Chapter 13

FIELD MANAGEMENT OF CHEMICAL CASUALTIES

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INTRODUCTION

In the event of an enemy attack with chemical agents, those in the military medical departments must consider first aid, treatment, evacuation, and decontamination procedures of contaminated casualties—some of whom may have injuries made by conventional weapons in addition to their chemical injuries. The ultimate objective in the management of all contaminated casualties is to provide the earliest and most effective treatment without compounding injuries or contaminating medical personnel and treatment facilities.

Although first aid will be initiated on the battlefield and continued during evacuation, these casualties must be moved to an uncontaminated environment as early as possible to permit the removal of protective gear and to allow initiation of optimal treatment in a "shirtsleeve" environment unencumbered by protective clothing or masks. Otherwise, medical personnel must don protective gear, which will significantly compromise their efficiency.

The basic threat to and management principles for chemical casualties have not changed since World War I. To survive and to accomplish the mission on the chemical battlefield, medical care providers must be able to respond quickly and effectively. Soldiers must be trained in first-aid procedures. Decontamination procedures must be practiced. And medical care providers must know how to perform their mission in a chemical environment. Continued, careful attention to each of these requirements will significantly reduce the chemical threat to our military personnel.

HEALTH SERVICE SUPPORT ON THE BATTLEFIELD

A brief review of pertinent Health Service Support (HSS) doctrine will provide a background for the discussion of chemical casualty care. The basic objectives of HSS are to

- reduce the incidence of disease and nonbattle injury;
- provide treatment of acute illness, injury, and wounds; and
- return to duty as many soldiers as possible at each echelon or level.

These will be accomplished by emphasizing prevention, by providing far forward medical treatment including advanced trauma management (ATM) and by providing timely and efficient casualty evacuation. Determination of which casualties can be returned to duty will be made at the lowest possible level to preclude their being evacuated farther back than is necessary to provide appropriate care. HSS operations must conform to the tactical plan, allowing for rapid reinforcement or replacement of the forward echelon of medical support. It must provide for a continuum of care from the forward line of troops (FLOT) back to the continental United States (CONUS), emphasizing centralized control with flexibility of execution. Table 13-1 summarizes the various echelons of care and the treatment capabilities at each command level. Each higher echelon reflects an increase in medical capability while it retains the capabilities found in the lower echelons. Echelons I, II, and III are found in the combat zone; Echelon IV is in the communication zone; and Echelon V is in the Zone of the Interior (ZOI).

In the past, the terms "echelon," "level of care," and "level," have sometimes been used in a confusing and seemingly indiscriminate manner. In an attempt to clarify this semantic imprecision, we use the definitions provided in the *American, British, Canadian, Australian Armies Medical Interoperability Handbook*:

> [T]he term *echelon* is used to describe the phased system of health care delivery in the Theater of Operations (such as far forward care is provided at Echelon I). The term *level* is used to describe the level of command (such as division, regiment, or corps).[1(p1-1)]

Echelon I: The Unit Level

Echelon I medical care, found at the unit level and all higher levels, consists of ATM, sick call, and evacuation capability provided by the medical platoon/section organic to combat maneuver battalions and to some combat support battalions. Major emphasis is placed on those measures necessary to resuscitate, stabilize, and prepare for the evacuation of the casualty to the next higher echelon of care. This care may be in the form of self-aid/buddy aid or it may be treatment provided by the combat lifesaver or the combat medic.

TABLE 13-1

TREATMENT EMPHASIS AT THE ECHELONS OF CARE

	CZ			COMMZ	ZOI
Treatment Emphasis	**Level I (Unit)**	**Level II (Division)**	**Level III (Corps)**	**Level IV (EAC)**	**Level V (CONUS)**
Emergency medical treatment, first aid, self-aid, buddy aid	Combat medic, combat lifesaver, all soldiers				
Emergency medical care (advanced trauma management)	Echelon I: Battalion/squadron aid stations		Echelon I: Aid station of the troop medical clinic	Echelon I: Aid station of the troop medical clinic	
Beginning resuscitation and emergency medical care (advanced trauma management)		Echelon II: Clearing station of the forward support medical company in the brigade support area Clearing stations of the medical battalion, or the medical company of the main support battalion in the division rear	Echelon II: Clearing stations of the medical companies of the area support medical battalion	Echelon II: Clearing stations of the medical companies of the area support medical battalion	
Resuscitative surgery			Echelon III: Mobile army surgical hospitals,* combat surgical hospitals	Echelon III: Field hospitals	
Definitive care				Echelon IV: General hospitals	
Definitive and restorative care					Echelon V: Medical centers, medical department activities, federal hospitals

*In the future, resuscitative surgery will be provided by forward surgical teams deployed at Level II
COMMZ: Communications Zone
CONUS: Continental United States
CZ: Combat Zone
EAC: Echelon Above Corps
ZOI: Zone of the Interior

The combat lifesaver is not a medic but is an ordinary soldier who has received, in addition to his primary military training, additional training beyond basic first aid and, when the situation permits, assists the combat medic by providing immediate care. The combat medic is the first individual in the HSS chain who makes medically substantiated decisions (including triage decisions) based on military occupation specialty (MOS) training. This individual is capable of providing emergency medical treatment.

The treatment squad or battalion aid station (BAS) is the other source of Echelon I care. Personnel here are trained and equipped to provide ATM as well as routine sick call.

Echelon II: The Division Level

Echelon II medical care, found at the division level and all higher levels, is provided at the clearing station by the treatment platoon of the medical company of the main support battalion and the forward support battalion of the Division Support Command (DISCOM). Here the casualty is evaluated to determine the priority for continued

evacuation to the rear, or is treated and returned to duty.

Echelon II possesses an increased medical treatment capability plus emergency and sustaining dental care, radiology, laboratory, optometry, patient holding, preventive medicine, mental health, and medical supply capabilities. However, these capabilities do not exceed levels dictated by immediate necessity. Nondivisional units in the division sector receive medical support on an area basis from the nearest medical treatment facility (MTF). In the division, Echelons I and II medical care will not be bypassed, although this may occur in the corps area.

Echelon III: The Corps Level

Echelon III medical care, found at the corps level and higher, is at present provided in a Mobile Army Surgical Hospital (MASH), Combat Support Hospital (CSH), or Field Hospital (FH). A hospital presently being designed as part of the Medical Reengineering Initiative (MRI) is planned to replace these hospitals in the near future. In addition, resuscitative surgical care will be provided by forward surgical teams at both Echelon III and the brigade division level. Echelon III facilities are staffed and equipped to provide care for all categories of casualties. Those whose injuries permit additional transportation without detriment to their conditions receive surgical care in a hospital farther to the rear.

Echelon IV: The Echelon Above Corps

Echelon IV medical care, found at the Echelon Above Corps (EAC) and higher, is presently provided in a General Hospital (GH). The MRI plans to replace the GH with a hospital of similar capability at the EAC. The GH or its replacement consists of general and specialized medical and surgical capability, including treatment that may be required to stabilize the casualties who require evacuation to CONUS.

Echelon V: The Continental United States

Echelon V medical care, provided by hospitals in the ZOI and CONUS, is the most comprehensive care available within the U.S. Army Medical Department (AMEDD) HSS system. Echelon V hospitals also provide all the types of medical care found at lower echelons.

MEDICAL SUPPORT IN A CHEMICAL ENVIRONMENT

Medical units, like their line counterparts, must be able to survive a chemical attack if they are to successfully perform their primary mission. Protective measures available to them fall into three categories: preattack, attack, and postattack.

Preattack measures include

- gaining knowledge of the characteristics of anticipated chemical agents and the effects of these agents on individuals and on unit operations;
- proper defensive planning (including use of individual protective equipment);
- a full understanding of self-aid, buddy aid, and medical pretreatment;
- casualty decontamination; and
- activation of collective protection and detection/monitoring equipment. An ability to implement protective measures including use of shelters, dispersal, and camouflage is essential, as is the accurate correlation of alert states with mission-oriented protective posture (MOPP) levels.

Attack measures during enemy use of one or more chemical agents include

- detection and monitoring for the continued presence of chemical agent,
- guidance to commanders on potential performance degradation,
- first aid measures,
- initial treatment and evacuation of casualties, and
- individual protection and collective protection, including chemically hardened shelters.

Postattack measures consist of

- monitoring and reporting of chemical contamination and effects;
- control of contamination (avoidance, limitation of spread, weathering/decay);
- damage assessment and control;
- monitoring for effects on command, control and communications elements;
- medical treatment, evacuation and/or quarantine of chemical casualties;

- use of casualty wraps;
- operation and supervision of casualty decontamination centers; and
- preparation for future attacks.

Several categories of casualties will require treatment depending on whether they sustain conventional wounds, chemical poisoning, or both. The number of chemical casualties is dependent on the level of unit training and discipline and the preparedness of the unit. Casualties' conditions may also be adversely affected because normal tasks such as driving an ambulance will take longer in protective equipment, thereby delaying the arrival of the casualty at the point of definitive medical care. For example, at MOPP 4 (ie, full protection), it is generally assumed that all operations will be performed at approximately 50% efficiency. Additionally, medical services must decontaminate liquid agent on individual protective equipment to the vapor-free state to permit entry into collective protection. This will further delay definitive treatment of the casualty, potentially aggravating the injuries.

Key objectives in the management of chemical casualties include

- minimizing chemical agent injuries,
- preventing aggravation of conventional injuries during first aid and decontamination procedures,
- controlling the spread of chemical contamination, and
- continuation of the primary medical mission.

The accomplishment of these objectives plus patient decontamination will require augmentation of the BAS and Forward Support Medical Company (FSMC) by 10 to 20 personnel from the supported unit.

Another important factor is heat stress. The wet bulb globe thermometer (WBGT) index determines the heat condition; this condition is assigned a number (1–5) or a corresponding color code (white, green, yellow, red, black) that can be displayed with flags or other devices. MOPP gear increases the ambient WBGT index by about 10°F; that is, 10° is added to the WBGT reading before the heat condition is designated. The recommended amount of water intake per hour for each heat condition and physical activity for each condition are shown in Table 13-2. Individuals wearing butyl rubber aprons on the decontamination line while at MOPP 4 may experience an even greater heat load. For someone at MOPP 4, a relatively comfortable WBGT of 82°F (heat category 2, green) would increase to a level of over 92°F (heat category 5, black), the most severe and debilitating level of heat stress. Therefore, frequent rotation of personnel to reduce the occurrence of heat injuries is another factor to consider when determining total manpower requirements.

Specific medications and items of equipment to treat chemical casualties will be carried by units operating in an area of chemical threat. When collective protection systems are not available, casualties will be taken upwind 100 m or more to permit treatment to occur in a shirtsleeve environment. Chemical agent detection equipment, such as the chemical agent monitor (CAM), should be available to determine (*a*) if agent vapors have been absorbed on surfaces of the casualty's clothing or equipment before entering a treatment area, and (*b*) if decontamination procedures have been properly accomplished.

Medical facilities treating chemical casualties must divide their operations into two categories: contaminated (dirty) and uncontaminated (clean). Contaminated operations include triage, emergency treatment, and patient decontamination. Uncontaminated operations include treatment and final disposition. All activities conducted in the Casualty Decontamination Center (CDC) and not inside a collective protection shelter must be conducted at MOPP 4. Operational flexibility is essential. Therefore, the number and arrangement of functional areas will be adapted to both medical and tactical situations.

First Aid for a Chemical Casualty

The most important care for a chemical casualty is that provided within the first few minutes. This cannot be provided by medical personnel and must be done by each individual. This self-aid includes decontamination and the self-administration of the antidote kit if exposure was to a nerve agent.

After exposure to chemical agent vapor, the most important aspect of care is for the soldier to don his mask immediately to prevent further exposure. If the soldier is symptomatic from nerve agent exposure, he should immediately administer the contents of one MARK I kit to himself and notify his buddy of the exposure. For other agents (vesicants, cyanide, and pulmonary agents) there is no self-aid or first-aid therapy.

After exposure to liquid agent, the most important aspect of care is to decontaminate (ie, remove

TABLE 13-2

HEAT CATEGORIES AND WORK/REST CYCLES

Criteria*			Controls: Physical Activity for Soldiers	
Heat Condition/ Color Code	**WBGT Index (°F)**	**Water Intake (Qt/h)**	**Work/Rest† Cycles for Acclimatized‡ Soldiers**	**Unacclimatized Soldiers and Trainees**
1/White	78–81.9	At least 0.5	Continuous	Use discretion in planning heavy exercises. Suspend strenuous exercise during the first 3 wk of training. Training activities may be continued on a reduced scale after week 2 of training. Avoid activity in direct sunlight.
2/Green	82–84.9	At least 0.5	50 min work/10 min rest	
3/Yellow	85–87.9	At least 1.0	45/15	
4/Red	88–89.9	At least 1.5	30/30	Curtail strenuous exercise for all personnel with < 12 wk of hot-weather training.
5/Black	≥ 90	> 2	20/40	Physical training and strenuous exercise are suspended. Essential operational commitments not for training, where risk of heat casualties is warranted, are excluded from suspension. Enforce water intake to minimize expected heat injuries.

*Wearing mission-oriented protective posture (MOPP) gear or body armor adds 10°F to the wet bulb globe thermometer (WBGT) index.
†Rest: minimal physical activity, which should be accomplished in the shade if possible; however, any activity requiring only minimal physical activity can be performed during "rest" periods (training by lecture/demonstration, minor maintenance of vehicles/weapons, personal hygiene activities).
‡Acclimatized: the soldier has worked in the given heat condition for 10–14 d.
Adapted from Department of the US Army. *Field Hygiene and Sanitation.* Washington, DC: HQ, DA; Nov 1988: 39. Field Manual 21-10.

the agent) as quickly as possible. Decontamination done within a minute or two after exposure to mustard will decrease skin damage; the severity of subsequent skin damage increases greatly each minute the agent is in contact with skin. Immediate decontamination of nerve agent droplets from the skin can prevent severe poisoning or death. Large amounts of cyanide must be present on skin to cause clinical effects, and pulmonary agents generally penetrate the skin poorly or cause no effects by this route of exposure, so decontamination is of much less importance when exposure is to these agents.

A soldier who is symptomatic from a nerve agent should immediately take steps to prevent further exposure, and then he should self-administer the nerve agent antidote kit (the MARK I). Each member of the military is taught to administer one kit if he has minimal or moderate symptoms from a nerve agent. He administers one and waits 10 minutes. If he is no better after this time, he seeks out a buddy to evaluate him; if there has been no improvement, a second MARK I kit is given.[2]

For a casualty who is able to administer a MARK I kit and seek out a buddy, a total of two antidote kits usually will be sufficient. On the other hand, a soldier with effects so severe that he is unable to self-administer the antidotes must depend on buddy-aid. A soldier who is not walking or talking should be given three MARK I antidote kits and diazepam by his buddy as quickly as they can be administered. When the unit medic or combat lifesaver arrives, he can administer additional atropine and one or two more injectors of diazepam as conditions indicate.[2]

Casualties who improve significantly from one or two MARK I kits given for nerve agent symptoms will continue their mission on improvement. Those casualties who later develop symptoms after vesicant or pulmonary agent exposure will seek medical aid either at the unit aid station or at the BAS. Generally, they will decide to seek assistance before the effects become severe, and they will trans-

port themselves to the medical site before they have received assistance from a combat lifesaver or medic.

Casualties with severe effects, those who require on-the-spot assistance from the unit lifesaver or medic, will generally be sent back to the aid post or BAS for further care. The decision by the unit lifesaver or medic to call for the litter team or ambulance team to evacuate that casualty is the first of many levels at which triage decisions are made on each casualty.

Ambulances that transport casualties from the FLOT to the first-echelon MTF are generally contaminated, or "dirty," and the personnel on these vehicles are at MOPP 4.

Casualty-Receiving Area

Any MTF that receives contaminated casualties will have a casualty-receiving area, which consists of a dirty side and a clean side, separated by a "hotline" that must not be crossed by contaminated casualties, garments, or equipment. The area where casualties are received, on the dirty side of the line, is where initial triage is done, emergency medical care is provided, and the casualty is decontaminated (Figure 13-1).

The number and types of personnel in this area will be different at each echelon of care. For example, at a BAS, a single senior medic may staff both the triage and emergency treatment areas, but at a hospital, physicians' assistants or physicians might be present at each area. Similarly, what is done with the casualty at each station will be different at each echelon. At the BAS or other first-echelon MTF, the goals are to return casualties with minor injuries to duty, and to stabilize casualties with more-severe injuries for evacuation to higher echelons of care. Of these, only two categories of casualties will be decontaminated. Those who have severe injuries will be decontaminated to enter the clean medical treatment area; those who can return to duty may go through a MOPP-gear exchange process or go through decontamination to enter the clean area to don new protective gear, providing they have their own second set of gear.

Casualties with severe but stable injuries or others who must be evacuated without treatment will be sent directly from the triage area to the ambulance area to be evacuated dirty. At a higher-echelon MTF, such as a hospital, where more-complete care can be provided, all casualties will be decontaminated for entry into the clean treatment area.

Behind the contaminated receiving area and separated from it by a hotline is the clean treatment area.

A clearing company or a clearing company team will set up ambulance exchange points, which have a treatment squad to perform first aid and the capability to perform patient decontamination before further evacuation. As a rule, contaminated ambulances operate from the FLOT, transporting contaminated casualties back to the exchange point, while clean vehicles transport decontaminated casualties to Echelon III medical treatment facilities.

The Entry Point

The entry point is a clearly demarcated area into which all casualties arrive. Ambulances unload casualties at this point, and ambulatory casualties report to this point. The entry and exit roads must also be clearly marked. Organic (ie, intrinsic) staffing in this area may be minimal, and all casualties arriving at this area will be sent to the triage station.

The Triage Station

The triage officer sorts each casualty into one of the four triage categories: immediate, minimal, delayed, or expectant (Exhibit 13-1). At lower echelons of care, the triage officer may be a senior medic (who may also be the staff at the emergency treatment station); at higher echelons, he may be a physician's assistant, dentist, or physician.

As discussed in greater detail in Chapter 14, Triage of Chemical Casualties, the triage officer must know the natural history of the injuries he faces, including chemical injuries. He must also have knowledge of evacuation capabilities and the facilities at higher echelons of care as well as his own decontamination capabilities and assets for medical care.

The triage officer will send casualties (*a*) back to duty, (*b*) to the emergency treatment station, (*c*) to the decontamination area, or (*d*) to the dirty evacuation area.

The Emergency Treatment Station

In the most forward MTF, the emergency treatment station will likely be staffed by the same senior medic who functions as the triage officer. At higher echelons of care, a physician's assistant or physician might staff this station.

At the emergency treatment station, the casualty is provided emergency lifesaving medical care and is stabilized for the 10- to 20-minute decontamination procedure that is necessary before he can enter the clean area of the MTF for more-elaborate treatment.

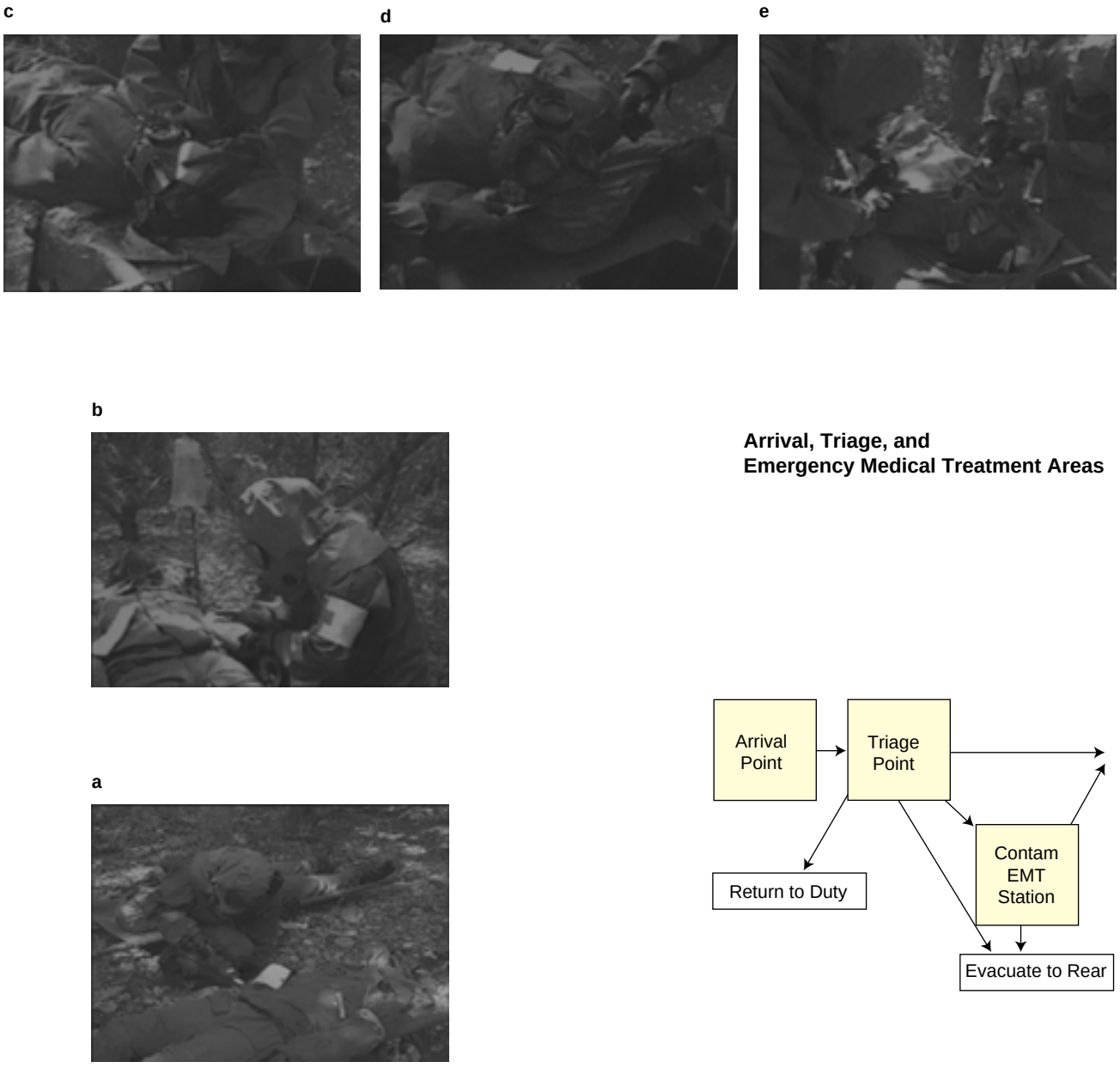
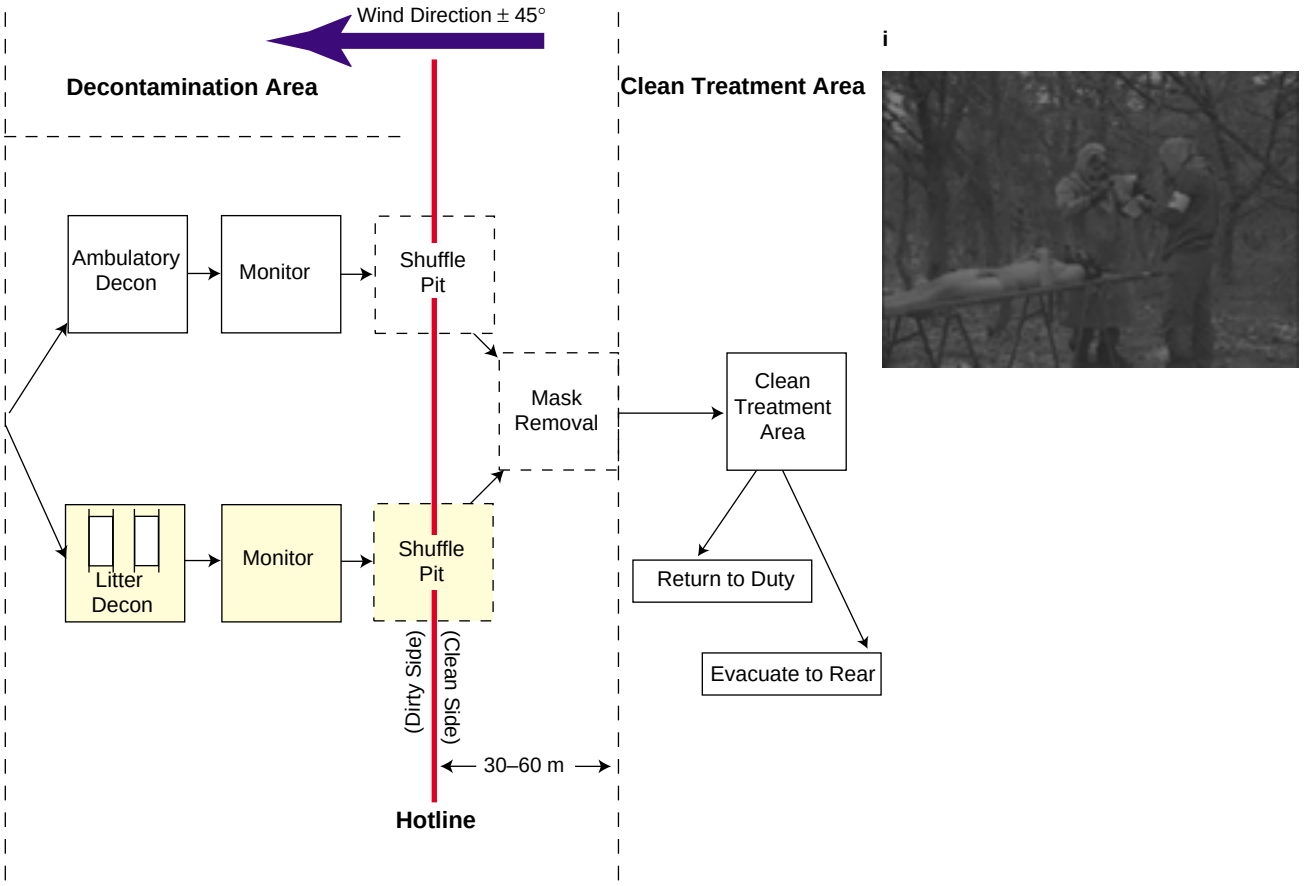


Fig. 13-1. A casualty receiving area, or chemical decontamination receiving area, is located in front of any medical treatment facility (MTF) that receives chemically contaminated casualties. Although the precise details will vary depending on the echelon of medical care and the resources available, any MTF at any echelon of care that might receive contaminated casualties will have a receiving area for contaminated casualties. This area, seen in the drawing, consists of the casualty arrival point, triage point, emergency medical treatment (EMT) station, decontamination area, and the hotline, which is set perpendicular to the wind direction. Only after a casualty has been decontaminated can he be taken across the hotline into the clean treatment area for more complete chemical casualty care. The pathway for nonambulatory casualties shown in this figure is shaded yellow; ambulatory casualties, further medical treatment, and the disposition of contaminated equipment and garments are not addressed in the following discussion. *Clockwise, from bottom left:* **(a)** At the arrival point, the healthcare provider uses a chemical agent monitor (CAM) to assess the nature and magnitude of the casualty's chemical contamination. **(b)** After the casualty has been triaged, treatment at the EMT station may involve emergency first aid for conventional injuries as well as the administration of chemical agent antidotes. Note that healthcare providers are at mission-oriented protective posture (MOPP) 4 and, in addition, are wearing butyl rubber aprons. At the litter decon-



tamination station, **(c)** the casualty's hood is decontaminated with 5% hypochlorite solution and **(d)** is being cut away prior to removal; **(e)** the outer garment is being excised prior to removal (not seen: the medical record card is inserted in a plastic bag and placed under the casualty's mask headstrap); **(f)** the overboots are removed; and **(g)** the battledress uniform is being excised prior to removal. After the casualty's underwear has been excised and removed, the casualty is monitored for additional contamination and **(h)** the skin is spot decontaminated with 0.5% hypochlorite solution. **(i)** At the shuffle pit, the still-masked, litter-borne casualty is transferred to the clean side of the hotline for further treatment at the MTF. (Not shown: the clean casualty is checked with the CAM before crossing the hot line.) The bag containing the casualty's medical record card, which has also been decontaminated with 5% hypochlorite solution, is transferred with the casualty. Total elapsed time for decontamination of a litter-borne casualty to this point is 10 to 20 minutes.
Diagram: Adapted from Combat Casualty Care Office. *Medical Management of Chemical Casualties Handbook*. Aberdeen Proving Ground, Md: US Army Medical Research Institute of Chemical Defense; 1994: 194. Photographs: Reproduced electronically from *US Army Chemical Decontamination of Nonambulatory Casualties*. Fort Sam Houston, Tex: Health Sciences Media Division, US Army Medical Department Center and School; 1995. Training videorecording 710175; TVT 8-252.

EXHIBIT 13-1

TRIAGE CATEGORIES FOR CASUALTIES OF CHEMICAL WARFARE AGENTS

Immediate

A casualty in the immediate category needs to have a medical procedure performed within an hour or so to save his life. This may be something as simple as giving more atropine and additional diazepam, and inserting an airway for ventilation in a nerve agent casualty who is convulsing or who has just become apneic. In this instance, the triage officer would send the casualty to the emergency treatment station in the contaminated area. If the casualty needs more care and that care can be provided in his facility, the triage officer sends the patient for decontamination for entry into the clean (ie, not contaminated) medical treatment area of his facility. However, he might send the casualty to the contaminated emergency treatment area for stabilization before the 10- to 20-minute decontamination procedure. Rarely, he might send an immediate casualty for urgent evacuation to a facility at a higher echelon, but he would do this only if he were certain that the casualty could reach that echelon in a timely fashion and that that facility could provide the needed care on arrival.

In a higher-echelon medical facility, all immediate patients will be sent through decontamination for entry into the clean area. However, the casualty might require stabilization at the contaminated emergency treatment facility before entry into the lengthy decontamination process.

Minimal

A casualty in the minimal category is one who needs minor care and who is expected to return to duty within hours after that care is provided. In a noncontaminated environment, these casualties will generally not be evacuated.

In a contaminated environment, a minimal casualty might be one with a tear in his battledress overgarment through which he became wounded by chemical or conventional means (eg, a small tear through which he became exposed to mustard). At a lower-echelon medical treatment facility (MTF) the medical care can be provided, but a replacement for his torn garment cannot be provided by that facility. He can return to duty shortly, but needs new protective clothing; he can (*a*) go through ambulatory decontamination at that MTF and replace his protective gear with his own second set, (*b*) go through procedure for exchanging his mission-oriented protective posture gear if he has his own second set of protective gear, or (*c*) return to his unit for resupply. In the latter case, the triage officer might send the casualty to the contaminated evacuation area for evacuation in a dirty (ie, contaminated) vehicle. Or he might send him to be evacuated in a clean ambulance, in which case the casualty must go through decontamination.

Delayed

A casualty in the delayed category is one who has a serious injury, but who can wait for care. The delay will not change the ultimate outcome. Most vesicant casualties with skin lesions will be in this category. Generally, delayed casualties will not be sent to the emergency treatment area and will not be decontaminated at the lower-echelon facility. They will be evacuated in a dirty vehicle.

Expectant

A casualty in the expectant category is one who needs care that is beyond the capability of that MTF to provide. In addition, the needed care is required *before* the casualty can be evacuated to the MTF that can provide such care. Depending on his condition and the circumstances in the MTF at the time, the casualty will initially be set aside but will be decontaminated. As circumstances permit, he will be reexamined and possibly be retriaged to a higher category.

Casualties with minor wounds might be treated here if they can be returned to duty. However, most will need to have their protective garments replaced and will (1) go through decontamination, or (2) go through a MOPP exchange procedure if they have a second set of garments, or (3) be returned to their own units for resupply. These latter casualties may be evacuated in a dirty vehicle, or they might be decontaminated and sent in a clean vehicle.

Care at the emergency treatment station is limited. The care provider and the casualty are both in MOPP 4. The care provider can apply dressings, start intravenous fluids, and insert an endotracheal tube. In each case, the care provider must decon-

taminate the casualty's skin in the areas that he will touch, and he must ensure that his hands (gloves) are decontaminated. Although he will be able to insert an endotracheal tube, he may not have a ventilator, or if he has a mask-valve-bag device, he may not have the personnel to use it.

From the emergency treatment station the casualty will (*a*) return to duty, (*b*) go to the decontamination area, or (*c*) go to the ambulance area for evacuation in a dirty ambulance.

The Decontamination Area

At the first echelons of care the organic staff is small, and dedicated personnel are not available to decontaminate casualties. Personnel from the supported unit must be assigned to the MTF for this purpose, to allow all medical care providers to care for casualties. These augmentees should be identified early and be thoroughly trained for these tasks. To most effectively decontaminate a patient on a litter, three—or possibly two—people are needed. The actual size of the augmented decontamination staff needed, however, will be severalfold larger than this number because the personnel will need rest periods, the frequency and duration of which will depend on the ambient temperature.

A minority of casualties who are able to walk will be decontaminated at the BAS or other low echelon of care. Most walking casualties who require significant medical attention will have nonurgent injuries and can be evacuated to a higher echelon for needed care. Casualties in either of these categories, those who need significant care and those who can be returned to duty after MOPP replacement, can be evacuated in a dirty vehicle.

Casualties who need care at the first-echelon MTF or who need stabilization before evacuation will be decontaminated on a litter by the decontamination staff, who are supervised by a medic. The first stage in this process is the removal of the outer garment, followed by removal of the casualty's battledress uniform, gloves, protective boots, and boots. The field medical card (FMC) is placed in a sealed plastic bag and will remain with the casualty until the information is copied onto another FMC; personal effects will be bagged and tested later for contamination.

This is followed by decontamination of exposed areas of skin with 0.5% hypochlorite solution or the M291 (or M258A1) decontamination kits. The CAM or M8 paper may be used to test for contamination before and after decontamination. It is generally believed that removal of the protective clothing will remove 90% of contamination and removal of the uniform will remove 5% more, leaving only a small amount to be removed by skin decontamination.

The decontamination team then hands the nude, decontaminated casualty across the hotline to the medical staff. As a final step, far from the hotline the casualty's mask is removed. All contaminated material is placed in a dirty dump, which is located 100 m downwind and marked with the North Atlantic Treaty Organization "gas" marking.

During the decontamination process, the medic overseeing decontamination is responsible for splints, tourniquets, and bandages. Splints are soaked thoroughly with the decontaminating solution but are not removed. Tourniquets are removed after a new one is placed proximally over decontaminated skin. Bandages are removed and not replaced except as needed (ie, to control bleeding). Wounds that are neither truncal nor neurological are flushed with 0.5% hypochlorite; other wounds are thoroughly flushed with water or saline.

The decontamination process will usually take about 10 to 20 minutes; a well-trained team can decontaminate a casualty in slightly less than 10 minutes.

As the capability to provide medical care increases at higher echelons of care, a larger number of casualties will be decontaminated, and at hospitals, all contaminated casualties will go through this procedure.

The Clean Treatment Area

The capability to care for casualties increases greatly from the lowest echelon of care to the highest. The BAS will have a physician's assistant, a physician, or both, and several medics. The higher echelons, the hospitals, will have a full surgical staff including subspecialists, surgical facilities, and full support capabilities to provide all needed immediate care.

With limited resources available, the major tasks of the BAS are to provide lifesaving care and to prepare the casualty for evacuation. By necessity these must be short, simple procedures. After receiving care in a low-echelon MTF, the casualty is evacuated in a clean vehicle to a higher echelon for further care. If clean vehicles are not available, the casualty may be placed in a patient protective wrap and evacuated in a dirty vehicle (see Figure 16-42 in Chapter 16, Chemical Defense Equipment). At higher echelons, the treatment area will be located in a collective protection shelter; otherwise, this should be at least 100 m upwind from the receiving area.

SUMMARY

Field management of a contaminated casualty or of a casualty in a contaminated environment is cumbersome and manpower-intensive. In front of each medical care facility, from battalion aid station to field hospital, there must be a casualty-receiving station if casualties are contaminated, or if casualties are entering from a contaminated area. In this station, casualties are (*a*) triaged, (*b*) given the emergency care that can be provided with both casualty and medical care provider encapsulated in protective garments, (*c*) decontaminated, and then (*d*) taken into a noncontaminated—or clean—area for further care. At this stage or after the initial triage, the casualty may be evacuated to a higher-echelon facility, depending on the needs of the casualty and on the resources available. Initial triage is greatly hampered by the partial loss of the senses of sight and touch because of the protective garments. Initial medical care in the contaminated area is rudimentary because of potential contamination on the casualty and because of the protective equipment. Decontamination of a casualty takes about 10 to 20 minutes.

REFERENCES

1. *American, British, Canadian, Australian Armies Medical Interoperability Handbook*. ABCA: March 1996. Initial draft.

2. Departments of the Army, the Navy, and the Air Force, and Commandant, Marine Corps. *Treatment of Chemical Agent Casualties and Conventional Military Chemical Injuries*. Washington, DC: Headquarters, DA; DN; DAF; and Commandant, MC; 22 Dec 1995: Chap 2, Nerve Agents. Army FM 8-285, Navy NAVMED P-5041, Air Force AFJMAN 44-149, Marine Corps FMFM 11-11.