o_two INSIGHTS
Your Simple Path to Medical Findings

Moe Halawani, MD | O-Two Clinical Specialist

We simplify major findings into brief, straightforward summaries to keep you in the loop.

Insights into Disease-Specific Ventilation Strategies

1 Introcuction

Effective prehospital mechanical ventilation requires disease-specific strategies that align with in-hospital best practices to ensure optimal patient outcomes. Various conditions, such as COPD, hypercapnic respiratory failure, and cardiac arrest, present unique challenges that necessitate customized ventilation approaches. The following insights outline some recommended ventilation practices to prevent ventilator-induced lung injuries and improve the management of critically ill patients in the EMS setting.

2 Pre-Hospital Mechanical Ventilation

Prehospital mechanical ventilation techniques, strategies, and parameters should be disease-specific and mirror in-hospital best practices. Numerous studies of critically ill patients in the intensive care unit, emergency department, and operating room highlight best practices for mechanical ventilation to prevent ventilator-induced lung injury. The targeted ventilation parameters include:

- **Tidal Volumes:** 6 mL/kg of predicted body weight (range 4 to 8 mL/kg).
- **Plateau Pressure (Pplat):** Less than 30 cmH2O.
- **Driving Pressure (Pplat - PEEP):** Less than 15 cmH2O.

Although there are no prehospital data that formally validate these standards, it is reasonable to apply these parameters to the EMS setting.

www.otwo.com
45A Armthorpe Road, Brampton, ON, Canada, L6T 5M4
Telephone: +1 905 792-OTWO (6896) N.A. Toll Free: +1 800 387 3405
Facsimile: +1 905 799 1339 Email: resuscitation@otwo.com

Moe Halawani, MD | O-Two Clinical Specialist

Insights into Disease-Specific Ventilation Strategies

3 COPD

In Chronic Obstructive Pulmonary Disease (COPD), severe bronchospasm results in prolonged exhalation, causing air trapping and elevated carbon dioxide (CO2) levels.

Ventilation Strategy

1. **Tidal Volume (Vt):** Use low tidal volumes to limit plateau pressure to less than 30 cm H2O and to decrease the I:E ratio to allow an extended expiration to empty the hyperinflated COPD lung.

2. **Respiratory Rate (RR):** Set a low respiratory rate to avoid the development of auto-PEEP, and to allow for extended exhalation.

3. **FiO2:** Adjust to maintain oxygen saturation between 88-92%.

4. **PEEP:** Use PEEP but ensure it does not exceed intrinsic PEEP to lower the risk of dynamic hyperinflation.

4 Hypercapnic respiratory failure

Hypercapnic respiratory failure can result from various conditions, including sedative use or toxicological agents (such as narcotics), central nervous system disorders (such as infections or strokes), and respiratory muscular or thoracic problems (including neuromuscular disorders). Unlike COPD, these cases typically do not involve a primary lung issue. Instead, hypercapnia usually arises due to hypoventilation.

Ventilation Strategy

1. **Identify the etiologic factor:** Management should focus primarily on addressing the underlying cause of respiratory failure.

2. **Initiating the Mechanical Ventilation Support:** It should be initiated if there is ongoing respiratory failure or central nervous system (CNS) depression.

3. **Minute Ventilation (RR x Vt):** To correct hypercapnia, set a higher respiratory rate to ensure sufficient ventilation.

4. **Oxygen Saturations:** Maintain oxygen saturation at 94-98%.

www.otwo.com
45A Armthorpe Road, Brampton, ON, Canada, L6T 5M4
Telephone: +1 905 792-OTWO (6896) N.A. Toll Free: +1 800 387 3405
Facsimile: +1 905 799 1339 Email: resuscitation@otwo.com

Insights into Disease-Specific Ventilation Strategies

5 Cardiac Arrest

During cardiac arrest, the body experiences a low-flow state due to reduced cardiac output, leading to severe tissue hypoxia. The primary goal during resuscitation is to maximize oxygen delivery to tissues while maintaining effective chest compressions. Once an advanced airway is in place, follow the current ACLS recommendations for cardiac arrest resuscitation:

Ventilation Strategy

- **Maximal Inspired Oxygen (FiO2):** 100% should be supplied to improve tissue hypoxia.
- **Ventilation Rate:** Provide a ventilation rate of 10 breaths per minute during continuous uninterrupted chest compressions.
- **Post-ROSC Management:** The Return of Spontaneous Circulation (ROSC) indicates the restoration of a sustained, effective cardiac activity that improves tissue perfusion after cardiac arrest. Following the ROSC, the inspired oxygen levels should be adjusted to maintain oxygen saturations within the range of 94-98%.
- **Avoid Hyperventilation:** High minute ventilation or tidal volumes can increase intrathoracic pressures, reducing venous return to the heart and worsening cardiac output.

REFERENCES

The insights presented on this topic are derived from the following article. For a comprehensive review and more detailed information on this topic, please refer to the original text:

Baez, A. A., Qasim, Z., Wilcox, S., Weir, W. B., Loeffler, P., Golden, B. M., … Levy, M. (2022). Prehospital Mechanical Ventilation: An NAEMSP Position Statement and Resource Document. Prehospital Emergency Care, 26(sup1), 88–95. https://doi.org/10.1080/10903127.2021.1994676

MEDICAL DISCLAIMER

The medical information provided in these insights is derived from published sources and is intended only for educational and informational purposes. This information aims to enhance understanding and support ongoing learning within the medical community. It is not a substitute for local policies or the clinical judgment of healthcare professionals and does not constitute medical advice, diagnosis, or treatment. It is crucial to follow the officially authorized guidelines of your healthcare or EMS facility. Always consult your institution's specific protocols and policies before making any changes to patient care practices.

www.otwo.com
45A Armthorpe Road, Brampton, ON, Canada, L6T 5M4
Telephone: +1 905 792-OTWO (6896) N.A. Toll Free: +1 800 387 3405
Facsimile: +1 905 799 1339 Email: resuscitation@otwo.com