Chapter 14

TRIAGE OF CHEMICAL CASUALTIES

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INTRODUCTION

The word triage comes from the French word *trier,* meaning to sort, to cull, or to select. Simply stated, triage is the process of sorting or prioritizing casualties when providing immediate and maximal care to each is impossible. Triage is practiced only when a mass casualty situation occurs and the needs of the casualties for care overwhelm the medical capabilities to provide that care. A triage situation need not involve large numbers of casualties: for example, when only one chest surgeon is available in a hospital to care for two auto accident victims with chest wounds needing immediate surgical intervention. More commonly, triage in peacetime is used in a large hospital after a disastrous accident with large numbers of casualties. On a battlefield, triage is required at a unit-level medical facility (such as the battalion aid station [BAS]), where medical personnel and capabilities are limited and the casualties are numerous. In addition to the sorting of casualties for care, the triage process on a battlefield also requires setting evacuation priorities; do not, however, confuse evacuation priorities with triage.

The intent of triage is to provide immediate help to those who need it; to delay care for those who have less threatening injuries; and to set aside, at least temporarily, both those who need care beyond the capabilities of the available medical assets (personnel, equipment, and facilities) and those who require such extensive care that the time and assets spent would delay or prevent care for those more likely to recover.

The latter concept, setting aside casualties who are in need, is unpopular among medical care providers, whose goal is to provide the ultimate care for each patient. It is understandable that the thought of setting aside a critically sick or injured patient is repugnant to someone who has not been in a mass casualty situation or who has given little thought to such situations. After all, in peacetime, every patient who enters the hospital emergency room receives the full attention of all personnel needed to provide optimal care. Barring a mass casualty situation, no need for triage exists under these circumstances and most medical care providers do not live with it or the thought of it.

In a mass casualty situation, whether in peacetime or on a battlefield, triage is carried out to provide immediate and appropriate care for casualties with treatable injuries, to delay care for those with less immediate needs, and to set aside those for whom care would be too time- or asset-consuming. It ensures the greatest care for the greatest number and the maximal utilization of medical assets: personnel, supplies, and facilities.

It is essential that a triage officer know

- the natural course of a given injury,
- the medical resources on hand,
- the current and likely casualty flow, and
- the medical evacuation capabilities.

Commonly, the most experienced surgeon available performs triage. A surgeon is selected because physical injuries are involved in most triage situations, and surgeons have the most extensive training and experience in evaluating them. An experienced surgeon is desirable because he is most familiar with the natural course of the injury presented. Part of the triage process is the evaluation of the benefit that immediate assistance will provide. This evaluation is based, in part, on the natural course of the injury or disease. For example, dedicating medical assets to a casualty with an injury that will either heal or prove fatal no matter what immediate care is given would be of little benefit.

When working in a chemically contaminated environment, the triage officer is in protective gear and is not immediately available to assist with casualty care, which, ideally, is done within a collective protection area (a "shirtsleeve" environment). Examination of the casualty will not be as thorough as it might be in a clean (ie, not contaminated) environment, and very little care can be given a casualty in the emergency treatment section in the contaminated area. In chemically contaminated environments, therefore, in contrast to other triage situations, the most experienced surgeon is in the clean treatment area where he can provide maximum care. In these cases, the triage officer is a senior corpsman or someone else with medical training, such as a dentist.

In addition to knowing the natural course of the disease or injury, the triage officer also should be aware of the current medical assets, the current casualty population, the anticipated number and types of incoming casualties, the current status of the evacuation process, and the assets and casualty population at the evacuation site. Committing assets to the stabilization of a seriously injured casualty in anticipation of early evacuation and more definitive care would be pointless if evacuation could not be accomplished within the time needed

for the casualty's effective care, or if the assets at the evacuation site were already committed. The officer might also triage differently if, for example, he knew that the 10 casualties present were all that would need care in the next 24 hours or, on the other hand, that those 10 casualties were to be followed by 50 more within an hour.

Triage is not a static process but a dynamic one that occurs at every echelon of medical care, preferably several times. The first triage is done by the field medic or unit lifesaver when he encounters an injured soldier in the field. The medic first decides whether anything can be done for that soldier to save life or limb. If the answer is no, the medic moves on, perhaps after administering an analgesic. More commonly, the medic decides that care is indicated. Can the medic provide that care on the spot to return the soldier to duty quickly? Can the care wait until the battle is less intense or an ambulance arrives? Or must the care be given immediately if the casualty is to survive? In the latter case, the medic will do what is possible to return the casualty to the medical facility.

A casualty is triaged once more upon entry into a medical care facility and is triaged again and again within that facility as circumstances change. Those circumstances include the casualty's condition and the assets available. For example, a casualty set aside as expectant (see Triage Groups, below, for definitions of classification categories) because personnel are occupied with more salvageable casualties might be reclassified as immediate when those personnel become free. On the other hand, a casualty with a serious wound but in no immediate danger of loss of life might initially be classified as delayed, but if he suddenly developed unanticipated bleeding and if assets were available to care for him, he might be retriaged as immediate.

In an unfavorable tactical situation, another consideration may arise. Casualties with minor wounds, who otherwise may be classified minimal, might have highest priority for care to enable them to return to duty. The fighting strength thus preserved could save medical personnel and casualties from attack.

Even in the most sophisticated medical setting, a form of triage is usually performed, perhaps not always consciously by those doing it: separation of those casualties who will benefit from medical intervention from those who will not be helped by maximal care. However, in most circumstances in a large medical facility, care is administered anyway; for instance, an individual with a devastating head injury might receive life-support measures. The realization that in some settings assets cannot be spent in this manner is an integral part of triage.

TRIAGE OF CHEMICAL CASUALTIES

In the simplest form of triage, patients or casualties are separated into three groups. The first group is those for whom medical care cannot be provided because medical assets and time are not available to care for a wound or illness of the severity presented, and because the triage officer knows from experience that the casualty will die no matter what care is given. Again, a casualty's classification might change as assets become available or when later reevaluation shows that the casualty's condition was not as serious as first anticipated. The second group consists of casualties who require immediate intervention to save life. In a conventional situation (ie, a noncontaminated environment), these casualties usually have injuries affecting the airway, breathing, or circulation—the "ABCs"—which can be treated effectively with the assets available within the time available. The third group consists of casualties who have injuries that place them in no immediate danger of loss of life. Casualties in this group might include someone with a minor injury who merely needs suturing and a bandage before being returned to duty, or someone who has an extensive injury necessitating long-term hospitalization, but who at present is stable.

The triage system commonly used by U.S. military medical departments and by civilian medical systems contains four categories: *immediate*, *delayed*, *minimal*, and *expectant* (Exhibit 14-1). Sometimes, as was done in the *NATO Emergency War Surgery Handbook*,[1] a fifth category, *urgent*, is added to denote a casualty for whom intervention must occur within minutes to save life. In Exhibit 14-1, this concept is included in the immediate category. Also, in some schemes, the term *chemical intermediate* is used for a casualty who requires that antidotes be given immediately to save life (as in nerve agent or cyanide poisoning). The triage categories used in this chapter do not make the distinction between chemical casualties and casualties whose injuries are caused by conventional weapons.

Triage categories are based on the need for medical care, and they should not be confused with categories for evacuation to a higher-echelon medical treatment facility (MTF) for definitive care. The need for evacuation and, more importantly, the

EXHIBIT 14-1

U.S. ARMY MEDICAL DEPARTMENT MASS CASUALTY TREATMENT PRIORITIES

Treatment priorities for mass casualties are as follows:

1. *Immediate*: casualties who require lifesaving care within a short time, when that care is available and of short duration. This care may be a procedure that can be done within minutes at an emergency treatment station by a corpsman (eg, relief of airway obstruction) or may be acute lifesaving surgery.
2. *Delayed*: casualties with severe injuries who are in need of major or prolonged surgery or other care and who will require hospitalization, but delay of this care will not adversely affect the outcome of the injury. Fixation of a stable fracture is an example.
3. *Minimal*: casualties who have minor injuries, can be helped by nonphysician medical personnel, will not be evacuated, and will be able to return to duty shortly.
4. *Expectant*: casualties with severe life-threatening injuries who would not survive with optimal medical care, or casualties whose injuries are so severe that their chance of survival does not justify expenditure of resources.

availability of evacuation assets will certainly influence the medical triage decision. For example, if a casualty at a BAS is urgently in need of short-term surgery to control bleeding and evacuation is not possible for several hours, his triage category might be expectant instead of immediate. The evacuation categories are *urgent* (life immediately threatened), *priority* (life or limb in serious jeopardy), and *routine*.

Because this is a textbook on the management of chemical casualties, triage of the conventionally wounded casualty is not discussed except in the context of *combined* casualties (ie, casualties whose wounds were caused by conventional weapons but who have also been exposed to a chemical agent; see Casualties With Combined Injuries, below). The distinction between the urgent and immediate groups has been ignored, as has the separation of the chemical immediate and immediate groups. Chemical casualties are discussed under the commonly used groups of immediate, minimal, delayed, and expectant.

At the first echelon of medical care, the chemical casualty is contaminated and both he and the triage officer are in protective clothing. Furthermore, the first medical care given to the casualty is in a contaminated area, on the "hot" or dirty side of the "hotline" at the emergency treatment station (see Figure 13-1 in Chapter 13, Field Management of Chemical Casualties). This is unlike the clean side of the hotline at any echelon of care where casualties are decontaminated before they enter, or unlike a hospital in peacetime where usually there is no contamination.

It must be remembered that triage refers to priority for medical or surgical care, not priority for decontamination. *All* chemical casualties require decontamination. One might argue that a casualty exposed to vapor from a volatile agent, such as cyanide or phosgene, or from some of the volatile nerve agents does not need to be decontaminated. However, one can seldom be certain that in a situation in which vapor and liquid both exist, some liquid is not also present on the casualty.

It is extremely unlikely that immediate decontamination at the first echelon of medical care will change the fate of the chemical casualty or the outcome of the injury. Various estimates indicate that the casualty usually will not reach the first echelon of care for 15 to 60 minutes after the injury or onset of effects, except when the MTF is close to the battle line or is under attack and the injury occurs just outside. The casualty is unlikely to seek care until the injury becomes apparent, which is usually long after he becomes contaminated. For example, mustard, a vesicant, may be on the skin for many hours before a lesion becomes noticeable. Thus, it is likely that the agent has been completely absorbed or has evaporated from the skin by the time the casualty reaches the MTF. The small amount unabsorbed or the amount absorbed during a wait for decontamination is very unlikely to be significant.

The process of patient decontamination must be a factor in the judgment of the triage officer during

triage. In a contaminated environment, emergency care is given by personnel in the highest level of mission-oriented protective posture (MOPP 4), whose capabilities are limited by their protective gear. After receiving emergency care, a casualty must go through the decontamination station before receiving more definitive care in a clean environment. Decontamination takes 10 to 20 minutes. No medical care is provided during this time or during the time spent waiting to begin the decontamination process. Therefore, before leaving the emergency care area, the patient must be stabilized to an extent that his condition will not deteriorate during this time. If stabilization cannot be achieved, the triage officer must consider this factor when making the triage judgment. A different type of decontamination—immediate spot-decontamination—must be performed at the triage or emergency treatment station in the dirty (ie, contaminated) area when there is a break in the clothing or a wound that is suspected to be the source of contamination.

Casualties from certain chemical agents, such as nerve agents, may be apneic or nearly apneic; one of the first interventions required is assisted ventilation. It is unlikely that the equipment and personnel needed to provide assistance will be available in the contaminated area. However, if a device for ventilatory assistance, such as a mask-valve-bag device, is available, should it be used in a contaminated area? If there is a brisk wind and if the medical facility is far upwind from the source of contamination, there will be very little agent vapor in the air. One may choose the lesser of two undesirable circumstances and ventilate with air that is possibly minimally contaminated rather than let the casualty continue to be apneic. The apnea is certain to be fatal, whereas with further but minimal vapor inhalation, the casualty may possibly be assisted. The knowledge that a limited number of medical care providers are available in the contaminated area might affect the decision, however, because when care providers begin ventilation, they are committed to that process and cannot care for other casualties. However, a walking wounded (a casualty in the minimal category) can quickly be taught how to ventilate these casualties.

REVIEW OF CHEMICAL AGENT EFFECTS

Before discussing the triage groups and the types of chemical casualties that might be placed in each, a brief review of the type of casualty seen with each chemical agent is presented. Under the best of circumstances, a casualty probably will not reach a medical treatment area until at least 15 minutes after exposure (or after onset of effects, if onset immediately follows exposure). Moreover, a casualty will not seek medical attention until effects are apparent; an appreciable amount of time, therefore, may elapse before the casualty is seen.

Nerve Agents

In a unit-level MTF, nerve agent casualties might be classified as immediate, minimal, delayed, or expectant. In a full-care MTF, it would be unlikely to classify one as expectant.

If a nerve agent casualty is walking and talking, he can generally be treated and returned to duty within a short period (see Chapter 5, Nerve Agents, for a more complete discussion of nerve agent effects and treatment). In most cases he should not present himself at the triage point, but should self-administer his MARK I autoinjectors, which usually will be enough to reverse the respiratory effects of vapor exposure. If the casualty appears at the triage station, he should be classified as minimal because he can self-administer the antidote (or it can be given by a medic), evacuation is not anticipated, and he will return to duty shortly. If the casualty has received the contents of all three MARK I kits and continues to have dyspnea, if his dyspnea is increasing, or if he is beginning to have other systemic symptoms (such as nausea and vomiting, muscular twitching, or weakness), he should be classified as immediate. A source of continuing contamination, such as a break in protective clothing or a wound, should be sought and spot-decontaminated and irrigated. The progression of his illness can be stopped or reversed with a minimal expenditure of time and effort in the emergency treatment area. More atropine should help considerably.

One additional consideration, which is contrary to the general advice about decontamination, must be remembered. It is quite possible that the condition of the casualty described above, who had a vapor exposure and administered the contents of his MARK I kits, continues to worsen because he also has had a liquid exposure, which is being absorbed through the skin. A break in his protective garb should be sought; if one is found, the skin under it should be quickly spot-decontaminated using whatever liquid is available (preferably bleach, but saline or water will help). If the casu-

alty is conscious, has not convulsed, and is still breathing, prevention of further illness will ensure a quick return to duty. He will survive unless he continues to absorb agent.

At the other end of the spectrum, casualties who are seriously poisoned will usually not survive long enough to reach an MTF. There are exceptions. If the attack is near an MTF, casualties who are unconscious, apneic, and convulsing or postictal might be seen within minutes of exposure. Or, if the casualties have taken pyridostigmine, a nerve agent pretreatment, they might remain unconscious, convulsing, and with some impairment (but not cessation) of respiration for many minutes to hours. These patients, as well as those in a similar condition who have not used pyridostigmine, require immediate care. If they receive that care before circulation fails and convulsions have become prolonged (see Chapter 5, Nerve Agents), they eventually will recover and be able to return to duty.

Supporting this view is a report from the Tokyo subway terrorist incident of 1995. One hospital received two casualties who were apneic with no heartbeat. With vigorous resuscitation, cardiac activity was established in both. One resumed spontaneous respiration and walked out of the hospital several days later, and the other did not start breathing spontaneously and died days later. These anecdotes suggest that when circumstances permit, resuscitation should be attempted. In a contaminated area where resources, including personnel, are limited, the use of ventilatory support and closed chest cardiac compression must be balanced against other factors (see above), but the immediate administration of diazepam and additional atropine requires little effort and can be very rewarding in the casualty who still has apparent cardiopulmonary function.

Cyanide

Cyanide casualties present the triage officer with few problems. In general, a person exposed to a lethal amount of cyanide will die within 5 to 10 minutes and will not reach the MTF. Conversely, a person who does reach the MTF will not require therapy and will probably be in the minimal group, able to return to duty soon. If the exposure occurs near the treatment area, a severely exposed casualty might appear for treatment. He will be unconscious, convulsing or postictal, and apneic. If the circulation is still intact, the antidotes will restore the casualty to a reasonably functional status within a short period of time. The triage officer, however, must keep in mind that it takes 5 to 10 minutes to inject the two antidotes needed. In a unit-level MTF, a cyanide casualty might be immediate, minimal, or expectant; the last classification would apply if the antidote could not be administered or if the circulation had failed before the casualty reached medical care. In a full-care facility, the casualty might be classified as immediate or minimal.

Vesicants

Most casualties from mustard exposure will require evacuation to a facility where they can receive care for several days to months. The exceptions are those with small areas of erythema and those with only a few small, discrete blisters. Even these guidelines are not as clear-cut as they seem. If the casualty is seen early after exposure, erythema may be the only manifestation, but it may be the precursor of blister formation. Small, discrete blisters may appear innocuous, but on certain areas of the body they can be quite incapacitating, rendering the soldier unfit for duty (see Chapter 7, Vesicants, for a more complete discussion).

Mustard casualties, especially those with eye involvement, are often classified erroneously as immediate for purposes of decontamination. Little is to be gained by this. By the time the mustard lesion forms, the agent has been in contact with the skin, eye, or mucous membrane for a number of hours and the agent that will absorb into the skin or eye tissue has already been absorbed. Immediate decontamination at this time, rather than 30 to 60 minutes later, might prevent the last fraction of a percent of agent penetration, but this will rarely have a significant impact on the care of a casualty or the outcome. These casualties should be decontaminated only after those who require urgent medical care.

Casualties who have liquid mustard burns over 50% or more of body surface area or burns of lesser extent but with more than minimal pulmonary involvement pose a problem for the triage officer. An estimated LD_{50} (ie, the dose that is lethal to 50% of the exposed population) of liquid mustard, 100 mg/kg, will cover 20% to 25% of body surface area. It is unlikely that a casualty will survive 2 LD_{50} because of the tissue damage from the radiomimetic effects of mustard. Two LD_{50} of liquid will cover about 50% of body surface area, and casualties with a burn this size or greater from liquid mustard should be considered expectant. They will require intensive care (which may include care in an aseptic environment because of leukopenia) for weeks to months, which can be provided only at the far-rear echelons or in the continental United States. Chances of survival

are very low in the best of circumstances and are decreased by delays in evacuation. Furthermore, even in a major hospital, long-term care will require assets that might be used for more salvageable casualties. When such casualties are the only casualties, they will receive this care, but in a wartime situation, when beds and medical care are at a premium, medical care assets might best be used for more salvageable casualties elsewhere.

Under battlefield or other mass casualty conditions, casualties with conventional thermal burns covering greater than 70% of body surface area are usually put in the expectant group[1] when medical facilities are limited. This percentage is subject to downward modification (in increments of 10%) by other factors, including further restriction of healthcare availability, coexisting inhalational injury, and associated traumatic injury. There are differences between mustard burns and conventional burns. Conventional burns are likely to have a larger component of third-degree burns, whereas mustard burns are mostly second-degree. On the other hand, exposure to mustard causes problems not seen with conventional burns: hemopoietic suppression and the ensuing susceptibility to systemic infection, which is greater than that seen with conventional burns.

In general, mustard casualties will be classified delayed for both medical attention and decontamination. Exceptions are casualties with a very small lesion (< 5% of body surface area) in a nonsensitive area, who would be classified as minimal and returned to duty; those with large burn areas from liquid mustard (> 50% of body surface area) and those with more than minimal pulmonary involvement, who might be classified as expectant; and those with more than minimal pulmonary involvement, who might also be expectant. In a more favorable medical environment, every effort would be made to provide care for these casualties; at least those in the latter group would be classified as immediate.

In a unit-level MTF, a mustard casualty might be categorized as minimal, delayed, or expectant, but probably not immediate, because the care this casualty would require would not be available. Even if immediate evacuation is possible, the eventual cost in medical care for a casualty needing evacuation must be compared to the probable cost and outcome of care for a casualty of another type. In a large medical facility where optimum care is available and the cost is negligible, a mustard casualty might be classified as minimal, delayed, or immediate.

Phosgene

The phosgene casualty also may present a dilemma to the triage officer. A casualty who is in marked distress, severely dyspneic, and coughing up frothy sputum might be saved if he entered a fully equipped and staffed hospital; at least, he would receive the full capabilities of that facility. If this casualty does not receive some ventilatory assistance within minutes to an hour, he will not survive. In a forward echelon, this care is not possible, nor is it possible to transport the casualty to a hospital within the critical period. A casualty with mild or moderate respiratory distress and physical findings of pulmonary edema must also be evacuated immediately (even though not triaged in the immediate treatment category because immediate *therapy* will not be provided). Capability for the immediate care that this moderately distressed individual needs is probably unavailable at the first echelons; if evacuation to a full-care MTF is not forthcoming in a reasonably short period, the prognosis becomes grim. Thus, with phosgene casualties, availability of both evacuation and further medical care is important in the triage decision.

Phosgene-induced pulmonary edema varies in severity; a casualty might recover with the limited care given at the unit-level MTF. The real dilemma for the triage officer is a casualty who complains of dyspnea but has no physical signs. One should keep in mind that malingering and "gas hysteria" were common in World War I. To evacuate this casualty might encourage others to come to the MTF with the same complaint, anticipating evacuation from the battle area; not to evacuate might preclude timely care and potentially cause an unnecessary fatality. To observe the individual until signs of illness appear might also postpone medical intervention until the damage is irreversible.

Knowledge about the following physical manifestations of phosgene intoxication[2] may be helpful to the triage officer if a reliable history of the time of exposure is available:

- The first physical signs of phosgene intoxication (crackles or rhonchi) occur at about half the time it takes for the injury to become fully evident. Thus if crackles (rales) are first heard 3 hours after exposure, the lesion will increase in severity for the next 3 hours.
- If there are no signs of intoxication within the first 4 hours, the chance for survival is good, although severe disease may ultimately develop. In contrast, if the first sign

is within 4 hours of exposure, the prognosis is not good, even with care in a medical center. The shorter the onset time, the more ominous the outlook.

Thus, if the triage officer sees a casualty with crackles or rhonchi 3 hours after exposure, the officer can assume that the casualty will be severely ill in 3 hours; within that time, the casualty must reach a medical facility where care can be provided. Even with optimal care, the chances of survival are not good. It should be emphasized that these guidelines apply only to objective signs, not the casualty's symptoms (such as dyspnea). In a contaminated area, it will not be easy and may not be possible to elicit these signs.

In a unit-level MTF, a phosgene casualty might be minimal or expectant, with a separate evacuation group for those who require immediate care if they can be evacuated in time to a facility that can provide it. In a large, higher-echelon MTF, phosgene casualties might be classified as minimal or immediate since there should be no delayed or expectant casualties at a facility in which full care can be provided.

Incapacitating Agents

Casualties showing the effects of exposure to an incapacitating agent may be confused, incoherent, disoriented, and disruptive. They cannot be held at the unit-level MTF but should not be evacuated ahead of those needing lifesaving care unless they are completely unmanageable and are threatening harm to themselves or others. A casualty may be only mildly confused from exposure to a small amount of such an agent, or his history may indicate that he is improving or near recovery. In such instances, the casualty may be held and reevaluated in 24 hours.

In a unit-level MTF, a casualty from exposure to an incapacitating agent might be minimal or delayed, with little need for high priority in evacuation. In a higher-echelon MTF, these casualties would be cared for on a nonurgent basis.

CATEGORIES FOR TRIAGE OF CHEMICAL CASUALTIES

The categories of triage for chemical casualties and the types of chemical casualties that might be placed in each group (Exhibit 14-2) follow.

Immediate

Nerve Agents

A casualty of nerve agents who is in severe distress would be classified as immediate. He may or may not be conscious. He may be in severe respiratory distress, or may have become apneic minutes before reaching the facility. He may not have convulsed, or he may be convulsing or immediately postictal. Often the contents of three MARK I kits (or more) plus diazepam and, possibly, short-term ventilatory assistance will be all that is required to prevent further deterioration and to save a life. In addition, a casualty with signs in two or more systems (eg, neuromuscular, gastrointestinal, respiratory—but excluding eyes and nose) should be classified as immediate and given the contents of three MARK I kits and diazepam.

Cyanide

A casualty of cyanide who is convulsing or became apneic minutes before reaching the medical station and has adequate circulation would be in the immediate group. If the circulation is still adequate, the administration of antidote may be all that is required for complete recovery. Since death may occur within 4 to 5 minutes of exposure to a lethal amount of cyanide unless treatment is immediate, this type of casualty is unlikely to be seen in the MTF.

Phosgene and Vesicants

Casualties of phosgene or vesicant agents who have moderate or severe respiratory distress should be placed in the immediate group when intense ventilatory and other support are immediately available. In a BAS or other unit-level MTF, these support systems will not be available immediately and probably will not be available during the hours required to transport this casualty to a large medical facility. In general, limited assets would best be used for other casualties more likely to benefit from them.

Delayed

Nerve Agents

Casualties who require hospitalization but have no immediate threat to life should be placed in the

EXHIBIT 14-2

CHARACTERISTICS OF CHEMICAL CASUALTIES BY TRIAGE GROUP

Immediate

- *Nerve Agent*
  - Talking, not walking (severe distress with dyspnea, twitching, and/or nausea and vomiting); moderate-to-severe effects in two or more systems (eg, respiratory, gastrointestinal, muscular); circulation intact
  - Not talking (unconscious), not walking; circulation intact
  - Not talking, not walking; circulation not intact (if treatment facilities are available; if not, classify as *expectant*)
- *Cyanide*

  Severe distress (unconscious, convulsing or postictal, with or without apnea) with circulation intact
- *Vesicant*

  Airway injury; classify as *immediate* if help can be obtained (rare)
- *Phosgene*

  Classify as *immediate* if help can be obtained

Delayed

- *Nerve Agent*

  Recovering from severe exposure, antidotes, or both
- *Vesicant*

  Skin injury > 5% but < 50% (liquid exposure) of body surface area; any body surface area burn (vapor exposure); most eye injuries; airway problems starting > 6 hours after exposure
- *Cyanide*

  Recovering; has survived more than 15 minutes after vapor exposure

Minimal

- *Nerve Agent*

  Casualty walking and talking; capable of self-aid; return to duty imminent
- *Vesicant*

  Skin injury < 5% of body surface area in noncritical areas; minor eye injuries; minor upper-airway injury

Expectant

- *Nerve Agent*

  Not talking; circulation failed (with adequate treatment resources, should classify as *immediate*)
- *Vesicant*

  Over 50% body surface area skin injury from liquid; moderate-to-severe airway injury, particularly with early onset (< 6 h after exposure)
- *Cyanide*

  Circulation failed
- *Phosgene*

  Moderate-to-severe injury with early onset

delayed group. This is generally limited to a casualty who has survived a severe nerve agent exposure, is regaining consciousness, and has resumed spontaneous respiration. This casualty will require further medical care but cannot be held in the unit-level MTF for the time necessary for recovery.

Vesicants

A casualty with a vesicant burn exceeding about 5% and less than 50% of body surface area (if by liquid) or with eye involvement will require hospitalization, but needs no immediate, lifesaving care. He must be observed for respiratory and hemopoietic complications, although, in general, respiratory complications occur at about the time the dermal injury becomes apparent.

Cyanide

After cyanide injury, a casualty will recover completely within the period that he can be held at the unit-level MTF (72 h) and need not be evacuated.

Phosgene

For casualties with significant phosgene injury, evacuation should not be delayed. Pulmonary edema can become life-threatening shortly after onset. If the casualty is to be saved, medical intervention must occur as quickly as possible. As noted above, however, this may not be possible.

Incapacitating Agents

A casualty showing signs of exposure to an incapacitating agent (such as BZ; see Chapter 11, Incapacitating Agents) usually does not have a life-threatening injury, but will not recover within days and must be evacuated. A casualty who has had a very large exposure, however, and is convulsing or has cardiac arrhythmias might be an exception. He requires immediate attention if it can be made available.

Minimal

Nerve Agents

A nerve agent casualty who has only mild effects from the agent vapor (such as miosis, rhinorrhea, or mild-to-moderate respiratory distress) should be categorized as minimal. He can be treated satisfactorily with the contents of one or more MARK I kits if any treatment is indicated. A casualty who has administered self-aid for these effects may need no further therapy and can often be returned to duty in 24 hours or sooner.

Vesicants

A vesicant casualty with a small area of burn—generally less than 5% of body surface area in a noncritical site, but the area size depends on the site (see Chapter 7, Vesicants)—can possibly be cared for and returned to duty. Lesions covering larger areas or evidence suggesting more than minimal pulmonary involvement would place this casualty in another triage group.

Cyanide

A casualty who has been exposed to cyanide and has not required therapy will recover quickly.

Phosgene

A casualty exposed to phosgene rarely belongs in the minimal group. If development of pulmonary edema is suspected, the casualty is placed in a different triage group. On the other hand, if a casualty gives a reliable history of exposure several days before, reports mild dyspnea in the intervening time, and is now improving, the triage officer should consider holding the casualty for 24 hours for reevaluation, with the intent of returning him to duty.

Incapacitating Agents

The evaluation of a casualty exposed to an incapacitating agent should be similar to that of a phosgene casualty. If the casualty's condition is worsening, evacuation is necessary. On the other hand, if there is a reliable history of exposure with an intervening period of mild effects and evidence of recovery, he could be observed for 24 hours on-site with the intent of returning him to duty.

Expectant

Nerve Agents

Any nerve agent casualty who does not have a palpable pulse or is apneic with the onset time of apnea unknown should be categorized as expectant. (However, as noted above, some of these casualties may survive if prolonged, aggressive care is possible.)

Cyanide

A cyanide casualty who does not have a palpable pulse belongs in the expectant group.

Vesicants

A vesicant casualty who has burns covering more than about 50% of body surface area from liquid exposure, or who has definite signs of more than minimal pulmonary involvement, will survive only with extensive medical care, which will not be forthcoming in forward echelons. This care might be available at rear echelons, but care there should be reserved primarily for those with greater chances of survival at a lower expenditure of medical assets.

Phosgene

A casualty with moderate or severe dyspnea and signs of advanced pulmonary edema from phosgene exposure requires a major expenditure of rear-area medical assets if evacuation could be accomplished quickly enough.

CASUALTIES WITH COMBINED INJURIES

Casualties with combined injuries not only have wounds that were caused by conventional weapons but also have been exposed to a chemical agent. The conventional wounds may or may not be contaminated with chemical agent. Few experimental data on this topic exist, and little has been written specifically about these casualties from experiences in World War I or the Iran–Iraq War.

Some factors that might influence triage decisions at a unit-level MTF are discussed below. As noted above, most of these factors would not apply or would be ignored at a higher-level MTF that is relatively fully staffed and equipped, where the capability for medical care is not at a premium.

Nerve Agents

In a casualty with mild-to-moderate intoxication from exposure to nerve agent vapor, administering the contents of MARK I kits can rapidly and completely reverse the nerve agent effects. Further triage decisions and medical care should focus on the conventional wound.

In a casualty with severe systemic effects from agent exposure, the effects should be treated before all but the most emergent wound care is given. Of course, airway support (including removal of obstruction) must be given and bleeding controlled if the casualty is to be saved. Which is done first—airway management, bleeding control, or antidote administration—will depend on which problem, in the judgment of the emergency care provider, is the most immediate threat to life. (Immediate spot-decontamination or thorough flushing of the wound and surrounding skin, if these are possibly sites of exposure, must be done at once.) If the casualty is convulsing, bleeding might be difficult to control; on the other hand, his airway is probably at least minimally intact.

In general, if a casualty is walking and talking, the agent injury should not influence judgments about treatment of conventional injuries. If the casualty is talking but not walking because of the agent injury, the casualty is immediate because of the agent injury. He should be given the contents of three MARK I kits and diazepam immediately. His response will determine his further triage. Muscular paralysis or weakness, however, and its cause, inhibition of cholinesterase (pyridostigmine, the nerve agent pretreatment drug, also inhibits cholinesterase), might influence later decisions about anesthesia.[3]

If the casualty is not breathing because of nerve agent effects, attempting to provide ventilatory assistance might preclude the immediate care of a severe wound or other assistance in the contaminated area. If ventilation is marginal and the wound alone would classify the casualty as immediate, the time and effort required to stabilize ventilation might preclude timely wound care. The dual requirements might require more care providers than are available.

A casualty who has a wound that needs immediate care, but who is unconscious and has impaired ventilation resulting from nerve agent intoxication might initially be considered expectant, particularly if other, more salvageable casualties exist. One should administer the contents of three MARK I kits and diazepam and reevaluate this casualty when time becomes available. A major medical facility would have the personnel to devote to simultaneous care of ventilation and the wound.

Mustard

In the front echelon, devoting a large effort to wound care in a patient whose long-term progno-

sis is poor from the effects of chemical agent exposure alone may not be warranted. A patient with a wound that would warrant a classification of immediate might become expectant with the addition of a significant skin lesion or more than minimal pulmonary effects from mustard exposure. Similarly, classifying a casualty as delayed on the basis of a wound may not be appropriate if liquid mustard burns are spread over more than 50% of his body surface or if the casualty has more than minimal pulmonary effects. Hemopoietic suppression may influence wound healing and will certainly decrease resistance to infection and the ability to recover from it. The long-term care of a major wound, whether initially classified as immediate or delayed, will often be unsuccessful in a patient with moderate or severe pulmonary signs and symptoms or with dermal involvement of more than 50% of body surface (from liquid) when first seen.

Phosgene

Several factors in the pathophysiology and natural course of phosgene intoxication suggest that a casualty with moderate-to-severe effects from phosgene exposure is not a good candidate to survive major wounding. The pulmonary edema causes hypoxia, which must be corrected before surgery. In addition, the fluid causing pulmonary edema is fluid lost from the circulation, which results in significant volume depletion, hypotension, and a large degree of hemoconcentration (eg, a hematocrit of 0.65–0.70). A wound with more than minimal blood loss further impairs the circulating volume, and the hypotension would be more difficult than usual to correct. The administration of fluid to correct the hypovolemia and hypotension potentially causes more fluid to leak through the alveolar-capillary membranes into the alveoli, which increases the pulmonary lesion and further reduces the capacity for oxygen and carbon dioxide exchange. Fluids must be given, however, to prevent failure of other organs. Even if it were possible to repair the traumatic wound, several days later the lung would inevitably become the focus for bacterial colonization. The ensuing pneumonitis or pneumonia often becomes a nidus for sepsis, which might impair healing.

In the forward echelons, these problems cannot be corrected; the triage officer must judge whether the casualty can be evacuated to a higher-level MTF where they can be addressed, and whether evacuation can be carried out before the damage becomes irreversible. The treatment of phosgene injury alone requires a significant expenditure of assets. When that injury is complicated by factors that tend to worsen the pathophysiology, treatment becomes a major problem that might be insurmountable in all but the most fully staffed and equipped medical centers.

Cyanide

A casualty from exposure to a lethal amount of cyanide will die within a few minutes if he receives no therapy. If antidotes are given in time, he will recover with no serious adverse effects or sequelae to interfere with wound care. One of the antidotes, sodium nitrite, causes vasodilation and orthostatic hypotension, but these effects are short and should not be factors in overall patient care. If a casualty with a conventional wound and severe effects from cyanide poisoning presented at the unit-level MTF (or even at a major hospital), the procedure would be to give the antidote immediately. If the effects of cyanide are reversed, he should receive further care.

Incapacitating Agents

A serious problem in treating a casualty presenting with a major wound and intoxication by an incapacitating compound is that he might be delirious and unmanageable. If the compound is a cholinergic blocking agent, such as BZ (3-quinuclidinyl benzilate), the administration of the antidote physostigmine will calm him temporarily (the effects dissipate in 45–60 min) so that care can be given. At some stage of their effects, these incapacitating compounds cause tachycardia, suggesting that heart rate may not be a reliable indication of cardiovascular status. Otherwise, nothing known about these compounds suggests that they will interfere with wound healing or further care.

SUMMARY

Triage of casualties of chemical agents is based on the same principles as the triage of conventional casualties. The triage officer tries to provide immediate care to those who need it to survive; he sets aside temporarily or delays treatment of those who have minor injuries or do not need immediate medical intervention; and he does not use limited medical assets on the hopelessly injured. At the first echelon of medical care on a battlefield, medical capabilities are very limited. When chemical agents

are present or suspected, medical capabilities are further diminished because early care must be given while the medical care provider and casualty are in protective clothing. Decontamination, a time-consuming process, must be carried out before the casualty receives more definitive care, even at this level. At the rear echelons of care—or at a hospital in peacetime—medical capabilities are much greater and decontamination has already been accomplished before the casualty enters for treatment.

Triage is a matter of judgment by the triage officer. This judgment should be based on knowledge of medical assets, the casualty load, and, at least at unit-level MTFs, the evacuation process. Most importantly, the triage officer must have full knowledge of the natural course of an injury and its potential complications.

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