

# Rapid response team: what factors interfere with its performance?

Aline A. S. Moreira<sup>1</sup>  
Rogiane O. Ramos<sup>2</sup>  
Anna Beatriz S. Ligório<sup>3</sup>  
Karolina D. Junqueira<sup>4</sup>  
Krislainy S. Corrêa<sup>5</sup>



Original article



UNIVERSIDAD  
DE ANTIOQUIA  
1803

## Rapid response team: what factors interfere with your performance?

**Objective.** Describe the knowledge in the literature related to factors that influence the performance of response teams. **Methods.** Integrative review of the literature of articles published in Portuguese, English or Spanish between 2006 and 2016. The descriptors *hospital rapid response equipment, cardiac arrest and hospital mortality* were used for the search in the PubMed/Medline, Lilacs - Bireme and CINAHL bibliographic databases. **Results.** 19 studies were included for the analysis. The results were categorized in: sociocultural barriers and institutional policies, late activation of the rapid response team, composition and/or strengthening of the team's capacity, and use of facilitating tools. The sociocultural barriers found were: the presence of interprofessional hierarchies and beliefs, the limitations of institutional policies were related to the lack of training and human resources deficit. Late activations increased mortality, duration of hospitalization, and admission

- 1 Physiotherapist, Master Student, Federal University of Goiás, Brazil.  
email: aalineee.alves@gmail.com
- 2 Physiotherapist, Multiprofessional Resident of Goiás Clinic Hospital, Federal University of Goiás, Brazil.  
email: rogiane.fisio@gmail.com
- 3 Physiotherapist, Multiprofessional Resident of Goiás Clinic Hospital, Federal University of Goiás, Brazil.  
email: annabsligorio@gmail.com
- 4 Physiotherapist, Physical Therapist. Emergency Hospital in Goiania, Brazil.  
email: duarte.karolina@gmail.com
- 5 Physiotherapist, Ph.D. Assistant Professor, Pontifical Catholic University of Goiás, Brazil.  
email: krislainykorrea@hotmail.com

**Conflicts of interest:** None.

**Received:** November 8<sup>th</sup>, 2017.

**Accepted:** Mayo 31<sup>st</sup>, 2018.

**How to cite this article:** Moreira AAS, Ramos RO, Ligório ABS, Junqueira KD, Corrêa KS. Rapid response team: what factors interfere with its performance? Invest. Educ. Enferm. 2018; 36(2):e05.

**DOI:** 10.17533/udea.iee.v36n2e05



Investigación y Educación en

# Enfermería

—Nursing Research and Education—

Vol. 36 No. 2, • June 15<sup>th</sup> 2018 • ISSN: 2216-0280

to the intensive care unit. The teams composed of intensive care professionals showed a reduction in mortality and in the occurrence of cardiac arrest. The use of new tools did not promote changes in the response of the team. **Conclusion.** The factors found in this review influence the performance of the rapid response team. The foregoing should be taken into account to improve the survival of patients who require this type of care.

**Descriptors:** hospital rapid response team; heart arrest; hospital mortality; critical care.

## Equipo de respuesta rápida: ¿qué factores interfieren con su desempeño?

**Objetivo.** Describir el conocimiento en la literatura relacionado con factores que influyen en el desempeño de equipos de respuesta. **Métodos.** Revisión integradora de la literatura de artículos publicados en portugués, inglés o español entre 2006 a 2016. Se emplearon los descriptores *hospital equipo de respuesta rápida, paro cardíaco y mortalidad hospitalaria* para la búsqueda en las bases bibliográficas PubMed/Medline, Lilacs – Bireme y CINAHL. **Resultados.** Se incluyeron para el análisis 19 estudios. Los resultados se categorizaron en: barreras socioculturales y políticas institucionales; activación tardía del equipo de respuesta rápida; composición y/o fortalecimiento de la capacidad del equipo; y uso de herramientas facilitadoras. Las barreras socioculturales encontradas fueron: presencia de creencias y jerarquías interprofesionales. Las limitaciones de las políticas institucionales se relacionaron con la falta de capacitación y déficit de recurso humano. Las activaciones tardías aumentaron la mortalidad, la duración de la hospitalización y el ingreso del paciente a la unidad de cuidados intensivos. Los equipos compuestos por profesionales de cuidados intensivos mostraron una reducción en la mortalidad y en la ocurrencia de paro cardíaco. El uso de nuevas herramientas no promovió cambios en la respuesta del equipo. **Conclusión.** Los factores encontrados en esta revisión influyen en el desempeño del equipo de

respuesta rápida. Lo anterior debe tenerse en cuenta para mejorar la supervivencia de los pacientes que requieren este tipo de atención.

**Descritores:** equipo hospitalario de respuesta rápida; paro cardíaco; mortalidad hospitalaria; cuidados críticos.

## Equipe de resposta rápida: quais fatores interferem no seu desempenho?

**Objetivo.** Descrever o conhecimento da literatura a respeito dos fatores que influenciam o desempenho das equipes de resposta. **Métodos.** Revisão integrativa da literatura de artigos publicados em português, inglês ou espanhol entre 2006 e 2016. Foram usados os descritores equipe de respostas rápidas de hospitais, parada cardíaca e mortalidade hospitalar para pesquisar nas bases de dados bibliográficas PubMed/Medline, Lilacs – Bireme e CINAHL. **Resultados.** Foram incluídos 19 estudos para a análise. Os resultados foram categorizados em: barreiras socioculturais e políticas institucionais; ativação tardia da equipe de resposta rápida; composição e/ou fortalecimento da capacidade da equipe; e uso de ferramentas facilitadoras. As barreiras socioculturais encontradas foram: presença de hierarquias e crenças interprofissionais. As limitações das políticas institucionais se relacionaram à falta de capacitação e déficit de recursos humanos. As ativações tardias aumentaram a mortalidade, a duração da hospitalização e internação em unidade de terapia intensiva. As equipes compostas por profissionais de terapia intensiva mostraram redução na mortalidade e na ocorrência de parada cardiorrespiratória. O uso de novas ferramentas não promoveu mudanças na resposta da equipe. **Conclusão.** Os fatores encontrados nesta revisão influenciam no desempenho da equipe de resposta rápida. Isso deve ser levado em conta para melhorar a sobrevivência dos pacientes que necessitam desse tipo de cuidado.

**Descritores:** equipe de respostas rápidas de hospitais; parada cardíaca; mortalidade hospitalar; cuidados críticos.

## Introduction

**R**apid response teams (RRTs) first appeared in Australia in the early 1990s. They aim to bring knowledge and skills for the critical care of patients with signs of physiological deterioration, at sites outside the intensive care unit (ICU), in a timely manner to avoid adverse events.<sup>(1)</sup> The RRTs are systems composed primarily of two components. The first is called afferent team, which is next to the patient providing the normal care and with the appearance of signs of deterioration is to trigger a call to the efferent team, respecting assessment criteria. The efferent team responds to the call and conducts rapid and necessary measures to avoid worsening and death.<sup>(2)</sup> With the creation of the teams, several studies were carried out that evaluated their efficiency in hospitals. A significant reduction was observed as to the number of cardiorespiratory arrests (CRAs) and mortality of patients who showed signs of clinical deterioration.<sup>(3)</sup> However, other studies have not shown effectiveness of RRTs concerning the same parameters.<sup>(4)</sup> In order to clarify these differences, a recent meta-analysis<sup>(5)</sup> was conducted that evaluated 29 studies and concluded that the presence of RRTs reduces rates for hospital mortality and CRAs. However, it was suggested that there are factors that can interfere with the quality of the outcomes and that should be better elucidated. Therefore, this study aims to review the literature to determine the main factors that can interfere with the performance of RRTs.

## Methods

This is a literature review of scientific articles (clinical trials, observational studies, and qualitative studies) published from January 1, 2006 to July 25, 2016, in Portuguese, English, and Spanish. The databases researched were PubMed/Medline, Lilacs – Bireme e CINAHL. The keywords used in the search were “hospital rapid response team,” “cardiac arrest,” and “hospital mortality” and their respective terms in Portuguese and Spanish. The search strategies used were the following associations of keywords: “hospital rapid response team” AND “cardiac arrest”; “hospital rapid response team” AND “hospital mortality”; and “hospital rapid response team” AND “cardiac arrest” AND “hospital mortality.” We included studies that described or evaluated one or more factors that could interfere with the performance of RRTS, both those with quantitative and qualitative characteristics. There was no restriction as to the studies’ countries of origin; however, we included only the complete articles published in Spanish, English, or Portuguese. We excluded the literature reviews and editorials because it did not present intervention methods.

Four phases for the selection of studies were previously defined. The first phase was the exclusion on articles that were repeated in the databases; in the second phase we excluded studies that did not address the proposed

topic in their titles; in the third stage we excluded studies that – after reading of the abstracts – were found to not address the research topic; and, finally, in the fourth stage – after complete reading of the articles – we excluded those that did not address the research question. In the first and second stages the exclusion of the studies was done by a principal evaluator; in the other stages, two reviewers carried out the reading and agreed to include only articles that answered the research question. At the end of the steps the selected studies were analyzed and classified according to the study objective and interference factor tested using the comparison method. From

the classification it was possible to categorize the studies that tested the same interference factor.

## Results

We selected 19 studies to compose the integrative review, as described in Figure 1. After analysis and classification, the studies were organized into categories according to the assessed interference factor. As follows: sociocultural barriers and institutional policies, delayed RRT activations, composition and/or capacity building of teams, use of enabling tools for RRTs.

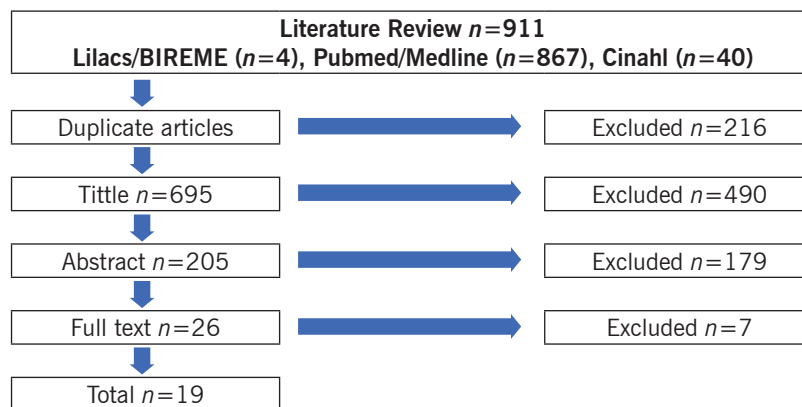


Figure 1. Article selection flowchart

### Sociocultural barriers and institutional policies.

Two qualitative studies investigated what factors influenced the performance of RRTs. The results of these studies, as described in Table 1, pointed as limiting aspects: the sociocultural barriers such as interprofessional hierarchy and beliefs. Firstly, due to believing that the afferent team needs to provide justifications when activating the efferent team. Secondly, due to believing that the specialized afferent team should be sufficient to resolve adverse events. Other factors were the lack of training of professionals and lack of human resources to meet the demands of patients, as well as limitations in protocols and institutional policies.<sup>(6,7)</sup>

**Delayed RRT activation.** In Table 2, the articles showed that delayed RRT activations are associated with increased hospital mortality rates, length of hospital stay, number of CRAs, and higher risk of admission to ICU.<sup>(8-11)</sup> For patients admitted to ICU there is also increased mechanical ventilation time, length of hospital stay, and death.<sup>(9)</sup> There was no reduction of delayed activation even with monitoring of patients.<sup>(12)</sup> The causes for delayed activation were described as the presence of unnecessary information reported during the activation, hesitant speeches, and difficulty in locating the emergency event.<sup>(8)</sup>

**Table 1. Sociocultural barriers and institutional policies**

Authors / Year / Country / Journal	Objectives	Type of study	Results
Braaten JS / 2015 / United States. <sup>(6)</sup>	Describe the factors that interfere with the behavior of nurses when activating the RRT.	Qualitative study	The interference factors were the lack of training, lack of human resources, limitations in institutional policies and protocols, need to justify RRT* activation, social acceptance of activations for patients with lower severity, and professional competence.
Shearer B, Marshall S, Buist MD. 2012. United Kingdom. BMJ Quality & Safety. <sup>(7)</sup>	Explore the causes of the failures for activation of the RRT.	Observational study	4.04% of the patients met the criteria for RRT activation in the 24-hour period before the index event; however, the RRT was not activated in 10 (1.75%) of these patients. There were 31 activations considered missed. When the RRT activation was delayed, it was identified the need to wait for further investigation, treatment, and reviews by the treatment and ICU teams. When the RRT had not been activated, the most common answers were that there had been no need for RRT activation and that the team assembled had the necessary expertise.

**Composition and/or capacity building of teams.**

We selected 8 studies (Table 3) that showed that RRTs led by intensivist professionals or professionals with experience in critical care can reduce hospital mortality and the number of CRAs, unplanned ICU admissions, and decrease disease severity scores.<sup>(13-17)</sup> The teams were mostly composed of doctors, nurses, and physical therapists with experience and/or specialization in critical care.<sup>(13-20)</sup> Some studies included a pharmacist, laboratory technicians, radiology technicians, and administrators and clinical secretaries.<sup>(13,16-18,20)</sup> It was shown that the presence of a resident doctor in the team represented no difference when compared with the responsible intensivist.<sup>(16)</sup> Capacity building and maturation of the teams can improve the outcomes, reducing mortality and unplanned ICU admissions as well as enabling shorter activation time for efferent teams.<sup>(18-21)</sup>

**Use of enabling tools for RRT.**

Four studies evaluated some enabling tools for the success of RRTs, as shown in Table 4. These tools were described as early warning systems, new activation criteria, two-level response systems (early and late), and case handoff tools. Early warning systems functioned as a digital

program that through electronic medical records could detect changes in the patient's vital signs in real-time and thus promote earlier detection.<sup>(22)</sup> New activation criteria corresponded to instruments to observe the patients' vital signs with definition of new criteria for activation of the RRT and that were completed by the afferent team.<sup>(23)</sup> The two-level response system consisted in coordinating the response, in the first instance the patient was provided care when there were minor changes in vital signs by the afferent team (early) and if the patient remained with worsening of clinical condition there was activation of the second level of response executed by the efferent team (late).<sup>(23,24)</sup> The case handoff tool evaluated was the SBAR (situation-background-assessment-recommendation), which aims to enhance communication among nurses and optimize response time for critical patients.<sup>(25)</sup> The use of all tools did not show a significant reduction in patient mortality.<sup>(22-25)</sup> However, there was an increase in the number of team activations when using new activation criteria, two-level response system, and case handoff tool<sup>(23-25)</sup> and a decrease in length of hospital stay when using an early warning system.<sup>(22)</sup>

**Table 2. Delayed RTT activation**

Authors / Year / Country / Journal	Objectives	Type study	Results
Barwise A, Thongprayoon C, Jensen J, <i>et al.</i> 2016. United States. <i>Critical Care Medicine.</i> <sup>(9)</sup>	Determine if delayed RRT activations contribute to mortality and morbidity of patients that are provided care.	Observational retrospective cohort study.	57% of the patients had delayed RRT activation. In the delay group, hospital mortality, mortality after 30 days, and hospital stay were significantly higher than in the no delay group. In patients with delay transferred to ICU, use of mechanical ventilation, use of vasopressor, mortality in the ICU after 30 days, and ICU stay were higher.
Chen J, Bellomo R, Flabouris A, <i>et al.</i> 2015. Australia. <i>Critical Care Medicine.</i> <sup>(10)</sup>	Test if delay greater than 15 minutes in RRT calls may be associated with increased mortality.	Observational study that used data from a randomized clinical trial.	The risk of death in patients with delayed calls was significantly higher than in those with no delay both for hospitals with RRT and for control hospitals. There was significant decrease of delayed calls in groups with RRT than in control hospitals, and patients with delayed calls had higher risk of admission to ICU.
Chen J, Bellomo R, Flabouris A, <i>et al.</i> 2009. Australia. <i>Critical Care Medicine.</i> <sup>(11)</sup>	Examine the relation between early emergency calls and the incidence of serious adverse events.	Observational retrospective study that used data from a randomized clinical trial (MERIT study).	There was no significant relation between the presence of RRT and the increase in the proportion of early calls; however, in hospitals with RRT there was significant decrease in total deaths. The increase in the number of early calls significantly decreased the number of unexpected CRAs and deaths.
Akhtar N, Field RA, Greenwood L, <i>et al.</i> 2011. United Kingdom. <i>BMJ Quality &amp; Safety.</i> <sup>(8)</sup>	Determine the quality and accuracy of diagnosis in emergency calls in an adult clinical hospital.	Prospective observational study.	The average duration of calls for CRA and medical emergency was 15 and 20 seconds respectively. The specificity and sensitivity of calls for CRA was 62% and 91% respectively. Specificity was higher in calls with greater duration. Survival rates were higher in shorter calls. The qualities of the delayed calls were grouped into 5 themes: unnecessary information, incorrect terminology, hesitant speech, difficulty in locating the event, and uncertainty of the nature of the emergency.
Tirkkonen J, Yla-Mattila, Oikkola KT, <i>et al.</i> 2013. Finland. <i>Resuscitation.</i> <sup>(12)</sup>	Study the factors related with delayed RRT activation and the increase in hospital mortality.	Prospective observational study.	The action of the RRT was more evident in monitored patients (41% of the calls). Verification of vital signs preceded the RRT call by about 6 hours, compared with the beds without monitoring. The reasons for RRT activation were CRA (76%) and altered vital signs (26%). The failure of the afferent team presents as a risk factor for hospital mortality.

**Table 3. Composition and/or training of teams**

Authors / Year / Country	Objectives	Type of study	Results
Al-Qahtani S. <i>et al.</i> / 2013 / Saudi Arabia. <sup>(13)</sup>	Examine the impact of implementing an intensivist-led RRT on CRAs and mortality.	Observational study	After the implementation of the RRT, there was a decrease in transferences to the ICU, in CRAs outside the ICU, in mortality in the recovery room, in the occurrence of CRAs in the ICU, in total hospital mortality, and in APACHE II scores.
Dacey MJ. <i>et al.</i> / 2007 / Iceland. <sup>(14)</sup>	Determine the effect of a RRT conducted by medical assistants on the rate of CRAs, unplanned admissions to the ICU, and hospital mortality.	Prospective study controlled with trial before and after implementation of the RRT.	After implementation of the RRT, there was significant decrease in the number of CRAs, mortality, and unexpected admissions in the ICU. However, there was no significant decrease in the length of ICU stay. Over time there was also significant decrease in the number of CRAs, mortality, and admission in the ICU. The satisfaction of nurses in the care of the RRT was reported in 98% of the cases as extremely satisfied.
Sebat F. <i>et al.</i> / 2010 / United States. <sup>(18)</sup>	Determine whether a training program for RRT professionals can improve the response in patients in shock.	Prospective observational study.	After deployment of the RRT with the training, there was significant increase in the number of patients identified as with shock and significant decrease in time to treatment and hospital mortality. The length of ICU stay had no significant reduction and hospital stay increased after deployment.
Jung B. <i>et al.</i> / 2016 / France. <sup>(15)</sup>	Evaluate the effect of the implementation of the RRT led by an intensivist on mortality in hospitalized patients.	Retrospective observational study.	After the RRT period there was significant reduction in rates of unexpected death and total hospital deaths. This reduction was not observed in the three hospitals without the RRT. CRA rates were reduced, but not significantly.
Davis DP. <i>et al.</i> / 2015 / United States. <sup>(19)</sup>	Explore the effectiveness of a new RRT to decrease intrahospital CRA, the need of ICU, and hospital mortality.	Longitudinal experimental study.	The incidence of CRA outside the ICUs decreased, while in the ICUs it remained unchanged. There was significant reduction of hospital mortality (2.12% to 1.74% $p < 0.0001$ ).
Morris DS. <i>et al.</i> / 2012 / United States. <sup>(16)</sup>	Evaluate the differences between the RRT led by a resident physician or intensivist physician.	Observational retrospective study.	Of the events 38% were for the intensivist physician-led RRT and 62% for the resident physician-led RRT. There was no considerable difference for CRAs, transfers to ICU, and hospital mortality between the RRTs evaluated. However, there was higher incidence of invasive procedures in the RRT led by medical residents.



**Table 3. Composition and/or training of teams. (Cont.)**

Authors / Year / Country	Objectives	Type of study	Results
Calzavacca P. <i>et al.</i> / 2010 / Australia. <sup>(20)</sup>	Evaluate the impact of a more experienced RRT on the delay in activation of the calls, the characteristics of patients, and their results.	Observational longitudinal study.	Lower RRT activation time was observed in the current group compared with the deployment group ( $p < 0.001$ ). Unplanned ICU admissions were also reduced from 31.3% to 17.3% in the current group, and hospital mortality was also reduced.
Hatlem T <i>et al.</i> / 2011 / United States. <sup>(17)</sup>	Analyze results of a RRT program composed of a critical care nurse and the use of a patient classification systems (All Patient Refined Diagnostic Related Groups - APR DRG).	Observational retrospective study.	Unplanned transfers to ICU after a RRT call decreased by 35.9%. The volume of patients in ICU between ROM groups 3 and 4 (more severe) increased by 12.5%, while in ROM groups 1 and 2 a corresponding decrease was observed. Moreover, the total number of days in the ICU increased. As for mortality, the HSMR decreased by 31.2%, while the overall mortality remained relatively stable, decreasing from 2.27% to 2.21%.

RRT: Rapid response team; CRA: Cardiorespiratory arrest; ICU: Intensive care unit; APR DRG: All Patient Refined Diagnostic Related Groups; ROM: Risk of mortality; HSMR: Hospital-Standardized Mortality Ratio.

## Discussion

This study through a broad literature review provided the determination of four main factors that interfere with the performance of RRTs. Categorization of these factors can enable access by professionals to this information and improve their understanding of it, consequently, contributing to institutional planning in health. With the growing demand for quality care in critical patients<sup>(2)</sup> it is necessary to understand the causes of failures in the provision of care of these RRTs, enable better planning of actions to correct and remodel systems and thus provide better safety to the patient. Health safety policies require scientific foundations that ensure health care with minimal adverse events as possible, which makes it essential to know elements that lead to inefficiency of these assistance systems.

Sociocultural barriers were underlined as elements that interfere with the quality of the care provided by RRTs and derive from the creation of a nightmarish institutional culture among the professionals, particularly concerning the activation for efferent teams of the RRT. The need to justify the activation, as observed in this study, come from the establishment of a criticism culture in which early activations are deemed “unnecessary”.<sup>(26)</sup> In this context, the professionals’ lack of training can generate fear in activations, as they feel embarrassed to show little knowledge of the critical situation and consider themselves unable to handoff the case of the patient to efferent teams.<sup>(27)</sup> Institutional culture, therefore, can adversely influence professionals towards not executing activations in the correct time and consequently causing delays and worse outcomes.<sup>(27)</sup> This finding was also observed in the study of Tirkkonen *et al.* 2013, in which even with the identification

**Table 4. Use of enabling tools for RRTs**

Authors / Year / Country / Journal	Objectives	Type of study	Results
O'Connell A. <i>et al.</i> / 2016 / Australia. <sup>(23)</sup>	Examine the impact of a response chart and a change in call criteria on RRT calls, CRAs, unplanned admissions to the ICU, and hospital mortality.	Observational longitudinal study	After the introduction of the tool (response chart) and changes in call criteria, there was a significant increase in the number of calls. Hospital mortality and number of CRAs had no significant reduction. The number of ICU admissions increased significantly, but remained constant over time.
Bertaut Y, <i>et al.</i> / 2007 / United States. <sup>(25)</sup>	Evaluate the results of implementing a RRT that uses a nurse-to-nurse consult approach (SBAR).	Experimental study.	One year after implementation of the RRT mortality decreased from 2.35% to 2.13% and the number of calls increased. The nurses' assessment in relation to RRT was predominantly positive, indicating a good job.
Kollef MH, <i>et al.</i> / 2014 / United States. <sup>(22)</sup>	Determine if real-time alerts improve patient care.	Randomized controlled trial.	Transfers to ICU (17.8% vs. 18.2%) and hospital mortality (7.3% vs. 7.7%) were similar for the intervention and control groups. The number of patients who required transfer to support houses or to long-term hospitals was similar in patients in the intervention and control groups (26.9% vs. 26.3%). The length of hospital stay (8,469,5 days vs. 9,4611,1 days) was statistically lower for the intervention group.
Kansal A, Havill K. / 2012 / Australia. <sup>(24)</sup>	Determine the impact on RRT calls and patient outcomes after implementation of a RRT with two levels of response with observation charts and new calling criteria.	Retrospective observational study.	There was a nonsignificant decrease of 20% in unexpected deaths and a decrease of 26% in CRAs. There were no significant differences in the severity scores of the admission and subsequent outcomes in the ICU and in the hospital for these patients. There was an increase of 50% in the number of rapid response calls after the introduction of a rapid response system in two levels of response and new observation charts and calling criteria.

RRT: Rapid response team; CRA: Cardiorespiratory arrest; ICU: Intensive Care Unit; SBAR: situation-background-assessment-recommendation.

of signs of clinical deterioration in the patient by monitoring, RRT activations remained late.

Institutional policies intended for professional valorization and training can reduce these barriers as they build a new culture, in which professionals can activate calls without being criticized and focus only on patient safety.<sup>(26)</sup> The presence of interprofessional hierarchy can also interfere negatively. Other studies that have also observed delays in the activation of RRTs identified as one

of the causes the hierarchical model in which the nurse of the sector where the patient is must first contact the local doctor before activating the RRT. Training the members of the multidisciplinary team in order to develop their professional autonomy in the workplace can assist in interprofessional relationship and avoid these limitations and impositions from a profession on the other.<sup>(28)</sup>

Delays, on the other hand, can be caused by the afferent teams' failure to recognize the signs of early

clinical deterioration in patients. These attitudes occur both due to the professionals' lack of adherence to the protocols and criteria for activation of calls and to the lack of human resources to meet the patients' demand.<sup>(26)</sup> The proportion of human resources in relation to the number of patients is a factor that is still questioned, and there are studies that relate the increase in the proportion of nurses with the reduction in mortality of patients; however, there are still limitations to demonstrate that the increase in the number of nurses can become a patient safety strategy.<sup>(29)</sup> Regarding the professionals' lack of adherence to protocols, it was observed that better knowledge and familiarity with the instruments of criteria to evaluate the signs can increase adherence to activation of the teams, avoiding delays.<sup>(30)</sup>

The team's composition may vary for each hospital, and most have a doctor leading the team. The need for the doctor in the RRT as a factor that can interfere with its efficiency is still controversial. Although most hospitals use the doctor as head of their teams, a meta-analysis did not show that the presence of the doctor is associated with better outcomes.<sup>(5)</sup> What has been observed is that when the professionals have experience and/or specialization in intensive care, the teams can achieve better outcomes.<sup>(31)</sup> In order to improve the RRT responses, tools and instruments have been devised that help professionals in the detection of signs of clinical deterioration, as well as in the team activation process and patient case handoffs.

Contrarily to what was found in this review, in some institutions the use of evaluation instruments led to lower rates of mortality and CRA events.<sup>(32)</sup> It is probably explained by the presence of programs of continuing education and training to employ the tools appropriately, which shows that, as much as the tools are useful to improve response, without the proper training for their use they may not bring clear benefits.<sup>(32)</sup>

This review presents limitations: firstly, due to the fact that instruments have not been used to assess the methodological quality of the studies identified; secondly, due to the existence of few controlled and randomized clinical trials that addressed the research question. However, this study was conducted based on a wide search in the literature in the world's main databases and managed to summarize the main aspects that can influence the performance of RRTs. Thus, it can guide health professionals and health managers to identify the flaws in their institutions in order to promote corrections and better results. Individuals who need critical care will be safer and with better chances of survival.

**Conclusion.** RRTs may have flaws due to the presence of sociocultural barriers, delayed efferent team activations, lack of experience, and lack of training. These factors may interfere with the increased occurrence of CRAs, ICU admissions, length of hospital stay, and hospital mortality.

## References

1. O'horo JC, Berrios RAS, Elmer JL, Velagapudi V, Caples SM, Kashyap R, et al. The role of the primary care team in the rapid response system. *J. Crit. Car.* 2015; 30:353-57.
2. Devita MA, Bellomo R, Hillman K, Kellum J, Rotondi A, Teres D, et al. Findings of the first consensus conference on medical emergency teams. *Crit. Care Med.* 2006; 34(9):2463-78.
3. Ludikhuizen J, Brunsveld-reinders AH, Dijkgraaf MGW, Smorenburg SM, de Rooij SE, Adams R, et al. Outcomes associated with the nationwide introduction of rapid response systems in the Netherlands. *Crit. Care Med.* 2015; 43(12):2544-51.
4. Simmes FM, Schoonhoven L, Mintjes J, Fikkers BG, van der Hoeven JG. Incidence of cardiac arrests and unexpected deaths in surgical patients before and after implementation of a rapid response system. *Ann. Intensive Care.* 2012; 2(20):1-6.

5. Maharaj R, Raffaele I, Wendon J. Rapide response systems: a systematic review and meta-analysis. *Crit. Care.* 2015; 19:1-15.
6. Braaten JS. Hospital System Barriers to Rapid Response Team Activation: A Cognitive Work Analysis. *Am.J.Nurs.* 2015; 115(2):22-32.
7. Shearer B, Marshall S, Buist MD, Finnigan M, Kitto S, Hore T, et al. What stops hospital clinical staff from following protocols? An analysis of the incidence and factors behind the failure of bedside clinical staff to activate the rapid response system in a multi-campus australian metropolitan healthcare service. *BMJ Qual. Saf.* 2012; 21(7):569-75.
8. Akhtar N, Field RA, Greenwood L, Finnigan M, Kitto S, Hore T, et al. Quality of in-hospital cardiac arrest calls: a prospective observational study. *BMJ Qual. Saf.* 2012; 21:184-90.
9. Barwise A, Thonpprayoon C, Gajic O, Jensen J, Herasevich V, Pickering BW. Delayed rapid response team activation is associated with increased hospital mortality, morbidity, and length of stay in a tertiary care institution. *Crit. Care Med.* 2016; 44(1):54-63.
10. Chen J, Bellomo R, Flabouris A, Hillman K, Assareh H, Ou L. Delayed emergency team calls and associated hospital mortality: a multicenter study. *Crit. Care Med.* 2015; 43(10):2059-65.
11. Chen J, Bellomo R, Flabouris A, Hillman K, Finfer S. The relationship between early emergency team calls and serious adverse events. *Crit. Care Med.* 2009; 37(1): 148-53.
12. Tirkkonen J, Yla-Mattila J, Oikkola KT, Huhtala H, Tenhunen J, Hopppu S. Factors associated with delayed activation of medical emergency team and excess mortality: an utstein-style analysis. *Resuscitation.* 2013; 84:173-8.
13. Al-Qahtani S, Al-Dorzi HM, Tamim HM, Fong L, Taher S, Al-Knawy BA, et al. Impact of an intensivist-led multidisciplinary extended rapid response team on hospital-wide cardiopulmonary arrests and mortality. *Crit. Care Med.* 2013; 41(2):506-17.
14. Dacey MJ, Mirza ER, Wilcox V, Doherty M, Mello J, Boyer A, et al. The effect of a rapid response team on major clinical outcome measures in a community hospital. *Crit. Care Med.* 2007; 35(9):2076-82.
15. Jung B, Daurat A, De Jong A, Chanques G, Mahul M, Monnin M, et al. Rapid response team and hospital mortality in hospitalized patients. *Intensive Care Med.* 2016; 42: 494-504.
16. Morris DS, Schweickert W, Holena D, Handzel R, Sims C, Pascual JL, et al. Differences in outcomes between ICU attending and senior resident physician led medical emergency team responses. *Resuscitation.* 2012; 83: 1434-37.
17. Hatlem T, Jones C, Woodard EK. Reducing mortality and avoiding preventable ICU utilization: analysis of a successful rapid response program using APR DRGs. *J. Health Qual.* 2011; 33(5):7-16.
18. Sebat F, Musthafa AA, Johnson D, Kramer AA, Shoffner D, Eliason M, et al. Effect of a rapid response system for patients in shock on time to treatment and mortality during 5 years. *Crit. Care Med.* 2007; 35(11):2568-75.
19. Davis DP, Aguilar SA, Graham PG, Lawrence B, Sell RE, Minokadeh A, et al. A novel configuration of a traditional rapid response team decreases non-intensive care unit arrests and overall hospital mortality. *J. Hosp. Med.* 2015; 10(6):352-57.
20. Calzavacca P, Licari E, Tee A, Egi M, Downey A, Quach J, et al. The impact of rapid response system on delayed emergency team activation patient characteristics and outcomes - a follow-up study. *Resuscitation.* 2010; 81:31-5.
21. Chen J, Ou L, Hillman K, Flabouris A, Bellomo R, Hollis SJ, et al. The impact of implementing a rapid response system: a comparison of cardiopulmonary arrests and mortality among four teaching hospitals in Australia. *Resuscitation.* 2014; 85:1275-81.
22. Kollef MH, Chen Y, Heard K, LaRossa GN, Lu C, Martin NR, et al. A randomized trial of real-time automated clinical deterioration alerts sent to a rapid response team. *J. Hosp. Med.* 2014; 9(7):424-9.
23. O'connell A, Flabouris A, Kim SW, Horwood C, Hakendorf P, Thompson CH. A newly designed observation and response chart's effect upon adverse inpatient outcomes and rapid response team activity. *Intern. Med.* 2016; 1:909-16.
24. Kansal A, Havill K. The effects of introduction of new observation charts and calling criteria on call characteristics and outcome of hospitalised patients. *Crit. Care Resusc.* 2012;14:38-43.
25. Bertaut Y, Campbell A, Goodlett D. Implementing a rapid-response team using a nurse-to-nurse consult approach. *J. Vasc. Nurs.* 2008; 26(2):37-42.

26. Singh S. In Reference to "A novel configuration of a traditional rapid response team decreases non-intensive care unit arrests and overall hospital mortality". *J. Hosp. Med.* 2015; 10(10):703.
27. Astroth KS, Woith WM, Stapleton S, Degitz RJ, Jenkins SH. Qualitative exploration of nurses' decisions to activate rapid response teams. *J. Clin. Nurs.* 2013; 22: 2876-82.
28. Macnaughton K, Chreim S, Bourgeault IL. Role construction and boundaries in interprofessional primary health care teams: a qualitative study. *BMC Health. Serv. Res.* 2013;13:486.
29. Shekelle PG. Nurse-patient ratios as a patient safety strategy: a systematic review. *Ann. Intern. Med.* 2013; 158: 404-9.
30. Buist M, Marshall S, Shearer B, Finnigan M, Hore T, Sturgess T, et al. Getting more efficient Rapid Response System (RRS) utilization by the use of a general ward based deteriorating patient contract. *Saf. Health.* 2015; 1:1-8.
31. Silva R, Saraiva M, Cardoso T, Aragão IC. Medical emergency team: how do we play when we stay? Characterization of MET actions at the scene. *Scand. J. Trauma Resus.* 2016; 24:1-6.
32. Rose MA, Hanna LA, Nur SA, Johnson CM. Utilization of electronic modified early warning score to engage rapid response team early in clinical deterioration. *J. Nurses Prof. Dev.* 2015; 31(3):e1-7.