

 <b>NEONATAL CLINICAL PRACTICE GUIDELINE</b>	<b>Title:</b> <b>Parenteral Fluid Management for Preterm &amp; High Risk Neonates</b>	
	<b>Approval Date:</b> June 2015	<b>Pages:</b> 1 of 4
	<b>Approved by:</b> Neonatal Patient Care Teams, HSC & SBH Child Health Standards Committee	<b>Supercedes:</b> HSC# 80.275.402 SBH #033

## 1.0 PURPOSE AND INTENT:

- 1.1 To provide a process for administration and adjustment of parenteral and enteral fluids in neonates in neonatal units.

*Note: All recommendations are approximate guidelines only and practitioners must take in to account individual patient characteristics and situation. Concerns regarding appropriate treatment must be discussed with the attending neonatologist.*

## 2.0 PRACTICE OUTCOME

- 2.1 To meet fluid and electrolyte needs of neonates and prevent dehydration, fluid overload or electrolyte imbalance.

## 2.3 DEFINITIONS:

- 3.1 **Total Fluid Intake (TFI):** The fluid intake requirements of the neonate as ordered by the physician. They include all parenteral infusions and enteral intake. Unless ordered otherwise by the prescribing practitioner, they *do not* include:
- line flushes;
  - intermittent medications;
  - blood products;
  - fluid boluses;
  - volume expansion boluses.
- 3.2 **Total Fluids Received (TFR):** The total of all fluid sources the neonate receives which include:
- infusions;
  - flushes;
  - blood products;
  - fluid boluses.
- 3.3 **Basic Start Solution:** D10W with 5% amino acids.

## 4.0 GUIDELINES:

- 4.1 **Total Fluid Intake** standard maintenance fluids are ordered according to the following guidelines:
- 4.1.1 Term infant: 65 mL/kg/24h, increase by 15-20 mL/kg each 24 hours up to 150 mL/kg/day.
- 4.1.2 Preterm infant ( $\leq 2000$  g): 80 mL/kg/24h, increase by 15-20 mL/kg each 24 hours up to a maximum of 150mL/kg/24h.
- 4.1.3 Extremely low birth weight infant ( $\leq 1000$  g): 100 mL/kg/24h, increase by 15-30 mL/kg. Adjust fluids based on electrolytes q8-12h as indicated.
- 4.1.4 Hypoglycemic infants of diabetic mothers start at least 80mL/kg/day on day one of life.
- 4.1.5 For infants with gastroschisis preoperative management:
- Start 150-200 mL/kg/day on day 1 of life until the defect repaired or silo placed.
  - Initially use D5W with ½ Normal Saline for infusion.
  - Use D5W (not D10W) for all infusions to avoid excessive glucose intake.

- 4.2 For all infants with less than 1500 g birthweight start Parenteral Nutrition at 0-6 hours of age using "Basic Start Solution" IV at 40mL/kg/24 hours and to provide 2 g/kg/24 hours of amino acids, and lipid 20% to provide 1g/kg/24hours. Make up the remainder of the total TFI with D10W.
- 4.3 For infants >2000 g with hypoglycemia and no central venous access, D20W with no electrolytes can be run through a peripheral IV with assessment for phlebitis and extravasation at least every 30 minutes.
- 4.4 For any ongoing fluid losses such as gastric or chest tube, use normal saline or ½ normal saline for fluid replacement losses. The solution should not include glucose or potassium. Replacement is usually ordered in 6-8 hour blocks.
- 4.5 Write parenteral fluid orders at least once a day for all neonates who are receiving parenteral fluids
- 4.6 For daily general fluid orders write the Total Fluid Intake (TFI) in mL/kg/24 hr with the weight on which the order is based, and *all* parenteral infusions including monitoring lines (e.g. UAC, arterial line).
- 4.7 For orders of electrolyte solutions indicate the desired solution (e.g. D10W, D5W) and the dose of electrolyte additives in mmol/24h AND mmol/kg/24h.
- 4.8 Adjust infusion rates for fluid deficits or excesses, increased or decreased fluid losses or altered maintenance fluid requirements based on disease condition.
- 4.9 Calculate the patient's actual TFR, output and fluid balance a minimum of every 24 hours. This may be ordered at more frequent intervals (most often q6h) as patient's condition requires.
- 4.10 Assess fluid balance at 2400 h and at 6 hour intervals as required by the infant's clinical status. The fluid balance includes total intake from enteral and parenteral sources and all measured output but does not include insensible water losses.
- 4.11 Use 10-20 mL/kg normal saline for fluid boluses meant to increase circulating blood volume and treat hypotension.
- 4.12 Maintain a minimum infusion of 0.8-1 mL/hr for all central venous lines with a diameter of 3 Fr or less as they have a high risk of losing patency when locked.
- 4.13 Mix medication infusions in D10W unless otherwise ordered or the medication is not compatible with D10W.
- 4.14 Calculate total glucose intake in mg/kg/min during morning rounds from all parenteral and enteral sources for all patients in the first week of life with a birth weight of less than or equal to 1000g, those with documented hypoglycemia, or if patient is on insulin.
- 4.15 Adjust IV solution rates to maintain TFI as the volume and schedules of enteral feeds are altered.
- 4.16 When infusion rates must be increased or decreased by greater than 20%, discuss the following options with the pharmacist, physician and nurse:
- Infuse D10W or D5W (for infants less than 1500 g or if hyperglycemia is a concern) for "piggyback";
  - Use current electrolyte or Total Parenteral Nutrition (TPN) solution until it expires to maintain the minimal required infusion rate for each site; and
  - Remix the electrolyte solution.
- 4.17 If the volume of feeds (plus) mandatory parenteral fluids exceeds the ordered TFI the physician

either recalculates the TFI or writes an order to limit the volume of feeds.

- 4.18 When running a central line to keep open (TKO) use current electrolyte solution, *including TPN*, if any, until the expiry time to maintain the minimal required infusion rate for each site.
- 4.19 When the volume of enteral feeds reaches 75 mL/kg consider discontinuing lipid infusion.
- 4.20 When the volume of enteral feeds reaches 120 mL/kg/day, if fluid intake is not critical, discontinue all IV access. If fluid intake is critical, D10W with any necessary electrolyte additives may be used to make up the TFI once the TPN or electrolyte solution expires.
- 4.21 Administer insulin infusions through the same type of tubing as lipids.
- 4.22 Do not filter lipids. Change lipid tubing every 24 hours.
- 4.23 When central venous access devices (CVADs) have extremely small lumens (such as the double-lumen 1.9 Fr Argyle), consider adding heparin 0.5 - 1 unit/mL to the solution if compatible.
- 3.23 Determine Parenteral route by the following guidelines:

Type of Line	Infusion
<b>Arterial Line: Peripheral</b> (radial, tibial, axillary)	<ul style="list-style-type: none"> <li>• Standard: ½ Normal saline with heparin 1 unit/ml @ 1mL/hr</li> <li>• Option: Sodium Acetate 77 mmol/L with heparin 1.0 units/mL @ 1mL/hr</li> </ul>
<b>Arterial Line: Umbilical</b>	<ul style="list-style-type: none"> <li>• Standard: ½ Normal saline @ 1mL/hr</li> <li>• Option: Sodium acetate 77 mmol/L @ 1 mL/hr</li> </ul>
<b>Central Venous Access Device (peripherally inserted or cutdown)</b>	<ul style="list-style-type: none"> <li>• High concentration glucose.</li> <li>• TPN, Electrolyte solutions requiring central access @ minimum 1mL/hr up to required rates.</li> <li>• Medications (bolus and infusion).</li> <li>• Vasopressors.</li> <li>• Drug infusions with high osmolality or pH.</li> <li>• Blood products: Line size 3Fr or greater.</li> </ul>
<b>Peripheral Intravenous</b>	<ul style="list-style-type: none"> <li>• D10W with Electrolyte solutions.</li> <li>• Up to D20 with no electrolytes (<i>as outlined in 3.24</i>).</li> <li>• TPN – glucose concentration dependent on amino acid concentration (<i>central or peripheral will be indicated on solution by pharmacy</i>).</li> <li>• May be saline locked.</li> </ul>

**5.0 REFERENCES:**

Bhatia, J. (2006). Fluid and electrolyte management in the very low birth weight neonate. *Journal of Perinatology*, 26 Suppl 1:S19-21.

Fann, B.D. (1998). Fluid and electrolyte balance in the pediatric patient. *Journal of Intravenous Nursing*, 21(3), 153-159. (still current)

Hay WW Jr (2005) Intravenous nutrition of the very preterm neonate. *Acta Paediatr Suppl*. 94(449):47-56. (still current)

Hartnoll, G. (2003). Basic principles and practical steps in the management of fluid balance in the newborn. *Seminars In Neonatology*, 8(4), 307-13.

Modi, N. (2004). Management of fluid balance in the very immature neonate. *Archives of Diseases in Childhood*, 89, F108-F111. (still current)

- Shah, P.S., Kalyn, A., Satodia, P., Dunn, M.S., Parvez, B., Daneman, A., Salem, S., Glanc, P., Ohlsson, A. & Shah, V. (2007). A randomized, controlled trial of heparin versus placebo infusion to prolong the usability of peripherally placed percutaneous central venous catheters (PCVCs) in neonates: The HIP (Heparin Infusion for PCVC) Study. *Pediatrics*, 119,1, e284-e291.
- Vanhatalo, T. & Tammela, O. (2010) Glucose infusions into peripheral veins in the management of neonatal hypoglycemia – 20% instead of 15%?. *Acta Paediatrica*, 99, 350-353.
- Wada M, Kusuda S, Takahashi N, Nishida H. (2008). Fluid and electrolyte balance in extremely preterm infants <24 weeks of gestation in the first week of life. *Pediatrics International*, 50(3):331-6.
- Willock, J. & Jewkes, F. (2000). Making sense of fluid balance in children. *Paediatric Nursing*, 12(7), 37-43.
- WRHA Child Health Pediatric Enteral and Parenteral Nutrition Handbook 2<sup>nd</sup> Edition. (2008).Winnipeg, MB.

## 6.0 **PRIMARY AUTHORS:**

- 6.1 Jarrid McKittrick, Clinical Pharmacist, NICU
- 6.2 Dr. Michael Narvey, Section Head, Neonatology
- 6.3 Doris Sawatzky-Dickson, Clinical Nurse Specialist, NICU
- 6.4 Karen Bodnaryk, Nurse Educator, Child Health
- 6.5 Dr. John Baier, Assistant Medical Director, NICU