DOI: 10.21088/ijtep.2348.9987.17225.1

Indian Journal of Trauma and Emergency Pediatrics
Volume 17 Number 2/July – December 2025

REVIEW ARTICLE

PARDS 2.0: A Contemporary Review of the PALICC-2 Guidelines

Shivam Yadav

HOW TO CITE THIS ARTICLE:

Shivam Yadav. PARDS 2.0: A Contemporary Review of the PALICC-2 Guidelines. Indian J Trauma Emerg Pediatr. 2025; 17(2) 43-47.

ABSTRACT

Pediatric Acute Respiratory Distress Syndrome (PARDS) remains one of the most significant causes of respiratory failure, morbidity, and mortality in pediatric intensive care units worldwide. The first Pediatric Acute Lung Injury Consensus Conference (PALICC-1) in 2015 provided the inaugural pediatric-specific ARDS definition, addressing limitations of adult criteria. Since then, advances in pediatric respiratory support, especially high-flow nasal cannula (HFNC), noninvasive ventilation (NIV), and lung-protective invasive ventilation have necessitated updated clinical recommendations. The Second International Guidelines (PALICC-2), released in 2023, represent a comprehensive revision of PARDS definitions, diagnostic thresholds, severity classification, monitoring protocols, and management strategies. This article synthesizes these updates by integrating the PALICC-2 Executive Summary and contemporary review published in 2023. The review explores revised diagnostic criteria incorporating noninvasive modalities, introduction of "possible PARDS" and "at-risk for PARDS" categories, restructured severity classification, and updated management practices spanning oxygen therapy, NIV, lung-protective mechanical ventilation, monitoring, sedation, fluid balance, nutrition, ancillary therapies, and ECMO. Emphasis is also placed on special populations, resource-limited settings, implementation challenges, and long-term outcomes. PARDS 2.0, as articulated through PALICC-2, offers a more inclusive, pragmatic, and physiologically relevant framework designed to improve early recognition, standardization of care, equity, research continuity, and global applicability.

AUTHOR'S AFFILIATION:

Assistant Professor, Department of Pediatrics, Autonomous State Medical College, Etah, India.

CORRESPONDING AUTHOR:

Shivam Yadav, Assistant Professor, Department of Pediatrics, Autonomous State Medical College, Etah, India.

E-mail: drsky.paeds@gmail.com

➢ **Received:** 25-11-2025 ➢ **Accepted:** 20-12-2025

KEYWORDS

• Pediatric Acute Respiratory Distress Syndrome • PARDS • PALICC-2 Guidelines • Pediatric Critical Care • Non-invasive Ventilation • High-Flow Nasal Cannula • Oxygenation Index • Lung-ProtectiveVentilation; • Pediatric Mechanical Ventilation • ECMO • Resource-Limited Settings • Long-Term Outcomes

INTRODUCTION

Acute respiratory distress syndrome (ARDS) was originally defined in adults in 1967, and for decades pediatric practice relied on adult-centric definitions such as the American-European Consensus Criteria (AECC 1994) and the Berlin Definition (2012). These criteria, while valuable for adult ARDS research, failed to capture the distinct developmental, physiological, anatomical, and clinical contexts of pediatric patients. Children differ substantially from adults in chest wall compliance, metabolic rate, airway structure, lung growth, immune response, and ventilatory mechanics; consequently, ARDS manifests differently across pediatric age groups. The PALICC-1 definition of PARDS in 2015 was the first to provide a pediatric-specific consensus, incorporating oxygenation index (OI), oxygen saturation index (OSI), pulse-oximetry-based diagnostics, and broadening radiographic interpretations. Although PALICC-1 represented a major advance, pediatric critical care has since undergone significant transformation, particularly with the expanded use of HFNC, NIV, improvements in PICU monitoring, ECMO accessibility, and increasing global focus on implementation science.

The publication of the PALICC-2 Guidelines in 2023 marked a major evolution in PARDS classification and management. PALICC-2 was based on a rigorous methodology using GRADE principles, systematic reviews, and expert consensus. Two essential documents lay the foundation for contemporary PARDS understanding: the PALICC-2 Executive Summary[1] and a recent narrative update synthesizing clinical implications of the new recommendations.[2] Together, these documents provide the most complete, current, and applicable redefinition of PARDS. This review integrates both sources to create a cohesive, narrative analysis of PARDS 2.0, covering definitions, pathophysiology, epidemiology, risk factors, diagnostic considerations, severity classification, ventilatory and nonventilatory management strategies, ancillary therapies, ECMO, and future directions.

Evolution of PARDS Definitions

Before PALICC-1, children with ARDS were evaluated using adult definitions, which required bilateral infiltrates on chest imaging, acute onset respiratory failure, and specific levels of hypoxemia assessed through PaO_2/FiO_2 thresholds. These criteria had several limitations in pediatrics: they relied heavily on arterial blood gases, which are less commonly used in children; they assumed adult ventilator practices; they did not account for pulse oximetry; and they did not allow diagnosis on noninvasive support. PALICC-1 fundamentally shifted this paradigm by incorporating pediatric oxygenation metrics and relaxing imaging requirements, allowing unilateral infiltrates and recognizing the limitations of radiography.

PALICC-2 builds upon these foundations, introducing several key updates. The definition remains restricted to children younger than 18 years, excluding perinatal lung disease. Timing remains consistent with ARDS definitions in adults acute onset within seven days of a known clinical insult. Imaging still requires new infiltrates, but diagnosis no longer depends on chest radiography in resource-limited settings. The most significant conceptual expansion is the incorporation of noninvasive respiratory modalities into the diagnostic pathway, allowing diagnosis of PARDS in children receiving full-face NIV and introducing a novel intermediate category, "possible PARDS," for those on HFNC or nasal NIV who exhibit oxygenation impairment but do not yet require higher levels of support.[1,2]

Updated Diagnostic Criteria: PARDS 2.0 Framework

Based on PALICC-2, PARDS is diagnosed when a child exhibits acute onset hypoxemia requiring respiratory support, has evidence of new pulmonary infiltrates, and cannot be fully explained by cardiac failure. What distinguishes PARDS 2.0 is the incorporation of noninvasive modalities and the development of three interrelated diagnostic categories: **confirmed PARDS**, **possible PARDS**, and **at-risk for PARDS**.

Confirmed PARDS

Confirmed PARDS can be established in children receiving invasive mechanical ventilation (IMV) or full-face NIV with a PEEP or CPAP ≥5 cmH_2O. For IMV, oxygenation thresholds rely on OI or OSI, using OI ≥4 or OSI ≥5 as the minimum criteria. For NIV, diagnosis uses P/F ≤300 or S/F ≤250.(1) This update reflects contemporary PICU practice, where NIV is frequently used as first-line support for acute respiratory failure.

Possible PARDS

Recognizing the widespread global use of HFNC and nasal NIV, PALICC-2 introduces "possible PARDS" for children requiring HFNC at ≥1.5 L/kg/min or ≥30 L/min who meet oxygenation thresholds but are not receiving full-face NIV. This category aims to improve early detection and prevent delayed escalation. In resource-limited settings, "possible PARDS" may function as a primary diagnostic category when imaging or NIV is not available.[1,2]

At-Risk for PARDS

The "at-risk" classification encompasses children with acute respiratory illness requiring supplemental oxygen but who do not yet meet PARDS criteria. This addition reflects the clinical reality that children often deteriorate over time, and early recognition may allow timely intervention.

Severity Classification

PALICC-2 recommends that severity classification should not occur at the moment of diagnosis but should instead be assessed four hours after stabilization on consistent respiratory support. This shift avoids misclassification due to rapid fluctuations in oxygenation during transitions in ventilatory support.

Severity is stratified separately for IMV and NIV. For IMV, mild to moderate PARDS is defined as OI <16 or OSI <12, while severe PARDS is defined as OI ≥16 or OSI ≥12. For NIV, children with P/F >100 or S/F >150 are mild to moderate, whereas those with P/F ≤100 or S/F ≤150 are classified as severe (1). Certain groups including children with congenital cyanotic heart disease, chronic lung disease requiring baseline ventilation, or pre-existing tracheostomy cannot be classified using standard severity scales.[2]

Pathophysiology and Etiology

The pathophysiology of PARDS resembles adult ARDS, characterized by diffuse alveolar damage, increased permeability edema, impaired gas exchange, ventilation perfusion mismatch, decreased lung compliance, and inflammatory dysregulation. However, pediatric patients demonstrate unique vulnerabilities due to higher chest wall compliance, smaller airways, a higher metabolic oxygen demand, and ongoing lung development. These factors can exacerbate the severity of hypoxemia and lead to earlier respiratory muscle fatigue.

PARDS may arise from direct pulmonary insults including pneumonia, aspiration, inhalational injury, and drowning or from indirect insults such as sepsis, pancreatitis, trauma, and burns. Pediatric-specific etiologies include viral lower respiratory tract infections, congenital anomalies, and postoperative complications following cardiac surgery.[2]

Risk Factors and Special Populations

PALICC-2 highlights several high-risk populations, including children with chronic lung disease, congenital or acquired heart disease, neuromuscular weakness, home mechanical ventilation, prematurity, and immunosuppression. These groups require tailored monitoring strategies, often relying on pulse oximetry trends rather than radiography or ABG analysis. Special considerations also apply to children with cyanotic congenital heart disease, where oxygenation thresholds cannot be interpreted using conventional indexes. PALICC-2 therefore avoids strict severity classification in these populations.[1,2]

Noninvasive Respiratory Support

Noninvasive respiratory support plays an increasingly prominent role in early PARDS management, and PALICC-2 provides detailed guidance on its appropriate use. HFNC is recommended with humidification to reduce airway injury and improve comfort. In resource-limited settings, HFNC or CPAP may be the preferred modalities for moderate hypoxemia when invasive ventilation is unavailable.[1]

NIV, including full-face CPAP or BiPAP, is recommended as a time-limited trial. Failure to improve within zero to six hours should prompt early intubation to avoid worsening fatigue or gas exchange failure. The guidelines stress the importance of optimal interface selection, skin protection, monitoring for air leaks, vigilance against gastric distension, and judicious sedation to improve patient–device synchrony.[1,2]

Invasive Mechanical Ventilation

Invasive mechanical ventilation remains the cornerstone of management for moderate to severe PARDS. PALICC-2 reinforces lung-protective strategies that emphasize low tidal volume ventilation, lower plateau pressures, limited driving pressures, and adequate PEEP titration. For most children, tidal volumes of 6–8 mL/kg are recommended for mild to moderate PARDS, whereas in severe PARDS or poor compliance states, 4–6 mL/kg is preferred. Plateau pressures should be ≤28 cmH_2O, or ≤32 cmH_2O in children with reduced chest wall compliance. Driving pressure should ideally remain ≤15 cmH_2O.[1]

Permissive hypercapnia is acceptable when pH remains ≥7.20 and is not contraindicated. Oxygenation targets differ by severity, with SpO_2 92–97 percent advised for mild to moderate PARDS and lower saturation thresholds acceptable in severe disease provided perfusion is adequate.[2]

Monitoring

Monitoring strategies outlined in PALICC-2 emphasize continuous pulse oximetry, ECG monitoring, respiratory rate assessment, and routine evaluation of ventilatory synchrony. End-tidal CO_2 monitoring is recommended, especially for detecting dead space changes. Imaging, while helpful, is not mandatory for diagnosis and may not provide additional utility after the initial assessment, except in complications or unexplained deterioration. PALICC-2 also highlights hemodynamic monitoring to assess perfusion and the impacts of ventilatory adjustments, particularly in severe cases.[1,2]

Sedation, Analgesia, Neuromuscular Blockade

Sedation practices must be individualized, balancing patient comfort, ventilatory synchrony, and avoidance of excessive drug exposure. Daily sedation assessment and delirium screening are recommended. Analgesia-first strategies reduce the risk of oversedation. Neuromuscular blockade is not routinely recommended but may be necessary in children with severe dyssynchrony refractory to sedation. PALICC-2 encourages cautious use with frequent re-evaluation.[2]

Fluid Management and Hemodynamic Support

Fluid overload worsens pulmonary edema and can exacerbate PARDS. PALICC-2 recommends avoiding cumulative fluid overload and using diuretics or renal replacement therapy as indicated. Hemodynamic support should target adequate perfusion rather than aggressive fluid resuscitation. Transfusion thresholds are conservative, recommending transfusion only when hemoglobin falls below 5 g/dL and avoiding transfusion when hemoglobin is ≥7 g/dL except in special circumstances.[1,2]

Nutrition in PARDS

Nutrition plays an important supportive role in recovery. PALICC-2 recommends early enteral nutrition within 72 hours of admission when feasible. High-protein diets of at least 1.5 g/kg/day are encouraged to support healing and immune function. Monitoring for feeding intolerance is essential, particularly in ventilated patients receiving high PEEP or prone positioning.[2]

Ancillary Therapies

Evidence for many adjunctive therapies in PARDS remains limited. PALICC-2 issues no recommendation for or against routine use of prone positioning or recruitment maneuvers due to insufficient pediatric data. Surfactant is not routinely recommended

except in specific etiologies such as congenital surfactant deficiency. Inhaled nitric oxide is not recommended for most PARDS cases except in children with severe pulmonary hypertension or right ventricular dysfunction. Corticosteroids lack strong evidence for routine use and should be reserved for selected etiologies such as certain inflammatory lung diseases.[1,2]

Extracorporeal Membrane Oxygenation (ECMO)

ECMO remains a critical rescue therapy for severe, refractory PARDS. PALICC-2 recommends venovenous ECMO as the preferred modality when feasible. Strict adherence to lung-protective ventilation during ECMO is essential to minimize ventilator-associated lung injury. Correction of $PaCO_2$ should be gradual to avoid cerebral complications, and hyperoxia should be avoided. ECMO candidacy should be assessed by multidisciplinary teams with expertise in pediatric extracorporeal support.[1]

Long-Term Outcomes and Follow-Up

Survival alone does not capture the full impact of PARDS. PALICC-2 underscores emerging evidence showing that survivors may experience prolonged pulmonary dysfunction, neurocognitive deficits, psychological distress, growth impairment, and reduced quality of life. Post-PICU follow-up is therefore essential. Structured outpatient programs and rehabilitation pathways are recommended to address long-term sequelae, family stress, and quality-of-life impairments.[2]

PARDS in Resource-Limited Settings

A major strength of PALICC-2 is its global applicability. In many settings, arterial blood gas analysis, radiography, or invasive ventilation may be unavailable. PALICC-2 allows diagnosis of "possible PARDS" without imaging, endorses HFNC or CPAP as feasible alternatives to invasive ventilation, and supports local adaptation of care protocols. Training and implementation strategies are emphasized to improve outcomes in low-resource environments.[1]

Implementation and Future Directions

PALICC-2 highlights the ongoing gap between evidence and implementation. Adherence to lung-protective ventilation remains inconsistent across PICUs globally. Implementation science, quality improvement strategies, standardized care bundles, and simulation-based training are needed to ensure uniform adoption of recommendations. Biomarker-based risk stratification, phenotyping, and personalized ventilation strategies represent future research priorities. The integration of long-term outcome monitoring into clinical care pathways will further refine PARDS management.

CONCLUSION

The PALICC-2 Guidelines represent the most comprehensive and clinically relevant update to PARDS management since the introduction of the pediatric-specific definition in 2015. By incorporating noninvasive respiratory modalities into diagnostic criteria, introducing new categories such as "possible PARDS" and "at-risk for PARDS," refining severity classification, and updating management across respiratory and non-respiratory domains, PARDS 2.0 provides a modern and holistic framework for pediatric respiratory failure. The explicit consideration of resource-limited settings enhances global applicability, while emphasis on long-term outcomes shifts the focus from survival alone to overall recovery. Continued research, education, and implementation efforts will be necessary to translate these guidelines into improved outcomes for critically ill children worldwide.

REFERENCES

1. Executive Summary of the Second International Guidelines for the Diagnosis and Management of Pediatric Acute Respiratory Distress Syndrome (PALICC-2). Uploaded PDF: /mnt/data/executive_summary_of_the_second_international.8.pdf; 2023.
2. PARDS: Updates in Light of PALICC-2 Recommendations. Uploaded PDF: /mnt/data/tap-60-4-362.pdf; 2023.