

Toxins and Environmental: Toxic Chemical Exposure

Goals: Remove patient from toxic environment; decontaminate patient, if clinically indicated; identify intoxicating agent; administer antidote or mitigating agent, if available; treat signs/symptoms in order to preserve vital functions and minimize end-organ damage

Inclusion Criteria: Patients and responders with confirmed or suspected exposure to toxic pharmaceutical, industrial, illicit or other drugs/substances, such as chemical weapons of mass effect

Exclusion Criteria: No specific recommendations

Refer to: [Altered Mental Status \(AMS\)](#), [Bradycardia](#), [Burns](#), [Cardiac Arrest](#), [Cyanide Exposure](#), [Eye Injury](#), [Poisoned Patient/Overdose](#), [Respiratory Distress](#), [Seizure](#), and other, symptom-specific CPGs

NOTES:

- This CPG outlines the general approach to the patient (or responder) with a toxic chemical exposure:
 - It is not intended to serve as a replacement for agency SOPs or formal HazMat guidelines.
 - It cannot account for all possible poisonings or toxic chemical exposures.
 - Early consultation with Hazardous Materials (HazMat) experts is strongly encouraged.
- Toxidrome definition: Constellation of signs and symptoms associated with exposure to a specific class of medications, drugs or toxins:
 - Toxidrome recognition may facilitate patient care, especially if an antidote is available.
 - NOTE: A toxidrome may be masked or obscured in cases of multi-substance poisoning.
- **Consult BioTel and the North Texas Poison Control Center early to coordinate patient care, especially in the following circumstances:**
 - **Confirmed or suspected exposure to chemical weapons of mass effect (WME); OR**
 - **Confirmed or suspected multi-substance poisoning or overdose; OR**
 - **Drug(s) or substance(s) not covered by this or other BioTel CPGs; OR**
 - **Drug(s) or substances are unknown.**
- **BioTel/Poison Control Center contact is mandatory for the symptomatic and asymptomatic pediatric patient with confirmed or suspected toxic chemical exposure.**
- **Scene safety and use of appropriate PPE – especially respiratory protection – are critical!**
 - Refer to the [Poisoned Patient/Overdose CPG](#)

Basic Level

1. Observe for scene clues suggesting the possibility of toxic chemical exposure:
 - a. Timing: sudden onset within minutes, especially among multiple victims
 - b. Unusual fogs or smokes or odors:
 - i. Do NOT rely on odors (e.g. musty, bleach, newly cut hay, or rotten eggs) to consider the possibility of toxic vapor exposure: many toxic chemicals are odorless at toxic concentrations
 - c. Common clinical findings in multiple patients, especially in those downwind from release site
 - d. Failure to respond to usual therapy
 - e. Unexplained human, animal, fish or plant deaths
2. Following scene safety principles and agency HazMat SOPs, remove patient from toxic environment:
 - a. EMS Provider safety is the first priority
 - b. Depending on the agent, dose and route of exposure, triage, treatment and decontamination may need to proceed essentially simultaneously
 - c. Initiate agency SOPs for patient dry and/or wet decontamination, as indicated
 - d. In most cases of vapor exposure, dry decontamination will suffice
 - i. If possible, remove patient contact lenses, and treat according to the [Eye Injury CPG](#)
 - e. When wet decontamination is indicated, use measures to avoid accidental hypothermia
 - f. Patient vomitus and other body fluids may be contaminated, even after external decontamination
3. Assess and support ABCs according to [UNIVERSAL CARE – ADULT](#) or [UNIVERSAL CARE – PEDIATRIC](#), and [Airway Management – Adult](#) or [Airway Management – Pediatric](#), as clinically indicated:
 - a. A (Airway): Ensure airway patency, with positioning, suctioning and OPA or NPA, as needed
 - b. B (Breathing): Provide supplemental oxygen to maintain SpO₂ of at least 94% (continuous monitoring)

- c. C (Circulation): Evaluate, document and treat signs/symptoms of shock according to the [Shock CPG](#); initiate continuous ECG monitoring
- d. D (Disability): Assess and document GCS; assess pupillary size and reactivity
- e. E (Exposure/Environmental): Treat traumatic injuries according to the [Trauma CPG](#)
4. Positioning:
 - a. If trauma is not suspected, position the patient supine or in the left lateral decubitus position, facing EMS Providers, in order to monitor and manage the airway
5. Perform and document a POC Glucose analysis and treat according to the [Diabetic Emergencies CPG](#)
6. Assess for general and toxidrome-specific sign and symptoms suggestive of toxin exposure:
 - a. Signs/symptoms may vary according to route, concentration, dose, and duration of exposure:
 - i. Routes include: inhalation, injection, ingestion, or absorption (skin or mucous membranes)
 - b. Check for needle marks, paraphernalia, bites, bottles or other items, and for possible trauma
7. Obtain SAMPLE history from patient/bystanders, focusing on toxic:
 - a. For prescription/OTC meds, identify drug name, time of ingestion, dose and quantity, if possible
 - b. Collect and transport with patient all pill bottles or other containers present on-scene:
 - i. Use extreme caution & PPE handling these items if opioid-related poisoning is suspected
8. Once advanced level care arrives on scene, give report and transfer care

Advanced Level

9. Maintain continuous SpO₂ and ECG monitoring until patient care has been transferred to hospital staff
10. Initiate continuous PetCO₂ monitoring if signs/symptoms of shock, hypoperfusion or respiratory distress
11. Treat specific toxidromes according to the considerations outlined below*, including use of antidotes, when available
12. Obtain and transmit a 12-Lead ECG, preferably before initiating transport, if cardiac dysrhythmias are present:
 - a. Treat hemodynamically significant dysrhythmias according to the relevant CPG
13. Consider establishing IV/IO access at TKO rate or with a saline lock
 - a. Treat shock/hypotension with fluid resuscitation according to the [Shock CPG](#)
14. Initiate transport, with continuous monitoring and frequent reassessment
15. Follow agency SOPs for patient decontamination prior to E.D. transport
 - a. Follow agency SOPs for personnel, equipment and apparatus decontamination
16. For patient care considerations not covered under standing orders, especially for toxic exposure to chemicals not covered under this CPG, consult BioTel and the North Texas Poison Control Center

*Specific Considerations for Representative Toxin Classes (confirmed or suspected):

- **Scene safety & use of appropriate PPE – especially respiratory protection – are critical!**
- **Consult BioTel and the North Texas Poison Control Center early to coordinate patient care**

1. ASPHYXIANTS

- a. Carbon monoxide (CO):
 - i. Toxidrome recognition and treatment according to the [Carbon Monoxide Exposure CPG](#)
- b. Cyanide (CN):
 - i. Toxidrome recognition and treatment according to the [Cyanide Exposure CPG](#)
- c. Hydrogen Sulfide (H₂S):
 - i. **Treat with supportive care, supplemental oxygen, bronchodilators**

2. INCAPACITATING AGENTS

- a. Narcotics/opioids (including fentanyl, carfentanil, and related substances):
 - i. Toxidrome recognition and treatment according to the [Altered Mental Status CPG](#)
- b. Stimulants (e.g. methamphetamine, PCP, Ecstasy, etc.):
 - i. Request additional EMS and Law Enforcement resources, as needed
 - ii. Treat according to the [Behavioral Emergencies/Excited Delirium CPG](#)
- c. Riot control agents (e.g. “tear gas”, mace, pepper spray):
 - i. Toxidrome recognition and treatment according to the [Eye Injury CPG](#)
 - ii. Patients with persistent symptoms 30 minutes after exposure should be transported to an E.D. for ophthalmologic evaluation

3. RESPIRATORY IRRITANTS

- a. UPPER AIRWAY TOXIDROME (e.g. ammonia, bleach+ammonia mixture, sulfur dioxide, formaldehyde): Upper airway (and other mucous membrane) irritation and swelling, stridor, cough, laryngospasm, respiratory distress, respiratory arrest
- b. UPPER AND LOWER AIRWAY TOXIDROME (e.g. chlorine): Upper airway toxidrome, PLUS bronchospasm, non-cardiogenic pulmonary edema
- c. LOWER AIRWAY TOXIDROME (e.g. phosgene, nitrogen dioxide): Bronchorrhea, bronchospasm, non-cardiogenic pulmonary edema, cyanosis, chest pain, headache
- d. Treatment:
 - i. General treatment according to [Airway Management – Adult](#) or [Airway Management – Pediatric](#)
 - ii. Mainstays: 100% supplemental oxygen, suction, inhaled bronchodilators
 - iii. For laryngospasm causing upper airway obstruction: consider emergency [Cricothyroidotomy](#)
 - iv. Symptom onset after phosgene exposure may be delayed: E.D. transport is mandatory
 1. Lack of early symptoms or mucous membrane irritation does not exclude exposure

4. NERVE AGENTS, organophosphate or carbamate pesticides

- a. TOXIDROME: “DUMBBELS” (Cholinergic)
 - i. Diarrhea, Urination, Miosis (pinpoint pupils), BRONCHORRHEA and BRONCHOSPASM, Bradycardia, Emesis, Lacrimation (watery eyes), Salivation: “wet patients who cannot breathe”
- b. TOXIDROME: “Days of the Week” (Cholinergic)
 - i. Mydriasis (dilated pupils), Tachycardia, Weakness, Hypertension, Fasciculations
- c. Treatment:
 - i. Immediate treatment with IM atropine/2-PAM via (Duodote®) autoinjector, if available:
 1. Mid-lateral thigh injection preferred (avoid femur, zippers, foreign objects in pockets)
 2. **Pediatric patients less than 14 years (if no pediatric autoinjector):**

a. 25 kg or less: 1 adult autoinjector
b. 25-50 kg: up to 2 adult autoinjectors
c. At least 50 kg: up to 3 adult autoinjectors
 - ii. If atropine/2-PAM Duodote® autoinjectors are unavailable, administer atropine IV/IO:
 1. ADULT at least 14 years of age: 1-2 mg IV/IO
 2. **Pediatric patients less than 14 years: 0.1-0.2 mg/kg IV/IO**
 - iii. Repeat dosing every 3 to 5 minutes may be needed, up to 3 total, cumulative doses
 - iv. Treatment endpoint: improved respiratory status
 1. Observe for atropine side effects: tachycardia, decreased sweating, confusion
 2. Observe for 2-PAM side effects: laryngospasm, tachycardia, hypertension
 - v. NOTE: Patients with mild (e.g. running nose) or no symptoms 60 minutes after vapor exposure do not need antidote treatment
 - vi. Additional treatment considerations: refer to the [Respiratory Distress – Adult](#) or [Respiratory Distress – Pediatric CPG](#)
 - vii. Treat seizures according to the [Seizure CPG](#)

5. BLISTER AGENTS (Vesicants) (e.g. Mustard, Lewisite):

- a. TOXIDROME:
 - i. Vapor: Eye and mucous membrane irritation, hoarseness, sore throat (early); pneumonia, respiratory failure, sepsis (late)
 - ii. Liquid:
 1. Skin itching, burning, stinging (early); redness, swelling, blisters, pain (late)
 2. Symptom onset may be delayed (except for Lewisite): EMS Providers may be inadvertently exposed if patient decontamination is not performed before patient care
- b. Treatment:
 - i. Immediate wet decontamination, if possible, according to agency SOPs
 1. Avoid hot water and excessive scrubbing
 - ii. Treat respiratory distress according to the [Respiratory Distress \(Adult or Pediatric\) CPG](#)
 - iii. Treat eye signs/symptoms according to the [Eye Injury CPG](#)
 - iv. Treat skin burns according to the [Burns CPG](#)
 - v. Treat pain according to the [Pain Management CPG](#)