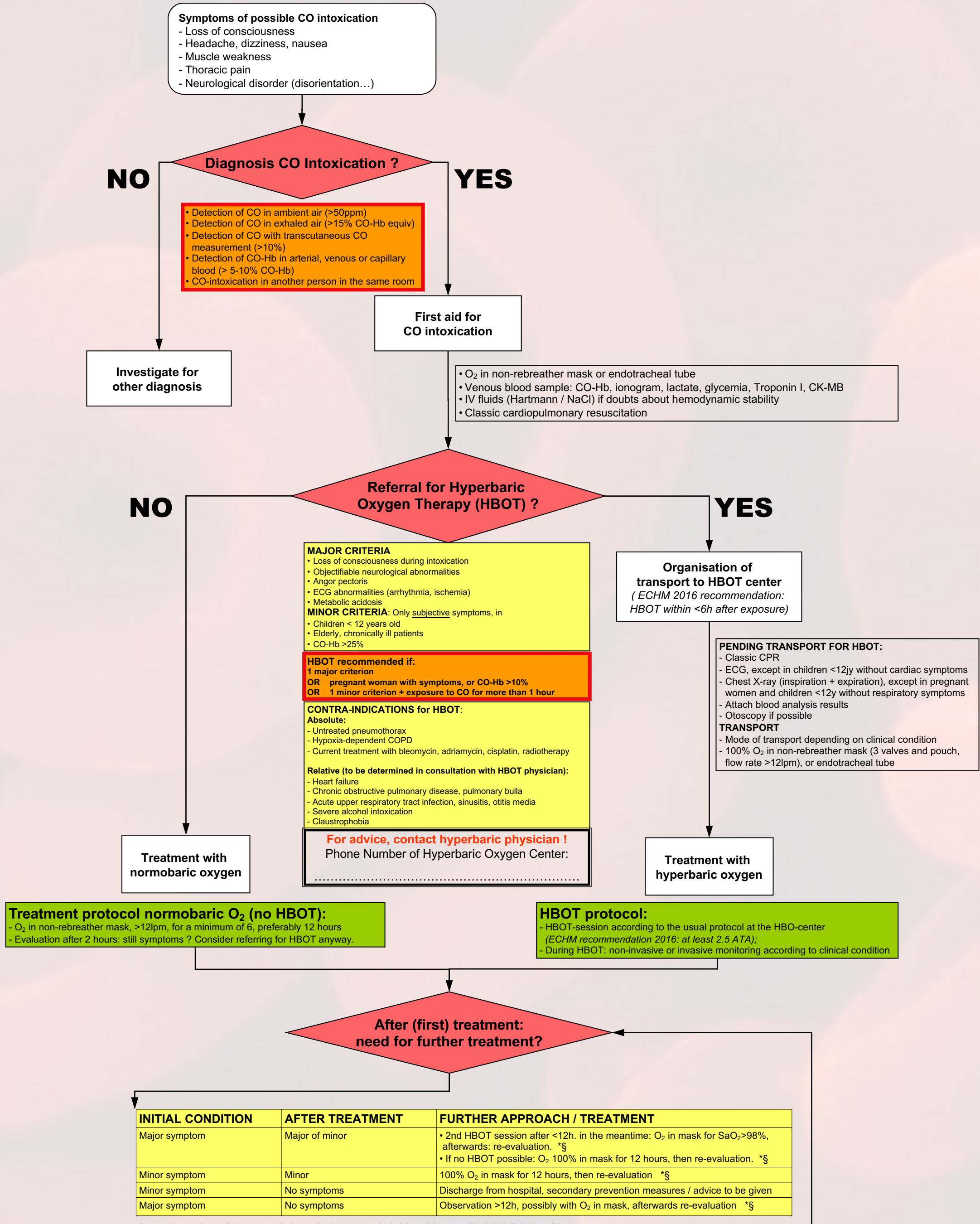


Decision tree and algorithm for the management of carbon monoxide intoxication

(pre-hospital – primary hospital – HBO hospital)



Symptoms of possible CO intoxication
 - Loss of consciousness
 - Headache, dizziness, nausea
 - Muscle weakness
 - Thoracic pain
 - Neurological disorder (disorientation...)

Diagnosis CO Intoxication ?

- Detection of CO in ambient air (>50ppm)
- Detection of CO in exhaled air (>15% CO-Hb equiv)
- Detection of CO with transcutaneous CO measurement (>10%)
- Detection of CO-Hb in arterial, venous or capillary blood (> 5-10% CO-Hb)
- CO-intoxication in another person in the same room

First aid for CO intoxication

- O₂ in non-rebreather mask or endotracheal tube
- Venous blood sample: CO-Hb, ionogram, lactate, glycemia, Troponin I, CK-MB
- IV fluids (Hartmann / NaCl) if doubts about hemodynamic stability
- Classic cardiopulmonary resuscitation

Referral for Hyperbaric Oxygen Therapy (HBOT) ?

- MAJOR CRITERIA**
- Loss of consciousness during intoxication
 - Objectifiable neurological abnormalities
 - Angor pectoris
 - ECG abnormalities (arrhythmia, ischemia)
 - Metabolic acidosis
- MINOR CRITERIA:** Only subjective symptoms, in
- Children < 12 years old
 - Elderly, chronically ill patients
 - CO-Hb >25%

HBOT recommended if:
 1 major criterion
 OR pregnant woman with symptoms, or CO-Hb >10%
 OR 1 minor criterion + exposure to CO for more than 1 hour

- CONTRA-INDICATIONS for HBOT:**
- Absolute:**
- Untreated pneumothorax
 - Hypoxia-dependent COPD
 - Current treatment with bleomycin, adriamycin, cisplatin, radiotherapy
- Relative (to be determined in consultation with HBOT physician):**
- Heart failure
 - Chronic obstructive pulmonary disease, pulmonary bulla
 - Acute upper respiratory tract infection, sinusitis, otitis media
 - Severe alcohol intoxication
 - Claustrophobia

For advice, contact hyperbaric physician !
 Phone Number of Hyperbaric Oxygen Center:

Organisation of transport to HBOT center
 (ECHM 2016 recommendation: HBOT within <6h after exposure)

- PENDING TRANSPORT FOR HBOT:**
- Classic CPR
 - ECG, except in children <12y without cardiac symptoms
 - Chest X-ray (inspiration + expiration), except in pregnant women and children <12y without respiratory symptoms
 - Attach blood analysis results
 - Otoscopy if possible
- TRANSPORT**
- Mode of transport depending on clinical condition
 - 100% O₂ in non-rebreather mask (3 valves and pouch, flow rate >12lpm), or endotracheal tube

Treatment with normobaric oxygen

Treatment with hyperbaric oxygen

Treatment protocol normobaric O₂ (no HBOT):
 - O₂ in non-rebreather mask, >12lpm, for a minimum of 6, preferably 12 hours
 - Evaluation after 2 hours: still symptoms? Consider referring for HBOT anyway.

HBOT protocol:
 - HBOT-session according to the usual protocol at the HBO-center (ECHM recommendation 2016: at least 2.5 ATA);
 - During HBOT: non-invasive or invasive monitoring according to clinical condition

After (first) treatment: need for further treatment?

INITIAL CONDITION	AFTER TREATMENT	FURTHER APPROACH / TREATMENT
Major symptom	Major or minor	• 2nd HBOT session after <12h. in the meantime: O ₂ in mask for SaO ₂ >98%, afterwards: re-evaluation. *§ • If no HBOT possible: O ₂ 100% in mask for 12 hours, then re-evaluation. *§
Minor symptom	Minor	100% O ₂ in mask for 12 hours, then re-evaluation *§
Minor symptom	No symptoms	Discharge from hospital, secondary prevention measures / advice to be given
Major symptom	No symptoms	Observation >12h, possibly with O ₂ in mask, afterwards re-evaluation *§

*: re-evaluation by cardiologist, neurologist, pediatrician, gynecologist/obstetrician according initial clinical condition
 §: after evaluation, go back to column "after treatment" to determine further approach/treatment