Carbon Monoxide, Smoke Inhalation and Cyanide Poisoning

Protocol

Douglas County KS EMS System **November 2022**

Reference Procedures: Cyanokit, Pulse Oximetry

Goals for Patient care:

- Remove patient from toxic environment
- Assure adequate ventilation, oxygenation, and correction of hypoperfusion
- Rapid administration of oxygen or hydroxocobalamin if applicable

Medications:

ADULT Medications:	PEDIATRIC Medications: Refer to HandTevy
• **Hydroxocobalamin (Cyanokit):** 5g IV/IO infused over 15 minutes ○ **In its own IV/IO line** (*Administer with stopcock and 30ml*) (Each 5g vial needs to be reconstituted with 200cc of normal saline.) ☎ If signs and symptoms persist, repeat dose at a rate between 15 minutes and 2 hours	• **Hydroxocobalamin (Cyanokit):** 70 mg/kg IV/IO over 15 minutes ○ **In its own IV/IO line** (*Administer with stopcock and 30ml*) (Each 5g vial needs to be reconstituted with 200cc of normal saline.) ☎ If signs and symptoms persist, repeat dose at a rate between 15 minutes and 2 hours

Baseline Assessment

Besides obvious injuries in house fires, three silent assailants pose a threat to patients – carbon monoxide, smoke inhalation, and cyanide poisoning.

- Remove patient from toxic environment
- Decontaminate patient, if needed
- Secure airway, administer oxygen and assist ventilation as required
- Take vitals, including SpCO with RAD-57, or Zoll Monitor

CARBON MONOXIDE (CO)

CO is a cellular toxin which can result in delayed or persistent neurologic sequelae in significant exposures. With any form of combustion (fire/smoke [e.g. propane, kerosene, or charcoal stoves or heaters], combustion engines [e.g. generators, lawn mowers, motor vehicles, home heating systems]), carbon monoxide will be generated.

Patients exposed to carbon monoxide may present with a spectrum of sign/symptoms which could include nonspecific symptoms such as nausea, fatigue, headache, vertigo, altered mentation, tachycardia, seizures, etc.

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CO Treatment and Interventions

- Apply high-flow 100% oxygen and manage airway as indicated
- Do not rely upon pulse oximetry as it is often is inaccurate due to the carbon monoxide binding with hemoglobin **– treat all suspected patients with oxygen**
- Treat respiratory distress as indicated
- Consider transporting patients with concern for severe carbon monoxide poisoning directly to a facility with hyperbaric oxygen capabilities if feasible and patient does not meet criteria for other specialty care (e.g. trauma or burns)

SpCO %	**Clinical Manifestations**
0-4%	None – Normal
5-9%	Minor Headache
10-19%	Headache, Shortness of Breath
20-29%	Headache, Nausea, Dizziness, Fatigue
30-39%	Severe Headache, Vomiting, Vertigo, Altered mentation
40-49%	Confusion, Syncope, Tachycardia
50-59%	Seizures, Shock, Apnea, Coma
> 60%	Progresses to coma & death

SMOKE INHALATION

Ensure scene safety (to protect providers from unseen threats)
Treat respiratory distress according to protocol
Consider upper airway swelling due to thermal burn
Consider BiPAP/CPAP as necessary

CYANIDE POISONING

Cyanide toxicity should considered in the hemodynamically unstable patient removed from a fire and in occupational smoke exposures (e.g., firefighting), industrial accidents, natural catastrophes, suicide attempts, chemical warfare, etc.

Signs/symptoms of cyanide exposure (inhalation, ingestion, or absorption) may include anxiety, vertigo, weakness, headache, tachypnea, nausea, dyspnea, vomiting, and tachycardia, hypotension, altered mental status, seizures, respiratory depression, cardiac dysrhythmias, etc.

Cyanide Treatment and Interventions:

- Apply 100% oxygen via non-rebreather mask and manage airway as
- Administer hydroxocobalamin for symptomatic smoke inhalation and/or cardiac arrest due to suspected exposure to cyanide. (see hydroxocobalamin formulary situation)
- **Pulse oximetry accurately reflects serum levels of oxygen but does not accurately reflect tissue oxygen levels therefore should not be relied upon in possible cyanide and/or carbon monoxide toxicity. After hydroxocobalamin has been administered, pulse oximetry levels are no longer accurate**
- Treatment decisions must be made based on clinical history and signs and symptoms of cyanide poisoning. For the patient with an appropriate history and manifesting one or more significant cyanide exposure signs or symptoms, treat with hydroxocobalamin (cyanokit procedure)

HYDROXOCOBALAMIN/CYANOKIT PROCEDURE

- If clinical suspicion of cyanide poisoning is high, CYANOKIT® should be administered without delay
- In cardiac arrest, infuse CYANOKIT® ON A SEPARATE IV LINE
- If signs/symptoms persist, may consider contacting medical control to administer an additional 5g dose of CYANOKIT® over 15-120 minutes
- When mixing, rock the vial gently for 60 seconds – do not shake! Please discard if solution is not deep red in color, or particulate matter is visible
- Medication may cause transient hypertension
- **Highly interacts with other medications so should be given in a dedicated IV line**
- Administer with included drop set. Attach stopcock to end of drop set. Use 30ml syringe to administer 200ml over 20 minutes.

Considerations

Considerations for crews on scene prior to ambulance arrival.

1. Remove patient from toxic environment
2. Provide oxygen
3. Obtain (SAMPLE)
4. Obtain CO reading if possible
5. Obtain baseline vitals
6. Give full report to arriving paramedic of all information gathered, treatments rendered, and whether the patient would like to be transported