

# Triage in Mass Casualty Incidents: Our Preparedness and Response – A Cross-sectional Study from a Tertiary Care Hospital, Karachi, Pakistan

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## Abstract

**Background and Objectives:** Trauma is the major concern of the modern world. The ever-intensifying number of casualties being presented with the scarcity of resources, heavily burdens the emergency departments, which are the fundamental centers of a hospital. For a smooth flow and an efficient ER, implementation of a strong triage system with trained emergency staff personnel remains a dire necessity. The present study is aimed to review the awareness and implication of triage among emergency personnel, to evaluate the preparedness of emergency staff involved in the management of massive trauma casualties and highlight the self-identified deficiencies of the hospital and pre-hospital system.

**Methods:** A cross-sectional study was conducted to evaluate the preparedness, knowledge, and implication of triage by emergency room personnel at Accident and Emergency Department, Jinnah Postgraduate Medical Center, Karachi. The target population for the survey included casualty medical officers (CMOs), assistant casualty medical officers (ACMOs), nursing staff, and casualty operation theatre staff working in all three shifts morning, evening and night from December 2016 to February 2017.

**Results:** Of the 126 respondents questioned, 32% had no concept of triage. 70% of the respondents mentioned that they have never witnessed any patient already triaged brought to their ER indicating a poor onsite triage system. Only 23% (n = 29) received any training for triage before in past 5 years. Therefore, 97.61% emphasized the need of refresher training programs. On testing with standard scenarios of triage, it was investigated that 27 out of 126 participants answered all the questions correctly. No training drill or courses had been conducted for disaster management of the surveyed hospital.

**Conclusion:** Effective and early disposal of patients from accident and emergency needs trained triage team. Thus, it is imperative that training of ER personnel to be conducted as a continuous process. This study finding will be useful for planning future triage awareness programs in the form of classroom courses and hospital drills to curb mass casualties.

**Keywords:** Triage, Emergency personnel, Trauma, Bomb blast, Mass incidents.

## Introduction

Triage is medical term derived from French word “Trier” which means to sort, separate, or select [1]. It is believed to be first used during Napoleonic Wars by Baron Dominique Jean Larrey, who articulated a clear rule for sorting patients for treatment: “Those who are dangerously wounded should receive the first attention, without regard to rank or distinction [2].” Later, triage was used during American Civil War, WWI, and WWII, but it was not until the 60s that the concept of triage was applied in civilian practice [3]. However, these days when the casualties are not limited to borders and wars, there is an increased need of triage to be implemented both in and out of hospitals such as ED triage (emergency department), inpatient triage (ICU surgery), military triage (battlefield),

multicasualty incident triage (road traffic accidents, train collisions, and fires), and disaster mass casualty triage (bomb blasts) [4]. Trauma has become the major concern of the modern world [5]. Over 3400 people die on the world’s roads every day, and tens of millions of people are injured or disabled every year [6]. Nearly one-third of the 5.8 million deaths from injuries are the result of direct violence due to war, suicide, and homicide [7]. In Pakistan alone, according to “Pakistan Security Report 2016,” there were 441 terrorist attacks spread over 57 districts which took 908 lives and left 1627 people severely injured [8]. Karachi, the key city of Pakistan alone had 474 terror and militancy-related deaths in 2016. Despite the fact that there has been a 45% decrement since 2015, it still remains one of the most violent cities in the country [9]. Almost about 30,000 road traffic accidents are reported in Karachi every year, and there has been hardly any improvement recorded so far [10]. With increasing number of terrorist attacks and road traffic accidents, a high influx of patients presenting in the ER has become a common occurrence. However, with timely and appropriate pre-hospital and hospital-based medical care, it is possible to reduce the mortality and morbidity as a consequence of trauma as the critical trauma patient has only 60 minutes from the time of injury to reach definitive surgical care, or the odds of a successful

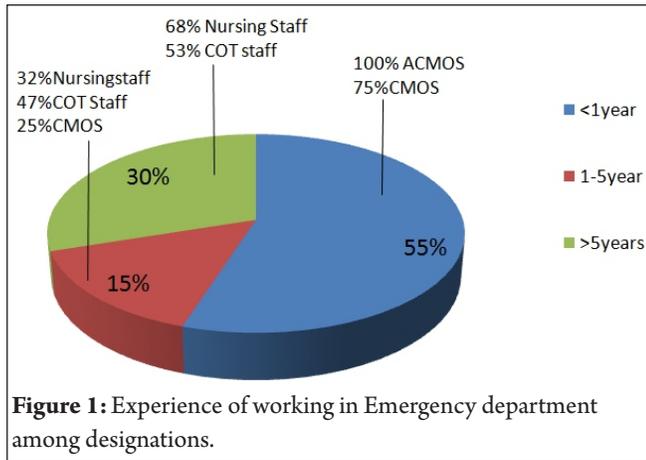
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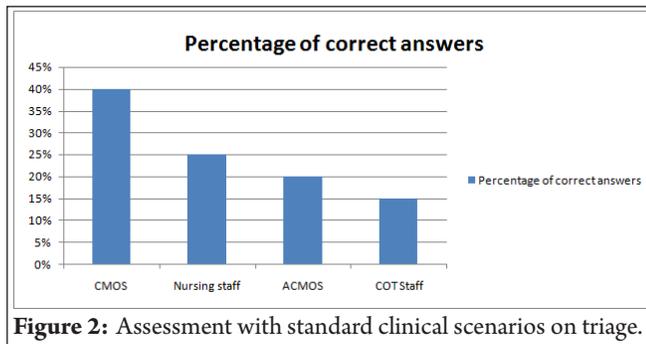
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**Figure 1:** Experience of working in Emergency department among designations.



**Figure 2:** Assessment with standard clinical scenarios on triage.

recovery diminish dramatically referred to as the “Golden Hour [11]”. The ever-intensifying number of casualties being presented in ERs along with the scarcity of resources, heavily burdens the emergency departments, which are the fundamental centers of a hospital. For a smooth flow and an efficient ER, implementation of a strong triage system becomes a dire necessity. Not everyone requires the same level of care at the exact same time, and triage helps differentiate critically ill from sick and subsequently separates patients who require immediate intervention from those who do not and prevents competition for resources in events of overcrowding [12]. Therefore, this system when augmented with proper knowledge and trained emergency triage personnel improves patient’s safety and provides a quality care [13]. Therefore, the purpose of this study was to review the understanding and implication of triage and to evaluate the preparedness of emergency staff involved in the management of massive trauma casualties. Self-identified deficiencies of the hospital and pre-hospital system are also highlighted in relation to the inherent problems of a developing country where the scene triage is non-existent making ER the primary place for onsite triage.

**Subjects and Methods**

A cross-sectional study was conducted to evaluate the preparedness, knowledge, and implication of triage by emergency room personnel

at Accident and Emergency Department, Jinnah Postgraduate Medical Center (JPMC), Karachi. The survey also aimed to highlight the deficiencies of the hospital and pre-hospital system. The target population for the survey included the residents appointed as casualty medical officers (CMOs), house officers (interns) appointed as assistant CMOs (ACMOs), nursing staff, and casualty OT (COT) staff working in all three shifts morning, evening, and night from December 2016 to –February 2017. Those who were on leave or did not give the consent were excluded from the study. A self-constructed questionnaire was prepared by the researchers and administered to the target population. The questionnaire included questions pertaining to the experience of the individuals dealing with massive casualties in ER, their knowledge about triage, its color coding with implication and self-assessment of their preparedness instilled in the form of any workshops or drills conducted by the hospital management. The questionnaire also made a brief assessment of the problems that these emergency personnel face while handling massive casualty incidents. The respondents were also asked to triage and prioritize the patients for management through four standard clinical scenarios. With the help of the standardized pretested questionnaire, data were collected. The questionnaire was adequately discussed by the investigators, and predetermined phrases were decided to reduce errors. A verbal consent was taken by every individual before the questionnaire was handed. Survey was conducted within 5 days to eliminate repetition and bias due to information spreading about the questionnaire content. Any questions by the respondents were answered in a predetermined manner. Confidentiality of the respondents was ensured and maintained by the researchers.

**Results**

A total of 126 emergency personnel gave their consent to participate in the survey. Four questionnaires were excluded from the study due to incomplete information. The study included 16 (12.6%) CMOs, 55 (43.6%) ACMOs, 40 (31.7%) nursing staff, and 15 (11.9%) COT staff. Among 126 participants, 64 were male and 62 females. The minimum age of participants observed was 23 years and maximum 52 years mean 37.5 SD 20.50. Experience of working in ER varied among the designations. The nursing and the COT staff were found to have the most diverse amount of experience where most of them had an experience of more than 5 years, whereas the ACMOs and majority of CMOs had an experience of <1 year (Fig 1). On asking question regarding trauma experience, 100% think trauma incidents are high in Karachi and 97.6% agree there is high influx of trauma patients in their ER. 55.5% of the respondents said that they had been involved in the management of mass casualty incidents brought to their ER, out of which only 60% felt that they were assigned any specific role in such events. Regarding the concept of triage, 68% of the respondents agreed that every trauma patient does not need the same level of care at the same time and the critical ones must be

Designation	Use of color codes in MCI (%)	No use of color codes in MCI (%)
CMO	10 (62.5)	6 (37.5)
Nursing Staff	23 (57.5)	17 (42.5)
ACMOs	22 (40)	33 (60)
COT Staff	4 (26.66)	11 (73.33)

CMO: Casualty medical officer, ACMOs: Assistant casualty medical officers, COT staff: Casualty Operation Theatre staff, MCIs: Mass casualty incidents (p=0.004)

Designation	Confident (%)	Unconfident (%)
CMOs	52	48
Nursing staff	51	49
COT staff	31	69
ACMOs	14	86

identified and isolated first to begin with. 70% of the respondents mentioned that they had never witnessed any patient already triaged brought to their ER and the remaining 30% indicated that the patients who were triaged and brought to them were mostly referred from other hospitals. All of which indicates a poor pre-hospital onsite triage system. On asking about knowledge on triage, 96.82% of all the respondents think they are familiar with the word "triage," but only 62% correctly answered the color codes. Enlisting the usage of triage during mass casualties, CMOs seemed to be more aware to prioritize the individuals requiring the need of color tagging compared to rest of the ER personnel (Table 1). When the respondents were inquired with their confidence level, while triaging patients, it was seen that CMOs generated a better level of confidence compared to others followed by the nursing staff and the COT staff (Table 2). ACMOs generated a very poor level of confidence with 86% agreeing to being unconfident and requiring the need of a senior when it comes to triaging. Of 126 respondents, only 29 people (23%) received any training for triage before in past 5 years. This included 5 CMOs, 10 ACMOs, 11 nursing staff, and 3 COT staff. 100% reported that there was no hospital drill during past 5 years. Therefore, 95.23% agreed they need to be properly trained to carry out triage effectively while 97.61% emphasized the need of refresher training workshops and drills. Regarding self-identified deficiencies of the hospital, 50.79% do not agree that their ER department is equipped with all the facilities for effective triage. 60.31% recommended interdepartmental communication between surgical wards to be effective while 39.69% recommend additional trained staff for enhancing efficiency of triage system. Regarding standard scenarios on triage, it was investigated that 27 (21%) out of 126 participants answered all the questions correctly where the highest correct answers in descending order CMOs, nursing staff, then ACMOs and lowest among COT staff (Fig. 2).

### Discussion

Keeping in view, how mass casualty incidents are not such a rare occurrence in Karachi, there is a great burden on hospitals to manage situations of overcrowding, especially in the emergency department. JPMCs ER has a continuous influx of patients not only from within the city but also from interior Sindh which has overburdened it greatly during incidents of mass casualties as seen recently in a train accident occurring on November 3, 2016, at Landhi station of Karachi, which killed 17 people and injured 65 [14]. An emergency was declared in all the major hospitals of the city and according to the head of JPMC Emergency Department, they received 16 dead bodies and 40 injured people in their ER [15]. Subsequently, on November 12, 2016, a bomb blast at shrine of Shah Noorani in Khuzdar, Balochistan, claimed 52 lives and 102 were injured. Nearly 50 ambulances were dispatched from Karachi bringing back the injured to JPMC along to two other tertiary care hospitals [16], which shows that JPMC not only caters the residents of Karachi but also the casualties from all over Sindh and some areas of Balochistan as well. The ER becomes even more chaotic and without a proper triage system in place, it becomes very hard to differentiate who requires immediate care and who can wait. Thus, the impact of timely evacuation and triage on effectively dealing with a mass casualty event cannot be underestimated [17, 18]. With no onsite triage whatsoever, the role of ED becomes even more crucial as it is inundated with the casualties that do not even belong to it [19].

Although the ambulance services are quick to respond to disasters, the drivers are not trained paramedics and use a "scoop and run" technique to transfer casualties to the ambulance and lack even the basic en-route treatment facilities [20]. With no onsite triage at times, the first to arrive in hospitals is the dead converting the casualty unit into a morgue [21]. The concept is simple and uses the simple triage and rapid treatment. It is based on three parameters respiration, perfusion, and mental status, and the patient is labeled with Black, Red, Yellow, and Green color tags where red requiring an immediate intervention [22]. This system allows the first respondents to triage multiple victims in 30 seconds or less on spot. However, sadly with no existing national or regional guidelines for onsite triage, the emergency personnel are thus the first respondents to make this effective. Therefore, in this research, the emergency personnel were primarily tested with standard scenarios dealing with color-coded tags to be allotted in such situations. It is alarming to note that 38% of the respondents had no concept of color coding of triage in massive casualties; however, the residents who are postgraduates and designated as CMOs during ER rotations seemed to have a better understanding when compared to nursing staff or ACMOs. It is integral that knowledge of such an important principle of trauma care be inculcated as early as possible. In case of major mass casualty incidents, the faculty including the professors and associate professors of the surgical department are usually called to the ER providing much-needed knowledge and experience to the rescue effort. However, the ER personnel of the hospital are the primary responders of the victims; therefore, they play a key role until the seniors arrive. A study conducted in Karachi, in July 2008, at two major hospitals, including Jinnah Postgraduate and Medical Center (JPMC), evaluated the preparedness of doctors working in accident and emergency department revealed that only 3.3% of doctors were confident about their management of blast victims [13]. After this survey, 12 two day courses and workshops were conducted by "Primary Trauma Care (PTC)" for doctors and nurses working in JPMC. In this series of events triage was performed and supervised by "Primary Trauma Care" instructors. It was also observed that simplified triage scheme and tabletop exercises for emergency staff, enhance their performance in multiple casualty incidents [23]. Thus, it is a dire need to train them adequately to efficiently utilize the limited resources at such times as a continuous process. A self-analysis of their training and confidence in the management of such casualties reveals a devastating situation. An overwhelming 95% of the respondents felt that they were deficient in their training and management of such scenarios while nearly 98% emphasized the need of refresher training workshops on trauma. The widespread responses to prioritize the patients for the treatment order in the tested scenarios highlights the lack of uniformity among the respondents which significantly decreases the efficiency of triage response. Among the common problems and hindrances noted are overcrowding, aggression, shortage of trained and experienced staff and lack of interdepartmental communication. Of which overcrowding being reported as the most serious and common. Overcrowding creates a workload and dissatisfaction among the ER staff and the patients. Typically, the situation is also compounded by large emotionally charged crowd. All of which leads to inadequate patient care delaying treatments, thus adversely affecting the patient's satisfaction and staff contentment. Lack of funds and resources both in terms of treatment modalities and workforce is also identified as a

problem. The number of patients with varying severity of injuries and multisystem involvement requires the management by different specialties, but lack of interdepartmental communication adds up to time to transfer victims to a definitive care unit further overcrowding the situation. The chaos associated with such scenarios may not be totally avoidable, but a high degree of training and pre-assigned roles to the hospital staff has the potential to undertake an efficient rescue effort [24].

### Recommendations

To resolve the issues enlisted, at hospital level, a number of countermeasures need to be taken; the staff which includes nurses, COT staff, ACMOs, and CMOs needs to be educated and trained with concept of triage. Simulated training drills should be conducted by the hospital along with mandatory participation by the ER personnel to have a real feel of the situations and problems that need to be dealt in mass casualty incidents. It is recommended that such drills should be conducted at least once a year [25]. Specialist trauma physicians as triage officers should be appointed. The presence of experienced trauma physician or surgeon is the most important resource in reducing preventable injuries [26]. A triage color coding system should be made effective in the ER with triage rooms having complete facilities from where a unidirectional flow can be generated

to the hospital. Having a dedicated area in ER designated as mild injury site, moderate injury, and severely injured has proven to be effective [27]. At national level, a centralized coordinated disaster plan should be developed immediately with proper communication and links to paramedic services, security agencies, charity-based ambulance services, and all major hospitals to enhance the pre-hospital management of the trauma victims. Individual preferentially a trained doctor should provide his services at the trauma site. As most of the fatalities are on site, these trained individuals can identify potentially salvageable severely injured victims requiring immediate intervention providing an efficient rescue effort.

### Conclusion

An increasing influx of trauma victims in a relatively short time span has become a regular feature of Pakistani hospital system. Lack of adequate training at pre-hospital and in-hospital level may translate into increasing morbidity and mortality. The knowledge regarding the triage and triage practice among the emergency personnel was found to be very inadequate as only 21% of the respondents correctly answered standard triage scenarios in massive casualties. This study finding will be useful for planning future triage awareness programs in the form of classroom courses and hospital drills as a continuous process to curb mass casualties.

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