

Evaluations on Triage Applications for Chemical Casualties in Chemically Contaminated Area

*Kimyasalla Kirlenmiş Sahadaki Yaralıları İçin
Trijaj Uygulamalarının Değerlendirilmesi*

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ABSTRACT

In mass casualty situation occurred due to attacks involving chemical weapons either in peacetime or in a battlefield, triage is absolutely required for categorizing the casualties in accordance with medical care priorities. While applying triage system for chemical casualties, in particular available medical resources and medical treatment facilities and also maximally utilization of medical assets should be taken into consideration by experienced triage officers who are most familiar with the natural course of the injury presented and have highly information on medical assets. There are several triage systems applied to chemical casualties but not standardized. An effective and excellent triage application would not only reduce the destroying effects of chemical weapons on people but also increase the casualty survival.

Key words: Medical management, Triage, Chemical Weapon, First aid

ÖZET

Kimyasal ajanlar veya silahlar ile meydana gelen ve kitlesel zayıya yol açan olaylarda eldeki tıbbi olanaklara göre yaralıların kategorize edilmesi için triyaj işlemlerinin mutlaka yapılması gerekmektedir. Triyajı uygulayacak triyaj sorumlusu olayın ve ajanın etkilerini en iyi bilebilecek, eldeki tıbbi unsurları takip edebilecek yetenek ve tecrübeye özen gösterilmelidir. Bu kişi, triyaj sistemlerini uygularken, en uygun tıbbi olanakları göz önüne almalı, bunları maksimum düzeyde kullanmaya özen göstermelidir. Kimyasal olaylara yönelik bir kaç triyaj sisteminden söz edilebilir, ancak bunların standardize edilemediği de bir gerçektir. Etkin ve uygun bir şekilde yapılan triyaj işlemi sadece kimyasal silahların yıkıcı etkisini azaltmayacak, aynı zamanda yaralıların yaşam yüzdelerini de artıracaktır.

Anahtar Kelimeler: Tıbbi Yönetim, Triyaj, Kimyasal Silah, İlk yardım

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INTRODUCTION

Chemical warfare agents (CWAs) are toxic substances which are capable of producing incapacitation, serious injury and death, in addition, destroying the animals and habitants which have importance regarding the economical status of countries. CWAs may be used for military or terrorist purposes. The threat from chemical weapons has evolved over this century and has traditionally been considered as a military issue. Several recent events have indicated that civilians may also be exposed to these agents through terrorist attacks or industrial accidents ^[1,2,3].

The first aid to chemical casualties should be provided within a short period of time. On the other hand, triage application which involves sorting of patients into categories based on urgency of the requirement for treatment in terms of doing the best for the most should be performed in a chemical environment. Other than first aid, medical treatment, decontamination and evacuation procedures of chemical casualties should also be fulfilled by medical care providers. These procedures are launched in accordance with the decision of triage officer being experienced over the management of mass casualties. With respect to medical sources available and medical care priorities, triage officer could decide to which procedure the priority will be given ^[4,5].

Triage is a dynamic process that has to be repeated at each echelon of care and contributes that those casualties may be able to survive by the proper treatment ^[6]. Therefore, a triage policy and some points for practices associated with the incidence management will be discussed for the use in the concepts and preparation of response plans.

MATERIALS AND METHOD

Categorizing the chemical casualties must be made in accordance with the several factors like medical resources, the type and nature of injuries, personnel capabilities, etc. While conducting this difficult task, triage officers are supposed to be the most experienced in the care of conventional and contaminated casualties, in addition, aware of the present medical sources and capabilities in the battlefield or incident site (*Table 1*).

Chemical casualties are categorized depending on several criteria mentioned above and, thus, different triage systems are recommended by NBC authorities (*Table 2*).

According to Simon Ward working in Guys' and St. Thomas Hospital, chemical casualties are categorized into three priority (P) groups ^[7].

PI : Those who require resuscitation during decontamination in a stretcher facility

P2 : Those whose treatment may be delayed until decontamination ends in a stretcher facility

P3 : Those who have minor injuries that may walk spontaneously.

The other group including Frederick R. Sidell and colleagues triaged the chemical casualties as mentioned below (*Table 3*) ^[6].

There have also been another triage systems established similar basically to them the previously mentioned above by the medical NBC official groups. However the criteriage applied to chemical casualties or taken into consideration during triage procedure are more or less different from each other.

RESULTS AND DISCUSSION

Triage is to classify the mass casualties in accordance with the medical care priorities by taking into consideration especially neurological, respiratory and circulatory status of the injured people and available medical supplies that the government can provide. The main aim is to provide life-saving medical intervention to those who need treatment immediately or delayed categorized ^[8].

Triage officer may be senior surgeons or medics who are the most experienced in not only medical care, but also in medical management and delivery of medical sources. While making decision on the evacuation of casualties, triage officer must classify them in accordance with the priorities called as urgent priority and routine application .

While approaching to these casualties it must be taken into account by triage officer that chemical casualties may have either conventional injuries or psychological trauma at the same time. Triage categories are based on the need for medical care and therefore they should not be confused with evacuation categories which are made for definitive care. Evacuation possibilities and chances may influence the medical triage decision or classification.

While applying triage, evaluation of signs and symptoms of chemical casualties is as significant as existing medical care possibilities such as medical assets and treatment facilities. It is difficult to standardize which signs and symptoms belong to which triage category. First of all, respiratory and circulatory findings are the most important criteria for such a determination. Respiration rate, systolic blood pressure or pulse rate are also reported that have to be scored in accordance with degree of severity. Applying this triage system is apparently highly practical, but, on the other hand, it seems time consuming for mass casualties who are in need of urgent medical care and first aid (*Table 4*) ^[9].

It should be emphasized once again that triage be performed at every echelon of medical care preferably several times. Because the health status of some chemical casualties categorized as "delayed" may change within a short time and develop unanticipated life-threatening conditions like severe bleeding. Demand to medical goods for chemical casualties may exceed beyond current resources. Delaying at medical care for casualties who are categorized into "delayed" group may not change or affect adversely the outcome of progress. Therefore taking basic life support measures for this triage category and then providing the discharge to treatment centers can be beneficial for other chemical casualties with severe injuries in immediate category to improve the survival rate ^[10].

It must be kept in mind that, in triage system, priority for medical care or surgical care is more superior to that of decontamination. So, some chemical victims may be transported to higher-echelon treatment facilities without any decontamination. Throughout the decontamination process, attention must also be given to symptoms of exposure to chemicals indicating early poisoning like sore throat, or mild shortness of breath. However, patient isolation and environmental protection measures along with agent monitoring should be used to avoid secondary contamination while performing medical or surgical treatment at these locations^[10, 11].

During triage, detection of CWAs used is of significant due to various exposure time each has. Particularly, nerve agents and cyanide, a blood agent, have fatal effects within a very short period of time which may further affect the sorting of the casualties as “immediate” or “expectant”.

On the other hand, it must be pointed out that chemical casualties may have mild symptoms though they are severely exposed so called latent period. So, in this case, the patient who is really in immediate group may be categorized as “delayed”. Whereas, this grouping might be falsely made and such casualties could become under the risk of life-threatening status as long as they remain on the chemical battlefield. Therefore, triage should be repeated several times at every echelon of medical care. Additionally, large spaces can be used for observation of large numbers of patients with minor or no apparent injuries by physicians (*Figure 1*).

Accordingly, casualties in “delayed” category must be under continuous observation by experienced triage staff and, if necessary, they should be retriaged as “immediate” by taking the medical assets, staff, supplies and capabilities into consideration to provide adequate care. On the other hand, triage officer must make decision on which casualties may not survive whatever care is given. In the light of this decision made on such chemical casualties, the medical sources are able to be utilized up to request of the real needers.

Table-1: The following types of information the triage officer must have will absolutely facilitate the procedures.

- a. The nature and the severity of injury
- b. The medical resources available
 - Medical care providers
 - Existing medical goods
 - Medical treatment facilities for evacuation
- c. Casualty load
 - Present following the attack
 - Estimated overwhelming
- d. The medical evacuation capabilities
 - Surgeon and surgical operation rooms
 - Ambulance (functional) and the content
 - Decontamination units and their equipment

Table-2: Categories of triage commonly accepted to be used in casualties injured with weapons of mass destruction.

T1- Immediate	: Casualties who require life saving care within a short time
T2- Delayed	: Casualties who will require hospitalization and prolonged surgery
T3- Minimal	: Casualties who have minor injuries
T4- Expectant	: Casualties who would not survive with optimal medical care

Table-3: A summary of physical characteristics of Nerve and Blister agents exposures in a triage procedure.

IMMEDIATE CATEGORY:

* Nerve Agent:

- Talking, but not walking and circulation intact.
 - Dispnea, twitching, nausea and vomiting
 - Symptoms in two or more organ systems (Respiratory, gastrointestinal, muscular)
- Not talking, not walking, circulation intact.

* Blister Agent

- Airway injury

DELAYED CATEGORY:

* Nerve Agent

- Recovering with antidotes

* Blister Agent

- Skin injury or burns between 5 % and 50 % of body surface area
- Eye injuries (moderate to severe)
- Pulmonary problems 6 hours after exposure

MINIMAL CATEGORY:

* Nerve Agent

- Casualty walking, talking and being capable of self aid
- Miosis and rhinorrhea
- Mild to moderate respiratory distress

* Blister Agent

- Skin injury (burn) being lower 5 % of body surface area
- Minor eye irritations
- Minor upper-airway injury

EXPECTANT CATEGORY:

* Nerve Agent

- Not talking (unconscious)
- Circulation failed (no heartbeat or having a palpable pulse)

* Blister Agent

- Skin injury over 50 % of body surface area
- Moderate-to-severe airway injury

Table-4: Another triage system proposed by NBC health care providers that may be used in the medical management of chemical casualties.

A. RESPIRATORY RATE	None	0
	1-5	1
	6-9	2
	> 29	3
	10-29	4
B. SYSTOLIC BLOOD PRESSURE	None	0
	1-49	1
	50-75	2
	76-89	3
	> 90	4
C. NEUROLOGICAL SYSTEM (based on Glasgow Coma Scale)		
Eye Response	No eye opening	1
	Eye opening to pain	2
	Eye opening to verbal command	3
	Eyes open spontaneously	4
Verbal Response	No verbal response	1
	Incomprehensible sounds	2
	Inappropriate words	3
	Confused	4
	Orientated	5
Motor Response	No motor response	1
	Extension to pain	2
	Flexion to pain	3
	Withdrawal from pain	4
	Localizing pain	5
	Obeys commands	6
Neurological score: Sum of three scores mentioned above (Eye, verbal, motor)		
	13-15	4
	9-12	3
	6-8	2
	4-5	1
	0-3	0

- EVALUATION OF TRIAGE SCORING -

Sum of Respiratory Rate Score + Systolic Blood Pressure Score + Neurological System Score (A + B + C)	
T1 = 1 – 10	IMMEDIATE
T2 = 11	URGENTLY
T3 = 12	DELAYED
T4 = 0	EXPECTANT

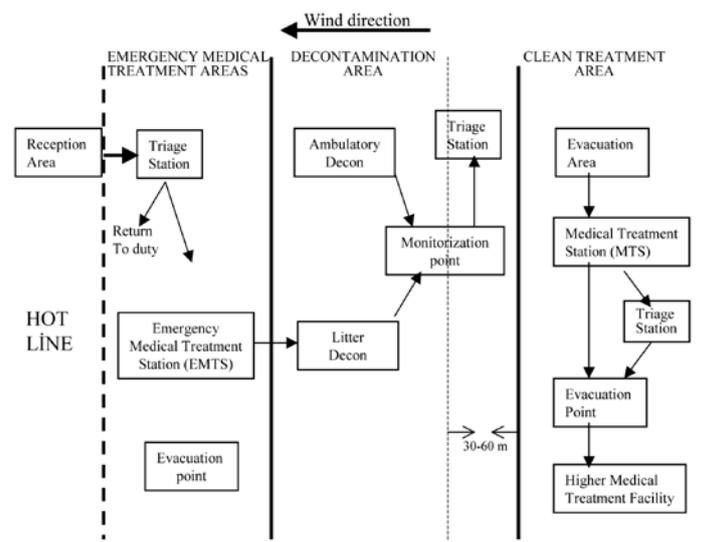


Figure 1: A flow model for the emergency medical intervention and approach to chemically contaminated casualties.

CONCLUSION

As medical NBC officers and scientists, we have to determine the triage principles certainly and give this issue a special importance in the training of NBC medical care providers in terms of reducing the destroying effects of CWAs used in any deliberate attack over the civilian people or military personnel in chemical battlefield.

Consequently, when any mass casualty situation would take place excellent triage application will be absolutely required in order to reduce the harmful and fatal effects of CWAs over the population. Therefore, specific triage systems for different catastrophic events should be put into practice by NBC authorities.

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