
Mechanical Ventilation in Adults with ARDS
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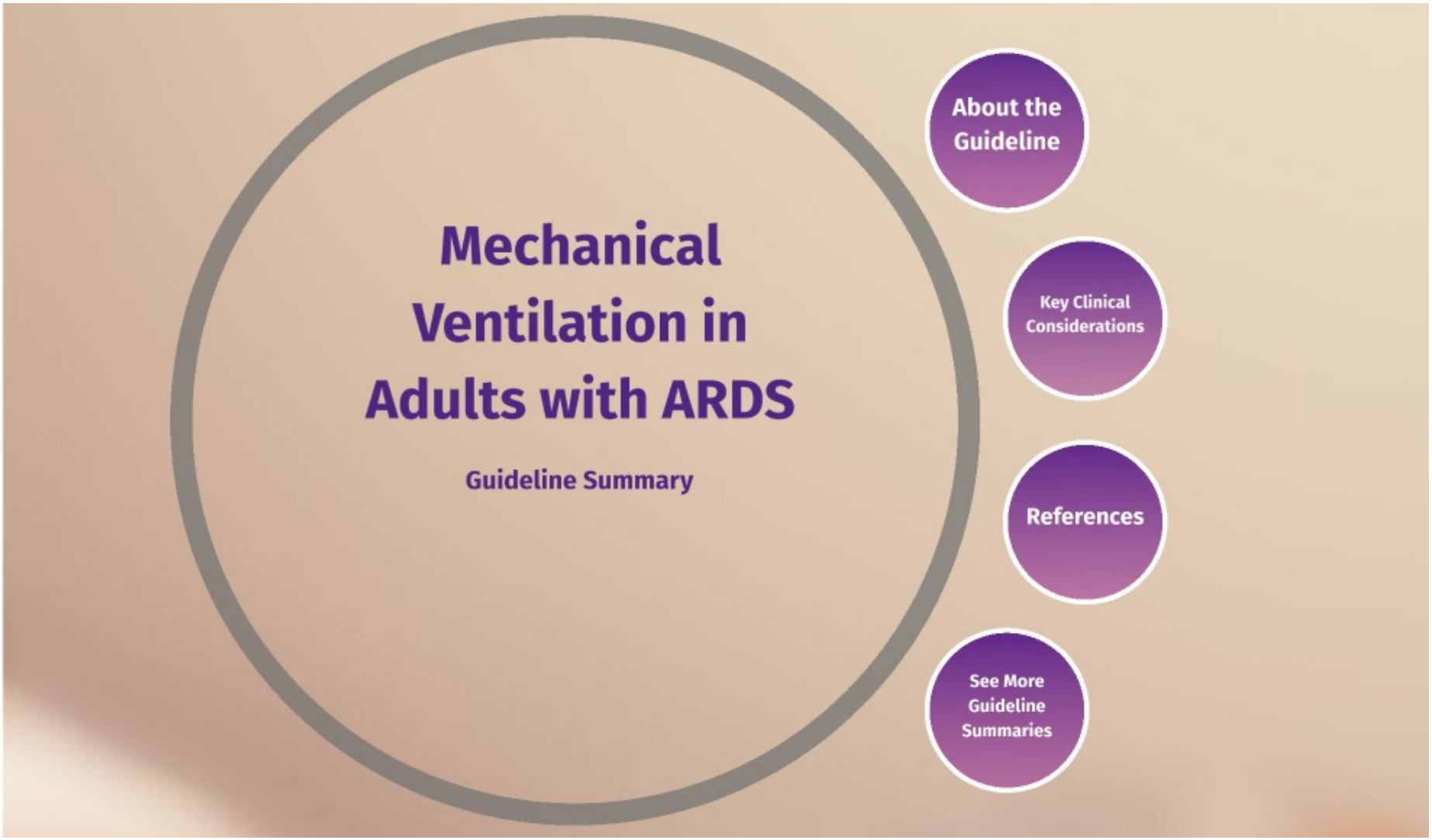
Mechanical Ventilation in Adults with ARDS
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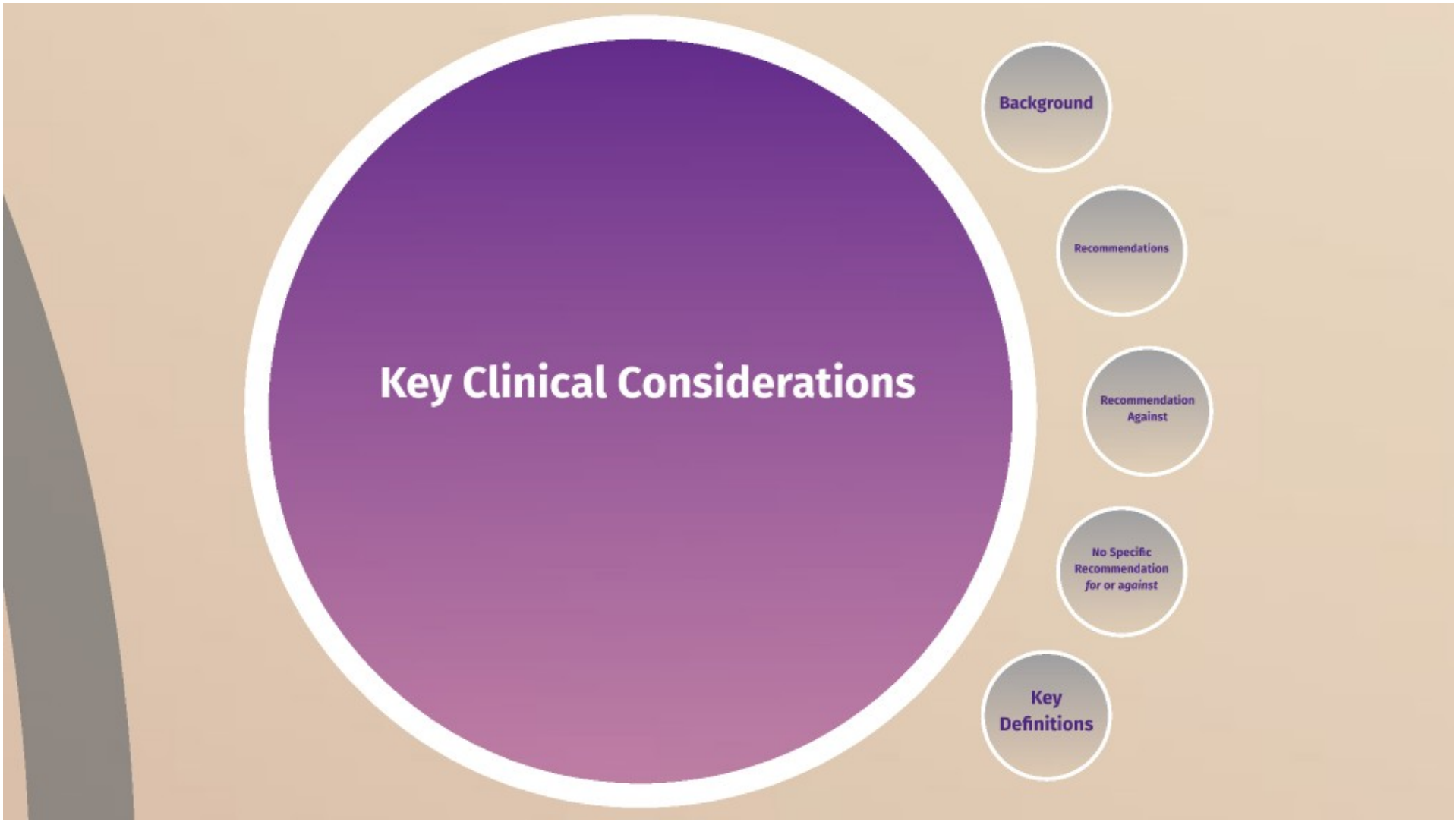
About the Guideline
• Developed by a multi-disciplinary committee representing the American Thoracic Society, the European Society of Intensive Care Medicine and the Society of Critical Care Medicine.
• The objective was to evaluate the latest available evidence on mechanical ventilation strategies in patients with acute respiratory distress syndrome (ARDS) and make recommendations based on this information with the potential to improve outcomes in this patient population.
• Six major foci surrounding mechanical ventilation in patients with ARDS were addressed in the form of six specific clinical questions from which recommendations were surmised. These areas of focus included the following: lower tidal volume (LTV) and low inspiratory pressure ventilation, prone positioning, high-frequency oscillatory ventilation (HFOV), positive end-expiratory pressure (PEEP) strategies, recruitment maneuvers (RMs), and extracorporeal membrane oxygenation (ECMO).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No Specific Recommendation for or against
Key Definitions

Background

ARDS is a form of respiratory failure associated with high morbidity and mortality. The key clinical sequelae of ARDS are severe, inflammation-mediated pulmonary edema, and hypoxemia. ARDS is classified according to the degree of hypoxemia as follows:

- Mild - PaO_2/FiO_2 ratio of 201-300
- Moderate - PaO_2/FiO_2 ratio of 101-200
- Severe - PaO_2/FiO_2 ratio ≤ 100 (Ranieri et al., 2012).

Despite ongoing research and improved understanding of the pathophysiology of ARDS, there have been minimal advances in adjuvant treatment modalities or pharmacologic therapies for ARDS. The management of the ARDS patient is primarily supportive with mechanical ventilation. The recommendations below provide evidence-based interventions to best provide ventilator management of ARDS aimed at limiting the potential for lung injury and improving patient outcomes.

Recommendations

- For all patients with ARDS:
  - Lower tidal volume mechanical ventilation (4-8 mL/kg predicted body weight)
  - Lower inspiratory pressure ventilation (plateau pressures < 30cm H_2O)

- For patients with moderate to severe ARDS:
  - Higher PEEP strategies as opposed to lower PEEP

- Recruitment maneuvers (RMs)
  - Defined as transient increases in applied airway pressures to open or "recruit" collapsed lung (Fan et al., 2017)
  - Several variations of RMs (Fan et al., 2008)
    - prolonged high continuous positive airway pressure (30-40 cm H_2O)
    - progressive incremental increases in PEEP at constant driving pressure
    - high driving pressures
  - Both higher PEEP and RMs are have been shown to decrease atelectasis and improve end-expiratory lung volumes (Fan et al., 2017).

- For patients with severe ARDS:
  - Prone positioning to decrease the pleural pressure gradient between dependent and nondependent regions of the lung tissue.
  - The recommended duration of prone positioning is > 12 hours per day.

Recommendation Against

- The routine use of high-frequency oscillatory ventilation in patients with moderate to severe ARDS (Fan et al., 2017).

No Specific Recommendation *for* or *against*

- The use of extracorporeal membrane oxygenation (ECMO) for patients with severe ARDS; additional research is needed.

Key Definitions

Positive End Expiratory Pressure (PEEP)

- Pressure remaining in the lungs at end expiration.
- Used to keep alveoli open and “recruit” more alveoli to improve oxygenation for patients.
- High levels may cause barotrauma, increased intracranial pressure and decreased cardiac output.

Tidal volume (V_t)

- Volume of gas exchanged with each breath.
- A lower V_t is indicated in patients with stiff, non-compliant lungs.
- Higher V_t may cause tachycardia, decreased blood pressure and lung injury.

Key Definitions (cont'd.)

Inspiratory pressure

- Amount of pressure in the lungs during inspiration.
- The *peak* inspiratory pressure is the highest proximal airway pressure reached during inspiration.

High-frequency oscillatory ventilation

- A mode of ventilation where small tidal volumes and high mean airway pressures are used.
- Goal is to prevent both alveolar collapse and overdistention.

Extracorporeal membrane oxygenation (ECMO)

- A modified form of cardiopulmonary bypass.
- Can reduce hypercarbia, improve oxygenation, and allow the injured lung to rest or recover.

References

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