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Triage

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Abstract

During austere conditions when there is a large demand on healthcare services and the resources are limited for different reasons, there should be a special way of managing patients and victims in order to make the most benefit to the community. Trial of first come, first served will lead to losing most of the seriously injured patients because they will reach late if they reached a healthcare facility. In addition, day-to-day work protocols with full resources also are not the optimum to offer for the whole community during a major incident. Triage has been created and evolved in military medical services to face mass casualty with limited resources and then transferred to civilian life to deal with mass casualty incidents. Applying triage to patients created some interference with medical bioethics if those applied on individual bases, but if applied in the whole picture of state or country, we can understand its rations.

Keywords: military triage, major incident, disaster, bioethics, sorting, emergency department triage

1. Introduction

God created human beings and honored them over other creatures; therefore, keeping life is one of utmost urges. This urge to save lives is challenged in time of major incidents when patients' needs are exceeding care resources. Moreover, with the increase in global population and escalation in the costs of healthcare, more patients are visiting emergency departments (EDs) all over the world to cut expenses and bypass remote appointments. Most EDs today adopt a triage system to prioritize patients who need urgent care.

2. Definition

2.1 Linguistic definition

“The process of determining the most important people or things from amongst a large number that require attention” [1].

2.2 In medical use

It is the sorting of victims by giving them grade to prioritize them for treatment and transportation in order to maximize the number of survivors in major incidents and war victims [2]. According to the assigned grade, patients will have their priority in attending by healthcare givers, investigations, and operation rooms.

The term triage is similar to “rationing” and “allocation” which is practiced on a daily basis in every field. For the term triage to be applied for a situation, there are three prerequisites that must be fulfilled:

1. There is shortage of resources in comparison to the needs.
2. There should be a system set to triage by the health body or facility.
3. Trained health personnel should do the triage [3].

3. History of triage

Triage started as war time medical effort driven by the increased number of wounded and shortage of resources. In addition the need for manpower during wars affected the priorities in triage in some armies.

It is believed that the first time triage used in military medicine to prioritize treatment for the wounded was by Baron Dominique Jean Larrey (8 July 1766–25 July 1842). He made rules that the wounded are treated by the severity of their clinical conditions regardless of the rank; even enemies were treated in the same way [4].

The next milestone in triage was attributed to British rear admiral John Crawford Wilson (1834–4 July 1885) [5]. He differentiated between the severity levels of the wounded; he wrote in his book *Outlines of Naval Surgery*: “If a case should be hopeless, or the man apparently dying, an operation then would be useless” [6]. He was sorting wounded soldiers into three categories: slight, serious, and fatal. This was the base for further division in triage system by creation of the expectant zone. In the triage system created by Dominique, all serious cases are treated in the same level.

Triage in the American civil war was depending on the first-come, first-served basis regardless of the severity, salvageability, or best use of limited resources [3].

The World War I with the development of more lethal weapons like machine guns and chemical gases with a large number of wounds that could be treated pushed the military surgeons to apply and refine triage protocols. This has led to the concept of “The greatest good of the greatest number.” This is the rule for triage practiced in military and civilian life during major incidents now [7]. This rule means that at time of limited resources and facing huge demand, some patients can be saved if long time and large amount of resources devote to them, but this will not be done. The reason to not offering help to those patients is that we can save much more number of wounded patients (who are less critical) using the same resources during the same time. We may save 10 patients instead of one. The pressure of escalating numbers of wounded soldiers with limited fighters in the battles made some health strategic planners in the armies to give higher priorities to patients that can be treated and sent back to front war lines rapidly over seriously injured patients that need urgent intervention for long duration. Winslow listed the two objectives of triage as “1st, conservation of manpower; 2nd, the conservation of the interest of the sick and wounded” [8].

In the World War II, the weapons were more developed with the introduction of tanks and air forces. On the other hand, medications and health services improved. The health strategic planners still concentrate on supporting the troops. They direct resources for soldiers who are able to fight rather than injured or diseased ones.

With the improvement of transportation and less dependence on the manpower in modern wars, it is rarely nowadays needed to leave somebody without

treatment for the sake of others. The triage decision now is to which facility best transfer the patient and what is the optimum method of transportation.

4. Moral and ethical issues in triage

Health system ethics has been developing and improving since the eighteenth century by the First Geneva Conventions (1859) and Nuremberg Act [9]. In 1979, Beauchamp and Childress published their book *Principles of Biomedical Ethics* [10]. They put four main principles which are:

1. Respect of autonomy
2. Beneficence
3. Non-maleficence
4. Justice

4.1 Requirements for a triage system

To have a triage system, there are three requirements to be fulfilled:

- A. There should be shortage of resources in comparison to the need.
- B. There should be a system set by health authority to be used in such circumstances (point A).
- C. There are personnel trained on the system who will implement it.

If there is no shortage, then no need to use triage, but for every patient, the health facility will do its best to treat the patient.

A triage system should be set by the health authority or facility administration to be followed by anyone doing this task. The aim of this step is to look for the benefit of the community and the population as a whole and not to just part of it.

- D. Trained personnel to practice the triage to ensure the justice and prevent personal preference.

During major incidents, there are situations in which the triage officer should take some decisions that may be hard and not in the best interest of some patients. The decisions made by the planners in the First and Second World Wars and before are made not by patients' will or his best interest and benefit. Below is the discussion of the principles one by one:

1. Respect of autonomy: During a normal life, this is the first patient's right. No intervention should be done unless the patient understands the issue fully and accepts it. For this reason, the informed consent is needed to be signed by the patient. In time of major incidents with a large number of patients present, there should be prioritization of patients according to system agreed upon by the hospital or health authority. In time of major incidents, absolute knowledge of the whole community needs is predominant over individual liberty. It is sure

that some people will not be happy with delaying them regardless of their presentation time or their degree of severity.

2. **Beneficence:** In 1964, the World Medical Association (WMA) developed the Declaration of Helsinki as a set of ethical principles for experimentation on human beings. The declaration strongly emphasizes (a) that the concern for the interests of the subject must always prevail over the interests of science and society and (b) that ethical considerations must always take precedence over laws and regulations. Those principles cannot be applied during disaster conditions. The overall benefit to the community should overrule the personal benefit, and the concept of “maximum benefit to maximum number” should be used to maximize community benefit and welfare.

Later in the chapter, there is a section regarding exceptions to the general rules.

3. **Non-maleficence:** Non-maleficence means doing non-harming or inflicting the least harm possible to reach a beneficial outcome [11]. In this meaning trying to save as much as possible of the community can explain depriving some patients from treatment or delay them until suitable time and resources are available. In this issue we may not consider all people as the same, for example, if there is a healthcare giver and a fighter that are wounded, then we should not count each as one person, because when the healthcare giver is treated, he will help in saving the other.
4. **Justice:** In justice we mean that each patient should take what he needs and no one should be disadvantaged or deprived from treatment. People may misunderstand the meaning well and have high expectations to treat all patients as the highest-priority patient. To explain this we should differentiate between *equality* and *justice*. The first one means that everybody should receive the same amount. For example, a patient with fracture can wait for days, while the unconscious patient with multiple injuries needs rapid assessment and a full management plan rapidly implemented. This is justice; each patient will take time and resources according to the severity of the condition.
5. **Ownership of resources** is challenged in time of major incidents, and the hospital should accept and treat any patient involved in the incident (according to the plan) [3].

5. Special circumstances in triage

Although triage depends mainly on patients' injury severity, there are conditions which oblige the officer to modify his triage decision or in austere condition to decide to whom priority of care is given. The triage officer should look to the whole picture of the community, putting in his mind the aims at that particular time he is doing it and the full resources in addition to the type of patients he is dealing with. The following are examples of special conditions which need special care and by no means are they exhaustive:

- A. **Children:** Dealing with children is sensitive not only from the emotional side but also the practical side. Children have more expected life span than old

people, and in time of limited resources with the equality of other factors, priority should be given to children for the sake of the community.

- B. Pregnant women: In dealing with pregnant women, we are dealing with two lives; therefore, they have double importance and should take priority.
- C. Emergency services personnel: All those personnel should not be counted as one person; if we give them priority and save them, they will help in saving more lives. We give them the value of the expected number of lives they may save. In addition taking care of someone injured rapidly will encourage other to put all their efforts, knowing that their colleagues will treat them in high priority if they are injured, and this will improve the quality of care given to all patients.
- D. People with special skills or knowledge or with special importance: There are some people who possess some special knowledge and skills or have some special importance to the country. Those should also get special treatment and priority. This will need confirmation of their status and priority from local or national authority to recognize them during major incidents.
- E. The surrounding circumstance: If there is a critical need to manpower like in war condition, for example, then the triage officer may make the highest priority to simple cases that can be treated with minimal resources and time and go back to combat area. Another example is facing floods and waiting for central help, until extra help reaches them, and there is a desperate need for all hands even the slightly wounded; otherwise, the whole area and local community will have grave outcomes.
- F. Combination of the abovementioned conditions needs the triaging officer to put his priority at that single moment.

6. Common triage systems

We can divide triage systems into several categories:

- 1. Military triage system
 - 2. Major incidents in civilian life
 - 3. Emergency department triage system which is used for managing patients on a daily basis
1. **Military triage system:** The military triage differs from civilian life because in many occasions there is chaos and many of the infrastructures are not present or destroyed by the combat. Another reason is that the troops are usually located outside the cities where there are no or small services and they need to build their own treatment and evacuation system. The healthcare in present time is provided to every wounded for two reasons. First, there is no dependence on manpower like previous battles, and, second, there is huge improvement in communication and transportation tools and equipment. Now every wounded soldier is treated, but the difference is in time and place.

2. Major incidents in civilian life: Civilian triage started around 200 years after the military one. The first triage system is simple triage and rapid treatment (START) which is a method used in the field to rapidly sort and prioritize patients during major incidents according to the severity of their injuries. It was developed in 1983 in California [12, 13]. Later there will be discussion of other systems that are developed later.

The triage systems used in military and major incidents “that occur in civilian life” are the same, and it will be discussed in combination. They differ in the infrastructures supporting each one, with clear overlap between them.

Table 1 shows some of scoring systems used to evaluate the severity of the injuries which is the base for triage.

There are different categories for triage in major incidents. They are the physiological and the anatomical methods.

Year introduced	Abbreviation	Name
1970	AIS	Abbreviated injury scale
1971	TI	Trauma index
1974	GCS	Glasgow Coma Scale
1974	TISS	Therapeutic intervention
1974	ISS	Injury severity score
1980	TI	Triage index
1980	TRISS	Trauma injury and severity score
1981	APACHE	Acute physiological and chronic health evaluation
1982	PGCS	Pediatric GCS
1987	PT	Pediatric trauma score
1987	OIS	Organ injury scale (AAST)
1988	PRISM	Pediatric risk of mortality score
1989	AP	Anatomical profile
1989	RTS	Revised trauma score
1989	T-RTS	Triage version of RTS
1990	ASCOT	A severity characterization of trauma
1994	UST	Uniform scoring system for trauma (Utstein style)
1994	APSC	Acute physiology score for children
1996	ICD-9-CM	ICD-9 clinical modification based on AIS and ISS
1996	TOXALSTM	Toxic advanced life support TM
1997	NISS	New ISS
2001	ASPTS	Age-specific pediatric trauma score
2002	PAAT	Pediatric age-adjusted TRISS
2003	START	Simple triage and rapid treatment
2003	JUMP-START	Pediatric version of START

The year input is the first time the system was introduced. Some has been updated later.

Table 1.
List of scoring systems [14].

The physiological systems are easily learned and need simple training; any health personnel can be trained and perform it. Moreover it can be reproduced easily and is a reliable method of following up the patient's condition. On the other hand, it is time-consuming and not suitable for incidents with a huge number of victims.

Anatomical systems of triage are fast and depend on visual recognition of injuries. These methods need a good amount of experience in injuries and when the patient needs surgery. It is difficult to reproduce the results as it is subjective and not objective. A very large number of victims is suitable for this type of triage.

After knowledge of the anatomical and physiological condition of patients, the triage officer needs to know the comorbidities to and other circumstances (discussed above in the section of special situations) to give the patient the final triage level.

The most common triage systems used in major incidents are as follows:

A. Glasgow Coma Scale: It is a scoring system used to evaluate the patients with coma or disturbed consciousness (**Table 2**). It was first described by Graham Teasdale and Bryan Jennett in 1974 and was used as a practical method to evaluate patients with brain injury and a good method to communicate the patient's condition between different healthcare providers or facilities. The findings use the scale guide initial decision-making and monitor trends in responsiveness that are important in signaling the need for new actions [15]. Each point will be given a number: the maximum score is (15) and means the patient is fully conscious, and the lowest is (3) which is clearly seriously injured. The reactions to be noticed are:

There are studies comparing the full GCS to the motor reaction alone. It is believed that motor response is better predictive of patients' condition than full GCS [16]. Recently the use of GCS in triage is objected because it is time-consuming and can be interpreted in different combinations for the same score [17].

B. Simple triage and rapid treatment (START): It is currently widely used in the United States and many other countries. People can be easily trained on it and used to sort victims rapidly into four categories: red, yellow, green, and white (or black). It depends on the ability of the victim to walk and then give the green category. If the patient cannot walk and has any alteration in his level of consciousness or vital signs, then he is categorized as red. If there is no alteration, he will be yellow. If no breathing and unconscious, then he is considered dead (white). **Figure 1** shows the flowchart for START triage system [18].

C. JumpSTART: It is the pediatric version of the START system; the main difference is the trial with the child to do airway maneuver and short

Eyes		Verbal		Motor	
Spontaneous	4	Orientated	5	Obey commands	6
To sound	3	Confused	4	Localizing	5
To pressure	2	Words	3	Normal flexion	4
None	1	Sounds	2	Abnormal flexion	3
		None	1	Extension	2
				None	1

Table 2.
Glasgow Coma Scale (GCS). (glasgowcomascale.org) [15].

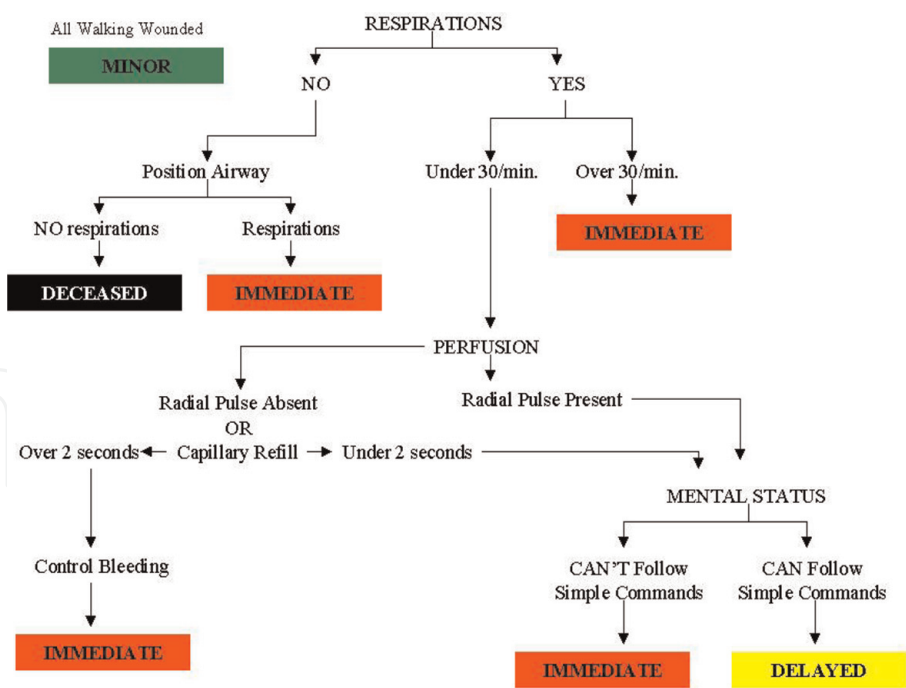


Figure 1. Flowchart for START triage system [18].

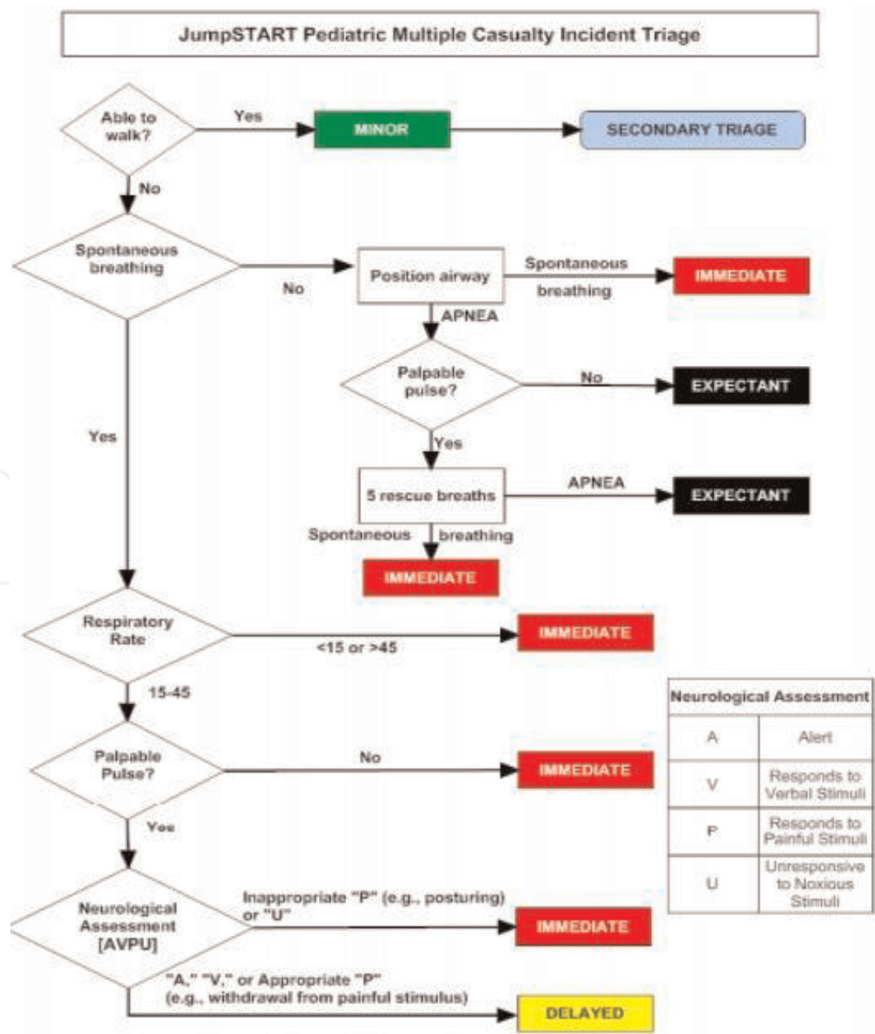


Figure 2. Flow sheet for JumpSTART triage system [18].

resuscitation trial in the field before declaring death of the child. In addition to considering the change of heart rate in different age groups, **Figure 2** shows the flowchart for JumpSTART triage system.

D. Triage-revised trauma score (T-RTS): This system depends on physiological parameters of the patient at the time of evaluation. It is found to be a good indicator of the severity of the injury [19]. It depends on three physiological parameters which are (1) Glasgow Coma Score (GCS), (2) systolic blood pressure (BP), and (3) respiratory rate (RR). Each factor will be given a score, and then the scores of the three factors are summed: the more the score, the

STEP 1: calculate the physiologic variables

A Respiratory rate, /min	
	points
10-29	4
>29	3
6-9	2
1-5	1
0	0

B Systolic blood pressure, mmHg	
	points
≥90	4
76-89	3
50-75	2
1-49	1
0	0

C Glasgow coma score	
	points
13-15	4
9-12	3
6-8	2
4-5	1
3	0

$$TRTS = A + B + C$$

STEP 2: Assign a triage priority

TRTS	triage priority
1-10	Immediate
11	Urgent
12	Delayed
0	Dead

Step 1: Different variables in TRTS. Step 2: Interpretation of the results.

Table 3.
Triage-revised trauma score [19].

Categories and urgencies in the emergency triage system	
Category	Urgency of the condition
One	Patients in this category should be attended immediately when presented
Two	Patients will have priority and seen in the next doctor available. By passing que of patients present
Three	To place the patient's file at the front of the waiting list
Four	Wait for their que or may be advised to go to a primary health facility
Five	Discharged from emergency side and advised to visit the primary health facility

Table 4.
The five levels of triage in emergency department [21].

better the condition of the patient and vice versa. **Table 3** shows the different items in T-RTS and their interpretation.

There are several other systems, but they are used to assess and predict prognosis in trauma patients and not used for prioritizing them during response to major incidents.

3. Emergency department triage systems: The emergency department shares with the military life the inability to control the number and time of patients presented. With timeliness of the care and relative scarce of resources, in addition to the increase in the demand on beds and blocked access to other services, more patients are seeking medical care in emergency departments [20]. To make risk assessment of patient introduced to the ED and make the best benefit of the resources, a five-level triage system was introduced in Ipswich, Australia. This system was validated and adopted in several states in Australia and formed the base for different national systems in several countries in the world. The triage is done by experienced nurses, will give patients one of the five levels depending on the urgency of the conditions. **Table 4** shows the five levels in emergency department triage and the period allowed before attending the patient [21].

There are several triaging systems in different countries like the Manchester triage system which is widely used in the UK hospitals and the Canadian triage system (CTAS) and others, all using five levels and basically similar in sorting patients. There are minimal differences in the bench mark for the time frame each category should be seen within.

7. Wrong triage

With the rush and chaos occurring during response to major incidents, there are mistakes that may be committed by the triaging officer. Under-triage and over-triage are the wrong decisions that may occur:

1. Under-triage: It is defined as “A term of art referring to underestimating the urgency of the condition of a person arriving in A&E and not prioritizing his or her management over that of a patient with less urgent needs” [22]. It is a medical problem and may result in serious bad outcomes because it deprives a patient from the resources he/she needs. What is the level of acceptable risk of under-triage? The CDC puts the threshold as 20%, but in practice it is 35% [23].

If the validation depends on the injury severity score (ISS) and any patient with a score of >15 transferred to a hospital without trauma center, then the acceptable level is 5% [24]. It is found that patients with under-triage have less mortality rate than patients with right triage to the trauma centers because they have better GCS score, blood pressure, and base deficit [25].

2. **Over-triage:** A term of art referring to unintentionally overestimating the urgency of the condition of a person arriving in A&E (casualty) and prioritizing that person's management over that of a patient with more urgent needs [26]. This is a less risky medical mistake. Its effect is on the limited resources during a major incident in terms of human resources, stuff used, or space occupied, e.g., intensive care beds, CT scan, operating theater, etc.; due to its low risk to patients, it is agreed that 25–50% is accepted [25].

8. Summary


Triage is a key step in managing major incidents properly. It is not contradicting bioethics, but it is looking from a different focus to make the best to the whole community. It has no rigid rules, and the triage officer must look for different aspects of resources and patients' situation to make the best triage decision leading to most benefits for all.

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