 6 presents the demographic data for patients with a single MET call and those with multiple calls. We found no significant difference in the age or sex of patients in these 2 groups, nor in the length of time from admission to the first MET review. The median time between the first and second MET reviews, and between the second and third MET reviews, was 24 hours. Medical patients were less likely to be categorized as having multiple MET calls. The Figure shows the percentage of patients who scored in the 6 physiological measurements that compose

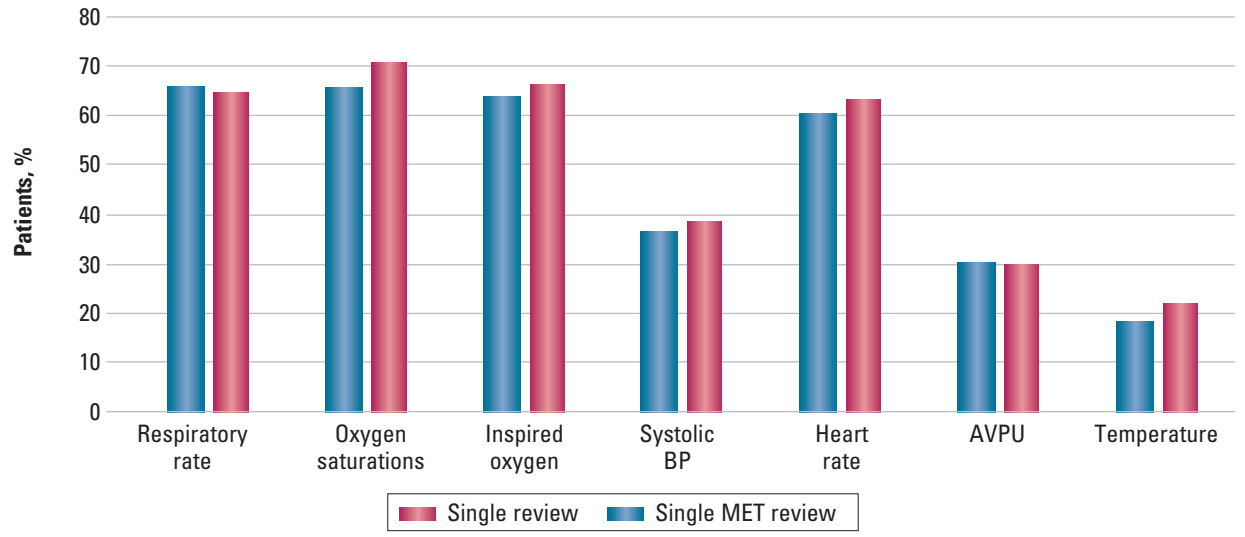

Figure Comparison of triggers for a call to the medical emergency team (MET) for patients who had 1 MET review and those who had multiple MET reviews.

Abbreviations: AVPU, alert, verbal, pain, unresponsive; BP, blood pressure.

the EWS. The most frequent triggers were respiratory-related categories. We found no significant difference in the triggers between groups (see Figure). Patients who required another MET review were significantly more likely to receive antibiotics (22%) than those who required only a single review (15%). No significant differences emerged regarding the amount of time members of the MET spent with patients from either of these groups: physicians spent 41.9 minutes with patients who had 1 MET call and 37.9 minutes with patients with multiple MET calls ($t = .98$; $P > .05$), and nurses spent 36.4 minutes and 37.2 minutes, respectively ($t = .19$; $P > .05$).

Patients requiring multiple MET calls demonstrated higher mortality than those who had 1 MET call during the admission (odds ratio [OR] 1.49 [95% CI 1.12-1.98]; Table 6). This risk of higher mortality associated with multiple MET calls still existed after controlling for transfer to an HLCB after the first MET call (OR 1.56 [95% CI 1.17-2.08]).

Table 4 presents the 2 logistic regression models: one with the all patients (model 1) and one with patients who were not categorized as having an LOMT after the first MET call (model 2). Both of these models were statistically significant. Table 5 presents the goodness of fit statistics of the logistic regression models. More surgical patients than medical patients were categorized as having multiple MET calls, but this was not statistically significant in either the bivariate or the multivariate analysis. The bivariate analysis indicated that patients with multiple reviews were more likely to be prescribed antibiotics and receive respiratory interventions at the first MET review. Logistic regression identified that these 2 interventions were significant predictors of a subsequent MET call, after controlling for specialty and transfer to an HLCB bed after the first review. Controlling for specialty and interventions during the first review, we found that patients who were admitted to an HLCB after the first MET call had a lower OR of requiring further reviews by the MET. This was true for model 2, which excluded patients who were classified as having an LOMT.

Discussion

This study compared patients who required a single MET call with those who required multiple MET calls during a single admission. Overall, the findings demonstrate little demographic difference between these 2 groups of patients. Similarly, the types of triggers that alerted the MET team did not differ between the groups. The percentage of patients who had multiple MET calls in this study—21% (260 of 1252) of patients—was lower than that in some studies[22,26] but higher than that in others.[17,19,20] In this study, and in a study by Mullins and Psirides,[19] surgical patients were more likely than medical

patients to require multiple reviews by the MET. A recent Irish study outlined the concerns of nurses and physicians that the Irish national EWS did not correlate well with patients who were "day 0" postoperatively.[12] Furthermore, Australian surgical nurses identified that their patients often had a high EWS during the immediate postoperative period, thus requiring a review by the MET.[27] In contrast, other investigators found that the EWS identified deterioration (death or unplanned ICU admission) equally well in emergency medical and surgical patients.[28] These findings suggest that more research examining surgical patients is warranted. In our study, the hospital's MET database identified patients as only surgical or medical. Neither this study nor that by Fernando et al[20] could determine whether the MET review occurred before or after a surgical procedure, or if the patient had emergency or elective surgery.

In this study, we found that respiratory interventions and antibiotics at the first MET review were significant predictors of patients requiring multiple reviews, after controlling for specialty and transfer to an HLCB; this finding is similar to those of other studies.[29] These respiratory interventions were provided in the ward setting. Health care providers likely made the decision to provide these interventions as first-line measures in an attempt to avoid need for admission to an HLCB. If these first-line measures were unsuccessful and a patient required invasive ventilation, the patient would need to be transferred to an HLCB.

We found that respiratory interventions and antibiotics at the first MET review were significant predictors of patients requiring multiple reviews.

Ireland is experiencing a shortage of critical care beds, and recent reports have identified a need to increase the number of critical care beds by 45%.[30,31] Our study does not provide enough data on whether the availability of a critical care bed influenced the decision to transfer a patient to an HLCB. A higher percentage (20%) of patients were transferred to an HLCB after the initial MET call compared with 15% in an Australian study.[16] In a recent systematic review of the outcomes of MET calls, researchers found that a lower percentage (8.3%-27.0%) of patients in Australia were admitted to an HLCB than patients in US studies (23%-56%).[32] Currently, in the setting where our study was conducted, a critical care outreach nurse led service reviews of all patients after their discharge from an HLCB, which may be why this group of patients had a lower rate of second review by the MET. Further research is required to ascertain whether routine follow-up of every patient by the critical care outreach service after the initial MET review would reduce the number of patients who require multiple MET reviews and prevent further deterioration of this cohort.

In a recent Irish study conducted in a hospital without a dedicated MET as part of the escalation protocol, investigators reported that nurses expressed concern about the delayed medical response to patients with a high EWS.[33] National guidelines for an EWS were developed in 2017 in the United Kingdom, and they recommend urgent review of patients who have a national EWS of 7 by staff who have critical care competencies.[34] Hegarty et al[10] concur with this recommendation. In organizations using track and trigger systems, barriers to introducing a MET as part of the escalation protocol include lack of resources and fear that the clinical governance/ownership of the deteriorating patient will transfer from the primary care team to the MET.[35-37]

Fernando et al[20] found that MET activation had been delayed at least 1 hour for patients who had multiple MET reviews. We did not collect data on delays in MET activation. Previous research has identified that junior nurses, agency nurses, and student nurses were perceived as less likely to escalate care after identifying a high EWS.[38,39] Critical care outreach services provide education and support to nurses caring for deteriorating patients at the bedside.[40] Nurses need to recognize that some patients may require multiple reviews by the MET—the prevalence varies from 11% to 26%.[16,18] Both nursing and medical staff must also be aware of the high mortality associated with patients who have multiple reviews by a MET.

In this study, we examined data collected as part of routine care in 1 hospital, and even though the sample size is robust, the collection of data from only a single site limits the generalizability of the findings. The hospital routinely reviews all data on MET calls and the events preceding every cardiac arrest, as recommended in the national guidelines.[6] At the time of data collection, electronic patient records were not used at the study site. Thus, we relied primarily on paper records manually recorded by the MET team, which the MET coordinator had collected and collated, to obtain data relating to MET calls. Because of the emergency nature of MET calls and

the laborious process clinical staff complete to collect data, some data were not recorded at the time of call; when possible, however, records were completed retrospectively. Consequently, some information was not available for consideration. The data files also did not differentiate whether the trigger was hypotension or hypertension. We did not capture the point at which the initial MET call was triggered for surgical patients (ie, preoperatively, on "day 0" postoperatively, or later during their hospital stay). We also do not know whether the MET call was a result of early or late postoperative complications or was due to a preexisting condition that was exacerbated by surgery. Specific details on the amount of time between surgery and the initial MET call could provide valuable information on possible opportunities to prevent subsequent triggers of MET calls from occurring among surgical patients.

During this study, a nationally approved sepsis screening tool was in use at the hospital to support staff in recognizing and managing sepsis.[41] However, data were not recorded to identify whether the implementation of the Sepsis Six protocol was associated with patients requiring multiple reviews by the MET. Likewise, neither time spent awaiting an HLCB after a MET call nor HLCB availability was recorded, and therefore we could not ascertain whether, because of bed shortages, patients who required an HLCB needed to be treated on the ward and subsequently required multiple MET reviews. Introduction of the Irish National ICU Audit will help hospitals identify whether patients in different hospitals are waiting for long periods for a critical care bed.[42]

Several continuous quality improvements have been implemented since we completed this study, including additional education for registered nurses on noninvasive ventilation, sepsis, and how to recognize and manage acutely ill adults. Protocols on the use of noninvasive ventilation have been developed and implemented. The findings of this study have informed how critical care outreach nurses prioritize reviews of patients who have been identified as being at increased risk of deterioration.

Relevance to Clinical Practice

A greater understanding of the pathways of patients who experience multiple MET reviews will inform clinical decision-making. Nurses activate the MET according to hospital-specific criteria, and as the activators of MET reviews, they need to be aware of patients who have a high risk of requiring multiple MET reviews and ultimately a high risk of mortality. Hospitals need to monitor the prevalence of patients requiring multiple MET reviews. Such data may lead to changes in policies and procedures regarding MET activation and response, leading to earlier interventions both before and after an initial MET review. Doing so may reduce the prevalence of multiple MET calls for these patients and improve their outcomes.

Conclusion

In this retrospective cohort study, patients requiring multiple MET reviews had higher mortality than those requiring only 1 review. Guidelines from both Ireland[6] and the United Kingdom[34] identify the need to audit implementation of the EWS. Relatedly, our study highlights the need for hospitals to record more data during their audits of MET calls, including whether the patient had an elective or an emergency procedure and the number of days after the procedure the MET call occurred. Recommendations for auditing EWSs do not currently include these variables.[6,43] The National Clinical Effectiveness Committee in Ireland is presently reviewing the EWS guidelines and should include these surgical variables in its revised guidelines, which would allow for comparisons of surgical patients receiving elective procedures and those undergoing nonelective procedures. Capture and analysis of these additional data may inform more timely, focused care for surgical patients who are at a high risk of deteriorating. Such findings could also determine whether an EWS of 7 is appropriate for activating the MET, or whether recognition and treatment of deterioration should begin earlier, at a lower EWS. Ongoing audit of MET activation will evaluate current quality improvement initiatives and thus enhance the identification and management of deteriorating adult patients. CCN

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Financial Disclosures
None reported.

See also

To learn more about rapid response teams, read "Rapid Response Team Calls and Unplanned Transfers to the Pediatric Intensive Care Unit in a Pediatric Hospital" by Humphreys and Totapally in the *American Journal of Critical Care,* 2016;25(1):e9-e13. Available at **www.ajcconline.org.**

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