

Beyond Rapid Response Teams: Instituting a “Rover Team” Improves the Management of At-Risk Patients, Facilitates Proactive Interventions, and Improves Outcomes

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Abstract

Objectives: The objective of this paper is to describe how a Rapid Response System with a proactive Rover Team and a complementary reactive Pediatric Rapid Response Team (PRRT) had positive effects on patients and providers in one children’s hospital. **Background:** Rapid Response Teams (RRTs) are “reactive,” and their effectiveness depends on recognition of the problem and activation of the system. **Methods:** The Rover Team expands the PRRT to include a proactive assessment of patients at risk for clinical deterioration. **Results:** After PRRT/Rover Team implementation, non-intensive care unit pediatric codes dropped from 1 code/month to 0.16 code/month. The Rover Team was most commonly utilized by the nursing staff to deliver time-sensitive therapies, allowing for patients to remain in their current care environment 90 percent of the time. **Conclusion:** A Rover Team identifies at-risk patients and facilitates the prompt administration of time-sensitive therapies. This proactive approach supports the reactive PRRT, provides a critical-care resource, and improves clinically important outcomes.

Introduction

In response to challenges from the Institute for Health Care Improvement and “The 100,000 Lives Campaign,”¹ many hospitals have spent considerable resources developing, implementing, and reviewing Medical Emergency Teams (METs) or Rapid Response Systems (RRSs). Because of growing interest in these systems, experts in the field of patient safety and critical-care medicine have converged in specialized conferences for Medical Emergency Teams.

The First Consensus Conference on Medical Emergency Teams defines the RRS as having a specific structure that includes two distinct pathways. On the “afferent” limb, a critical event is identified, and a systematic response is triggered. The “efferent” limb involves the team—the MET, Rapid Response Team (RRT), or the critical care outreach (CCO) team—that responds to an identified patient need with triage, direct patient care, or escalation of patient monitoring.² Patient safety, evaluations of in-hospital emergencies, and availability of appropriate resources have emerged as important threads in the evaluation of RRSs by both the MET consensus conference and in the adult and pediatric literature.^{2, 3, 4, 5}

As is often the case, many of the early reports described the advantages of METs in adult patient populations. The primary outcomes in these reports described effects of MET implementation on the incidence of out-of-intensive care unit (ICU) cardiac arrests and the number of unplanned readmissions to the ICU.^{2,5,6} Recently, data from pediatric studies have begun to emerge. Brill and colleagues provide the first pediatric report about the implementation of a MET and its impact on out-of-ICU respiratory and cardiac arrests.³ Previous adult and pediatric investigators have included information only about cardiac arrest rates.² Tiballs, et al., described the development of a MET in a pediatric hospital in Australia. Cardiac arrest and death after introduction of a MET were evaluated, as were admissions to the ICU and changes in clinical practice.⁴

RRSs have been developed to bring critical care expertise to patients who demonstrate clinical changes that might herald an acute deterioration outside of the ICU setting. The reactive component of these teams has been described in the literature.² More proactive CCOs have emerged in Europe. These teams not only focus on emergency visits in response to a change in patient status, but they also provide followup visits to patients discharged from the ICU.⁶

Despite improving the timeliness of treatments for patients in non-critical care settings, the Rapid Response model contains one major weakness: its effectiveness depends on an individual first activating the system. This person might not have the clinical expertise or, as the result of other patient care obligations, the time to recognize important changes in a patient's clinical status.

Adding a proactive component to the RRS allows for a systematic review of patients at risk for clinical deterioration and provides clinicians caring for patients in non-ICU settings the resources to help identify these at-risk patients. Rather than depending on an individual to recognize that a patient meets Rapid Response criteria, this RRS includes a collective evaluation of patients who might be at risk for meeting these criteria. This proactive "Rover Team" makes scheduled visits (Roves) to each non-ICU inpatient pediatric ward to provide a critical care resource to the medical and nursing staff outside of the ICU and to systematically review patients at risk for clinical deterioration.

We hypothesized that implementing a "Rover Team" as part of a pediatric RRS would add a proactive component that would result in patients receiving necessary treatments prior to meeting RRT criteria, improve clinical outcomes, such as increasing patient throughput and decreasing number of readmissions to the ICU, and decrease the number of emergency responses from the pediatric ICU (PICU) to non-ICU areas (i.e., Code Blue responses).

Methods

Pediatric Rapid Response Team

Our PICU is part of a 153-bed children's hospital within the Duke University Health System. The 20-bed combined PICU and pediatric cardiac ICU provides critical care to patients for all medical and surgical subspecialties. The children's hospital also includes two inpatient pediatric intermediate care units, a nine-bed pediatric progressive care/step-down unit (PCU), a 16-bed Bone Marrow Transplant Unit (PBMTU), and the Children's Health Center outpatient clinic.

The Pediatric Rapid Response Team (PRRT) was developed through an interdisciplinary process that included collaboration with pediatric critical care faculty, PICU nursing staff, respiratory therapists, pediatric residents, nursing leadership, and pediatric critical care nurse practitioners and fellows. Activation criteria were established according to age-based norms, pediatric advanced life support, and previously published criteria.^{3,4,7} Optimal care delivery also depends on effective communication between the bedside provider and the responding team.⁸

To facilitate the many interactions necessary in a rapid response, all the members of the PRRT and the multidisciplinary team participated in team-training activities to develop expertise in the use of SBAR (Situation, Background, Assessment, Recommendation) communication. In addition, prior to implementation of the PRRT, the pediatric house staff and nursing staff also participated in focused educational sessions.

The PRRT comprised a pediatric critical care nurse practitioner or fellow, the PICU charge nurse, and a PICU respiratory therapist. Prior to implementation of the PRRT, the pediatric house staff and nursing staff participated in a 45-minute educational session. The PRRT was implemented on a trial basis in the progressive care unit (PCU) in January 2006. The PRRT was put into place to respond to patients whose clinical status had deteriorated based on an objective set of activation criteria.

Over a very short period, it became apparent that the PRRT was also being utilized as a critical care resource for patients identified by the ward providers as having potential for clinical change. Therefore, to improve patient safety, we attempted to proactively survey care providers on the wards in order to seek out those patients at greatest risk of clinical deterioration.

Initial reviews of PRRT responses and discussions of anecdotal feedback regarding the PRRT at weekly multidisciplinary evaluations revealed that while the team was involved in a response, providers for patients not in the PCU would stop the team to solicit input on the care of their patients or to clarify the plan of care for patients who had been recently transferred from the PICU. A tracking tool was put in place to record these encounters, and from these, the Rover concept emerged. The Rover role became a prequel to a rapid response.

In April 2006, the RRS incorporated a proactive Rover Team component to complement the reactive PRRT. This care-delivery model was then made available for all inpatient pediatric patients and providers outside of the PICU.

The Rover Team

The Rover Team expands the PRRT responsibilities to include a proactive assessment of patients at risk for clinical deterioration, such as acutely ill children admitted to non-ICU inpatient areas or those recently transferred from the PICU. To ensure that these patients are evaluated systematically, a member of the Rover Team meets with the on-call senior resident and the charge nurses of inpatient intermediate care units at scheduled intervals (Figure 1). During these scheduled evaluations (i.e., “Rover Rounds”), the Rover reviews the clinical data, evaluates the patient, provides a critical care perspective, and coordinates transfer to a higher level of care if needed. If necessary, these patients are then targeted for further evaluation by the Rover Team

and scheduled for followup by the primary team. In addition to these scheduled patient identification rounds, the Rover Team evaluates two other patient populations identified as potentially high-risk: all children who have been discharged from the PICU within the prior 12 hours and all patients admitted to the PCU within 1 hour of admission. This process allows for continuity of care as the patient transitions out of the PICU and ensures that these high-risk patients are assessed on a timely basis.

Data Collection

Data were collected on all PRRT activations and Rover Team interventions to any pediatric patient in the Children’s Health Center outpatient clinics and all children admitted to either of the inpatient pediatric intermediate care units, PCU, or PBMTU between April 2006 and June 2007.

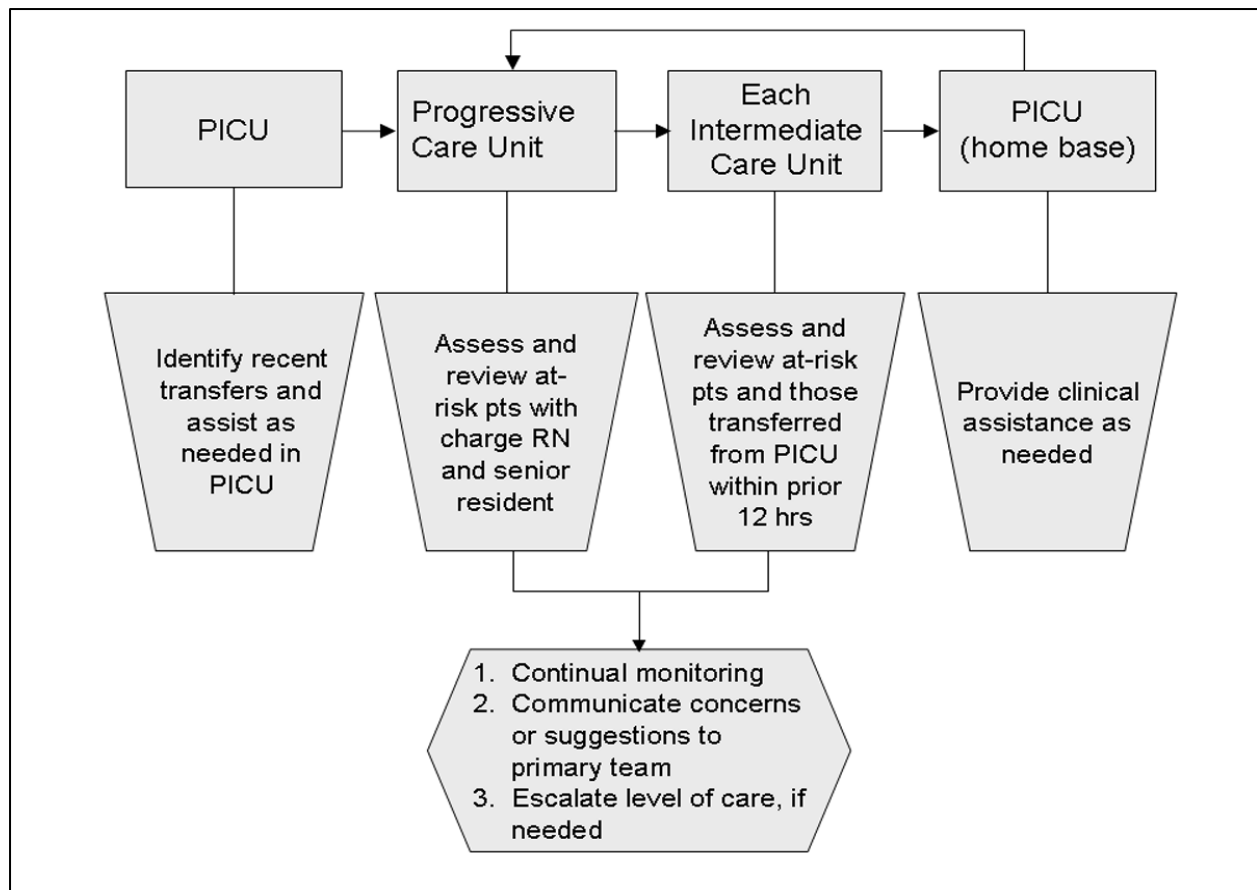


Figure 1. Rover Team process map. Scheduled rounds are made to each of the pediatric inpatient care areas to discuss at-risk patients with the charge nurses and senior resident on-call. The Rover Team representative (NP or fellow) is available for clinical assistance in the PICU, answers Rapid Response calls, and fields questions and pages to the PRRT when not doing rover rounds.

Data collected from rapid responses included time, day, and location of the call; who initiated the call; primary and secondary reasons for team activation; and a list of interventions performed by the PRRT. The data also captured whether the patient was transferred to a higher level of care because of the response.

Rover activities were recorded using a tracking tool to further analyze the system of identifying at-risk patients and the scheduled followup. In addition, the data captured when the Rover was called or paged to solicit critical-care input for medical or nursing assistance. When “Rover Rounds” did not identify at-risk patients and no critical care input was necessary, these rounds were not counted in the total number of Rover interactions.

Feedback

To assess the perceived effectiveness of the PRRT and Rover Team and to determine whether they had contributed an overall feeling of safety within the Children’s Health Center, the nursing staff from all of the intermediate care units and the PBMTU were surveyed. This 12-question survey was sent by e-mail to 132 staff RNs. Respondents had the opportunity to e-mail their responses or to respond anonymously by returning a hard-copy of the survey to their manager. The survey measured responses on a 6-point scale and elicited general comments to questions regarding the staff’s use of the PRRT/Rover Team and the Team’s contribution to an environment of patient safety.

Results

Emergent PICU Calls or Transfers to PICU

Rapid Response and Rover Teams offer a critical-care resource to non-ICU providers for systematic review and prompt evaluation of patients at risk for clinical deterioration. They also allow for delivery of time-sensitive interventions to these patients. Prior to the implementation of the RRS, this critical-care support was obtained by calling the PICU or initiating a Code Blue. Such a system was subjective and inconsistent. Establishing specific criteria to identify at-risk patients would be expected to standardize the response and offer opportunities to assess and monitor those patients by the Rover Team, the non-ICU patient care team, and the responding PRRT.

Analysis of the number of days between Codes is one way to evaluate the effectiveness of the PRRT and Rover Teams. Concurrent with the initiation of the PRRT and Rover teams, the number of in-hospital cardiopulmonary arrests on the pediatric wards has decreased and the number of days between Codes has increased. Prior to PRRT/Rover implementation (July 2005 – February 2006), an average of one non-ICU pediatric Code occurred per month. After activation of the RRS, the average number of Codes dropped to 0.16/month, with not more than one non-ICU Code in a single month (Figure 2). For the same timeframe, the average daily census in the inpatient pediatric patient care areas increased 4.9 percent. The largest percentage of growth within these units was in the PICU and PCU, while the proportion of patients on intermediate care units decreased. This describes an overall more acute patient population compared with the 18 months prior to PRRT initiation.

During the pilot phase, it was noted that the RRT was being utilized in the PCU for much more than responding to a change in patient status in an isolated area. Medical providers and nurses were activating the RRT to clarify patient care plans and to seek ICU guidance on patient care scenarios outside of the PCU. After the pilot period ended, pediatric inpatient implementation of the PRRT and Rover Team evolved simultaneously.

Therefore, data collected reflect both the proactive and reactive components of our RRS. Because both components were so closely linked in the initiation phase, and because the personnel of the PRRT and the Rover Team are one in the same, we were unable to determine whether the proactive education and interventions of the Rover Team altered the number of rapid response calls.

Patient Throughput

Since the team was called upon to evaluate the appropriateness of resource allocation and patient placement, an unanticipated benefit of the Rover implementation was a positive effect on patient throughput. For example, the Rover Team was often called upon to evaluate the appropriateness of continued stepdown (PCU) monitoring.

Through systematic evaluation of the clinical climate of intermediate-care units, the Rover Team not only gained an awareness of patients whose clinical status could deteriorate, but they were able to intervene early and thus avoid transferring the patient to a higher level of care. Figure 3 illustrates the disposition of patients after PRRT and Rover interaction.

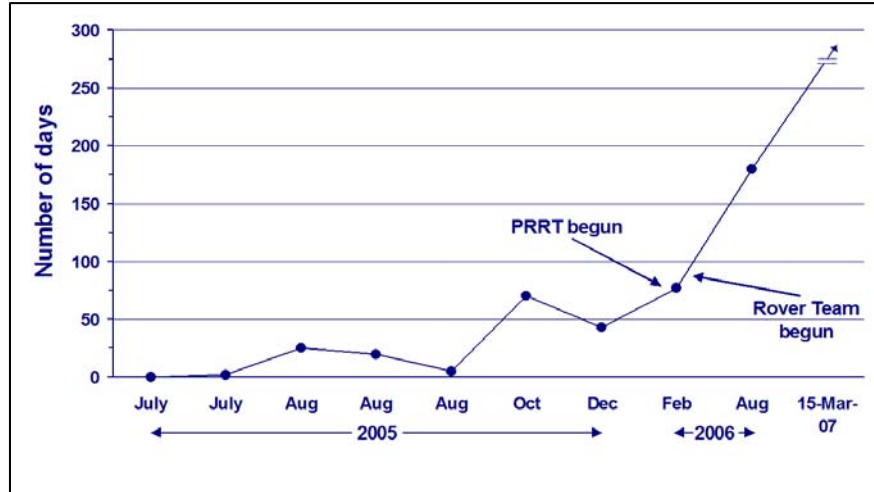


Figure 2. Days between Codes before and after PRRT and Rover implementation

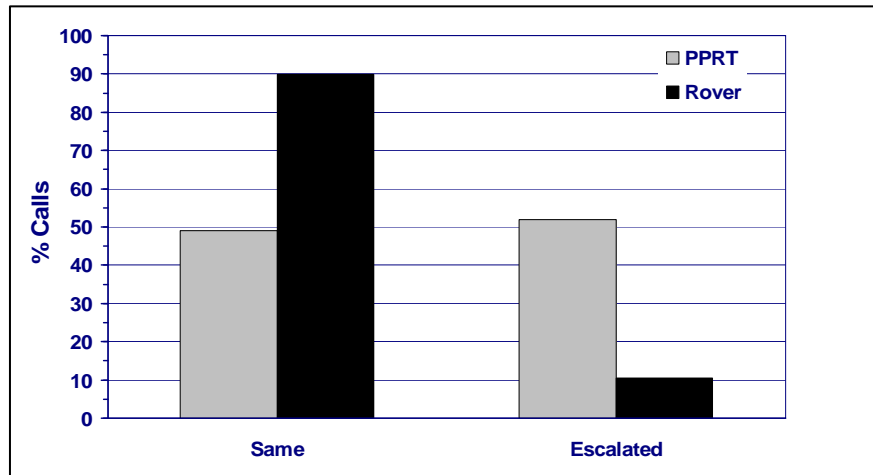


Figure 3. Disposition after PRRT and Rover interaction. Utilization of the Rover Team by both medical and nursing staff has allowed a greater portion of patients to remain in their current inpatient units. In contrast, waiting until the patient has a change in status before calling a rapid response has resulted in escalation of the patient's clinical care status 50 percent of the time.

The proactive Rover Team was able to identify and assist in the care of at-risk patients early, avoiding transfer to a higher level of care 90 percent of the time. Examples of these proactive interventions by the Rover Team include assisting with venous access, clarification of orders, and educating staff about equipment. In response to a change in patient clinical status, activation of the Rapid Response Team resulted in patient transfer to a higher level of care (floor to PCU, floor to ICU, or PCU to ICU) over 50 percent of the time.

Proactive Interventions

A total of 281 rapid responses were documented during this 14-month period, along with 291 Rover interactions. The total number of Rover interactions did not include times when the Rover Team contacted either the senior resident or intermediate care unit charge nurses, but no high-risk patients were identified. Even though no patients were identified, these encounters still allowed for review of the patients, education about transfer criteria, and the opportunity for critical care input, as well as support of the patients and the nursing and medical teams outside the PICU. While not measured or recorded, this opportunity for critical care input and teamwork might have been an additional positive effect of the Rover Team.

Consistent with its name, the PRRT was activated due to a change in patient status in 100 percent of activations. The most common reason for PRRT activation was a change in respiratory status with triggers, such as tachypnea, increased work of breathing, and respiratory distress. Physicians activated the PRRT more frequently than the nursing staff, although this may have reflected the patient's RN first calling for physician assistance, followed by both the RN and MD deciding to call the PRRT. The PRRT was also activated by respiratory therapists and other clinical support staff. A formal mechanism for the family to activate PRRT is still in development, but families have asked the nursing or medical teams to initiate a PRRT call.

Approximately 40 percent (115/291) of interactions occurred during the Rover Team's scheduled rounds with the senior resident and intermediate care unit charge nurse, during which they identified and evaluated at-risk patients. Sixty percent of Rover interactions were initiated by a page or phone call from a member of a non-ICU medical or nursing team seeking critical care input due to a change in patient status or assistance with the development of the patient's care plan. To facilitate continuity of care, these discussions included information sharing regarding a transferred patient's ICU stay and clarification of ongoing clinical issues. Other interventions by the Rover Team included facilitating communication between members of the multidisciplinary team; escalating respiratory therapies; establishing intravenous access; assisting nursing staff with patient medical equipment (e.g., Hemovac[®] drainage systems, noninvasive positive pressure devices, chest-tubes, and central line maintenance); and followup on high-risk patients, including those whose status had necessitated a previous rapid response and patients who had been transferred out of the PICU.

Positive Feedback

Of the 132 nurses surveyed, 36 responded (27 percent response rate). Additional feedback about the RRS has come from conversations during Rover Rounds and through e-mail and discussions with other patient care teams. Returned questionnaires revealed that 80 percent of responding

nurses had activated the PRRT or interacted with the Rover Team (Figure 4). Nurses who had not activated the RPRT indicated that this was due to a lack of necessity rather than a hesitancy to activate the system. Overall, the vast majority of the nursing staff polled felt that the presence of the RRS made them feel more comfortable and confident in caring for their patients and that it greatly strengthened the environment of safety within the Children’s Hospital; 100 hundred percent said they would recommend using the PRRT/Rover Team to a colleague and would encourage or assist others in activating the team.

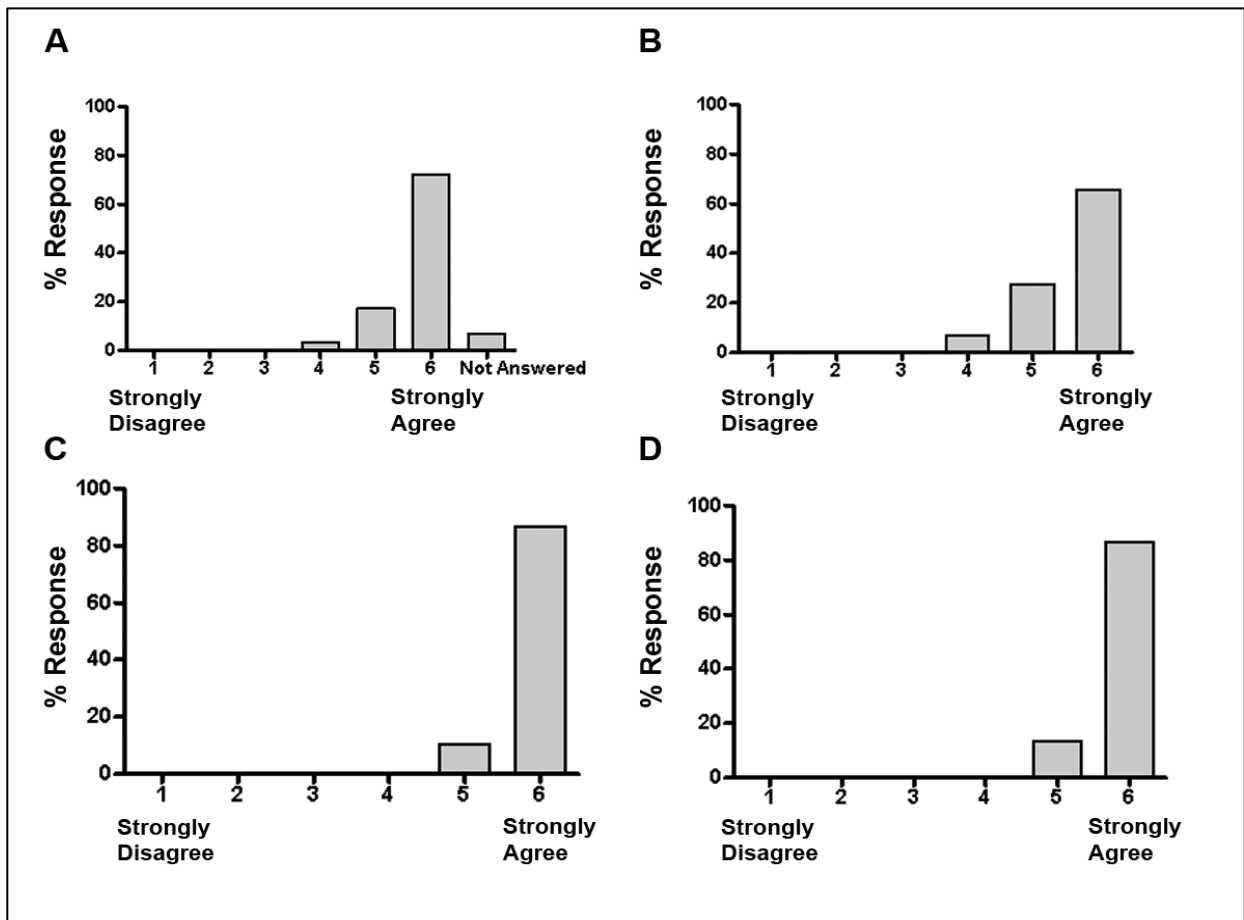


Figure 4. RN feedback:

- A. By working with the Rapid Response/Rover Teams, nurses felt more comfortable and confident managing patients in crisis.
- B. The PRRT and Rover Teams contributed to an environment of patient safety.
- C. Nurses who utilized the PRRT/Rover system felt comfortable with the system and would activate the PRRT or Rover team again.
- D. Nurses would recommend the use of the PRRT/Rover Team to a colleague and have encouraged or assisted others to activate the PRRT.

Because any provider could activate the PRRT or Rover Team at any time, patients had the opportunity to receive time-sensitive therapy before an emergent transfer back to the PICU became necessary (Figure 5).

While some “Rover Rounds” resulted in no at-risk patients being identified, the medical and nursing staffs came to expect “Rover Rounds,” and often these predictable systematic interactions between the critical care staff and the non-ICU staff led to welcomed educational sessions. Non-ICU medical and surgical teams and nursing staff provided positive feedback about these “Rover Rounds.”

Examples of responses: “It’s nice to know that the Rover Team will be around soon; we save many of our questions for them.” “I appreciate knowing that there is someone I can call at any time to help me.”

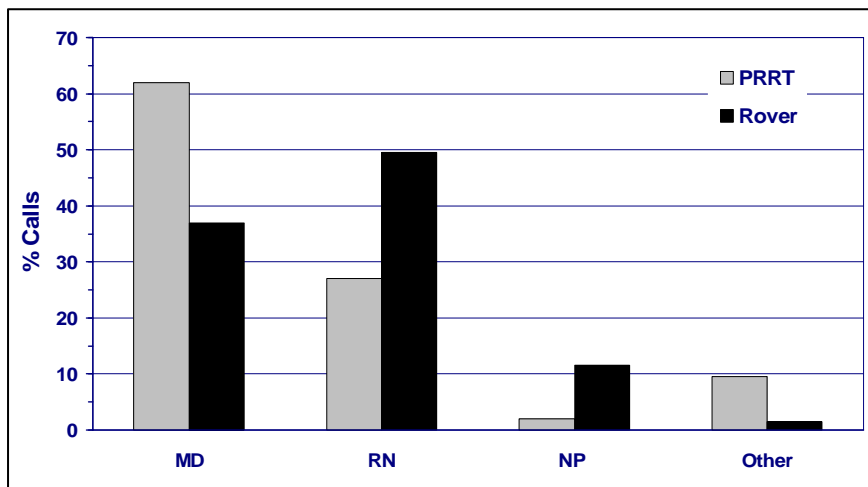


Figure 5. Providers activating PRRT and Rover Teams. Both the PRRT and Rover Team provided critical-care support for medical and nursing staff outside the PICU. The PRRT primarily supported the medical staff in response to a change in patient status. The Rover Team supported personnel by answering questions and scheduling a time to bring up concerns prior to a change in patient status or a situation becoming an emergency. Patient families, respiratory therapists, and physical therapists have also utilized the PRRT and, to a lesser extent, the Rover Team.

Discussion

A Rapid Response System that included a proactive Rover component and a Reactive Response Team was found to contribute to an environment of patient safety. Pediatric patients have significantly worse outcomes if readmitted to the PICU during the same hospital admission.⁹ Readmitted patients were more likely to be brought back to the PICU emergently and had higher severity of illness scores, compared to patients not readmitted to the PICU. The Rover Team was responsible for evaluation of patients transferred out of the PICU at least once within 12 hours of PICU transfer, facilitated communication with the accepting, non-ICU team, and assured a smoother transition of care during this critical transfer period.

It has been reported that, during a 6-year study period, a greater number of readmissions to the PICU occurred during the summer months (July to September) than during other times of the year, presumably because of the number of novice providers present during these months.⁹ When faced with patients whose clinical exams are deteriorating, a less experienced provider might feel more comfortable transferring those patients back to the PICU rather than monitoring them in their current location. Again, the Rover and Rapid Response Teams offered an opportunity to

provide a critical care resource to these patients and providers in their current location and might have decreased the number of unnecessary readmissions to the PICU (Figure 3).

Successful transfer of a patient out of the PICU reflects a balance of avoiding premature transfers and resisting the urge to keep the patient in the ICU for a prolonged stay with the attendant risk of ICU-related complications. PICU readmissions often occur due to progression of the patient's disease process or development of complications from the illness or from the treatment.¹⁰

Collaboration with the Rover Team allows non-ICU providers caring for these at-risk patients the opportunity to seek critical care guidance before the patients' clinical status deteriorates and to avoid PICU readmission. The proactive component of the RRS contributes to an environment of patient safety and improved communication, helps maintain that tenuous balance of successful patient transfer out of the PICU, and facilitates the patient's progress toward hospital discharge.

The inability of medical or nursing staff to recognize serious illness, a delay in calling for assistance, and a delay in arrival of assistance have been described as perceived reasons for unexpected deterioration, cardiac arrest, and/or death on pediatric patient care wards.⁴ Scheduled, proactive "Rover Rounds" allow for expected, timely consideration and evaluation of potentially at-risk patients. The medical and nursing teams expect a call or visit from the Rover Team and prepare for this interaction by reviewing their patients and communicating their concerns regarding patients that have required their recent attention. Staff education is ongoing to ensure that a rapid response is called and to reinforce staff awareness that they can call "at any time," rather than wait for "Rover Rounds," should a question or situation require an immediate response.

Furthermore, establishing specific criteria and education programs to improve staff's abilities and timeliness in recognizing early signs of clinical deterioration can empower nursing and medical personnel to request urgent medical assistance in a more timely fashion.⁴ The nonthreatening presence of the Rover Team, which, through scheduled rounding times, is available for discussion and education when a patient's status is stable, provides non-ICU providers with a resource they can feel confident in calling about a patient's status change.

The implementation of both the RRT and the proactive Rover component was received positively by medical and nursing staff for several reasons. The proactive approach allowed a number of patients to be evaluated prior to the initiation of a rapid response. Additionally, the formalized interaction between the Rover Team members and medical and nursing staff provided a welcome educational opportunity. Identifying concerns about a patient during Rover rounds allowed for clinical discussions about the pathophysiology of the patient's underlying condition and expected clinical progression. These conversations helped to improve continuity of care as the multidisciplinary team of critical care provider (Rover representative), intermediate care provider (ward resident), and nursing created a shared mental model of the patient's current clinical status.⁸

Future Directions

Further evaluation is needed to determine whether mortality, hospital and ICU length of stay, hospital mortality, and PICU readmission rates will be significantly altered by establishing and utilizing a comprehensive RRS. We are currently examining all non-ICU Codes for the presence of PRRT or Rover Team involvement in the 12 to 24 hours prior to Code events. In addition, for all patients transferred to the PICU because of PRRT or Rover interaction, we would like to evaluate patients' subsequent PICU stay for the need for intubation, the presence of an ICU Code event, length of that PICU stay, and the patient's post-ICU disposition. A more comprehensive post-PRRT or Rover Team interaction survey is being developed to gather feedback from all members involved in PRRT or Rover Team interactions. Such ongoing and multidisciplinary feedback should help PRRT and Rover Teams to improve.

Conclusion

The Pediatric Rapid Response System with the proactive Rover Team and rapidly-reactive PRRT helped reduce patient cardiac arrests outside the ICU setting, improved patient continuity between the critical care and non-ICU inpatient areas, and strengthened multidisciplinary team culture and communication. A proactive Rover Team more easily identifies patients at risk for clinical deterioration and more quickly administers time-sensitive therapies. This proactive approach helps support the reactive RRT, facilitates care throughout Children's Service, and improves clinically important outcomes.

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