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EMS News in Focus

EMS use of CPAP for respiratory emergencies

CPAP for emergency management of congestive heart failure and other respiratory emergencies has become the standard of care

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Editor's Note:

After seeing a number of inquiries about the potential uses for CPAP in COVID-19 treatment, we reached out to EMS1 contributors from the Montgomery County Hospital District, Robert Dickson, MD, FAAEM, FACEP, FACEM, MCHD medical director; and Casey Patrick, MD, MCHD assistant medical director, to get their take.

"The bottom line is to avoid all nebs in patients who are not in frank respiratory failure – and, if you have to give them – do it "in line" with NIV, only if you have the proper kit with filter," Dr. Dickson noted. Read more: Airway management adjustments in the era of COVID-19

The use of continuous positive airway pressure, commonly called CPAP, for the emergency management of congestive heart failure is rapidly becoming the new standard of care, replacing the traditional approaches of nitrates, diuretics and invasive airway

management. As CPAP becomes more commonplace, more uses for the technology have emerged.

POSITIVE PRESSURE: A BRIEF REVIEW

We covered the basic physiologic principles in the use of CPAP previously. As you might remember from your initial training, the exchange of carbon dioxide and oxygen gases occurs within the lung's alveoli. The walls of each alveolus is very thin, in order for the red blood cells to pick up oxygen molecules from each inspiration and for carbon dioxide to be released from the bloodstream during each exhalation.

The pressure created by CPAP is held constant throughout the breathing cycle; the patient will feel a small amount of "back pressure" during the exhalation phase. (Photo/Getty Images)

Within the alveolus is a liquid called surfactant, which reduces water surface tension within the space and keeps the alveolus open. Excess fluid from heart failure will disturb this balance, causing the alveoli to collapse and gas exchange to be compromised.

CPAP forces a small amount of air pressure through the pulmonary tree and into the alveoli, causing them to reopen. Additionally, the increased intrathoracic pressure will also reduce the patient's hypertensive state, allowing the fluid shift to occur more easily.

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MAINSTAY OF HEART FAILURE TREATMENT

The main use of CPAP in the field care setting is for the management of heart failure secondary to pulmonary hypertension. It has been shown to be highly effective in reducing the length of stay in hospitals and the overall cost of care to the patient.

It remains important to carefully monitor a patient's blood pressure prior to and during CPAP treatment. CPAP is not indicated for pulmonary edema secondary to cardiogenic shock.

Additionally, patients must be able to follow simple commands and have adequate ventilation ability in order to use CPAP.

OTHER USES FOR CPAP

EMS providers, depending on their local protocols, need to be aware of these additional uses for CPAP.

1. Bronchoconstriction

CPAP has been shown to be effective in managing asthma and COPD in patients in moderate to severe distress. It's believed that a combination of forcing the small bronchioles to open and allowing trapped air to be released from the alveoli provides relief from the acute event.

Several CPAP devices also allow bronchodilator medications to be nebulized and administered simultaneously with consistent and continuous positive pressure. Evaluate your CPAP supplies because an integrated nebulizer port is an additional feature and not available on every system.

2. Toxic inhalation

everal types of toxic gas, such as chlorine, can irritate and injure lower airway tissue, causing swelling, bronchospasm and noncardiogenic pulmonary edema.

Even larger airways, such as the main bronchioles, can be affected by smoke and other combustion byproducts.CPAP may offer relief in these situations.

3. Drowning

Water inhaled into the lungs during a drowning episode can cause atelectasis (collapse of the alveoli) and pulmonary edema. Water aspiration can worsen the ability of the lung tissue to exchange gases. There is some evidence that CPAP in these circumstances improves gas exchange.

4. Flail chest

Small studies have indicated that a patient with a significant flail chest can be safely managed with CPAP and pain control. In a flail chest, the ability to create adequate chest rise during inhalation is compromised through an unstable rib cage and significant pain.

Positive pressure ventilation through a bag-mask device requires training and careful use with such a spontaneously breathing patient. CPAP may provide better control of tidal volume in these circumstances.

5. Lung infections

Pneumonia and other infections in the lung can create a pulmonary-ventilation mismatch, where oxygen and carbon dioxide are unable to pass freely through the alveolar-capillary membrane.

CPAP appears to help improve gas diffusion in these cases, possibly by reducing inflammation of the cells and improving airflow to the alveoli.

SUMMARY

There are several states that permit basic EMTs to use CPAP within their scope of practice, including Illinois, Wisconsin and North Dakota. CPAP has been found to be safe to use, and it's easy to train and retain the information for CPAP.

Our understanding of CPAP and its uses in emergency field care will continue to expand as the technology develops and research continues. It will also become more widespread as the devices become less expensive.

It's clear that its use in heart failure is highly effective, giving the EMS provider a valuable tool in efforts to deliver high-quality care.

But there are other conditions that also appear to benefit from CPAP, making it a versatile technique to deploy quickly and easily in the field.

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About the author

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