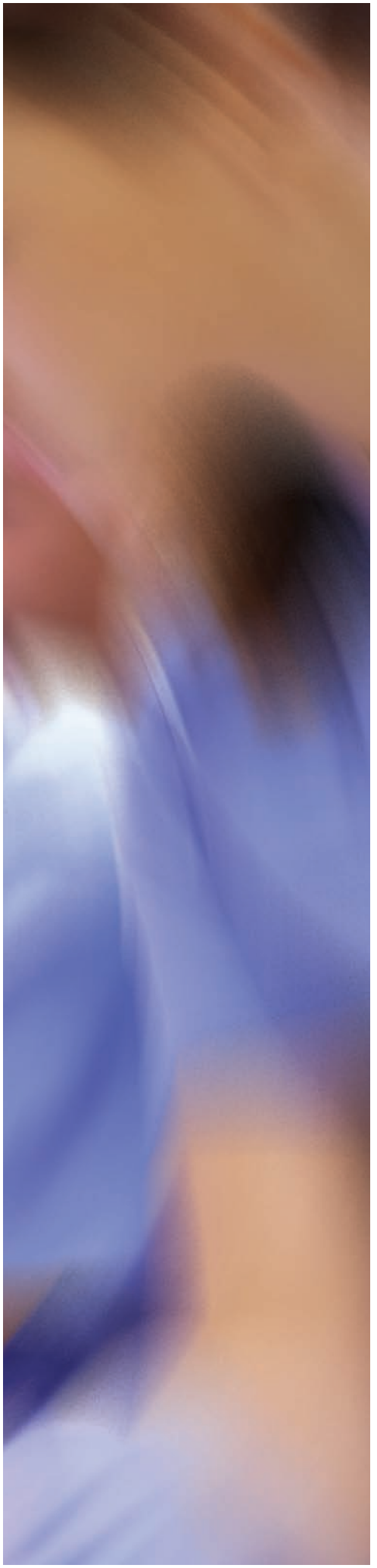

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Rapid response teams:

What's the latest?

By Shirley A. Jackson, DNP, RN, CCRN-K, CCNS, CHSE

FOR NEARLY 25 YEARS, rapid response teams (RRTs) have been assessing and managing patients who experience acute clinical deterioration.[1] Nurses perform a vital role in the function of the team. This article reviews the team members, responsibilities, and common challenges of RRTs.

Acute clinical deterioration

Mr. P, 64, was admitted to the medical-surgical unit from the ED with worsening dyspnea and productive cough over the last 2 days. He'd been diagnosed with squamous cell non–small cell lung cancer, but he wasn't a surgical candidate. Instead, he was planning to undergo palliative radiation therapy. Mr. P's history included atrial fibrillation (AF), heart failure, type 2 diabetes, hypertension, and dyslipidemia. His vital signs were temperature, 97.8° F (36.5° C); heart rate (HR), 98 beats/minute (AF); respiratory rate, 16 breaths/minute; BP, 136/89 mm Hg; and Spo_2, 98% on 2 L nasal cannula. The chest X-ray obtained in the ED showed a left basilar infiltrate consistent with

pneumonia. White blood cell counts were elevated, but serum electrolytes were within normal limits. Arterial blood gas (ABG) analysis on room air in the ED revealed the following: pH 7.46 (normal, 7.35 to 7.45); $PaCo_2$, 45 mm Hg (normal, 35 to 45 mm Hg); Pao_2, 77 mm Hg (normal, 80 to 100 mm Hg); HCO_3^-, 32 mEq/L (normal, 22 to 26 mEq/L).

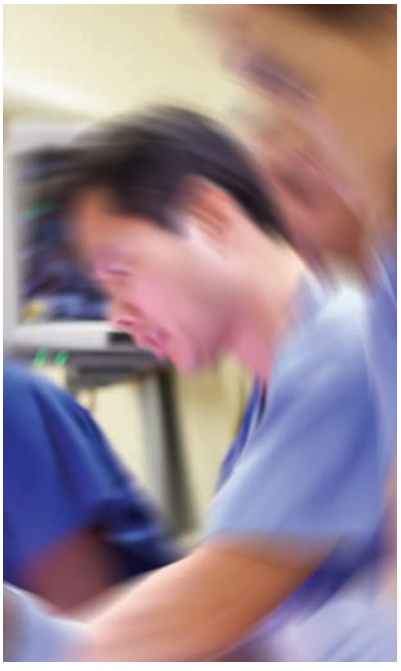
Three hours after he'd arrived at the medical-surgical unit, Mr. P was found sitting in a tripod position with labored breathing. His Spo_2 dropped to 86% on 2 L nasal cannula. The primary RN contacted the physician, and Mr. P was placed on 100% non-rebreather mask (NRM), but his Spo_2 remained at 86%. He continued to be dyspneic, tried to remove the NRM, and was in rapid AF at 140 beats/minute.

The RRT was activated. The ICU RN and respiratory therapist arrived to find Mr. P with declining mentation. His vital signs were HR, 110 beats/minute (AF); respiratory rate, 28 breaths/minute; BP, 120/64 mm Hg; and Spo_2, 92% on 100% NRM. The RRT gathered information from Mr. P's primary nurse about the current situation.

The respiratory therapist auscultated coarse crackles and expiratory wheezes throughout the right lung, and diminished breath sounds in the left lung. The ICU RN paged the covering hospitalist to the event. ABGs on 100% NRM were pH, 7.21; $PaCo_2$, 108 mm Hg; Pao_2, 205 mm Hg; HCO_3^-, 35 mEq/L. The hospitalist consulted the intensivist, and the RRT coordinated a rapid transfer to the ICU for endotracheal intubation and further intensive care. Three days later, Mr. P was extubated and returned to the medical-surgical unit.

Improving patient outcomes

Mr. P's case is one example of the many assessments and interventions performed by RRTs across the country every day. Nurses serve vital roles



Rapid response teams reduce both non-ICU cardiopulmonary arrests and hospital mortality.

on these teams in acute care institutions around the globe.[1]

RRTs are designed to provide rapid assessment and intervention to any non-ICU patient who's experiencing acute clinical deterioration. The goal of early intervention during clinical deterioration is to improve patient outcomes. Rapid response systems have been shown to reduce both cardiopulmonary arrests outside of the ICU and hospital mortality.[2,3] The impact of RRTs on patient outcomes is evolving. More data are needed on long-term outcomes for patients treated by an RRT, including functional outcomes and quality of life.[4]

An RRT functions within the rapid response system, which has two main functions: recognize urgent unmet patient needs and activate the RRT (afferent arm); and initiate an RRT response for assessment, intervention, and patient triage (efferent arm).[5]

RRT activation: Afferent arm

Much attention has been paid to the afferent arm of the rapid response system. Optimum patient care relies on timely identification of clinical deterioration and prompt activation of the team. Despite positive attitudes toward RRTs, delays in activation, known as afferent limb failure, are still a problem. These delays can increase mortality and morbidity.[6,7] Frequency of delay ranges from 21% to 56% of all calls.[7,8]

Reasons for these delays fall into three main areas: failure to monitor, failure to recognize, and failure to escalate.[9] Identification and activation often rely on established single clinical triggers or multiple weighted clinical triggers mediated by early warning systems (EWS). Many of the triggers used are physiologic, such as HR, BP, and respiratory rate. Others may be diagnostic information such as lab values. EWS function by identifying clinical deviations from normal, which are then weighted and provided as a total risk score. These scores can be used by the provider to help identify patients at risk for acute clinical deterioration. EWS scores can predict cardiac arrest and mortality within 48 hours; however, the impact of EWS on health outcomes and resource utilization is less clear.[10] (See *Monitoring for clinical deterioration*.)

Alterations in physiologic parameters may not be the only indication that a patient is deteriorating. Some institutions have incorporated "worried/concerned" criteria, based on nurse intuition, into their EWS or RRT activation criteria. Causes of worry include such indicators as pain, agitation, patient not progressing, and patient indicating he or she isn't feeling well.[11] Nurses may incorporate this subjective feeling into their assessment and decision to activate an RRT. The intuitive nature of this assessment makes it difficult to quantify. New worry indicator scores

Monitoring for clinical deterioration

Early warning systems

Several types of EWS exist, ranging from hard copy scoring systems to those involving continuous monitoring and automated risk score calculation. Early versions of EWS used manual pen-and-paper calculations. Hand calculations of scores were cumbersome and unsustainable. With the recent healthcare information technology regulatory initiatives, many institutions are moving to an electronic medical record (EMR) where monitoring parameters utilized by EWS are routinely entered. Many EWS now provide an automatic score when physiologic parameters are entered into the EMR.

Inputting and utilizing the EMR data effectively increases the efficiency of the EWS. However, several studies have identified key vital sign and assessment data routinely missing in the EMR. In a study aimed at describing the current practice of measuring and documenting vital signs, researchers studied all vital sign parameters that were collected and documented in the 48 hours preceding a severe adverse event.[37] Pulse rate and systolic BP were measured in 72% and 73% of cases, respectively. Respiratory rate was recorded in just 23% of cases. This is particularly concerning because considerable evidence shows that an abnormal respiratory rate is an early indicator of clinical deterioration.[38]

The timing of data entry is also important to ensure early identification of deterioration. Significant delays have been reported in documentation of vital signs and early warning scores by RNs.[39] Cited reasons included lack of computer availability, poor computer functionality, excessive log-in times, and preferences for not documenting in front of families. An excessive workload may cause an RN to batch data entry at the end of the shift, defeating the real-time benefit of the EWS.

Electronic bedside monitors

In an effort to address the delay in documentation and risk alert scoring, investigators have evaluated point-of-care electronic devices meant to record vital signs, calculate a risk score, and escalate care per the institution's protocol. These electronic bedside monitors measure patient temperature, BP, HR, and Spo_2. The monitor can prompt the nurse to manually enter respiratory rate and other unit-specific optional parameters such as urine output.

Once the data are entered, the monitor automatically calculates the early warning score at the bedside and recommends an action customized to the institution's acute deterioration protocol, which often includes activation of the RRT. These bedside monitors have been studied to determine their effect on frequency, type, and treatment of RRT calls; survival to hospital discharge or to 90 days for RRT call patients; overall type and number of serious adverse events; and length of hospital stay. Findings demonstrate an improvement in the proportion of RRT calls triggered by abnormal respiratory signs, improved in-hospital survival of patients receiving RRT calls, and decreased time required for vital sign measurement and recording.[40]

Continuous electronic monitoring

Even when bedside devices are used to prompt nursing assessment and automatically calculate an early warning score, periods still remain when patients aren't monitored. As vital sign and EWS documentation practices are studied, revealing omissions and delays in entry, continuous electronic measurement may help. Continuous monitoring provides an ongoing representation of the patient's clinical status, in contrast to intermittent monitoring, which may miss early deterioration signals between acquisition times.[41] Nursing staff can escalate care based on the continuously trended data.

Patient feedback on continuous monitoring systems has been very positive.[41] Reports of nursing satisfaction with the continuous monitoring system are also positive, ranging from 70% to 92% satisfied.[41,42] However, this technology has the potential to increase alarm fatigue. Organizations must ensure alarm parameters aren't too sensitive and that nurses are customizing alarms to the patient clinical status to avoid desensitization.

such as the Dutch-Early-Nurse-Worry-Indicator-Score are being developed and evaluated.[12] If these prove reliable and valid, they could be incorporated into EWS.[13]

With the advent of point-of-care and continuous monitoring, vital sign documentation has improved, but referral for help remains suboptimal.[14] Several factors can lead to failure to escalate clinical deterioration to the RRT. Lack of information, scarcity of resources, informal hierarchical culture, fear of criticism that the patient wasn't sick enough, and calling the covering provider before activating the RRT are all causative factors of delays in escalation and barriers to activation.[15-17]

The case study described at the beginning of this article provides an example of a delay in escalation because the nurse contacted the patient's healthcare provider before activating the RRT. Individual organizations should examine their facility's barriers and factors affecting delays in RRT activation.

RRT activation: Efferent arm

The functioning of the team (efferent arm) also affects the overall outcomes of the rapid response system. The composition of an RRT is multidisciplinary and varies by institution, but it commonly includes an ICU nurse, a respiratory therapist, and the nursing supervisor. A critical care nurse often is the ICU charge nurse who may not have an assignment or may have the primary role of rapid response nurse; this nurse attends all RRT activations.[18] Respiratory

therapists are vital to the team because many activations require patient ventilation or supplemental oxygen.

Pharmacists may attend all calls or respond as consultants. Adding a pharmacist to the RRT can reduce medication administration time as well as optimize medication selection and dosing.[19]

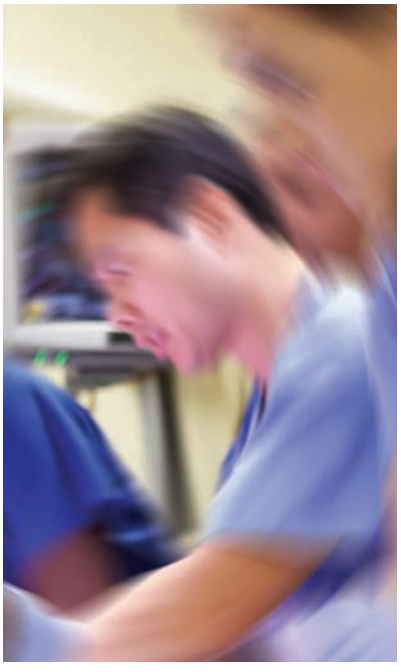
A provider is an important RRT member. The provider may be a hospitalist, who may or may not be the patient's attending physician. In some RRT models, the provider automatically responds to every RRT activation. In many institutions, the provider doesn't respond to every activation but is available as needed.[18]

Typically, a critical care nurse is responsible for leading the initial and ongoing patient assessment and, together with the rest of the team, initiates approved protocols and elevates the call to the provider if necessary. These protocols are a means to begin treatment before provider arrival and can include interventions such as providing supplemental oxygen, obtaining a 12-lead ECG and lab specimens, and administering medications based on the presence and type of cardiac dysrhythmias.

The respiratory therapist is responsible for initial and ongoing respiratory assessment and basic airway management such as administering supplemental oxygen, airway clearance, and in some cases, noninvasive positive pressure ventilation.[20]

The nursing supervisor is responsible for arranging disposition of the patient to a higher level of care if necessary, assisting with documentation, facilitating interventions, and providing general support.

The patient's primary nurse is a valuable member of the team. The primary nurse should remain at the bedside with the team to provide information, such as what prompted RRT activation, and pertinent patient history including current medications, recent diagnostic test results, and code status.



The RRT's effectiveness depends on organizational culture, team structure, expertise, communication, and teamwork.

Five keys to success

The entire team must work collaboratively to provide care. Five key categories have been identified as important to the RRT's effectiveness: organizational culture, team structure, expertise, communication, and teamwork.[21]

The organization in which the RRT operates must support a culture of patient safety and all team members must possess a solid understanding of the role of the RRT, the design of the team, and the role of each of the team members. Members must possess clinical expertise and crisis management skills.

Interdepartmental relationships often improve with the use of an RRT. At events, the disciplines work together to improve patient outcomes and can experience first-hand the valuable contribution of each member. For example, a critical care nurse who attends events outside the ICU may become more aware of what nurses experience in medical-surgical units.[18] Effective teamwork relies on shared purpose, familiarity, and collaboration.

After RRT activation, reviews or debriefing can help teams reflect on performance. Positive reinforcement for the primary nurse on a job well done and encouragement to use the team again in the future can be accomplished in these debriefings; this is particularly important for novice nursing staff.

Several studies have examined attitudes toward RRTs.[15,22,23] Nursing staff who use an RRT find it a positive experience. Nurses believe the process reduces cardiopulmonary arrests and prevents minor problems from becoming major problems. They also believe that RRTs are helpful in managing sick patients, and they feel safer knowing that an RRT is available in their hospital. Despite early concerns, staff members don't believe that these teams increase workload and think the assistance of the team can improve their own skills in managing deteriorating patients. Staff members often welcome the expertise of the RRT and the chance to collaborate with colleagues to manage deteriorating patients. The RRT provides an element of emotional support that reassures nursing staff involved in tenuous clinical situations.[15,22,23]

Many situations provide real-time education for the medical-surgical nurse, and this has been identified as a major benefit of the rapid response system.[18] The RRT nurse often mentors and coaches nurses who are developing their assessment and critical-thinking skills. Communication skills are also fostered as the medical-surgical nurse observes

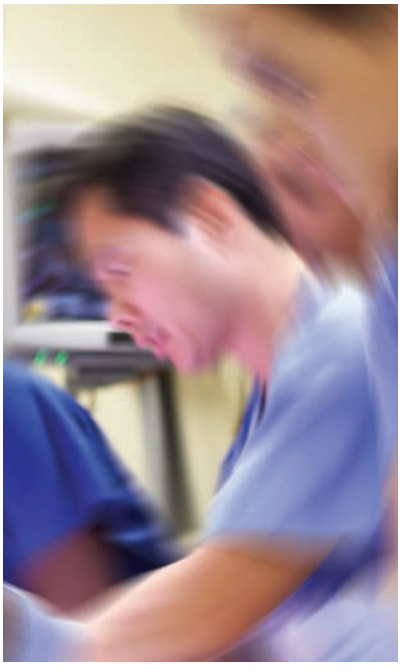
interactions between team members. Continuing education can improve identification of clinical deterioration by nurses and provide opportunities for RRTs to practice teamwork, communication, and leadership skills.

Recently, a systematic review was conducted to study the impact of education on staffs' recognition and management of deteriorating patients.[24] Educational programs that incorporate medium- to high-fidelity simulation have improved recognition and management of patient deterioration. In situ simulation (simulation that takes place in the participants' clinical environment) provides a level of realism that can incorporate real-world distractions and organizational cultural norms, enhancing the learning. Web-based simulation also improves recognition of patient deterioration.[25]

Patient and family participation

Although many rapid response systems include a patient and family activation process, the literature is limited about whether patient and family participation results in improved patient outcomes. Some data suggest increased patient or family calls, also known as consumer calls, result in earlier intervention for patient deterioration.[26] Clinicians have raised concerns that allowing the patient and family to activate the RRT might result in a significant increase in calls, some of which may be unrelated to clinical deterioration. This fear that consumer-based activation will overwhelm staff and resources isn't supported by research.[26,27]

More research is needed to determine how the participation of patients and families can be used in conjunction with clinician judgment for optimal patient outcomes. The essential elements of a successful patient/consumer RRT activation process for clinical deterioration include staff education and training about the program and patient education by the nursing staff. Educational materials must be clear, easy to read, and available in a range of media.[26] The nurse acting as a member of the RRT can play an active role in educating staff and developing educational materials for patients and families.



Some data suggest increased patient or family calls result in earlier intervention for patient deterioration.

End-of-life issues

RRTs are increasingly involved in clinical deterioration associated with end-of-life (EOL) events. This may require members of the RRT to make difficult decisions. In fact, 24% to 33% of all RRT activations involve EOL decision making.[28,29] Many signs and symptoms at EOL correlate with RRT activation triggers. Even though palliative care consults may have occurred before RRT activation, the patient and family may not have made their final decisions. Particular challenges during these events include decision-making time constraints and the severity of the patient's clinical status when the team arrives. This is frustrating to the unit staff as well as RRT members, who may be forced to elevate care to a higher level, knowing that the chance of a positive outcome is minimal.

During an acute clinical decompensation, the patient may not be in a position to make decisions. Members of the RRT may not be skilled at engaging in EOL conversations with family and, due to the episodic nature of RRT activation, typically haven't established a relationship with the family.

To address these challenges and knowledge gaps in EOL care, an organization in the United Kingdom has started a training program for RRT members about patients who don't want to be resuscitated.[30] Each member participates in a high-fidelity simulation involving EOL conversations with professional actors who play the part of the patient or family members. Colleagues watch via live-stream video. Debriefing follows the simulation, and the team members reflect on their experiences and the challenges of the event. Included in the debriefings are the legal, religious, and ethical elements of resuscitation decisions. To date, evaluations of the program have been largely positive.[30]

Overcoming barriers

In an effort to mitigate barriers to activation and avert failure-to-rescue events, some RRTs or RRT members proactively round on patients discharged from the ICU. These critical care transition programs are also referred to as ICU consult teams, critical care outreach, or ICU liaison nurses.

Evidence about the patient outcomes of these transition programs is

conflicting. One systematic review provided evidence that, in patients discharged from the ICU to a general hospital unit, these transition teams reduced the risk of ICU readmission.[31] In contrast, a study evaluating the effects of rounding by a critical care multidisciplinary ICU team (physician, nurse, and respiratory therapist) post-ICU discharge found readmission to ICU and mortality after ICU discharge didn't improve with the rounding process.[32]

Butcher and colleagues also evaluated the effect of proactive RRT rounding on patients discharged from the ICU.[33] Outcomes evaluated were ICU readmission rate, average ICU length of stay, and in-hospital mortality of patients discharged from the ICU. The proactive rounding didn't improve patient outcomes.

In the ICU nurse liaison model, the nurse provides follow-up to patients discharged from the ICU as well as general surveillance of patients at risk for deterioration. In comparing multidisciplinary teams such as an ICU consult team with an individual nurse program, risks of readmission to the ICU were similar and didn't depend on the presence of an intensivist.[31]

Most of the activities of the ICU liaison nurse are directed at providing expert consultation to the primary nurse. These liaisons also provide real-time staff education in areas such as patient safety, nursing assessment, device management, care planning, and patient/family support.[34] The ICU liaison nurse identifies patients who were discharged from the ICU based on referrals from unit staff or nursing administration. Referrals to the ICU liaison nurse are often done through routine ICU discharge follow-up, paging, or face-to-face communication.[35]

With the widespread use of the EMR and EWS, data mining, coupled with proactive surveillance by the RRT nurse or ICU liaison nurse, is possible and productive. In some models, the nurse on the RRT periodically reviews early warning scores from patients on each unit and, based on an algorithm of care, either calls to discuss the patient with the primary nurse, visits the unit to assess the patient, or activates the RRT.[33,36]

These notifications can be done in real time and/or sent to pagers. This proactive approach leverages computerized surveillance and expert nursing knowledge to support the primary nurse in identifying and managing early clinical deterioration. Each organization must evaluate the financial and staffing resources needed to implement some of the more advanced RRT options.

Nurses play a vital role

For almost 3 decades, multidisciplinary teams have been responding to circumstances of acute clinical deterioration to assist the nursing staff in non-ICU settings and provide improved care for these patients. Positive patient outcomes have been realized due to the efforts of the RRT.

Nurses play a vital role on this team. As rapid response systems evolve, nurses will contribute their knowledge in expanding areas such as educating staff and patients to recognize clinical deterioration and participating in proactive assessments on patients at risk for deterioration. ■

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Shirley A. Jackson is a clinical nurse specialist at Elliot Health System in Manchester, N.H.

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