Instructor Guide v 2.6

ADLS - M.A.S.S. TRIAGE STATION

OUTLINE

1. Introduction
2. Station objectives
3. Personnel list
4. Equipment list
5. Site considerations
6. Instructor actions
7. Student actions (competencies)
8. The scenario
9. Manikin information tags
10. Teaching points
11. Options

INTRODUCTION

The M.A.S.S. triage station is a practical exercise station conducted on Day 2 of the Advanced Disaster Life Support course (ADLS). The student group is divided into 4 equal groups which then rotate separately thru the 4 different stations. Each station lasts a total of 90 minutes per student group. This station consists of a short introductory talk followed by a practical exercise in the use of M.A.S.S. triage in a simulated mass casualty incident (M.C.I.). Role-players and manikins are utilized as victims in the exercise. After the exercise is completed, the students' performance is discussed and an after-action-review is conducted to facilitate learning.

STATION OBJECTIVES

At the conclusion of this station, the student should be able to:

1. Demonstrate improved ability to use the D-I-S-A-S-T-E-R paradigm to manage (or assist in the management of) a simulated mass casualty incident (M.C.I.).
2. Demonstrate a safe initial-approach to a simulated disaster scene.
3. Demonstrate the steps of the M.A.S.S. triage process.
4. Describe the difficulties in communication and scene management that are commonly encountered during disasters and ways to improve communication.
5. Describe the importance of the Incident Command system as a method of working efficiently with other rescuers
6. Describe the stress of a simulated disaster scene and its effects on the ability of rescuers to perform their duties.

PERSONNEL LIST

2	certified ADLS instructors
2	(or more) assistants
10 -20	role-players
--	individual(s) skilled in the use of moulage (may be anyone above)

EQUIPMENT LIST

1	ADLS M.A.S.S. Triage station instructor guide (per instructor)
1	Emergency Action sheet (per instructor) filled out by a station instructor)
1	signed waiver of liability per instructor/assistant
1	signed waiver of liability per role-player (may require parent/guardian if a minor)
1	contact-information list of all instructors/assistants/role-players
1	signed compensation-agreement form per instructor/assistant/role-player
1	appropriate tax information form per instructor/assistant/role-player (if paid)
1	signed permission slip (by parent/guardian) per minor (in age) role-player
1	approved work permit (per child role-player…….if required by law)
--	several clip boards for the above forms
2	Bull horns (preferably with sirens) for use as distracters and to control scene by instructors and students
1	large sign denoting station name or number (waterproof/windproof)
--	sign-holder/string/rope/tape/stakes/etc…to secure the sign as needed
--	several signs stating “TRAINING IN PROGRESS” + means to secure them up
10	information tags for manikins (if manikins are used)(waterproofed in some way)
1	numbered bracelet (per victim/manikin)
1	large red tarp
1	large yellow tarp
1	large green tarp
1	large blue tarp
100	triage tags
25	pens (if triage tags require writing)
10	two-way radios with charged batteries (+chargers or extra charged batteries)
1	large metal flashlight with batteries
1	mock improvised explosive device CLEARLY MAEKED AS A TRAINING AID(batteries/tape/wires/etc…NO EXPLOSIVES)
--	weather-specific equipment as needed (sunscreen, ice, tents/tarps for shade or warmth, heaters, fans, etc…)
--	drinks for students/role players/instructors (+ cups/ice/coolers/etc…)
--	trash can / trash bags
--	litters (preferably at least 5)(with litter straps)(or SKED’s, or similar devices)
--	moulage kit/materials (enough to moulage 10-20 victims)

10 manikins (adult size……preferably realistic weight, may be substituted with moulaged live victims)
-- sets of old clothing for role-players/manikins (+ tape to 'repair' clothes if they are to be cut off)
2-4 jump kits/bags (with a few supplies……bandages/dressings/gloves/bag valve mask/E.T. tubes/stethoscope/BP cuff)
1 large dry-erase board + several dry-erase markers of different colors
-- enough sheets/blankets/tarps for non-ambulatory role-players to lay on (if ground is hot/cold/wet/muddy/fire ants/etc…)
1 fully stocked first-aid kit (for emergency use)
-- means to summon EMS and course coordinator (cell phone/radio/etc…)
-- uniform clothing items such as vests/shirts/hats/armbands (to identify the instructors/assistants)

SITE CONSIDERATIONS

1. Introductory lecture site-
   - should be area that is quiet enough to allow students to hear instructions/lecture
   - should be relatively free of distractions (have students face AWAY from the practical exercise site if they are within sight of it)
   - should be relatively comfortable (use shade/windbreaks/heaters/indoor areas as needed), so students can concentrate on listening/learning

2. Practical exercise site-

A. Outdoor site- large enough for 20 patients to be scattered around site. A field or lightly wooded area 125 ft x 125 ft is ideal. The site must be relatively free from hazards such as large numbers of holes, ant hills, snakes, or other obvious hazards. Consideration should also be given to the noise that will be generated during the simulation so as not to disturb students in other stations, host location meetings/classrooms, or neighbors.

B. Indoor site (backup)- in case of severe weather. A space the size of a typical gym works well.

3. After-action-review site
   -should be area that is quiet enough to allow students to hear instructions/lecture
   -should be relatively comfortable (use shade/windbreaks/heaters/indoor areas as needed), so students can concentrate on listening/learning

INSTRUCTOR ACTIONS

Course Planning

1. Confirm sites to be used with course coordinator

2. Notify campus security, building or hotel security, local police and 911 center that training will be occurring at location/date/time using realistic moulage and noise/sirens.
3. Notify other interested parties (building managers, public relations, nearby interest) of the training using realistic moulage and noise/sirens.
4. Inventory and check all equipment
5. Ensure adequate battery charging / replacements
6. Ensure adequate moulage supplies
7. Review weather forcast for training day

Task Prior to Arrival of Students

1. Receive a completed Emergency Action sheet from course coordinator
2. Mark the station site with signs
3. Ensure all instructors/assistants/role-players are present and have all necessary paperwork completed (waivers, contact-info sheet, compensation agreement, etc…)
4. Ensure that all needed equipment is present
5. Inform course coordinator if equipment or personnel are missing
6. Survey the area for additional hazards and note them on Emergency Action sheet.
7. Mark any hazards identified and notify students during the pre-scenario briefing of these hazards.
8. Review the Emergency Action sheet with other instructors/assistants
9. Review all site hazards with all instructors/assistants/role-players
10. Review the "START THE SCENARIO" and "STOP THE SCENARIO" commands with all personnel
11. Assign role-players to numbered roles of victims
12. Apply moulage to role-players and brief them on their roles (and ask them to attempt to stay out of sight of the students until scenario begins)
13. Apply information tags to manikins (tape/secure on their chest)
14. Place numbered bracelets on role-players and manikins' (corresponding with patient number)
15. Move manikins to various locations around the practical-exercise site (some may be prone, supine, seated, etc…. Refer to manikin's information tag for manikin's ability to raise a limb…..some manikins should have a limb in a raised position)
16. Apply basic moulage to manikins if desired
17. Place the MOCK improvised-explosive-device somewhere on the scene (with wires/batteries/tape/nails showing) (may be placed inside an open cooler next to a patient)
18. Place the student's equipment at the introductory-lecture site (radios/jump-bags/litters/SKEDS/triage tags/pens/tarps)
19. Test all radios for reception/transmission/battery strength (and ensure that the channel that will be used is free and appropriate for practical-exercise-usage)

Upon arrival of students at station:

1. Direct the students to the introductory-lecture site and try to orient them so they do not have a direct view of the practical-exercise site (and try to ensure that students do not walk thru the practical-exercise site on their way to the station)
2. Welcome students to the station and ensure they have come to the correct station
3. Introduce the instructors/assistants (and explain how to identify them….vests/uniform shirts/etc…)
4. Explain the station objectives and give an explanation of the equipment available to the students (show how to use radios/triage tags/tarps/etc…)
5. Demonstrate the use of litters/SKEDs. Place strong emphasis on safety of students/role-players. Use litter straps. DO NOT DROP ROLE PLAYERS!
6. Use proper lifting technique. Do NOT attempt to lift if you think you may be injured. Students should take responsibility for their own health/safety and should NOT attempt to exceed their capabilities.
7. Explain that one of the instructors will play the role of the dispatcher (and any other person called on the radio). The instructor will answer the students' requests by radio
8. Explain that assessment information about the manikins may be obtained by looking at the manikin's anterior chest (or by asking a nearby instructor)
9. Explain that assessment information about the role-players may be obtained by:
    a. observing the role-player's behavior
    b. asking the role questions
    c. assessing the role-player and then asking an instructor for the findings
10. Clarify if clothing may or may not be cut off manikins or role-players (have role-players wear swimsuit/body suit under their clothing if it is to be cut off)
11. Explain the physical boundaries of the scenario
12. Brief the students on any real hazards present at the practical-exercise site
13. Review the "START THE SCENARIO" and "STOP THE SCENARIO" commands with all personnel. ***ANYONE*** present should issue the "STOP THE SCENARIO" command if they see a dangerous situation present.
14. Emphasize that this is just a training exercise and that it is not worth anyone getting hurt over. Be careful!
15. Ensure that no students are carrying weapons or other dangerous items that may be hazardous if used in the excitement of the scenario
16. Have an assistant position the role-players in the practical-exercise site while the introductory lecture is being done
17. Have the students divide up into groups of 2-3 and divide the equipment among them

Safety Briefing

Immediately before starting the scenario, the following points of the safety briefing should be reviewed with the students:

- No weapons are to be taken into the scenario
- Live role players should not be lifted and should only be moved on Skeds (or similar device)
- Students should not engage in any lifting, pulling or other activity which they feel unsafe or will injure them or others.

- Any person may stop the scenario at any time by saying "STOP THE SCENARIO".
- If a stop the scenario order is given all students, instructors, and role player should immediately stop any activity and look for further instruction
- Any hazards or safety issues that are identified should be immediately reported to an instructor
- Any student who is feeling psychologically stressed may leave the scenario at any time.

This introductory briefing should take approximately 15-20 minutes

The beginning of the practical exercise:

1. An instructor should make a quick radio transmission (on the frequency that will be used for the exercise) to advise anyone monitoring the channel that, "The following radio traffic is related to a disaster drill being conducted on this frequency. Please disregard the next 40-60 minutes of radio traffic on this channel. This is only an exercise." This announcement should be repeated twice a few minutes apart before each start of the scenario.
2. Position instructors/assistants throughout the practical-exercise site
3. Give the command, "START THE SCENARIO" and start a timer. (role-players begin their acting now)
4. Start distracting noises. This may be in the form of sirens, alarms, noise tracks of screaming, etc. Care should be taken to provide enough noise in the background to add realism, and sensory overload but not so much as to make communication / coordination impossible. An instructor in charge of this task should observe closely for the effects of the noise on the provider's ability to manage the scene and adjust accordingly. A bull horn with an adjustable volume siren is ideal for accomplishing this. If an adjustable volume siren is not available, muffling the siren manually will work to dampen the noise enough to allow effective communication. The siren can may also be distanced further away from the scene.
5. Using the radio, dispatch one crew of students to the scene of a possible explosion at a local outdoor concert event. The order in which the crews are dispatched may play a large role in the amount of chaos that occurs with the arrival of the first crew on the scene. If students are allowed to self-distribute into groups 1-4, then the healthcare providers who are most comfortable with this type of environment are likely to self select group 1 thinking that this will be the first unit to be dispatched and arrive. Therefore in order to add to the confusion that is common at a disaster scene one of the groups 2-4 should be dispatched first and other units should instructed not to repond until dispatched.
6. Let the first crew handle the scene alone for the first few minutes of the exercise (even if they immediately call for backup)
7. Tell the students who are NOT on the scene yet to listen carefully to the radio traffic from the first crew on scene
8. Space out the arrival of the remaining crews so that they do not all arrive at once

9. Instructors should evaluate students' performance by observing their actions and listening to their radio traffic (notes should be taken to assist in the after-action review)
10. Monitor all radio traffic and respond as the dispatcher (or as any other units that are requested (for example, Hazmat team, EOD unit, etc…)
11. Observe closely for any safety hazards and be ready to intervene to prevent injury
12. At some point after students have entered the scene there should be a simulated detonation of a secondary device. This can be done if a student moves an object that could have been boobey-trapped, or when the come close to the device that has been placed next to a victim. If no-one has come over to evaluate the victim, the instructor may consider taking on the role of a family member who pulls a rescuer over to see about their family member. When the student comes close and begins to evaluate the patient, then the simulated secondary device should be detonated. It is important that the student have ample opportunity to recognize the device, and it should be in plain view so that if the student were actively looking for secondary devices that they would note it and immediately leave the area. The simulated detonation of the secondary device can be by a variety of methods, but caution should be used if pyrotechnics, fireworks, are used as these can present real hazards to the students, role-players and instructors. A safe and effective alternative is the sounding of an air-horn, followed by an announcement on a bull horn of the explosion of a secondary device, and the number of team members that are killed and/or injured. The announcement is extremely important in order for students to be informed as to what has happened as other clues of another explosion would not be present.
13. If the rescuers identify the device and take the appropriate measures to evacuate the area, role players should be instructed to scream "Don't leave me!, Why aren't you helping us!" to add pressure to the rescuers to return to an unsafe environment.

Optional confounders:

Listed below are potential confounders that may be added to the scene depending on student performance and instructor preference.

1. **News media on scene –** an instructor may take on the role of a newspaper or television reported who has arrived on the scene. The instructor (hat off) should inconspicuously initially, and then more blatantly walk up to victims, rescuers, or the incident commander introduce themselves and then begin asking questions concerning the event. The students should politely remove the reporter from the scene and direct them to the PIO. Students should not become forceful or rude, and should not allow continued reporting/interviewing. If the reporter does not leave the scene as requested then law enforcement should be contacted to remove the reporter.
2. **Law Enforcement victims/ Psychologically Stressed Law Enforcement –** An instructor (hat-off) may take on the role of a police officer who discovers the body of dead colleague in the scenario area. He insist that someone care for his friend and upon being informed that his partner is dead, becomes insistant that he is not

dead and was just breathing. Despite any efforts of the students to convince his of the death of his partner he becomes more forceful in insisting that he be given care immediately. Despite the best approaches to manage him, he pulls a simulated weapon (red gun, toy gun, or points another object or pointed finger and identifies it as a gun) and demands that his partner be treated immediately. The student must decide how to intervene with viable options being notification of law enforcement, treating the victim despite his obvious death, and involving the law enforcement officer in the treatment of his friend. The obvious mistake is to try to take the weapon away from the officer. The teaching point being that psychologically stressed armed persons have demanded treatment of friends, family, and law enforcement personnel on the scene at previous disasters and such situations represent real management challenges.

3. **Wandering and unruly patients** – Some minimum patients are instructed to wander off, return to the area of the event or become hysterical. This requires the students to devote some resources to the management of these patients. If the patient becomes a severe management problem, transporting them from the scene may be the best way of preventing further disruption of the rescue effort.

Instructors should use their discretion to run the scenario in such a way as to maximize the students' learning. Different student groups will have different needs. The level of difficulty and the number of confounders presented can be adjusted depending on student performance during the scenario. Be flexible and remember that the point of the class is to MAKE THE STUDENTS BETTER ABLE TO RESPOND TO REAL MCI's. Stop the exercise when all victims have been "evacuated" from the scene or when there are 20-30 minutes left before next rotation.

After the practical-exercise:

1. Move the students to the after-action-review site (if it is apart from practical exercise site)
2. Take a moment to help correct any environmental extremes (position students so they are in shade/ out of wind / not looking into sun / etc…) If students are extremely hot or cold, it will detract from their ability to concentrate on the review.
3. Hand out cold drinks / hot drinks as needed to students/role-players/instructors
4. Can let students sit down/rest near the dry-erase board (optional)
5. Tell students,
    a. "We're going to do a quick review of how the exercise went. There are very few absolutes in the review process. There are many correct ways to get things done. The point of the review is to identify things that worked well, and also to discuss things that could have been done better.
    b. What kinds of things did you notice that seemed to work very well for you?" (discuss these with students)
    c. It is extremely important to start off with the positive aspects about what happened and to give a disclaimer that this is a training exercise and that the environment of simulation, lack of other personnel (fire/police) adds

difficulty. It is also important to point out that there are few absolutes in disaster management and there may be more than one way to correctly accomplish a task.

d. "So, if you could do the exercise over again, what would you do differently the second time?" (discuss)
e. Then bring up any additional points that instructors noticed. It may be helpful to refer to any notes taken during the exercise or to the "*TEACHING POINTS*" section of this guide.

6. Review each patient's
    a. Presentation
    b. injuries (and cause of the injuries)
    c. triage category as assigned by student
    d. correct triage category
    e. treatment received
    f. treatment needed
    g. transport priority
    h. appropriateness of transport method used
7. Ask for questions/comments from students
8. Have students return all equipment to instructors
9. Thank the students for their participation and ensure that any injuries are treated and documented
10. **Have the students report to their next ADLS Station and ask them <u>not to say anything about the scenario to the other student groups until everyone has had a chance to run the scenario</u>**

<u>Post Scenario</u>

1. An assistant should move the manikins back into their positions in the practical-exercise site and raise the arm of the appropriate manikins (may utilize some of the role-players to move manikins)
2. Ensure that the manikin information tags remain secured to manikin's chest
3. An assistant should gather the role-players in a comfortable location and
    a. re-apply moulage as needed
    b. ensure role-players are not overheating/hypothermic/injured
    c. answer any questions from role-players
    d. give feedback / coach on role-players' performance
4. Reassemble the students' equipment at the introductory-lecture site (tarps/radios/pens/triage tags/jump bags/etc…)

Critical STUDENT ACTIONS

1. the first crew must act alone to
    a. approach the scene SAFELY
    b. attempt to ASSESS HAZARDS/SECURITY issues
    c. DETECT the occurrence of a multi-casualty-incident (MCI)
    d. alert the system to the presence of an MCI
    e. establish INCIDENT COMMAND (and place it in appropriate area)
    f. request appropriate SUPPORT units/agencies
    g. designate TRIAGE personnel
    h. designate TREATMENT areas/personnel
    i. designate EVACUATION areas/personnel
    j. Request the appropriate resources to begin recover efforts
2. Subsequent crews should report to the Incident Commander upon their arrival (at least by radio) and then must accomplish the tasks they are assigned by the Incident Commander, such as;
    a. rapid and accurate TRIAGE of patients (M.A.S.S. triage)
    b. correct use of TRIAGE tags
    c. appropriate TREATMENT of patients
    d. continued vigilance for HAZARDS
    e. immediately leave the scene upon discovery of secondary device
    f. move patients from the scene to treatment areas
    g. maintain appropriate communication between on-scene units requests appropriate for SUPPORT units/transport units from incident commander or sector leader
    h. EVACUATE patients from scene in a logical order
    i. notification to hospitals of patients being transported
    j. Acknowledgement of recovery issues that will be present and ways to mitigate them

THE SCENARIO

SIMULATED LOCATION:	An outdoor public concert (to support our troops) being held at a local park……several hundred concert-goers in attendance…….There is no organized medical staff/presence at the event. There are about 12 law enforcement officers at the concert for routine crowd control/security. The nearest hospital is 10 minutes away (at this time of day). The nearest *trauma center* is 15 minutes away (at this time of day). Both hospitals (and the local police/fire/EMS) can be reached by radio for updates and/or requests. (helicopter transport may or may not be available depending on instructor preference)
THE PROBLEM:	An improvised explosive device is detonated in the crowd during the concert (inside a large cooler). At least 20 people are injured immediately.
INITIAL SCENE:	Upon the rescuer's arrival, the scene is chaotic, disorganized, and extremely confusing. Hundreds of people are milling about the area……..many screaming, crying, yelling, searching for loved ones, etc….The law enforcement officials on-scene are frantically calling for assistance on their radios, trying to control the crowd, and trying to locate all their own personnel on-scene (because 6 of the officers are not answering their radios). No medical care is being performed. Most of the individuals near the blast have been partially deafened by the blast. This adds to the confusion.
PT. 1	manikin DOA Obvious mortal wounds…….very bloody/spectacular Detach limbs???……blood in ears/mouth/nose
PT. 2	manikin DOA Evisceration……..blood in ears/nose/mouth……..mult. penetrating injuries or impalement
PT. 3	manikin DOA (pt. is a law enforcement officer)

Blood in nose/mouth/ears….no other visible injury

PT. 4 manikin EXPECTANT NO LIMB RAISE
Some minor penetrating trauma
UNRESPONSIVE
Small amount of blood in airway
APNEIC
No radial pulses……carotid pulse 130/min.

PT. 5 manikin IMMEDIATE NO LIMB RAISE
Arterial bleed from a limb(?)
RESPONSIVE TO PAIN ONLY
Airway open
Resp.- rapid/shallow
No radial pulses……carotid pulse 130/min.

PT. 6 manikin IMMEDIATE NO LIMB RAISE
Tension pneumothorax……..blood in ears/mouth
RESPONSIVE TO VERBAL STIMULI
Airway open
Resp.- rapid/shallow
Weak radial pulses/rapid
(+JVD, cyanosis, diaphoretic, no breath sounds on right side)

PT. 7 manikin IMMEDIATE NO LIMB RAISE
Mult. Penetrating injuries + blood in ears
RESPONSIVE TO PAIN ONLY
Airway clear
Resp.- normal
Strong radial pulses

PT. 8 manikin DELAYED + LIMB RAISE
Extremity fractures + blood in ears
A & O x 3 (but partially deafened)
Airway clear
Resp.-normal
Strong peripheral pulses

PT. 9 manikin DELAYED + LIMB RAISE
Abd. Pain/tenderness + minor penetrating trauma
A & O x 3
Airway clear
Resp.-normal
Strong peripheral pulses

PT. 10	manikin DELAYED + LIMB RAISE Open fracture (bleeding controlled)….penetrating trauma A & O x 3 Airway clear Resp.- normal Strong peripheral pulses
PT. 11	role-player (little girl) EXPECTANT - NO LIMB RAISE 100% total body surface area burns (partial & full thickness) A & O x 2 NOT ambulatory Airway clear (for the moment) Resp.-rapid (with coughing) Strong peripheral pulses
PT. 12	role-player IMMEDIATE NO LIMB RAISE Left tension pneumothorax + penetrating inj.+ blood in ears RESPONSIVE TO PAIN ONLY NOT ambulatory Airway clear (upper) Resp.- rapid/shallow/labored (poor compliance if BVM used)(no breath sounds to left) Weak radial pulses + severe JVD + cyanosis
PT. 13	role-player IMMEDIATE NO LIMB RAISE Arterial air embolism (cardiac & cerebral) Chest pain/dyspnea + slurred speech/right-sided paresthesia A & O x1 AMBULATORY (drags right leg) Airway clear Resp.- rapid / slightly labored Strong radial pulses – rapid Partial hearing loss + blood in ears
PT. 14	role-player IMMEDIATE NO LIMB RAISE Penetrating injuries + avulsion to upper arm- arterial bleed A & O x 2 AMBULATORY (for short distances……stumbles) Airway clear Resp.- rapid/shallow Weak radial pulses Says “I’m thirsty….can you give me some water?”

PT. 15 role-player IMMEDIATE + LIMB RAISE
Chest pain/palpitations/difficulty breathing – no trauma
Pt. wasn't near blast….."I have a weak heart…"
A & O x 3
AMBULATORY
Airway clear
Resp.- rapid/shallow
Weak radial pulses……too fast to count

PT. 16 role-player DELAYED + LIMB RAISE
Amputated finger(s) + head wound
A & O x 3
NOT AMBULATORY (dizzy)
Airway clear
Resp.- normal (smells like ETOH {beer})
Pulses normal

PT. 17 role-player DELAYED + LIMB RAISE
Open fractures to legs + blood in ears
A & O x 3
NOT AMBULATORY
Airway clear
Resp.- normal
Pulses normal

PT. 18 role-player DELAYED + LIMB RAISE
HYSTERICAL & SCREAMING
Blood in ears + partial hearing loss
Minor lacs./abrasions + open humerus fracture
AMBULATORY (won't stay in one place)
A & O x 3
Airway clear
Resp.- rapid
Pulses normal

PT. 19 role-player (child) MINIMAL + LIMB RAISE
HYSTERICAL & SCREAMING
"Please help my mommy!!!…" (mommy= PT. 4)
minor lacs./abrasions + blood in ears
AMBULATORY
A & O x 3
Airway clear
Resp.- rapid
Pulses rapid/strong

PT. 20	role-player MINIMAL Minor lacs./abrasions + crying AMBULATORY A & O x 3 Airway clear Resp.- normal Pulses normal	+ LIMB RAISE

MANIKIN INFORMATION TAGS

These descriptions below are to be photocopied, cut out, and secured to the anterior chest of each appropriate manikin. It is advisable to waterproof the tags in some way (place in a sheet protector / ziplock bag / lamination / etc…). When a student assesses a manikin, he can read the tag to determine the necessary assessment information.

PT. 1	manikin no breathing no pulse	unresponsive	no limb raise

PT. 2	manikin No breathing No pulse	unresponsive	no limb raise

PT. 3	manikin unresponsive no limb raise (pt. is a law enforcement officer- in full uniform/gear) no breathing no pulse	

PT. 4 manikin NO LIMB RAISE

UNRESPONSIVE
Small amount of blood in airway
APNEIC
No radial pulses……carotid pulse 130/min.

PT. 5 manikin NO LIMB RAISE

Arterial bleed from a limb
RESPONSIVE TO PAIN ONLY
Airway open
Resp.- rapid/shallow
No radial pulses……carotid pulse 130/min.

PT. 6	manikin blood in ears/mouth RESPONSIVE TO VERBAL STIMULI Airway open Resp.- rapid/shallow Weak radial pulses/rapid (+JVD, cyanosis, diaphoretic, no breath sounds on right side)	NO LIMB RAISE

PT. 7	manikin	NO LIMB RAISE

Mult. Penetrating injuries + blood in ears
RESPONSIVE TO PAIN ONLY
Airway clear
Resp.- normal
Strong radial pulses

PT. 8	manikin	+ LIMB RAISE
	Extremity fractures + blood in ears	
	A & O x 3 (but partially deafened)	
	Airway clear	
	Resp.-normal	
	Strong peripheral pulses	

PT. 9	manikin	+ LIMB RAISE

Abd. Pain/tenderness + minor penetrating trauma
A & O x 3
Airway clear
Resp.-normal
Strong peripheral pulses

PT. 10	manikin	+ LIMB RAISE
	Open fracture (bleeding controlled)….penetrating trauma	
	A & O x 3	
	Airway clear	
	Resp.- normal	
	Strong peripheral pulses	

ADLS Instructor Module: Personal Protective Equipment and Decontamination

Station Objectives:

- Understand advantages and disadvantages of level A, B, C, and D personal protective equipment. Become familiar with the differences between each.
- Understand the concepts of LD50, PEL, and IDLH as well as the differences in fit protective factors of various available air purifying respirators.
- Understand basic use of chemical management manuals such as the NIOSH Pocket Guide to Chemical Hazards, the Chemical Agent MSDS, and the Emergency Response Guidebook.
- Understand basic chemical and radiological detection devices and their use.
- Understand elements of decontamination site selection, including special considerations for wind patterns, terrain, and climate.
- Understand differences between wet and dry decontamination, when to use each method, and the basic equipment requirements for each method.
- Understand the differences between ambulatory and litter decontamination and the procedural differences for each.
- Understand differences in requirements for small scale versus large scale decontaminations and consider appropriate local facilities for such.
- Understand basic contents of patient decontamination packs as well as instructions for use.
- Understand basic decontamination line flow, including review of appropriate immediate treatment procedures within the hot zone.
- Understand basic procedures for employing Level C Personal Protective Equipment, basic function of PAPR masks, and basic equipment removal and personnel decontamination protocols.
- Understand basic non-ambulatory wet decontamination procedures with particular attention to cut-out techniques, decontamination methods, decontamination solutions, equipment, and medical treatment limitations.
- Understand military decontamination model and the differences between the civilian model and available resources.

Station Instructor Guide:

1. Review differences between Level A, B, C, and D Personal Protective Equipment. Display examples of each and discuss advantages and disadvantages of each. Review scenarios in which each level of equipment might be utilized. Emphasize current recommendations for use of Level C PPE for most hospital decontamination procedures.

2. Review concepts of LD50, IDLH, and PEL/REL. Display various types of APRs and emphasize the differences and significance of the fit protection factors (FPF) for each. Emphasize advantages of hooded PAPR masks versus fitted negative pressure APRs for hospital use. Discuss differences in APR filters and selection process for each.

3. Display examples of chemical agent manuals such as the NIOSH Pocket Guide to Chemical Hazards, the Chemical Agent MSDS, and the Emergency Response Guidebook. Explain procedures for use and emphasize importance of cross-referencing materials.

4. Display different chemical detection devices such as M-8 and M-9 paper, M2561A chemical detection kit, and the Chemical Agent Monitor. Discuss methods for use. Display radiation monitoring equipment such as the Geiger-Mueller counter and discuss use.

5. Display ambulatory decontamination lanes. Discuss set-up, basic equipment requirements, differences between wet and dry decontamination lanes and reasons for each. Emphasize that vapor exposure from liquid nerve agents are most commonly seen in the hospital setting from walking wounded and the basic dry decontamination requirements which should be employed for such.

6. Discuss site selection for decontamination lanes, reviewing the hot-zone, warm-zone, and cold-zone. Emphasize adjustments for wind patterns (flow moves up-wind), terrain (flow moves uphill, control of run-off and when EPA will wave regulations for such), and climate (increased heat and humidity requires frequent manpower rotation, outdoor wet decontamination employed to as low as 35 degrees Fahrenheit).

7. Discuss differences between various patient decontamination packs. Discuss essential contents and instructions for packs. Emphasize the need for patient clothing in the packs to differ from that of operating staff. Review procedures for patient use of decontamination packs by walking students through the decontamination lanes. Emphasize drop points for contaminated clothing/towels. Discuss procedures for patient personal belongings and valuables.

8. Discuss differences between decontamination solutions used by the military (0.5% bleach solution), civilian (liquid detergent soaps solution), and equipment (5% bleach solution). Note that bleach solution has been shown to cause some skin irritation and tissue breakdown with blistering agents – especially with vigorous scrubbing. Note that military still uses bleach solution primarily due to limited water resources. Discuss water temperature (warm optimal, hot uncomfortable, cold not as effective).

9. Discuss options for small scale decontamination (<10 patients) versus large scale decontamination. Discuss possible sites for large scale decontamination procedures (gym, parking deck, stadium/football field, etc). Discuss differences in set-up, transportation and communication, and equipment requirements.

10. Display mock non-ambulatory decontamination lane and discuss patient flow, emphasizing immediate treatment procedures and life-threatening treatment conditions within the hot-zone (intubations, needle decompressions, and antidotes). Discuss monitoring in the warm-zone after initial stabilization.

11. Outfit at least four students in PAPR masks and Level C PPE or MOPP gear. Review essential equipment. Display proper use of PAPR masks, reinforcing equipment care, storage, battery charge/monitoring, and equipment cleaning. Emphasize proper taping techniques. Familiarize all students with operation of PAPR masks and review need for rotation of personnel.

12. Take students to mock litter decontamination lane and dressed procedure mannequin. Have students decontaminate the patient's face and attempt orotracheal intubation while in Level C PPE. Emphasize inability to use stethoscope and need for other methods of tube placement confirmation (chest rise, CO2 detector, tube fogging, etc). Emphasize life-saving procedures within the hot-zone. Have students deploy the Mark I trainers. One student should continue to manage the patient airway throughout the decontamination process.

13. Discuss cut-out procedures and have two students perform task. Emphasize military foot to head technique when APRs are in place versus civilian head to foot technique to remove possible exposure from the airway. Emphasize single cuts moving away from the head. Emphasize rinsing gloves and shears in decon solution after each cut is made. Emphasize importance of not reaching across the patient. Review procedures for rolling the clothing away from the patient to minimize re-exposure.

14. Discuss non-ambulatory decontamination procedures. Have two students perform task. Emphasize singular broad swipes of small areas with frequent rinsing of gloves and sponges in decon solution. Emphasize attention to obvious source of exposure if still present. Emphasize movements away from the patient's head towards the feet. Have the remaining student rinse the patient with broad sweeps from the spray shower, moving from head to toe. Reiterate importance of not rinsing the patient back-and-forth (pools contaminated water on the patient). Have two students roll the patient on their side into the student arms while elevating the patient from the litter. The remaining student should decontaminate the patient's back in the same fashion as the front and rinse the patient. Re-emphasize frequent glove and sponge rinsing in the decon solution. Transfer the patient from the students' arms to a clean litter and transfer the patient to the warm-zone.

15. Walk the students to the warm-zone and allow them to attempt IV placement and set-up while in Level C PPE. Discuss relative ease of large motor skill tasks such as intubation versus fine motor skills such as IV placement and manipulation of tubing.

16. Discuss procedure for removal of PPE. Have students remove PPE under supervision. Emphasize initial personnel decontamination, particularly overboots and PAPR hoods. Direct removal of outer gloves, tape, and boots followed by removal of tyvek suits and finally PAPR masks and inner gloves. Emphasize proper storage of PAPR masks.

17. Walk students to mock military decontamination lanes. Discuss differences between civilian and military decontamination while walking through the arrival point, triage area, decontamination area, shuffle pit, and clean treatment areas. Emphasize wind direction and hot/warm/and cool-zones as they pertain, as well as noting differences between ambulatory and litter decontamination procedures.

18. Be sure to push rehydration throughout the scenarios.

Helpful Resources:

Code of Federal Regulations – 1910.120 and 1910.134
Chemical Agent MSDS
Decon Reports
Emergency Response Guidebook
USAMRICD Medical Management of Chemical Casualties Handbook
NIOSH Pocket Guide to Chemical Hazards
Hick JL, Hanfling D, Burstein JL, et al. Protective equipment for health care facility decontamination personnel: regulations, risks, and recommendations. *Annals of Emergency Medicine*. 2003;42:370-380.

Many of the above resources as well as some additional information are included in the CLEARMADD informational CD provided in the ADLS course.

Human patient simulation station

Objective: To give the student the opportunity to practice ADLS skills on a human patient simulator. There will be four standard scenarios covering various ADLS concepts. These will be conducted in a realistic manor giving the student the opportunity to see and treat simulated ADLS patients.

Instructor information

When planning the scenarios, note that the scenarios will not take the same time to complete. Scenarios 1, and 3 are short, and scenarios 2 and 4 are longer. Typically the short scenario will take 10 min or less, and the longer scenario will take about 15 to 20 min, not counting the wrap up time. You need a minimum of 1 instructor to run a scenario, and depending on the simulator you may need another person to run the simulator. If there is an extra person to act this is helpful. Two to three students per scenario is best, but typically they are run with 4 students up to about 6 max. The entire 4 scenarios will typically take about 1 to 1 ½ hrs to complete.

We have found that up to 12 students at a time can do this station if there are a minimum of 2 instructors, 2 simulators, and at least 1 other person to run the simulator (if they are able to run between the 2). What typically has been done is that the 12 students all together are first shown the simulator what it can do and how to interact with it. This brief introduction typically takes about 5-7 min. They are then divided into 2 groups. One instructor does scenarios 1 and 2. The other instructor does scenarios 3 and 4, then the students switch instructors. This ensures that the students get all four scenarios.

When running the scenario, try to treat it like the students are working on a real patient. For example in a traditional simulation the students would listen to the lungs then ask the instructor what did I hear? With the simulators that you will be using the students listen to the lungs and they actually hear the lung sounds. The students may ask what do I see, you should reply what do you see? Look at the patient. The student may ask is the patient awake? You should reply I don't know ask the patient. If the students ask what the vital signs are, you should state look at your monitors, and did you take any vitals. Only feed the students information that they cannot get from the simulator.

When the scenarios are run typically the instructors try to make it as realistic as possible. Usually the shortest, least complicated scenario is done first this gives the students time to get used to the simulator. The instructor's role is more of a facilitator than your typical instructor. Some scenarios will require the instructor to be part actor, acting out various parts to give some sense of realism as well as point the students in the right direction. The instructor needs to be like a guide, making sure the students stay on tract. A good trick to do is if the students are way off base is to act like someone who would be at the scene and ask the students "Do you really want to do that?" For example when the students asked for MAST trousers the instructor acting like a rescue person stated to them "I don't know about this, I have not seen those used for many years I am not even sure we carry them." The better the instructor can act and make it seem realistic the better the student experience. Use the wrap up at the end to reinforce any teaching points or to point what could have been done better.

At the completion of the scenario the instructor should leave at least 5 min or more for a wrap up. At this time the instructor should go over the scenario teaching

objectives. The instructor should also give time for the students to ask questions, and let the students evaluate themselves. And finally reinforce any last concepts needed. Then start the next scenario. The more realistic feeling the instructors can make it seem the better the student experience.

Scenario 1:

Set up:

Set up the simulator to be able to bleed from the nose, eyes and IV site on command, Put a peticheal rash on the legs.
Dress the simulator in normal cloths. If possible try to make the area look like an apartment, put the simulator on a piece of furniture. To be able to simulate seizures have someone available to shake the simulator on cue or a simulator with the ability to seize is preferred. If available for realism there can be an ambulance stretcher.

The equipment available to the students should be what is normally carried in an ALS bag, medications should be what is available to an ALS unit, lifepack monitor, Oxygen and O2 supplies.

Background: (read to the students to set the context of the scenario) You all are paramedics with a local ambulance service. You are called to a "Person Ill" call. You arrive at the patient's apartment to find Joe, the patient, lying on the couch. You can now begin.

Scenario flow (brief outline): Simulator is placed on a stretcher (or couch if available) Patient is confused and delirious; he cannot give any history other than "I feel sick" and mumbles nonsense. As they begin their assessment the patient's brother shows up. The brother is coughing constantly when trying to talk to the paramedics. He states that the patient developed a really bad nose bleed, cough, and fever. He then felt sick and started acting weird and felt really hot. The brother eventually tells them that he recently (yesterday) returned from a safari in Africa. The brother is overly concerned about the patient's condition and states that he told his brother to go to the hospital before he got "real bad". He then tries to help and gets in the way of things until he is dealt with. During the interview

On initial evaluation of the patient the students find the following. P:130 RR: 32 T: 40.2 BP: 80/20 Patient is confused and coughing. There is some blood at the nose (not actively bleeding yet). When they examine the skin they notice petechiae (simulate this on the manikin or tell the students that it is present) During the exam the patient starts seizing. If the brother is there he gets excited and is telling them to do something now. After they treat the seizures the patient starts bleeding from the nose, eyes, mouth and the IV site all ooze blood. The paramount activity is for the students to recognize that this is a potentially infectious patient, place a surgical mask on the patient and an N-95 mask on the providers. The students should start fluid boluses and stabilize the patient as much as possible and state they are now transporting the patient. The students should then be prompted to give a report to the ER. If they tell the ER what they suspect they are instructed to take the patient to a special isolation area.

Critical actions (Review with students at the conclusion)

1. Recognize that this is a biologic exposure and take the appropriate measures for personal protection, infection control and protecting the public
2. When they give a report to the ER they should convey appropriate information so that the patient is not placed in the general area and needs an isolation room.
3. They need to be able to deal with the brother and treat him as potentially infectious since he has a cough.
4. They need to treat the seizures
5. They should have established an IV and treated the hypotension, attempted to control bleeding.
6. They should put on personal protective gear and follow universal precautions
7. They should realize that they are in the Detection phase of the DIASTER paradigm.

Final outcome: Viral Hemorrhagic Fever

Scenario flow more detailed

Patient is septic and hypotensive vitals P 130 BP 80/40 RR 32 T 40.1
When the students talk to the patient he states "I feel sick" and talks nonsense. (Watch the students and give appropriate time to do a primary and secondary survey)
The brother walks in and gives the travel information and gets in the way (test how the students deal with distraught family, watch the students and see how they are doing before advancing)
As the students are dealing with the brother the patient seizes (depending on the simulator you may have to shake the simulator)
Simulator should respond in an appropriate manor to their interventions.
Appropriate actions include
Oxygen
Benzodiazepine, (Valium 5 mg IV or Ativan 1-4 mg IV
Repeat as necessary
If patient stops breathing start BVM
Fluid bolus for BP
Intubate if needed

After the seizures stop
The patient begins to bleed from the nose, eyes, mouth, IV sites begin to ooze blood.
Patient is less responsive and hypotensive.

Appropriate actions
Control bleeding
Put on protective gear if not done already
Use universal precautions
IV fluid bolus for hypotension
Get the patient ready for transport
Apply mask to the patient and the brother
Notify the receiving hospital of potentially infectious patient

If available transfer the simulator to an ambulance stretcher.
Students are then informed that they are in the ambulance on the way to the ER
Students should be prompted to give a radio report to the accepting ER.
Patient is transferred to the ER staff
End

Scenario 1
Evaluation sheet

1. Recognize that this is a potentially infectious patient	Y/N
2. Gave an appropriate report to the Emergency department	Y/N
3. Used personal protection and universal precautions	Y/N
4. Were able to appropriate manage with the brother	Y/N
5. Treated the seizures appropriately	Y/N
6. Treated the hypotension	Y/N
7. Overall patient management was appropriate	Y/N
8. Recognized they were in the Detection phase of the disaster	Y/N

Scenario 2

Setup

Dress the simulator in normal cloths. Place the simulator on the floor. Place dust in airway. If available place fake metal beams or a table over the simulator's legs. Overturn a desk to simulate rubble, if available place fake rubble around the simulator. Overturn some chairs and tables to create a small working space around the simulator to simulate the environment. Use creativity to simulate a collapsed structure space. Depending on the students you can even dim the lights and have the students work with hand/head lights

Equipment available to the students. A typical ALS bag with meds, extra meds for RSI, morphine, insulin, dextrose, bicarb, extra IV bags, manitol, dopamine, albuterol neb supplies, Oxygen tanks, life pack monitor, Back boards, Ked boards, SKED boards, C collars, REEVES Sleeve. Splints. Protective gear for the patient a helmet, safety glasses, a dust mask, gloves.

Background: (read to the students) you all are now the medical component of an Urban Search and Rescue team. You have been deployed to a bombing of a large hotel. The event happened at 7:00 AM it is now 5:00 PM. You have been informed that the search team has located a patient. He is trapped by a large beam pinning his legs. He is in a large void space. It is a long way through the rubble to the void space. It will be some time before the rescue team can breach the area. Gather the equipment and medications that you think you will need. (After they gather their equipment, the rescue team manager arrives and briefs the team)

The search team canine indicated contact at 16:15 hrs. We were able to place a microphone and pick up some movement noise at 16:28 hrs. At 16:32 we were able to get the fiberoptic scope in, and got a visual contact. And at 16:45 we were able to get voice contact. What we know is that Stan is trapped by a large beam pinning both of his legs. The rest of his body is free. He is in a rather large void area. We should be breaching into that area momentarily. Stan is in good spirits after having been discovered. He is 35 yrs old, and has no medical problems. Other than his legs being trapped and his asthma acting up he has no other complaints. From the look we got of the beams that are pinning his legs, it will be awhile once we get in there before we can remove the beam. I just got word that we are about to breach the area, gather your equipment and lets get started. (If students ask about about the environment) As far as we know all hazards are clear, gas, water, electricity are off, and no hazardous materials present.

Scenario flow: After the students have gathered the equipment they think they will need, they will take their equipment to the scene and begin an assessment and treatment. They will be advised by the rescue team manager that the rubble in place cannot be moved yet that they are working on it.

The patient is slightly hypothermic, P 120, BP 90/50 RR 30, (O2 sat if placed 89 to 90 %) fingerstick glucose is 89. He is slightly confused and will answer questions. On exam airway has dust in it, and hear wheezes, coughing and breathing wheezes, weak pulses in

all extremities, unable to move legs. There is not a pulse palpable in the distal extremities (if they are accessible)

Actions to be taken:

1. Clear dust from airway / face
2. Start oxygen via NR at 12 lpm
3. Start albuterol neb
4. Establish an IV give fluid bolus
5. Give dextrose and insulin
6. Give appropriate analgesia
7. Rewarm the patient
8. Place protective gear on the patient
9. Complete secondary survey
10. Provide psychological support
11. If time place foley (optional)
12. Check urine for myoglobin

Stan will be extremely anxious about getting out, he will keep saying I am going to get out right? He will state do not leave me.

At this point the rescue team manager will pull one team member aside and state to them that he does not want to upset the patient, but that the team has to leave right away because a secondary device has been found and the area is not safe. Alternatively you can sound or state that an evacuation order has been given.

Actions to be taken.

1. Deal with the patient's psychological needs
2. Leave quickly

Once the team has left gather the team together and have the rescue team manager give another briefing. They are informed that the secondary device has been found, and they are in the process of dealing with it. They are asked about the patient, how he is doing, and if there is anything else they need. They are informed that the area is safe and they can continue. They are told that the rescue team will be able to remove the beams shortly. They are lead back to the scene.

Stan will be grateful they are back and also more anxious about getting out.

If no albuterol neb given Stan has more wheezes and pulse OX now 88%
This will improve with albuterol and O2.
If had given albuterol the wheezes will have improved , Stan may start wheezing again and need a 2nd treatment.
If no dextrose given Stan more confused improves with dextrose (if insulin given)
If no warming was done Stan more hypothermic and confused

After they have had time to reassess the patient and start treating the patient the rescue chief arrives and states they are ready to release the beam. The beam will be released and crush syndrome will start unless the students tell them to wait.

Actions

1. Make sure that they tell the rescue team to wait until they are ready
2. Pre treat the patient before the beam is released by a fluid bolus and 1 amp bicarb.
3. make sure the patient is protected (if no safety glasses are placed Stan will complain about stuff getting in his eyes as the beam is released, also if no helmet is placed an object may hit him.)
4. Place foley (optional if time) check urine for myoglobin

Once the beam is released the following will happen.

1. Stan will suddenly scream in pain in his legs
2. His legs will swell
3. He will loose pulses in the legs
4. If not pre treated with fluids, dextrose and D50w, albuterol, he will go into V tach requiring Defibrillation which will last a short time before converting to Vfib/Vtach until the students treat with bicarb, fluid bolus, (optional Calicum) insulin, dextrose, and possible albuterol neb.
5. If pre treated he will not immediately go into the rhythm but if not continuously monitored he will develop crush syndrome and go into Vtach/Vfib requiring treatment of the hyperkalemia, acidosis, and possibly defibrillation.

Actions after the beam release

1. Treat crush syndrome with fluids, bicarb, (insulin, dextrose, (CA only for rhythms not responding), albuterol neb)]
2. Treat his pain generously with morphine
3. Recognize that compartment syndrome is occuring
4. Splint the legs in a non compressive splint
5. Prepare the patient on a board for transport out of the rubble
6. Place a foley (optional) to monitor urine output
7. Hydrate think about alkalization of urine, consider low dose manitol
8. Consider about Kayexalate
9. Continue to monitor for effects of hyperkalemia and treat, may happen a few times

Finally the patient is released from the rubble and handed off to be transported to the trauma center.

During wrap up, discuss crush syndrome its presentation and treatment, discuss field amputations, discuss field fasciotomy. Discuss the critical actions below.

Critical Actions

1. Students were able to bring appropriate equipment to the site
2. Students were able to recognize that this had potential for crush syndrome to develop

3. Students recognized potential for hypothermia and warmed the patient
4. Students were able to deal with the psychological issues of the patient
5. Students pretreated the patient before releasing the beam
6. Students protected the patient from further injury
7. Students recognized inhalation of dust and treated
8. Students treated the crush syndrome
9. Students recognized that compartment syndrome was developing
10. Students realized that since they were going directly to a trauma center there was no need for a field fasciotomy
11. Students treated the patients pain

Scenario II Evaluation sheet

1. Students took appropriate equipment to the scene	Y/N
2. Students recognized potential for crush syndrome	Y/N
3. Students dealt with the psychological issues	Y/N
4. Students pre treated before releasing beam	Y/N
5. Students students protected the patient	Y/N
6. Students recognized and treated dust/inhalation injury	Y/N
7. Students treated patients pain	Y/N
8. Students treated crush syndrome	Y/N
9. Students recognized compartment syndrome	Y/N
10. Students prepared patient for transport out of rubble	Y/N
11. Students had smooth transfer of care	Y/N
12. Overall patient management was appropriate	Y/N
13. Recognized hypothermia and warmed the patient	Y/N

Scenario 3

Set up: Simulator is partially dressed in a chemical protective suit, on a stretcher (if available a decontamination stretcher can be used). Set up the simulator to be able to have secretions from the nose, mouth, eyes, skin, on command. Equipment available to the students is what is in a typical ALS bag, medications in addition to what an ALS unit carries they will have extra atropine, and 2PAM, Oxygen and O2 supplies, and a life pack monitor.

Background: (read to students to set context) You are paramedics on an ambulance. You have been dispatched to help in a Mass Causality event. What happened is that at the local stadium during a concert someone put something in the air intake for the stadium. People started having respiratory symptoms, blurry vision, and several people seized and collapsed. There was mass panic as people ran from the stadium. All of the primary ambulances in the area are in use transporting patients; you have been dispatched to help out. You arrive on scene and find that the local hazardous materials unit is set up and operational. They are requesting that you station just outside the warm zone in case they discover any more patients. They still are unsure of the agent used. As you get situated you get an urgent call requesting your presence in the warm decontamination zone. What has happened is that one of the hazmat team members found the source, tripped and fell ripped his suit and was exposed to the substance. They are in the process of decontaminating him now.

Scenario flow: Students find the patient on a decontamination stretcher, having just been decontaminated. He is unresponsive. Pupils are constricted, secretions coming from mouth, nose, eyes, skin sweating. P 50, RR 10, BP 80/40 O2 sat 89%. Lungs wheezing, (SLUDGE syndrome)

Actions

1. Recognize the SLUDGE syndrome
2. Suspect a nerve agent (sarin)
3. Make sure patient is decontaminated
4. Give IM atropine
5. Give IM 2PAM
6. Start O2
7. Start an IV
8. Treat seizures appropriately with benzodiazepines.

If appropriate treatment done the patient improves slightly
If not the patient gets worse
The students need to reassess the patient continuously
The patient's condition will change and the patient will need additional doses of atropine.
The patient may seize

Actions

1. Recheck the patients condition
2. Give more atropine as needed to dry up secretions
3. If there are seizures treat the seizures
4. If needed intubate
5. Make sure the patient does not need secondary decontamination
6. Stabilize the patient as much as possible
7. Transport the patient, give report to the ER

Students transfer patient care to the ER

Wrap up, discuss nerve agents

Critical Actions

1. Recognize a nerve agent
2. Recognize the SLUDGE syndrome
3. Treat with IM atropine first if not able to get a quick IV
4. Start IV, give 2PAM
5. Make sure decontamination is complete
6. Treat seizures if they happen
7. stabilize the patient as much as possible]

Scenario 3 Evaluation sheet

1. Recognize a nerve agent	Y/N
2. Recognize the SLUDGE syndrome	Y/N
3. Treated with atropine	Y/N
4. Recognize need for 2PAM	Y/N
5. Overall patient management appropriate	Y/N
6. Patient was decontaminated	Y/N

Disaster Skills Station

Strategic National Stockpile (SNS) & Clinical Skills: Medication Administration Techniques

Objectives

Provide an overview of the Strategic National Stockpile program, its value as a medication and medical supply resource during a disaster event, and the planning process for development of a functional plan to receive and distribute the SNS

Demonstrate proper administration technique and evaluate participant's administration technique for two products available through the SNS program: Mark I auto injector and Smallpox Vaccine

Contents

Strategic National Stockpile Program (SNS)

Medication Administration Techniques

- Mark I auto injectors
  - Medication overview
  - Administration technique demonstration
  - Technique practice & skills check
- Smallpox Vaccine
  - Vaccine overview
  - Adverse reactions to vaccine administration
  - Administration technique demonstration
  - Vaccination site care
  - Technique practice & skills check

Skills

Participants will demonstrate proper technique for administration of Mark I auto injector

Participants will demonstrate proper technique for administration of smallpox vaccine

Evaluation method

Observation and completion of skills checklist

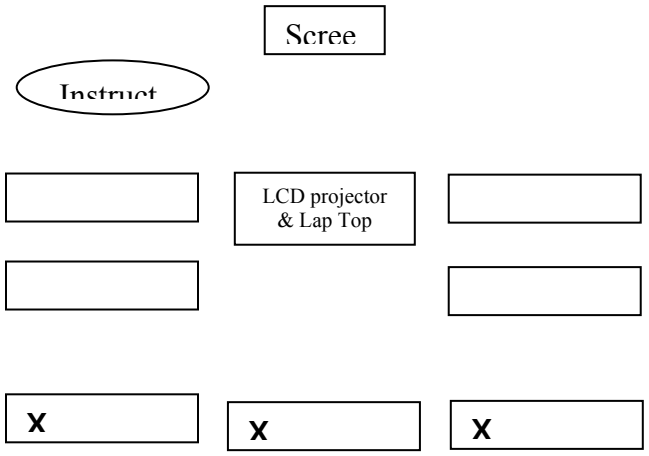
ADLS Disaster Skills Station
Lesson Plan

Maximum number of participants: 12

Number of instructors: 1 presenter & 1 assistant

Facility: 1 classroom with 8 tables
Access to electricity
Extension cords, depending on facility

Suggested classroom setup
8 tables, vaccination stations located at 3 tables in back of room with 1 station (**X**) located at end of each table



AV equipment:
- VCR
- Television
- Laptop computer
- LCD Projector
- Screen (or blank wall on which to project)

Strategic National Stockpile

Time: 25 minutes

Video: *Strategic National Stockpile: Guidance and overview for State and Local Planners*

Optional materials: Unit-of-use sample medication bottle from SNS program

Medication Administration Techniques

Mark I auto injector

Time: 15 minutes

PowerPoint: Mark I auto injector administration technique

Equipment: Mark I auto injector training kit (24)
Optional equipment: CANA auto injector training kit (12)

Smallpox Vaccine

Time: 45 minutes

PowerPoints: Smallpox Vaccine
Adverse Reactions to Smallpox Vaccination
Vaccine Administration Technique
Vaccination Site Care

Optional handouts, 50 each:

- Brochure, *Smallpox Vaccination Pocket Reference Guide* ID # 099-7392, download from http://www.bt.cdc.gov/training/smallpoxvaccine/reactions/download_pocket_guide.htm
  or order online from the National Immunization Program (NIP) at https://www2.cdc.gov/nchstp_od/PIWeb/NIPorderform.asp
- Poster, *Evaluating Patients for Smallpox,* ID # 99-7157, download from http://www.bt.cdc.gov/agent/smallpox/diagnosis/evalposter.asp or order from the NIP at https://www2.cdc.gov/nchstp_od/PIWeb/NIPorderform.asp

Supplies:

- Absorbent chuck pad (1 pad/station)
- Sterile saline/water or MMR diluent (1 vial/station)
- Biohazard sharps containers for needle and vial disposal (1 for every 2 stations)
- Biohazard medical waste bag for contaminated material (1 for every 2 stations)
- Hand-cleaner, 60% alcohol (1 bottle/station)
- Paper tape (1 roll/ station)

- 2x2 gauze pads (~ 4/station)
- Sterile bifurcated needles (1 per participant) supplied by CDC in vials of 100, must
  repackage and autoclave
- One pair of bandage scissors
- Pliers for removing metal rings from vials
- Latex-free gloves, approximately 60 pairs
- Oranges for students who do not wish to practice vaccination on another individual (3)

The exact number of supplies depends on the final number of training participants.

Skills Checklist - Mark I auto injector

√	Procedure	Technique
	1. Select administration site	• Thigh, outer muscle • Buttock, upper outer quadrant if thinly-built • Check site for buttons or objects that may interfere with injection
	2. Remove and hold kit	• Use nondominant hand • Hold injectors by plastic clip • Hold injectors at eye level • Hold clip so that larger autoinjector is on top
	3. Remove first autoinjector from clip	• Grasp smaller autoinjector (atropine) first • Use thumb and first 2 fingers • Remove with smooth motion • Do not cover green (needle) end with hand or fingers • Form fist around autoinjector
	4. Inject medication	• Position green end of injector against injection site • Apply firm, even pressure • Do not use jabbing motion • Hold injector firmly in place for at least 10 seconds; verbally counts off seconds
	5. Remove autojector from site	• Carefully remove injector from injection site • Place between little finger and ring finger of hand holding autoinjector clip • Do not get needle-stick
	6. Remove second autoinjector from clip	• Grasp larger autoinjector (2 PAM Cl) first • Use thumb and first 2 fingers • Remove with smooth motion • Do not cover black (needle) end with hand or fingers • Form fist around autoinjectot
	7. Inject medication	• Position black end of injector against injection site • Apply firm, even pressure • Do not use jabbing motion • Hold injector firmly in place for at least 10 seconds; verbally counts off seconds
	8. Remove autojector from site	• Carefully remove injector from injection site
	9. Attach used injectors to clothing	• Drop empty injector clip without dropping used autoinjectors • Do not to tear protective clothing/ gloves with needle • Push needle of injector through flap of

		clothing • Bend each needle to form hook • Apply tape across attached injectors (optional)
	10. Massage site	• Time permitting

Skills Checklist – Smallpox Vaccine Administration

√	Procedure	Technique
	1. Select administration site	• Skin over deltoid muscle on upper arm • Non-dominant arm
	2. Prepare site	• No site preparation required, unless grossly contaminated • Do not use alcohol or chemical cleansers. Use soap and water, if necessary, and allow area to thoroughly dry.
	3. Remove needle from packaging	• Do not touch bifurcated end of needle • Hold needle between thumb and forefinger perpendicular to floor • Dip point of needle in vaccine • Withdraw needle from vial; examine tip for small drop of vaccine between prongs on needle
	4. Administer punctures	• Hold skin taut on the deltoid region of arm • Stabilize wrist and heal of hand on recipient's arm • Position needle perpendicular to site with prongs parallel to floor • Administer appropriate number of punctures based on vaccination status and vaccine product being used. For Dryvax, administer 3 for primary and 15 for revaccination. • Observe for trace of blood appearing at puncture site within 15-20 seconds; leave wrist resting on recipient's arm until blood is noted • Administer 3 additional punctures if no trace of blood is observed • Remove any excess vaccine from site with gauze • Discard needle in sharps container • Discard gauze in biohazard waste container
	5. Cover vaccination site	• Loosely cover site with gauze and tape • For healthcare worker returning to work, cover gauze with semi-permeable dressing

The Strategic National Stockpile (SNS)

In 1999, Congress charged the Department of Health and Human Services (HHS) and the Centers for Disease Control and Prevention (CDC) with establishment of the National Pharmaceutical Stockpile (NPS). The mission of the NPS was to assist states and communities in responding to public health emergencies resulting from natural and technological disasters as well as terrorist attacks. The Homeland Security Act of 2002 tasked the Department of Homeland Security (DHS) with defining the goals and performance requirements of the NPS Program as well as managing the actual deployment of assets. Effective March 1, 2003, the NPS became the Strategic National Stockpile (SNS), managed jointly by DHS and HHS.

The SNS meets its mission through the provision and rapid delivery of medical material. On September 11, 2001, the first shipment of the SNS and the program's team of technical advisors arrived in New York City in 7 hours after the federal decision to deploy, 5 hours faster than the 12-hour goal. After September 11, Congress substantially increased funding to expand the range of medical items and the amount of each item held by the CDC.

The SNS is a national repository of antibiotics, chemical antidotes, antitoxins, life-support medications, IV administration, airway maintenance supplies, and medical/surgical items. The composition of the SNS Program assets is determined and reviewed jointly by DHS, HHS and CDC considering many factors such as current biological and/or chemical threats, the availability of medical material, and the ease of dissemination of pharmaceuticals. One of the most significant factors in determining SNS composition, however, is the medical vulnerability of the U.S. civilian population.

The SNS is designed to supplement and re-supply state and local public health agencies in the event of a national emergency occurring anywhere and at anytime within the U.S. or its territories. Currently, there are twelve 12-Hour Push Packages strategically located around the country in secure warehouses ready for immediate deployment to a designated site. The SNS Program is committed to delivering the Push Packages anywhere in the U.S. or its territories within 12 hours of a federal decision to deploy.

The decision to deploy SNS assets may be based on evidence showing the overt release of an agent that may adversely affect public health. It is more likely, however, that subtle indicators, such as unusual morbidity and/or mortality identified through the nation's disease outbreak surveillance and epidemiology network, will alert health officials to the possibility (and confirmation) of a biological or chemical incident resulting in a national emergency. To receive SNS assets, the affected state's governor's office requests the deployment of the SNS

assets from CDC or DHS. DHS, HHS, CDC, and other federal officials will evaluate the situation and determine an appropriate, prompt course of action.

The 12-hour Push Packages are configured to be rapidly loaded onto trucks or commercial cargo aircraft for transportation. A single Push Package requires 5000 square feet of storage space and a total of 12,000 square feet for breakdown and distribution. A 12-Hour Push Package contains 50 tons of medical material including pharmaceuticals, medical supplies, and medical equipment designed to provide a broad spectrum of assets for an ill-defined threat in the early hours of an event. If the incident requires additional pharmaceuticals and/or medical supplies, follow-on vendor managed inventory (VMI) will be shipped to arrive within 24 to 36 hours. If the agent is well defined, VMI can be tailored to provide pharmaceuticals, supplies and/or products specific to the suspected or confirmed agent(s). In this case, the VMI may be the option for immediate response from the SNS Program. These assets will treat thousands of symptomatic individuals and protect hundreds of thousands more who were potentially exposed to biological agents such as anthrax, plague, and tularemia.

Concurrent with deployment of assets, the SNS Program will deploy its Technical Advisory Response Unit (TARU) to coordinate with state and local officials. DHS will transfer authority for the SNS material to state and local authorities at the designated receiving and storage site. The local SNS team will break down the 12-hour Push Package for distribution to dispensing sites or treatment centers, or both, as required by the event. SNS TARU members will remain on site for the duration of the event to assist and advise state and local officials.

In the event of such an emergency, lives will depend on the response of the state and the local community. The planning for this eventuality requires a tremendous amount of work to identify the people, facilities, equipment, resources, and processes needed to respond quickly. The local SNS plan must include protocols, policies, and procedures that address

- the identification, call-down, credentialing, and protection of personnel who are essential to the response;
- the availability of and access to local inventories or stockpiles of drugs and medical supplies;
- the command and control function to coordinate state, regional, or community response to the event;
- the operations management function to ensure all SNS functions operate smoothly, to coordinate with other agencies, and to report to command and control;
- the RSS function to operate the warehouse to receive and distribute material;
- the inventory control function to manage inventory;

- the distribution function to transport material to dispensing sites, treatment centers, and other delivery locations;
- the dispensing function to provide medication to protect the public from a biological threat;
- the communication support function to ensure effective communications and continual and timely flow of material;
- the security function to provide protection of assets, processes, equipment, and staff and to provide traffic and crowd control;
- the coordination with treatment centers;
- the public information communications plan to inform and reassure the public; and
- the training, exercising, and evaluation of the plan functions and components.

The speed and effectiveness of the distribution process will rely on a well-designed, coordinated local SNS plan and a team that is trained and prepared to receive, manage and distribute the SNS.

Clinical Skill: Administration Technique, Mark I - Nerve Agent Antidote Kit

Nerve agents are among the deadliest of chemical agents. They are rapidly absorbed and can enter the body by inhalation, ingestion, and absorption through the skin. The effects can be produced by very small amounts and are felt immediately upon entry into the body. A casualty exhibiting signs/symptoms of nerve agent poisoning must be given aid as quickly as possible.

The Mark I (Nerve Agent Antidote Kit) consists of an atropine autoinjector (2 mg), a pralidoxime chloride autoinjector (2-PAM CI, 600 mg), the plastic clip joining the two injectors, and a foam case. The Mark I kit is FDA approved, and the atropine and 2-PAM Cl are safe and effective for the indication of nerve agent poisoning.

Side effects of the use of atropine include inhibition of sweating, dilation of pupils, dry mouth, decreased secretions, mild sedation, and increased heart rate. Side effects of the use of 2-PAM-Cl include dizziness, blurred vision, nausea and vomiting. These effects are insignificant in a nerve agent casualty.

On recognition of the signs and symptoms of nerve agent poisoning, the individual should immediately put on a protective mask, if available, and inject himself with the contents of one Mark I kit (see **Table 1** for Signs and Symptoms of Nerve Agent Poisoning).

Table 1

Signs/Symptoms of Nerve Agent Poisoning

The symptoms of nerve agent poisoning are grouped as MILD--those which you recognize and for which you can administer the injections -- and SEVERE--those which require someone else to administer.

MILD Symptoms

- Unexplained runny nose
- Unexplained sudden headache
- Sudden drooling
- Difficulty seeing (blurred vision)
- Tightness in the chest or difficulty in breathing
- Localized sweating and twitching (as a result of small amount of nerve agent on skin)
- Stomach cramps
- Nausea

SEVERE Signs/Symptoms

- Strange or confused behavior.
- Wheezing, difficulty in breathing, and coughing.
- Severely pinpointed pupils.
- Red eyes with tearing (if agent gets into the eyes).
- Vomiting.
- Severe muscular twitching and general weakness.
- Loss of bladder/bowel control.
- Convulsions.
- Unconsciousness.
- Stoppage of breathing.

Injections must be given into a large muscle area. The preferred injection site for administering the Mark I kit is in the outer thigh muscle (see Figure 7-2).

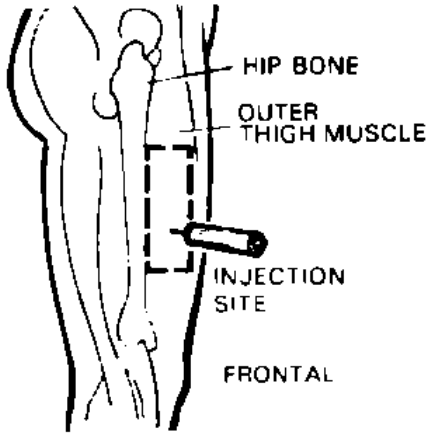


Figure 7-2. Thigh injection site.

If the individual is thinly-built, the injection should be administered into the upper outer quadrant of the buttocks to avoid injury to the thighbone. To avoid injury to the nerve that crosses the buttocks and possible paralysis, inject *only* into the upper outer quadrant (see Figure 7-3).

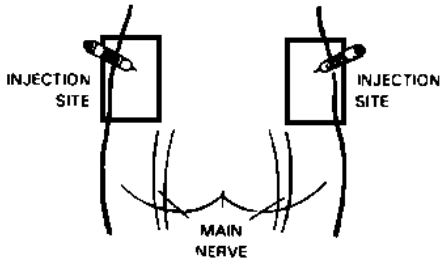


Figure 7-3. Buttocks injection site.

When pressure is applied to the autoinjector at the injection site, the coiled spring mechanism automatically triggers, plunges the needle through the clothing into the muscle, and the fluid injects into the muscle tissue. Using a jabbing motion may result in an improper injection or injury to the thigh or buttocks. The injector should be held in place for ten seconds to allow the entire contents of the injector to flow into the muscle. Once the injector is removed from the injection site, the area should be massaged, time permitting.

WARNING

> If within 5 to 10 minutes after administering the first set of injections, the heart begins to beat rapidly and the mouth becomes very dry, do NOT administer another set of injections. If the person can walk without assistance and knows where and who he is, he will NOT need the second set of injections. The individual has received enough antidote to overcome

the dangerous effects of the nerve agent. Giving a second set of injections, if not needed, may cause a nerve agent antidote overdose, risking incapacitation. If, however, symptoms of nerve agent poisoning continue for 10 to 15 minutes after receiving one set of injections, medical assistance should be obtained. If symptoms are worsening, a second set of injections should be administered. No more than 3 sets of autoinjectors should be administered.

In a civilian mass casualty event, different agencies with different methods of documentation may respond to provide assistance. For this reason, the practice established by the military of attaching used injectors to clothing of the individual who received the injection(s) may be prudent and helpful. Regardless of documentation, subsequent medical personnel can then accurately determine how much antidote was given in the field and provide proper follow-up treatment as needed.

The following procedure describes the technique to administer a Mark I kit:

(1) Remove one Mark I kit.

(2) With the nondominant hand, hold the autoinjectors by the plastic clip so that the larger autoinjector is on top and both are positioned at eye level (see Figure 7-4).

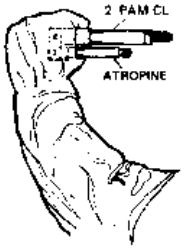


Figure 7-4. Holding the set of autoinjectors by the plastic clip.

(3) With the other hand, check the injection site (thigh or buttocks) for buttons or objects that may interfere with the injections.

(4) Grasp the atropine (smaller) autoinjector with the thumb and first two fingers (see Figure 7-5). To avoid accidental injection, do NOT cover/hold the green end (needle) with the hand or fingers.

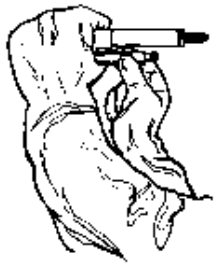


Figure 7-5. Grasping the atropine autoinjector between the thumb and first two fingers of the hand.

(6) Pull the injector out of the clip with a smooth motion (see Figure 7-6).

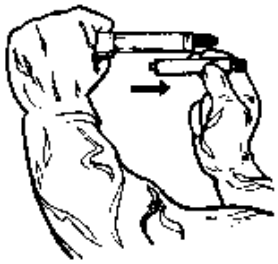


Figure 7-6. Removing the atropine autoinjector from the clip.

(6) Form a fist around the autoinjector.

(7) Position the green end of the atropine autoinjector against the injection site (thigh or buttocks):

(a) On the outer thigh muscle (see Figure 7-7).

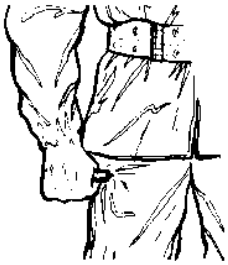


Figure 7-7. Thigh injection site for self-aid.

OR

(b) On the upper outer portion of the buttocks (see Figure 7-8*).*

Figure 7-8. Buttocks injection site for self-aid.

(8) Apply firm, even pressure (not a jabbing motion) to the injector until it pushes the needle into the thigh or buttock.

(9) Hold the injector firmly in place for at least ten seconds. Counting “one thousand and one, one thousand and two,” and so forth can estimate the ten seconds.

(10) Carefully remove the autoinjector.

(11) Place the used atropine injector between the little finger and the ring finger of the hand holding the remaining autoinjector and the clip (see Figure 7-9). WATCH OUT FOR THE NEEDLE.

Figure 7-9. Used atropine autoinjector placed between the little finger and ring finger.

(12) Pull the 2 PAM Cl autoinjector (the larger of the two injectors) out of the clip (see Figure 7-10) and inject in the same manner as steps (6) through (10) above, holding the black (needle) end against the thigh or buttocks.

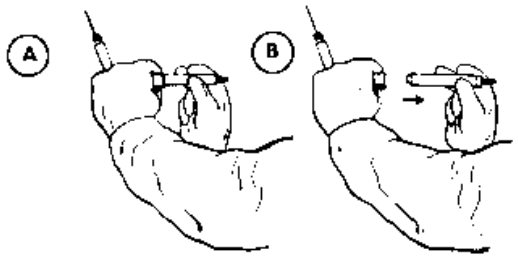


Figure 7-10. Removing the 2 PAM Cl autoinjector.

(13) Drop the empty injector clip *without* dropping the used autoinjectors.

(14) Attach the used injectors to clothing (see Figure 7-11).

(a) Push the needle of each injector, one at a time, through a flap of clothing. Be careful NOT to tear protective gloves/clothing with the needles.

(b) Bend each needle to form a hook. Additionally, tape may be applied across the injectors.

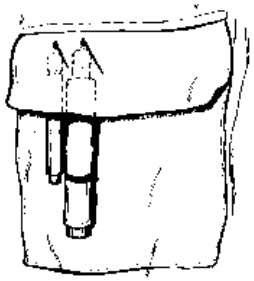


Figure 7-11. One set of used autoinjectors attached to pocket flap.

15) Massage the injection site, time permitting.

References

Virtual Naval Hospital™

FM 21-11 First Aid for Soldiers: Chapter 7

http://www.vnh.org/FirstAidForSoldiers/Fm211_7.html

http://www.vnh.org/GoBook/nervekit.html

Clinical Skill: Smallpox Vaccine Administration

The occurrence of smallpox was once worldwide in scope. A global campaign, begun in 1967 under the auspices of the World Health Organization (WHO), succeeded in eradicating naturally acquired smallpox in 1977. In the United States, routine vaccination ceased in 1972. Before 1972, smallpox vaccination was recommended for all U.S. children at 1 year of age. Most states required evidence of vaccination for school entry. Vaccination was also required for military recruits and tourists visiting other countries. In 1998, the U.S. Census reported approximately 114 million persons were 29 years or younger and, most likely, not vaccinated against smallpox.

From January 24 to August 28, 2003, smallpox vaccine was administered to 38,257 civilian health-care and public health workers to prepare the United States for a possible terrorist attack using smallpox virus. In the event of a smallpox outbreak, outbreak-specific guidance will be disseminated by CDC regarding populations to be vaccinated and specific contraindications to vaccination. There are no contraindications to vaccination for an individual who has been in contact with a confirmed smallpox case.

In a smallpox outbreak, evaluating smallpox disease will be necessary in the differential diagnosis of any recently vaccinated person who has an acute, generalized, vesicular, or pustular rash illness. Until a determination is made regarding whether the rash is early smallpox disease or an adverse reaction to smallpox vaccine, these patients should be presumed to be highly infectious and placed in contact and respiratory isolation immediately. Appropriate local, state, and federal health and security officials should be contacted.

Adverse Reactions

Information regarding adverse reactions to smallpox vaccination will aid the vaccinator in identifying those who may be at risk for adverse reactions, may not choose vaccination, or may not be a candidate for vaccination in a smallpox outbreak. The information regarding adverse events is primarily based on reports from the 1960s. Although the vaccine remains unchanged, supportive care and therapeutic care options have improved. The U.S. population has also changed and now has a higher proportion of persons with pre-event contraindications to smallpox vaccination and who are at increased risk for adverse reactions. Groups at special risks for complications include persons with eczema, atopic dermatitis or other significant exfoliative conditions; patients with leukemia, lymphoma, or generalized malignancy who are receiving therapy with alkylating agents, antimetabolites, radiation, or large doses of corticosteroids; patients with HIV infection; persons with hereditary immune disorders; persons with organ transplants; and pregnant women.

The outcomes associated with adverse events may be better than previously reported because of advances in medical care. Rates for all adverse events may be lower for persons previously vaccinated, who may have some residual immunity.

Adverse reactions caused by smallpox vaccination range from mild and self-limited to severe and potentially life-threatening. Pre-existing conditions or underlying risk factors may affect the magnitude and/or severity of the reaction. The strain of vaccinia virus may correlate with the type and frequency of adverse reactions. All U.S. preparations of vaccine contain the New York City Board of Health (NYCBOH) strain, one of the less reactogenic strains. Vaccinia-specific complications can occur among vaccinees or their contacts that have been inadvertently inoculated.

Expected Range of Vaccine Reactions

A range of expected reactions occurs after vaccination. These normal reactions do not require specific treatment and may include fatigue, headache, myalgia, regional lymphadenopathy, lymphangitis, pruritis, and edema and pain at the vaccination site as well as satellite lesions. The majority of local symptoms were reported during the second week after vaccination. Approximately one third of vaccinees were sufficiently ill to have trouble sleeping or to miss work, school, or recreation. These symptoms have been reported to be self-limited, requiring only symptomatic care. Creams, ointments, salves, or sprays should not be applied to the vaccination site.

Local Skin Reactions

Local skin reactions may occur following smallpox vaccination. These include allergic reactions to bandage and tape adhesives, large vaccination reactions, sometimes referred to as robust takes, and less commonly, bacterial infections of the vaccination site.

Non-Specific Rashes

Common nonspecific rashes associated with smallpox vaccination include nonspecific fine reticular maculopapular rashes, lymphangitic streaking, generalized urticaria, and broad, flat, roseola-like erythematous macules and patches. Erythematous or urticarial rashes may occur approximately 10 days (range 4-17 days) after first-time vaccination in one person per 3700 vaccinated. The lesions of these rashes, believed to be caused by immune response to vaccination, do not contain vaccinia virus. In general, nonspecific rashes are self-limited and resolve spontaneously within 2-4 days. The individual is usually afebrile, appears well and may benefit from oral NSAIDS and oral antipruritic agents.

Hypersensitivity Reactions

Erythema multiforme (EM), sometimes called roseola vaccinia or toxic urticaria, may present as a variety of lesions, including macules, papules, urticaria, and typical bull's-eye lesions. The hallmark target lesion of EM associated with other infections usually presents with a central, dark papule or vesicle, surrounded by a pale zone and a halo of erythema, usually within 10 days following viral infection. The limited clinical description of EM following smallpox vaccination appears to follow a similar time course. The rash of EM may be extremely pruritic, lasting up to 4 weeks. Less commonly, erythema multiforme can progress to Stevens-Johnson syndrome (SJS), a more serious condition requiring hospitalization and supportive care.

Vaccinees may benefit from antipruritic medications. Vaccinia immune globulin (VIG) is not used to treat nonspecific rashes, EM, or Stevens-Johnson syndrome (SJS) since these lesions are likely a manifestation of a hypersensitivity reaction and are not believed to contain vaccinia virus.

Inadvertent inoculation

Inadvertent inoculation occurs when vaccinia virus is transferred from a vaccination site to second location on the vaccinee or to a close contact; consequently, lesions contain live vaccinia virus. The most common sites involved are the face, eyelid, nose, mouth, lips, genitalia, and anus. Lesions from an inadvertent inoculation contain live vaccinia virus and the same contact precautions necessary for a vaccination site are necessary for these secondary lesions.

Ocular vaccinial infection accounts for the majority of inadvertent inoculations and is often noted within 7-10 days of vaccination in first-time vaccinees. Ocular vaccinial disease may occur as blepharitis (inflammation of the eyelid), conjunctivitis, keratitis (inflammation of the cornea), iritis, or combinations thereof. Conditions that cause eye itching and scratching increase risk of inadvertent inoculation due to manipulation of vaccination site followed by eye rubbing. The goal of therapy is to prevent complications, and the patient should be co-managed with an ophthalmologist. If severe manifestation of inoculation (without keratitis) has occurred, treatment with vaccinia immune globulin may speed recovery.

Individuals at highest risk for inadvertent inoculation appear to be the very young (e.g., ages 1-4 years). Conditions that disrupt the epidermis (burns, severe acne, psoriasis, etc.) increase risk. Among immunocompetent persons, lesions follow the same course as the vaccination site, are self-limited, resolve in approximately 3 weeks, and require no therapy. Because the lesions contain live virus, infection

control precautions are required. If extensive body surface is involved or the vaccinee is immunocompromised, VIG may be recommended.

Inadvertent inoculation is a common but avoidable complication of smallpox vaccination (529 per million primary vaccinees). A primary prevention strategy to avoid inadvertent inoculation is to instruct vaccinees and their close contacts to avoid touching or scratching the vaccination site from the time of vaccination until the scab separates. In addition, vigilant hand washing with soap and warm water, or hand rubs containing 60% alcoholic solutions, is critical after touching an unhealed vaccination site or changing a vaccination dressing.

Generalized Vaccinia (GV)

Generalized Vaccinia (GV) is characterized by a disseminated maculopapular or vesicular rash, frequently on an erythematous base usually occurring 6-9 days after first-time vaccination. The rash spans the spectrum of vaccinial lesions, from maculopapules to vesicles and may be numerous or limited. The lesions of generalized vaccinia can, at times, be difficult to distinguish from variola (smallpox) infection. GV may be preceded by fever and the pearly vesicles may resemble the lesions of smallpox, but GV does not follow the centrifugal distribution that is characteristic of smallpox. Lesions follow the same course as the vaccination site and can be present anywhere on the body, including the palms and soles. GV is estimated to occur in 242 per million primary vaccinees.

The skin lesions of GV are believed to be spread by the hematogenous route and might contain vaccinia virus; therefore, infection control precautions should be followed. GV is self-limited in immunocompetent hosts. These patients appear well, may benefit from simple supportive measures such as NSAIDS and oral antipruritics, and do not require VIG. GV is often more severe among persons with an underlying immunodeficiency, and these patients may benefit from early intervention with VIG.

Eczema Vaccinatum (EV)

Eczema Vaccinatum (EV) is a localized or generalized papular, vesicular, or pustular rash, which can occur anywhere on the body, with a predilection for areas of previous atopic dermatitis lesions. Persons with a history of atopic dermatitis are at highest risk for EV. Onset of the characteristic lesions can be noted either concurrently with or shortly after the development of the local vaccinial lesions. EV lesions follow the same dermatological course as the vaccination site and confluent lesions can occur. The rash is often accompanied by fever, malaise, and lymphadenopathy. EV tends to be more severe in first-time vaccinees or unvaccinated contacts. EV is estimated to occur in 10-39 per million primary vaccinees.

Atopic dermatitis, regardless of disease severity or activity, is a risk factor for experiencing EV, but no data exist to predict the absolute risk factor for these persons. The majority of primary-care providers do not distinguish between eczema and atopic dermatitis when describing chronic exfoliative skin conditions. Animal studies demonstrate that an immunologic T-cell dysregulation predisposes persons affected with atopic dermatitis to disseminated progressive papular, vesicular, and pustular lesions, even in intact skin.

Patients are usually severely ill and can require multiple doses of VIG. Establishing diagnosis early and treatment with VIG is imperative to reducing mortality. Management includes hemodynamic support and meticulous skin care. Patients may require volume repletion and vigilant monitoring of electrolytes as a result of the disruption of the dermal barrier. EV patients are at risk for secondary bacterial and fungal infections of the lesions. Virus can be isolated from the EV lesions, making these patients highly infectious. Infection-control precautions should be used to prevent secondary transmission and nosocomial infection.

Progressive Vaccinia (PV)

Progressive vaccinia (PV), also called vaccinia necrosum, is a rare, severe, often lethal complication in persons with immunodeficiencies. This diagnosis should be suspected if the initial vaccination lesion continues to progress without apparent healing 15 or more days after smallpox vaccination. PV is characterized by painless progressive necrosis at the vaccination site. The vaccination lesion does not heal, presumably secondary to an immune derangement, and progresses to an ulcerative lesion, often with central necrosis. Initially, there is little to no inflammation at the site. After several weeks, patients may develop bacterial super-infection and signs of inflammation. Vaccinia virus continues to spread locally and can metastasize to distant sites through viremia (e.g., skin, bones and other viscera). Live virus can be isolated from the skin lesions of these patients. Infection-control precautions are required to avoid vaccinial infection of other persons and to limit risk for secondary infections.

Persons at highest risk for PV include those with congenital or acquired immunodeficiencies, HIV/AIDS, cancer, and those on immunosuppressive therapies for organ transplantation or autoimmune disease. It is likely that the degree and type of immunocompromise correlates with the risk of progressive vaccinia, although the protective level of cellular count or humoral immunity is unknown.

Management of PV should include aggressive therapy with VIG, intensive monitoring, and tertiary-level supportive care. In the past, PV is estimated to occur in approximately 1 to 2 per million primary vaccinations, and was almost fatal. Despite advances in medical care, PV probably will continue to be associated with a high mortality rate.

Post-Vaccinial Encephalitis

Encephalitis or meningoencephalitis following vaccination has been reported in about 3 to 12 per million primary vaccinees; how many of such cases are coincidental in time and how many are related to the vaccination itself is impossible to know. Symptoms may include fever, headache, malaise, lethargy, vomiting, seizures, paralysis, drowsiness, altered mental state, and coma.

Because many different infectious agents and non-infectious processes can be responsible, it is often impossible to establish the etiology. Most cases are believed to result from autoimmune or allergic reactions rather than direct viral invasion of the nervous system. The strain of vaccinia virus used in smallpox vaccines may influence the frequency.

In general, post-vaccinial encephalitis is a severe disease with high mortality and morbidity. Approximately 15-25% percent of affected vaccinees with this complication die, and 25% develop permanent neurological sequelae.

No study has shown vaccinia immune globulin to be an effective therapy and is not recommended. No specific therapy exists; however, supportive care, anticonvulsants and hospitalization in intensive care may be required in individual cases.

Fetal Vaccinia

Fetal vaccinia, resulting from vaccinial transmission from mother to fetus, is a very rare, serious complication of smallpox vaccination during pregnancy or shortly before conception. There are fewer than 50 cases reported in the literature. Fetal vaccinia is manifested by skin lesions, and organ involvement, and often results in fetal or neonatal death. Few affected pregnancies are maintained until term. Affected pregnancies have been reported among women vaccinated in all three trimesters, among first-time vaccinees as well as in those being revaccinated, and among non-vaccinated contacts of vaccinees. Because fetal vaccinia is so rare, the frequency of and risks for fetal vaccinia cannot be reliably determined. Whether virus infects the fetus through blood or by direct contact with infected amniotic fluid is unknown. There is no recognizable pattern of congenital malformations associated with smallpox vaccination during pregnancy.

Currently there is no indication for routine, prophylactic use of VIG in vaccinated pregnant woman; VIG should not be withheld, however, if a pregnant woman develops a condition where VIG is needed (e.g., eczema vaccinatum). Given the rarity of fetal vaccinia, vaccination during pregnancy should not ordinarily be a reason to terminate pregnancy.

Myocarditis/Pericarditis

Careful monitoring of smallpox vaccinations given over recent months suggests the vaccine may cause heart inflammation (myocarditis), inflammation of the

membrane covering the heart (pericarditis), and/or a combination of these two problems (myopericarditis). Data from recent vaccinations have found to be consistent with a causal association between vaccination and myocarditis. Angina and heart attack have also been reported following smallpox vaccination. However, it is not known at this time if smallpox vaccination caused these problems. A certain number of cardiac events and deaths following vaccination would be expected to occur by chance alone, given how common cardiac problems are and the numbers of people already vaccinated in the civilian program. Experts are investigating these events in depth.

Myocarditis and pericarditis have been reported previously following smallpox vaccination in Europe, but had not been a well-accepted complication using the strain of vaccine that is used in the United States (New York City Board of Health). The current smallpox vaccination program may differ from historical experience because a greater number of older patients with underlying heart disease and cardiac risk factors such as hypertension and diabetes mellitus received vaccinations. Moreover, because current diagnostic tests, including cardiac enzymes and echocardiography, are more sensitive for diagnosing myocardial infarction, more events may be detected than were historically observed.

Cardiac-associated death following smallpox vaccination, although extremely rare, has been reported in Europe and Australia and has been thought to be associated with myocarditis. Persons receiving smallpox vaccine should be informed that myocarditis is a potential complication of smallpox vaccination and that they should seek medical attention if they develop chest pain, shortness of breath, or other symptoms of cardiac disease. A causal relation between smallpox vaccination and serious cardiac events cannot be excluded.

Frequency of Adverse Events

For the time period of January 24 through November 30 of the civilian vaccination program beginning in 2003, no cases of eczema vaccinatum, erythema multiforme major (SJS), fetal vaccinia, and progressive vaccinia have been reported. For the same period of time, 3 cases of generalized vaccinia, 20 cases of inadvertent inoculations (nonocular), 3 cases of ocular vaccinia, 22 cases of myocarditis/pericarditis, and 1 case of postvaccinial encephalitis have been reported.

The CDC publishes updated reports regarding the frequency of adverse reactions as data becomes available. The following CDC websites provide current information regarding adverse events: 1) *Morbidity and Mortality Weekly Report* http://www.cdc.gov/mmwr and 2) *Office of Communications, Media Relations* http://www.cdc.gov/od/oc/media.

Additional information and resources for the clinician regarding adverse events can be found on the following websites:

1) *Clinical Evaluation Tools for Smallpox Vaccine Adverse Reactions*
http://www.bt.cdc.gov/agent/smallpox/vaccination/clineval/index.asp
2) *MMWR: Smallpox Vaccination and Adverse Reactions: Guidance for Clinicians, 2003*
http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5204a1.htm
3) *Smallpox Vaccination and Adverse Events Training Module*
http://www.bt.cdc.gov/training/smallpoxvaccine/reactions
4) *Medical Management of Smallpox (Vaccinia) Vaccine Adverse Reactions*
http://www.bt.cdc.gov/agent/smallpox/vaccination/mgmt-adv-reactions.asp

Smallpox Vaccine

Smallpox vaccine is made from live vaccinia virus and protects against the disease smallpox. It does not contain variola virus, the causative agent of smallpox. Worldwide, different vaccinia strains have been used for production of smallpox vaccine, but all U.S. vaccine formulations contain the New York City Board of Health (NYCBOH) vaccinia strain. This strain has been reported to be less reactogenic (i.e., it causes fewer adverse events) than other strains. Dryvax® is the vaccine used in the current U.S. smallpox vaccination effort.

Dryvax® is a live-virus preparation of vaccinia virus prepared from calf lymph. The freeze-dried powder contains trace amounts of the antibiotics polymyxin B, streptomycin, tetracycline, and neomycin.

Dryvax® is approved by the FDA and is stored by the CDC as a component of the Strategic National Stockpile. CDC currently holds approximately 6.7 million doses. In addition to Dryvax®, CDC holds additional stores of newly developed vaccines from Acambis/Baxter Pharmaceuticals (Cambridge, Massachusetts), ACAM1000, which is grown in human embryonic lung cell culture (MRC-5), and ACAM2000, which is grown in African green monkey cells (VERO cells) (CDC Drug Services, unpublished data, 2002). Like Dryvax®, these vaccines contain live vaccinia virus, New York City Board of Health strain, but do not contain any antibiotics. The FDA will soon license these products.

Currently available smallpox vaccines are distributed as freeze-dried powder and must be reconstituted before use. Diluent and instructions for reconstitution are vaccine-specific and will be supplied with the vaccine being used. Proper reconstitution is critical to successful vaccination.

Dryvax® is supplied as a package containing 1 vial of Dried Smallpox Vaccine, 1 Diluent syringe (0.25ml), 1 vented needle, and 100 individually wrapped bifurcated needles (20 strips, 5 needles per strip). The diluent contains 50%

glycerin and 0.25% phenol in Sterile Water for Injection, USP. The un-reconstituted product should be refrigerated and stored at temperatures of 2° to 8° C or 36° to 46°F. Dryvax® should not be frozen. Reconstituted vaccine may be used for 90 days after reconstitution if stored at the above temperatures. The date should be recorded at the time of reconstitution. Proper refrigeration should be provided at the storage or clinic sites, and routine temperature logs maintained twice daily for refrigeration accountability.

In a post-event vaccination campaign, additional supplies will be needed that are not supplied in the Dryvax® kit. The following is a list of needed supplies:

- Absorbent pads for work areas
- Hand disinfectants
- Gloves
- Dressing gowns or screens for vaccine recipients whose shirt/blouse fit tightly around arm
- 21 gauge needle to release the vacuum on the Dryvax® vial prior to reconstituting
- 2x2 gauze pads
- Paper tape
- Sharps containers
- Medical biohazard waste bags

  Note: Alcohol or other chemical cleansers inactivate the vaccine and should not be procured for vaccine administration.

Vaccine spills should be handled using universal precautions, whether in powder or reconstituted liquid form. Spills should be cleaned with a 1:10 sodium hypochlorite/water (bleach) solution.

All contaminated materials should be disposed of in a biohazard waste container. Bifurcated needles and empty vaccine vials should be disposed of in a sharps container.

Vaccine Administration

In general, alcohol, soap and water, or other chemical agents are not needed for preparation of the skin for vaccination unless the area is grossly contaminated. If needed, soap and water are the preferred cleaning agents. If any cleaning agent is used, the skin must be thoroughly dry in order to prevent inactivation of the vaccine.

Multiple Puncture Vaccination
During the global smallpox eradication effort, the bifurcated needle was used along with a technique called multiple puncture vaccination. Today, this is still the recommended method for administering smallpox vaccine.

Each bifurcated needle is sterile and individually wrapped. The bifurcated needle is for one-time use only and should be discarded in an appropriate biohazard container immediately after vaccinating each patient.

Step-by-Step Instructions

1. **Choose the site for vaccination.**
   The deltoid area on the upper arm is recommended.

2. **Skin preparation.**
   No skin preparation is required. Under no circumstances should alcohol be applied to the skin prior to vaccination as it has been shown to inactivate the vaccine virus.

3. **Dip needle.**
   The needle is dipped into the vaccine vial and withdrawn. The needle is designed to hold a tiny drop of vaccine of sufficient size and strength to ensure a take if properly administered. The same needle *should never be dipped into the vaccine vial more than once*, in order to avoid contamination of the vaccine vial.

4. **Make perpendicular insertions within a 5-mm diameter area.**
   The needle is held perpendicular to the site of insertion. The wrist of the vaccinator should be maintained in a firm position by resting on the arm of the vaccinee or another firm support.
   - A number of perpendicular insertions are made in rapid order in an area approximately 5 mm in diameter. The number of insertions should be in accordance with the package insert, using 3 insertions for primary vaccination and 15 insertions for revaccination with the Dryvax® vaccine. A trace of blood should appear at the site of vaccination within 15-20 seconds. During primary vaccination, if no trace of blood is visible after 3 insertions, an additional 3 insertions should be made using the same bifurcated needle without reinserting the needle into the vaccine vial.
   - The bifurcated needle is for one-time use only and should be discarded in an appropriate biohazard container immediately after vaccinating each patient.

5. **Absorb Excess Vaccine**
   After vaccination, excess vaccine should be absorbed with sterile gauze. Discard the gauze in a safe manner (usually in an infection control receptacle) in order not to contaminate the site or infect others who may come in contact with it.

6. **Cover vaccination site.**
   It is important that the vaccination site be covered to prevent dissemination of virus. Recommended coverings include the following:

- Gauze loosely secured by first aid adhesive tape (taking care to obtain history of tape sensitivity).
- When working in a health care setting, vaccinees should keep their vaccination site covered with gauze or a similar absorbent material. This dressing should, in turn, be covered with a semipermeable dressing. Products combining an absorbent base with an overlying semipermeable layer also can be used to cover the vaccination site. Healthcare workers do not need to be placed on leave after receiving a smallpox vaccination.
- Vaccinees in settings where close personal contact is likely (such as parents of infants and young children) should cover the vaccination site with gauze or a similar absorbent material, wear a shirt or other clothing that would cover the vaccination site, and also make sure to practice good hand hygiene.

Note: The use of semipermeable dressing alone could cause maceration of the vaccination site and increased, prolonged irritation and itching at the site, thereby increasing touching, scratching, and contamination of the hands. Thus, only persons working in healthcare settings should use semipermeable dressings (over gauze or a similar absorbent material as described above).

7. **Educate vaccinee.**
   To avoid contact transmission of the virus, vaccinees must be cautioned to do the following:
   - Do not rub or scratch the vaccination site.
   - Keep the site covered and change gauze-only dressings every 1–2 days or if wet. Change semipermeable dressings at least every 3-5 days.
   - Keep the vaccination site dry, covering it with a water-proof bandage while bathing.
   - Discard gauze carefully in plastic zip bags.
   - Set aside a laundry hamper for clothes, towels, sheets and other items that may come into contact with the vaccination site.
   - Wash clothing or other materials that come into contact with the vaccination site in hot water with detergent and/or bleach. Wash hands afterward.
   - Wash hands thoroughly with soap and hot water or with alcohol-based hand rubs such as gels or foams after touching the vaccination site, or bandages, clothing, towels, or sheets that have come into contact with the vaccination site.
   - When the scab falls off, throw it away in a plastic zip bag.

Additional educational resources for the clinician are available on the CDC website at http://www.bt.cdc.gov/agent/smallpox/vaccination/clinicians.asp and ***Notice to Readers: Smallpox: What Every Clinician Should Know --- A SelfStudy Course*** Vol 51, No 16;352 04/26/2002 http://www.cdc.gov/mmwr/PDF/wk/mm5116.pdf.

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http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5204a1.htm

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http://www.bt.cdc.gov/agent/smallpox/vaccination/vaccination-program-qa.asp?type=cat&cat=Post%2DEvent&subCat1=Vaccination

Adverse Events Following Civilian Smallpox Vaccination --- United States, 2003 *Vol 52, No 34; 819 08/29/2003*
http://www.cdc.gov/mmwr/PDF/wk/mm5234.pdf

SMALLPOX FACT SHEET - *Information for Clinicians*
Adverse Reactions Following Smallpox Vaccination

http://www.bt.cdc.gov/agent/smallpox/vaccination/reactions-vacc-clinic.asp

INTERIM SMALLPOX FACT SHEET
Smallpox Vaccine and Heart Problems

http://www.bt.cdc.gov/agent/smallpox/vaccination/heartproblems.asp

Cardiac Adverse Events Following Smallpox Vaccination --- United States, 2003 *Vol 52, No 12;248 03/28/2003*
http://www.cdc.gov/mmwr/PDF/wk/mm5212.pdf

Smallpox Vaccination and Adverse Events Training module
http://www.bt.cdc.gov/training/smallpoxvaccine/reactions/vac_method.html

SMALLPOX FACT SHEET – *Information for Clinicians*
Smallpox Vaccination Method
http://www.bt.cdc.gov/agent/smallpox/vaccination/vaccination-method.asp

Smallpox Vaccination Site
Size = 5mm

Practice your technique on this paper prior to practicing on another individual. The circles below approximate the 5mm area into which you should place the punctures within about 3 seconds. Refer to the package insert for the product being used for the number of punctures required. For Dryvax®, administer 3 punctures for primary vaccination and 15 punctures for revaccination.