

**REGION I EMERGENCY MEDICAL SERVICES
STANDING MEDICAL ORDERS
EMT-Basic, Intermediate, Paramedic**

SMO: Carbon Monoxide Exposure

Overview: Carbon monoxide is a colorless, odorless, tasteless gas produced by incomplete combustion of carbon-containing fuels. Carbon monoxide does not physically harm lung tissue, but it causes a reversible displacement of oxygen in the hemoglobin. The result is low circulating volumes of oxygen. Tissues become hypoxic before oxygen is released from the hemoglobin to fuel the cells.

INFORMATION NEEDED

- Type of exposure to patient
- Scene is safe
- Patient respiratory symptoms

OBJECTIVE FINDINGS

- Headache
- Irritability
- Vomiting
- Chest pain
- Loss of coordination
- Cyanosis
- Loss of consciousness
- Cherry red skin color (late sign)

TREATMENT

- Remove patient from source to fresh air.
- ROUTINE MEDICAL CARE
- Keep patient quiet as possible to decrease oxygen requirements.
- Treat per appropriate SMO for:
 - Cardiac Arrest
 - Cardiac Dysrhythmia
 - Pulmonary Edema

Documentation of adherence to SMO:

- Patient removed from CO environment
- 100% oxygen administered to patient

PRECAUTIONS AND COMMENTS

- **NOTE** Pulse oximeter gives false elevated readings in CO poisoning.
- Don't assume levels of CO are always consistent with the patient's smoking or occupational history.
- You should primarily be looking for altered levels of consciousness and flu-like symptoms

CARBOXYHEMOGLOBIN LEVELS & CLINICAL MANIFESTATIONS

<u>% COHb</u>	<u>MANIFESTATIONS</u>	<u>TREATMENT AND TRANSPORT DECISION</u>
5	Mild headache	100% O ₂
10	Mild headache, shortness of breath with vigorous exertion	100% O ₂
10 - 20	Mild headache, shortness of breath with moderate exertion	100% O ₂
20 - 30	Worsening headache, nausea, dizziness, fatigue	Hyperbaric O ₂
30 - 40	Severe headache, vomiting, vertigo, altered judgement	Hyperbaric O ₂
40 - 50	Confusion, syncope, tachycardia	Hyperbaric O ₂
50 - 60	Seizures, shock, apnea, coma	Hyperbaric O ₂
60 - 70	Seizures, coma, cardiac arrhythmias, death	Hyperbaric O ₂
> 70	Death within minutes	Hyperbaric O ₂

COHb Levels in Persons 3-74 Years Of Age

<u>Smoking Status</u>	<u>COHb %</u> (mean ± SD)	<u>COHb %</u> (98 th percentile)
Nonsmokers	0.83 ± 0.67	≤ 2.50
Current Smokers	4.30 ± 2.55	≤ 10.00
All smoking statuses combined	1.94 ± 2.24	≤ 9.00

**REGION I EMERGENCY MEDICAL SERVICES
STANDING MEDICAL ORDERS
EMT-Basic, Intermediate, Paramedic**

Procedure: Pulse CO-Oximeter

Overview: A recently introduced pulse oximeter, the Rad-57 pulse CO-oximeter, has the capability to measure blood carbon monoxide (SpCO) levels as well as arterial hemoglobin oxygen saturation (SpO₂) and pulse rate. Carbon monoxide (CO) is a colorless, odorless, and poisonous gas that kills or permanently harms thousands of people each year. It is the leading cause of accidental poisoning in the US. Approximately 500 people die annually from unintentional CO exposure, and there are more than 40,000 reported emergency department visits resulting from CO poisoning each year. Carbon monoxide is a byproduct of combustion, with the most common sources including fire, exhaust from automobiles, gas furnaces and ovens, propane and kerosene heaters, and charcoal grills. Carbon monoxide is harmful when inhaled because it binds to the hemoglobin in red blood cells 200 times more strongly than oxygen, producing carboxyhemoglobin (COHb). Carboxyhemoglobin decreases the oxygen carrying capacity of the blood, thereby reducing the amount of oxygen delivered to the tissues and vital organs.

The general symptoms of CO poisoning are vague, including headache, dizziness, nausea, fatigue, and weakness. See Table 1. Patients with acute CO poisoning are more likely to present with more serious symptoms, such as cardiopulmonary problems, confusion, syncope, coma, and seizure. Chronic poisoning is generally associated with the less severe symptoms.

Smokers present with higher levels of COHb than do non-smokers. See Table 2. The COHb level in non-smokers is approximately one to two percent. In patients who smoke, a baseline level of nearly five percent is considered normal, although it can be as high as 13 percent. Although COHb concentrations between 11 percent and 30 percent can produce symptoms, it is important to consider the patient's smoking status.

OBJECTIVE FINDINGS

- Victim or victims with signs and symptoms of CO poisoning
- CO indicated by CO detector, either residential or Fire Department

PROCEDURE

- Immediately remove yourself, your crew, and the patient to an area of fresh air if CO is suspected or indicated by a CO detector.
- Place the patient on 100% O₂ by NRB mask.
- Turn on the pulse CO-oximeter
- Clip the sensor onto your patient's finger, toe, or earlobe. The manufacturer recommends the patient's third (ring) finger as it is usually less callused and/or scarred.
- Note patient's pulse and SpO₂
- Press the appropriate button to initiate blood CO detection.
- Contact Medical Control and/or refer to flowchart below when a reading is achieved.

Documentation of adherence to SMO:

- Pulse and SpO₂
- SpCO
- Treatment rendered
- Contact with Medical Control

PRECAUTIONS AND COMMENTS

- This device only measures CO levels, not other gases, such as cyanide, methane, radon, arsine, etc.
- Don't assume levels of CO are always consistent with the patient's smoking or occupational history.
- You should primarily be looking for altered levels of consciousness and flu-like symptoms

Table 1: Clinical Signs & Symptoms Associated With CO Poisoning and Correlated COHb levels		
Severity	COHb Level	Signs & Symptoms
Mild	<15 - 20%	Headache, Nausea, Vomiting, Dizziness, Blurred Vision.
Moderate	21 - 40%*	Confusion, Syncope, Chest Pain, Dyspnea, Weakness, Tachycardia, Tachypnea, Rhabdomyolysis
Severe	41 - 59%*	Palpitations, Dysrhythmias, Hypotension, Myocardial ischemia, Cardiac arrest, Respiratory arrest, Pulmonary edema, Seizures; Coma
Fatal	60+%	Death
* At moderate to severe levels of COHb poisoning the correlation between blood levels and symptomatology is poor.		

Table 2: COHb Levels in Persons 3-74 Years Of Age		
Smoking Status	COHb % (mean ± SD)	COHb % (98th percentile)
Nonsmokers	0.83 ± 0.67	≤ 2.50
Current Smokers	4.30 ± 2.55	≤ 10.00
All smoking statuses combined	1.94 ± 2.24	≤ 9.00

FLOWCHART

