

Each year, millions of neonates and young infants worldwide undergo surgery requiring general anesthesia, highlighting the critical role of pediatric anesthesia in modern healthcare.¹

In the United States alone, approximately six million children, including 1.5 million infants, undergo surgical procedures under general anesthesia annually, with many requiring multiple procedures and anesthetics.^{2, 3, 4}



Neonates and infants are the most vulnerable patient population undergoing anesthesia:

81%

risk of neurodevelopmental disorder⁵

72%

mortality of cardiac arrest in neonates receiving anesthesia⁶

They need:

- ✓ Specialized care environments and equipment
- ✓ Precise delivery of medications and ventilation
- ✓ Experienced clinicians

Neonates are from birth up to 28 days old. They:

- Are the highest risk pediatric population, due to underdeveloped organ systems, higher consumption of oxygen, immature liver and kidney function, and more.
- Face increased perioperative complications and higher mortality.
- Have higher sensitivity to anesthesia medications, increased risk of postoperative apnea, greater susceptibility to hypothermia, and more.
- Require more complex airway, vascular, and procedural management.

Infants are ages 1 month to 12 months.

Almost 30% of all general anesthesia procedures are for children less than 15 years of age.⁷

93% of pediatric cases use general anesthesia

21% of all pediatric anesthetics are for diagnostic procedures, with 79% of anesthetics for surgery.⁸

40% of anesthesia cases require non-operating room anesthesia (NORA) due to the limited ability of young children to be still during radiologic procedures such as Interventional Radiology.

Anesthesia care requires meticulous precision and personalization, especially for neonates.



Lung-protective ventilation

Key strategies⁸ include:

- **Optimal PEEP**, preventing the collapsing of alveoli at end-exhalation
- **Low and precise volume** preventing over-distention and lung injury

Advancements in mechanical ventilation capabilities enable precise, adaptive delivery of lung-protective strategies tailored to the fragile physiology of neonates.

Precise Individualized Patient Care

Advances in anesthesia now enable tailored care for neonates through precise mechanical ventilation and inhaled low-flow anesthetic delivery.



In neonates, precise and protective ventilation is critical to minimize the risks of lung injury and long-term complications.

This challenge is particularly pronounced in extremely small neonates, where even minor deviations in tidal volume can have significant physiological consequences.⁹

Precise vaporization

In neonates and children, low-flow anesthesia must be precise, accurate, and support cardiopulmonary stability. This requires vaporizers that can:^{10, 11}

- **Deliver accurate concentrations of volatile anesthetics** at fresh gas flows as low as <500 mL/min.
- **Maintain output consistency** despite changes in ambient temperature or carrier gas composition.
- **Respond quickly to changes in flow or concentration settings.**

Digital vaporizers are designed to support the requirements of neonatal and pediatric patients with digital controls. By combining agent monitoring with flow compensation, digital vaporizer solutions are designed to deliver accuracy even at very low flows. The ability to respond rapidly to setting adjustments helps clinicians maintain control in anesthetic delivery, aligning precision with the adaptability needed in diverse and dynamic care environments.

To learn more about advanced digital vaporization, visit **Aisys CS²™**

Non-Operating Room Anesthesia (NORA)

In recent years, there has been a substantial increase in pediatric NORA cases.¹² This trend is likely to continue as technological advancements enable more non-invasive procedures to be performed outside the traditional OR setting on more medically complex patients. This requires anesthesiologists to be adaptable and resourceful, coordinating with proceduralists, nursing staff, technicians, and support personnel outside the immediate vicinity.

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Team Coordination, Communication, and Preparation

Effective multidisciplinary team training is critical for improving outcomes in neonatal and infant anesthesia, including simulations, clear definition of OR roles and responsibilities, and emergency response preparedness.^{13, 14}

Optimizing anesthesia care for neonates and infants requires a deliberate focus on precision, personalization, and collaboration to address the unique challenges of this high-risk population.

By advancing care pathways through innovations in refining ventilation strategies tailored to these patients' dynamic physiology, and precise vaporization along with prioritizing effective team collaboration, anesthesia teams can significantly improve outcomes for these vulnerable patients.



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