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STRESS PRECAUTIONS: WHAT NURSES CAN DO TO PREVENT OR MINIMIZE PPHN

What is PPHN?

Persistent pulmonary hypertension of the newborn occurs when pulmonary vessels respond to hypoxia and acidosis with vasoconstriction, causing increased pulmonary vascular resistance (PVR). High PVR and pulmonary hypertension impede pulmonary blood flow and cause right-to-left shunting through fetal shunts at the atrial (PFO) and ductal (PDA) levels. Blood is shunted away from the lungs, which leads to hypoxemia and acidosis. And, the vicious cycle begins. Make no mistake…these are some of the sickest babies we see in the NICU today.

Who is at risk for PPHN?

This is most often seen in near term, term, and post term infants. Babies with low Apgar scores and those who are initially slow to breathe or difficult to ventilate are at risk for PPHN. Infants born with meconium stained fluid, nuchal cord, placental abruption, acute blood loss, or respiratory depression secondary to maternal sedation also have an increased risk of developing pulmonary hypertension.

Consider pulmonary hypertension if the following conditions are suspected or confirmed:

- Difficult delivery with an acute hypoxic episode
- Respiratory Distress Syndrome (RDS)
- Meconium Aspiration Syndrome (MAS)
- Pneumonia
- Bacterial Sepsis
- Congenital Diaphragmatic Hernia (CDH)
- Hyperviscosity/ Polycythemia
- Any condition preventing normal circulatory transition at delivery

What does PPHN look like?

Symptoms are usually seen before 12 hours of life. Signs of respiratory distress may include tachypnea, retractions, cyanosis or low PaO_2 levels, despite administration of high oxygen concentrations. These babies are poorly oxygenated even in 100% O_2. Their PVR is so high that blood can't get to the lungs to pick up oxygen. They have a hyper-reactive pulmonary bed that constricts with agitation and crying, so these infants frequently desaturate with nursing cares. Blood pressure may be lower than normal. They can exhibit hypoglycemia or hypocalcemia…these patients should be on a hypoglycemia protocol. Metabolic acidosis and decreased urine output are

often noted. You may have a chest x-ray that appears normal. The right-to-left shunting consistent with pulmonary hypertension can be confirmed with an echocardiogram. So, what can we do? A *Stress Precautions Protocol* will help to minimize pulmonary hypertension and vasoconstriction by reducing oxygen demand. It will also help to avoid conditions that potentiate vasoconstriction and PPHN: hypoglycemia, hypoxia, hypothermia, acidosis, anemia, hypotension, and unnecessary stimulation.

Stress Precautions Protocol

Vital Signs

- Document VS hourly (P, R, BP): take hands on VS every 4 hours; otherwise, take VS from the monitor as long as there is correlation
- Invasive BP monitoring with hourly documentation is recommended
- Maintain neutral thermal environment with core temperature 36.5-37.5°C: take temperature once a shift

Respiratory Care

- No routine suctioning for intubated babies, unless ordered by a physician
- No routine suctioning for NP-CPAP: if tube is plugged, replace it by inserting new tube before old tube is removed
- No ventilator circuit or in-line suction catheter changes, unless ordered by a physician
- Provide 100% oxygen at all times, unless otherwise ordered

Hands On Care

- No baths or weights
- Minimal linen changes
- Avoid skin breakdown: keep infant on sheepskin; use water/gel pillow to support the head, if needed
- Minimal exams
- Minimal/no peripheral blood sampling: utilize central lines for access and nutrition
- Diaper changes done every 4 hours or when soiled for sedated babies; done only when awake for non-sedated babies
- Parental touch by hand to baby's head or extremity *as tolerated*
- Swaddle, nest, contain before leaving the bedside

Environmental Interventions

- Avoid hot/cold products
- Minimal noise at the bedside: use ear muffs, as needed
- Provide shaded light: protect eyes with mask, as needed
- Secure all tubes and equipment to avoid dislodgement
- Post "Stress Precautions" sign at the bedside to remind others of infant's need for quiet and minimal stimulation

(References available upon request)

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