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Boston EMS

STANDARD OPERATING PROCEDURE



Title: Use of the Rad-57tm for Carbon Monoxide Exposure in the Prehospital

Setting

Supersedes: 8-20-06

Effective: 10-23-06

Authorized: C1(RS)/MD1(PM)

Purpose

Carbon monoxide poisoning is one of the single most common poisoning exposure in the United States. Carbon monoxide, or CO, is an odorless, colorless gas that can cause sudden illness and death. Carbon monoxide is found in combustion fumes, such as those produced by cars and trucks, gasoline engines, camp stoves, lanterns, burning charcoal and wood, gas ranges, heating systems, generators and poorly vented chimneys. Structural fires are another common source of CO exposure for both victims and fire fighters. Carbon monoxide from these sources can build up in enclosed or semi-enclosed spaces. Breathing it can poison people and animals in these spaces. All people and animals are at risk for carbon monoxide poisoning. Certain groups including pregnant women/fetuses, infants, and people with chronic heart disease, anemia, or respiratory problems are more susceptible to its effects.

CO toxicity causes impaired oxygen delivery and utilization at the cellular level. CO affects several different sites within the body but has its most profound impact on the organs with the highest oxygen requirement (e.g., brain, heart). Misdiagnosis commonly occurs because of the vagueness and broad spectrum of complaints. Symptoms often are attributed to a viral illness, frequently “the flu” in winter months. It is important to remember that symptoms may not correlate well with measured HbCO levels.

The following list includes commonly recognized symptoms associated with carbon monoxide poisoning. Any of the following should alert suspicion if related to a potential source of CO and when more than one patient in a group or household presents with similar complaints at the same time:

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|-------------------------------------|---------------------|------------------------------|
| Malaise, flu like symptoms, fatigue | Dyspnea on exertion | Coma |
| Chest pain, palpitations | Lethargy | Headache, drowsiness |
| Confusion | Depression | Syncope, seizure |
| Impulsiveness | Distractibility | Dizziness, weakness, |
| Hallucination, confabulation | Agitation | Memory and gait disturbances |
| Nausea, vomiting, diarrhea | Visual disturbance | Abdominal pain |
| Fecal and urinary incontinence | | |

Carbon monoxide should be a diagnosis of exclusion, within the scope of pre-hospital practice. Common, identifiable causes of the above symptoms should be entertained. For example, hypoglycemia or drug overdose.

Not just a winter phenomenon, carbon monoxide poisoning has been seen in other climates and seasons after natural disasters, when residents use generators or pumps which are not properly ventilated. Any process which burns fuel [gasoline, diesel, kerosene, propane, natural gas, charcoal, wood etc.] in an engine, heater or construction equipment can emit C.O.

Additional information that is helpful in assessing carbon monoxide exposure includes presence of detectors as well as environmental readings on the environment available from BFD, Inspectional Services or utilities such as Keyspan.

Rad-57 Operation

Masimo Rainbow™ SET Pulse CO-Oximetry™. Rainbow technology combines the latest in system theory, adaptive signal processing and a sensor that employs eight wavelengths of light to collect and analyze physiological data. Processing of this data allows it to accurately measure carbon monoxide (SpCO™). This device was FDA approved in 2005. Clinically proven accuracy up to 40% SpCO (+/- 3%). The device will also read carboxyhemoglobin at levels above 40%.

- Ideal operating temperatures are 41-104 degrees F with storage temperatures between -40 to 158 degrees F. As with all biological sensors, dropping the device might lead to damage. The finger probe is not compatible with other devices. The finger probe should be kept with the device at all times. The device should also not be submerged or be exposed to very wet conditions.
- Attach probe to patient prior to turning on the device.
- The Rad-57 will display a standard O2 saturation (SpO2) and perfusion index.
- Make sure the probe is seated on the finger, with light sensors going thru the nailbed
- Attention to the directional markings on the finger probe, false readings can be generated from incorrect seating of the probe on the finger
- The sensing light for the Rad-57 is sensitive to certain waves of light, shielding probe under clothing, blanket or with your hand will be helpful if you are not getting a reading with the Rad-57
- To change to the carboxyhemoglobin display, press the button labeled 'SpCO'. The carboxyhemoglobin will be displayed as a number on the upper readout as '%SpCO'. The Rad-57 can be used to spot check patients, as trending is not necessary in most situations.
- Inaccurate SpCO readings can be seen in the setting of significant methemoglobin, abnormal hemoglobin levels, low arterial perfusion, intravascular dye or sickle cell anemia
- All elevated readings above 12% should be reconfirmed on another digit
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The SpCO reading is to be use as a screening measure. Definitive carboxyhemoglobin determinations should be performed via blood draw. The level in combination with signs and symptoms will assist the physician in making determinations about treatment options. In the prehospital setting any patient with suspected carbon monoxide poisoning should receive oxygen by a non-rebreather mask, unless otherwise contraindicated.

Documentation

Patients SpCO% reading must be documented as part of the Patient Care Report. In the case of a multiple patients, the SpCO% should be documented on triage tag. In addition, a 'Carbon Monoxide Report Sheet' should be filled out and returned to the Shift Commander. The form should be forwarded to Dr. Dyer, as part of our on going QI/QA for this device.

Trouble Shooting the Rad-57

- Not getting a reading? Check finger placement, shut machine off then on
- Check correlating heart rate
- Check correlating perfusion index on right upper hand side of machine
- ? remove nail polish, purple and metallic nail colors might interfere
- Works best on non-dominant hand, 3rd and 4th fingers if the patient's hands are heavily calloused
- Patients with anemia or sickle cell anemia might have incorrect readings, definitive testing with blood gas is indicated if the patient has exposure and symptoms, as with all patients.

Special Considerations

Pediatric Patients

Rad-57 probe is not intended for use on patients under 30 kg.

Smokers

Cigarette smoke produces some degree of carbon monoxide. Heavy smokers can have carboxyhemoglobin levels up to 10%. Smoking status should be taken into consideration and this information combined with symptoms and history of environmental carbon monoxide.

Pregnant Women

Pregnant women maybe at higher risk in carbon monoxide situations. This is because of the increased susceptibility of the fetus to the effects of carbon monoxide. The fetal SpCO% maybe 10-15% higher than the maternal readings. All pregnant women with possible CO exposure should be encouraged to have definitive COHb blood levels and physician evaluation.

Multiple Patient Events

The Rad-57 could be most useful as an early screening tool. It may prove to be helpful in decisions to prioritize patients for transportation and in selecting hospital destinations for a multiple casualty incident. For any event with more than 5 patients involving possible CO exposure, the medical director or his designee should be contacted.

Rad-57 readings should not be the sole determining factor in treating carbon monoxide exposure. Like any biological monitor, data should be considered in combination with history of exposure (chronic vs. acute) with attention to signs, symptoms and any special considerations. Treat all possibly exposed patients with high concentration oxygen if there is any doubt.

Treatment

Initial treatment for all levels of carbon monoxide exposure is oxygen either by non-rebreather mask or via ETT for the patient unable to control his/her airway. In addition, to considering other causes for presenting symptoms within the scope of EMS practice. For example, blood glucose for altered mental status or 12 lead ECG for chest pain. Definitive treatment for some elevated levels of carboxyhemoglobin included persistent oxygen therapy and/or hyperbaric oxygen. Decisions for hyperbaric oxygen therapy are made with definitive blood levels of carbon monoxide as well as history and physical exam. On occasionally, neuropsychiatric testing will be utilized.