

## SEPSIS

Emergency medical service providers transfer approximately 50% of septic patients. These patients are at increased risk of death if sepsis progresses to septic shock. Without timely identification of sepsis, and prompt intervention methods to decrease the infection's severity, an individual's likelihood of mortality increases. According to a study published in the Journal of Emergency Medicine patients of EMS providers who were trained on a severe sepsis alert protocol that included prehospital sepsis screening who alerted the receiving ED had a lower mortality rate of 13.6%, compared to the overall mortality rate of 26.7% in patients transported by EMS without following a sepsis alert criteria.

Guerra WF, Mayfield TR, Meyers MS, Clouatre AE, Riccio JC. Early detection and treatment of patients with severe sepsis by prehospital personnel. J Emerg Med. 2013 Jun;44(6):1116-25. doi: 10.1016/j.jemermed.2012.11.003. Epub 2013 Jan 13. PMID: 23321295.

### [Sepsis: First Response](#)

## IDENTIFICATION TOOLS

The clinical indicator of metabolic distress has been lactate monitoring. The problem is that most EMS systems do not monitor lactate in the field leaving EMS systems reliant on finding a surrogate for lactate monitoring. Quantitative waveform capnography can be used as a surrogate for lactate monitoring in detecting metabolic distress in sepsis patients.

For our purposes, a serum lactate level of 4 mmol/L is considered a reliable indicator of metabolic distress, and often presents itself well before hypotension occurs. When organ hypoperfusion occurs, serum lactate levels rise precipitously, and lactic acidosis follows soon thereafter. The body's physiologic response is to increase respiratory rate to attenuate the metabolic acidosis. There is an inverse relationship between serum lactate levels and end-tidal CO<sub>2</sub> (ETCO<sub>2</sub>); as lactate rises, carbon dioxide levels fall. ETCO<sub>2</sub> levels have been shown to be an accurate predictor of mortality in patients with severe sepsis and septic shock and Hunter, et al found that ETCO<sub>2</sub> levels less than 25 mm Hg are strongly associated with serum lactate levels > 4 mmol/L.

Hunter CL, Silvestri S, Dean M, Falk JL, Papa L. End-tidal carbon dioxide is associated with mortality and lactate in patients with suspected sepsis. American Journal of Emergency Medicine. 2013 Jan; 31(1):64-71.

McGillicuddy DC, Tang A, Cataldo L, Gusev J, Shapiro NI. Evaluation of end-tidal carbon dioxide role in predicting elevated SOFA scores and lactic acidosis. Internal Emergency Medicine. 2009 Feb; 4(1):41-4.

### [JEMS - Using ETCO<sub>2</sub> to detect Sepsis](#)

## TREATMENT

In the prehospital setting, the septic patient should receive a thorough assessment, appropriate airway management, high-flow oxygen and fluid resuscitation. If the patient is hypotensive after being properly fluid resuscitated, the use of norepinephrine may be considered.

[Medication Review: Norepinephrine \(Levophed\)](#)

### **NOREPINEPHRINE** **(LEVOPHED)**

#### **THERAPEUTIC EFFECTS**

Onset: 1-2 minutes

Peripheral vasoconstriction is primary mechanism of action. Norepinephrine is also a positive inotropic medication.

#### **INDICATIONS**

Neurogenic, cardiogenic, septic shock. Severe hypotension refractory to fluid resuscitation.

#### **CONTRAINDICATIONS**

Hypovolemia without adequate fluid resuscitation.

#### **ADVERSE REACTIONS**

Administration of Norepinephrine may cause anxiety, hypertension, headache, palpitations.

#### **DOSAGE AND ADMINISTRATION**

Adult: 1-30 mcg/min (**Initiation of Levophed should be done at 1 mcg/min and titrated to maintain a systolic blood pressure of 90 mmHg or a MAP of 65**).

Pediatric: Rarely indicated. 0.01-0.3 mcg/kg/min for shock. Consult medical control.

\*\*\*Patients with profound septic shock may require higher doses of Norepinephrine\*\*\*

\*\*\*Patients requiring higher doses may require a second pressor. Contact medical control\*\*\*

## **NOREPINEPHRINE (LEVOPHED) DOSING GUIDELINES**

- Add 4 milligrams of Norepinephrine to 250 mL of D5W. This results in a 16 microgram/milliliter solution.
- Initiate infusion at 1 mcg/min. \*\*\*Must use IV pump\*\*\*
- Label medication with orange label

### **IV PUMP INFORMATION**

- ICAS IV pumps are setup for 8 mg/500 mL
- No change is needed as concentration is the same. Input the desired dose per minute and begin infusion.
- Monitor blood pressure closely.

<b>Norepinephrine (Levophed) Drip Rates</b>								
Dose mcg/min	1	2	4	8	12	16	20	24
Rate mL/hr	4	8	15	30	45	60	75	90

## **CPAP**

[JEMS: How CPAP is making a massive difference](#)

[GO-PAP Inservicing Video](#)

## **CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP)**

### **Purpose:**

Continuous Positive Airway Pressure has been shown to rapidly improve vital signs, gas exchange, the work of breathing, decrease the sense of dyspnea, and decrease the need for endotracheal intubation in the patients who suffer from shortness of breath from congestive heart failure and acute carcinogenic pulmonary edema. CPAP is also shown to improve dyspnea associated with pneumonia, (COPD) chronic obstructive pulmonary disease (asthma, bronchitis, & emphysema). In patients with CHF, CPAP improves hemodynamics by reducing preload and afterload.

### **Indications:**

Dyspnea / Hypoxemia secondary to congestive heart failure (CHF), acute carcinogenic pulmonary edema pneumonia, (COPD) - chronic obstructive pulmonary disease (asthma, bronchitis, emphysema) and:

- A. Any patient who is complaining of shortness of breath for reasons other than pneumothorax
- B. Is awake and oriented
- C. Has the ability to maintain an open airway (GCS>10)
- D. Has a systolic blood pressure above 90 mmHg
- E. Uses accessory muscles during respirations
- F. Sign and Symptoms consistent with asthma, COPD, pulmonary edema, CHF, or pneumonia

### **Contraindications**

Do NOT use if patient has:

- 1. Pneumothorax
- 2. Tracheostomy
- 3. Respiratory arrest
- 4. Agonal respirations
- 5. Unconscious
- 6. Shock associated with cardiac insufficiency
- 7. Penetrating chest trauma
- 8. Persistent nausea/vomiting
- 9. Facial anomalies / stroke obtundation / facial trauma

## **10. Pediatrics – Do not use for children under 12 years of age**

### **Precautions:**

Use care if patient:

- A. Has impaired mental status and is not able to cooperate with the procedure
- B. Had failed at past attempts at non-invasive ventilation
- C. Has active upper GI bleeding or history of recent gastric surgery
- D. Complains of nausea or vomiting
- E. Has inadequate respiratory effort
- F. Has excessive secretions
- G. Has facial deformity that prevents the use of CPAP mask
- H. CPAP should not be used with portable O<sub>2</sub> because of the large amount of oxygen it takes to operate the device
- I. Use Intubation if:
  - a. Respiratory or cardiac arrest
  - b. Unresponsive to verbal stimuli (GCS is <9)

### **Procedure:**

1. Make sure the patient does not have a pneumothorax!
2. Place patient in a sitting position
3. Assess vital signs and SpO<sub>2</sub> q5 min
4. Attach heart monitor and pulse oximeter (SAO<sub>2</sub>)
5. If BP <90 systolic contact Medical Control prior to beginning CPAP
6. Use 1-10cmH<sub>2</sub>O
7. Explain the procedure to the patient:
  - i. Patient requires “verbal sedation” to be used effectively.
    - a. Example: “You are going to feel some pressure from the mask but this will help you breathe easier.”
  - ii. Place delivery device over mouth and nose.
  - iii. Instruct patient to breath in through their nose slowly and exhale through their mouth as long as possible (count slowly and aloud to four, then instruct to inhale slowly).

8. Check for air leaks
9. Treatment should be given continuously throughout transport to ED.
10. Continue to coach patient to keep mask in place and readjust as needed
11. If respiratory status / level of consciousness deteriorates, remove device and consider bag valve mask ventilation and/or endotracheal intubation (see intubation protocol)
12. Documentation on the patient care record should include:
  - a. CPAP level →(10cmH<sub>2</sub>O) or “PEEP”
  - b. FiO<sub>2</sub> →(100%)
  - c. SpO<sub>2</sub> q5 minutes
  - d. Vital Sign q5 minutes
  - e. Response to treatment
  - f. Any adverse reactions

**Special Notes:**

1. Advise receiving hospital as soon as possible so they can prepare for the patient's arrival
2. Do not remove CPAP until hospital therapy is ready to be placed on the patient
3. Most patients will improve in 5-10 minutes. If no improvement, consider positive pressure ventilation
4. Monitor patient for gastric distension which may lead to vomiting
5. Use nitroglycerine tablets if needed – this avoids nitroglycerine spray from being dispersed on patient/EMS crew
6. May be the treatment of choice for a patient with a DNR order