ICU
MANAGEMENT & PRACTICE

Redefining Acute Respiratory Distress Syndrome

Acute Respiratory Distress Syndrome (ARDS) has been known for over a century but was officially described in 1967. Despite revisions in its definition, there's ongoing debate about whether ARDS is a distinct medical condition. The current diagnostic criteria for ARDS are challenging to apply in clinical practice, so standardising the assessment of pulmonary and extrapulmonary involvement is needed for more personalised treatment.

Each revision has used the PaO2/FiO2 ratio as a key criterion for diagnosing and assessing the severity of ARDS. However, there is a lack of data linking PaO2 to specific structural changes in the lungs or the extent of damage at the time of diagnosis. Recent evidence suggests that measuring PaO2 under standardised ventilatory settings correlates with the severity of lung injury and outcomes. Other factors like cardiac output, shunt fraction, metabolic rate, and haemoglobin concentration can also affect the PaO2/FiO2 ratio. Relying on a single value obtained outside a defined standard setting for clinical decisions is problematic. Using definitions with such limitations can impact the treatment patients receive and their eligibility for clinical trials, especially for hypoxaemic patients who improve after 24 hours of standard intensive care.

ARDS can result from various pulmonary and systemic insults and is characterised by diffuse alveolar damage (DAD). Distinguishing ARDS from other conditions can be challenging, as not all patients meeting the Berlin criteria for ARDS have DAD. Some limitations in diagnosis result from the timing of lung biopsies, therapy initiation, and variations in ventilation settings. Addressing these issues may require physiological enrichment in trial designs.

Supportive therapy for ARDS includes respiratory support to achieve adequate gas exchange and tissue oxygenation without further lung damage. Mechanical ventilation (MV) is crucial for most ARDS patients, but in recent years, mild or moderate cases have been successfully managed without intubation, as recognised by the Berlin definition and recent guidelines.

The PaO2/FiO2 ratio is likely to remain a part of future ARDS definitions. However, using a standardised level of FiO2 and PEEP has never been a requirement for defining hypoxaemia under MV. In some cases, assessing patients on PEEP ≥ 10 cmH2O with FiO2 ≥ 0.5 for 30 minutes led to an increase in the PaO2/FiO2 ratio, causing more than a third of patients to no longer meet ARDS criteria. The exact FiO2 is difficult to determine in patients on non-invasive ventilation or high-flow nasal oxygen. Proposed oxygenation indices may not be useful for clinical decisions unless assessed or calculated using standardised ventilatory settings.

Experts suggest reevaluating the current framework of this illness. Clinicians should focus on operational criteria that lead to using therapies likely to improve outcomes. To accurately assess ARDS severity, two indices are needed: one for measuring lung injury severity and another for the patient's overall illness context. Without these measures and an understanding of the impact of specific causes on outcomes, any updated ARDS definition will lack substantial progress since its initial description. Subdividing ARDS patients into categories reflecting different severities or pathophysiological processes is a significant step for precision medicine in ARDS. This approach can help identify therapy-resistant patients, candidates for innovative treatments, those who can avoid intubation and mechanical ventilation, or individuals excluded from certain clinical trials. While most sub-phenotype studies in ARDS have been retrospective, combining information from lung imaging and biomarkers can personalise ARDS management.

Future research should focus on precision medicine in ARDS, considering the concept of treatable traits. Clinical trials are needed to compare current management with precision medicine-derived treatments. Tools for personalising ARDS treatment and aiding real-time clinical decisions at the bedside are lacking. Machine learning models for predicting ICU mortality based on clinical and biological parameters show promise.

Source: Critical Care
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