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SCIENTIFIC LETTER

The epidemiology and outcomes of adult rapid response team patients in a tertiary care hospital in India

Epidemiología y resultados de los pacientes adultos del Equipo de Respuesta Rápida en un hospital de atención terciaria de la India

Dear Editor,

During their course of hospitalisation, many ward patients may deteriorate unexpectedly requiring intensive care unit (ICU) admission and leading to poor outcomes. A significant proportion of these events may be preventable.[1] Rapid response teams (RRTs) have been introduced with an aim to detect early deterioration among ward patients to prevent morbidity, mortality and reduce ICU readmission rates.[2–4] In spite of various studies claiming its effectiveness, the role of RRTs in reducing hospital mortality remains controversial. Recent meta-analyses have shown that RRT implementation is associated with an overall reduction in hospital mortality and out-of-ICU cardiopulmonary arrests.[5,6]

There is a wide variation in how RRTs are constituted, delivered and evaluated.[5] Hence, it becomes imperative to have knowledge of the local factors, which might influence its efficacy, quality and impact. Moreover, there is dearth of data regarding the demographics and outcomes of RRT patients. Hence, we aimed to determine the patient characteristics, causes, and outcomes of RRT in a tertiary care hospital in India.

A well-established RRT, headed by intensivist, has been in place for more than a decade in our hospital. The nurses are given a set of triggers, based on which they call the RRT through a dedicated hotline number. We use a single-parameter trigger system, rather than an aggregate weighted scoring system like the early warning score.

All adult patients with activation of RRT between 1 January 2017 and 31st January 2018 were included. Patients below 15 years, patients with code blue activations and those with do-not-resuscitate (DNR) status were excluded. Data were collected retrospectively from the RRT audit forms. Variables included patient characteristics, timing, location, triggers, need for transfer to higher-level care area, and the hospital mortality. Only the first RRT event of each admission was analysed. Hospital mortality was taken as the primary outcome measure.

Chi square test, Fisher's exact test, or independent sample *t*-test, were performed as appropriate. Uni-variate and multi-variate logistic regression analysis was performed to assess the factors associated with need for transfer to higher-level care units and those associated with higher hospital mortality. All tests were two-tailed, with $p < 0.05$ defined as being significant.

135 RRT activations were analysed out of 13,782 total admissions (9.8/1000 admissions) (Table 1). The most common organ system involved was respiratory (56, 41.5%), with new onset or worsening of breathlessness (43, 31.9%) being the commonest trigger followed by desaturation (11, 8.4%) and tachypnea (2, 1.5%). Neurological system was involved in 16 (11.9%) with 8 patients each having altered mental status and seizures, respectively. Cardiovascular system was involved in 13 (9.62%), with complaints of hypotension or hypertension (7 patients) and tachycardia or bradycardia (6 patients). Five patients (3.7%) had acute bleeding and multisystem involvement was present in 50 (37%). In univariate analysis, patients with multiple triggers were more likely to require higher-level care ($p = 0.017$).

Fifty patients (37%) died in hospital. In univariate analysis, three factors; multiple triggers, place for RRT and underlying malignancy were associated with hospital mortality. However, on multivariate analysis, only two factors, multiple triggers and underlying malignancy were associated with hospital mortality (Table 2).

The reported number of RRT activations have varied across studies with the reported mean around 16.3/1000 admissions (95%CI: 9–23.7).[5] The activation trigger may provide an important clue to underlying diagnosis or the problem necessitating RRT. Certain triggers may even be associated with poorer outcomes.[7,8] Moreover, it is common to have more than one trigger.[8] In our study, the symptoms related to respiratory system were the commonest cause for RRT activation and multiple triggers were present in 66.7%. In addition, presence of multiple triggers were associated with need for transfer to higher care unit and increased hospital mortality.

Other studies have also shown that majority of RRT calls occur outside the normal work hours and most calls occur in ward patients.[8] Chances of RRT calls are also more in the first few days of hospitalisation.[8]

In our study, the most common primary speciality involved were oncology and general medicine. Other studies have also shown significant number of patients from these departments, but this proportion may vary from hospital to hospital, depending on the case-mix.[6] However, identifying these departments in a particular hospital may aid in identifying the lacunae and taking appropriate quality initiatives, to improve patient outcomes.

In a large study assessing the epidemiology of adult RRT patients in Australia, 25% mortality was reported.[9]A meta-

Table 1 Patient characteristics.

Patient parameter	$N = 135$
Age, mean (± SD)	60.6 (±16.7) years
Sex	Males 83 (61.5%)
	Females 52 (38.5%)
Length of stay before RRT, mean (± SD)	8.6 (±12.8) days
Patients requiring RRT within 48 h of hospitalisation	55 (40.7%)
Type of patient	Medical 124 (91.9%)
	Surgical 11 (8.1%)
Primary speciality	Cardiology 4 (3%)
	CTVS 2 (1.5%)
	Gastroenterology 2 (1.5%)
	General surgery 1 (0.7%)
	Liver transplant 1 (0.7%)
	Medicine 23 (17%)
	Nephrology 26 (19.3%)
	Neurology 4 (3%)
	Oncology 61 (45.2%)
	Respiratory medicine 4 (3%)
	Onco-sugery 4 (3%)
	Urology 3 (2.2%)
Timing of RRT	Working hours 64 (47.4%)
	Off hours 71 (52.6%)
Previous ICU stay	25 (18.5%)
Organ system involvement	Respiratory 56 (41.5%)
	CVS 13 (9.6%)
	CNS 16 (11.9%)
	Multiple organ involvement 45 (33.3%)
	Bleed 5 (3.7%)
More than one trigger	90 (66.7%)
Place of RRT	Wards 123 (91.1%)
	Procedure room 8 (5.9%)
	OPD 4 (3%)
Transfer to higher care unit	115 (85.2%)
Length of stay in hospital	8.6 (±12.8) days
Length of stay in ICU	7 (±7.6) days
Hospital mortality	50 (37%)

SD – standard deviation, RRT – rapid response team, CTVS – cardio-thoracic vascular surgery, CVS – cardiovascular system, CNS – central nervous system, OPD – out patient department, ICU – intensive care unit.

analysis involving 29 studies with 157,383 RRT activations reported a median of 23% (8.2–56%) activations resulting in ICU transfer.[10] However, in our study, rate of transfer to a higher care was 85.2%. The reasons for a higher rate could be that we included those patients also who were shifted to any monitored bed including emergency room, or a low threshold of shifting the patients. However, this could also depend on our case-mix, as a large proportion of our patients had underlying malignancy which may explain higher transfer rates and hospital mortality. The same meta-analysis also reported a wide variation in the mortality rates between different studies. The median hospital mortality reported was 26% (12–60%), and the median 30-day mortality rate was 29% (8–39%).[10] Our hospital mortality rate of 37% was within the reported range.

This is one of the first studies, from India, assessing the utility of RRT. As our case-mix and problems are unique, we need further studies to assess the problems faced in RRT implementation and make the necessary policy changes. Apart from assessing the triggering factors, this study also evaluated the factors leading to poor patient outcomes, which only a few other studies have done.[5] Our study had some limitations too. It was single centre, retrospective study. Although, we did assess the factors associated with hospital mortality, our study was not designed to assess the impact of RRT on hospital mortality.

To conclude, RRT activation triggers may provide a general indication of the underlying diagnosis and provide some clues regarding the preventable issues which could provide a focus for unit-based quality initiatives. The high rate of need for transfer to higher-level care units and post-RRT deaths suggest need for prospective identification of such patients in order to target appropriate care and improve outcomes. Patients who have multiple triggers and those with underlying malignancy may have poorer outcomes.

Table 2 Comparison between survivors and non-survivors.

Patient parameters	Survivors ($n = 85$)	Non-survivors ($n = 50$)	*P* value
Age, mean (± SD)	59.5 (±17.7) years	62.6 (±14.8) years	0.091
Sex			
Males	50	33	0.466
Females	35	17	
Type of patient			
Medical	78	46	1.000
Surgical	7	4	
Underlying malignancy	32	33	0.002*
Timings			
Working hours	37	27	0.285
Off-hours	48	23	
RRT within 48 h of hospitalisation	39	16	0.147
Length of hospitalisation before RRT, mean (± SD)	8 (±14.1) days	9.6 (±10.3) days	0.738
Previous ICU stay	12	13	0.109
Multiple RRT triggers	50	40	0.014*
Place of RRT			
Wards	73	50 (100%)	0.021*
Procedure room	8		
OPD	4		
Length of stay in hospital, mean (± SD)	20.2 (±21.9) days	18.4 (±14.6) days	0.334
Length of stay in ICU, mean (± SD)	6.6 (±6.5) days	7.7 (±8.8) days	0.148
Multivariate analysis			
Multiple triggers	Odds ratio: 2.69	95% confidence interval = 1.1–6.5	0.028*
Underlying malignancy	Odds ratio: 3.69	95% confidence interval = 1.7–8	0.001*
Place of RRT			0.999

SD – standard deviation, RRT – rapid response team, OPD – out patient department, ICU – intensive care unit.

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Conflict of interest

Nil.

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V. Arora[a], D. Juneja[b,*], O. Singh[c], A. Singh[d], D. Tiwari[e], A. Gupta[f]

[a] *Attending Consultant, Institute of Critical Care Medicine, Max Super Speciality Hospital, Saket, New Delhi 110017, India*
[b] *Director, Institute of Critical Care Medicine, Max Super Speciality Hospital, New Delhi 110017, India*
[c] *Principal Director, Institute of Critical Care Medicine, Max Super Speciality Hospital, New Delhi 110017, India*

[d] *Senior Consultant, Institute of Critical Care Medicine, Max Super Speciality Hospital, New Delhi 110017, India*
[e] *Deputy Medical Superintendent, Max Super Speciality Hospital, New Delhi 110017, India*
[f] *Consultant, Institute of Critical Care Medicine, Max Super Speciality Hospital, New Delhi 110017, India*

* Corresponding author.
E-mail address: devenjuneja@gmail.com (D. Juneja).

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Analytic review and meta-analysis of awake prone positioning in patients with Covid-19

Revisión analítica y meta-análisis de prono vigil en pacientes con Covid-19

Dear Editor,

SARS-CoV-2 virus (Covid-19) is an infectious disease where most cases have mild symptoms, while few have pneumonia with respiratory failure. Because prone positioning (PP) improves survival in patients with acute respiratory distress syndrome (ARDS), its use has been recommended in Covid-19 patients. PP has shown more homogenous distribution of ventilation and decreasing shunt in dorsal regions and dead space in ventral regions in mechanically ventilated COVID-19 patients. However, the impact of PP in awake patients has not been well defined. Our aim was to perform a meta-analysis to assess the impact of awake prone positioning (APP) on intubation rate, mortality and gas exchange in Covid-19.

A systematic search was performed in MEDLINE, CENTRAL, Web of Science and Lilacs on August 20th, 2021. We used a strategy that combined keywords and descriptors and screened the reference list of all the available articles. Two groups of keywords linked by the Boolean ''OR'' operator were included. Covid-19; SARCov2, SARSCoV-2; SARS-CoV-2; COVID; novel coronavirus; coronavirus disease; coronavirus-2019 (first group) and prone positioning; awake prone positioning; self-proning; awake prone position; early awake prone; awake proning (second group). Subsequently, both groups were joined by the Boolean operator AND. Only randomized controlled trials (RCTs) that compared the use of APP with usual care in patient with acute respiratory failure due to COVID-19 were included. No language restrictions were imposed. Two authors screened the studies for eligibility (disagreements were resolved by a third author).

We contacted investigators for unreported data. Cochrane Collaboration tool to assess risk of bias was used. The following variables were evaluated: age, sex, setting, interventions (respiratory support, time session of APP) and outcomes. The primary outcome was intubation rate and secondary outcomes were mortality and oxygenation. We combined the studies through a meta-analysis with dichotomous data as risk ratios (RRs) and continuous data as mean differences (MDs). We assessed the variation in the results by drawing a forest plot and statistical heterogeneity through the I^2 test at a 95% confidence interval (CI95). According to statistical heterogeneity, fixed-effects model ($I^2 < 20\%$) or a random-effects model ($I^2 \geq 20\%$) were used. Analyses were performed with Review Manager version 5.4 (The Cochrane Collaboration, Copenhagen, Denmark). The quality of the evidence was assessed according to GRADE (Grading of Recommendations Assessment, Development, and Evaluation criteria guidelines).

Of the 1041 citations, after discarding the duplicates, we identified 59 potentially relevant studies where 51 studies were discarded and eight RCT were included (Fig. 1 ESM).[1–8] The age of the patients ranged between 49 and 66 years (66.7% male).

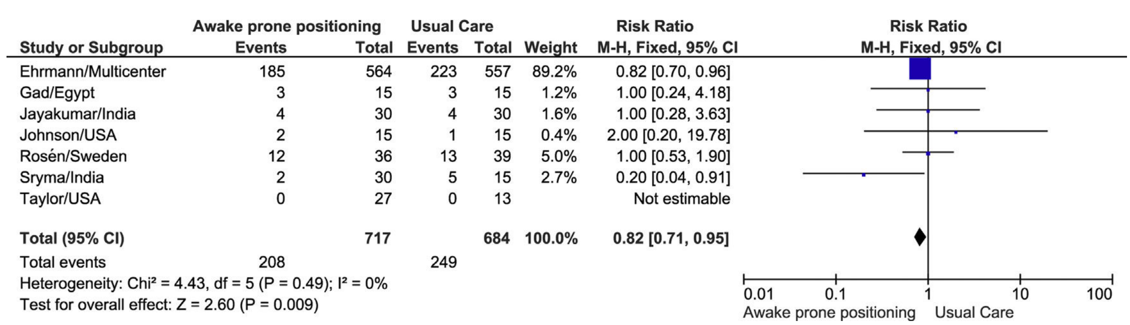

Figure 1 Intubation rate. Forest plot of comparisons between APP and UC.