



## Research paper

## Effect of a 2-tier rapid response system on patient outcome and staff satisfaction



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At the conclusion of this article a Continuing Professional Development activity is attached

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## ABSTRACT

**Background:** Rapid response systems (RRS) have been recommended as a strategy to prevent and treat deterioration in acute care patients. Questions regarding the most effective characteristics of RRS and strategies for implementing these systems remain.

**Aims:** The aims of this study were to (i) describe the structures and processes used to implement a 2-tier RRS, (ii) determine the comparative prevalence of deteriorating patients and incidence of unplanned intensive care unit (ICU) admission and cardiac arrest prior to and after implementation of the RRS, and (iii) determine clinician satisfaction with the RRS.

**Method:** A quasi-experimental pre-test, post-test design was used to assess patient related outcomes and clinician satisfaction prior to and after implementation of a 2-tier RRS in a tertiary metropolitan hospital. Primary components of the RRS included an ICU Outreach Nurse and a Rapid Response Team. Prevalence of deteriorating patients was assessed through a point prevalence assessment and chart audit. Incidence of unplanned admission to ICU and cardiac arrests were accessed from routine hospital databases. Clinician satisfaction was measured through surveys.

**Results:** Prevalence of patients who met medical emergency call criteria without current treatment reduced from 3% prior to RRS implementation to 1% after implementation; a similar reduction from 9% to 3% was identified on chart review. The number of unplanned admissions to ICU increased slightly from 17.4/month prior to RRS implementation to 18.1/month after implementation ( $p=0.45$ ) while cardiac arrests reduced slightly from 7.5/month to 5.6/month ( $p=0.22$ ) but neither of these changes were statistically significant. Staff satisfaction with the RRS was generally high.

**Conclusion:** The 2-tier RRS was accessed by staff to assist with care of deteriorating patients in a large, tertiary hospital. High levels of satisfaction have been reported by clinical staff.

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## 1. Introduction

Rapid response system (RRS) development has been driven by the knowledge that critical deterioration in patients is often preceded by measurable signs of physiological deterioration for many hours prior to that event.<sup>1</sup> Early identification of this deterioration, with implementation of appropriate treatment, has the potential to improve patient outcomes. Yet, hospitals struggle to ensure that RRS are both implemented and activated appropriately.

RRS are conceptualised as having an afferent and efferent arm, both of which are multifaceted.<sup>1,2</sup> The afferent arm focuses on detecting deterioration and consists of tools such as the modified early warning score<sup>3</sup> and the medical emergency calling criteria.<sup>4</sup> The efferent arm encompasses response strategies such as intensive care unit (ICU) outreach nurses, sometimes called ICU Liaison Nurses<sup>5</sup> and Rapid Response Teams (RRT), also called medical emergency teams (MET).<sup>1</sup> Many single centre, before-and-after studies have suggested that implementing a RRS improves patient morbidity and mortality,<sup>6</sup> although the results of reviews to identify the effects of both afferent and efferent interventions have been mixed.<sup>2</sup> These conflicting results are likely related to the difficulties in conducting high quality studies such as randomised controlled trials of health system interventions as well as heterogeneity of the implementation strategies used.

Despite these inconsistencies, many agree that early intervention makes 'sense' and widespread recommendations for the implementation of RRS in acute care hospitals have been made.<sup>7,8</sup> Questions around the most effective characteristics of RRS and methods for implementing these systems remain. There are variations in characteristics such as activation criteria, membership of the RRT and funding for RRS activities.<sup>9–11</sup> An additional question includes whether RRT should act separate from, or as an extension of any 'code' (cardiac arrest) team that exists.<sup>12,13</sup> Recent literature has suggested RRS models that incorporate both afferent and efferent strategies provide benefit over single purpose systems.<sup>1,4</sup>

Despite widespread support for RRS, there has been little documentation and analysis of the strategies used to implement, sustain or evaluate these systems.<sup>14,15</sup> Use of RRS remains inconsistent and probably underutilised, and although reasons for lack of activation are not entirely clear,<sup>2,16</sup> some beginning understanding of relevant factors is available.<sup>17</sup> Given this beginning knowledge, the recommendations made by the Australian Commission on Safety and Quality in Healthcare for all healthcare facilities to have systems in place to recognise and respond to clinical deterioration<sup>7</sup> and anecdotal evidence to suggest the current local system did not meet all clinical needs, a revised 2-tier RRS was planned. The two tiers of this system were to consist of an ICU Outreach Nurse service and a RRT, with the aim of enabling easy and rapid escalation of care for patients whose condition was deteriorating.<sup>7</sup> A system that takes account of the structures that exist within the surrounding organisation, supports effective processes of care, is perceived as being easy and relevant to use and produces a high level of outcomes is essential to achieve intended goals.<sup>18</sup> The aims of this present study were therefore to (i) describe the structures and processes used to implement a 2-tier RRS, (ii) determine the success of the 2-tier RRS using patient-centred outcomes and (iii) to determine clinician satisfaction with the 2-tier RRS.

## 2. Method

A quasi-experimental, pre-test post-test design was used to assess the impact of a new 2-tier RRS within the Princess Alexandra Hospital (PAH) in Brisbane, Australia on the:

(1) Prevalence of deteriorating patients;

(2) Incidence of unplanned admissions to ICU from the hospital wards and cardiac arrests (excluding ICU and Emergency Department [ED] arrests); and Staff satisfaction with the new service.

The PAH is a 750 bed tertiary hospital that caters to most specialties except maternity and paediatrics.

### 2.1. Pre-implementation RRS practice

Prior to implementation of the new service, if hospital staff were concerned about the condition of a patient and unable to access assistance from the relevant medical team they requested assistance from a Medical Registrar based on Medical Emergency Call (MEC) criteria consistent with those used internationally for RRS (i.e. abnormal blood pressure, heart rate, respiratory rate or conscious level, low oxygen saturation, threatened airway, ongoing seizures, significant blood loss or any other clinical condition causing concern to the staff). If a patient deteriorated further definitive assistance was available from a Cardiac Arrest team. Both of these strategies to access help were managed via a phone call to the hospital switchboard who paged the relevant clinical staff.

### 2.2. RRS interventions

The 2-tier RRS implemented during this study consisted of:

1. Intensive Care Unit Outreach Nurse (ICUON) – senior ICU nursing staff available to assist with stabilisation and care of deteriorating patients
2. Rapid Response Team (RRT) – multi-disciplinary team that replaced the previous MEC system and Cardiac Arrest team to manage medical emergencies.

Any clinical staff member throughout the hospital was able to activate either tier of the RRS by phone 24/7. Activation of the ICUON was achieved by direct phone call or via the hospital switchboard who transferred the call to the ICUON, while activation of the RRT was achieved via the hospital switchboard who paged the relevant team members. MEC criteria did not change with implementation of the new system and included changes in airway, breathing, circulation, neurology and other factors. Staff could make a decision to call either the ICUON or the RRT – in practice they called the RRT if a patient met the specific physiological alert criteria, but called the ICUON for general concern prior to a patient meeting any specific physiological alert criteria. Patients who had been reviewed by the ICUON or RRT or discharged from the ICU received daily review by the ICUON until they were considered stable.

The ICUON provided a dedicated service from 0700 to 2300; overnight the service consisted of an ICU nurse allocated reduced patient load to allow them to provide the outreach service. The RRT was a single team that responded to both deteriorating patients and cardio/respiratory arrests and included a Medical Registrar and Resident, ICU Junior Registrar, ICUON, Coronary Care Unit (CCU) or ED nurse, Resuscitation Coordinator and Operational Officers from 0800 to 1700 (in hours). After hours the team included the after-hours Medical Resident, ICU Junior Registrar, ICUON and a CCU or ED nurse. When a RRT was called the treating team Registrar and Resident were also notified during hours.

### 2.3. Implementation strategies

Prior to introduction of the 2-tier RRS for the management of deteriorating patients a number of structural and process

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