JHH NICU Parenteral Nutrition Verification Tipsheet
Updated 11/14/19

Items in **bold** are essential, while other items are listed to provide background information.

### The Basics

| Weight | - Was the correct weight-based template used? (ex. <2.5 kg, 2.5 – 15 kg)  
|        | - Was the same weight used on both the PN and lipid order?  
|        |   - In patients < DOL 7, NICU uses birth weight as the PN order weight  
|        |   - In patients ≥ DOL 7 (once birth weight is regained), NICU usually uses ‘current weight’ for PN and enteral nutrition orders  
| Venous access | - Is the PN appropriate for the patient’s access? Peripherally: <1000 mOsm/L  
|        |   - Access: documented in I/O flowsheet or Summary ➔ Overview ➔ LDA or under Snapshot report  
|        |   - Are there any blatant compatibility issues? JHCC Compatibility Chart  
|        |     - Ex. Amphotericin B; midazolam infusions; dexmedetomidine infusions  
| Volume | - Is there ≥ 30 mL universal ingredient / overfill? (dextrose or sterile water)  
|        |     - Required due to TPN compounding  
| Cyclic PN | - True cyclic PN: “For” and “administer over” should be the total cycling duration and must match (ex. “For: 20 hours”, “administer over: 20 hours”)  
|        |   - Providers may select a one-step or two-step escalation or de-escalation  
|        |     - One-step escalation results in a lower peak GIR compared to a two-step escalation  
|        |     - Two-step escalation may be better for a patient sensitive to increases/decreases in GIR  
|        |     - Cyclic PN must be administered via a central line regardless of osmolarity  
|        |   - Glucose checks on the first day of cycling: 1 hour after end of infusion (monitor for hypoglycemia) and 1 hour after start of peak infusion rate (monitor for hyperglycemia)  
|        | - Continuous PN: “for” should be 26 hours and “administer over” should be 24 hours  
|        |   - Continuous PN that is turned off for compatibilities: “for” should be 26 hours and “administer over” should be the number of hours the PN will be running over in a 24 hour period  
|        |     - Write as continuous; providers should not select a “cycle up” or “cycle down”  
|        |     - Ex. Amphotericin B infused over 2 hours, Q24H; PN will “administer over” 22 hours  
|        |     - Ex. Acyclovir infused over 1 hour, Q8H; PN will “administer over” 21 hours  

### Hydration

| Fluids | - Expressed in “mL/kg/day” in the NICU  
|        |   - Includes enteral feeds, IV fluids, PN, lipids and continuous medications  
|        |   - Total fluid goal is listed in the most recent progress note  
|        |   - Overall: assess for volume overload, high sensible losses, risk of high insensible losses  
|        |     - I/O flowsheet  
|        |     - Weight trend (growth chart)  
|        |   - *Assess PN rate change orders* (listed under “medications” or “manage orders”) and enteral rate orders (under Manage orders ➔ diet orders or I/O)  

### Macronutrients

| Dextrose | - [Glucose infusion rate (GIR) calculator](#)  
|        | - New start PN in an NPO NICU patient: GIR > 4.5 mcg/kg/minute  
|        | - Continuing PN: trend dextrose percentage, fluids, GIR  
|        |   - Brand new baby: advance by 1 – 2 mcg/kg/minute/day  
|        |   - Weaning PN: decrease by 1 – 2 mcg/kg/minute/day  
|        |   - Sources of GIR: PN, IV fluids, drips mixed in dextrose  
|        | - Ex. A change in dextrose from 10% to 17% accompanied by a drop in PN volume may provide the same GIR  
|        | - Monitoring: point of care and serum blood glucose  
| Protein | - See [Pediatric PN Guidelines](#)  
|        | - NICU-specific guideline pending 2019  
| Lipids | - See [NICU Triglyceride Guidelines](#) for more detailed information  
|        | - Alternative Lipids: require approval (Bethany, Kim, Dr. Aucott)  
|        |   - SMOF Lipid (20%): indicated for prevention of cholestasis (may be dosed 1 – 3 g/kg/day)  
|        |   - Omegaven (10%): indicated for treatment of cholestasis (dose is always 1 g/kg/day)  
|        |   - Rarely patients will require two different lipids (ex. proven essential fatty acid deficiency in the setting of cholestasis, or poor weight gain with cholestasis): total dose should not exceed 3 g/kg/day.  
|        |   - Tipsheets for order entry, manipulation / verification on I-Drive  

### Vitamins and Minerals
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Trace Elements
- In patients who have been on PN >14 days and develop cholestasis (direct bilirubin >2 mg/dL), teams may cycle trace elements (ex. Administer on 3 days per week)
  o Trace element cycling will be noted in Pharmacy “Weekend Handoff” column
  o Direct hyperbilirubinemia may occur for many reasons in neonates (ex. Critical illness, UTI, congenital viral infection) - onset / magnitude of bilirubin change in relation to PN exposure is important.
- NICU guideline update pending 2019

Electrolytes
- Evaluate recent labs
  o Chemistry profile (BMP, CMP) and whole blood (point-of-care)
  o NICU-specific laboratory reference ranges
  o Hemolyzed samples are common (most NICU blood samples are obtained via heel stick) – consider sample hemolysis when evaluating potassium
  o Hypercalcemia: evaluate phos levels / provision in PN. In newborns, hypercalcemia is often secondary to hypophosphatemia.
    ▪ Calcium is ordered “per liter” in PN template, but teams assess the patient’s calcium dose “per kg” (goal calcium dose of 2 – 4 mEq/kg/day, alongside lab interpretation)
    ▪ iCal goal: generally >1, >1.2 for patients with cardiac concerns
  o Sodium disturbances: evaluate for fluid issues
- Evaluate renal function (Serum creatinine values/trend and urine output)
- Note: changes in sodium and potassium may be selected to provide additional chloride, acetate, or phosphorus depending on patient-specific needs
  o Tip: Evaluate electrolytes that are presented in units “per kg”

Heparin
Type of access matters!!!
GEN106: Appendix A
- Peripheral IV: safe to add heparin 0.5 unit/mL, not required
  o May add pre-emptively if team is attempting to obtain central access that day
- Umbilical venous catheter (UVC):
  o ≥ 1 mL/hour: 0.5 unit/mL
  o Total lumen flow rates < 1 mL/hour are discouraged due to line occlusions/clots – if required, use 1 unit/mL heparin [must be approved by attending]
- PICC:
  o ≥ 2 mL/hour: 0.5 unit/mL
  o < 2 mL/hour: 1 unit/mL
  o Rates < 1 mL/hour are discouraged

Total heparin
- Total heparin from all sources: only required to calculate in patients < 32 weeks GA AND < 7 days postnatal age
  o Highest risk group for IVH
  o Goal: ≤ 80 units/kg/day [VAD policy update pending 2019]
  o Exceptions require attending approval (document in an iVent)
- NICU patients undergoing systemic anticoagulation still require heparin for line patency

Acid suppression
Famotidine
- Use of acid suppression (proton pump inhibitors and histamine 2 receptor antagonists) has been associated with an increased risk of infection and necrotizing enterocolitis (NEC) in neonates
  o Gastric acid is a defense mechanism against infections
  o Stress ulcer prophylaxis should not be routinely recommended for neonates!!!
    ▪ Risk vs. benefit discussion
    ▪ Specific risk factors for NEC: prematurity, prior history of NEC, cardiac disease resulting in altered perfusion to the gut, abdominal wall defects (ex. Gastrochisis, omphalocele)

Useful References / Policies:
- PN I-Drive Folder: includes pediatric PN training documents
  o Orientation for Checking Peds PN Orders in EPIC
- JHHCC Pediatric PN Guidelines
- Parenteral Nutrition Policy, Pediatric (MM044)
- VAD Central Maintenance (GEN106)
  o Appendix A: Heparin flush / fluids chart
- VAD Peripheral: Insertion and Maintenance (GEN107)