



REGION 11 CHICAGO EMS SYSTEM PROTOCOL	Title: Carbon Monoxide/Smoke Inhalation – BLS/ALS
	Section: Toxins and Environmental
	Approved: EMS Medical Directors Consortium
	Effective: December 6, 2023

CARBON MONOXIDE/SMOKE INHALATION – BLS/ALS

I. PATIENT CARE GOALS

1. Remove patient from toxic environment.
2. Assure adequate ventilation, oxygenation, and correction of hypoperfusion.
3. Use of environmental carbon monoxide (CO) monitors to assist in detection of CO toxicity.

II. PATIENT PRESENTATION

Carbon monoxide is a colorless, odorless gas which has a high affinity for binding to red cell hemoglobin, thus preventing the binding of oxygen to the hemoglobin, leading to tissue hypoxia (although pulse oximetry may appear to be normal). A significant reduction in oxygen delivery to tissues and organs occurs with carbon monoxide poisoning. Carbon monoxide is also a cellular toxin which can result in delayed or persistent neurologic sequelae in significant exposures. With any form of combustion including fire/smoke (e.g., propane, kerosene, or charcoal stoves or heaters) and combustion engines (e.g., generators, lawn mowers, motor vehicles, home heating systems) carbon monoxide will be generated. People in a fire may also be exposed to cyanide from the combustion of some synthetic materials.

A. Inclusion Criteria

1. Patients exposed to carbon monoxide may present with a spectrum of symptoms:
 - a. Mild intoxication:
 - i. Nausea
 - ii. Fatigue
 - iii. Headache
 - iv. Vertigo
 - v. Lightheadedness
 - b. Moderate to severe intoxication:
 - i. Altered mental status
 - ii. Tachypnea
 - iii. Tachycardia
 - iv. Seizure
 - v. Cardiac arrest



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B. Exclusion Criteria

None

III. PATIENT MANAGEMENT

A. Assessment

1. Remove patient from toxic environment.
2. Assess ABCDs and, if indicated, expose patient and re-cover to assure retention of body heat.
3. Vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment), oxygen saturation, and ETCO₂ if available.
4. Apply the CO-oximeter (carbon monoxide measuring device) to the finger and document the reading as SpCO.
5. For ALS providers, apply a cardiac monitor, examine rhythm strip for arrhythmias, and obtain a 12-lead ECG if available.
6. Check blood glucose level.
7. Monitor pulse oximetry and ETCO₂ for respiratory decompensation.
8. Patient pertinent history.
9. Patient physical examination.

B. Treatment and Interventions

1. Apply 100% oxygen via non-rebreather mask, bag valve mask, or advanced airway as indicated.
2. If seizure, treat per Seizure Protocol.



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C. Patient Safety Considerations

1. Use an environmental carbon monoxide detector to assist with detection of occult CO toxicity. If the detector signals elevated CO levels with an alarm, apply appropriate respiratory protection and exit scene.
2. Remove patient and response personnel from potentially hazardous environment as soon as possible.
3. Provide instruction to the patient, the patient's family, and other appropriate bystanders to not enter the environment (e.g., building, car) where the carbon monoxide exposure occurred until the source of the poisoning has been eliminated.
4. Cherry red skin coloration is an indication of carbon monoxide poisoning, but is an unusual finding.
5. **CO-oximeter devices may yield inaccurate low/normal results for patients with CO poisoning.** For any patients with smoke exposure, document the reading of the CO-oximeter in the patient care report. All patients with probable or suspected CO poisoning should be transported to the closest, most appropriate hospital based on their presenting signs and symptoms.

IV. NOTES/EDUCATIONAL PEARLS

A. Key Considerations

1. Pulse oximetry is inaccurate due to the carbon monoxide binding with hemoglobin.
2. As maternal carboxyhemoglobin levels do not accurately reflect fetal carboxyhemoglobin levels, pregnant patients are more likely to be treated with caution.
3. Consider cyanide toxicity if carbon monoxide poisoning is from a fire.

B. Pertinent Assessment Findings

1. Early and repeat assessment of patient's mental status and motor function are extremely useful in determining response to therapy and the need for additional treatment.
2. Identification of possible etiology of poisoning.



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3. Time of symptom onset and time of initiation of exposure-specific treatment.
4. Response to therapy.

C. Key Documentation Elements

1. If using an environmental carbon monoxide detector, record the level detected including units of measurement.
2. Evidence of soot or burns around the face, nares, or pharynx.
3. Early and repeat assessment of patient's mental status and motor function are extremely useful in determining response to therapy and the need for additional treatment.
4. Accurate exposure history
 - a. Time of ingestion/exposure
 - b. Route of exposure
 - c. Quantity of medication or toxin taken
 - d. Alcohol or other intoxicant taken
5. Signs and symptoms of other patients encountered at same location, if present.