

## Research Article

# Pediatric Rapid Response System: An Exploration of Team Members' Perceptions

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Received: August 14, 2014; Accepted: October 01, 2014; Published: October 29, 2014

## Abstract

**Background:** Complex modern healthcare systems create challenges with medical communication and coordination. Serious adverse events are known to occur as a result of inadequate communication. Emergency code and rapid response teams provide care for critical decompensations of patients and bridge communication gaps. Qualitative reviews of the emergency teams may improve healthcare communication and patient safety.

**Methods:** A cross sectional web-based survey study was conducted to investigate the perceptions of the rapid response (RR) personnel about the RR system in our institution. The survey investigated four domains: 1) Clinician experience and knowledge, 2) System deficiencies, 3) Team performance and 4) Opportunity for feedback. Respondents were blinded to the investigator and answered Likert Scale and free text questions.

**Results:** Eighty-five RR members from our institution [nurses (RN), respiratory therapists (RT) and critical care fellows (MD)] were electronically queried. The response rate was 77.6% with no significant difference among the three groups of respondents. Majority of responders had more than three years of clinical and RR experience. RNs and MDs reported equipment inadequacies more than RTs ( $p=0.026$ ). MDs reported information paucity more than RNs and RTs ( $p=0.001$ ). Responders also reported deficiency of timely availability of pharmacy staff. Team performance was overall satisfactory, with family update rated the highest and staff education the lowest. Feedback process was deemed adequate.

**Conclusion:** A survey of RR team members can help to identify perceived system and personnel deficiencies and provide valuable knowledge to direct performance improvement endeavors.

**Keywords:** Rapid Response Team; Medical Emergency Team; Survey; Perceptions; Critical Communication; Quality Improvement

## Abbreviations

RR: Rapid Response; RN: Registered Nurses; RT: Respiratory Therapists; MD: Critical Care Fellows; MET: Medical Emergency Teams; ICU: Intensive Care Unit; SBAR: Situation-Background-Assessment-Recommendation; TCH: Texas Children's Hospital; PDSA: Plan-Do-Study-Act

## Introduction

In the landmark report "To Err is Human", the Institute of Medicine stated that more people die annually from medical errors than motor vehicle accidents. Lack of coordination and communication among different health care providers is reported to be a huge contributor to these errors [1]. Serious adverse events are reported to occur in as many as 3.7% of hospitalizations. More than a quarter of these adverse events are related to negligence and substandard care [2,3]. Many unrecognized serious adverse events progress to cardiopulmonary arrest. Clinical signs of deterioration are reported to be present for as long as eight hours prior to cardiac arrest [4]. Hospital deaths can potentially be prevented by early interventions targeted to address physiologic abnormalities [5].

Medical emergency teams (MET), code response or rapid response (RR) teams were created to provide correct and timely interventions to deteriorating patients. Code teams respond to critical and emergently fatal patient events. MET or RR teams respond to other decompensations that are not acutely fatal, but which require timely intervention to prevent subsequent deterioration. These emergency teams function as specialized healthcare teams to provide acute assessment, timely intervention and necessary communication to escalate care for the clinically deteriorating patients outside the intensive care unit (ICU) [6,7].

The RR system has four elements: activation (afferent), response (efferent), administrative and quality control [8]. The afferent element has a crisis detection and response triggering mechanism that examines medical data to recognize clinical deterioration of a patient and trigger the rapid response [9]. The efferent component is composed of highly skilled response personnel who have advanced knowledge and skill set to assess and intervene. The administrative group provides structure, education and resources to the system, and the quality control element reviews the adverse events and works to improve hospital-wide rapid response processes [10,11].

Extensive establishment of RR systems has occurred, across most hospitals of the country over the past decade. The performance of emergency teams of individual hospitals is carefully assessed at the national level. This evaluation scrutinizes the number of cardiac arrests outside the ICU as a measure of team efficacy. Another standard used is the frequency of RR team responses per patient days or per patient discharges. Other benchmarks have evaluated parent satisfaction with the RR team process [12]. Despite the widespread existence of RR teams, there is no study that evaluates resource availability and staff satisfaction with RR system. Such a study could potentially guide individual hospitals to optimally manage resources and improve their rapid response systems.

## Materials and Methods

### Setting

We performed a survey study at Texas Children's Hospital (TCH), Houston, Texas. The hospital is a pediatric tertiary care referral hospital with over 600 inpatient beds and around 500 rapid response events per year. Clinical staff and/or family members of the patients can activate a RR event. The criteria for RR activation include: acute change in patients' vital signs, respiratory distress, changes in mental status, seizures, difficult to control pain, or acute clinical concern expressed by the staff or family members. The RR team arrives to the patient's bedside within 15 minutes of being notified. The SBAR (situation-background-assessment and recommendation) communication tool is utilized for information exchange between team members [13]. The RR team personnel are derived from existing ICU based designated RN, RT and critical care fellows. The team members are specially trained and have advanced knowledge and skills necessary for rapid response to crisis situations. At the time of this study there were 85 RR system trained clinical personnel (34 RNs, 35 RTs and 16 MDs) who were potential RR system responders. All providers were included in our sample population.

### Hypothesis

The Rapid Response (RR) Team members who function as the actual responders to the emergent situations will provide an insight into the RR system function, resource availability and team performance. The information obtained from the responders will help identify the strengths and deficiencies of this system and facilitate endeavors to build a platform for team and RR process improvement.

### Study Design

We designed a web-based cross-sectional survey to investigate perceptions of the RR team personnel about the RR system. A focus group of clinicians helped us identify salient traits related to RR events that needed to be studied. The survey investigated four main domains: 1) Clinician experience and knowledge, 2) System deficiencies during a RR event, 3) Team performance during and after the event and 4) Opportunity and mode of feedback process. In the domain of system deficiencies, the survey queried the responders about their perceived satisfaction with availability of: a) essential equipment needed for patient care, b) pertinent medical information and c) clinical personnel needed during a RR event. The responders scored these three on a scale of 1 (never available) to 5 (always available). The survey further investigated the themes of missing equipment, information and personnel using free text response questions. Regarding team

performance (domain 3), the survey asked the responders to score areas of clinical care on a scale of 1 (poor) to 5 (excellent). The areas addressed within this domain were: communication (information exchange between team members while providing emergency care to the patient), collaboration (coordination between team members to achieve patient care goals), role assignment (team members performing specific tasks during a crisis situation), mental modeling (team leader reflecting on clinical summary during the emergency event and seeking feedback), staff education (ongoing teaching received by RR skilled personnel and education provided by RR team to other clinical staff) and family update (account of events given by staff to family). The last domain asked respondents about their satisfaction with the opportunity of feedback that is available for them to provide criticisms and comments to their supervisors and the RR system administrative committee regarding concerns about individual events and overall system function.

### Survey administration

The survey tool was designed and administered via electronic survey administration software [14]. All RNs, RTs and MDs who were on the roster of RR system response list were the available "convenience" sample and were approached via email with a link to the survey. All responses were collected anonymously and there was no penalty for non-responsiveness. Two reminder emails were sent at one-week intervals after the original survey email, to each participant.

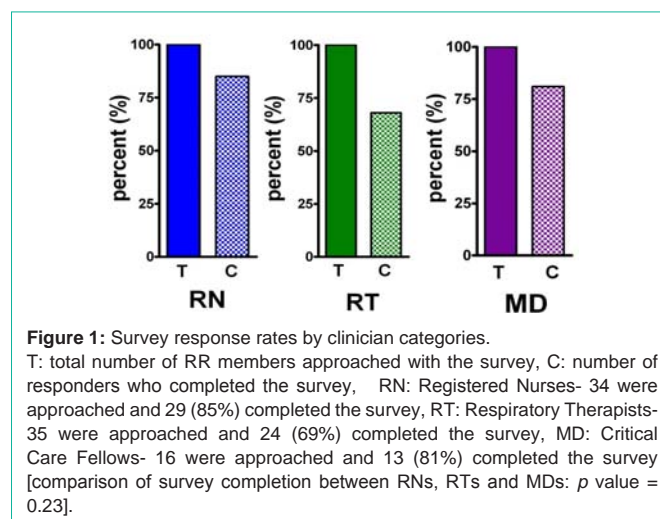
### Statistical analysis

Survey responses with a completion rate of 80% or more questions were included in the analysis. We did not assume any data for missing answers. Chi-square testing was used to compare differences between the provider groups. A *p* value of less than or equal to 0.05 was considered as a level of significance. Graph Pad Prism version 5.0 (Graph Pad Software Inc. San Diego, CA, USA.) was used for all statistical calculations.

## Results

### Survey response rate

Eighty-five RR team members (34 RNs, 35 RTs and 16 MDs) were approached via email with a link to complete the survey. Sixty-six clinical personnel (29 RNs, 24 RTs and 13 MDs) responded to



**Table 1:** Experience of Survey Responders.

Categories	Survey responders (%) and experience duration			
	Less than 6 months	6 months to 1 year	1 year to 3 years	More than 3 years
Clinical Role (RN, RT or MD)	0	7	25.8	67.2
Designation as RR Team Member	6.6	8.4	30	55

the survey with a response rate of 77.6%. All responses were 80% or more complete and were included in the analysis. The distribution of total personnel in each clinical category approached with the survey and percentage of completed responses is depicted in attached figure (Figure 1). There was no statistically significant difference of representation between the three groups of respondents. (Chi-square  $p$  value = 0.23)

**Clinician experience and knowledge about RR system**

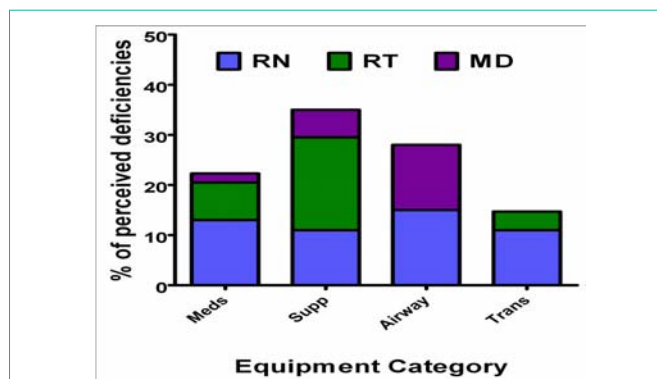
At the time of this survey, 67.2% of the respondents had been in their respective clinical roles (RN, RT and MD) for more than three years and 25.8% had between one to three years of experience. Fifty-five percent responders were on the RR system team members’ list for more than three years (Table 1). Majority of the responders (94%) felt adequately trained in the management of critical situations and were comfortable to participate in the RR team. More than 96% had the knowledge on how to trigger the RR system in the situation that they had to activate a RR event.

**System deficiencies during a RR event**

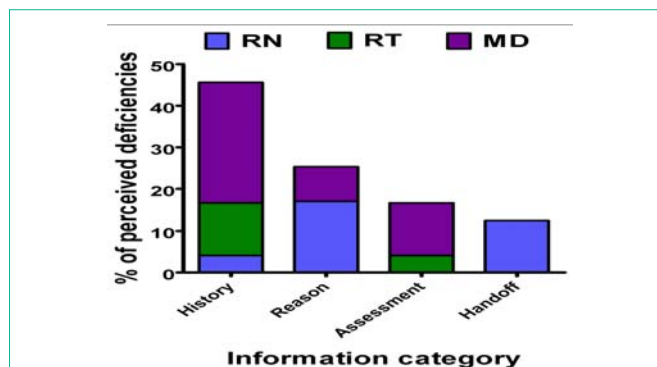
Availability of essential equipment, pertinent medical information and accessibility of necessary personnel were allotted Likert scores of 4.09, 4.12 and 4.23 respectively on a scale of 1 (never available) to 5 (always available), by the survey responders. RNs and MDs were the most common responders who reported equipment related deficiencies. RTs were less likely to report paucity of equipment with a statistically significant difference between the groups. (Chi-square  $p$  value = 0.026) The most commonly reported equipment absence was related to emergency patient supplies (example: IV bolus administration setup, medication connector tubings etc.). Other equipment inadequacies fell into the categories of medications, airway supplies and transportation resources (Figure 2). The areas of information deficiency included lack of comprehensive history, reason for RR activation, patient assessment and accurate SBAR handoff from RR event activating staff to the RR team. MDs were significantly higher than the RNs or RTs to report information insufficiency (Figure 3). (Chi-square  $p$  value = 0.001) RTs did not report any insufficiency of airway supplies, or information related to reason for RR call or handoff. Presence of necessary personnel during a RR event was mostly reported to be satisfactory (64%). Among the respondents who reported that this realm was inadequate, the commonly perceived deficit was lack of pharmacy staff by 32% followed by absence of primary medical team members (4%).

**Team performance during and after a RR event**

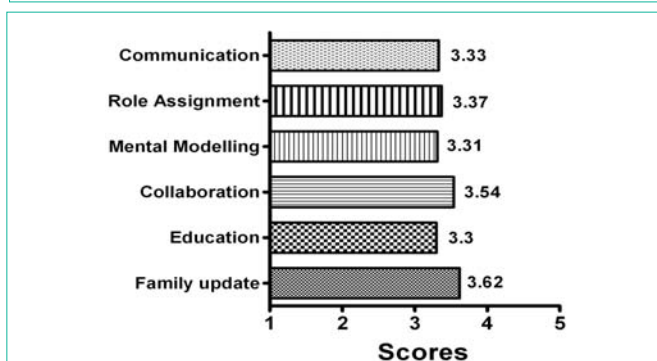
The mean scores for the six items describing team performance: Communication, role assignment, mental modeling, collaboration, education of staff and family update ranged from 3.3 to 3.62 on a five point Likert scale (1: poor to 5: excellent). The highest scoring item was “family update”. Survey responders allotted lower scores to “staff education” and “mental modeling” (Figure 4). The percentage of survey responders in each liket level of satisfaction with different



**Figure 2:** Perceptions about equipment deficiency. Meds: medications, Supp: patient supplies, Trans: transportation materials (example: stretchers, transport monitors).



**Figure 3:** Perceptions about information deficiency.



**Figure 4:** Likert scores of items depicting team performance.

team performance attributes is depicted in Table 2.

**Opportunity and mode of feedback process**

Overall, 70% responders affirmed that the current feedback system for RR events was adequate. The preferred method for feedback to their supervisors and the RR system administrative committee was discussion and debriefing immediately following the event for 43% of the responders. This was closely followed by email correspondence as the preferred forum for feedback (38%). Most nurses preferred

**Table 2:** Perceptions of Survey Responders about Team Performance.

Team Performance Attributes	Survey responders (%)				
	Poor	Average	Good	Very Good	Excellent
Communication	1.6	22.2	27	39.7	9.5
Role assignment	3.2	19	27	39.7	11.1
Mental modeling	3.8	17.9	34.9	32	11.4
Collaboration	0	15.9	31.7	35	17.4
Education of staff	1.6	26.9	23.8	35	12.7
Family update	0	7.9	36.5	41.3	14.3

The numbers indicate the percentage of respondents who graded the individual communication attribute on a Likert scale of poor to excellent.

discussion and debriefing form of feedback.

## Discussion

This is the first pediatric study we know of, that explores the perceptions of RR team members regarding the functioning of RR system during an emergent response to patient decompensations, in a busy tertiary care single large children's hospital.

Our survey response rate (77.6%) was higher compared to those obtained by medical survey studies. Not only was the overall response rate robust, but also there was a uniformly high respondent rate within each clinical group. This could be due to the fact that the responders were motivated to provide insightful opinions for system improvement. Another possibility for high response rate was the ensured anonymity of the applied survey methodology, which made the responders comfortable and forthcoming in providing their perceptions. A noteworthy aspect of the responses was that most of the respondents who answered the survey had significant experience in their respective clinical roles and as RR team members.

The study demonstrated several areas in which RR team members saw opportunities for RR system improvement. Different groups of providers (RN, RT and MD) reported different deficiencies. For example, RNs and MDs perceived equipment deficiencies, which may be related to specific delegated tasks in RR team roles. MDs opined that medical information was deficient more so than the RNs and RTs. Though the pharmacist is not a part of our RR team, when needed at bedside, timely presence of a pharmacist was reported to be deficient. In the domain of team performance it was informative to learn that the clinicians are content with the current level of team functioning. The team reported good satisfaction with the updates provided to family, but indicated lesser satisfaction with how the medical staff receives education. Another valuable knowledge gained was that the RR team members are content with the event and RR system related feedback process.

The survey provided the RR system administrative committee with valuable information to direct quality improvement efforts to enhance RR performance. This study has guided us to implement process checks that will ensure that commonly reported equipment; personnel and information gaps are bridged. For example, we now include an equipment checklist that a RR team member completes at the beginning of each shift to prevent equipment deficiencies. To enhance team coordination, we have provided additional communication tools such as bedside cards reminding the team members about SBAR communication and posters demonstrating the different team roles to be fulfilled during emergent events. RR

responders also receive specific information about closed loop communication during their initial rapid response training and periodic re-education sessions. We have explicit paging and alert processes in place to facilitate timely pharmacist presence when needed. The RR system administrative and quality improvement committee will continue ongoing assessment of system functioning and ensure ongoing PDSA (plan-do-study-act) cycles to evaluate outcomes of the process enhancement endeavors.

Despite the helpful information gained from our survey, we acknowledge certain limitations of this study. As it is a single center pediatric study, the survey tool may not be directly applicable to other hospitals' RR systems or adult facilities. Also, a lack of another gold standard survey tool that can be used in a similar setting to obtain the intended knowledge made it difficult to assess validity and reliability of individual survey questions. The survey administration software and the process of maintenance of responder anonymity may have allowed for some duplication of responses. Despite these limitations, we feel that our survey serves as a starting point to initiate process check endeavors to guide system improvement.

## Conclusion

We believe that our survey describes the overall team perceptions about RR system with clinical applicability towards process improvement goals. The RR administrative committee has implemented quality improvement initiatives to improve equipment availability, pharmacy presence and the relay of relevant information to the RR team members as guided by our survey results. The system deficiencies and strengths identified in our study can potentially benefit other centers to plan and execute a robust RR system, which is rapidly evolving into an essential modality for quality improvement and patient safety across the country. In future, we intend to perform a similar needs assessment endeavor to assess improvement strategies needed from the perspective of staff and patients who activate the RR system.

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