Brain Tissue Oxygenation ($PbtO_2$) Monitoring

Author: Joan L. Censullo, PhD, MSN, FAHA

Project Leads: Deborah Tran, DNP; Erin Supan, MSN; Amy Young, MSN; David Ricke, MSN

Reviewers: Amanda Johnson, DNP; Paula Zakrzewski, DNP; Mary Guanci, MSN; Katie Broadway, MSN; Barbara L. Johnson, DNP; Lorin Daniels, BSN

CONDITION/SKILL OVERVIEW

This quick guide was developed to provide a reference for bedside care and should be used in conjunction with the Intracranial Monitoring Evidence-based Clinical Review. $PbtO_2$ monitoring is used to monitor cerebral ischemic/hypoxic risk. The monitor may be tunneled under the scalp or inserted through a single or multi lumen bolt resting in white matter of the brain. If you have not managed a patient with a brain tissue oxygen monitor, it is important to seek guidance from experienced staff to demonstrate practices and elucidate other evidence-based resources. This guide does not replace your institutional guidelines for placement and management.

INSERTION AND PLACEMENT OF THE EVD

****This is a sterile procedure that may occur in the ED, OR, or ICU.*** Check with your institution to determine if there is an "Insertion Bundle." Shared responsibilities for provider and bedside nurse for placement include: patient prep, gathering supplies, monitor set up, *completion of pre-procedure check list*, verification of an informed consent, coagulation labs, and preprocedural medications. Check with the provider or team if you are not familiar with your role.

Supplies

- Cranial access kit
- Shave/clip prep kit
- Sterile or antimicrobial prep kit
- Sterile gloves, gown, mask, cap, eye shield
- Sterile drapes
- 4X4 sterile gauze (2)
- Large Clear, occlusive dressing (2)
- 2" tape
- PbtO2 monitor and connecting cables

Monitor Set Up

1. Insert smart card into appropriated slot in monitor (presence of card of depends on type of $PbtO_2$ monitor used).
2. Assemble monitor according to manufacturer guidelines and plug in to AC power source.
3. Wait for device set up process completion.

Patient Preparation and Insertion

1. Check coagulation labs as indicated. INR: between 1.2-1.6.
2. HOB 30-45 degrees, in neutral position, unless otherwise ordered by physician.
3. Intracranial catheter (IC) insertion is a sterile procedure that can take place at the bedside, in the OR, or procedural area.
4. Set up sterile trays and supplies for device insertion.
5. Don sterile PPE if assisting with IC catheter insertion.
6. Prep insertion site according to institutional sterile or aseptic technique.
7. Drape the head, neck and chest of the patient.
8. After probe insertion, secure cables with two points of tension. Anchor cables to patient's head and shoulder.
9. Attach cables to monitor.
10. Wait 20 minutes post insertion for $PbtO_2$ values to normalize.
11. Patient will have a CT to confirm placement.
12. Monitor for complications, such as hemorrhage or infection.

NURSING CARE

Patient Assessment

Neuro assessment as ordered by provider. Notify the provider of $PbtO_2$ measurements that are not within goal range.

- Monitor for target $PbtO_2$ range (WNL: 25-50 mm Hg; Licox® WNL: 20-40 mm Hg). Notify provider and/or administer interventions as prescribed (e.g., treat ICP, decrease metabolic demand, administer analgesia, sedation, fever management. Maintain perfusion, antihypertensive, vasopressors, increase FiO2, etc). Check with your institution for specific protocols for care of the patient with $PbtO_2$ monitoring in place.
- Minimize external catheter manipulation, in order to minimize accidental dislodgement/ disconnection/infection exposure.
- Probe may be in place for approximately 5-10 days. Discontinue as soon as no longer indicated.

Zeroing

Zeroing occurs when a catheter is placed.

Troubleshooting $Pbt0_2$ Monitoring

Unexpectedly low oxygen valuation

- Ensure that sufficient time has passed after insertion for valuation to stabilize (Up to 2 hours post insertion).
- Correlate clinically to a bedside neuro assessment.

Assess for physical equipment integrity- cable attachment security, adjacent electrical interference, adjacent thermal interference.

- If no issues are evident, discuss findings with provider.
- A head CT scan should be considered to ensure proper probe placement.

Patient Travel

Discussion with the team about risk vs benefit of travel. If EVD is concurrently being used, determine if drain is open or closed during transport. Nurses should accompany patients when off the unit.

- As the probe is dependent on a stable location, care should be taken when traveling to procedures or patient position changes.
- Check manufacturers recommendation about traveling with the $PbtO_2$ monitor.

Monitor Removal

1. Not to be removed by RN. Removal solely by medical provider.
2. Set up removal kit.
3. Place patient in semi-fowlers position.
4. Disconnect from monitor.
5. Assist provider with removal and site dressing.
6. Monitor for signs of drainage or infection.

PATIENT/FAMILY EDUCATION

Provide families with education about $PbtO_2$ monitoring, importance of positioning and safety concerns especially regarding infection risk. Place signage in the room as reminders to patients, family and other staff.