**Original Research**

# Reducing Patients' Death Rate Through Rapid Response Team Bell Activation in Emergency Room

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| Article Info | ABSTRACT |
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| | The patient death rate in the emergency department is a critical measure of the quality of hospital services and is regulated by legislation. The presence of a rapid response team is one of the factors influencing the fatality rate. A bell is a gadget that can summon a quick response team during the resuscitation process. The specific purpose of this research was to determine the effectiveness of the activation of the bell in the emergency room resuscitation of Universitas Airlangga Hospital on the patient death rate. The research design is a comparative study with a retrospective approach. Researchers used total sampling with a population of all patients in the emergency resuscitation room at Universitas Airlangga Hospital from July-December 2019 that met the criteria. The design of this study compared two groups that were extracted from the electronic register. The data were divided into two groups: three months before the intervention of the bell (N=62) and three months after the activation of the bell (N=65). The statistical analysis result of the Chi-Square Test obtained a p-value < 0.05 for the death rate between the two groups. There is a significant reduction in the death rate before and after the intervention. The result shows that it is possible to reduce the death rate by using a bell as a method to activate the rapid response team in the emergency room during resuscitation. This study offers a simple way to improve the death rate in the emergency room using bell intervention. |

## Introduction

The Emergency Room (ER) is a particular unit in a hospital designated for urgent medical attention problems. The patient mortality rate in the ER is one of the crucial indicators of the quality of hospital services. It is regulated in the law on Minimum Service Standards of ER (Kementerian Kesehatan Republik Indonesia, 2008). Choosing the emergency level of each patient admitted to the ER is essential because the number of patients flowing cannot be predicted over time (Di Somma *et al.*, 2015; Zachariasse *et al.*, 2019). Triage systems are used in the ER to control the flow of patients, maximize the service for the most needed patients and minimize the death rate despite the different kinds of triage systems (Zachariasse *et al.*, 2019; Zhu, Liu, & Zhang, 2021).

There are many kinds of triage systems used worldwide. Universitas Airlangga Hospital uses the Canadian Triage Acuity Scale/ CTAS system to sort patients in the ER. The CTAS system divides patients into five categories. The categories are priority 1 (also called resuscitation patients), priority 2 (emergency patients), priority 3 (urgent patients), priority 4 (less urgent patients) and priority 5 (non-urgent patients) (Bullard *et al.*, 2021). Each priority level has a different zone or spot in the ER (Ding, Park, Nagarajan, & Grafstein, 2019). Ideally, airway-breathing-circulation staff or a full team of resuscitation healthcare workers is established. Unfortunately, not all hospitals can provide enough staff because of the limited number of human resources.

In addition, the Indonesian Minimum Service Standards for the ER regulate the standard mortality rate for ER patients less than 24 hours, a maximum of 0.2% (Kementerian Kesehatan Republik Indonesia, 2008). The data found by the ER quality division team at Universitas Airlangga Hospital showed that in the third trimester of 2019, the mortality rate of ER patients did not meet the national standard, or it only scored 0.22%. The research shows that the main factors affecting patient mortality in the ER, besides human resources, are the method and the materials in a hospital (Limantara, Herjunianto, & Roosalina, 2013).

The resuscitation room is a particular zone in the hospital emergency room that handles life-threatening problems/ priority patients, such as a crisis of airway, breathing, and circulation condition (Kementerian Kesehatan Republik Indonesia, 2018). The resuscitation process requires rapid activation of the ER team response time to reduce patient mortality and improve the outcomes, especially in cardiac arrest patients (Herod, Frost, Parr, Hillman, & Aneman, 2014; Setiarini, Kriswidyatomo, & Sari, 2019; Silva, Saraiva, Cardoso, & Aragão, 2016). Implementing the rapid response team that comes on-site to answer calls for help from other staff can significantly reduce failed resuscitation events (Hall, Lim, & Gale, 2020). Appropriate hospital methods and materials are needed to support the resuscitation process, so we need a system that can activate rapid emergency response when a priority patient enters the ER despite the limited number of human resources.

Activating the rapid response system in hospitals that combines the Early Warning System and the cooperation of a competent, fast response team to carry out treatment/ resuscitation of patients immediately can reduce hospital mortality rates by 6% (Chen *et al.*, 2014). Nurses are generally the leaders in hospitals' initialing rapid response teams (Al-Omari, Mutair, & Aljamaan, 2019; Lyons, Edelson, & Churpek, 2018). Activating a quick response through appropriate communication methods is crucial and can be done effectively by utilizing existing technology. Currently, there are several communication tools used in hospitals to inform patient emergencies, such as walkie-talkies, pagers, wireless communication devices that can sound if there is a call for help between teams, etc. (Welch, Cheung, Apker, & Patterson, 2013). Unfortunately, most of the use of electronic devices in various emergency room hospitals requires high costs.

The emergency Room in Universitas Airlangga Hospital consists of 3 main designated rooms: Triage zone, priority levels 5 and 4 in one room; Priority levels 3 and 2 in

one room; and Priority level 1 in a particular room with an emergency trolley.

The distance between rooms is wide enough and separated by doors, so calling the resuscitation team requires a telephone. Regrettably, phone usage is often constrained due to slow response. One of the methods that can be used to increase the effectiveness of resuscitation services is the use of a bell as a communication tool in the ER. This study used a method of bell ringing to trigger the resuscitation team's arrival swiftly. While the triage nurse rings the bell indicating that there is a priority patient, all ER staff should be responding to the call. The bell used in this study is an electronic device used by ER staff to alarm a complete resuscitation team. The bell is chosen because it can reach three main rooms in the ER since the sound is loud. The convenience of using a bell as a communication tool is expected to reduce the death rate by increasing the response time.

The specific purpose of this research was to determine the effectiveness of the bell as an activator for the rapid response team in the resuscitation room. As ER is the entrance for patients in hospitals with high disease acuteness that requires special attention to minimize the mortality rate as low as possible, reducing the death number of ER patients means service improvement in the healthcare setting.

**Method**

The research design is comparative research with a retrospective study approach. In this case, the team made a comparison between the two groups. T0 before the bell intervention and T1 denoted the group after the bell intervention. The study is designed to compare mortality in the two groups mentioned. The sampling method in this study was total sampling. The population used is all patients admitted to the emergency resuscitation room at Universitas Airlangga Hospital for six months, considering the midyear report of ER quality data team. The researchers also took patients' data collection from electronic medical records provided during the July-December 2019 period that met the criteria as the primary source of demographic data.

The inclusion criteria in this study were all priority one emergency patients at Airlangga University Hospital from July-December 2019. The exclusion criteria were patients who triage from a lower priority (priority 5, 4, 3, 2, to priority 1; patients who were DAMA (Discharge Against Medical Advice); incomplete patient data on the electronic register or incoherent data from quality team register; and patients with DOA (Death on Arrival) status. The exclusion data were entirely removed from sampling.

The data was collected by extracting the electronic registers to obtain large numbers of deaths. Subsequently, the researchers cross-checked it against the ER quality team's data. Further, the patients' death data is selected while excluding the patients that satisfy the exclusion criteria based on the electronic medical record. The patient records gathered were divided into two groups, as shown in Figure 1. The first group, named T0, is the patient data during the last three months prior to the intervention. These data are taken from July, August, and September 2019 periods. The second group, named T1, is the data during the three months since the intervention, or from October, November, and December 2019. Finally, both groups are compared statistically.
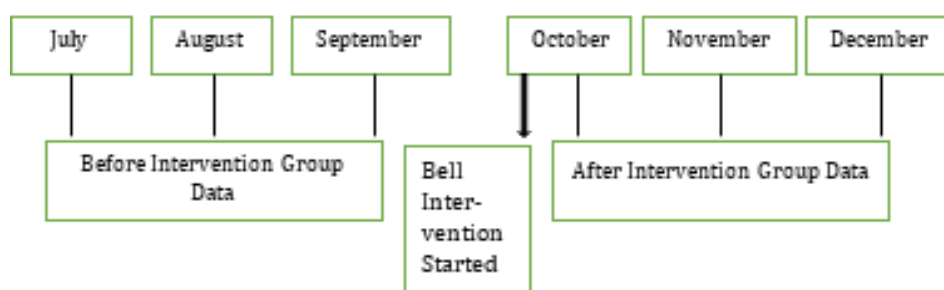


**Figure 1. The Flow of Data Collection**

The data were processed using IBM SPSS version 22, with the process of editing, coding, entry, and cleaning data on the computer program. Demographic data were analyzed in univariate form, with numerical data presented in the form of numbers and percentages. Furthermore, to compare the two groups using the Chi Square Test analysis in the software.

## Results and Discussion

**Table 1. Demographic Characteristics**

| Characteristics | | | N | % |
|---|---|---|---|---|
| Group T0 | Age | Neonates | 1 | 1.6% |
| | | Pediatric (1 month -18 years old) | 3 | 4.8% |
| | | Adult (18-70 years old) | 41 | 66.1% |
| | | Geriatric (>70 years old) | 17 | 27.4% |
| | | Total | 62 | 100% |
| | Gender | Female | 31 | 50% |
| | | Male | 31 | 50% |
| | | Total | 62 | 100% |
| Group T1 | Age | Neonates | 1 | 1.5% |
| | | Pediatric (1 month-18 years old) | 7 | 10.8% |
| | | Adult (18-70 years old) | 40 | 61.5% |
| | | Geriatric (>70 years old) | 17 | 26.2% |
| | | Total | 65 | 100% |
| | Gender | Female | 26 | 40% |
| | | Male | 39 | 60% |
| | | Total | 65 | 100% |

**Table 2. The Death Rate of Two Groups**

| Group | | N | % | p-value |
|---|---|---|---|---|
| Group T0 | Number of Survive | 44 | 70.97% | |
| | Number of Death | 18 | 29.03% | |
| | Sum of Level 1 Patients | 62 | 100% | 0.037 |
| Group T1 | Number of Survive | 56 | 86.15% | |
| | Number of Death | 9 | 13.85% | |
| | Sum of Level 1 Patients | 65 | 100% | |

The demographic characteristics of the resuscitation room patients are shown in Table 1. The characteristics include the age and gender of both groups. The table represents the number of highest patients aged 18-70 years (66.1%) and the fewest in the neonate patients (1.6%) in the T0 group. In the T1 group, most patients are adults aged 18-70 years (61.5%), and the fewest patients are neonates (1.5%).

Meanwhile, based on gender in the T0 group, there were 31 (50%) men and women, respectively. Then in the T1 group, the number of male sexes was 26 (40%) and 39 (60%). As we used total sampling as a research method, there is no homogeneity test. Table 2 compares the number of patients and the number of deaths before and after the intervention. The number of patients in the resuscitation room before the intervention group was 62, with a death rate of 29.03%. At the same time, the number of patients when the intervention was started was T1=65, with a death rate of 13.85%.

The death rate was improved from 29.03% (N=18) prior to the intervention

group to 13.85% (N=9). The Chi-Square test results showed that the death rate in the post-intervention group was significantly lower than in the pre-intervention group (p-value = 0.037). This study indicates that it is possible to reduce the death rate by using a bell as a method to activate the rapid response team in the emergency room, especially during resuscitation or in priority one patients.

The death rate decreased statistically within three months of bell intervention started. The healthcare workers placed in different zones in the ER can answer bell initiation by triage nurses immediately while it rings. All ER teams understand to prioritize the patients in priority 1 room while the bell starts, even if they also manage another patient in their zone. The ER team also can manage the role of airway or breathing or circulation handler based on team composition without a significant problem while they come to the resuscitation room. All ER staff have basic life support skills/ BLS or Advanced Life Support/ ALS skills. These certifications may affect the quality of the resuscitation process (Lockey, Lin, & Cheng, 2018; Müller *et al*., 2014).

The success rate of resuscitation of patients proves that a complete team is crucial in managing the emergency condition (Hall *et al*., 2020; Sun *et al*., 2018; Yarmohammadian, Rezaei, Haghshenas, & Tavakoli, 2017). As mentioned in this study, the lack of human resources can be overcome by using proper methods. Activating the bell by ringing it after doing an initial assessment or during triaging priority one patient contributes to accelerating the proper treatment and improves the survival rates and prognosis of the patients.

Implementation of the rapid response team on-site to respond to the call for help of other officers was able to significantly reduce the incidence of failure of resuscitation (Chen *et al*., 2014; Hall *et al*., 2020). Utilizing a bell in this study helps the response team immediately come to the resuscitation room. The study results are consistent with other previous studies that the increase in response to the handling of emergencies can improve patient outcomes, including death rate

(Boniatti *et al*., 2014; Herod *et al*., 2014). Although, in another study, it does not significantly improve the mortality rate, activating the emergency response team decreases other severe events in patients' health status (Kawaguchi *et al*., 2015).

Qualitative research about rapid response team communication also suggests cognitive aid tools to enhance teamwork during resuscitation (Calder *et al*., 2017). Implementing a bell intervention such as the bell ring used in this study can be utilized as a cognitive aid that significantly reduces the mortality rate in resuscitation patients through rapid response team activation. This bell method helps ER staff to complete the resuscitation tasks. Thus, the bell in this study is considered an eligible cognitive aid because its function met the format criteria in the prior study (Marshall, 2013). However, these findings should be cautiously interpreted because it has several limitations.

Some studies represent that the mortality rate in the ER is affected by several factors. Factors that come from patients include previous health conditions or patients' health status while coming to the ER (Limantara *et al*., 2013). In this study, the researchers did not measure the underlying condition of each patient. Researchers only looked at the triage level while in ER. However, the researchers found that age characteristic does not affect the outcomes of resuscitation patients. Response time is still the primary influence in the resuscitation process (Setiarini *et al*., 2019).

If it was the case, it is also needed to measure the response time of the resuscitation team that is coming while bell activation is implemented. It is also required to evaluate the number of the resuscitation team during the treatment process based on the role of the healthcare profession. Nevertheless, regarding the bell as the tool used in this study, it is pretty easy to operate for all ER staff and contributes to improving the mortality rate. The bell is also cheaper than many tools used nowadays to build effective communication in the team, such as the tools cited in previous research (Welch *et al*., 2013). So there is no harm in continuing intervention

while doing periodic evaluations on more terms in a year.

## Conclusion

The result of the study obtained that there is a significant reduction of death rate before and after using the bell as an intervention method. The complete resuscitation team in the priority 1 patients' room may affect the success of the treatment provided. The utilization of ringing the bell can be an alternative solution to be developed in the ER setting to call a resuscitation team in order to minimize mortality rate through rapid response team approach. However, it is needed to continue periodic evaluation on the intervention.

## Limitations of the study

This research involved a small number of sample sizes. The researchers faced difficulty in comparing the data after the bell intervention started because triage criteria were different during the COVID-19 pandemic. There are also no special characteristics of resuscitation room patients based on Airway, Breathing, or Circulation (A, B, C) emergency level. Different levels on A, B, C, could have affected the results. We also don't classify patients based on medical diagnosis or other clinical conditions beside the triage tag. Therefore, specific emergency characteristics or classifications may establish different results. Further study is needed to investigate this condition.

## Acknowledgement

## Conflict of Interest

The authors state there is no conflict of interest in this work.

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