Tactical Emergency Casualty Care (TECC) Guidelines for BLS/ALS Medical Provider

Response to Chemical Warfare Agents/Events

CURRENT AS OF 15 JULY 2021

PREAMBLE

The use of chemical, biologic, radioactive, and nuclear (CBRN) agents remains a credible threat. There is a likelihood of traumatic injuries to occur in conjunction with the dissemination of CBRN agents. Their potential use within a high threat environment requires treatment strategies that can vary from traditional prioritized response and medical interventions. These guidelines account for balancing operational needs and appropriate medical care in this unique environment. As with other high threat response approaches, rapidly managing victims at a CBRN event is essential to improve patient outcomes.

This annex serves to augment the TECC guidelines by addressing treatment required to patients during a CBRN event. Primarily focused on illness and injury sustained through the use of chemical agents, this document aims to provide guidance to medical providers rendering treatment during the three phases of care. Additionally, guidance and treatment recommendations are provided for patients exposed to pharmaceutical-based agents (PBAs), having been identified by civilian and counter-terrorism experts as a threat. The large quantities and rise in availability of synthetic opiates pose a significant risk of deliberate release during dynamic acts of violence.

Treatment recommendations, including antidotes, drug dosages, decontamination procedures, and remote medical assessment techniques, are based on literature review, industry standards, and subject matter expert consensus. These guidelines should be applied within existing local scope of practice and available resources. Warm zone interventions may occur before or during the decontamination (DECON) process, and they should be balanced based on tactical feasibility, available resources, estimated wait for DECON to occur, and other factors. Responders should enter and operate in a contaminated environment only if properly trained and equipped to do so.

DIRECT THREAT CARE (DTC) / HOT ZONE Guidelines

1) Don appropriate personal protective equipment (PPE) while mitigating any immediate threat and/or move to a safer position if possible. Recognize that threats are dynamic and may be ongoing, requiring continuous threat assessments.

2) Make recognized threats known to all responders operating on scene, evacuate if PPE is not available or appropriate. DECON as necessary before moving to the cold zone. Moving

additional responders into the HOT ZONE should be delayed until appropriate DECON is established.

3) Move casualties to a safer position.
   a. Instruct the alert, capable patient to don respiratory protection and any other necessary PPE as appropriate, ensure proper fit/function, move to a safer position, and apply self-aid / self-DECON as appropriate.
   b. If the patient is responsive but injured to the point that he/she cannot move, a rescue plan should be devised only if appropriate PPE is available to rescuers.
   c. If a patient is unresponsive, weigh the risks and benefits of an immediate rescue attempt in terms of manpower and likelihood of success. Remote medical assessment techniques should be considered to identify patients who are dead or have non-survivable wounds or signs of severe poisoning (no respirations, visible seizure activity).

4) If trauma is present in addition to CBRN agents, identify the most life-threatening condition and mitigate.
   a. If hemorrhage is non-life threatening, or once it is managed, stop the poisoning process (rapid spot DECON) and/or initiate antidote therapy as appropriate if reasonable in the current environment AND if the casualty will not survive through the DECON process. If antidote therapy requires removing respiratory protection, weigh risk/benefit of removing PPE in a contaminated environment.
      a. Rapid spot DECON:
         a. Remove visible skin contamination with absorbent / adsorbent material or scrape / blot contamination off the body.
         b. Apply Reactive Skin Decontamination Lotion (RSDL) on affected areas, place RSDL in breached PPE / clothing holes if liquid contamination is present and no open wound is present. **Do not breach PPE / clothing further in HOT ZONE**.
         c. If RSDL is not available, use any means available to flush the contaminated skin.
      b. Agent–specific interventions (note if IM injection site is not covered by clothing and there is a suspicion or possibility of liquid contamination, perform spot DECON prior to injection).
         a. Nerve agent
            i. For conscious / alert casualties with no central nervous system (CNS) symptoms, miosis, rhinorrhea, or headache/dizziness, antidotes should be deferred until DECON is complete or the casualty is in the cold zone.
            ii. For conscious / alert casualties with mild CNS symptoms, localized sweating, muscle twitching / fasciculations, excessive oral /nasal secretions, stomach cramps, or involuntary urination/defecation, administer 1 DuoDote® / Antidote Treatment Nerve Agent Autoinjector (ATNAA) or atropine 2 mg IM. Repeat after 15 minutes if no

improvement is noted, administer up to 3 DuoDote® / ATNAA / hr. Atropine max dose is unlimited.

iii. For conscious casualties, ambulatory, or non-ambulatory, that are disoriented, exhibiting moderate signs of CNS abnormality or are in moderate respiratory distress administer 2 DuoDote® / ATNAA or atropine 4 mg IM. If casualty is non-ambulatory, consider nasopharyngeal airway (NPA) and place in the recovery position. Administer a third DuoDote® / ATNAA or atropine 2 mg IM after 15 minutes if no improvement is noted, administer up to 3 DuoDote® / ATNAA / hr. Atropine max dose is unlimited.

iv. For unconscious casualties or conscious casualties exhibiting severe CNS abnormality, or severe respiratory distress, administer 3 DuoDote® / ATNAA or atropine 6 mg IM plus Convulsant Antidote for Nerve Agent (CANA) or diazepam 10 mg or midazolam 10 mg IM prn regardless of seizure activity. Administer up to 3 DuoDote® / ATNAA / hr. Continue atropine q. 3-5 min PRN. Atropine max dose is unlimited. Consider NPA, replace respiratory protection if removed during treatment.

b. Opioid

i. For conscious / alert casualties with mild signs / symptoms, antidote administration should be deferred until DECON is complete or casualty is in the “cold zone.”

ii. For conscious casualties with marked signs of opioid exposure administer naloxone 4 mg IM or IN only if respiratory protection is not present. After initial dose, administer naloxone 2mg prn.

iii. For unconscious casualties with or without respiratory compromise, administer naloxone 4 mg IM or IN prn only if respiratory protection is not present. If naloxone is ineffective after 10 mg, reevaluate for additional possible causes.

c. Cyanide / Blood agent

i. For conscious / alert casualties with no or mild CNS symptoms without respiratory protection and without suspicion or evidence of carbon monoxide (CO) poisoning, direct casualty to self-administer amyl nitrite 0.3 mL via inhalation in 15 seconds on / 15 seconds off intervals. Repeat as needed until DECON is complete or casualty is in the “cold zone.”

ii. For casualties with severe CNS symptoms or apnea with or without respiratory protection and without suspicion or evidence of CO poisoning, affix amyl nitrite 0.3 mL under nose. Consider simple airway adjunct. Replace respiratory

protection if removed during treatment. *Antidote may still be effective in apneic casualties with active circulation.*

d. Chlorine / Blister / TIC agent inhalation
    i. Rapid removal from the contaminated environment and rapid decontamination.
e. Blister agent skin contamination
    i. Manage as a general burn casualty (Note visible skin injury may be delayed 19-24 hours after contamination). Casualty must be transported to a higher level of care even in the absence of visible skin damage.
    ii. Consider treating for inhalation injury.
f. Hydrofluoric Acid (HF) skin contamination
    i. Apply calcium gluconate paste/gel/slurry to burns:
        1. Topical application with a pre-mixed commercial gel (10%).
        2. A paste/slurry can be made by mixing calcium gluconate powder 3.5 g in 150 mL water-based lubricant.
    ii. Massage the burn area or instruct the patient to massage the burn area until pain is relieved.

5) Consider quickly placing patient or directing the patient to be placed in a position to protect airway.

INDIRECT THREAT CARE (ITC) / WARM ZONE Guidelines

Note: This is where decontamination will occur. Some of these actions may occur before DECON, some during. If any intervention can be improved via vascular access (i.e. IV vs. IM), gain vascular access AFTER decontamination. Any interventions performed in the warm zone PRIOR to decontamination MUST be exchanged for clean interventions during the DECON process.

1) Any casualty with a weapon should have that weapon made safe/secured once the threat is neutralized and/or if mental status is altered. Handling, storage, or transportation of a weapon is specific to individual agency guidelines.
    a. Casualties' mental status may rapidly deteriorate with little or no warning.

2) Perform systematic assessment and intervention. Mnemonics such as $(MARCHE)^2$ to guide priorities may be of assistance.

3) Ensure a record of interventions performed in the HOT ZONE including intervention type and time travel with the casualty through the WARM ZONE, including DECON as appropriate. Take note of time of the intervention and repeat / reassess as necessary based on guidelines.

4) Massive Hemorrhage (Bleeding):

a. If the situation allows, examine the area immediately around open wounds for visible contamination. Perform *spot decontamination* as appropriate to minimize contamination entering wounds.

b. All hemorrhage control interventions applied during Hot Zone care must be replaced with clean interventions. Tourniquet downgrade or conversion should also be considered at this time. Assessment, downgrade/conversion, and decontamination should occur simultaneously if possible.

i. Extremity Tourniquets

a. Dirty tourniquet exchange / downgrade process:

i. Expose the wound fully.

ii. Assess to determine if the tourniquet is both *effective* and *necessary*.

iii. If the existing tourniquet is necessary but ineffective (continued bleeding or a palpable distal pulse), either tighten the existing tourniquet further, or apply a second tourniquet, preferably on clean skin if medically appropriate to eliminate the distal pulse.

iv. If a tourniquet is determined based on wound assessment to not be necessary, use other techniques to control bleeding and remove the tourniquet.

v. DECON proximal and distal to dirty tourniquet.

vi. Identify an appropriate location at least 2-3 inches above the most proximal injury (not over a joint) and apply a new tourniquet directly to the clean skin.

vii. Once properly applied, slowly remove the dirty torniquet, assess for effectiveness of the clean tourniquet.

a. If ineffective, apply a second tourniquet, preferably proximal to the existing clean tourniquet to eliminate the distal pulse.

viii. DECON the skin where the dirty tourniquet was removed, taking care to minimize runoff to the clean tourniquet(s).

b. Dirty tourniquet conversion process:

i. Expose the wound fully.

ii. Assess to determine if the tourniquet is both *effective* and *necessary*.

iii. If the existing tourniquet is necessary but ineffective (continued bleeding or a palpable distal pulse), either tighten the existing tourniquet further, or apply a second tourniquet, preferably on clean skin if medically appropriate to eliminate the distal pulse.

iv. If a tourniquet is determined based on wound assessment to not be necessary, use other techniques to control bleeding and remove the tourniquet.

v. DECON the wound and the area surrounding the wound.

vi. Fully pack the wound with hemostatic or plain gauze, and properly apply a pressure dressing.
vii. Once properly applied, the prior dirty tourniquet should be removed, and the skin in that area should be decontaminated while attempting to minimize runoff to clean interventions.

c. If a tourniquet exchange/conversion fails, it should not be attempted multiple times.
d. Clearly mark all tourniquet sites with the time of tourniquet exchange/conversion.

5) Airway Management:

a. If patient is wearing respiratory protection and has a compromised airway, weigh risk/benefit of removing or leaving in place. If removed, perform DECON of skin covered by respiratory protection and proceed to next step.
b. If the airway is compromised due to nerve agent or inhaled blister / toxic industrial chemicals (TIC) poisoning (secretions, constriction, inflammation).
    i. Administer atropine 2 mg IM q 3-5 min prn. No max dosage.
c. If previous measures are unsuccessful, or if there is a concern for airway compromise due to chemical warfare agents (CWAs), the operational situation allows, and equipment is available under an approved protocol, consider:
    i. Supraglottic devices (e.g., King LT®, laryngeal mask airway (LMA), iGel®)
    ii. Oro/nasotracheal intubation
    iii. Surgical cricothyroidotomy (with lidocaine if conscious)
    iv. If advanced airway is placed and there is a threat of gas / vapor still present utilize an Ambu® RDIC resuscitator (RDIC) to prevent further inhalation injury to casualty if available.
d. Consider applying oxygen if available.
e. All airway management interventions applied prior to DECON must be replaced during the DECON process.

6) Intravenous (IV) Access (only to be performed immediately before or during DECON process):

a. If additional antidotes are required, consider starting at least an 18-gauge IV or obtaining intraosseous (IO) access.
    a. Only establish access after site has been decontaminated unless there is no risk of internal contamination.
    b. If cyanide poisoning is suspected, start two lines due to possible incompatibility of medications.

7) Respiration (Breathing):

a. If respiratory distress is being caused secondary to:
    i. Nerve agents
        a. Administer atropine 2 mg IM/IV/IO (as appropriate) q 3-5 minutes until airway constriction / secretions resolve.
    ii. Blister / Choking agents

a. Albuterol / Beta 2 agonists. If available, consider positive end expiratory pressure (PEEP) 10-20 cm H_20.

iii. Cyanide / Blood agents

a. Inhaled amyl nitrite provided no suspicion of CO poisoning.

b. If IV/IO access is feasible:

i. DC amyl nitrite

ii. Administer sodium nitrite 300 mg (10 mL of 3% solution) infusion over 5 minutes followed immediately by sodium thiosulphate 12.5 g (50 mL of 25% solution) infusion over 10 minutes OR hydroxocobalamin 5 g infusion over 15 minutes AND sodium thiosulphate 12.5 g (50 mL of 25% solution) infusion over 10 minutes (if available). Monitor for hypotension throughout infusion for both formularies.

iii. If symptoms of cyanide poisoning return, repeat sodium nitrite and sodium thiosulphate at half dosage over same infusion times or an additional infusion of hydroxocobalamin 5 g over 15 minutes to 2 hours based on patient condition.

ii. Hydrofluoric Acid

a. 1.5 mL of 10% calcium gluconate in 4.5mL NS via nebulizer

b. Albuterol/Beta 2 agonist via nebulizer for bronchospasm. If available, PEEP 10-20 cm H_2O.

c. Methylprednisolone 250 mg IVP

d. Terbutaline 0.25 mg IV/IO

i. Repeat 0.25 mg IV/IO after 15 minutes if no noted improvement, maximum dose of 0.50 mg / hr.

b. If respiratory depression is being caused by suspected opioid poisoning:

i. Administer naloxone 4 mg IN/IM/IV/IO (as appropriate) up to 12 mg.

ii. If there is no marked relief after 12 mg, consider potential for additional or different agent contamination/exposure.

c. If needle decompression is indicated before DECON, ensure the site is cleaned via rapid spot decontamination prior to performing the procedure, or choose an anatomically appropriate location with no gross contamination visible.

d. Chest seals applied prior to DECON must be replaced during the DECON process, ensuring the skin under the dirty seal(s) are properly cleaned.

8) Circulation (Shock Management/Resuscitation):

a. Assess for shock: Altered mental status (in the absence of head injury) and weak or absent radial pulses are the best austere field indicators of shock. This can also be an indicator of nerve agent poisoning or hypoxia due to blood agent inhalation.

i. If equipment is available, assess for abnormal vital signs (e.g. systolic blood pressure (SBP) < 90 mm Hg with/without heart rate (HR) >100 bpm) or a shock index >1 (HR/SBP).

b. If not in shock:

i. No IV fluids necessary but consider intravascular access with saline lock.

c. If shock is present:

i. Resuscitate to normotensive state. Administer IV fluid bolus (per agency protocol) to a goal of improving mental status, radial pulses, or, if available, measured SBP > 90 mm Hg. Repeat bolus once after 30 minutes if still in shock.

d. Prioritize for rapid evacuation any patient with traumatic brain injury or any patient, especially those with penetrating torso injury, that is displaying signs of shock.

9) Hypothermia Prevention:

a. Minimize patient's exposure and subsequent heat loss.
   i. Avoid cutting off or removing clothes unless necessary for decontamination, wound evaluation, and management.
   ii. Attempt to perform spot decontamination vs. "wet and naked" as much as possible.
      a. Consider "dry decontamination" if technically and tactically feasible.
   iii. For injured public safety personnel, keep protective gear on or with the patient if feasible.

b. After decontamination (if necessary) keep the patient covered, warm, and dry.
   i. Place the patient onto an insulated surface as soon as possible to decrease conduction from cold ground temperatures.
   ii. Replace wet clothing with dry clothing if possible.
   iii. Cover the patient with dry blankets, jackets, commercial warming devices, or anything that will retain heat and assist in keeping the patient dry.
   iv. Warm fluids are preferred if IV fluids are administered.

10) Reassess Patient:

a. Inhalation of some pulmonary agents can lead to delayed, rapid-onset pulmonary edema. Casualties suspected of inhaling these agents should be prevented from any unnecessary exertion and monitored closely for change in condition.

b. If available and feasible, perform continuous cardiac and respiratory monitoring of casualties with known or suspected cyanide poisoning, especially if amyl nitrite has or is being administered.

11) Burns:

a. Cover the burn area with dry, sterile dressings and initiate aggressive measures to prevent heat loss and hypothermia.

b. Consider early airway management if the patient has signs of significant airway thermal injury (e.g., oral edema, hoarseness, stridor, throat pain, carbonaceous material in the posterior pharynx and respiratory difficulty), suspected or confirmed inhalation of choking / pulmonary or blister agents, or if there is a prolonged

evacuation period.

c. Smoke inhalation, particularly in a confined space, may be associated with significant carbon monoxide and cyanide toxicity.
    i. Significant symptoms of smoke inhalation and carbon monoxide toxicity should be treated with high flow oxygen if available.
    ii. Significant symptoms of smoke inhalation and cyanide toxicity should be considered candidates for cyanide antidote administration. Note: amyl nitrite is <u>not</u> indicated for patients suspected of CO poisoning.

d. Blister agent burns
    i. Signs / symptoms of skin damage typically will not appear for 1 – 2 hours (and up to 24 hours) after contamination, although skin damage has still occurred. In the event of contamination, all blister agent casualties should be treated as burn patients regardless of visible signs.
    ii. Blister agent burns do not need fluid resuscitation like traditional thermal burn patients, even with similar percentage total body surface area (%TBSA) affected. Do not use burn infusion formulas (e.g., Parkland, Modified Brooke, ISR rule of tens) as this will overestimate fluid needs. Administration should be titrated based on individual patient condition.
    iii. Blisters do not contain agent (only sterile fluid) and therefore do not pose a secondary / cross-contamination risk.
    iv. Keep blisters covered, do not attempt to lance / break open.
    v. Manage pain with typical burn formulary.

e. Hydrofluoric acid (HF) burns
    i. HF burns will often present with pain disproportionally high to perceived severity of the burns or total %TBSA effected.
    ii. HF burns / blisters <u>may</u> contain small volumes of HF.
        a. Make every effort to keep blisters intact.
        b. If blister breaks post-decontamination, perform spot decontamination by soaking up liquid with an appropriate material and immediately apply topical treatment to the newly affected area.
    iii. Apply calcium gluconate paste/gel/slurry to burns:
        a. Topical application with a pre-mixed commercial gel (2.5-10%).
        b. A paste/slurry (10%) can be made by mixing 3.5 g calcium gluconate powder in 150 mL water-based lubricant.
        c. Massage the burn area or instruct the casualty to do so until pain is relieved.
    iv. Casualties with HF burns MUST receive cardiac monitoring as soon as tactically feasible.

12) Seizure Management:

a. Exposure / contamination to many CWAs / TICs can and often do lead to seizure activity. This activity can be difficult to manage given the range of pathophysiology associated with it.
    a. Nerve agents
        i. Seizures due to nerve agent / organophosphate poisoning progress from cholinergic to cholinergic/non-cholinergic modulation to non-cholinergic over the course of roughly one hour. Seizure management efficacy may be inconsistent during this progression.
        ii. Nerve agent / organophosphate casualties will often progress to non-convulsive seizures (flaccid paralysis).
            a. Flaccid paralysis will require assisted ventilations.
        iii. Depending on antidote efficacy, seizures may restart with no warning.
    b. Hydrogen cyanide
        i. Hydrogen cyanide is a systemic asphyxiant. Due to cellular hypoxia, patients initially present with CNS excitation, then transition to CNS depression and seizure activity.
        ii. Cyanide antidote formulary can lead to rapid, profound reversal of cellular hypoxia and should be initiated as soon as possible, and concurrently with seizure management.
    c. Seizure formulary
        i. Any casualty experiencing or at risk of experiencing seizure activity should have, at minimum, a simple airway adjunct in-place.
            a. Copious oral/nasal secretions are likely and will require continuous suction / airway clearing in conjunction with assisted ventilation.
        ii. If IV/IO access has been established:
            a. Diazepam 5-10 mg IV/IO q 10-15 minutes prn or midazolam 2.5 mg IV/IO q 5 minutes prn
        iii. If IV/IO has not been established:
            a. CANA or diazepam 10 mg IM q 10 minutes prn or midazolam 10 mg IM q 10 minutes prn
        iv. Monitor respiratory drive, assist ventilations as needed.
    d. Consider placing postictal casualty in the recovery position.

13) Monitoring:

a. Apply appropriate monitoring devices and/or diagnostic equipment if available. Obtain and record vital signs.
    a. Pulse oximetry may not reflect underlying cellular oxygenation, further assessment may be required.

a. For patients with HF contamination, monitor for hypocalcemia if tactically feasible. ECG findings may display prolonged QT interval, premature ventricular contractions (PVCs), and ventricular fibrillation (with between 2.5% - 22% TBSA affected), that can lead to cardiac arrest.

b. Peaked T waves may, or may not be present, and can be a sign of hyperkalemia combined with hypocalcemia.

c. If patient begins experiencing cardiac dysrhythmias and it is tactically feasible, administer calcium chloride 10% solution 10 mL slow IV push.

14) ***Prepare Patient for Movement*:**

a. Only decontaminated casualties should be transported from the incident.

15) ***Communicate***:

a. With the patient if possible.

a. Encourage, reassure, and explain care.

16) ***Cardiopulmonary Resuscitation****:*

a. In certain circumstances (certain CWA casualties with the appropriate antidote) performing CPR *may be* of benefit and should be considered in the context of the operational situation.

b. CPR should NOT be attempted until DECON has been conducted (as required). Consider using a RDIC to decrease risk of secondary contamination of exhaled vapors.

17) Documentation of Care:

a. Document clinical assessments, treatments rendered, and changes in the patient's status in accordance with local protocol. Forward this information with the patient to the next level of care. Documented information on triage tags recorded in the Hot Zone must be preserved through decontamination by transferring to a clean tag or other record.

EVACUATION CARE (EVAC) Guidelines:

2) Reassess:

a. All applied interventions in previous phases of care.

b. Remember in certain CWA circumstances some patients may rapidly deteriorate.

3) Airway Management:

a. The principles of airway management in Evacuation Care / Cold Zone are the same as that in Indirect Threat Care / Warm Zone with the addition of increased utility of supraglottic devices and definitive airway control with endotracheal intubation.

b. Consider applying oxygen if available.

c. Consideration should be given to delayed onset of respiratory distress caused by delayed onset of pulmonary injury from pulmonary agents (chlorine, ammonia, phosgene, etc.).

d. Patients with significant continuous secretions, or those with confirmed or

suspected airway damage due to chlorine/TIC or blister agent inhalation may benefit from precautionary intubation to prevent rapid airway compromise.

i. If intubated and attached to a mechanical ventilator, consider lung protective strategies, ensure PEEP is adequate.
ii. Patients with chlorine inhalation or other respiratory system damage may require higher PEEP (10 cm H_2O or greater).

4) Breathing:

a. If respiratory distress is being caused secondary to:
   a. Nerve agents
      i. Administer atropine IV/IO q 3-5 minutes prn until airway constriction/secretions resolve.
   b. Blister / Choking agents
      i. Nebulized albuterol and Ipratropium bromide
         i. Albuterol max 3 doses
         ii. Ipratropium bromide 20-minute intervals
      ii. Nebulized 4.2% sodium bicarbonate over 20 minutes.
         i. 2.5 mL of 8.4% solution in 2.5 mL of NS
         ii. Administer separately from albuterol.
      iii. Methylprednisolone 250 mg IVP
      iv. Terbutaline 0.25 mg IV/IO
         i. Repeat 0.25 mg IV/IO after 15 minutes if no noted improvement, maximum dose of 0.50mg / hr.
   c. Cyanide / Blood agents
      i. Inhaled amyl nitrite (15 seconds on/15 seconds off) or
         i. Administer sodium nitrite 300 mg (10 mL of 3% solution) infusion over 5 minutes followed immediately by sodium thiosulphate 12.5 g (50 mL of 25% solution) infusion over 10 minutes or hydroxocobalamin 5 g infusion over 15 minutes and sodium thiosulphate 12.5 g (50 mL of 25% solution) infusion over 10 minutes (if available). Monitor for hypotension throughout infusion for both formularies.
         ii. If symptoms of cyanide poisoning return, repeat sodium nitrite and sodium thiosulphate at half dosage over same infusion times or additional infusion of hydroxocobalamin 5 g over 15 minutes to 2 hours based on patient condition.
   d. If respiratory depression is being caused by suspected opioid poisoning
      i. Administer naloxone 2 mg IV/IO or 4 mg IN prn (max 10 mg) until respirations improve.
         i. Titrate to consciousness / normal respirations, not to spontaneous respiration only.
         ii. Fentanyl / fentanyl analogues may require naloxone 8-10 mg IN to achieve desired result.
   e. Hydrofluoric acid
      i. 1.5 mL calcium gluconate 10% in 4.5ml NS via nebulizer

ii. Albuterol/Beta 2 agonist via nebulizer for bronchospasm. If available, PEEP 10-20 cm H_2O.
iii. Methylprednisolone 250 mg IVP
iv. Terbutaline 0.25 mg IV/IO
    i. Repeat 0.25 mg IV/IO after 15 minutes if no noted improvement, maximum dose 0.50mg / hr.

5) Shock Management / Fluid Resuscitation:

a. Establish intravenous or intraosseous access if not performed in Indirect Threat Care/ Warm Zone phase.
b. Reassess for shock (altered mental status in the absence of brain injury, weak or absent peripheral pulses, and/or change in pulse character). In this phase:
    i. BP monitoring should be available. If so, resuscitate to normotensive state. Administer IV fluid bolus (per agency protocol) to a goal of improving mental status, radial pulses, or, if available, measured SBP > 90 mm Hg. Repeat bolus once after 30 minutes if still in shock.
    ii. Continue resuscitation as needed to maintain target BP or clinical improvement.

6) Prevention of Hypothermia:

a. Minimize patient's exposure and subsequent heat loss.
    i. Avoid cutting off or removing clothes unless necessary for decontamination, wound evaluation, and management.
    ii. Attempt to perform spot decontamination vs. "wet and naked" as much as possible.
        i. Consider "dry decontamination" if technically and tactically feasible.
    iii. For injured public safety personnel, keep protective gear on or with the patient if feasible.
b. After decontamination (if necessary) keep the patient covered, warm, and dry.
    i. Place the patient onto an insulated surface as soon as possible to decrease conduction from cold ground temperatures.
    ii. Replace wet clothing with dry clothing if possible.
    iii. Cover the patient with dry blankets, jackets, commercial warming devices, or anything that will retain heat and assist in keeping the patient dry.
    iv. Warm fluids are preferred if IV fluids are administered.

7) Monitoring:

a. Institute electronic monitoring if available, including pulse oximetry, CO, methemoglobin, cardiac monitoring, end tidal CO_2 (if intubated), and blood pressure.
    i. Exposure to cyanide / smoke may lead to inconclusive results in pulse oximetry.
b. For patients with HF contamination, monitor for hypocalcemia. ECG findings

may display prolonged QT interval, premature ventricular contractions (PVCs), and ventricular fibrillation (with between 2.5% - 22% TBSA affected), that can lead to cardiac arrest.

i. Peaked T waves may, or may not be present, and can be a sign of hyperkalemia combined with hypocalcemia.

ii. If patient begins experiencing cardiac dysrhythmias, administer calcium chloride 10% solution 10 mL slow IV push.

c. Obtain and record vital signs.

8) Reassess Patient:

a. Determine mode and destination for evacuation to definitive care.

b. Consider delays in respiratory compromise secondary to inhalation of blister / TIC agents.

9) Burns:

a. Consider early airway management if the patient has signs of significant airway thermal injury (e.g., oral edema, hoarseness, stridor, throat pain, carbonaceous material in the posterior pharynx and respiratory difficulty), suspected or confirmed inhalation of choking / pulmonary or blister agents, or if there is a prolonged evacuation period.

b. Smoke inhalation, particularly in a confined space, may be associated with significant carbon monoxide and cyanide toxicity.

i. Significant symptoms of smoke inhalation and carbon monoxide toxicity should be treated with high flow oxygen if available.

ii. Significant symptoms of smoke inhalation and cyanide toxicity should be considered candidates for cyanide antidote administration. Note: amyl nitrite is <u>not</u> indicated for patients suspected of CO poisoning.

c. Blister agent burns

i. Signs / symptoms of skin damage typically will not appear for 1 – 2 hours (and up to 24 hours) after contamination, although skin damage has still occurred. In the event of contamination, all blister agent casualties should be treated as burn patients regardless of visible signs.

ii. Blister agent burns do not need fluid resuscitation like traditional thermal burn patients, even with similar %TBSA affected. Do not use burn infusion formulas (e.g., Parkland, Modified Brooke, ISR rule of tens) as this will overestimate fluid needs. Administration should be titrated based on individual patient condition.

iii. Blisters do not contain agent (only sterile fluid) and therefore do not pose a secondary / cross-contamination risk.

iv. Keep blisters covered, do not attempt to lance / break open.

v. Manage pain with typical burn formulary.

d. Hydrofluoric acid (HF) burns

i. HF burns will often present with pain disproportionally high to perceived

severity of the burns or total %TBSA effected.

ii. In the absence of cardiac indications of hypocalcemia, empiric prophylactic administration of calcium chloride 10% at 0.1 to 0.2 mL/kg via IV infusion can be considered.

iii. HF burns / blisters may contain small volumes of HF.

i. Make every effort to keep blisters intact.

ii. If blister breaks post-decontamination, perform spot decontamination by soaking up liquid with an appropriate material and immediately apply topical treatment to the newly affected area.

iv. Apply calcium gluconate paste/gel/slurry to burns:

i. Topical application with a pre-mixed commercial gel (2.5%-10%).

ii. A paste/slurry (10%) can be made by mixing 3.5 g calcium gluconate powder in 150 mL water-based lubricant.

iii. Massage the burn area or instruct the casualty to do so until pain is relieved.

v. For refractory pain/significant burns

i. Calcium gluconate 5% (10% solution diluted 1:1 with NS) syringe with 28 (or smaller) gauge needle, administered subcutaneous around perimeter of burn up to 0.5mL/quarter inch square skin surface area.

i. The limited injection amount is to avoid pain associated with the injection and minimize vascular compromise.

vi. HF burns involving the eyes

i. Provide eye irrigation with 1% calcium gluconate (50 mL calcium gluconate 10% in 500 mL of normal saline).

vii. Cardiac Complications

i. If patient begins experiencing cardiac dysrhythmias (prolonged QT interval, peaked T Waves, PVCs).

i. Calcium chloride 10% solution 10 mL slow IV push

10) Seizure Management:

a. Exposure / contamination to many CWAs / TICs can and often do lead to seizure activity. This activity can be difficult to manage given the range of pathophysiology associated with it.

a. Nerve agents

i. Seizures due to nerve agent / organophosphate poisoning progress from cholinergic to cholinergic/non-cholinergic modulation to non-cholinergic over the course of roughly one hour. Seizure management efficacy may be inconsistent during this progression.

ii. Nerve agent / organophosphate casualties will often progress to non-convulsive seizures (flaccid paralysis).

i. Flaccid paralysis will require assisted ventilations.

iii. Depending on antidote efficacy, seizures may restart with no warning.

b. Hydrogen cyanide
   i. Hydrogen cyanide is a systemic asphyxiant. Due to cellular hypoxia, patients initially present with CNS excitation, then transition to CNS depression and seizure activity.
   ii. Cyanide antidote formulary can lead to rapid, profound reversal of cellular hypoxia and should be initiated as soon as possible, and concurrently with seizure management.

c. Seizure Formulary
   i. Any casualty experiencing or at risk of experiencing seizure activity should have, at minimum, a simple airway adjunct in-place.
      i. Copious oral/nasal secretions are likely and will require continuous suction / airway clearing in conjunction with assisted ventilation.

ii. Diazepam 5-10 mg IV/IO q 10-15-minutes prn or midazolam 2.5 mg IV/IO q 5 minutes prn
   i. Consider placing postictal casualty in the recovery position.

iii. Provide supplemental high-flow oxygen at >15 L/min via non-rebreather face mask.
   i. Patients with inadequate spontaneous ventilation should be ventilated with BVM and 100% oxygen.

iv. Provide continuous monitoring of the postictal patient.

11) Prepare Patient for Movement:

a. Only decontaminated patients should be transported. Any contaminated items including personal gear must remain on-scene. Handling/custody of firearms and other sensitive items on scene after casualties are evacuated must be considered.
b. All equipment and vehicles used for and during transportation away from the scene should be assessed for contamination before returning into service.

12) Communicate:

a. With the patient, if possible, and with the receiving facility.
b. Encourage, reassure, and explain care to patient.
c. Notify receiving facility of wounds, patient condition, and treatments applied.
   i. Ensure facility is aware that the patient has been decontaminated appropriately at the scene to avoid secondary decontamination at the receiving facility.

13) Cardiopulmonary Resuscitation:

a. CPR may have a *larger role* during the evacuation phase, especially for patients with electrocution, hypothermia, non-traumatic arrest, near drowning or in conjunction with appropriate antidotes for CWAs.

14) Documentation of Care:

a. Continue or initiate documentation of clinical assessments, treatments rendered, and changes in the patient's status in accordance with local protocol.
b. Forward this information with the patient to the next level of care.
   i. Documentation of interventions performed / medications administered *prior* to

decontamination must follow the casualty to the receiving facility.

15) Definitions:

a. ***Antidote –*** A drug which opposes the action of a poison.

b. ***ATNAA – A**ntidote **T**reatment **N**erve **A**gent **A**utoinjector.* A dual-chamber injector containing atropine 2.1 mg and 2-pralidoxime chloride 600 mg. Spring-activated with a 23ga. 0.8" needle, specifically designed to go through chemical protective clothing. Approved for use in adults and pediatric patients weighing more than 41 kg (90 pounds).

c. ***Blister Agent –*** A chemical agent, also called a vesicant, which causes severe blistering and burns to tissues, skin, eyes, and respiratory tract. Exposure is through liquid or vapor contact. Also, referred to as mustard agents; examples include lewisite and mustard.

d. ***CANA – C**onvulsant **A**ntidote for **N**erve **A**gent.* Diazepam 10 mg packaged in an auto-injector. For use in the management of nerve agent and organophosphate exposure. The injector is spring-activated with a 22ga. 0.6" needle, specifically designed to go through chemical protective clothing.

e. ***CBRN – C**hemical **B**iological **R**adiological **N**uclear*

f. ***Chemical Warfare Agent (CWA) –*** Any toxic chemical or its precursors that can cause death, injury, temporary incapacitation, or sensory irritation through its chemical action. CWAs include five primary categories: nerve agents, asphyxiants, blistering agents, toxic industrial chemicals, and blood agents.

g. ***Choking Agent –*** Substances that cause physical injury to the lungs. Exposure is through inhalation. In extreme cases, membranes swell, and lungs become filled with liquid (pulmonary edema). In some instances, effects can be delayed up to 8 hours. Examples include chlorine and phosgene.

h. ***Decontamination (DECON)*** – The physical and/or chemical process of reducing and preventing the spread and effects of contaminants to people, animals, the environment, or equipment involved at a hazardous materials / WMD incidents.

i. ***DuoDote® (Trade Name) –*** A dual-chamber injector containing atropine 2.1 mg and 2-pralidoxime chloride 600 mg. Spring-activated with a 23ga. 0.8" needle, specifically designed to go through chemical protective clothing. Approved for use in adults and pediatric patients weighing more than 41 kg (90 pounds).

j. ***(MARCHE)^2 –*** Mnemonic to be considered to guide treatment priorities for trauma victims in a CBRN Environment:

Massive Bleeding/**M**ask & air

Airway/**A**ntidotes

Respirations/**R**apid Spot Decontamination

Circulation/**C**ountermeasures

Head/Hypothermia

Extraction/**E**vacuate

k. ***Nerve Agent –*** A substance that interferes with the central nervous system by

inhibiting acetylcholinesterase. Exposure is through liquid contact with the eyes or skin and inhalation of the vapor. Examples include sarin (GB), tabun (GA), and VX.

l. ***Rapid Spot DECON* –** Field expedient decontamination of a small area of skin contamination to stop the poisoning process and to prevent delay in while providing emergency care.

m. ***RDIC* – R**esuscitation **D**evice **I**ndividual **C**hemical. A Bag Valve Mask (BVM) device that can be used in toxic atmospheres by drawing contaminated air through a CBRN filter before flowing into the casualty's airway.

n. ***RSDL* – R**eactive **S**kin **D**econtamination **L**otion. A decontamination solution impregnated in a sponge that is intended to remove or neutralize chemical warfare agents and T-2 toxins from the skin. It is not intended for full-body or internal use. It must be removed from the skin after contact time, which varies based on the agent present.

o. ***TIC / TIM* – T**oxic **I**ndustrial **C**hemical / **M**aterial. Chemicals that are manufactured, stored, transported, and used throughout the world. Can be in the gas, liquid, or solid state. These agents can be highly toxic and are produced in large quantities. Examples include, but are not limited to, ammonia, chlorine, and fluorine.

p. ***WMD* – W**eapons of **M**ass **D**estruction. A destructive device, such as an explosive or incendiary bomb, rocket, or grenade; a weapon that is designed to cause death or serious injury through toxic or poisonous chemicals; a weapon that contains a biological agent or toxin; or a weapon that is designed to release dangerous levels of radiation or radioactivity.