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Implementation and Outcomes of a Rapid Response Team

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Adverse events in hospitalized patients are preceded by clinical signs of decline. Thus, early recognition and intervention should improve patient outcomes. At the University of Kentucky Hospital, the impetus to start a rapid response team (RRT) was to decrease unplanned admissions to ICU, adverse events, and mortality overall. On the basis of the outcomes at our hospital, we conclude that there *is* benefit to having an RRT. The following article outlines processes for RRT implementation and our outcomes to date. **Key words:** *adverse events*, *cardiac arrest*, *medical emergency team*, *patient outcomes*, *patient safety*, *rapid response team*

ADVERSE EVENTS such as unexpected cardiac arrest or unplanned admission to ICU are generally preceded by signs of physiologic instability in hospitalized patients.[1,2] In the late 1990s, medical emergency teams decreased the incidence of and mortality from unexpected in-hospital cardiac arrests with early intervention.[3] There is mounting evidence to support the addition of rapid response systems other than cardiac arrest teams to address signs of instability prior to a cardiac or respiratory arrest.[2] In December 2004, the Institute for Healthcare Improvement challenged the healthcare community with its *Saving 100 000 Lives Campaign* to create a culture of safety to achieve the best possible outcomes for patients. One of the recommendations of the *Saving 100 000 Lives Campaign* was the implementation of rapid response teams (RRTs).[4]

Until the First Consensus Conference on Medical Emergency Teams in 2005, *RRT*, *medical emergency team*, and *critical care outreach team* were variously defined and often interchangeable terms.[2] The consensus conference defined the characteristics of the teams to standardize the nomenclature, promote benchmarking, and identify possible research opportunities. *Medical emergency teams* are generally physician-led teams with advanced interventional capabilities and often replicate the functions of an arrest team. *Rapid response team* denotes a nurse-led urgent response team with intermediate interventional capability. *Critical care outreach teams* combine the rapid response concept with follow-up visitation and assessment of patients transferred from the ICU to proactively identify at-risk patients. This model is supported by the fact that patients requiring readmission to the ICU have a higher mortality rate than those not readmitted.[5] The goal is that early recognition and treatment of signs of decline will ultimately improve the patient's outcomes. The team at the University of Kentucky Hospital (UKH) functions as a critical care outreach but was named *rapid response* prior to the Consensus Conference and has remained so named.

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THE UNIVERSITY OF KENTUCKY HOSPITAL'S PERSPECTIVE

The UKH in Lexington, Kentucky, is a 472-bed Level 1 trauma center serving Central Kentucky, Eastern Kentucky, and bordering states. It also acts as a regional referral center for numerous smaller community hospitals throughout the state. The UKH received its Magnet designation from the American Nurses Credentialing Center in 2001 and was redesignated in 2005. UKH is also 1 of 98 University hospitals that make up the University HealthSystem Consortium and participate in benchmarking, research, and process improvement opportunities offered by the Consortium. The Hospital's RRT rose out of concepts learned from benchmarking and rapid cycle improvement projects and review of current literature.

Assessment: An improvement opportunity

In 2004, the UKH participated in a University HealthSystem Consortium benchmarking project using the Agency for Healthcare Research and Quality indicators of "Failure to Rescue." Failure to Rescue is defined as an in-hospital patient death resulting from the development of certain diagnoses during an admission: sepsis, acute renal failure, deep vein thrombosis/pulmonary embolism, gastrointestinal hemorrhage/acute ulcer, pneumonia, and shock/cardiac arrest.[6] With many patients admitted from outlying hospitals having the above complications already in progress, UKH did not identify a significant number of patients meeting the FTR criteria from within the hospital. Nonetheless, the benchmarking project identified that there was a fundamental improvement opportunity to recognize and intervene rapidly and appropriately with patients showing signs of physiologic instability.

Recommendations from the Failure to Rescue project included having a multidisciplinary collaboration to develop an improvement plan for early identification and treatment of clinical decline. It involved development of specific criteria used to identify physiologic instability, concise standardized communication techniques, development of standard orders and protocols, and formation/initiation of a RRT.

At that time of the benchmarking project, the UKH had a group of critical care nurses known as the SWAT team, employed by the per diem pool to act as a nursing resource throughout the hospital. The intent of the SWAT program, initiated in 1999, was to provide a resource for nursing staff during labor-intensive situations. SWAT nurses responded to all emergency codes, assisted with admissions, transported patients to procedures, and obtained peripheral venous access on difficult-to-access patients, among other nursing tasks. With the recommendations of the Failure to Rescue project and the focus of national attention on patient quality and safety, the chief nursing officer considered shifting its focus from a SWAT team to a Rapid Response Model.

Planning: Making it happen

The newly appointed RRT used Duke University's FADE model of process improvement in the development of the team.[7] The Fade Model has 4 components: *Focus* (identification of improvement opportunity), *Analyze* (information gathering), *Develop* (create implementation plan and probable solution), and *Execute* (execute plan and monitor results). Our Focus, or improvement opportunity, was already identified from the information received from the Failure to Rescue project. The RRT then reviewed available literature on medical emergency teams, RRTs, and critical care outreach teams as well as the Institute for Healthcare Improvement's *Saving 100 000 Lives Campaign*.[4] Because patients "bouncing" back to ICU have a significantly increased mortality rate,[5] the RRT wanted its focus to include prevention of ICU readmission as well as early recognition and treatment of patients having signs of clinical decline in the adult acute care setting. The 2 goals of the RRT were to (*a*) facilitate an interdisciplinary effort toward early recognition and appropriate

Table 1. Qualifications and responsibilities of nurse on rapid response team

Requirements and qualifications:
- Critical care RN with 5 or more year's experience
- Have current Basic Life Support and Advanced Cardiac Life Support and completion of Trauma Nursing Core Course; obtain Critical Care Registered Nurse (CCRN) certification within 1 year
- Have strong communication skills, ethics, and mentoring skills.

Roles and responsibilities:
- Assist with all emergency codes, respond to concerns of the RN staff about patients experiencing Early Warning Signs for decline
- Facilitate communication and action among the healthcare team to best meet the needs of the patient
- Initiate or assist with interventions to stabilize patient
- Expedite transfer of patient to higher level of care as appropriate
- Make rounds on all patient transfers from ICU within 12 to 24 h post transfer as well as all patients with an acuity score of 4 or 5 (UKH's acuity tool scale 1–5)
- Perform "head to toe" assessments on all patients seen
- Observe for clinical trends, lab trends, and Early Warning Signs of decline, and review plan of care
- Make recommendations to the healthcare team as needed.

Abbreviations: RN, registered nurse; ICU, intensive care unit; UKH, University of Kentucky Hospital.

treatment of signs of clinical decline in the adult acute care setting and (*b*) expedite provision of a higher level of care as needed.

Using information from the Failure to Rescue project, a list of "Early Warning Signs" of clinical decline was established. Nurses throughout the hospital's acute care units were educated using a poster presentation format that informed them of the upcoming RRT pilot. The goals of the team were presented, and a list of triggers or Early Warning Signs for which to call the RRT was provided, preparing the nursing staff for the eventual change from the SWAT team model. The house staff was informed via the Graduate Medical Education office's newsletter. The RRT pilot began February 2005 and continued through March 2005, at which time it was adopted as a program of merit that would continue. Table 1 outlines the qualifications and responsibilities of the nurses on our RRT.

What we learned during the pilot period

During the pilot phase, we found most nurses receptive to the new role of the RRT. Since the SWAT team had developed rapport with nurses on the units, this facilitated nurses using the RRT in its new role. Initially the team had difficulty with routine rounds becoming lengthy and patients not always being referred appropriately. For instance, since a patient scoring a 4 or 5 on the UKH's acuity tool would, in theory, exhibit physiologic instability, it was decided to make rounds on those patients. However, we found that many patients scoring 4s and 5s on the acuity tool scored high simply on the basis of the intensity and quantities of tasks required, but were not at risk physiologically. Eventually, the team made rounds on patients only when the RN demonstrated concern for the stability of that patient, which proved to be a more accurate trigger. The RNs are now responsible for referring patients "at risk" of decline to the RRT for every 12-hour rounds according to the Early Warning Signs. Nurses are receptive to the idea of referring patients to the RRT, and the Team has developed a cooperative relationship with them.

Some physicians however, were less responsive to the RRT being called for patient problems at the same time or prior to when they were called. Many physicians were not aware of the program, leading the team to

believe that attempts at communicating with them could have been better. A survey conducted after the RRT was in place for several months indicated a high level of satisfaction (92%) among the respondents, including 24 physicians, 69 RNs, and 7 respiratory therapists.

A FRESH PERSPECTIVE: COMMIT TO ACTION

In June 2005, the UKH was 1 of 18 hospitals invited to participate in University HealthSystem Consortium's "Commit to Action," a rapid cycle improvement project for new or forming RRT. The project began by assembling a multidisciplinary team to work together and add insight into the Team's current practice. The team included a physician champion, a nurse researcher, a respiratory therapist, a clinical pharmacist, an acute care RN and manager, a nursing care technician, a nutritionist, a patient care facilitator, and the RRT and its manager.

Initially, the team reviewed best practices for RRTs using much of the same literature the SWAT team had reviewed prior to the pilot. The process was valuable because the subsequent gap analysis helped identify areas where more work was needed and led to developing the necessary policies and standards to support the existing practice. The team also made the list of Early Warning Signs more concise, created an algorithm for activation of the RRT (Fig 1), and adapted the Situation, Background, Assessment, Recommendation (SBAR) format for standardizing communication among nurses, the RRT, and physicians about a patient's decline.[4] The team then educated healthcare providers hospital-wide about the goals of the RRT. The education process is ongoing and is repeated frequently to include new staff and provide current outcome information.

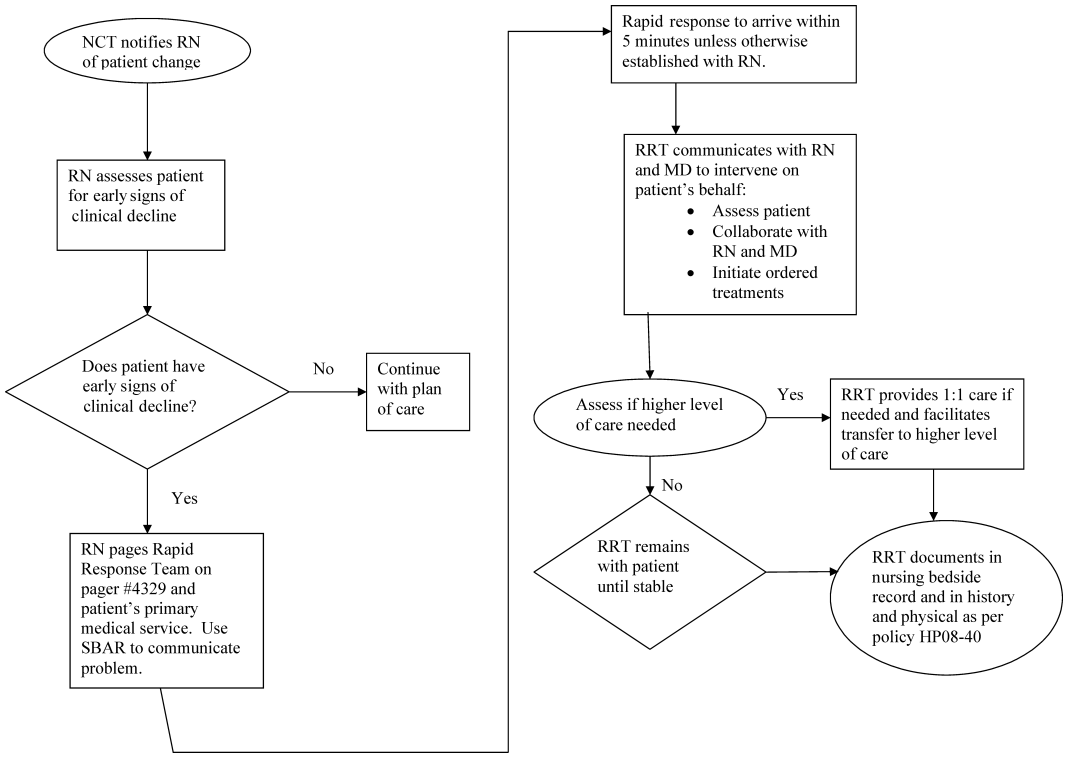


Figure 1. Algorithm for activation of the rapid response team. NCT indicates nursing care technician; RN, registered nurse; MD, medical doctor; and SBAR, situation, background, assessment, recommendation.

Finally, data were gathered on all RRT calls, signs, symptoms, and outcomes for the month of September 2005 and benchmarked results with the other participating University HealthSystem Consortium hospitals. With an established team, the UKH had one of the highest call volumes, which directly correlated with fewer cardiac arrests outside of the ICU setting, a decrease in mortality by 2 patients per 1000 discharges, and fewer unexpected ICU admissions. The UKH continues to benchmark RRT data with participating hospitals and learn from the outcomes and daily experiences.

Data collection

During the first several months, we managed data with a Microsoft Access™ database, which has been helpful for reporting outcomes and providing an organized base of information for research. The RRT's data set includes basic patient demographics such as name, age, gender, diagnosis, unit, medical team, admission source, medical record ID, and patient outcome/disposition. Signs and symptoms that relate to the list of Early Warning Signs, risk factors, past medical history, and nursing and medical interventions are also reported. The data are reported quarterly to the Patient Quality and Safety Committee at UKH.

Evaluation

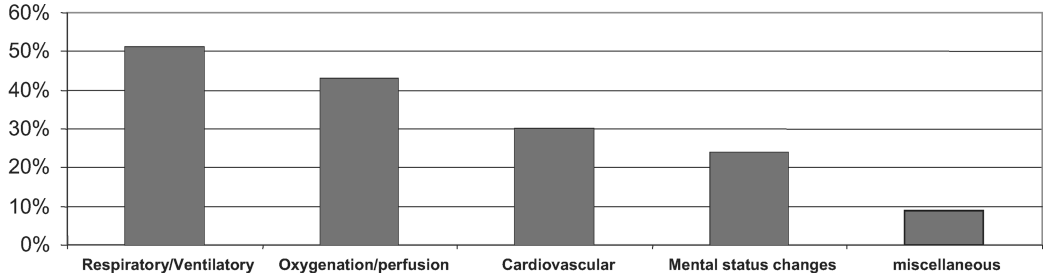
It is challenging to identify indicators that most accurately reflect the effects of the RRT. Many factors affect mortality, and since the RRT is involved only with adult acute care patients, mortality alone is not an adequate measure of the team's impact. The RRT is tracking the percentage of cardiac arrests occurring in non-ICU areas, with a target of $\leq$30%. The number of cardiac arrests in acute care has decreased from 36% in 2004 prior to implementation of the RRT to 28% currently (Table 2), meeting our target goal. Having fewer cardiac arrests occur in non-ICU units is a desirable outcome of an RRT.

The team is also evaluating unplanned admissions to ICU from acute care. Currently, there is no national benchmark, but the range observed during the Commit to Action benchmarking was 2 to 47 patients per 1000 discharges. The UKH had approximately 19 unplanned ICU admissions per 1000 discharges. This represented an initial increase in unplanned ICU admissions (from 16.8 patients per 1000) following implementation of the RRT, a trend that also was noted by other hospitals in the Commit to Action project. This correlated with a decrease in cardiac arrests in non-ICU areas. This trend will be monitored over time to determine if our

Table 2. Percentage of cardiac arrests occurring in acute care (non-ICU) areas

	Before RRT in place					After RRT implemented				
	Q3 2004	Q4 2004	Q1 2005	Q2 2005	Q3 2005	Q4 2005	Q1 2006	Q2 2006	Q3 2006	Q4 2006
Total cardiac arrests in hospital	11	18	30	24	22	37	32	30	41	35
Cardiac arrests in acute care areas	4	6	12	5	8	10	9	7	11	10
Percentage of cardiac arrests in acute care areas	36%	33%	40%	21%	36%	27%	28%	23%	27%	28%

Abbreviations: RRT, rapid response team; Q, quarter.



Respiratory/ventilatory signs	RR ≥ 24, <8, or apnea
	accessory muscle use
	adventitious breath sounds
	weak cough/threatened airway
Oxygenation/perfusion signs	↑ O_2 requirement from baseline
	$FIO_2 \geq 40\%$
	$SpO_2 < 90\%$ on room air or <94% on supplemental O_2
	$paO_2 < 80$ or $paCO_2 > 45$ on ABG
	pale, cool skin
Cardiovascular signs	HR ≥ 120 or ≤ 50
	SBP ≤ 90
	uncontrolled HTN
	arrhythmia/chest pain
Mental status change signs	confusion
	↓ LOC
	agitation
Miscellaneous signs	hemorrhage
	new, frequent, or intractable seizures
	temperature >101°F or <96°F
	pain: acute onset of or increase in
	oliguria

Figure 2. Percentage of patients referred to rapid response team (RRT) with 1 or more signs of decline in the given category from April 2005 through June 2006. ABG indicates arterial blood gas; FIO_2, fraction of inspired oxygen; HR, heart rate; LOC, decreased level of consciousness; and RR, respiratory rate.

efforts at recognition and treatment of early signs of decline are having a positive effect. We also track signs and symptoms that exist in patients referred for a decline in clinical status to identify which one are more likely to contribute to a transfer to the ICU. Respiratory signs, not surprisingly, are the most prevalent (Fig 2). Of patients seen because of a decline, 40% to 50% are able to stay in the acute care setting after intervention by the RRT; from 30% to 37% require transfer to the ICU; and the remainder are transferred to telemetry or step-down units.

TIPS FOR SUCCESS

During the process of planning for our RRT, we learned much from the barriers and successes encountered. Following are tips for implementation that have contributed to our success:

- Gain leadership support and buy-in (eg, from the chief nursing and medical officers)
- Pilot first in a limited area to work out the problems
- Educate staff before the pilot and on an ongoing basis

- Have multidisciplinary input
- Use a dedicated RRT (not staffing other areas)
- Keep and report data to show your results
- Seek ongoing input from RNs and physicians who use the services of the RRT (eg, satisfaction surveys)
- Have standardized communication technique for concise communication during crises.

GOALS FOR THE FUTURE

In the future, the RRT and researchers at the UKH plan to use the data gathered to develop models of patient characteristics predicting admission to the ICU. This may allow the RRT to act earlier on the behalf of patients with greater probability of an ICU admission or readmission. As we learn more from the data, the RRT will continue to adjust its practice to best meet the needs of the patient population. Additionally, we are involved in the development of protocols to better assist with care for patients requiring immediate intervention.

An opportunity exists for the RRT to explore the outreach portion of its practice as data gathered thus far have been related to patients having a clinical decline. Patients seen on outreach visits after transfer out of an ICU are usually stable and appropriately placed. However, the RRT serves many functions while visiting patients on routine rounds that are not currently being trended. Approximately 200 routine post-ICU visits are made monthly by the RRT. We know that about 75% of patients seen on outreach rounds receive teaching, and all of our rounds involve a review of the plan of care and interface with the patient's primary RN. There are other interventions that are not being reported currently because the focus has been on recognition of signs of decline. Thus, the RRT database will be revised to reflect interventions occurring during routine rounds and their effects on patient outcome.

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