CHF/Pulmonary Edema Administrative Guideline

History	Signs and Symptom	Differential
• Congestive heart failure • Medications (digoxin, Lasix, Viagra/sildenafil, Levitra/vardenafil, Cialis/tadalafil) • Cardiac history/past myocardial infarction	• Respiratory distress • Crackles on lung exam • Jugular vein distention • Frothy/pink sputum • Peripheral edema, diaphoresis • Hypotension, shock • Chest pain	• CHF exacerbation • MI • Asthma/COPD/Pneumonia/PE • Pericardial effusion/tamponade • Aspiration • Noncardiogenic pulmonary edema

Respiratory distress with signs of fluid overload and pulmonary edema

B	Administer oxygen and titrate to SpO_2 of ≥ 94% May obtain 12 lead ECG for paramedic interpretation
P	Cardiac monitoring Perform 12-lead ECG and transmit when available
P	Administer **nitroglycerin 0.4 mg SL tab** if SBP > 110 mm Hg Repeat every 5 min to total of 3 doses, as BP allows Administer **aspirin 324 mg** PO chewed

STEMI ALERT
(STEMI = 1 mm ST segment elevation in ≥ 2 contiguous limb leads or 2 mm elevation in precordial leads (v leads)

Obtain second IV

Transport patient to **Cardiac Receiving Center** or **Certified Chest Pain Center** with 24/7 cath lab capabilities

Patients without STEMI can be transported to the nearest receiving facility

No clinical improvement; continued hypoxia or respiratory distress

B	Administer CPAP if SBP > 90 Begin with **5 cmH_2O,** increase by 2.5cm cmH_2O increments up to a **max of 10 cmH_2O**
P	*For patients with agitation that interferes with necessary patient care* Administer **midazolam 0.05 mg/kg IM/IV/IO (max dose 2.5 mg)** **May repeat x 1 after 10 minutes to a max total dose of 5 mg IV/IO** **≤14 or > 65 years max initial and total doses are half** ***≤ 8 yrs: Contact Medical Direction for orders*** ***Use caution when patient at risk for hypotension, as midazolam administration will lower blood pressure.***

Education/Pearls

Heart failure describes a clinical syndrome in which the heart's ability to pump is impaired. When a patient experiences an increase in their fluid status (ingestion of excess fluid or salt) or a decrease in their heart's ability to pump (such as a myocardial infarction or valve failure), a heart failure exacerbation may occur. Pulmonary edema is a dangerous consequence and can impair breathing and gas exchange. Commonly, patients with heart failure may not tolerate lying supine and may complain of chest pain, shortness of breath, or sudden night-time awakening. Prehospital treatment goals include reducing the work of the heart with preload/afterload reduction (nitroglycerine and CPAP) and providing as needed ventilatory support with CPAP.

- ECG should be obtained on all patients, as STEMI may also be present
- Use care in administration of fluid in hypotension, as this may worsen respiratory status.

Nitroglycerin:
Nitroglycerin is beneficial in acute congestive heart failure (CHF) exacerbations due to its ability to reduce the workload on the heart and improve symptoms of pulmonary congestion. It acts primarily as a vasodilator, and its effects include:

1. **Reduction in Preload:** Nitroglycerin dilates the veins, which decreases the volume of blood returning to the heart (preload). This reduction in preload lessens the volume that the heart must pump, decreasing the pressure in the left ventricle. In patients with CHF, high preload often contributes to fluid backup in the lungs (pulmonary congestion), so reducing preload can relieve symptoms like shortness of breath.
2. **Reduction in Afterload (at higher doses):** Nitroglycerin also causes some arterial dilation at higher doses, reducing the pressure the heart has to pump against (afterload). By lowering afterload, it makes it easier for the left ventricle to eject blood, thus improving cardiac output and reducing strain on the heart muscle.
3. **Relief of Pulmonary Congestion:** By reducing both preload and afterload, nitroglycerin can rapidly relieve pulmonary congestion and reduce symptoms of dyspnea. This helps prevent further deterioration into severe respiratory distress or respiratory failure.
4. **Decrease in Myocardial Oxygen Demand:** With reduced workload on the heart, myocardial oxygen demand decreases, which is particularly beneficial if underlying ischemia is exacerbating heart failure symptoms.

Cautions:

- The use of **nitroglycerine is contraindicated** within 24-48 hours of the use of erectile dysfunction medication (sildenafil, tadalafil).
- Remember when providing nitroglycerin to patients with inferior STEMI patterns (II, III, aVF), that this may represent a right-sided MI, that could lead the patient to be more dependent on preload. These adverse events can by managed, as long as you are prepared to administer fluids if hypotension occurs. Monitor closely for hypotension after administration.
- Nitroglycerin may be repeated per dosing guidelines

Continuous Positive Airway Pressure (CPAP): CPAP, supports respiratory status in patients with evidence of pulmonary edema and assists in providing afterload reduction on the heart.

- Closely monitor vitals and mental status, and discontinue CPAP for shock, vomiting, or altered LOC.
- Patients with a decreased GCS and an inability to protect their airway are at risk for aspiration and should not receive CPAP.
- Consider Midazolam to assist with CPAP compliance. Benzodiazepines may precipitate respiratory depression or may worsen compliance with CPAP in patients who are already tired, already have altered LOC, or who have recent history of alcohol or drug ingestion. Benzodiazepines may also cause hypotension. All efforts at verbal coaching should be utilized prior to giving benzodiazepines for patients in respiratory distress.