

# Society of Critical Care Medicine Guidelines on Recognizing and Responding to Clinical Deterioration Outside the ICU: 2023

**RATIONALE:** Clinical deterioration of patients hospitalized outside the ICU is a source of potentially reversible morbidity and mortality. To address this, some acute care hospitals have implemented systems aimed at detecting and responding to such patients.

**OBJECTIVES:** To provide evidence-based recommendations for hospital clinicians and administrators to optimize recognition and response to clinical deterioration in non-ICU patients.

**PANEL DESIGN:** The 25-member panel included representatives from medicine, nursing, respiratory therapy, pharmacy, patient/family partners, and clinician-methodologists with expertise in developing evidence-based Clinical Practice Guidelines.

**METHODS:** We generated actionable questions using the Population, Intervention, Control, and Outcomes (PICO) format and performed a systematic review of the literature to identify and synthesize the best available evidence. We used the Grading of Recommendations Assessment, Development, and Evaluation Approach to determine certainty in the evidence and to formulate recommendations and good practice statements (GPSs).

**RESULTS:** The panel issued 10 statements on recognizing and responding to non-ICU patients with critical illness. Healthcare personnel and institutions should ensure that all vital sign acquisition is timely and accurate (GPS). We make no recommendation on the use of continuous vital sign monitoring among unselected patients. We suggest focused education for bedside clinicians in signs of clinical deterioration, and we also suggest that patient/family/care partners' concerns be included in decisions to obtain additional opinions and help (both conditional recommendations). We recommend hospital-wide deployment of a rapid response team or medical emergency team (RRT/MET) with explicit activation criteria (strong recommendation). We make no recommendation about RRT/MET professional composition or inclusion of palliative care members on the responding team but suggest that the skill set of responders should include eliciting patients' goals of care (conditional recommendation). Finally, quality improvement processes should be part of a rapid response system.

**CONCLUSIONS:** The panel provided guidance to inform clinicians and administrators on effective processes to improve the care of patients at-risk for developing critical illness outside the ICU.

**KEYWORDS:** clinical deterioration; guidelines; Grading of Recommendations Assessment, Development, and Evaluation; medical emergency teams; rapid response system

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DOI: 10.1097/CCM.0000000000006072

February 2024 • Volume 52 • Number 2

Critical illness in hospitalized patients is increasingly managed in ICUs to enable access to specific expertise, frequent clinical assessments, and technological support to manage life-threatening injuries and/or illness

(1). When the onset of critical illness occurs outside of the ICU, early identification and prompt response to deterioration confer the greatest chance of success, yet may be hampered by an environment where the staffing ratios and resource base are configured for lower levels of acuity. Various schemes for patient screening and clinician response—typified by rapid response systems (RRSs)—have been used, yet there is uncertainty over which components of such interventions provide measurable benefits to patients. This Clinical Practice Guideline (CPG) provides evidence-based recommendations and expert guidance for practitioners and decision-makers regarding processes for: 1) early recognition of non-ICU patients at-risk for critical illness, and 2) prompt mobilization of appropriate resources to improve their care.

## METHODOLOGY

### Panel Membership

Society of Critical Care Medicine (SCCM) appointed chairs (F.S., R.W.) and vice-chairs (D.P., G.L.) who convened a panel of 25 experts in acute illness and RRS including a patient/family representative (**Supplemental Digital Content 1**, <http://links.lww.com/CCM/H434>). The Guidelines in Intensive Care Development and Evaluation (GUIDE) group, represented by two clinician-methodologists (K.H., B.R.), provided methodological leadership based on the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) methodology (2). SCCM provided logistic and material support.

### Conflicts of Interest Management

Panel members disclosed all potential financial and intellectual conflicts of interest according to the American College of Critical Care Medicine (ACCM)/SCCM Standard Operating Procedures, which were reviewed and managed by SCCM (**Supplemental Digital Content 2**, <http://links.lww.com/CCM/H434>).

### Question Development and Outcome Prioritization

In a series of meetings, panel members established the scope of the guideline and formulated actionable population, intervention, comparator, outcomes

(PICO) questions related to the early recognition and response to clinical deterioration outside the ICU (**Supplemental Digital Content 3**, <http://links.lww.com/CCM/H434>). The panel also generated a list of outcomes which they then prioritized based on perceived patient-importance (**Supplemental Digital Content 4**, <http://links.lww.com/CCM/H434>).

### Systematic Review

A professional librarian performed a systematic search of the literature to identify studies that were potentially relevant to the PICO questions (**Supplemental Digital Content 5**, <http://links.lww.com/CCM/H434>). A team of reviewers (V.C.D., P.K., S.W., J.D.H.) led by the clinician-methodologists (B.R., K.H.) screened and selected relevant articles, followed by data extraction and risk of bias assessment, according to standard systematic review methodology (**Supplemental Digital Content 6**, <http://links.lww.com/CCM/H434>). Where possible, we performed meta-analysis of data using random effects models and inverse variance weighting (dataparty.ca). Where data were insufficient for meta-analysis, we summarized evidence narratively.

### GRADE Assessment

We performed assessment of the certainty in the evidence for each outcome using GRADE methodology (2) and generated evidence profiles using GRADEPro Guideline Development Tool ([www.grade.pro](http://www.grade.pro)); **Supplemental Digital Content 7**, <http://links.lww.com/CCM/H434>).

### Formulating Recommendations

In a series of web-based meetings, the panel used the GRADE Evidence-to-Decision framework (3) to generate recommendations. **Table 1** presents the GRADE classification of recommendation strength and their respective implications.

For questions addressing interventions in which the benefits unequivocally outweighed harms and met the appropriate criteria, the panel generated good practice statements (GPSs). According to GRADE, these statements are considered equivalent to strong recommendations but are clearly differentiated within the manuscript and intentionally worded differently from

**TABLE 1.**  
**Grading of Recommendations, Assessment, Development, and Evaluation Classification of Strengths of Recommendations and Their Implications**

Implications for...	Strong Recommendation “We recommend...”	Conditional Recommendation “We suggest...”
	Desirable effects of intervention clearly outweigh undesirable effects, or clearly do not.	Trade-offs are less certain, either because of low-quality evidence or because evidence suggests desirable and undesirable effects are closely balanced.
... patients	Most individuals in this situation would want the recommended course of action and only a small proportion would not	The majority of individuals in this situation would want the suggested course of action, but many would not
... clinicians	Most individuals should receive the recommended course of action. Adherence to this recommendation according to the guideline could be used as a quality criterion or performance indicator. Formal decision aids are not likely to be needed to help individuals make decisions consistent with their values and preferences	Different choices are likely to be appropriate for different patients, and therapy should be tailored to the individual patient’s circumstances. Those circumstances may include the patient or family’s values and preferences
... policymakers	The recommendation can be adapted as policy in most situations including for use as performance indicators	Policymaking will require substantial debates and involvement of many stakeholders. Policies are also more likely to vary between regions. Performance indicators would have to focus on the fact that adequate deliberation about the management options has taken place

GRADED PICOs (Supplemental Digital Content 8, <http://links.lww.com/CCM/H434>) (4).

**Voting Process**

Panel members reviewed and approved all recommendations and rationales by a formal web-based vote. We defined consensus as 80% agreement among at least 75% of panel members (Supplemental Digital Content 9, <http://links.lww.com/CCM/H434>).

**UPDATING THE RECOMMENDATIONS**

As new evidence emerges in the literature, the guideline panel is committed to ensuring that the current recommendations are affirmed, updated, and expanded at regular intervals based on directives from the ACCM.

**RECOMMENDATIONS**

The panel generated 10 statements which are summarized in Table 2.

**PART A. EARLY RECOGNITION OF CLINICAL DETERIORATION**

This section covers recommendations related to the early recognition of clinical deterioration among patients hospitalized outside the ICU.

**VITAL SIGN MEASUREMENT AND DOCUMENTATION**

*Good Practice Statement.* Ward staff caring for hospitalized patients should strive to acquire a complete and accurate set of vital signs when ordered and when there is additional cause for concern, and to escalate the reporting of significant abnormalities to the appropriate clinicians in an urgent manner.

*Rationale.* Clinical deterioration represents a loss of homeostatic functions in the face of an illness and leads to measurable changes from baseline conditions, with severity reflected by the degree of changes in vital signs. Vital signs are the simplest, cheapest, and most widely accepted signs of clinical change, and should be obtained at intervals appropriate for a patient’s level

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**TABLE 2.**  
**Summary of Recommendations**

Recommendation	Recommendation Strength, Quality of Evidence
<b>Recognizing clinical deterioration</b>	
1. Ward staff caring for hospitalized patients should strive to acquire a complete and accurate set of vital signs when ordered and when there is additional cause for concern, and to escalate the reporting of significant abnormalities to the appropriate clinicians in an urgent manner	Good practice statement
2. We make no recommendation regarding the routine use of continuous vital sign monitoring to recognize early clinical deterioration in unselected non-ICU patients	No recommendation
3. We suggest focused education of direct-care non-ICU hospital clinicians on recognizing early clinical deterioration	Conditional recommendation, low certainty evidence
4A. Patients, families, and care partners of hospitalized patients are able to recognize subtle differences in clinical status that may signify deterioration and should be empowered to alert appropriate personnel including the rapid response system	Good practice statement
4B. We suggest that patient, family, and care partner concerns be incorporated into hospital early warning systems	Conditional recommendation, low-certainty evidence
<b>Responding to clinical deterioration</b>	
5. We recommend hospital-wide deployment of rapid response systems (i.e., RRT/MET) for non-ICU patients that include explicit activation criteria for obtaining help from a designated response team	Strong recommendation, moderate certainty evidence
6. We make no recommendations regarding 1) whether an RRT/MET should be led by a “prescribing clinician” vs. a “non-prescribing clinician”; and 2) whether an RRT/MET should be led by a physician as compared to other healthcare providers	No recommendation
7A. We make no recommendation about involvement of palliative care-trained personnel as part of an RRT/MET	No recommendation
7B. We suggest ensuring that responding clinicians have expertise on eliciting patients’ goals of care and establishing treatment plans that best reflect their wishes and prognoses	Conditional recommendation, low-certainty evidence
8. A process for quality improvement should be part of a Rapid Response System	Good practice statement

MET = medical emergency team, RRT = rapid response team.

of illness and when unexpected abnormalities arise. Traditional vital signs include temperature, heart rate, respiratory rate, blood pressure, and oxygen saturation, with supplemental signs, such as pain and mental status often included. Vital signs are the most widespread triggers for summoning additional help and evaluation, and are also the core component of multiparameter early warning systems. Some advocate measuring end-tidal carbon dioxide for respiratory status (5) for patients using patient-controlled analgesia, certain laboratory values (e.g., lactate), and capillary refill time for peripheral perfusion (6).

The panel agreed that if full advantage is to be gained from obtaining vital signs, they need to be acquired in the most accurate manner possible, and with significant abnormalities reported to the

appropriate personnel in a timely manner. However, numerous studies demonstrate incomplete and/or incorrect vital sign measurement is common in hospitalized patients (7, 8) leading to failure to detect or recognize key signs of deterioration. We also noted the importance of education (9), audits (7), and feedback to encourage improvement (10, 11) and compliance (9) with proper measurement techniques, accurate documentation, and prompt response to significant physiologic abnormalities.

### **Routine Continuous Vital Sign Monitoring in Unselected Non-ICU Patients**

**Recommendation.** We make no recommendation regarding the routine use of continuous vital sign

monitoring to recognize early clinical deterioration in unselected non-ICU patients.

### **Rationale.**

**Evidence Summary.** Fourteen studies (3 randomized controlled trials [RCTs] [12–14], 11 observational [15–25]) reported inhospital clinical outcomes associated with continuous vital sign monitoring compared with intermittent monitoring (**Supplemental Digital Content 10A**, <http://links.lww.com/CCM/H434>).

The intervention may be associated with decreased ICU length of stay (two observational studies [21, 24], low certainty). Evidence suggests uncertain effects of this intervention on mortality (two RCTs [12, 14], seven observational studies [15, 17, 18, 20, 23–25]; very low certainty), cardiac arrests (two RCTs [12, 13] and six observational studies [17, 19–22, 24]; very low and low certainty, respectively), unplanned transfers to ICU (three RCTs [12–14] and eight observational studies [17–21, 23–25]; very low and low certainty, respectively), time to recognition of clinical deterioration (two observational studies [16, 19]; very low certainty), implementation of appropriate treatment (i.e., time to antibiotics in sepsis; one RCT [14]; very low certainty) and changes in goals of care/ resuscitation status (two observational studies [17, 20]; very low certainty).

**Evidence to Recommendation.** There was low certainty in the evidence for the desirable effects of the intervention. Although we found no evidence of undesirable effects, the panel acknowledged possible disrupted patient sleep and increased staff workload with frequent false alarms are of concern, but inadequately evaluated. The panel speculated that continuous vital sign monitoring may create a false sense of security that may substitute for other forms of meaningful patient contact including bedside assessments.

No studies reported the resource requirements associated with the intervention in unselected patients, although monitoring technology and personnel are required with varying costs. As such, cost-effectiveness is unknown. Concerns were discussed about the potential impact of the intervention on health inequity regarding racial or ethnicity-related differences in the accuracy of some monitoring devices (26, 27). The panel agreed that the intervention is probably feasible in some jurisdictions, but not in low-resource settings. The panel agreed that continuous vital sign monitoring provides benefit in some patients and settings (i.e., patient-controlled

analgesia infusions, active cardiac disease), but judged the evidence for default use in all (unselected) hospitalized patients to be insufficient.

## **Focused Education on Recognition of Early Clinical Deterioration**

**Recommendation.** We suggest focused education of direct-care non-ICU hospital clinicians on recognizing early clinical deterioration (conditional recommendation, low-certainty evidence).

### **Rationale.**

**Evidence Summary.** Twenty-one studies (1 cluster RCT [28], 20 before-after studies [29–48]) reported outcomes following the implementation of focused education programs; most were bundled with other interventions when implementing an RRT/MET. Education varied in format (i.e., in-person vs. online), structure (i.e., didactic vs. interactive sessions), and target audience (i.e., general ward nurses vs. physicians). See **Supplemental Digital Content 10B** (<http://links.lww.com/CCM/H434>) for the GRADE evidence profile.

The effect of focused education independent of other interventions on mortality, non-ICU cardiac arrests, hospital length of stay, and transfers to higher levels of care was uncertain (very low certainty for all outcomes). There was a possible reduction in ICU length of stay (low certainty) (36, 40, 44), increased compliance with early warning systems (low certainty), and possibly decreased time from RRT/MET activation to physician review (very low certainty).

**Evidence to Recommendation.** The desirable effects of focused education may include improved pairing between patients needing RRT/MET services and receipt of such services, with possible reductions of morbidity, mortality, resource use, and costs. Despite the low to very low-certainty evidence for benefit, the panel acknowledged that in GPSs, education was often part of an implementation or quality improvement (QI) package, of which the value of individual components is difficult to assess on their own. Thus, the clinical benefit of focused education may be underestimated in this analysis.

Undesirable patient effects of focused education were not identified. The panel considered factors, such as information/cognitive overload among healthcare providers and cost of the intervention. Depending on its effectiveness, costs may or may not be offset. The

panel agreed the intervention would be acceptable to healthcare providers although feasibility will vary depending on the complexity.

**Special considerations.** The panel agreed that education that is directed toward a specific behavior, such as calling for help in specific situations, instituting protocols when needed, and performing key actions in specific situations is unlikely to lead to meaningful clinical benefit without incorporation into a structured RRS (see infographic) with some form of audits and feedback (see Recommendation 5).

The panel identified areas of future research, including identifying:

- Course content: types of knowledge required based on the type of institution/clinical setting;
- Course duration, frequency, and format;
- Evaluation of cost-effectiveness;
- Duration of the learning effects and need for reinforcement over time.

### Patient, Family, and Care Partner RRT/MET Activation as a Formal Part of an Early Warning System

**Good Practice Statement.** Patients, families, and care partners of hospitalized patients are able to recognize subtle differences in clinical status that may signify deterioration and should be empowered to alert appropriate personnel including the GPS.

**Recommendation.** We suggest that patient, family, and care partner concerns be incorporated into hospital early warning systems (conditional recommendation, low-certainty evidence).

#### Rationale.

**Evidence Summary.** A recent SCCM CPG provides recommendations regarding family-centered care in the ICU (49). Here, we considered patient/family/care partner activation of RRT/MET to include a hospital-led, formalized pathway for patients, family members, and care partners to trigger and communicate with the RRT/MET directly, without requiring involvement by their primary medical team.

We identified five before-after studies that reported clinical outcomes after the implementation of patient/family/care partner RRT/MET activations among hospitalized adults (two studies) and children (three studies) (50–54) (**Supplemental Digital Content 10C**, <http://links.lww.com/CCM/H434>). This intervention

may be associated with decreased rates of mortality (one study [53]) and unsuccessful resuscitations (one study [53]), but no change in the rate of non-ICU cardiac arrests (three studies [51–53]; low certainty for all outcomes). Effects on unplanned transfers to ICU (two studies [51, 53]) and number of RRT/MET activations (four studies [50, 51, 53, 54]) were unclear (very low certainty for both).

The proportion of RRT/MET calls resulting in transfer to a higher level of care was increased in staff activations compared with family activations in three studies (50–52), while the fourth study reported that all family activations led to transfer to a higher level of care (55).

**Evidence to Recommendation.** The panel judged the overall certainty in the evidence to be low but agreed that there are other potential benefits for patient/family/care partner activation that are challenging to evaluate in quantitative studies (i.e., timely attention to patient/family/care partner concerns and opportunities for improved communication and care).

Despite concerns about increased RRT/MET personnel workload, patient/family/care partner RRT/MET activations, where they exist, are uncommon and mostly occur when there is a communication breakdown between the primary team and these stakeholders. The panel agreed that such activations are justified by more timely interventions or resolution of these stakeholders' concerns. As such, it was judged the balance of effects probably favors the intervention.

No studies were found reporting resource requirements associated with this intervention. The panel speculated that additional costs may come from establishing dedicated contact mechanisms and educational initiatives for patient/family/care partner RRT/MET activation Availability and presence of family members and care partners at the bedside provide greater opportunities for patient advocacy. The panel had concerns about the impact of this intervention on health inequity affecting non-dominant cultures, ethnic origins, or primary languages who may have variable access to this intervention. Remedies such as provision of translation tools in other languages may somewhat alleviate these concerns.

The panel judged that the intervention would be highly acceptable to patients, family members, and care partners. Some clinicians may have concerns

about the potential risk to relationships between ward clinicians and patients, family members, and care partners. Training patients, family members, and care partners about the purpose of the RRT/MET and training clinicians around timely communication with these stakeholders may improve acceptability of this intervention.

The panel unanimously agreed that patients, families, and care partners should be empowered to communicate any concerns with the healthcare team and that it is important that clinicians should take measures to ensure that such concerns are heard and addressed in a timely manner. The panel agreed that hospitals should create means for these stakeholders to escalate their concerns over patient deterioration and that this met the criteria for a GPS.

The panel judged that data supporting the incorporation of patient/family/care partner concerns as a formal component of a hospital's early warning system was less concrete, with panel members holding different perspectives on the topic, leading to a conditional recommendation pending further research.

## PART B. RESPONDING TO CLINICAL DETERIORATION

This section covers recommendations related to the response to clinical deterioration among patients hospitalized outside the ICU.

### Explicit Activation Criteria and Rapid Response Team (RRT)/Medical Emergency Team (MET)

**Recommendation.** We recommend hospital-wide deployment of GPSs (i.e., RRT/MET) for non-ICU patients that include explicit activation criteria for obtaining help from a designated response team (strong recommendation, moderate certainty evidence).

#### **Rationale.**

**Evidence Summary.** This recommendation addresses the 1) identification of acute patient deterioration requiring additional help, and 2) the deployment of a designated rapid response team/medical emergency team (RRT/MET) with expertise in addressing clinical deterioration. We identified 6 relevant RCTs (28, 56–60) and 112 before-after studies (9, 17–20, 31, 33, 34, 36, 37, 39, 42, 44, 48, 61–158) that evaluated the impact of activation criteria and/or RRT/MET interventions

on clinical outcomes (for details, see **Supplemental Digital Content 10D**, <http://links.lww.com/CCM/H434>). Important heterogeneity existed across study designs and interventions, with many implementing activation criteria and RRT/MET simultaneously; thus, evaluating the impact of each in isolation was not possible.

Among RCTs, pooled results demonstrated a reduction in mortality (three RCTs; respiratory rate 0.74; 95% CI, 0.66–0.83; moderate certainty) and non-ICU cardiac arrests (two RCTs; mean difference –0.43; 95% CI, –0.88 to 0.02; moderate certainty). Both findings were supported by most observational studies. There was no effect on health-related quality of life or discharge to assisted living facilities (low certainty). Effects on transfers to a higher level of care and changes in goals of care were unclear (very low certainty).

**Evidence to Recommendation.** Desirable effects of activation criteria and a designated RRT/MET include a possible reduction in mortality among hospitalized patients (moderate certainty from RCTs and supported by most observational studies). More recent interventional trials have confirmed that deployment of an early warning risk score leads to decreased mortality (159). The literature did not identify any undesirable effects of this intervention. The panel considered possible overutilization and reliance on the RRT/MET and deskilling among non-ICU staff. However, these effects are speculative and not reported in the literature. Overall, the panel deemed the balance of effects to favor activation criteria with RRT/MET interventions.

Resource requirements will vary based on jurisdictional differences in activation criteria and RRT/MET composition. The panel deemed that cost-effectiveness probably favors the intervention. The panel judged that the intervention would be highly acceptable to patients. Although the primary care team should be part of RRT/MET activation, there may be a perceived infringement on their autonomy although potential patient benefit likely supersedes such concerns. The panel judged the intervention is probably feasible in most settings, including in smaller healthcare settings.

**Special Considerations.** The panel acknowledged the difficulty of evaluating the impact of separate, yet interdependent, components within this complex system. This analysis was not possible given the heterogeneity in study designs, the types of explicit activation criteria

that were implemented, composition and structure of the RRT/MET, and reported outcomes. The panel strongly supported future research evaluating the impact of various types of activation criteria, such as those that are simple bedside parameters that are understood and acted upon by the patient's nurse or other clinicians vs. algorithmic electronic medical record analysis that predicts acute decline and summons help.

Most evidence supporting RRTs comes from their operation in non-ICU inpatient wards. Response to emergency departments (EDs) and other specialty areas within a hospital will depend on local needs and arrangements including consideration of support for admitted patients boarded in the ED.

### Rapid Response Team Leadership/Composition

**Recommendation.** We make no recommendations regarding 1) whether an RRT/MET should be led by a “prescribing clinician” versus a “non-prescribing clinician,” and 2) whether an RRT/MET should be led by a physician as compared to other healthcare providers.

#### Rationale.

**Background.** RRT/METs vary in their composition and approach to activations: 1) an RRT uses a “ramp-up” approach in which the initial response is most often led by a critical care-trained nurses (i.e., “non-prescribing clinicians”), who may then summon other clinicians as needed, and 2) a MET uses a “ramp-down” approach characterized by an initial presence of a prescribing clinician (i.e., physicians, nurse practitioners, or advanced care practitioners), which can be de-escalated as clinically indicated (160).

**Evidence Summary.** The panel considered two different comparisons:

1. RRT/MET led by a “prescribing” versus “non-prescribing” clinician. Due to high risk of bias, inconsistency, and imprecision across two included observational studies (**Supplemental Digital Content 10E**, <http://links.lww.com/CCM/H434>), there were uncertain effects on mortality (one study) (161), hospital length of stay (one study) (161), unplanned ICU transfers (two studies) (93, 161), and RRT/MET activations (one study) (93) (very low certainty for all outcomes).
2. The presence of a physician versus critical care nurse during the initial team-response. Due to inconsistency and high risk of bias across three included observational studies (**Supplemental Digital Content 10E**, <http://links.lww.com/CCM/H434>), there were uncertain effects on mortality (two

studies) (137, 162), cardiac arrests (three studies) (145, 149, 150), hospital and ICU lengths of stay (one study) (149), unplanned ICU transfers (three studies) (137, 162, 163), changes in patients' resuscitation status (one study) (162), and RRT/MET activations (one study) (163) (very low certainty for all outcomes).

**Evidence to Recommendation.** The panel considered possible unevaluated effects of RRT/MET compositions, including that prescribing clinicians may be more likely to initiate goals of care conversations where appropriate (see Recommendation 7B) and implement orders/interventions earlier. The panel speculated that ward clinician thresholds for requesting help may be higher when calling a physician-led RRT/MET.

No studies reported resource requirements, but the panel judged that physician-led teams may be moderately more resource-intensive and that hospitals in some areas (e.g., rural and low-income settings), may have limited physician support to implement this intervention. Emergency physician and staff support in the response to deteriorating patients outside the ED, for example, may create conflicts with areas of primary responsibility and highlight the need to carefully consider issues such as staffing policies when personnel are limited (164).

The panel judged acceptability and feasibility will vary by setting. For patients, the panel agreed that timeliness of the initial response to RRT/MET activations would be more valuable than the professional composition of the team.

**Special considerations.** The panel identified two areas for future research:

- The utility of protocolized care to guide RRT/MET interventions;
- Virtual consultations (e.g., telehealth) to offset the need for on-site physicians, particularly at smaller centers.

### Palliative Care Personnel as Part of the RRT/MET and Education/Guidance for Clinicians in Eliciting Patients' Goals of Care

#### Recommendations.

**Recommendation 7A.** We make no recommendation about involvement of palliative care-trained personnel as part of an RRT/MET.

**Recommendation 7B.** We suggest ensuring that responding clinicians have expertise on eliciting patients' goals of care and establishing treatment plans that best reflect their wishes and prognoses (conditional recommendation, low-certainty evidence).



**Rationale.**

**Evidence Summary.** This question was addressed in two parts:

1. Palliative care personnel as part of the RRT/MET: no relevant studies.
2. Education/guidance for clinicians regarding discussions about patients' goals of care. We identified three relevant studies (**Supplemental Digital Content 10F**, <http://links.lww.com/CCM/H434>):
  - One RCT in which the intervention consisted of an RRT/MET physician communicating scripted guidance regarding goals of care discussions to patients' ward physician (165).
  - A before-after study implemented a two-pronged educational program for non-ICU staff (166).
  - Another before-after study implemented a hospital-wide preprinted order set to facilitate discussion about goals of care by clinical staff (167).

The heterogenous interventions were associated with increased reevaluation and documentation of patients' goals of care preferences and change in resuscitation status (one RCT [165], two before-after studies [166, 167]; moderate certainty). There were no effects on palliative care consultations (one RCT [167] and one before-after study [153]; low certainty) or functional status at discharge (one before-after study [166]; low certainty), and uncertain effects on discharge to residential setting (one before-after study [166]; very low certainty) and lengths of stay (one RCT [165], two before-after studies [166, 167], very low certainty).

**Evidence to Recommendation.** The literature shows that patients who receive emergency team calls have a higher mortality than other ward patients (168, 169) such that the time of a call represents a critical juncture in care where it is important to understand a patient's values as well the disease at hand in formulating an appropriate care plan. We, therefore, consider it important that an emergency response team contain some members who are comfortable with discussing disease severity and goals of care and establishing treatment plans that best reflect a patient's wishes and prognoses. Where needed, additional training in this skill was considered by the panel to be important (170). The panel judged that the intervention improves communication and documentation around goals of care and may reduce administration of therapies inconsistent with patients' preferences and prognoses. Undesirable effects may include disagreement between ward clinicians and RRT/MET staff regarding timing and content of goals of care discussions. Although such conflicts

may be infrequent, their impact on subsequent patient care is unknown. On balance, the panel judged that the improved patient communication and choice outweighed potential undesirable effects and clear documentation of goals of care discussions in the medical record is an essential element in this process.

The costs of this intervention are unknown but providing treatments that are not consistent with patients' wishes likely increases costs. We identified no evidence of the impact of this intervention on health equity, although studies have found that recent immigrants (171) and some ethnic minorities (172) are more likely to receive aggressive interventions and die in an ICU than other groups. To enhance health equity, clinicians should 1) not approach goals of care discussions with a prespecified outcome in mind, 2) provide all patients with the opportunity to discuss their values and goals, regardless of race, ethnicity, and cultural background, and 3) adapt discussions to diverse languages and cultures. The panel judged that the intervention would be acceptable and feasible.

**RRS Quality Improvement**

**Good Practice Statement.** A process for QI should be part of a GPS.

**Rationale.** The most comprehensive programs that evaluated and treated deteriorating patients outside the ICU were GPSs. We identified 23 observational studies evaluating the effect of various QI initiatives on patient outcomes (9, 38, 40, 41, 44, 61, 64, 99, 142, 173–185). The studies employed heterogenous interventions, including RRS implementation education (40, 44, 61, 64, 99, 142, 176, 178, 180–184), clinician oversight with audit and feedback (40, 61, 177, 179, 184), and teamwork/communication strategies (38, 44, 87, 176, 184).

The panel agreed that QI is an integral part of an effective RRS, but that high variability exists in the types of QI strategies implemented and reported in the literature. The panel emphasized that each center should establish QI that is tailored to local context, including patient volumes, and resources. The structure of QI strategies may vary across centers in format and approach. For example, case-based reviews (e.g., review of RRT/MET activations, RRT/MET activation delays, morbidity and mortality rounds with case reviews) may be preferred in smaller institutions, whereas the addition trend analysis of volume-adjusted rates (e.g., RRT/MET activation delays,

non-ICU cardiac arrests) may be more salient in larger centers. Refinement of RRS processes should be informed by periodic audits to address barriers to early recognition and prompt response to clinical deterioration and team communication processes. The panel also determined that the ideal QI program be guided by the goal of capturing all events that qualified for and those that received an RRT/MET response into a database to monitor circumstances and outcomes surrounding these events. Such databases may include patient identifiers, dates, times, locations, reasons for RRT/MET calls, interventions, and outcomes among those with RRT/MET activations as well as adverse events among patients who would have qualified for an activation but did not receive one. (i.e., missed events resulting in clinical deterioration). Whenever possible, patient and family perspectives should be incorporated into the QI process to further ensure patient and family-centered care.

## RESEARCH AGENDA

Important questions remain across multiple domains relevant to recognizing critical illness outside of the ICU, including, but not limited to:

- What physiologic parameters could improve the recognition of at-risk patients and be included in the bedside examination, RRT/MET activation criteria, and Early Warning Scores?
- Is electronic health record-enabled RRT/MET activation superior to clinician-initiated RRT/MET activation?
- Does the professional composition of an RRT/MET team affect patient outcomes?
- Does the use of specific treatment protocols for specific conditions (shock, respiratory failure, etc.) improve patient outcomes?
- How can patient- and family-important outcome measures be incorporated in studies evaluating RRS effectiveness?
- Are there key interventions/ resuscitation goals to be met that need to take place within a specific time period to improve outcomes?

## ACKNOWLEDGMENTS

The panel acknowledges the Society of Critical Care Medicine (SCCM) administrative staff, Ms. Adair Andrews, Ms. Julie Higham, and Ms. Hariyali Patel for their support of this guideline. We also thank St. Joseph's Healthcare Hamilton's Library Services, Centre for Education and Innovation, Ms. Karin

Dearness (Director of Library Services) and Ms. Melanie Chiarot (Library Technician) for their contributions to the systematic review process. The American College of Critical Care Medicine (ACCM), which honors individuals for their achievements and contributions to multidisciplinary critical care medicine, is the consultative body of the SCCM, which possesses recognized expertise in the practice of critical care. The ACCM has developed administrative guidelines and clinical practice parameters for the critical care practitioner. New guidelines and practice parameters are continually developed, and current ones are systematically reviewed and revised. Librarian services, systematic review, and analysis for these guidelines were provided contractually through the Guidelines in Intensive Care Development and Evaluation Group, McMaster University, Canada. Methodologists served as expert panel members specializing in this area.

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Supplemental digital content is available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's website (<http://journals.lww.com/ccmjjournal>).

Funding for these guidelines was provided solely by the Society of Critical Care Medicine. Panel members disclosed all potential financial and intellectual conflicts of interest according to the American College of Critical Care Medicine/Society of Critical Care Medicine Standard Operating Procedures. Refer to **Supplemental Digital Contents 1 and 2** (<http://links.lww.com/CCM/H434>) for details. Dr. Penoyer received funding from Ivenix, Inc, Avanos, ICU Medical, and BD. Dr. Davis disclosed he is a consultant for Zoll and Healthstream and is Chief Executive Officer of Medical X Technologies. Dr. Edelson disclosed that she is president and co-founder of AgileMD and received equity interest, she is an employee of the National Institutes of Health, and received a research grant from BARDA (ARCD.P0535US). Dr. Rowley received funding from Draeger, STIMIT, and Vyair. Dr. DeVita disclosed that he is a consultant

for Hill Rom. Dr. Welch disclosed that he is an advisor in a one-off Becton, Dickinson and Co. Adult and Specialist Critical Care Advisory Board. Dr. Kellett disclosed that he is the founder and major shareholder of Tapa Healthcare DAC. The remaining authors have disclosed that they do not have any potential conflicts of interest.

American College of Emergency Physicians, The Society of Hospital Medicine, The International Society of Rapid Response Systems.

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## REFERENCES

- Nates JL, Nunnally M, Kleinpell R, et al: ICU admission, discharge, and triage guidelines: A framework to enhance clinical operations, development of institutional policies, and further research. *Crit Care Med* 2016; 44:1553–1602
- Guyatt GH, Oxman AD, Schunemann HJ, et al: GRADE guidelines: A new series of articles in the Journal of Clinical Epidemiology. *J Clin Epidemiol* 2011; 64:380–382
- Andrews J, Guyatt G, Oxman AD, et al: GRADE guidelines: 14. Going from evidence to recommendations: The significance and presentation of recommendations. *J Clin Epidemiol* 2013; 66:719–725
- Guyatt GH, Schunemann HJ, Djulbegovic B, et al: Guideline panels should not GRADE good practice statements. *J Clin Epidemiol* 2015; 68:597–600
- Stites M, Surprise J, McNeil J, et al: Continuous capnography reduces the incidence of opioid-induced respiratory rescue by hospital rapid resuscitation team. *J Patient Saf* 2021; 17:e557–e561
- Sebat C, Vandegrift MA, Oldroyd S, et al: Capillary refill time as part of an early warning score for rapid response team activation is an independent predictor of outcomes. *Resuscitation* 2020; 153:105–110
- Badawy J, Nguyen OK, Clark C, et al: Is everyone really breathing 20 times a minute? Assessing epidemiology and variation in recorded respiratory rate in hospitalised adults. *BMJ Qual Saf* 2017; 26:832–836
- Considine J, Trotter C, Currey J: Nurses' documentation of physiological observations in three acute care settings. *J Clin Nurs* 2016; 25:134–143
- Sebat F, Vandegrift MA, Childers S, et al: A novel bedside-focused ward surveillance and response system. *Jt Comm J Qual Patient Saf* 2018; 44:94–100
- Zdravec FJ, Tien L, Robertson-Dick BJ, et al: Comparison of mental-status scales for predicting mortality on the general wards. *J Hosp Med* 2015; 10:658–663
- Suzuki R, Takada T, Takeshima T, et al: Usefulness of a mobile phone application for respiratory rate measurement in adult patients. *Jpn J Nurs Sci* 2022; 19:e12481
- Watkinson PJ, Barber VS, Price JD, et al: A randomised controlled trial of the effect of continuous electronic physiological monitoring on the adverse event rate in high risk medical and surgical patients. *Anaesthesia* 2006; 61:1031–1039
- Paul JE, Chong MA, Buckley N, et al: Vital sign monitoring with continuous pulse oximetry and wireless clinical notification

- after surgery (the VIGILANCE pilot study)—a randomized controlled pilot trial. *Pilot Feasibility Stud* 2019; 5:36
14. Downey C, Randell R, Brown J, et al: Continuous versus intermittent vital signs monitoring in patients admitted to surgical wards: A cluster-randomised, controlled trial. *Colorectal Dis* 2018; 20(Supplement 4):60
  15. Xie L, Garg T, Svec D, et al: Reducing telemetry use is safe: A retrospective analysis of rapid response team and code events after a successful intervention to reduce telemetry use. *Am J Med Qual* 2019; 34:398–401
  16. Barwise A, Thongprayoon C, Herasevich V, et al: The association between monitoring and RRT activation. *Crit Care Med* 2015; 43(12 SUPPL. 1):51
  17. Subbe CP, Duller B, Bellomo R: Effect of an automated notification system for deteriorating ward patients on clinical outcomes. *Crit Care* 2017; 21:52
  18. Scott Evans R, Kuttler KG, Simpson KJ, et al: Automated detection of physiologic deterioration in hospitalized patients. *J Am Med Inform Assoc* 2015; 22:350–360
  19. Heller AR, Mees ST, Lauterwald B, et al: Detection of deteriorating patients on surgical wards outside the ICU by an automated MEWS-based early warning system with paging functionality. *Ann Surg* 2020; 271:100–105
  20. Bellomo R, Ackerman M, Bailey M, et al: Vital Signs to Identify, Target, and Assess Level of Care Study (VITAL Care Study) Investigators: A controlled trial of electronic automated advisory vital signs monitoring in general hospital wards. *Crit Care Med* 2012; 40:2349–2361
  21. Zimlichman E, Terrence J, Argaman D, et al: Effect of contactless continuous patient monitoring in a medical-surgical unit on intensive care unit transfers: A controlled clinical trial. *Am J Respir Crit Care Med* 2012; 185:A3793
  22. Long C, Murray K, Sparkes C: The use of electronic patient observations tracking and targeted critical care outreach to reduce in-hospital cardiac arrests. *J Intensive Care Soc* 2016; 17(4 Supplement 1):133
  23. Weller RS, Foard KL, Harwood TN: Evaluation of a wireless, portable, wearable multi-parameter vital signs monitor in hospitalized neurological and neurosurgical patients. *J Clin Monit Comput* 2018; 32:945–951
  24. Brown H, Terrence J, Vasquez P, et al: Continuous monitoring in an inpatient medical-surgical unit: A controlled clinical trial. *Am J Med* 2014; 127:226–232
  25. Verrillo SC, Cvach M, Hudson KW, et al: Using continuous vital sign monitoring to detect early deterioration in adult postoperative inpatients. *J Nurs Care Qual* 2019; 34:107–113
  26. Wiles MD, El-Nayal A, Elton G, et al: The effect of patient ethnicity on the accuracy of peripheral pulse oximetry in patients with COVID-19 pneumonitis: A single-centre, retrospective analysis. *Anaesthesia* 2022; 77:143–152
  27. Knight MJ, Subbe CP, Inada-Kim M: Racial discrepancies in oximetry: Where do we stand? *Anaesthesia* 2022; 77:129–131
  28. Hillman K, Chen J, Cretikos M, et al; MERIT study investigators: Introduction of the medical emergency team (MET) system: A cluster-randomised controlled trial. *Lancet* 2005; 365:2091–2097
  29. Davis DP, Aguilar SA, Graham PG, et al: A novel configuration of a traditional rapid response team decreases non-intensive care unit arrests and overall hospital mortality. *J Hosp Med* 2015; 10:352–357
  30. Chatwood AK, Osborne M: The impact of an integrated resuscitation and critical care training programme on cardiac arrest rates and survival after cardiac arrest. *Resuscitation* 2010; 81:S96
  31. Buist MD, Moore GE, Bernard SA, et al: Effects of a medical emergency team on reduction of incidence of and mortality from unexpected cardiac arrests in hospital: Preliminary study. *BMJ* 2002; 324:387–390
  32. Bradley P, DePolo M, Tipton J, et al: Improving sepsis survival using mews for early recognition and immediate response to patient decline. *Crit Care Med* 2019; 47(1 Supplement 1):788
  33. Bunkenborg G, Samuelson K, Poulsen I, et al: Lower incidence of unexpected in-hospital death after interprofessional implementation of a bedside track-and-trigger system. *Resuscitation* 2014; 85:424–430
  34. Campello G, Granja C, Carvalho F, et al: Immediate and long-term impact of medical emergency teams on cardiac arrest prevalence and mortality: A plea for periodic basic life-support training programs. *Crit Care Med* 2009; 37:3054–3061
  35. Fuhrmann L, Perner A, Klausen TW, et al: The effect of multi-professional education on the recognition and outcome of patients at risk on general wards. *Resuscitation* 2009; 80:1357–1360
  36. Guirgis FW, Jones L, Esmar R, et al: Managing sepsis: Electronic recognition, rapid response teams, and standardized care save lives. *J Crit Care* 2017; 40:296–302
  37. Heal M, Silvest-Guerrero S, Kohtz C: Design and development of a proactive rapid response team. *Computers Inform Nurs* 2017; 35:77–83
  38. Jones D, Bates S, Warrillow S, et al: Effect of an education programme on the utilization of a medical emergency team in a teaching hospital. *Intern Med J* 2006; 36:231–236
  39. Jones D, Opdam H, Egi M, et al: Long-term effect of a medical emergency team on mortality in a teaching hospital. *Resuscitation* 2007; 74:235–241
  40. Joshi KS, Campbell VK, Gooch RJ, et al: Adult deterioration detection system (Q-ADDS) based rapid response system (RRS) reduces severity of illness and length of stay of ICU admissions from the ward in a regional hospital. *Intensive Care Med Exp* 2015; 3(Supplement 1):A141
  41. Leech C, Cosgrove J, Laws P: MEWS (Modified Early Warning Score) chart completion as a marker for quality in the early recognition of acutely ill patients. The experience of a UK University Teaching Hospital NHS Trust. *J Intensive Care Soc* 2014; 15(1 SUPPL. 1):S32
  42. Lighthall GK, Parast LM, Rapoport L, et al: Introduction of a rapid response system at a United States Veterans Affairs hospital reduced cardiac arrests. *Anesth Analg* 2010; 111:679–686
  43. Merriel A, van der Nelson H, Merriel S, et al: Identifying deteriorating patients through multidisciplinary team training. *Am J Med Qual* 2016; 31:589–595
  44. Mullany DV, Ziegenfuss M, Goleby MA, et al: Improved hospital mortality with a low MET dose: The importance of a modified early warning score and communication tool. *Anaesth Intensive Care* 2016; 44:734–741

45. Peebles RC, Nicholson IK, Schlieff J, et al: Nurses' just-in-time training for clinical deterioration: Development, implementation and evaluation. *Nurse Educ Today* 2020; 84:104265
46. Raines K, Sevilla Berrios RA, Guttendorf J: Sepsis education initiative targeting qSOFA screening for non-ICU patients to improve sepsis recognition and time to treatment. *J Nurs Care Qual* 2019; 34:318–324
47. Sebat F, Vandegrift M, Amato V, et al: Effect on patient outcomes of rapid response system focused on the afferent arm. *Am J Respir Crit Care Med* 2014; 189:A4463
48. Mitchell IA, McKay H, Van Leuvan C, et al: A prospective controlled trial of the effect of a multi-faceted intervention on early recognition and intervention in deteriorating hospital patients. *Resuscitation* 2010; 81:658–666
49. Davidson JE, Aslakson RA, Long AC, et al: Guidelines for family-centered care in the neonatal, pediatric, and adult ICU. *Crit Care Med* 2017; 45:103–128
50. Zix J, Giaccone M, Wheeler D, et al: Family activated rapid response team: What we know five years later. *Crit Care Med* 2012; 40(12 SUPPL. 1):1–328
51. McCawley BA, Gannotta RJ, Champagne MT, et al: Calling a "condition H.". *Nurs Manage* 2013; 44:30–35
52. Brady PW, Zix J, Brill R, et al: Developing and evaluating the success of a family activated medical emergency team: A quality improvement report. *BMJ Qual Saf* 2015; 24:203–211
53. Gerdik C, Vallish RO, Miles K, et al: Successful implementation of a family and patient activated rapid response team in an adult level 1 trauma center. *Resuscitation* 2010; 81:1676–1681
54. Hueckel RM, Mericle JM, Frush K, et al: Implementation of condition help: Family teaching and evaluation of family understanding. *J Nurs Care Qual* 2012; 27:176–181
55. Ray EM, Smith R, Massie S, et al: Family alert: Implementing direct family activation of a pediatric rapid response team. *Jt Comm J Qual Patient Saf* 2009; 35:575–580
56. Ludikhuizen J, Borgert M, Binnekade J, et al: Standardized measurement of the modified early warning score results in enhanced implementation of a rapid response system: A quasi-experimental study. *Resuscitation* 2014; 85:676–682
57. Haegdorens F, Van Bogaert P, Roelant E, et al: The introduction of a rapid response system in acute hospitals: A pragmatic stepped wedge cluster randomised controlled trial. *Resuscitation* 2018; 129:127–134
58. Yekefallah L, Eskandari Z, Shahrokhi A, et al: Effect of rapid response nursing team on outcome of patient care. *Trauma Monthly* 2018; 23:e14488
59. Priestley G, Watson W, Rashidian A, et al: Introducing critical care outreach: A ward-randomised trial of phased introduction in a general hospital. *Intensive Care Med* 2004; 30:1398–1404
60. Jeddian A, Hemming K, Lindenmeyer A, et al: Evaluation of a critical care outreach service in a middle-income country: A stepped wedge cluster randomized trial and nested qualitative study. *J Crit Care* 2016; 36:212–217
61. Adelstein BA, Piza MA, Nayyar V, et al: Rapid response systems: A prospective study of response times. *J Crit Care* 2011; 26:635.e11–635.e18
62. Aitken LM, Chaboyer W, Vaux A, et al: Effect of a 2-tier rapid response system on patient outcome and staff satisfaction. *Aust Crit Care* 2015; 28:107–14; quiz 115
63. Al-Omari A, Al Mutair A, Aljamaan F: Outcomes of rapid response team implementation in tertiary private hospitals: A prospective cohort study. *Int J Emerg Med* 2019; 12:31
64. Al-Qahtani S, Al-Dorzi HM, Tamim HM, et al: Impact of an intensivist-led multidisciplinary extended rapid response team on hospital-wide cardiopulmonary arrests and mortality. *Crit Care Med* 2013; 41:506–517
65. Al-Rajhi A, Mardini L, Jayaraman D: The impact of implementation of an ICU consult service on hospital-wide outcomes and ICU-specific outcomes. *J Intensive Care Med* 2016; 31:478–484
66. Albert BL, Huesman L: Development of a modified early warning score using the electronic medical record. *Dimens Crit Care Nurs* 2011; 30:283–292
67. Aneman A, Frost SA, Parr MJ, et al: Characteristics and outcomes of patients admitted to ICU following activation of the medical emergency team: Impact of introducing a two-tier response system. *Crit Care Med* 2015; 43:765–773
68. Angel M, Ghneim M, Song J, et al: The effects of a rapid response team on decreasing cardiac arrest rates and improving outcomes for cardiac arrests outside critical care areas. *Medsurg Nurs* 2016; 25:153–158
69. Ball C: Critical care outreach services—do they make a difference? *Intensive Crit Care Nurs* 2002; 18:257–260
70. Bedoya AD, Clement ME, Phelan M, et al: Minimal impact of implemented early warning score and best practice alert for patient deterioration. *Crit Care Med* 2019; 47:49–55
71. Beitler JR, Link N, Bails DB, et al: Reduction in hospital-wide mortality after implementation of a rapid response team: A long-term cohort study. *Crit Care* 2011; 15:R269
72. Bellomo R, Goldsmith D, Uchino S, et al: Prospective controlled trial of effect of medical emergency team on post-operative morbidity and mortality rates. *Crit Care Med* 2004; 32:916–921
73. Bellomo R, Goldsmith D, Uchino S, et al: A prospective before-and-after trial of a medical emergency team. *Med J Aust* 2003; 179:283–287
74. Benson L, Hasenau S, O'Connor N, et al: The impact of a nurse practitioner rapid response team on systemic inflammatory response syndrome outcomes. *Dimens Crit Care Nurs* 2014; 33:108–115
75. Bergamasco e Paula R, Tanita MT, Festti J, et al: Analysis of re-admission rates to the intensive care unit after implementation of a rapid response team in a university hospital. *Med Intensiva* 2017; 41:411–417
76. Blotsky A, Mardini L, Jayaraman D: Impact of a local low-cost ward-based response system in a Canadian tertiary care hospital. *Crit Care Res Pract* 2016; 2016:1518760
77. Bristow PJ, Hillman KM, Chey T, et al: Rates of in-hospital arrests, deaths and intensive care admissions: The effect of a medical emergency team. *Med J Aust* 2000; 173:236–240
78. Chan PS, Khalid A, Longmore LS, et al: Hospital-wide code rates and mortality before and after implementation of a rapid response team. *JAMA* 2008; 300:2506–2513
79. Chaudhury P, Gadre S, Schneider E, et al: Impact of multi-disciplinary pulmonary embolism response team availability on management and outcomes. *Am J Cardiol* 2019; 124:1465–1469

80. Chen J, Lixin O, Hillman K, et al: The impact of implementing a rapid response system: A comparison of cardiopulmonary arrests and mortality among four teaching hospitals in Australia. *Resuscitation* 2014; 85:1275–1281
81. Chen J, Ou L, Flabouris A, et al: Impact of a standardized rapid response system on outcomes in a large healthcare jurisdiction. *Resuscitation* 2016; 107:47–56
82. Chen J, Ou L, Hillman KM, et al: Cardiopulmonary arrest and mortality trends, and their association with rapid response system expansion. *Med J Aust* 2014; 201:167–170
83. Chittawatanarat K, Ditsatham C, Chandacham K, et al: Effects of rapid response trauma team in thoracic injuries in northern trauma center level I. *J Med Assoc Thai* 2013; 96:1319–1325
84. Choi S, Shin Y, Lee J, et al: Effects of a medical emergency team follow-up programme on patients discharged from the medical intensive care unit to the general ward: A single-centre experience. *J Eval Clin Pract* 2016; 22:356–362
85. Considine J, Rawet J, Currey J: The effect of a staged, emergency department specific rapid response system on reporting of clinical deterioration. *Australas Emerg Nurs J* 2015; 18:218–226
86. Dacey MJ, Mirza ER, Wilcox V, et al: The effect of a rapid response team on major clinical outcome measures in a community hospital. *Crit Care Med* 2007; 35:2076–2082
87. Danesh V, Neff DF, Unruh L, et al: Can proactive rapid response team rounding improve surveillance and reduce unplanned escalations in care? A controlled before and after study. *Int J Nurs Stud* 2019; 91:128–133
88. De Meester K, Haegdorens F, Monsieurs KG, et al: Six-day postoperative impact of a standardized nurse observation and escalation protocol: A preintervention and postintervention study. *J Crit Care* 2013; 28:1068–1074
89. DeVita MA, Braithwaite RS, Mahidhara R, et al: Medical Emergency Response Improvement Team (MERIT): Use of medical emergency team responses to reduce hospital cardiopulmonary arrests. *Qual Safety Health Care* 2004; 13:251–254
90. Frost SA, Chapman A, Aneman A, et al: Hospital outcomes associated with introduction of a two-tiered response to the deteriorating patient. *Crit Care Resusc* 2015; 17:77–82
91. Goncales PD, Polessi JA, Bass LM, et al: Reduced frequency of cardiopulmonary arrests by rapid response teams. *Einstein (Sao Paulo, Brazil)* 2012; 10:442–448
92. Gurav SK, Zirpe KG, Wadia RS, et al: Impact of "stroke code"-rapid response team: An attempt to improve intravenous thrombolysis rate and to shorten door-to-needle time in acute ischemic stroke. *Indian J Crit Care Med* 2018; 22:243–248
93. Hatlem T, Jones C, Woodard EK: Reducing mortality and avoiding preventable ICU utilization: Analysis of a successful rapid response program using APR DRGs. *J Healthc Qual* 2011; 33:7–16
94. Hayani O, Al-Beihany A, Zarychanski R, et al: Impact of critical care outreach on hematopoietic stem cell transplant recipients: A cohort study. *Bone Marrow Transplant* 2011; 46:1138–1144
95. Hillel AT, Pandian V, Mark LJ, et al: A novel role for otolaryngologists in the multidisciplinary difficult airway response team. *Laryngoscope* 2015; 125:640–644
96. Howell MD, Ngo L, Folcarelli P, et al: Sustained effectiveness of a primary-team-based rapid response system. *Crit Care Med* 2012; 40:2562–2568
97. Jen WY, Kristanto W, Teo L, et al: Assessing the impact of a pulmonary embolism response team and treatment protocol on patients presenting with acute pulmonary embolism. *Heart Lung Circ* 2019; 29:345–353
98. Jones D, Bellomo R, Bates S, et al: Long term effect of a medical emergency team on cardiac arrests in a teaching hospital. *Crit Care* 2005; 9:R808–R815
99. Jones D, Bhasale A, Bailey M, et al: Effect of a national standard for deteriorating patients on intensive care admissions due to cardiac arrest in Australia. *Crit Care Med* 2018; 46:586–593
100. Jones D, Egi M, Bellomo R, et al: Effect of the medical emergency team on long-term mortality following major surgery. *Crit Care* 2007; 11:R12
101. Jones D, George C, Hart GK, et al: Introduction of medical emergency teams in Australia and New Zealand: A multicentre study. *Crit Care* 2008; 12:R46
102. Joshi K, Campbell V, Landy M, et al: The effect of rapid response system revision on standard and specific intensive care unit outcomes in a regional hospital. *Anaesth Intensive Care* 2017; 45:369–374
103. Jung B, Daurat A, de Jong A, et al: Rapid response team and hospital mortality in hospitalized patients. *Intensive Care Med* 2016; 42:494–504
104. Kansal A, Havill K: The effects of introduction of new observation charts and calling criteria on call characteristics and outcome of hospitalised patients. *Crit Care Resusc* 2012; 14:38–43
105. Karpman C, Keegan MT, Jensen JB, et al: The impact of rapid response team on outcome of patients transferred from the ward to the ICU: A single-center study. *Crit Care Med* 2013; 41:2284–2291
106. Karvellas CJ, De Souza IAO, Gibney RTN, et al: Association between implementation of an intensivist-led medical emergency team and mortality. *BMJ Qual Saf* 2012; 21:152–159
107. Kawaguchi R, Nakada TA, Oshima T, et al: Reduction of unexpected serious adverse events after introducing medical emergency team. *Acute Med Surg* 2015; 2:244–249
108. Kenward G, Castle N, Hodgetts T, et al: Evaluation of a medical emergency team one year after implementation. *Resuscitation* 2004; 61:257–263
109. Kim Y, Lee DS, Min H, et al: Effectiveness analysis of a part-time rapid response system during operation versus nonoperation. *Crit Care Med* 2017; 45:e592–e599
110. Klumpner TT, Kountanis JA, Langen ES, et al: Use of a novel electronic maternal surveillance system to generate automated alerts on the labor and delivery unit. *BMC Anesthesiol* 2018; 18:78
111. Kollef MH, Heard K, Chen Y, et al: Mortality and length of stay trends following implementation of a rapid response system and real-time automated clinical deterioration alerts. *Am J Med Qual* 2017; 32:12–18
112. Konrad D, Jaderling G, Bell M, et al: Reducing in-hospital cardiac arrests and hospital mortality by introducing a medical emergency team. *Intensive Care Med* 2010; 36:100–106

113. Laurens N, Dwyer T: The impact of medical emergency teams on ICU admission rates, cardiopulmonary arrests and mortality in a regional hospital. *Resuscitation* 2011; 82:707–712
114. Lee HY, Lee J, Lee S-M, et al: Effect of a rapid response system on code rates and in-hospital mortality in medical wards. *Acute Crit Care* 2019; 34:246–254
115. Lee SH, Leem AY, Nho Y, et al: A pilot study of the effectiveness of medical emergency system implementation at a single center in Korea. *Korean J Crit Care Med* 2017; 32:133–141
116. Lim SY, Park SY, Park HK, et al: Early impact of medical emergency team implementation in a country with limited medical resources: A before-and-after study. *J Crit Care* 2011; 26:373–378
117. Ludikhuizen J, Brunsveld-Reinders AH, Dijkgraaf MGW, et al; Cost and Outcomes of Medical Emergency Teams Study Group: Outcomes associated with the nationwide introduction of rapid response systems in The Netherlands. *Crit Care Med* 2015; 43:2544–2551
118. Ludikhuizen J, de Jonge E, Goossens A: Measuring adherence among nurses one year after training in applying the modified early warning score and situation-background-assessment-recommendation instruments. *Resuscitation* 2011; 82:1428–1433
119. Ludikhuizen J, Dijkgraaf MGW, Arbous MS, et al: Unexpected versus all-cause mortality as the endpoint for investigating the effects of a rapid response system in hospitalized patients. *Crit Care* 2016; 20:168
120. Massey D, Aitken LM, Chaboyer W: The impact of a nurse led rapid response system on adverse, major adverse events and activation of the medical emergency team. *Intensive Crit Care Nurs* 2015; 31:83–90
121. McGillicuddy DC, O'Connell FJ, Shapiro NI, et al: Emergency department abnormal vital sign “triggers” program improves time to therapy. *Acad Emerg Med* 2011; 18:483–487
122. Medina-Rivera B, Campos-Santiago Z, Palacios AT, et al: The effect of the medical emergency team on unexpected cardiac arrest and death at the VA Caribbean Healthcare System: A retrospective study. *Crit Care Shock* 2010; 13:98–105
123. Moriarty JP, Schiebel NE, Johnson MG, et al: Evaluating implementation of a rapid response team: Considering alternative outcome measures. *Int J Qual Health Care* 2014; 26:49–57
124. Moroseos T, Bidwell K, Rui L, et al: Rapid response team implementation on a burn surgery/acute care ward. *J Burn Care Res* 2014; 35:21–27
125. Noyes AM, Gluck JA, Madison D, et al: Reduction of cardiac arrests: The experience of a novel service centric medical emergency team. *Conn Med* 2015; 79:13–18
126. Offner PJ, Heit J, Roberts R: Implementation of a rapid response team decreases cardiac arrest outside of the intensive care unit. *J Trauma* 2007; 62:1223–7; discussion 1227
127. Oh TK, Kim S, Lee DS, et al: A rapid response system reduces the incidence of in-hospital postoperative cardiopulmonary arrest: A retrospective study. *Can J Anesth* 2018; 65:1303–1313
128. Park Y, Ahn J-J, Kang BJ, et al: Rapid response systems reduce in-hospital cardiopulmonary arrest: A pilot study and motivation for a nationwide survey. *Korean J Crit Care Med* 2017; 32:231–239
129. Pullinger R, Wilson S, Way R, et al: Implementing an electronic observation and early warning score chart in the emergency department: A feasibility study. *Eur J Emerg Med* 2017; 24:e11–e16
130. Rosovsky R, Chang Y, Rosenfield K, et al: Changes in treatment and outcomes after creation of a pulmonary embolism response team (PERT), a 10-year analysis. *J Thromb Thrombolysis* 2019; 47:31–40
131. Rothschild JM, Gandara E, Woolf S, et al: Single-parameter early warning criteria to predict life-threatening adverse events. *J Patient Saf* 2010; 6:97–101
132. Rothschild JM, Woolf S, Finn KM, et al: A controlled trial of a rapid response system in an academic medical center. *Jt Comm J Qual Patient Saf/ Jt Comm Res* 2008; 34:417–365
133. Sabahi M, Fanaei SA, Ziaee SA, et al: Efficacy of a rapid response team on reducing the incidence and mortality of unexpected cardiac arrests. *Trauma Monthly* 2012; 17:270–274
134. Salvatierra G, Bindler RC, Corbett C, et al: Rapid response team implementation and in-hospital mortality. *Crit Care Med* 2014; 42:2001–2006
135. Santamaria J, Tobin A, Holmes J: Changing cardiac arrest and hospital mortality rates through a medical emergency team takes time and constant review. *Crit Care Med* 2010; 38:445–450
136. Sarani B, Palilonis E, Sonnad S, et al: Clinical emergencies and outcomes in patients admitted to a surgical versus medical service. *Resuscitation* 2011; 82:415–418
137. Scherr K, Wilson DM, Wagner J, et al: Evaluating a new rapid response team: NP-led versus intensivist-led comparisons. *AACN Adv Crit Care* 2012; 23:32–42
138. Sebat F, Musthafa AA, Johnson D, et al: Effect of a rapid response system for patients in shock on time to treatment and mortality during 5 years. *Crit Care Med* 2007; 35:2568–2575
139. Segon A, Ahmad S, Segon Y, et al: Effect of a rapid response team on patient outcomes in a community-based teaching hospital. *J Grad Med Educ* 2014; 6:61–64
140. Shah SK, CardenasVJ Jr, Kuo YF, et al: Rapid response team in an academic institution: Does it make a difference? *Chest* 2011; 139:1361–1367
141. Shields LE, Wiesner S, Klein C, et al: Use of maternal early warning trigger tool reduces maternal morbidity. *Am J Obstet Gynecol* 2016; 214:527
142. Shin TG, Jo IJ, Song HG, et al: Improving survival rate of patients with in-hospital cardiac arrest: Five years of experience in a single center in Korea. *J Korean Med Sci* 2012; 27:146–152
143. Simmes F, Schoonhoven L, Mintjes J, et al: Effects of a rapid response system on quality of life: A prospective cohort study in surgical patients before and after implementing a rapid response system. *Health Qual Life Outcomes* 2013; 11:74
144. Skupski DW, Brady D, Lowenwirt IP, et al: Improvement in outcomes of major obstetric hemorrhage through systematic change. *Obstet Gynecol* 2017; 130:770–777
145. Skupski DW, Lowenwirt IP, Weinbaum FI, et al: Improving hospital systems for the care of women with major obstetric hemorrhage. *Obstet Gynecol* 2006; 107:977–983

146. Snyder CW, Patel RD, Roberson EP, et al: Unplanned intubation after surgery: Risk factors, prognosis, and medical emergency team effects. *Am Surg* 2009; 75:834–838
147. Stewart J, Carman M, Spegman A, et al: Evaluation of the effect of the modified early warning system on the nurse-led activation of the rapid response system. *J Nurs Care Qual* 2014; 29:223–229
148. Story DA, Shelton A, Jones D, et al; Austin Health Post-Operative Surveillance Team Investigators (POST): Audit of co-management and critical care outreach for high risk post-operative patients (The POST audit). *Anaesth Intensive Care* 2013; 41:793–798
149. Street M, Phillips NM, Mohebbi M, et al: Effect of a newly designed observation, response and discharge chart in the post anaesthesia care unit on patient outcomes: A quasi-experimental study in Australia. *BMJ Open* 2017; 7:e015149
150. The Concord Medical Emergency Team 2 Study Investigators: Outcomes following changing from a two-tiered to a three-tiered hospital rapid response system. *Aust Health Rev* 2019; 43:178–187
151. Sutherasan Y, Theerawit P, Suporn A, et al: The impact of introducing the early warning scoring system and protocol on clinical outcomes in tertiary referral university hospital. *Ther Clin Risk Manage* 2018; 14:2089–2095
152. Tobin AE, Santamaria JD: Medical emergency teams are associated with reduced mortality across a major metropolitan health network after two years service: A retrospective study using government administrative data. *Crit Care* 2012; 16:R210
153. Umscheid CA, Betesh J, VanZandbergen C, et al: Development, implementation, and impact of an automated early warning and response system for sepsis. *J Hosp Med* 2015; 10:26–31
154. Vazquez R, Gheorghe C, Grigoriyan A, et al: Enhanced end-of-life care associated with deploying a rapid response team: A pilot study. *J Hosp Med* 2009; 4:449–452
155. Wright C, Elbadawi A, Chen YL, et al: The impact of a pulmonary embolism response team on the efficiency of patient care in the emergency department. *J Thromb Thrombolysis* 2019; 48:331–335
156. Xenos ES, Davis GA, He Q, et al: The implementation of a pulmonary embolism response team in the management of intermediate- or high-risk pulmonary embolism. *J Vasc Surg* 2019; 7:493–500
157. Young RS, Gobel BH, Schumacher M, et al: Use of the modified early warning score and serum lactate to prevent cardiopulmonary arrest in hematology-oncology patients: A quality improvement study. *Am J Med Qual* 2014; 29:530–537
158. Downar J, Barua R, Rodin D, et al: Changes in end of life care 5 years after the introduction of a rapid response team: A multicentre retrospective study. *Resuscitation* 2013; 84:1339–1344
159. Winslow CJ, Edelson DP, Churpek MM, et al: The impact of a machine learning early warning score on hospital mortality: A multicenter clinical intervention trial. *Crit Care Med* 2022; 50:1339–1347
160. DeVita MA, Bellomo R, Hillman K, et al: Findings of the first consensus conference on medical emergency teams. *Crit Care Med* 2006; 34:2463–2478
161. Chassan C: Impact on outcomes and costs of acute care nurse practitioner vs. nurse led rapid response teams. *Crit Care Med* 2013; 41(12 SUPPL. 1):A151
162. Gupta S, Balachandran M, Bolton G, et al: Comparison of clinical outcomes between nurse practitioner and registrar-led medical emergency teams: A propensity-matched analysis. *Crit Care* 2021; 25:117
163. Rubis D, Popovich M: Comparison of outcomes with a nurse practitioner-led versus a physician-led rapid response team. *Crit Care Med* 2013; 41(12 SUPPL. 1):A125
164. ACEP: Available at: <https://www.acep.org/patient-care/policy-statements/emergency-physicians-patient-care-responsibilities-outside-of-the-emergency-department/>. Accessed March 30, 2023
165. Picker D, Dans M, Heard K, et al: A randomized trial of palliative care discussions linked to an automated early warning system alert. *Crit Care Med* 2017; 45:234–240
166. Johnson CE, Chong JC, Wilkinson A, et al: Goals of patient care system change with video-based education increases rates of advance cardiopulmonary resuscitation decision-making and discussions in hospitalised rehabilitation patients. *Intern Med J* 2017; 47:798–806
167. Tam B, Salib M, Fox-Robichaud A: The effect of rapid response teams on end-of-life care: A retrospective chart review. *Can Respir J* 2014; 21:302–306
168. Tran A, Fernando SM, McIsaac DI, et al: Predictors of mortality and cost among surgical patients requiring rapid response team activation. *Can J Surg* 2020; 63:E598–E605
169. ANZICS-CORE MET dose Investigators: Mortality of rapid response team patients in Australia: A multicentre study. *Crit Care Resusc* 2013; 15:273–278
170. Trankle SA, Shanmugam S, Lewis E, et al: Are we making progress on communication with people who are near the end of life in the Australian health system? A thematic analysis. *Health Commun* 2020; 35:158–167
171. Yarnell CJ, Fu L, Manuel D, et al: Association between immigrant status and end-of-life care in Ontario, Canada. *JAMA* 2017; 318:1479–1488
172. Yarnell CJ, Fu L, Bonares MJ, et al: Association between Chinese or South Asian ethnicity and end-of-life care in Ontario, Canada. *CMAJ* 2020; 192:E266–E274
173. Buist M, Harrison J, Abaloz E, et al: Six year audit of cardiac arrests and medical emergency team calls in an Australian outer metropolitan teaching hospital. *BMJ (Clin Res Ed)* 2007; 335:1210–1212
174. Lovett PB, Massone RJ, Holmes MN, et al: Rapid response team activations within 24 hours of admission from the emergency department: An innovative approach for performance improvement. *Acad Emerg Med* 2014; 21:667–672
175. Davis DP, Graham PG, Husa RD, et al: A performance improvement-based resuscitation programme reduces arrest incidence and increases survival from in-hospital cardiac arrest. *Resuscitation* 2015; 92:63–69
176. Rao BS, Lowe GO, Hughes AJ: Reduced emergency calls and improved weekend discharge after introduction of a new electronic handover system. *Med J Aust* 2012; 197:569–573
177. Proffitt R: Use of a clinical nurse specialist to decrease code calls: Evaluation and outcome. *Crit Care Med* 2011; 39(SUPPL. 12):122



178. Casamento AJ, Dunlop C, Jones DA, et al: Improving the documentation of medical emergency team reviews. *Crit Care Resusc* 2008; 10:29
179. Elliott D, Allen E, McKinley S, et al: User compliance with documenting on a track and trigger-based observation and response chart: A two-phase multi-site audit study. *J Adv Nurs* 2017; 73:2892–2902
180. Hall JA, Stockton LA, Tanner SB, et al: The “nursing cheat sheet,” a guide to aid nursing in management of patient care. *Proc (Baylor Univ Med Center)* 2019; 32:215–217
181. Jones DA, Mitra B, Barbetti J, et al: Increasing the use of an existing medical emergency team in a teaching hospital. *Anaesth Intensive Care* 2006; 34:731–735
182. Spiers L, Singh Mohal J, Pearson-Stuttard J, et al: Recognition of the deteriorating patient. *BMJ Qual Improv Rep* 2015; 4:u206777.w2734
183. Turkington P, Power M, Hunt C, et al: There is another way: Empowering frontline staff caring for acutely unwell adults. *Int J Qual Health Care* 2014; 26:71–78
184. Martin C, Jones D, Wolfe R: State-wide reduction in in-hospital cardiac complications in association with the introduction of a national standard for recognising deteriorating patients. *Resuscitation* 2017; 121:172–178
185. Moore MS, Howard SK, Lighthall G: Using the rapid response system to provide better oversight of patient care processes. *Jt Comm J Qual Patient Saf* 2007; 33:695–8, 645

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