

Point of Care Patient-Side NICU Testing



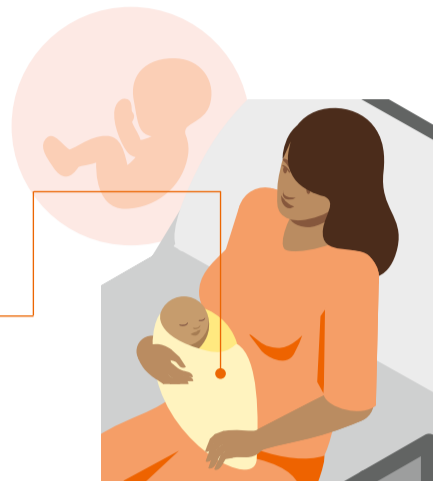
Neonatal care is *critical*

According to the World Health Organization, a newborn infant, or neonate, is a child under 28 days of age. **During the first 28 days of life, a child is at highest risk of dying.¹**

Transitioning from a fetus to a newborn is the most complex physiologic adaptation that occurs in humans. Every organ system is involved and often there is a need for medical assistance.²

Neonates have immature organ systems, different airway and lung mechanics, and a higher basal metabolic requirement for oxygen.³

Early signs of clinical deterioration are often nonspecific, making a diagnosis challenging.⁴ Blood analysis is integral to monitoring Neonatal Intensive Care Unit (NICU) patients.



Point-of-care bedside blood analyzers have been shown to reduce red blood cell transfusions in low birth weight infants.⁵⁻⁶



Blood drawn for laboratory testing should not exceed 5% of the total blood volume per draw.⁷ A 10 ml blood sample drawn with standard tubes may represent as much as 10% of the total blood volume in a preterm neonate.⁷

Babies have precious little blood

In term and preterm neonates, the total blood volume ranges from 80 to 115 ml/kg.⁷

Studies have shown that reduced fetal hemoglobin levels are related to increased neonatal morbidity rates.

Too much blood sampling can cause endogenous blood loss and has been associated with the development of bronchopulmonary dysplasia.⁸

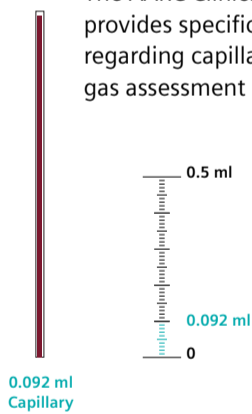
Modern handheld point-of-care analyzers need **as little as 92 µl or 0.092 ml to run 13 different tests** as compared to a standard laboratory tube which holds ~3 ml of blood.⁹



NICU respiratory care guidelines

Capillary blood sampling provides an alternative to arterial blood sampling, and compared with a percutaneous arterial puncture, is less technically challenging with fewer risks of harm.¹⁰⁻¹¹

The AARC Clinical Practice Guidelines provides specific recommendations regarding capillary sampling for blood gas assessment in neonatal patients.¹⁰



Premature infants benefit from rapid point-of-care blood analysis

Underdeveloped immune system leads to higher risk of infections. Capillary testing reduces the need to access central lines and blood lactate measurements can indicate infection.¹²



Underdeveloped lungs may need ventilator support and frequent blood gas measurements for inconsistent breathing and respiratory distress syndrome.¹²

Underdeveloped digestive tract and liver should be monitored for hyperbilirubinemia, metabolic acidosis, and hypoglycemia.¹²

Underdeveloped kidneys need careful monitoring for potassium, other electrolytes, and possible acidosis.¹²

POCT benefits baby and clinicians

There are clear advantages to routine point-of-care testing (POCT) in the NICU.



Patient-side testing in the NICU offers many benefits—the most important of which is responding quickly to your tiniest and most vulnerable patients.

Single or multiple analytes can be tested.⁹



You do not have to leave your patient.

Results can be obtained **within 1 minute** of sample loading.⁹

Response time is a critical factor that affects the overall time of treatment. Consequences of a prolonged response time are worse in preterm infants.¹³

A tiny amount of blood is needed.⁶

References

- <https://www.who.int/westernpacific/health-topics/newborn-health#:~:text=A%20newborn%20infant%2C%20or%20neonate,to%20health%20care%20is%20low.> Accessed 30 June 2023.
- Hillman, N, Kallapur SG, Jobe A. Physiology of transition from intrauterine to extrauterine life. *Clin Perinatol.* 2012 Dec; 39(4): 769–783.
- Saikia D, Mahanta B. Cardiovascular and respiratory physiology in children. *Indian J Anaesth.* 2019 Sep;63(9):690-697.
- Sullivan BA, Keim-Malpass J. Barriers to early detection of deterioration in hospitalized infants using predictive analytics. *Hosp Pediatr.* 2021 Sep;11(9):e195-e198.
- Madan A, Kumar R, Adams MM, et al. Reduction in red blood cell transfusions using a bedside analyzer in extremely low birth weight infants. *J Perinatol.* 2005 Jan;25(1):21-5.
- Mahieu L, Marien A, De Dooy J, Mahieu M, Mahieu H, Van Hoof V. Implementation of a multi-parameter point-of-care-blood test analyzer reduces central laboratory testing and need for blood transfusions in very low birth weight infants. *Clin Chim Acta.* 2012;413(1–2):325–330.
- Proytcheva MA. Issues in neonatal cellular analysis. *Am J Clin Path.* 2009;131(4):560–573.

- Hellström W, Forssell L, Morsing E, et al. Neonatal clinical blood sampling led to major blood loss and was associated with bronchopulmonary dysplasia. *Acta Paediatr.* 2020 Apr;109(4):679-687.
- [https://www.siemens-healthineers.com/en-us/blood-gas/blood-gas-systems/epoc-blood-analysis-system.](https://www.siemens-healthineers.com/en-us/blood-gas/blood-gas-systems/epoc-blood-analysis-system) Accessed 30 June 2023.
- Evans DL, Volsko TA, Capellari E, et al. AARC clinical practice guidelines: capillary blood gas sampling for neonatal and pediatric patients. *Respir Care.* 2022 Sep;67(9):1190-1204.
- Richter S, Kerry C, Hassan N, Chari A, Lunn D, Nickol A. Capillary blood gas as a substitute for arterial blood gas: a meta-analysis. *Br J Hosp Med (Lond)* 2014;75(3):136-142
- Balest AL. Preterm (Premature) Newborns. [https://www.merckmanuals.com/home/children-s-health-issues/general-problems-in-newborns/preterm-premature-newborns.](https://www.merckmanuals.com/home/children-s-health-issues/general-problems-in-newborns/preterm-premature-newborns) Accessed 20 July 2023.
- Martin S, Ackermann BW, Thome UH, et al. Association of response time and intermittent hypoxemia in extremely preterm infants. *Acta Paediatr.* 2023 Jul;112(7):1413-1421.



POINT OF CARE TESTING UNIVERSITY

Educational support provided by Siemens Healthineers.

All information is for education only and is not intended to be relied upon by the reader for instruction as to the practice of medicine.

Any healthcare practitioner reading this information is reminded that they must use their learning, training, and expertise in dealing with their individual patients.