

Acute Respiratory Distress Syndrome: New Guidelines for Pediatric Patients

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Acute respiratory distress syndrome (ARDS) is an acute diffuse pulmonary inflammation that occurs within 7 days of an insult incurred by a pulmonary or non-pulmonary etiology such as sepsis and pneumonia. The pathophysiology involves increased vascular permeability, non-cardiogenic pulmonary edema, inflammation, and hyaline membrane formation which is expressed clinically as hypoxemia, decreased lung compliance, and new pulmonary infiltrates on the chest x ray. For many years, pediatric practitioners have relied on ARDS definitions developed for adults. However, in 2015, new consensus recommendations came from the "Pediatric Acute Lung Injury Consensus Conference".

The new guidelines state that for ARDS to be diagnosed, the respiratory failure should not be fully explained by heart failure or fluid overload. In addition, the guidelines recommend no age criteria for ARDS definition but exclude perinatal causes of hypoxemia (such as meconium aspiration syndrome). The onset of respiratory failure should be within 7 days of a known clinical insult. There should be also a radiographic evidence of new pulmonary parenchymal infiltrate. More importantly, a distinction is made between patients on invasive and non-invasive mechanical ventilation (MV).

For those on invasive MV, the oxygenation index (OI) should be used instead of the conventional $\text{PaO}_2/\text{FiO}_2$. The $\text{OI} = [\text{FiO}_2 \times \text{Mean airway pressure} \times 100] / \text{PaO}_2$. ARDS is diagnosed if OI is ≥ 4 . On the other hand, for children under non-invasive MV (full face-mask bi-level ventilation or CPAP ≥ 5 cm H_2O), ARDS is diagnosed when the conventional $\text{PaO}_2/\text{FiO}_2$ is ≤ 300 .

A significant aspect of the new guidelines is that Oxygen saturation (SpO_2) can be of help. SpO_2 is readily obtained and can be used to calculate the Oxygen saturation index (OSI): $\text{OSI} = \text{FiO}_2 \times \text{Mean airway pressure} \times 100 / \text{SpO}_2$. OSI can be used if OI is not available and a value ≥ 5 is consistent with ARDS.

Likewise, the $\text{SpO}_2/\text{FiO}_2$ ratio can be used in place of $\text{PaO}_2/\text{FiO}_2$. An $\text{SpO}_2/\text{FiO}_2$ ratio ≤ 264 is consistent with ARDS.

A special situation is met in children with cyanotic heart disease or left ventricular dysfunction. These patients require the standard criteria but the acute deterioration in oxygenation should not be explained by underlying cardiac disease.

Notwithstanding, pediatric ARDS remains a controversial issue and many questions are waiting for future answers.

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