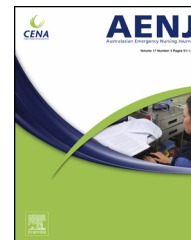




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RESEARCH PAPER

# Epidemiology of early Rapid Response Team activation after Emergency Department admission



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## KEYWORDS

Emergency medicine;  
Hospital Rapid  
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Intensive care units;  
Mortality;  
Triage

## Summary

**Background:** Rapid Response Team (RRT) calls can often occur within 24 h of hospital admission to a general ward. We seek to determine whether it is possible to identify these patients before there is a significant clinical deterioration.

**Methods:** Retrospective case–controlled study comparing patient characteristics, vital signs, and hospital outcomes in patients triggering RRT activation within 24 h of ED admission (cases) with matched ED admissions not receiving a RRT call (controls).

**Results:** Over 12 months, there were 154 early RRT calls. Compared with controls, cases had a higher heart rate (HR) at triage (92 vs. 84 beats/min;  $p=0.008$ ); after 3 h in the ED (91 vs. 80 beats/min;  $p=0.0007$ ); and at ED discharge (91 vs. 81 beats/min;  $p=0.0005$ ). Respiratory rate (RR) was also higher at triage (21.2 vs. 19.2 breaths/min;  $p=0.001$ ). On multiple variable

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analysis, RR at triage and HR before ward transfer predicted early RRT activation: OR 1.07 [95% CI 1.02–1.12] for each 1 breath/min increase in RR; and 1.02 [95% CI 1.002–1.030] for each beat/minute increase in HR, respectively. Study patients required transfer to the intensive care in approximately 20% of cases and also had a greater mortality: (21% vs. 6%; OR 4.65 [95% CI 1.86–11.65];  $p=0.0003$ ) compared with controls.

**Conclusions:** Patients that trigger RRT calls within 24h of admission have a fourfold increase in risk of in-hospital mortality. Such patients may be identified by greater tachycardia and tachypnoea in the ED.

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## What is known

- There is already extensive research supporting the notion that the implementation of Rapid Response Teams (RRT) reduces in-hospital cardiac arrests and morbidity.
- Also many epidemiological studies have shown that up to a quarter of RRT calls occur in the first 24h of a patient's hospital admission.
- These phenomena may represent inappropriate disposition of an unstable patient from the Emergency Department to a general ward or it may simply represent early clinical deterioration after admission; the reason for this high incidence of early RRT calls is not clear.
- However, we do know from the current data on RRTs that significant clinical events are preceded by significant abnormalities in clinical signs several hours prior.
- Can we therefore use similar clinical signs to predict RRT calls before they occur, to predict clinical deterioration at an earlier stage in a patient's hospital admission such as while they are being assessed in the Emergency Department so that an intervention may take place to improve patient outcomes?

## What this paper adds?

- Our study confirmed that the patients that have an early RRT call during their admission are within the cohort of patients that are at high risk of in-hospital mortality.
- Furthermore, we showed that it is possible to identify these high risk patients while they are still being managed in the Emergency Department by means of abnormalities in heart rate and respiratory rate.
- Our study also showed many other associations between abnormal vital signs and early RRT calls, which with further future research may once help to produce a more robust clinical tool to help clinical Emergency Department staff to identify and improve care and disposition of these high risk patients.

## Introduction

At least two-thirds of in-hospital cardiac arrests are preceded by abnormal vital signs within the previous 24h.<sup>1–3</sup> To reduce preventable cardiac arrests, many hospitals have implemented a Rapid Response Team (RRT) to review and manage deteriorating ward patients with deranged vital signs. In several single centre before-and-after studies, RRTs have been shown to reduce rates of in-hospital cardiac arrests and of other adverse clinical outcomes.<sup>4–7</sup>

There has been recent interest in identifying the factors that predispose patients to needing RRT review. One multi-centre study suggested that approximately one-quarter of all RRT calls occurred within 48h of admission to hospital.<sup>8</sup> These findings were supported by a more recent study,<sup>9</sup> which specifically investigated patients admitted via the Emergency Department (ED), and found that in these patients a quarter of RRT calls occurred within 24h of admission. Farley et al.<sup>10</sup> showed that tachypnoea during the ED episode of care increased the odds of RRT activation and need for higher-level care within the first 24h of admission.<sup>10</sup> Similarly, Considine et al.<sup>11</sup> showed that abnormal physiology early in the ED episode of care has been associated with critical care admission in patients triaged as low to moderate acuity. Specifically, heart rate or temperature abnormalities at triage and respiratory rate or heart rate abnormalities at first nursing assessment increased the odds of critical care admission by a factor of 1.6–2.9.<sup>11</sup>

Pronovost and Litvak<sup>12</sup> have suggested that RRT calls occurring early in a patient's admission may represent sub-optimal triage and disposition. They specifically advocated the need for better identification of at risk patients and their appropriate disposition to an adequate setting such as a critical care area. Nurses are primarily responsible for vital sign assessment, interpretation and escalation of care in both ED and ward settings.<sup>13,14</sup> It is possible that detailed assessment of patient characteristics prior to disposition from ED to a hospital ward may help identify patients at risk of an early RRT call.

The aim of this study was therefore to define the epidemiology and associations of patients receiving RRT activation within 24h of admission from ED to a non-critical care ward. In addition, we assessed whether the need for early RRT review was associated with increased risk of in-hospital mortality or need for critical care transfer.

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