1.0 PURPOSE AND INTENT

1.1 To ensure safe and effective use of umbilical catheters in neonates in administration of fluids, blood sampling and blood pressure monitoring.

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

2.0 PRACTICE OUTCOME

2.1 Prevent complications associated with central venous catheters including infection, venous thrombosis, vessel erosion and fluid infiltration into deep tissues.

2.0 DEFINITIONS:

2.1 Umbilical Arterial Catheter (UAC): A small tube threaded into a neonate’s artery in the umbilicus. Primarily used for arterial blood pressure monitoring and blood sampling. May be used to give fluids, medications, and parenteral nutrition if no other site available.

2.2 Umbilical Venous Catheter (UVC): A small tube threaded into a neonate’s vein in the umbilicus. Primarily used to give fluids, medications, and parenteral nutrition. Also used for venous pressure monitoring. May be used for taking blood samples if there is no arterial catheter in place.

3.0 GUIDELINES:

3.1 Use a UVC for short term central venous access. If access greater than 10 days is required consider alternative access such as peripherally inserted central catheter (PICC).

3.2 Use aseptic technique in preparing equipment for insertion of UAC and UVCs.

3.3 Before insertion clean the umbilical stump using the procedure outlined in Appendix A. For infants <1000 grams birthweight use 2% chlorhexidine without alcohol, for infants > 1000 grams birthweight use chlorhexidine with alcohol.

3.4 Select the smallest size catheter possible based on the weight of the neonate. See table below for the types and sizes of catheters and the most common indications:

<table>
<thead>
<tr>
<th>Catheter Size</th>
<th>Common Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single lumen 3.5 Fr</td>
<td>Most babies</td>
</tr>
<tr>
<td>Single lumen 5 Fr</td>
<td>Emergency UVC and infants weighing &gt;2.5kg</td>
</tr>
<tr>
<td>Double lumen 3.5 Fr</td>
<td>Weight must be &gt; 1.5 kg</td>
</tr>
<tr>
<td></td>
<td>Use only after consultation with attending Neonatologist</td>
</tr>
<tr>
<td></td>
<td>Indicated for infants where vasopressors or prostaglandin administration is anticipated</td>
</tr>
</tbody>
</table>

3.5 Determine appropriate catheter tip location as outlined below:

3.5.1 UAC Low catheter: Between lumbar vertebrae L3 and L4. The tip should lie just above the aortic bifurcation.

3.5.2 UAC High catheter: Between thoracic vertebrae T6 and T9. The tip should be above the diaphragm but well below the aortic valve.
3.5.3 UVC: Above the diaphragm and in the inferior vena cava at the right atrial junction.

3.6 Do an anterior-posterior chest and abdominal x-ray immediately following catheter insertion, repositioning of the catheter(s) and any time the catheter tip may have moved. Document results of x-rays in the Integrated Progress Notes (IPN) and inform the bedside nurse of the results as soon as possible (no later than 1 hour). Consider a cross table lateral abdominal x-ray when the catheter does NOT appear to be in an appropriate position, to determine it has not been placed into a parallel vein.

3.7 Confirm blood return before infusing any solution.

3.8 Infuse saline or dextrose solution before catheter tip location is verified by x-ray. Before x-ray verification infuse other solutions or medications only in emergency situations.

3.9 Apply a transducer and monitor all UACs. Apply a transducer and monitor a UVC only on order of a physician.

3.10 Do not advance the catheter after the insertion procedure is completed and the sterile field is breached. If advancement is necessary insert a new catheter.

3.11 When the catheter is no longer needed or has been advanced too far and must be pulled back, withdraw a specified length or remove the catheter on a written order. This may be done by the nurse or physician.

3.12 Document the insertion on the IPN and the Central Venous Access Device Insertion Procedure record (HSC form #NS01106 SBH form #7102-6258-3).

3.13 Assess the infant at least once an hour and prn for signs of bleeding at the insertion site and any signs of catheter related complications. Document assessment daily; HSC on the Central Venous Access Device Flow sheet form #NS01068, SBH on the fluid balance sheet.

3.14 A physician or surgeon removes surgically placed umbilical catheters (ie. cutdown insertion).

3.15 Catheters not in an ideal position are removed or repositioned (if possible). If it is necessary to use a catheter in a suboptimal position the situation should be:
   - discussed with the attending Neonatologist,
   - discussed with the family,
   - documented in the health record by the physician and cosigned by the attending Neonatologist within 24 hours,
   - remedied at the earliest possible time.

3.16 Infusions and medications appropriate for UAC and UVC administration:

<table>
<thead>
<tr>
<th>IV Solution</th>
<th>UAC</th>
<th>UVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parenteral Nutrition</td>
<td>Site of last choice&lt;br&gt;Peripheral concentrations only</td>
<td>YES</td>
</tr>
<tr>
<td>Glucose and electrolytes</td>
<td>Site of last choice.&lt;br&gt;Ca+ not recommended&lt;br&gt;Use KCl with caution&lt;br&gt;Peripheral concentrations only</td>
<td>YES</td>
</tr>
<tr>
<td>Bolus medications</td>
<td>Refer to Pediatric Parenteral Drug Manual&lt;br&gt;Avoid whenever possible</td>
<td>YES</td>
</tr>
<tr>
<td>Medication Infusions</td>
<td>Refer to Pediatric Parenteral Drug Manual&lt;br&gt;Avoid whenever possible</td>
<td>YES</td>
</tr>
<tr>
<td>Hypertonic Solutions</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Blood Product Transfusions</td>
<td>Under extreme circumstances only, with physician’s order</td>
<td>YES</td>
</tr>
<tr>
<td>Infusion rate</td>
<td>Minimum .8 mL/hr</td>
<td>Minimum .8 mL/hr</td>
</tr>
</tbody>
</table>
Note: See Pediatric Parenteral Drug Manual. UVCs are referenced under Central Lines. UAC are referenced individually. For specific guidelines on parenteral fluids see the Handbook of Pediatric Enteral & Parenteral Nutrition.

5.0 REFERENCES:

5.1 Barrington, K. (2010). Umbilical artery catheters in the newborn: effects of position of the catheter tip. Cochrane Database. Issue 1


5.0 PRIMARY AUTHORS

4.2 Dr. John Baier, Assistant Medical Director, NICU
4.4 Doris Sawatzky-Dickson RN MN, NICU Clinical Nurse Specialist
4.6 Karen Bodnaryk, Nurse Educator, NICU
APPENDIX A

PROCEDURE FOR SKIN ANTISEPSIS BEFORE UMBILICAL CATHETER INSERTION

1) Attach sterile Kelly forceps to cord or cord clamp and pass these to the assistant to hold the cord vertically off the abdomen

2) Place sterile drain gauze (4 inch square gauze sponge with keyhole fenestration) around the cord base

3) Clean the cord and clamp with appropriate antiseptic solution 3 times and allow antiseptic to dry

4) Remove the drain gauze with forceps, discard, and clean the cord with sterile saline to prevent skin burns (minimize friction)

5) Apply second drain gauze around the cord base

6) Drape area around the cord

7) Proceed with line insertion.