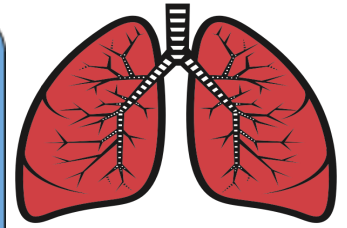


## Acute Respiratory Distress Syndrome

**(ARDS):** Also known as: Adult hyaline membrane disease, Adult Respiratory Distress Syndrome, Noncardiogenic pulmonary edema, non-hydrostatic edema, shock lung injury, and wet lung

### What is the disease?

According to the Clinical Manifestation of Respiratory Disease by Terry Des Jardins and George G. Burton, “in response to injury, the pulmonary capillaries become engorged and the permeability of the alveolar-capillary membrane increases. Interstitial and intra-alveolar edema and hemorrhagic ensue, as well as scattered areas of hemorrhagic alveolar consolidation. These processes result in a decrease in alveolar surfactant and in alveolar collapse, or atelectasis”.



### Signs and symptoms

Dyspnea, cyanosis, bilateral crackles, tachypnea, tachycardia, diaphoresis, use of accessory muscles of inspiration, dull percussion note, refractory hypoxemia, acute respiratory failure, decrease pulmonary lung compliance, cough and angina may be present

### Diagnostic Criteria for ARDS

The Berlin Definition of ARDS is used as the diagnostic criteria: rule out cardiogenic pulmonary edema; bilateral opacities similar to pulmonary edema appear on chest radiograph (CXR) or computed tomography scan (CT); Respiratory symptoms associated with ARDS have manifested within 1 week of a known clinical event; a moderate to severe impairment of oxygenation must be present, as defined by the ratio of arterial oxygen tension to fraction of inspired oxygen ratio (PaO<sub>2</sub>/FiO<sub>2</sub>). The severity of hypoxemia defines the severity of ARDS:

- Mild ARDS:** PaO<sub>2</sub>/FiO<sub>2</sub> is >200 mm Hg, but <300 mm Hg on ventilator settings that include positive end-expiratory pressure (PEEP) or continuous positive airway pressure (CPAP) >5 cm H<sub>2</sub>O
- Moderate ARDS:** PaO<sub>2</sub>/FiO<sub>2</sub> is >100 mm Hg, but <200 mm Hg
- Severe ARDS:** PaO<sub>2</sub>/FiO<sub>2</sub> is <100 mm Hg on ventilator settings that include PEEP >5 cm H<sub>2</sub>O

### Statistics:

According to the American Thoracic Society “approximately 150,000-200,000 Americans will be diagnosed with ARDS each year. Worldwide, that number is approximately 2.2 million” and “25% of ARDS are initially classified as mild and 75% as moderate or severe. However, a third of the mild cases go on to progress to moderate or severe diseases”

### Who it affects?

The American Lung Association states “most people who develop ARDS are already in the hospital because of injury or illness. While it is not clear who will develop ARDS, certain factors may increase the risk for ARDS including: Advanced age, a history of tobacco use, a history of alcoholism, presence of chronic lung disease, high-risk surgery”

### What are the risk factors?

**Direct lung injury:** Pneumonia (viral, bacterial, fungal), gastric aspiration, toxic inhalation (phosgene, cocaine, smoke, high concentration of oxygen), near-drowning, lung contusion

**Indirect injury:** Sepsis and prolonged shock, burn injury (chemical or heat induced), multiple trauma, massive blood transfusion (related to acute lung injury), pancreatitis, gynecologic causes, drug effect, sickle cell crisis

### What happens if it is not treated?

Despite advances in critical care, ARDS still has high morbidity and mortality. Even those who survive can have a poorer quality of life.

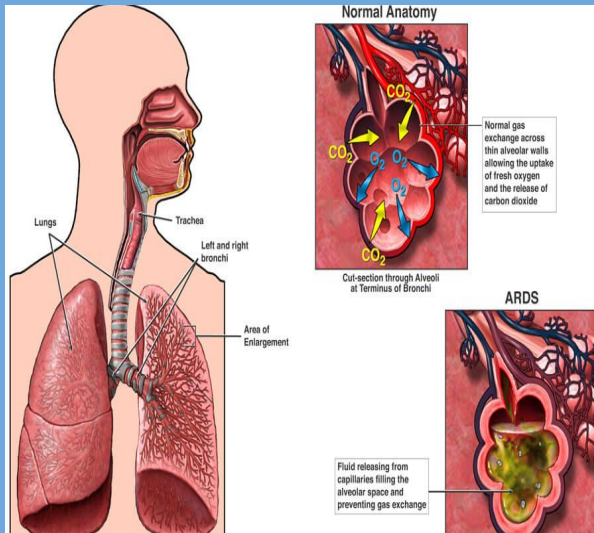
### Major pathologic/ structural changes:

- Interstitial and intraalveolar edema and hemorrhage
- Alveolar consolidation
- Intraalveolar hyaline membrane formation
- Pulmonary surfactant deficiency or abnormality
- Atelectasis

### How is it treated?

The “treatment is directed toward correcting the shock, treating the underlying condition that initiated the respiratory distress, and improving the oxygenation of the blood by means of a ventilator capable of delivering an increased concentration of oxygen to the lungs under slightly increased pressure, thereby facilitating diffusion of oxygen across the swollen alveolar septa” (Crowley, L. V. 2014. p.260)

- Organ support:** minimize delirium, treat anxiety and pain, promote patient awareness, ability to interact and orientation
- Support lung function:** maintain effective gas exchange, balance the benefits of PEEP in oxygenation and recruitment with the increased intrathoracic pressure and its potential negative impact on hemodynamics (venous return)
- Fluid balance:** once patient has achieved hemodynamic stability initiate protocolized conservative fluid management
- Prevent further lung injury:** avoid barotrauma and volume-trauma, Set tidal volume (VT) according to predicted body weight height, keep VT as low as possible 4-6mL/kg of PBW, keep plateau pressure below 30 cmH<sub>2</sub>O, allow permissive hypercapnia



The mortality of ARDS “is commensurate to the severity of the disease, it is 27%, 32%, and 45% for mild, moderate, and severe disease” (Diamond M., 2020)

While mortality rates are “now around 9% to 20%, it is much higher in older patients. ARDS has significant morbidity as these patients remain in the hospital for extended periods and have significant weight loss, poor muscle function, and functional impairment”(Diamond M., 2020).

- Avoid oxygen toxicity/ avoid barotrauma: titrate FiO<sub>2</sub> and PEEP to SpO<sub>2</sub> of 88-95%
  - Avoid aspiration and ventilator acquired pneumonia (VAP): keep head of bed elevated at 30 degrees, subglottic suction, and wean from mechanical ventilation as soon as possible
- The ARDS Network published the results of the Fluid And Catheter Treatment Trial (FACTT), in which “patients who were not in shock and who were managed with a protocolized fluid management plus furosemide had significantly more ventilator free days, more ICU free days, and a lower mortality” (Gardenhire, D. 2020 p.327).

### Where to get help and more information?

National Heart, Lung, and Blood Institute: <https://www.nhlbi.nih.gov/health-topics/acute-respiratory-distress-syndrome>

American Lung Association: <https://www.lung.org/lung-health-diseases/lung-disease-lookup/ards/learn-about-ards>

American Thoracic Society: <https://www.thoracic.org/patients/lung-disease-week/2012/ards-week/general-info.php>

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