

Resource use, governance and case load of rapid response teams in Australia and New Zealand in 2014

The Joint College of Intensive Care Medicine and Australian and New Zealand Intensive Care Society Special Interest Group on Rapid Response Systems, and ANZICS Centre for Outcome and Resource Evaluation

Rapid response teams (RRTs) are composed of expert staff who evaluate and manage patients whose condition is acutely deteriorating on hospital wards.¹ Three systematic reviews support their effectiveness in reducing cardiac arrests²⁻⁴ and, to a lesser extent, reducing in-hospital mortality.⁴ In Australia, RRTs are now an expected pathway for recognition of and response to clinical deterioration in hospitalised patients.⁵ Recent publications suggest that they function as a safety net for unstable patients admitted from the emergency department to the ward,^{6,7} and are often involved in end-of-life care planning for hospitalised patients.⁸

Previous studies suggest that the uptake and implementation of these teams into Australian hospitals was enthusiastic, and occurred before the publication of any evidence showing their effectiveness.⁹ However, in a study of 39 Australian hospitals, two-thirds had not received any additional funding for their RRT, and involvement of an intensive care consultant in the RRT appeared to be uncommon.¹⁰ A significant limitation of this study was the low response rate (36%) and lack of inclusion of data from New Zealand. Concerns have recently been raised about the cost of resourcing such services,¹¹ risks associated with removing staff from the intensive care unit,^{11,12} and the fact that their overuse can divert attention away from alternative strategies to improve patient safety.^{11,13}

The Australian and New Zealand Intensive Care Society (ANZICS) Centre for Outcome and Resource Evaluation (CORE) has traditionally focused on assessment of patients within the ICU.^{14,15} This and other registries provide important benchmarking data across the health system, permit evaluation of important questions that guide policy and advise future prospective research.

Additional questions related to RRTs were added to the 2013–14 Critical Care Resources Registry annual survey conducted by ANZICS. The purpose of our study was to report on the presence of RRTs in Australia and New Zealand, and governance details of such teams. We also aimed to report on the funding of RRTs, the number and nature of ICU staff who participate in RRTs, the proportion of ICUs who have dedicated staff for outreach services, and the clinical load of RRTs for the 2013–14 financial year.

ABSTRACT

Background: Rapid response teams (RRTs) are a mandatory element of Australian national health care policy. However, the uptake, resourcing, case load and funding of RRTs in Australian and New Zealand hospitals remain unknown.

Aim: To assess the clinical activity, funding, staffing and governance of RRTs in Australian and New Zealand hospitals.

Methods: Survey of Australian and New Zealand hospitals as part of a biannual audit of intensive care resources and capacity.

Results: Of 207 hospitals surveyed, 165 (79.7%) participated, including 22 (13.3%) from New Zealand. RRTs were present in 138/143 (95.5%) Australian and 11/22 (50%) New Zealand hospitals equipped with intensive care units ($P < 0.001$). Additional funding was provided in 43/146 hospitals (29.4%) but was more likely in tertiary ICUs ($P < 0.001$) and in New Zealand ($P = 0.012$). ICU staff participated in 147/148 RRTs (99.3%), which involved medical staff only (10.2%), nursing staff only (6.8%), and both medical and nursing staff (76.2%). Isolated ICU nursing involvement was more common in smaller ICUs ($P = 0.005$), in rural/regional and metropolitan hospitals ($P = 0.04$), and in New Zealand ($P = 0.006$). Dedicated ICU outreach registrars and consultants were present in 19/146 hospitals (13.0%) and 14/145 hospitals (9.7%), respectively. The ICU provided oversight for 122/147 RRTs (83%). In the 2013–14 financial year, there were more than 104 000 RRT calls.

Conclusion: In cases where data were known, ICU staff provided staff for most RRTs, and oversight for more than 80% of RRTs. However, additional funding for ICU RRT staff and dedicated doctors was relatively uncommon.

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Methods

Ethical considerations

We conducted our study under the auspices of a joint College of Intensive Care Medicine (CICM) and ANZICS steering committee tasked with development of a consensus statement to articulate ICU RRT work in Australia and New Zealand.

We submitted a detailed proposal to the ANZICS CORE and obtained ethics approval from the Alfred Health Human Ethics Committee (project 325/14). All data were provided to the investigators and are presented in a de-identified manner to avoid identification of participating hospitals.

ANZICS CORE Critical Care Resources survey

The ANZICS CORE runs the intensive care clinical quality registries within Australia and New Zealand. In addition to collecting patient-level data from adult and paediatric ICUs, all ICUs are surveyed annually to determine patterns of resource use, provision of ICU services (staffing and beds) and current practices. For the 2013–14 survey, we added additional questions to investigate RRT activity, resourcing and governance (Appendix 1). Members of the CICM–ANZICS Special Interest Group are listed in Appendix 2.

Questions and data

Hospital characteristics

The survey requested information on the following aspects of the hospital: state or country, hospital classification (rural/regional, metropolitan, tertiary or private), and hospital beds. Details of ICUs included: ICU level (using the CICM definitions for levels 1, 2 and 3), and the number of available ICU beds. A level 3 ICU has at least eight ICU beds, teaching and research commitments, a medical director with a full-time commitment to the ICU, and specialists who are Fellows of the CICM.¹⁶

Presence, governance and funding of RRTs

The survey also requested information on whether there was an RRT service at the hospital, and whether additional funding was obtained for the service (no additional funding, partial funding or full funding). It also collected data on whether the ICU managed the RRT and, if not, who was responsible for RRT governance and oversight.

ICU staff involvement in RRTs

Detailed information was requested about the role of ICU staff in the RRT, including the following: whether the ICU contributed any staff to the RRT (yes or no), the type of staff contributed by the ICU to the RRT (medical and nursing, medical only or nursing only), and whether the ICU had registrars or specialists exclusively rostered for services outside the ICU.

RRT case load

The survey also recorded the number of RRT calls for the 2013–14 year, as well as annual ICU separations. Accurate data on the annual number of hospital separations were not available to permit calculation of RRT calls/1000 admissions.

Statistical analysis

Raw numbers are shown as counts and percentages. No assumptions are made about missing data; results are

shown only for available data. To provide an estimate of the RRT case load in relation to the traditional ICU workload, we calculated the ratio of RRT calls to ICU admissions. We performed subanalysis for paediatric patients, New Zealand hospitals and hospitals where there were more than 1000 RRT calls per year.

We found distributed data to be skewed, so they are shown as medians with interquartile ranges (IQRs). We conducted comparison of proportions using the χ^2 or Fisher exact test, as appropriate, and comparison of distributed data with the Mann–Whitney *U* test or Kruskal–Wallis test, as appropriate. In all instances, a two-sided *P* value of < 0.05 was taken to indicate statistical significance.

Results

Participating hospitals

A total of 207 hospitals were invited to participate, and 165 (79.7%) responded. Non-participating hospitals were more likely to have a level 1 ICU (*P* < 0.001). Among the 165 participating hospitals, 22 (13.3%) were from New Zealand. The proportions of level 1, 2 and 3 ICUs were 10.9%, 42.4% and 46.7%, respectively. The proportions of metropolitan, private, rural/regional and tertiary hospitals were 17.0%, 30.3%, 26.1% and 26.7%, respectively. Most hospitals were adult (95.8%) and public (69.7%) hospitals. There were seven paediatric ICUs (PICUs).

An RRT service was implemented in 149 of 165 hospitals (90.3%). Australian hospitals were more likely to report having an RRT service (138/143; 95.5%) than New Zealand hospitals (11/22; 50%) (*P* < 0.001). Among the PICUs, the median number of beds was 13.5 (IQR, 7.5–18.8 beds), median number of annual admissions was 1173 (IQR, 830.3–1319.3 admissions), and six out of seven PICUs (85.7%) had an RRT service. The number of annual RRT calls was provided for 131 hospitals, of which 33 hospitals (25.2%) reported more than 1000 RRT calls per year.

RRT funding

Details of RRT funding were provided by 146 of 149 RRT-equipped hospitals (98%). RRTs were classified as partially funded in 20/146 hospitals (13.7%), fully funded in 23/146 hospitals (15.7%) and not funded in 103/146 hospitals (70.6%). We identified several differences between hospitals, based on RRT funding type (Table 1). Funding levels were greater for higher levels of ICU and ICUs with higher bed numbers, and were lowest in rural/regional and private hospitals. Although New Zealand hospitals were less likely to have an RRT, their RRT services were more likely to be funded.

There were no differences in the patterns of funding according to whether the ICU managed the RRT service or

Table 1. Differences in hospital characteristics, by rapid response team funding type

Hospital characteristic	Not funded	Partially funded	Fully funded	P
ICU level,* n (%)				
1 (n = 14)	13 (92.9)	1 (7.1)	0	
2 (n = 59)	47 (79.7)	2 (3.4)	10 (16.9)	0.004
3 (n = 73)	43 (58.9)	17 (23.2)	13 (17.8)	
Classification, n (%)				
Metropolitan (n = 26)	14 (53.8)	3 (11.5)	9 (34.6)	
Rural/regional (n = 33)	29 (87.9)	2 (6.1)	2 (6.1)	< 0.001
Tertiary (n = 41)	20 (48.4)	14 (34.1)	7 (17.1)	
Private (n = 46)	40 (87.0)	1 (2.2)	5 (10.9)	
Jurisdiction, n (%)				
Australia (n = 135)	99 (73.3)	18 (13.3)	18 (13.3)	0.012
New Zealand (n = 11)	4 (36.4)	2 (18.2)	5 (45.5)	
Median hospital beds (IQR)	220 (155–344)	480 (327–669)	417 (211–530)	< 0.001
Median available ICU beds (IQR)	10.0 (6.0–14.0)	17.5 (10.8–25.3)	13.5 (9.3–15.8)	< 0.001
Median ICU admissions (IQR)	357 (157–694)	1565 (614–2165)	903 (446–1786)	< 0.001

ICU = intensive care unit. IQR = interquartile range. * College of Intensive Care Medicine grading.

the nature of ICU staff who participated in RRTs (Table 1). None of the six PICUs had additional funding for the RRT. In the 33 hospitals with more than 1000 RRT calls per year, funding was reported as not funded, partially funded and fully funded in 11 hospitals (33.3%), 12 hospitals (36.4%) and eight hospitals (23.2%), respectively.

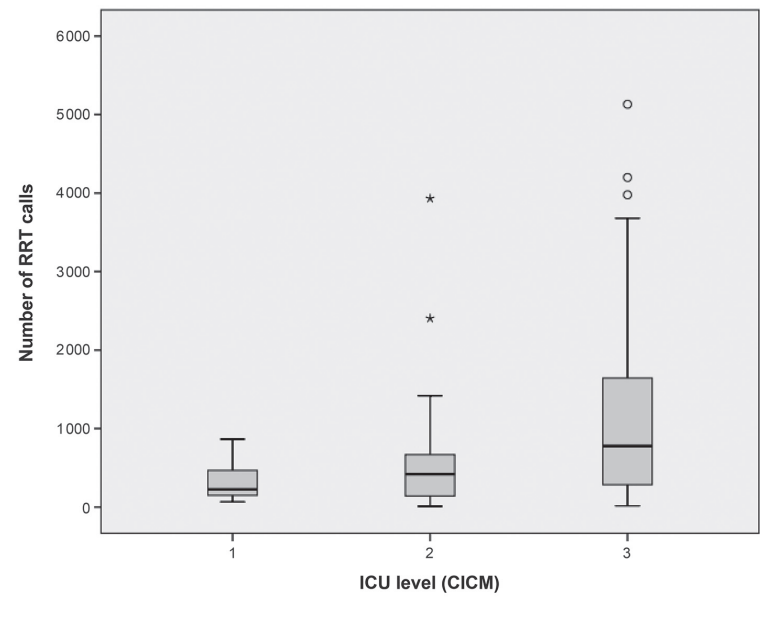
RRT case loads

Of the 149 RRT-equipped hospitals, data on annual RRT numbers were provided for 131 hospitals (87.9%). In 2013–14, there was a total of 104 067 RRT calls, with 92 858 of them in Australia, and 11 209 in New Zealand. The median number of annual RRT calls was 460 (IQR, 197–1010 calls; range, 10–5132 calls). There were five hospitals where there were more than 3500 RRT calls per year, of which two were fully funded, two were partially funded and one was unfunded. The median number of annual RRT calls among the four PICU RRT services that provided data was 621 (IQR, 158.3–1269.5 calls).

There was a trend for more RRT calls in New Zealand compared with Australia (869 calls [IQR, 477–2308 calls] v 454 calls [IQR, 192–904 calls]; *P* = 0.075). Calls were much more frequent with increasing ICU level (*P* < 0.001) (Figure 1), and also in public hospitals (700 calls [IQR, 336–1307 calls] v private hospitals, 205 calls [IQR, 99–421 calls]; *P* < 0.001). Annual RRT call numbers were highest in partially funded RRT services (1565 calls [IQR, 614–2165 calls]) compared with fully funded services (903 calls [IQR, 446–1786 calls]) and non-funded services (363 calls [IQR, 165–697 calls]) (*P* < 0.001 [three-group comparison]).

In 129/149 hospitals (86.6%), concurrent annual data on total RRT calls and ICU admissions were provided. Among these hospitals, there were 102 363 RRT calls and 140 389 ICU admissions. These data permitted comparison of the relative numbers of RRT and ICU admissions for each unit. Thus, the overall ratio of the RRT calls to ICU admissions was 0.73. The median ratio of RRT calls to ICU admissions for these 129 hospitals was 0.54 (IQR, 0.24–1.0). This ratio was higher in public than private hospitals (0.81 [IQR, 0.41–1.2] v 0.24 [IQR, 0.13–0.51]; *P* < 0.001) but similar across different ICU levels (*P* = 0.71). The RRT call to ICU admission ratio was higher for fully funded RRT services (0.83 [IQR, 0.51–1.16]) and partially funded services (0.89 [IQR, 0.51–1.03]) compared with the unfunded services (0.45 [IQR, 0.19–0.91]) (*P* = 0.01 [three-group comparison]). The RRT call to ICU admission ratio in New Zealand was 1.13 (IQR, 0.49–4.82), compared with 0.54 (IQR, 0.24–0.96) in Australia (*P* = 0.068). Among the four PICUs that provided

Figure 1. Box and whisker plot showing number of annual RRT calls, by ICU level



RRT = rapid response team. ICU = intensive care unit. CICM = College of Intensive Care Medicine.

Table 2. Differences in hospital characteristics, by ICU staff provided for RRT

Hospital characteristic	ICU staff provided for RRT			P
	Medical and nursing	Medical only	Nursing only	
ICU level, * n (%)				
1 (n = 14)	8 (57.1)	0	6 (42.9)	0.005
2 (n = 59)	45 (76.3)	5 (8.5)	9 (15.3)	
3 (n = 73)	59 (79.7)	10 (13.5)	5 (6.8)	
Classification, n (%)				
Metropolitan (n = 26)	21 (80.8)	1 (3.8)	4 (15.4)	0.04
Rural/regional (n = 35)	23 (65.7)	2 (5.7)	10 (28.6)	
Tertiary (n = 41)	32 (78.0)	7 (17.1)	2 (4.9)	
Private (n = 45)	36 (80.0)	5 (11.1)	4 (8.9)	
Jurisdiction, n (%)				
Australia (n = 136)	107 (78.7)	14 (10.3)	15 (11.0)	0.006
New Zealand (n = 11)	5 (45.5)	1 (9.1)	5 (45.5)	
Median hospital beds (IQR)	256 (169–450)	280 (203–500)	220 (96–393)	0.089
Median available ICU beds (IQR)	12.0 (8.0–16.0)	10.0 (5.5–16.5)	8.0 (4.0–11.5)	0.034
Median ICU admissions (IQR)	941 (553–1483)	1018 (752–1446)	643 (479–1235)	0.293

ICU = intensive care unit. RRT = rapid response team.
IQR = interquartile range. * College of Intensive Care Medicine grading.

data, the RRT call to ICU admission ratio was 0.42 (IQR, 0.20–0.82).

ICU staff participating in RRT responses

Among the 149 hospitals with RRTs, 147 (98.7%) reported providing some level of ICU staffing for the RRT. In one hospital, no ICU staff were provided, and in one hospital, data were missing. Thus, the ICU provided staff for the RRT in 147/148 hospitals (99.3%) that provided these data. Overall, ICUs participating in an RRT were reported as medical only, nursing only, or both medical and nursing in 15 (10.2%), 20 (6.8%) and 112 (76.2%) hospitals, respectively.

RRTs where ICU nurses functioned without direct ICU medical input were more prevalent in hospitals with level 1 ICUs, rural/regional classification, fewer ICU beds and in New Zealand (Table 2). The pattern of ICU staff provision for the RRT was similar in public and private hospitals ($P = 0.539$). Among the six PICUs with an RRT, five provided both medical and nursing staff, and one provided medical staff only.

All 33 hospitals with more than 1000 RRT calls per year contributed ICU staff to the RRT, and this was classified as both medical and nursing, or nursing only, in 29/33 (87.9%) and 4/33 (12.1%) hospitals, respectively.

Information on the presence of dedicated ICU outreach registrars and ICU consultants was submitted by 146/149 (98.0%) and 145/149 (97.3%) RRT-equipped hospitals, respectively. A dedicated ICU outreach registrar was reported to be present in only 19/146 sites (13.0%). A dedicated ICU outreach registrar was less likely to be present when the ICU oversaw the RRT (14/121 [11.6%]) compared with sites where the ICU did not oversee the running of the RRT (4/24 [16.7%]; $P = 0.027$) (data were missing for one site). There was no difference in the proportion of ICUs with a dedicated outreach registrar when analysed based on country ($P = 0.596$), ICU level ($P = 0.25$) or hospital classification ($P = 0.089$). The median number of reported annual RRT calls in hospitals with a dedicated registrar was not different from those without a dedicated registrar (868 calls [IQR, 242–1133 calls] v 454 calls [IQR, 192–903 calls]; $P = 0.23$).

A dedicated outreach ICU specialist was allocated in only 14/145 participating sites (9.7%) (Table 3). A dedicated ICU outreach specialist was present in 4/24 hospitals (16.7%)

Table 3. Differences in hospital characteristics, by presence of dedicated outreach specialist

Hospital characteristic	No dedicated specialist	Dedicated specialist	P
ICU level, * n (%)			
1 (n = 14)	13 (92.9)	1 (7.1)	0.269
2 (n = 59)	54 (94.7)	3 (5.3)	
3 (n = 73)	64 (86.5)	10 (13.5)	
Classification, n (%)			
Metropolitan (n = 25)	24 (96.0)	1 (4.0)	0.012
Rural/regional (n = 34)	31 (91.2)	3 (8.8)	
Tertiary (n = 41)	32 (78.0)	9 (22.0)	
Private (n = 45)	44 (97.8)	1 (2.2)	
Jurisdiction, n (%)			
Australia (n = 134)	120 (78.7)	14 (10.3)	0.259
New Zealand (n = 11)	11 (45.5)	0 (9.1)	
Median hospital beds (IQR)	252 (160–414)	400 (216–548)	0.083
Median available ICU beds (IQR)	11.0 (7.3–15.0)	19.0 (5.8–21.2)	0.11
Median ICU admissions (IQR)	876 (543–1349)	1341 (687–1944)	< 0.001
RRT call:ICU admission ratio	0.52 (0.23–1.02)	0.87 (0.60–1.71)	0.089

ICU = intensive care unit. IQR = interquartile range. RRT = rapid response team. * College of Intensive Care Medicine grading.

where the ICU did not oversee the RRT, compared with 9/120 hospitals (7.5%) where they did oversee the RRT (data were missing for one site). A dedicated ICU outreach specialist was also more likely to be present in tertiary ICUs compared with other ICU types. There was no difference between hospitals with a dedicated ICU specialist when analysis was based on ICU level, hospital bed numbers or ICU bed numbers (Table 3).

Among the six PICU RRT services, two services had a dedicated outreach specialist as well as a dedicated outreach registrar. Among the 33 hospitals with more than 1000 RRT calls per year, 7/33 (21.2%) had a dedicated outreach registrar or outreach consultant.

RRT oversight

Of the 149 hospitals with RRTs, information on the role of the ICU in RRT oversight was provided for 147. The ICU provided oversight of the RRT in 122/147 instances (83%). In the remaining 25, governance was provided by a dedicated committee or coordinator (13 hospitals), a nursing administrator (two hospitals), the emergency department (two hospitals), the anaesthetics department (one hospital), the coronary care unit (one hospital) or other methods (six hospitals).

ICU staff were more likely to provide oversight of the RRT in level 1 and level 2 ICUs than in level 3 ICUs, and less likely to provide such oversight in tertiary ICUs. There were no other statistically significant differences in hospital characteristics based on whether the ICU provided governance for the RRT, including private hospital status (Table 4). Among the 33 hospitals with more than 1000 RRT calls per year, the ICU provided oversight in 28 hospitals (84.8%).

Discussion

Major findings

We conducted a study to analyse data relating to RRTs in Australia and New Zealand for the 2013–14 financial year and obtained a 79.7% response rate. We found that a higher proportion of ICUs in Australia reported having an RRT service than in New Zealand, and that more than 100 000 RRT calls occurred during this financial year. Although the ICU provided oversight of the RRT in 80% of cases, and contributed staff in almost all cases, additional funding for these services was not provided in more than two-thirds of sites. In about 75% of ICUs, both medical and nursing ICU staff participated in the RRT, and ICU nurses functioned without ICU medical input primarily in rural/regional areas. Finally, we found that despite many units providing oversight of the RRT, and half attending more than 600 RRT calls per year, only about 10% of ICUs had dedicated medical staff for this service.

Table 4. Differences in hospital characteristics, by ICU management of RRT

Hospital characteristic	Not managed by ICU	Managed by ICU	P
ICU level,* n (%)			0.045
1 (n = 15)	2 (13.3)	13 (86.7)	
2 (n = 59)	5 (8.5)	54 (91.5)	
3 (n = 73)	18 (24.7)	55 (75.3)	
Classification, n (%)			0.001
Metropolitan (n = 26)	2 (7.7)	24 (92.3)	
Rural/regional (n = 36)	4 (11.1)	32 (88.9)	
Tertiary (n = 40)	15 (37.5)	25 (62.5)	
Private (n = 45)	4 (8.9)	41 (91.1)	
Jurisdiction, n (%)			0.346
Australia (n = 136)	22 (16.2)	114 (83.6)	
New Zealand (n = 11)	3 (27.3)	8 (72.7)	
Median hospital beds (IQR)	362 (170–607)	250 (160–390)	0.08
Median available ICU beds (IQR)	13.0 (8.5–19.0)	11.0 (6.0–15.0)	0.112
Median ICU admissions (IQR)	1039 (596–1708)	831 (543–1360)	0.286
RRT call:ICU admission ratio	0.51 (0.26–0.83)	0.57 (0.24–1.03)	0.17

ICU = intensive care unit. RRT = rapid response team.
IQR = interquartile range. * College of Intensive Care Medicine grading.

Comparison with previous studies

There are relatively few studies with which to compare our present data. A 2012 study of 39 Australian ICU-equipped hospitals revealed that only 10/39 hospitals (25.6%) had some additional funding for their RRT service.¹⁰ We found, similarly, that about 25% of hospitals had additional funding for their RRT, although this was more common in New Zealand hospitals and those with larger RRT case loads. In keeping with previous findings, we found that regular involvement of an ICU specialist in RRT calls was likely to be uncommon, as fewer than 10% of hospitals had a dedicated ICU specialist for outreach services.

Study strengths and limitations

Our study has several strengths, including a high level of response among ICU-equipped hospitals in Australia and New Zealand, and a very high response rate for each of the survey questions. We provide important information on the funding, staffing and resourcing of the ICU element of RRTs in these two countries, and associations with such variables.

Our study has important limitations. First, about 20% of hospitals did not participate in the survey, and such hospitals were more likely to have a level 1 ICU. In addition, the data were self-reported and cannot be verified for accuracy. The

classification of hospital and ICU levels is relatively crude, and may not provide sufficient granularity to account for differences observed. In addition, we have only provided data on the annual number of RRT calls in about 87% of RRT-equipped hospitals. Furthermore, we cannot provide information about hospitals that are not ICU-equipped and/or not affiliated with ANZICS.

It is possible that the phrasing of the survey questions may have been variably interpreted, leading to bias in the responses. For example, responses to questions on the level of funding may relate to hospital-wide funding, rather than funding specific for the ICU. Furthermore, partial funding may have been interpreted to mean that the role of the RRT was added to an additional staff member's duties. Questions related to staffing of services outside of the ICU may also have been interpreted to include trauma calls or tracheostomy reviews, for example.

We did not attempt to measure differences in the effectiveness of the RRT for different levels of funding, nor did we specifically attempt to gauge any negative impacts within the ICU that may have occurred due to inadequate resourcing of these teams. Recently, many hospitals have introduced a two-tiered system of response to clinical deterioration^{17,18} in line with changes in Australian national policy.⁵ We are unable to tell if the results of our study have been affected by systems in which there is a multi-tiered response to deteriorating patients that involves activation of home teams in response to less severe deterioration. Finally, our study does not provide information on important aspects of patient outcome, the cost of RRT utilisation and the effectiveness of RRTs in either economic or quality-of-life terms.

Implications for critical care staff

Our study reveals that RRTs in ICU-equipped hospitals in Australia and New Zealand now review more than 104 000 patients annually, which was almost 75% of the number of ICU admissions in the same year. As the ICU contributed staff to these services, and few RRTs have dedicated staff, such activity might place a strain on ICU resources, and potentially risk the safety of patients already in the ICU.^{11,12}

Our study also showed that ICU staff provide oversight for their hospital RRT in more than 80% of cases. Recently, the CICM and ANZICS have begun development of a joint position statement on the governance of RRTs in our two countries. This will include the development of criteria for appropriate resourcing, a minimal dataset and the logistics and infrastructure required for a binational database for patients subject to RRT review.

We have shown that ICU staff participate in the overwhelming majority of RRTs in the hospitals studied. This

implies the need for resources and guidelines for training RRT staff, and reinforces previous opinions on the need to enhance education of staff on deteriorating patients.^{19,20} In addition, regular specialist involvement in RRTs appears to be uncommon, and 6.8% of RRTs do not have regular ICU medical input.

Consequently, it will be important to establish guidelines to inform RRT staff about circumstances in which they should escalate care to the on-duty ICU specialist or the specialist of the usual treating team.

Future research

Given the frequent involvement of ICU staff in RRTs in Australia and New Zealand, it will be imperative to conduct research into the characteristics of patients subject to RRT review, predictors of the need for RRT review, and effects of different RRT composition on patient outcomes. In addition, it may be possible to conduct interventional studies for common causes of RRTs, such as arrhythmias, acute pulmonary oedema and sepsis.

Conclusions

RRTs in Australia and New Zealand now see more than 100 000 patients annually. For cases in which data are known, the ICU provides staff for almost all RRTs and provides oversight in more than 80% of rapid response systems. However, additional funding for RRTs is provided in fewer than one-third of instances and consultant participation appears to be uncommon. These observations suggest the need to improve the resources allocated to such rapid response services and for training of ICU registrars who participate in an RRT.

Competing interests

None declared.

Author details

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Appendix 1. Critical Care Resources Registry survey questions

Routine questions asked annually

- State or country of the ICU
- ICU level (using CICM definition; self-reported by ICU)
- Hospital classification (tertiary, metropolitan, rural/regional, private)
- Hospital type (public or private)
- Is the ICU adult or paediatric?
- Total number of hospital beds reported
- Total number of hospital separations reported
- ICU type (cardiac ICU/HDU, general ICU, HDU, ICU/CCU/HDU, oncology, PICU, other)
- Total number of ICU/HDU admissions
- Total number of ICU/HDU available beds
- Total number of ICU/HDU bed days

Specific MET/RRT questions

- Does the hospital have an MET/RRT service?
- MET/RRT service funding type
- Is the MET/RRT service managed by ICU?
- If the MET/RRT service is not managed by ICU, who manages this service?
- Does the ICU contribute staff to the MET/RRT?
- What type of staff are involved in the MET/RRT?
- Total number of MET/RRT calls for the 2013–14 financial year
- Did the MET/RRT commence this financial year?
- Does your hospital have a whole-of-hospital program for the identification and management of deterioration of patients, that is separate from the MET/RRT team?
- Total number of non NFR deaths in hospital (deaths in patients who did not have an NFR order at the time of death)
- Are any of your registrars rostered exclusively for services outside the ICU?
- Are any of your specialists rostered exclusively for services outside the ICU?

ICU = intensive care unit. CICM = College of Intensive Care Medicine. HDU = high dependency unit. CCU = cardiac care unit. PICU = paediatric intensive care unit. MET = medical emergency team. RRT = rapid response team. NFR = not for resuscitation.

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Appendix 2. Members of the joint CICM–ANZICS special interest group on rapid response systems

- Daryl Jones: Corresponding author; chair writing committee; Monash University Melbourne
 David Pilcher: Chair, ANZICS CORE
 Robert Boots: Co-chair, steering committee; CICM representative
 Angus Carter: Co-chair, steering committee; ANZICS representative
 Andrew Turner: President, ANZICS
 Peter Hicks: Wellington Regional Hospital, Wellington, New Zealand
 Mark Nicholls: St Vincent's Hospital, Sydney, NSW, Australia
 Judy Currey: Deakin University, Melbourne, VIC, Australia
 Simon Erickson: Princess Margaret Hospital for Children, Perth, WA, Australia
 Dianne Stephens: Royal Darwin Hospital, Darwin, NT, Australia
 Mary Pinder: Sir Charles Gairdner Hospital, Perth, WA, Australia
 Alex Psirides: Wellington Regional Hospital, Wellington, New Zealand
 Jonathan Barrett: Epworth Hospital, Melbourne, VIC, Australia
 Richard Chalwin: Lyell McEwin Hospital, Adelaide, SA, Australia
 Rinaldo Bellomo: Austin Health, Melbourne, VIC, Australia
 Ken Hillman: University of New South Wales, Sydney, NSW, Australia
 Michael Buist: North West Region Health Service, Burnie, TAS, Australia
 Jane Parker: Project support officer, ANZICS CORE
 Sue Huckson: Manager, ANZICS CORE

CICM = College of Intensive Care Medicine. ANZICS = Australian and New Zealand Intensive Care Society. CORE = Centre for Outcome and Resource Evaluation.

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