

## Treating Congestive Heart Failure with CPAP

Congestive Heart Failure (CHF) is defined as, *“excessive blood or fluid in the lungs or body tissues caused by the failure of ventricles to pump blood effectively”*. The condition is termed congestive because the fluids congest, or clog the organs. It is termed heart failure because the congestion both results from and also aggravates failure of the heart to function properly.

CHF occurs when the left ventricle cannot pump out the amount of blood entering the ventricle, or when the ventricle is damaged and cannot effectively pump enough blood to meet the body's requirements. It may also occur due to a build up of excess fluid in the body due to kidneys being damaged or not functioning properly due to disease.

Blood begins to congest in the lungs (pulmonary edema). The work of breathing increases as the airways are obstructed by the fluids, impeding the flow of air into the lungs. The alveoli are unable to exchange gases effectively creating severe shortness of breath in patients. As the condition worsens, this congestion will eventually cause the right ventricle to fail. When this occurs, valuable blood supply (oxygen and nutrients) to the body's cells are seriously disrupted, and the waste products of metabolism are no longer eliminated effectively causing these toxins to accumulate and ultimately causing cell death.

CPAP (Continuous Positive Airway Pressure)

EMS Providers play a large role in the emergency management of the patients suffering from Congestive Heart Failure. CPAP is a form of Non-invasive Positive Pressure

Ventilation (NPPV) which is becoming increasingly popular in the field management of the patient suffering from CHF. CPAP can save precious seconds when managing a patient with CHF, avoiding intubation and its associated field and long term concerns and side effects.

For CPAP to work the patient must be able to breathe spontaneously to benefit from this patient management protocol. The patient breathes through a pressurized circuit against a set threshold resistor that keeps the airway pressure at a pre-set level, which may be monitored on an airway pressure gauge.

The inspiratory and expiratory pressures must remain positive during the full respiratory cycle for CPAP to function correctly.

If the patient moves into respiratory arrest during CPAP treatment, the rescuer will be required to provide artificial ventilation will be required via a bag-valve-mask or automatic ventilator.

Some transport ventilators like the eSeries from O-Two Medical Technologies provide CPAP within their operating modes. They also have the additional benefit of monitoring the patient and, if the patient stops breathing, will automatically warn the rescuer and at the same time switch to Assist Control volume ventilation. This is achieved without the operator's input.

CPAP is a great tool in the pre-hospital treatment of CHF as well as many other respiratory conditions including Pulmonary Emphysema and even Asthma!

## CPAP

- Improves the ability of the alveoli to diffuse oxygen to the red blood cells, by using pressure to drive gas into the alveoli and open up unused or collapsed alveoli.
- Increases the resistance of gas flow during exhalation providing resistance to the exiting airflow of gas from the lungs.
- Can lessen the shortness of breath experienced by the patient by improving the performance of the heart. Ventilation improves and airway secretions are removed improving oxygenation and CO2 removal.
- Also helps by increasing intrathoracic pressure, causing an increase in cardiac output. It helps to reduce the need for CHF patients to be intubated and placed on a ventilator.
- Increases the chance that the patient can avoid an ICU stay on a ventilator and reducing the associated costs