ORIGINAL ARTICLE

ONSITE TRIAGE, PRE-HOSPITAL MANAGEMENT AND EFFECTIVE HOSPITAL TRANSPORTATION "WHERE DO WE STAND?"

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Background: To improve morbidity and mortality outcomes in mass casualty victims it is pertinent that a system of prehospital triage be implemented. The objectives of this study are to determine the knowledge, attitude and practices of emergency care transporters and ambulance personnel towards onsite triage, pre-hospital management and transportation to hospital of critically injured and wounded patients in mass casualty incidents and other emergencies in Karachi, Pakistan. **Method:** All ambulance personnel and emergency care transporters who transported patients to the hospital were included in the study. Pre-tested questionnaire was self-administered after obtaining written consent. **Results**: Among 250 emergency care transporters (ambulance personnel), mostly belonged to age group 21–25 years 73 (29.2%). Most of emergency transport provider teams were composed of only 1 person who was the driver of ambulance 22 (80%) and only 44 (17.6%) had the facility of paramedics. Regarding lifesaving equipment facilities in ambulance, 188 (75.2%) ambulances did not have these and only 62 (24.8%) were equipped. Predominantly, the ambulance personnel performed the 'scoop and run' practice and the ambulance works as a transport vehicle 188(75.2%), while facilities of basic life support were available in only 45 (18%) and advance life support facility in 17 (6.8%). Among all 203 (81.2%) did not think they are able to decide who is severely injured and 183(73.2%) believe they are unable to do triage in mass causalities. **Conclusion:** Our study showed significant gaps in the knowledge of the emergency care providers regarding triage of patients especially in mass casualty incidents. Though the response time and time to the hospital center is comparable, no pre-hospital lifesaving interventions are attempted en-route. A coordinated effort by the ambulance services, hospitals and the government are detrimental for a swift functioning of a trauma system.

Keywords: Onsite triage; Pre-hospital management; Effective transportation; Emergency medical service; Ambulance; Mass casualty incidents; Knowledge

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INTRODUCTION

The term Mass Casualty Incident (MCI) is used to describe a situation in which the number of persons injured or killed exceeds the Emergency Medical Services (EMS) resources such as personnel and equipment.[1] This mismatch between resources and the number of persons who need them underscores the importance of Triage. Triage is a medical term that allows categorization of patients per injury severity and need for immediate medical treatment as compared to the probability of them benefiting from such care so that limited resources are used wisely.[2] As such, triage prioritizes the number of patients that will benefit with immediate care regardless of the quality of care. Triage works by prioritizing the patients that need emergency medical treatment and emergency transport services to the most suitable hospital center with respect to the injury type of the patient.

The word triage takes root from the French word "Trier: which means to distribute, separate or select.[3] The concept of triage was first practiced in the military. Napoleon's army Surgeon in Chief, Baron Dominque Jean Larry (1766–1842)[4], is often credited for classifying casualties on the battle field.[4] e insisted that those troops most seriously injured get medical attention first.[5] The practice and protocols of triage underwent further changes during the American Civil war, World War 1 and 2.[6,7] The military triage system was adopted into civilian care in the 60s and in 1964 the first systemic description of Civilian Emergency Department's use of triage was published by Weinerman.[8] Subsequent developments in triage has led to it being applied in different scenarios in today's world of medical care e.g. prehospital triage at the site of massive casualties like earthquakes, Road Traffic Accidents (RTAs), bomb blast injuries as well as Triage in hospitals to distribute the patient to the relevant department of care e.g. inpatient, outpatient, ICU etc. depending upon the patients injuries.[9] Patients in rural hospitals in remote areas are triaged on the basis of severity of symptoms in developing countries so that they can be

timely referred to an advanced care facility for proper treatment.[10]

To improve morbidity and mortality outcomes in mass casualty victims it is pertinent that a system of prehospital triage be implemented. According to a report, Karachi, which is the largest and most populated urban city of Pakistan has about 30,000 road traffic accidents (RTAs) every year.[11] The general practice observed in Karachi is that the ambulance workers scoop up the injured and drop them at the nearest available hospital not considering whether the nature of the injury necessitates immediate treatment.[12] Also, this practice risks potential overburdening of "near-by" hospitals that may not necessarily be equipped with the expertise and resources to handle special trauma injuries.[13] Pakistan spends only 0.5% of its gross domestic product (GDP) on health which is very low leading to inability of the government to provide required healthcare.[14] Lack of an integrated system to overlook the process of patient transfer from the site of injury to the adequately equipped hospital with the ability to handle the influx of many patients at a time hampers immediate medical interventions that may be vital for some patients. The municipal authorities lack a coordinated system for prehospital care in Karachi and this space is taken up by private and charity-based ambulance services that operate independently of a common set of protocols and compete for business often neglecting prehospital triage of patients and rushing them to the nearest available hospital.[13] This adversely affects survival outcomes. Thus, there is a need for prehospital triage at the site mass trauma. This study looks at the current knowledge, attitude and practices amongst ambulance workers of the practice of triage, pre-hospital management and transportation to hospital of critically injured and wounded patients in mass casualty incidents in Karachi, Pakistan. These ambulance personnel are potentially the first care providers that transport the patients to the hospital for medical attention and can make or break the patients' chances of survival.

MATERIAL AND METHODS

A cross- sectional study was conducted to evaluate the awareness and implication of onsite triage among emergency care transporter (ambulance services) at Accident and Emergency department Jinnah Postgraduate Medical Center Karachi from Jan to February 2018.

A self-constructed questionnaire was prepared by the researchers and administered to the target population. We also aimed to highlight the self-identified deficiencies of pre-hospital trauma system.

A self-constructed questionnaire was prepared by the researchers and administered to the target population and data was collected. The questionnaire was adequately discussed by the investigators and pre-determined phrases were decided to reduce errors. Questionnaire was pre tested on a small sample of respondents (10 participants) before a full-scale study, in order to identify any problems such as unclear wording or the questionnaire taking too long to administer etc. Pre-tested questionnaire was self-administered after obtaining written consent and data was collected. The survey was conducted within 5 days to eliminate repetition and bias due to information spreading about the questionnaire content. Confidentiality of the respondents was ensured and maintained by the researchers.

All data was analysed through SPSS version 20. Cross –tabulations were performed to get relations between study variables. Chi Square test was used to observe the significant relationships between categorical variables. Statistically significant *p*-value <0.05 was considered.

RESULTS

This study was conducted on 250 emergency care transporters (ambulance services), age range from 18–50 years, mean age 34±9.79, mostly belonged to the age group 21–25 years 73 (29.2%). All respondents were males. On educational basis, most 122 (48.8%) were pre-matriculated, only 45 (18%) were graduate level educated (Table-1). regarding experience in emergency care transportation 163 (65.2%) had experience of 1–5 years and 106 (42.4%) had experienced mass causality -incidents while 144 (57.6%) had not (Table-2).

Most of emergency transport provider team were composed of only 1 personnel who was driver of ambulance 22 (80%) and only 44 (17.6%) had the facility of paramedics. Moreover, only 6 (2.4%) had a security officer (Table-3). All ambulance services belonged to private organizations and mostly belonged to Chippa 91 (36.4%), followed by Edhi 80 (32%), Aman 62 (24.8%), and others 17 (6.8%) (Table-4). Only 63 (25.2%) reported the use of GPS/road map to reach incident site while 187 (74.8%) did not.

Regarding lifesaving equipment facilities (AED, pulse oximeter, suction machine, umbo bag, IV cannula/crystalloids, spinal board and cervical collars) in the ambulance, 188 (75.2%) ambulances did not have these and only 62 (24.8%) were equipped with above mentioned facilities. None of the ambulances were equipped with chest tube and ventilator facility. The only facility which was available in all ambulance was oxygen mask and oxygen cylinder.

Predominantly, the ambulance personnel performed the 'scoop and run' practice and work as transport vehicle 188 (75.2%), while facilities of basic life support were available in only 45 (18%) and advance life support facility in 17 (6.8%) (Table-5).

On enquiring regarding the time for response to trauma, ambulance response time to reach patient at incidence site was less than 30 min 160 (64%), less than 10 min 39 (15.6%) and less than 45 mins 51 (20.4%). Patient transportation from site of incident to hospital was less than 30mins 203 (81.2%), less than 10 min 45 (18%) and less than 45 min 2 (0.8%).

Source of information regarding incident and incident site was reported as mostly from call from ambulance service center 148 (59.2%) and most reported that they were not informed about type of incident or event like RTA/Gunshot/Blast 135 (54%) while 115 (46%) were informed. Complete information regarding incident or event was provided to only 59 (23.6%) and scant information was provided to 188 (75.2%). Only 63 (25.2%) reported being informed regarding expected number of causalities and 187 (74.8%) were not. All 250 (100%) laid emphasis on the importance of informing emergency department before ambulance arrival as there is no communication between recipient emergency department and ambulance care provider. On questions about number of patients transported over last 24 hours, most reported 5–10 patient per ambulance 222 (88.8%), 1–5 patients 16 (6.4%) and 10–15 patient was 12 (4.8%).

On enquiring regarding response to mass causalities, most respondents reported placing a call to another ambulance 106 (42.4%) and 77 (30.8%) prefer to inform to call center. Most agreed with importance to inform regarding incident to both ambulance and call center 247 (98.8%). On encountering multiple patients in mass casualties, most personnel reported following scoop and run policy by random picking of patient from incident site 97 (38.8%), while 91 (36.4%) chose severely injured over mildly injured.

On questioning regarding knowledge about onsite triage, 227 (90.8%) did not know about onsite triage and did not have an idea regarding colour coding of triage, only 23 (9.2) had heard about onsite triage (Table-VI). Among all 203(81.2%) did not think they are able to decide who is severely injured and 183(73.2%) believe they are unable to do triage in mass causalities. Only 25 (10%) participated in training or workshops on triage once in their life while 225 (90%) did not. Among them 184 (73.6%) think workshops help in effective triage and 250 (100%) think applying triage lessens the burden of disaster causalities. On enquiring regarding willingness in training for triage 198 (79.2%) would like to get trained and 189 (75.6%) think that ambulance care provider should be provided triage training workshops.

Table-1: Education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	none	60	24.0	24.0	24.0
	prematric	62	24.8	24.8	48.8
	matric	49	19.6	19.6	68.4
	Intermediate	34	13.6	13.6	82.0
	Graduate	45	18.0	18.0	100.0
	Total	250	100.0	100.0	

Table-2: Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<1 year	2	.8	.8	.8
	1-5 year	163	65.2	65.2	66.0
	5-10 year	68	27.2	27.2	93.2
	>10 year	17	6.8	6.8	100.0
	Total	250	100.0	100.0	

Table-3: Role

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Driver	200	80.0	80.0	80.0
	Paramedic	44	17.6	17.6	97.6
	Security	6	2.4	2.4	100.0
	Total	250	100.0	100.0	

Table-4: Name of service

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Edhi	80	32.0	32.0	32.0
	Chipa	91	36.4	36.4	68.4
	Aman	62	24.8	24.8	93.2
	Other	17	6.8	6.8	100.0
	Total	250	100.0	100.0	

Table-5: Ambulance vehicle character

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	transport vehicle	188	75.2	75.2	75.2
	Basic Life support	45	18.0	18.0	93.2
	Advanced Life Support	17	6.8	6.8	100.0
	Total	250	100.0	100.0	

Table-6: Knowledge about onsite triage

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	23	9.2	9.2	9.2
	no	227	90.8	90.8	100.0
	Total	250	100.0	100.0	

DISCUSSION

The development of integrated trauma systems that incorporate care from the road side injury to the rehabilitation of the victim has improved trauma outcomes in high income countries. Outcomes in hospitals are dependent upon pre-hospital triage, distribution of injuries and volume vs resources in hospitals. In one of the largest collaborative data

collection and publication from Karachi, 5 trauma centers which were studied were seen to have loosely and overlapping catchment areas. This study showed that the burden of road trauma victims presenting to the tertiary care hospitals was poorly distributed and not triaged according to the severity of injuries.[15] This leads us in to our discussion of the knowledge, attitudes and practices of emergency response services (ambulance personnel) at one of the public sector tertiary centers in Karachi, Pakistan.

The respondents in our study were all males mostly in the 21–25-year age group. This may be a consequence of cultural and social structure of the society where women are not routinely involved in outside hospital activities as opposed to a robust representation of women in healthcare services in the 'in-hospital' care of patients. Almost half of our respondents had not completed formal 10 year of schooling (matriculation) which potentially influences their responses in disasters as 90% did not know what on-site triage or colour coding of triage victims were. 42% of the respondents had experience mass casualty incidents which can be attributed to the two decades of turmoil, terrorism and disasters that Pakistan experienced since the War on Terror was launched by the United States.

The ambulances in our survey were predominantly (80%) operated by a single person, the driver, who is the only individual responding to the emergency calls. This is reported in a previous study on ambulance personnel in Karachi which reports 98% solo drivers taking emergency calls.[16] Furthermore, 75% of the ambulances were not equipped with lifesaving equipment and not a single one in our survey had a ventilator. However, all ambulances were reported to have an oxygen tank and a mask which is consistent with the findings reported in the Prehospital Airway Management (AM) in Emergency and Trauma Patientsstudy.[17]

In our study, a small number of ambulances 6.8% were claimed to be equipped with an advanced life support equipment. In the pre-hospital AM study, 35% of the responders had awareness regarding airway management out of which 77% of belonged to only one ambulance service out of six services that were included in the study.[17] The 6.8% ambulances mentioned above may also be part of the same fleet.

The ambulance staff predominantly (75%) applied 'scoop and run' method from the site to the hospital. By this mechanism of transportation, no C-Spine immobilization, airway management, bleeding control or other lifesaving interventions are done during transport. The ICTIRT data for 5 tertiary care trauma centers in Karachi report 20.1 % patient arrival by ambulance while 74% arrival by private vehicles. This study noted that patients arriving via private transport had higher chances of survival as opposed to arrival by ambulance.[15] Razzak JA *et al* in 2001 studied EMS and cultural determinants of an emergency in Karachi and also reported 58% patients brought by Taxis and 23% by cars. The most common reasons for not using the ambulance services were a perception that the patient was not sick enough, slow response of the ambulance, not knowing where to find one and high cost.[18]

Provision of emergency care at the site and during transport has improved survival of patients in the developed countries with integrated trauma systems as evidenced by study from San Diego, which showed that pre-hospital endotracheal intubation in victims of blunt injuries and GCS of 8 or less was associated with improved survival.[19]

The majority of the ambulance staff in our study reported response and transport to hospital times of less than 30 min. In comparison, a study from Islamabad, the capital city of Pakistan, reported rescue time of 10.4min by Rescue-15 which is an EMS collaboration project between police, public sector and the community.[20] Karachi, just by the fact that its size and population is much larger than Islamabad it is considerably more challenging to cover by the ambulance services. A previous study reports mean time from trauma occurrence to ED as 4.7 hours at a tertiary care hospital in Karachi in 2011.[21]

In our study, the largest number of ambulances belonged to Chippa followed by Edhi, Aman and others. An editorial by Baqir S. M. *et al* from December 2011 mentions St John and Edhi ambulances being the most common ambulances in the past. The article reports the later introduction of Chippa and Aman Foundation ambulances to the city in the recent years. Interestingly, the introduction of advance life support in ambulance was introduced first by the Aman Foundation Ambulances in Karachi along with the provision of trained paramedics.[22] This is consistent with the Airway Management study mentioned previously where three quarters of the respondents who had knowledge of AM were from the same ambulance network.

There was a consistent poor report of information about the nature and extent of casualties being relayed to the ambulance drivers. This also contributes to the lack of preparedness and lack of expectation of the severity and number

of injuries and injured. The lack of communication has an impact especially in triaging of critically injured patients across the trauma centers and tertiary care hospitals during mass casualty incidents. This affects the mortality outcomes as reported in the study by Baqir, S. M.*et al*.[22] There was however a unanimous agreement among the respondents about the importance of communicating with the hospitals during the transportation of the victim so the emergency departments can prepare and anticipate the number and severity of casualties. There was also agreement about the importance of communication during mass casualty incident and majority of the respondents practice of calling the call center and relaying information and calling other ambulance drivers too to inform them about the casualties.

The respondent's deficient knowledge on triage and the use of colours designated for the severity of victims was seen to be translated in their practices as one-third practiced 'scoop and run' of severely injured patients while the other third reported randomly picking patients in a mass casualty incident. Over 80% of the ambulance personnel reported being unable to identify severely injured patients and over 70% unable to perform triage. Only 10% had attended a workshop on triage. This is an area of concern that needs immediate attention. The effect of uncoordinated pre-hospital triage during mass casualty incidents affects mortality outcomes as reported by previous studies on LMIC showing that the extremely busy and poorly busy have higher mortality than middle-volume centers which was reported in the study on 5 trauma centers in Karachi.[15]

There is however much enthusiasm and willingness demonstrated by the ambulance personnel to participate in mass casualty and disaster management workshops and most believe the training will improve mortality of trauma victims.

CONCLUSION

Our study showed significant gaps in the knowledge of the emergency care providers regarding triage of patients especially in mass casualty incidents. Though the response time and time to the hospital center is comparable, no pre-hospital lifesaving interventions are attempted en-route. However, the ambulance personnel demonstrated interest in enhancing their training. A coordinated effort by the ambulance services, hospitals and the government is detrimental for a swift functioning of a trauma system. A command-and-control system with radio communication with all the different charity ambulances under one roof can enhance this communication. Paramedic training, equipment provision should be ensured so that lifesaving procedures can be attempted by paramedics.

AUTHORS' CONTRIBUTION

MM, MSM and ASK conceived, designed and did statistical analysis and editing of manuscript. JE, MOM, and SJ did data collection and manuscript writing. MM and ASK did review and final approval of manuscript.

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