NICU blood gas testing checklist

Purpose: Improve reliability, minimize delays, and enhance clinical decision-making in neonatal care through best practices, including capillary sampling and point-of-care (handheld) testing.

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1) Pre-analytical preparedness

- ☐ Ensure staff competency in sampling, handling, and operating handheld or near-patient analyzers.[4]
- ☐ Wear appropriate PPE (personal protective equipment) and follow infection control protocols.
- ☐ Double-check patient identifiers (name, MRN, DOB) prior to sampling.
- ☐ Use appropriate sampling method: arterial, capillary, or venous.
- ☐ Collect sufficient volume based on analyzer requirements.
- ☐ Record time of collection.
- ☐ Avoid sample hemolysis by gentle technique (capillary collection).
- ☐ Use accurate bedside labeling before leaving the neonate.
- ☐ Minimize air bubbles in syringes and expel immediately if present.
- ☐ Dispose of sharps and biohazard materials immediately per infection control guidelines.
- ☐ Consider handheld point-of-care (POC) testing to minimize transport delays and errors, enabling sample-to-result turnaround in under five minutes.[1,2,9,11]
- ☐ Ensure device calibration and quality control checks per manufacturer recommendations.
- ☐ Follow hospital barcode scanning protocols.
- ☐ Check expiration dates on cartridges prior to testing.
- ☐ Regularly assess competency through direct observation and periodic retraining.
- ☐ Establish protocols for troubleshooting device errors including cartridge rejection, connectivity issues, or abnormal readings.
- ☐ Store consumables (cartridges, syringes) per manufacturer temperature guidelines.

2) Handheld POC testing

- ☐ Use handheld blood gas devices at the bedside to lower sample-to-result times.[1,2,9,11]
- ☐ Minimize blood draw volume — critical for preterm infants.[2,10]
- ☐ Reduce handling errors and preanalytical variability by eliminating manual transfers.[2,9]
- ☐ Follow manufacturer-recommended sample volume precisely to avoid under or overfilling.
- ☐ Train staff on proper cartridge handling, expiration checks, and correct cartridge insertion.
- ☐ Keep devices fully charged or with backup batteries ready for use in emergencies.
- ☐ Integrate results into the electronic health record (EHR) in real time.
- ☐ Review and update policies regularly to reflect changes in device models, manufacturer guidelines, or clinical best practices.

3) Sample type selection

- ☐ Capillary sampling is appropriate for many NICU infants and, when the sample is properly warmed, it yields pH and pCO_2 values that closely reflect arterial measurements.[3,4,6,7,8]
- ☐ Arterial sampling may be used when precise oxygenation or rapid physiological shifts occur.[4,6,7]
- ☐ Sample collection in accordance with hospital protocol (capillary, venous, or arterial sampling).

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4) Capillary collection protocol

Click link to watch video: How to properly handle a capillary blood gas sample

- ☐ Warming the sampling site for 3–5 minutes may aid arterialization, as insufficient warming has been associated with reduced accuracy. Always follow hospital protocols.[4,8]
- ☐ Discard the first blood drop to avoid tissue fluid contamination.[8]
- ☐ Avoid squeezing or "milking" the finger as it may introduce hemolysis.[8]
- ☐ Fill and cap promptly to prevent air bubble admixture and clotting.[8,9]
- ☐ Ensure the sample is gently mixed, if applicable, to prevent clotting (follow device-specific guidance).
- ☐ Use accurate bedside labeling before leaving the neonate.
- ☐ Dispose of sharps and biohazard materials immediately per infection control guidelines.

5) Sample handling and timing

- ☐ Wear appropriate PPE (personal protective equipment) and follow infection control protocols.
- ☐ Test immediately using handheld POC device or deliver directly to analyzer. Each minute delay shifts acid–base gases.[1,2,9,11]
- ☐ Gently mix anticoagulated samples to avoid clot formation.[8]
- ☐ Avoid vigorous shaking, which may cause hemolysis or air bubble formation.
- ☐ Inspect the sample for clots and bubbles before analysis, attempt to expel if present, and discard if compromised.
- ☐ Document sample collection time to support accurate interpretation.
- ☐ Dispose of sharps and biohazard materials immediately per infection control guidelines.

6) Analytical integrity

- ☐ Confirm analyzer readiness by verifying that quality control (QC) checks have passed and the device is within calibration limits before testing.
- ☐ Handheld POC systems allow testing with minimal blood — less iatrogenic anemia.[2,10]
- ☐ Minimize air bubbles in syringes and expel immediately if present.
- ☐ Visually inspect all samples and reject those with clots or insufficient volume, as they can significantly distort results.
- ☐ Follow manufacturer and hospital protocols for error codes, cartridge rejection, or retesting criteria.
- ☐ Ensure results are transmitted accurately (manually or electronically) to the patient record and flagged for urgent review if critical per hospital protocol.

7) Result interpretation and clinical action

- ☐ Trend pH and pCO_2 over time, especially with capillary samples.[3,4,6]
- ☐ Enter results promptly into the EHR or confirm automatic upload; notify the clinical team immediately if results include critical or life-threatening values per your institutions protocol.
- ☐ If results are unexpected or inconsistent with clinical presentation, consider preanalytical error (e.g., poor perfusion, air bubbles, or delayed testing) and repeat the test if needed per hospital protocol.
- ☐ Document interpretation and any actions taken (e.g., escalation, repeat test) in the patient record.

8) Ongoing quality and safety monitoring

- ☐ Track and log sample rejection rates (e.g., due to clots, bubbles, hemolysis, or mislabeling) and analyze trends.
- ☐ Use findings to guide staff retraining or process improvements per hospital protocol.
- ☐ Monitor turnaround times (TAT) from sample collection to result reporting; use this data to assess workflow efficiency and the impact of point-of-care testing.[1,2,9,11]
- ☐ Review critical result reporting compliance to ensure all critical values are documented, communicated, and acted upon per hospital protocol.
- ☐ Ensure device maintenance logs, QC records, and cartridge storage conditions meet manufacturer standards.
- ☐ Conduct periodic staff competency assessments for sample collection, device operation, and result interpretation.

Why capillary sampling and handheld POC testing matter in the NICU

Capillary sampling, when properly performed, is less invasive and helps conserve blood volume, which is critical in neonates. It enables rapid bedside assessment of critical blood gas analytes. Handheld POC testing enhances these advantages by delivering near-instant results, minimizing transport delays, and requiring minimal sample volume. Together, these approaches help reduce preanalytical errors, accelerate clinical decision-making, and lower the risk of iatrogenic anemia.[3-7,9,10]

References

1. Respiratory Therapy. *RTs and Neonatal Critical Care Testing*.
2. Siemens Healthineers. *epoc Blood Analysis System* – Near-patient handheld testing, workflow impact.
3. Brodkorb S, et al. *Accounting for arterial and capillary blood gases in neonates*.
4. AARC Clinical Practice Guideline. *Capillary Blood Gas Sampling for Neonatal and Pediatric Patients*.
5. Neola Medical White Paper. *Blood gas analysis and iatrogenic blood loss in preterm infants*.
6. Tan RNGB, et al. *Monitoring Oxygenation and Gas Exchange in Neonatal Intensive Care*.
7. Tan RNGB, et al. *Frontiers in Pediatrics*. Capillary sampling as ABG alternative.
8. McLain BI, et al. *Comparison of capillary and arterial blood gas in neonates*.
9. Siemens Healthineers. *Keep Critical NICU Testing Close to Your Patients*.
10. Siemens Healthineers. *How Much Blood Do You Need for the epoc System?*
11. Siemens Healthineers. *Point of Care Blood Analysis System* (single-card panel workflow).

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