Original research article: A comparative study to assess the response to a medical emergency and its effect on the patient wellbeing, within the healthcare setting and from outside the healthcare setting

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Abstract
Introduction: This study is intended to address the emic perspective of cardiac arrest resuscitation teams and the organizational and educational approaches that would best support their functioning.
Objectives: The specific objectives of this study are as follows:
1. To describe the emergency response events within and outside the hospital.
2. To identify organizational factors in order to improve cardiac arrest resuscitation training, teamwork and patient care.
Material and Methods: The present study is a longitudinal analysis of secondary data collected from patients in Mumbai, India. The data was collected from the Emergency response Closure form filled by the ICU Intensivist after the emergency for patient from within the healthcare setting. The hospital follows the CPR policy for medical emergencies from within the healthcare setting.
Result: Though in our study the results shows that there was no significant difference in the neurological outcome of patient of calls from within the hospital and outside the hospital. The variable of age in this study depicted that the emergency calls from outside the hospital were patient aged more than 60 years, than from within the hospital emergency calls. A study has also suggested that with increasing challenges of aging population, the crude annual rate of emergency transportations across all age groups increased from 32 per 1000 people in 1994–95 to 58 per 1000 people in 2007–08. The rate of transportation for all ages increased by 75% (95% CI, 62%–89%) over the 14-year study period, representing an average annual growth rate of 4.8% (95% CI, 4.3%–5.3%) beyond that explained by demographic changes. Patients aged $\geq$ 85 years were eight times (incident rate ratio, 7.9 [95% CI, 7.6–8.3]) more likely to be transported than those aged 45–69 years over. The study also reflects that most of the emergency calls from outside the hospital were due to cardiovascular emergency. The study results also show that the response time to outside emergency calls took more time as compared to internal call. The response time to internal calls was 1min as compared to external calls of 20 mins.

Keywords: medical emergency, wellbeing, healthcare, management, diabetes, cardiovascular emergency

Introduction
Medical emergency is a medical or behavioral condition, the onset of which is sudden and manifests itself by symptoms of sufficient severity, including severe pain, such that a prudent lay person could reasonably expect the absence of immediate medical attention to result in, placing the health of the afflicted person with such a condition in serious jeopardy; serious impairment to the person's bodily functions; serious dysfunction of any bodily organ or part; or serious disfigurement.

Examples Severe chest pain, severe or multiple injuries, severe Sudden onset of breathlessness, loss of consciousness, sudden change in mental status (e.g., disorientation), severe bleeding, acute pain, conditions requiring immediate attention (e.g., acute MI, appendicitis, poisoning, convulsions). (Segen's Medical Dictionary. © 2012 Farlex, Inc.) [1].

In Emergencies that typically occur in the community for example cases like road accidents, cardiac problems, convulsions and so on trained technicians or paramedics provide first aid to the patient i.e. pre-hospital care and shift the patient to an appropriate facility. EMS can be provided in two forms-treatment to in-patients and pre-hospital services. Pre-hospital medical services include ambulatory services, transportation of the patients to or from places of treatment and acute medical care (also called first aid). Ambulance services were largely unregulated prior to the 1970s. But over the last 2-3 decades, a largely regulated system has emerged around the world. As compared to developed countries with proper emergency systems in place, there is no single system which could play a major role in managing emergency medical services in India. There is a fragmented system in place to attend the emergencies in the country. 102 is the emergency telephone number for ambulance in parts of India. There are different emergency numbers in India's 28 states and seven Union Territories. Hospitals in the country provide different telephone numbers for ambulance services. Clearly, India is in need for proper emergency medical service that can be accessed from anywhere in the country. The existing

fragmented system falls terribly short of meeting the demand. [8].

These emergencies may require assistance from another person, who should ideally be suitably qualified to do so, although some of these emergencies can be dealt with by the victim themselves. Dependent on the severity of the emergency, and the quality of any treatment given, it may require the involvement of multiple levels of care, from first aiders to Emergency Medical Technicians and emergency physicians. Any response to an emergency medical situation will depend strongly on the situation, the patient involved and availability of resources to help them. It will also vary depending on whether the emergency occurs whilst in hospital under medical care, or outside of medical care [2]. Cardiac arrests are more common than you think, and they can happen to anyone at any time. In a review on Rapid response to an emergency outside the intensive care unit in a healthcare setting reiterated the fact that hospital wide mortality reduced due to the frequent use of clinical judgment as a criterion for rapid response team activation [5]. Another study cited the importance of early calls association with reductions in the rate of cardiac arrests and unexpected deaths. For every 10% increase in early calls, there was a 2.2 per 100,000 reduction in cardiac arrests and a 0.94 per 100,000 reduction in unexpected deaths [6, 7].

The other aspect covered in the study was response to a medical emergency from outside the healthcare setting. A common tenet in emergency medical services (EMS) is that faster response equates to better patient outcome, translated by some EMS operations into a goal of a response time of 8 minutes or less for advanced life support (ALS) units responding to life-threatening events [3]. Nearly 383,000 out-of-hospital sudden cardiac arrests occur annually, and 88 percent of cardiac arrests occur at home. Many victims appear healthy with no known heart disease or other risk factors. Sudden cardiac arrest is not the same as a heart attack. Sudden cardiac arrest occurs when electrical impulses in the heart become rapid or chaotic, which causes the heart to suddenly stop beating. Failure to act in a cardiac emergency can lead to unnecessary deaths. Effective bystander CPR provided immediately after sudden cardiac arrest can double or triple a victim's chance of survival, but only 32 percent of cardiac arrest victims get CPR from a bystander. Sadly, less than eight percent of people who suffer cardiac arrest outside the hospital survive. The American Heart Association trains more than 12 million people in CPR annually, to equip Americans with the skills they need to perform bystander CPR [4].

For emergency responses within the hospital, a major challenge to hospital preparedness for IHCA (In hospital cardiac arrest) involves its frequency. IHCA is neither common nor truly rare, occurring roughly 200 000 times per year in the USA, or an incidence of 4.5 cases per 1000 hospital admissions [12]. The infrequency of IHCA, coupled with the necessity for prompt and coordinated response, indicates a need for frequent and interdisciplinary training.

Aims and objectives
The specific objectives of this study are as follows
1. To describe the emergency response events within and outside the hospital.

2. To identify organizational factors in order to improve cardiac arrest resuscitation training, teamwork and patient care.

Materials and methodology
The present study is a longitudinal analysis of secondary data collected from patients in Mumbai, India. The data was collected from the Emergency response Closure form filled by the ICU Intensivist after the emergency for patient from within the healthcare setting. The hospital follows the CPR policy for medical emergencies from within the healthcare setting. The CPR policy defines the criteria for management of the medical emergency. The data for outside the healthcare setting was collected from the Case history filled by the Casualty Medical Officer and the Ambulance register. The hospital emergency department receives the call for the emergency. The hospital emergency team comprises of the Casualty Medical Officer, registered nurse who is ACLS and BLS certified, a housekeeping personnel and the ambulance driver. The housekeeping personnel and the ambulance driver is also trained in non medical BLS and safe transport of patient.

Study site
The study was conducted at Dr. L H Hiranandani Hospital. It is a private hospital situated in Suburban Mumbai, India and has all the major specialties and subspecialties (such as medical, surgical, orthopedics, obstetrics and gynecology, pediatrics). It caters to about 600 patients on an out-patient basis and 50 patients on an in-patient basis daily. The hospital also conducts about 450 surgeries on an average every month.

Study population
We evaluated the patient with in the healthcare setting for whom an emergency response (4444) was activated and outside the healthcare settings the Ambulance calls were evaluated. The patients were evaluated within the healthcare setting using an Emergency response closure form filled by the ICU Intensivist and the data for outside the healthcare setting was collected from the Case history filled by the Casualty Medical Officer and the Ambulance register. The factors evaluated were age, sex, co – morbidities, presenting diagnosis, response time to the event, emergency management at the crash site and management on shifting to the Intensive care unit. The factors slightly varied for patient from outside the healthcare setting when it came to the management at the crash site, then on shifting to the emergency department and subsequently to the intensive care unit. The management parameters evaluated were CPR (Cardiopulmonary cerebral resuscitation), Defibrillation, Oxygen support in the form of mask, nasal prong, bag mask ventilation, Non invasive ventilation, endotracheal intubation/tracheostomy with ventilator support, medications administered and any other management. The outcome of the patient was measured for the event as well as the final outcome as survival and the neurological outcome measured as per the Glasgow Coma Scale.

Result and Discussion
Despite advances in the science of cardiopulmonary

resuscitation over the past several decades, the odds of neurologically intact survival from in-hospital cardiac arrest (IHCA) remain low [9, 10] When an emergency occurs a patient's survival depends on both the immediate recognition of the event (as each minute delay from the time of cardiac arrest to the initiation of cardiopulmonary resuscitation (CPR) corresponds to a 10% decrease in the likelihood of survival), as well as aggressive resuscitation in the form of CPR, mechanical ventilation, administration of cardioactive medications and electrical defibrillation [11]. Though in our study the results show that there was no significant difference in the neurological outcome of patient of calls from within the hospital and outside the hospital. The variable of age in this study depicted that the emergency calls from outside the hospital were patient aged more than 60 years, than from within the hospital emergency calls [14, 15]. A study has also suggested that with increasing challenges of aging population, the crude annual rate of emergency transportations across all age groups increased from 32 per 1000 people in 1994–95 to 58 per 1000 people in 2007–08. The rate of transportation for all ages increased by 75% (95% CI, 62%–89%) over the 14-year study period, representing an average annual growth rate of 4.8% (95% CI, 4.3%–5.3%) beyond that explained by demographic changes. Patients aged ≥ 85 years were eight times (incident rate ratio, 7.9 [95% CI, 7.6–8.3]) more likely to be transported than those aged 45–69 years over [21].

The study also reflects that most of the emergency calls from outside the hospital were due to cardiovascular emergency as this data is supported by another study on the "Prevalence of Cardiovascular Emergencies in Specialized Hospital" by Tsegalem Hailemariam that 11% of all emergencies were due to cardiac morbidity in the Emergency room [13, 14, 22]. The other co morbidity showing significant influence on emergency calls from outside the hospital was diabetes mellitus. This data is supported by studies like the "Risk of Diabetes Mellitus on Incidence of Out-of-Hospital Cardiac Arrests: A Case-Control Study" by Young Sun Ro *et al*. [16, 17]. There is also evidence of patients presenting with cardiac emergencies to the emergency department having high prevalence of diabetes mellitus [18]. The study results also show that the response time to outside emergency calls took more time as compared to internal call. The response time to internal calls was 1min as compared to external calls of 20 mins. In another study that studied that the clinical outcome of the patient within a clinical setting where response was less than 4 mins. Showed a significant survival benefit [19, 20].

Limitation of the study
The study was limited to patient brought by cardiac call to the emergency department and emergency response calls within the hospital. The correlation of co morbidities with the presenting diagnosis was not studied and could be a scope for further studies.

Conclusion
Cardiopulmonary resuscitation is an emergency in which health care team should be active enough to approach the patient with quick response for better survival of the patient as in the study it was shown that the response time to internal calls was 1min as compared to external calls of 20 mins which will delay the clinical outcome of the patient.

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