

What is CPAP

CPAP (Continuous Positive Airway Pressure) is used to assist a sick or injured patient by supplying generally enriched air at above atmospheric pressure to the patient. CPAP maintains constant pressure during both inspiration and expiration of a spontaneously breathing patient. This keeps the smaller airways open and prevents the collapse of alveoli at the end of expiration, thereby minimizing the work of breathing. CPAP also produces an increase in pressure inside the chest, including the surface surrounding the heart. This makes it easier for the left ventricle to eject blood and reduces cardiac work through a reduction in left ventricular preload. CPAP may be used in this way to assist patients with “weakened” hearts. Concentrated oxygen supplies also assist patient recovery in a delicate state.

Evidence for the Use and Efficacy of CPAP

History

Negative pressure ventilators (iron lungs) were developed in the early 20th century to assist victims of poliomyelitis. However during Copenhagen’s polio epidemic in 1952 there was a shortage of negative pressure ventilators. Rather than let children die of respiratory failure, they were ventilated by medical students providing positive pressure through an endotracheal tube. This new approach caused the patient survival rate to improve from 10 to 90 percent. The advantages of positive pressure ventilation became abundantly clear causing a paradigm shift in the management of acute respiratory failure.

Today

CPAP has been used in the acute hospital setting for the last three decades and the efficacy of the applications is well documented. CPAP is now being regarded as being a basic standard of care in patients with acute heart failure and refractory hypoxemia due to pulmonary oedema.

CPAP may also have some benefit in patients with postoperative pulmonary complications, or in the early stages of acute respiratory distress syndrome (ARDS). It is also used as an adjuvant to physiotherapy in patients with secretion retention and focal areas of lung collapse.

The CPAP acute care applications have almost exclusively been confined to the acute care facilities. This restriction has been due to the characteristics of the equipment (bulky, high gas flow, non-portable) and the availability of trained personnel to operate the equipment. However, recent research has

demonstrated the efficacy of using CPAP in the pre-hospital setting by Emergency Medical Services. The results of these studies have shown:

- A significant decrease in the need for endotracheal intubation and artificial ventilation after CPAP by face mask was introduced for patients suffering from acute respiratory failure secondary to congestive heart failure/cardiac pulmonary oedema.
- A decrease in mortality rate and the length of admission for patients treated with CPAP.

Avoiding intubation negates complications from having to sedate or paralyze patients. Also once on a ventilator, patients have to be admitted to intensive care. Additional problems associated with intubation include increased risk of ventilator associated lung injury and barotraumas and nosocomial (hospital acquired) infections. Intubation also causes agitation, anxiety and discomfort in awakened patients. The patients require additional treatment with sedative and analgesic drugs. Excess sedation has been shown to increase intensive care length of stay by up to 30%. There is little doubt that managing patients on ventilators poses significant risk, is expensive and very resource intensive.