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The Assessment of a Rapid Response System in Shizuoka Hospital, Juntendo University

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Original Research Article

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Abstract: Our hospital includes a total of 577 beds, two hundred fifteen physicians work in the hospital along with 705 nurses. On average, the hospital treats a total of 1,600 outpatients daily, and the inpatient facilities are almost fully occupied. A rapid response system (RRS) is activated by staff members in the inpatient and outpatient wards. There is only one other English report concerning the implementation of an RRS in Japan. We herein report the results of the implementation of an RRS in our hospital. The review of the RRS reports was retrospectively performed in all cases in which the activation of the RRS was required in our hospital between April 2017 and March 2018. There were 32 cases in which the activation of the RRS was required during the investigation period; all patients were defined as subjects. Twenty-one of the patients were male. Most cases involved patients of 70–90 years of age. Eleven of the cases involved inpatients. An extreme predominance was seen in daytime activations, particularly around noon. The cardiology department was predominant, followed by the cardiovascular, psychiatry, and gynecology departments. The reasons for RRS activation included consciousness disturbance (n=23), cardiac arrest (n=15), respiratory arrest (n=9), and convulsion (n=4) in total. Final mortality rate was 28%. Male sex, advanced age, cardiogenic disease and daytime were risk factors for the activation of the RRS in the present study.
Key word; rapid response system; epidemiology; outcome.

INTRODUCTION

A rapid response system (RRS) is a hospital-based system designed to allow any staff member to alert other staff of the need for help when a patient's vital signs have fallen outside set criteria [1]. In Shizuka Hospital, Juntendo University, acute critical care physicians and nurses in the emergency department of the acute critical care center are the main members who respond to alerts. Our hospital includes a total of 577 beds, including 20 intensive care unit (ICU) beds for outpatients who require urgent critical care, 7 ICU beds for post-operative care, and 20 high care unit beds for outpatients who require urgent high care. Two hundred fifteen physicians work in the hospital, including 10 acute critical care physicians, along with 705 nurses. On average, the hospital treats a total of 1,600 outpatients daily, and the inpatient facilities are almost fully occupied. The RRS is activated by staff members in the inpatient and outpatient wards when patients fulfill specific criteria or in response to staff concerns; its roles is to stabilize the patient in the ward or move the patient to a higher level of care [2]. The RRS activation criteria in our hospital are as follows: airway obstruction requiring emergent airway management (e.g., asphyxia), respiratory insufficiency, shock, drastically depressed level of consciousness, unexpected cardiac arrest, or any other deteriorating condition that the discoverer considers to necessitate RRS activation. The RRS, which was mainly developed in Northern America, Australia and Scandinavia, is used to identify high-risk hospital patients early so that serious adverse events can be prevented and their outcomes can be improved [1, 3-5]. There is only one other English report concerning the implementation of an RRS in Japan. We herein report the results of the implementation of an RRS in our hospital [6].

METHODS

The retrospective study protocol was approved by the review board of Juntendo Shizuoka Hospital, and the examinations were conducted according to the standards of good clinical practice and the Declaration of Helsinki.

The review of the RRS reports was retrospectively performed in all cases in which the activation of the RRS was required in our hospital between April 2017 (when a new format was applied) and March 2018. The following parameters were subsequently investigated for each case in which the RRS was activated: date, time, place, age, sex, reason for activation of the RRS, treatments, survival outcome, and the problems associated with the RRS. We used narrative methods to show the results of the investigation.

RESULTS

There were 32 cases in which the activation of the RRS was required during the investigation period; all patients were defined as subjects. The average time from discovery to the activation of the RSS was 3 minutes (range: 0-15 minutes) and the average time from the activation of the RSS to the arrival of the acute critical care center staff was 1 minute (range: 0 – 5 minutes). Twenty-one of the patients were male and 11 were female. Eleven of the cases involved inpatients; 21 involved outpatients. The age distribution is shown in Figure 1. Most cases involved patients of 70–90 years of age.

The distribution according to the months of the year is shown in Figure 2. July showed the maximum distribution, followed by April, but there was no specific pattern. The distribution according to time is shown in Figure 3. An extreme predominance was seen in daytime activations, particularly around noon. The distribution according to the department in which the patient was treated is shown in Figure 4. The cardiology department was predominant, followed by the cardiovascular, psychiatry, and gynecology departments.

The reasons for RRS activation included consciousness disturbance (n=23), cardiac arrest (n=15), respiratory arrest (n=9), and convulsion (n=4).

The medical treatments performed at the scene included chest compression (n=16), tracheal intubation (n=11), securing a venous route (n=13), adrenalin infusion (n=12), electrical shock (n=4), pericardiocentesis (n=1), and observation alone (n=2). With regard to the final outcomes, 22 patients survived, 9 died and 1 case was undescribed; thus, the mortality rate was 28%.

A list of problematic points in which the RRS can be improved is shown in Table 1. The problems are categorized into three sections; cooperation, preparedness and education.

Age from 70 to 90 was predominant. The highest number of activations was observed in July followed by April; however, there was no specific pattern.

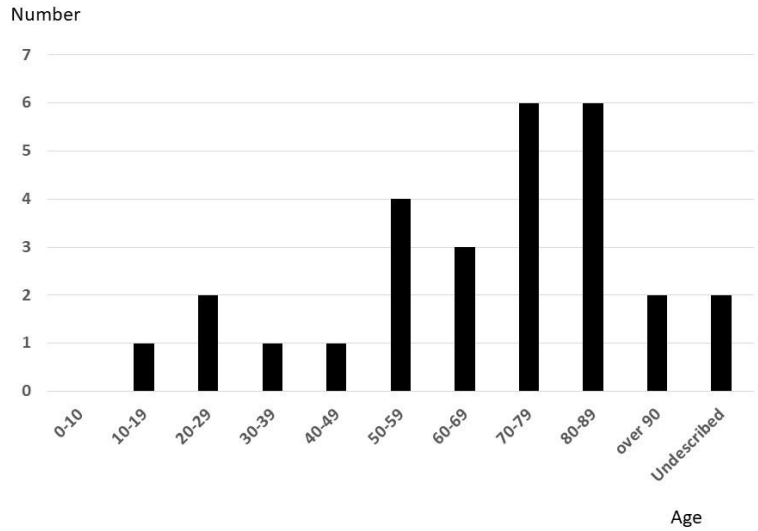

Fig-1: Age distribution

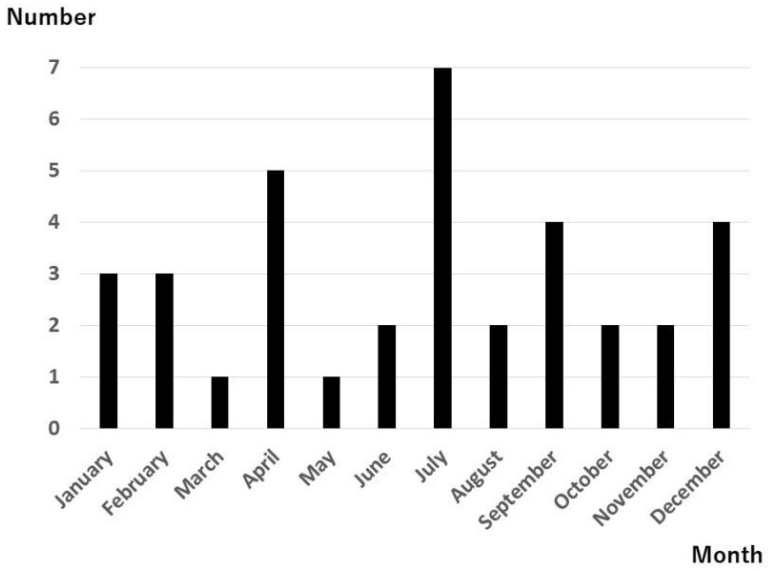

Fig-2: Distribution according to the month of the year

As this investigation included outpatients, daytime around noon was extremely predominant (Fig-2).

The cardiology department was predominant, followed by the cardiovascular, psychiatry, and gynecology departments (Fig-3).

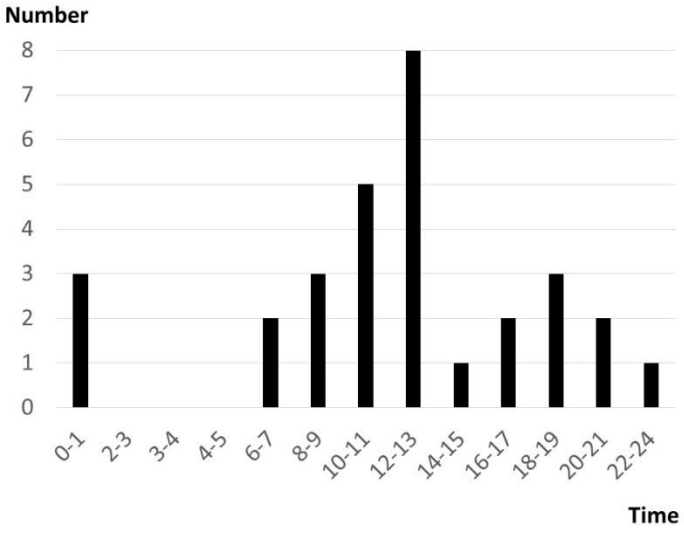

Fig-3: Distribution according to time

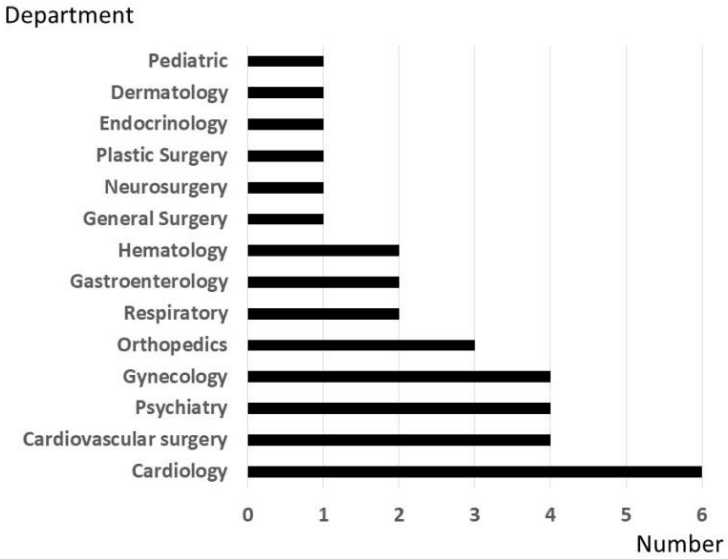

Fig-4: Distribution according to department

Table-1: A list of problems to be addressed to improve the rapid response system (RRS)

1. Cooperation	Lack of sharing 'do not attempt resuscitation' orders
	Insufficiency in grasping the condition of severely ill patients
	Lack of rounds by nurses
	Crowding at the scene by responding medical staff
	Failure to establish control of the scene
2. Preparedness	Loss of monitoring battery
	Lack of substance in the emergency cart
	Narrow space at the scene
3. Preparedness	Shortage of training for the RRS members
	Lack of knowledge regarding how to activate the RRS
	Hesitation or delay in activating the RRS

DISCUSSION

This is the second English report on an RRS in Japan. This study evaluated the clinical and epidemiological profile of the assessments performed by the RRS, which was led by acute critical care physicians and nurses in a secondary university hospital over the course of one year.

This report showed that old age, male sex, and treatment in a cardiology department were associated with RRS activation. This tendency was the same as in previous reports [3-5]. The incidence of sudden cardiac arrest (SCA) in the out-of-hospital setting is also reported to differ according to sex and race; the reasons for this are largely unexplained. Women have a lower incidence of SCA than men, even when one accounts for the prevalence of other predisposing conditions, such as chronic heart failure, myocardial infarction, and heart failure [7]. Elderly and male individuals tended to have more complications and more severe illness in comparison to young and female individuals, this might explain a sudden deterioration of these patients was observed occur more frequently in comparison to young or female patients [8-11].

This report showed the RRS was most frequently required during the daytime. This tendency was in line with previous reports [12,13]. One reason for this was that the population density of the hospital was affected by outpatients, who visited in the daytime. This difference in the population density affected the results. Another possibility was that there was less opportunity to find deteriorating patients because physicians tended to avoid measuring vital signs during the night time to order to allow the patients to sleep well.

The mortality rate in the present study was 28%. The mortality rates in studies of RRSs differ among reports. This may be due to differences in the criteria for RRS activation, the contents of the RRS, the conditions of the patients who were admitted to the hospital and/or definition of mortality. In another Japanese study, Kawaguchi *et al*. reported that the mortality rate in cases in which the RRS was activated was 8%. As their hospital was located in a city, the study population included young patients and the hospital did not have an acute critical care center for accommodating severely injured or ill patients. In contrast, our hospital was located in rural area, treated

elderly patients, and had acute critical care center. These different background characteristics might have influenced the difference in the mortality rate. In contrast, Bankan *et al*. reported that the mortality rate in cases in which the RRS was activated was 63% because they selected severely ill patients using scoring systems to assess the severity of disease, including the APACHE II and PRISM scores [5]. Accordingly, the differences in background factors should be evaluated when comparing the results from previous reports on RRSs.

The present study is associated with some limitations, including its retrospective nature, small study population, and the lack of a control group. Accordingly, a further prospective study is warranted to investigate whether the establishment of an RRS is associated with a decrease in the incidence of cardiac arrest and an increase in overall and unexpected hospital mortality.

CONCLUSION

In this second English report from Japan on the effects of an RRS, we evaluated the clinical and epidemiological profile of cases in which an RRS was activated. Male sex, advanced age, cardiogenic disease and daytime were risk factors for the activation of the RRS in the present study.

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