

Insertion & Management of a Peripheral Cannula and Intravenous Therapy

Introduction

Insertion of a short venous access cannula for the purpose of providing intravenous fluids and medications is a routine part of neonatal practice (CDC 1996; Duck, 1998; McCullen & Pieper 2006; Wilson 2005). Sick and / or preterm neonates who are unable to maintain fluid and electrolyte balance without support may require intravenous access for extended periods in order to provide parenteral nutrition and / or medication (McCullen & Pieper, 2006) – *see Central Line Guidelines*.

Indications

- Infants greater than 32 weeks gestation who require short-term intravenous fluid therapy and/or medications.
- Infants who need a platelet transfusion
- Infants without umbilical venous access who require red blood cell transfusion or fresh frozen plasma
- Infants who require antibiotics
- Infants who require volume
- Infants receiving peripheral total parenteral nutrition

Related protocols

1. *Central Lines - Umbilical catheters & PCVCs*
2. *Developmental Care Guidelines (intranet)*
3. *Enteral feeding*
4. *Extravasation injuries*
5. *Management of IV cannula and administration of antibiotics (intranet)*
6. *Medication Guidelines*
7. *Pain*
8. *Small Baby Guideline*
9. *Sucrose protocol*
10. *Transfusion*
11. *Total Parenteral Nutrition*

Potential Risks

1. *Occupational Risks:* The clinician must maintain standard precautions when handling sharps, and ensure safe disposal of sharps and body fluid.
2. *Infection Risks:* Clinicians must comply with infection control principles including aseptic technique when performing this procedure.
3. *Clinical Risks:* The registered nurse
 - should utilise strategies such as swaddling, containment and sucrose to promote comfort and minimise heat loss during the procedure.

- must use a syringe driver or volumetric infusion pump for the administration of all IV infusions to ensure a consistent rate of administration and to prevent fluid overload (Policy Directive – look up).

Goals

- Cannula integrity is maintained for duration of infusion / medication regimen
- Accidental dislodgement of cannula prevented
- Early detection of possible extravasation and appropriate removal of cannula
- Skin integrity maintained
- Comfort of neonate ensured throughout all management interventions

Procedure for insertion of a peripheral venous cannula

Equipment

Clean	Sterile
<ul style="list-style-type: none"> • IV Trolley cleaned with Lemex 1:20 • Armboard and safety pin if cannula positioned over a joint • Duropore™ tape to secure IV tubing • Skin preparation: 0.015% chlorhexidine aqueous (Baxter) • IV stand with Alaris™ infusion pump if fluid therapy required • Additive label 	<ul style="list-style-type: none"> • Dressing pack & Tegaderm™ IV transparent film • 2ml syringe • 10 ml plastic ampoule of normal saline • 24g surflo™ intravenous cannula • Alaris™ short straight extension tubing • Alaris™ intravenous giving set if fluid therapy required and prescribed intravenous solution

Procedure

Clinicians

Resident medical officers and accredited clinical nurse specialists may only have two attempts at inserting an intravenous cannula and should seek guidance in the extremely preterm infant before attempting the procedure.

Pain management

The insertion of a peripheral venous cannula has been identified as a painful procedure (Harrison et al, 2003). As such, use of sucrose is now routine- *Sucrose medication protocol*. Sucrose is a nurse initiated medication and administration must be documented by the RN in the *Once Only Section* of the medication chart (MR70).). As sucrose and sucking is synergistic a pacifier should also be offered.

Site of insertion – see protocol Extravasation Injuries

Acceptable sites in order of preference include:

1. The back of the hand and forearm - (dorsal venous arch, basilic vein, metacarpal veins)
2. The saphenous vein (as long as the site of entry is close to the ankle joint and the cannula tip is beyond the ankle joint).^{**}
3. The antecubital fossa ^{**} - (the basilic vein, medial cubital vein, cephalic veins)
4. The scalp veins.

****Don't use these veins if it is likely that the baby will need a silastic long line in the future.**

Topical antiseptic

The skin is cleansed with aqueous *chlorhexidine 0.015%* and allowed to dry (2-3 minutes) before insertion of cannula (Garland et al 1995).

Taping the cannula

Following insertion of the cannula, steri strips may be used to anchor the cannula and Tegaderm™ IV (3M) is then applied over the insertion site. Sterile, transparent, occlusive, semi permeable dressings are recommended for use on peripheral cannula sites because they allow direct observation of the insertion site for signs of phlebitis or infiltration (CDC 1996; Duck, 1998; Stoios 1999; Wilson 2005). Ensure the cannula tip position is clearly visible and the circulation (venous return) is not impaired.

If the cannula has been inserted over a joint, try to splint the limb in neutral alignment. For infants greater than 27 weeks Duropore™ (3M) may be used to stabilise the splint and for infants less than 27 weeks Coban™ (3M) should be used to prevent injury to the skin.

Use caution as both these tapes can expand and conceal increasing oedema or extravasation.

Importantly the IV cannula site should be visible at all times so as it may be inspected every hour without disturbing the infant.

Use of Leukoplast® tape (BSN medical GmbH & Co KG) is no longer recommended to secure an intravenous cannula as it occludes the insertion site and does not allow moisture to escape (Kiernan 1997). Moreover, the use of precut Leukoplast® tapes is associated with an increase in coagulase-negative staphylococcus colonisation at insertion sites (Almonte et al, 1999).

<p>Step 1</p>  <p>Ensure hub of cannula is not flush with the skin</p>	<p>Step 2</p>  <p>Tegaderm™ IV (3M)</p> <p>Cut sterile strip in two & secure cannula. Ensure insertion site is visible.</p> <p>Do not use dressing on infants < 27 weeks or infants with congenital skin conditions such as EB.</p>	<p>Step 3</p>  <p>Tegaderm™ IV (3M)</p> <p>Peel the lining from the dressing & position so the notch fits snugly around the cannula hub.</p> <p>Press the dressing into place & overlap the tabs under the catheter hub to protect the skin.</p>
<p>Step 4</p>  <p>Remove the dressing frame & smooth the dressing into place from the centre to the edges.</p>	<p>Step 5</p>  <p>Attach the primed extension tubing to the cannula & secure using Duropore™ (3M).</p> <p>An additional piece of tape may be used to secure the tubing and prevent kinking.</p>	<p>Step 6</p> <p>If a splint is required, secure using 2 pieces of Duropore™ (3M) / Coban™ (3M) one on either side of the cannula site. The insertion site must remain visible. Maintain normal alignment of limb.</p>

Modified from Holland, T. (2009).

Replacement of cannula

There is no evidence to recommend routine replacement of peripheral cannulas in the neonatal population. Studies suggest the risk of phlebitis is not significantly increased with length of placement (Shimandle et al 1999). Cannulas only require replacement when they are dislodged; show signs of infection or fluids infiltrate the tissues surrounding the cannula site.

IV cannula should be removed promptly when no longer needed to reduce the risk of nosocomial infection.

Documentation

Date and time of insertion and removal should be recorded by the proceduralist in the case history notes (MR45). Documentation should also include reason for insertion / removal and description of site.

Nursing management of IV Infusion

Check intra venous solution with a second registered nurse or medical officer against the IV fluid order chart (MR665A) before priming IV giving set and connecting to cannula.

Confirm and set hourly IV fluid rate on IVAC® Signature infusion pump (Alaris Medical Systems) as per prescription. This approach will require the IV volume to be confirmed and reset each hour thus minimising the risk of accidental fluid overload.

Commence a fluid balance chart (MR662B or MR582 / MR581) and document volume of fluid infused, pressure reading and visual observation of insertion site and surrounding tissue every hour.

Total fluid Balance (total in & total out) should be calculated at midnight for all infants receiving intravenous fluids. This is essential for infants with HIE, cardiac failure, renal compromise, SIADH or other electrolyte / fluid disturbances.

The cannula should be flushed with 0.9% normal saline to assess integrity of line before and after administration of medication and to ensure there is no precipitation of incompatible solutions. Before accessing a cannula the injection port should be cleaned using 70% alcohol chlorhexidine solution and allowed to dry (1-2 minutes).

Antibiotics including common ones used in Newborn Care (penicillin and vancomycin) have a low pH and have been associated with serious extravasation injuries (Montgomery et al, 1999). In addition solutions such as concentrations $\geq 12\%$ dextrose, additives (calcium gluconate) and medications (sodium bicarbonate, inotropes) should not be delivered through a peripheral cannula – *see medication protocols* prior to administration of drugs. Peripheral total parenteral nutrition should not be used routinely but when ordered the infusion site requires close observation for early signs of extravasation.

Infants who are nil-by-mouth should have an 8 Fg intra gastric tube inserted, left on free drainage and aspirated 4th hourly – describe amount and type of gastric return.

Infants should also have a routine blood sugar screen (at least 4th hourly – first 24 hours) and urinary specific gravity attended 8th hourly for the first 48 hours. Review frequency at 48 hours.

Parenteral IV solutions and giving sets to be routinely changed every 48 hours

Prevention and Recognition of Infiltration / Extravasation

Difficult venous access and fragile vessels along with the use of vesicant infusions and medications combine to create this risk. While many of these infiltration injuries will heal without problem, some cause permanent scarring and particularly so when close to joints (Wada et al, 2003) – *see protocol Extravasation Injuries* for appropriate management protocols.

Neonates are at high risk for extravasation as their skin and underlying tissues are easily distended (Duck 1997). In addition pressure alarm limits cannot be relied on to identify early infiltration (McCullen & Pieper, 2006; Sutcliffe & Thompson 2011). Extremely premature infants, infants with circulatory compromise ie poor perfusion and those infants having therapeutic hypothermia are most at risk.

Observe the infant for signs of pain or discomfort during the infusion. Every hour inspect and palpate insertion site and surrounding area for signs of oedema and blanching or tension in the skin that may suggest infiltration or phlebitis.

The pressure monitoring system should be *re zeroed* at the beginning of each shift and if the infusion set is removed from the pump for any reason – document same on the Intensive Care Chart (MR581) or Fluid Balance Chart (MR582 / MR662B).

While pressure readings on infusion pumps do not reliably predict or detect infiltration (Gnanalingham et al 2010; Phelps 1990; Sutcliff & Thompson 2011), a study by Guy & Pons de Vincent (1992) recommended that the optimal pressure limit above baseline infusion pressure should be set at *30cms H₂O that is 22mmHg*. Any rise or fall in the trend of pressure readings should be evaluated by the RN.

Variability in pressure readings is common in the neonate. Increase in pressure readings may be due to extravasation but more commonly result from a change in the height of the infusion pump with respect to the infant, the behavioural state of the infant, position of the limb or addition of side lines to administer medications or fluids (Sutcliffe & Thompson 2011).

A fall in pressure readings may indicate leaking connections, a perforated line or again a change in the position of the infusion pump with respect to the infant. While changes in pressure readings from these conditions are not necessarily detecting extravasation, it is essential for the RN to assess and evaluate the cannula site, dressing and volume infused in response to pressure readings trending up or down.

It is recommended that ALL changes in pressures readings above OR below 30mmHg be investigated and action documented on the fluid balance / intensive care charts (MR662B or MR582 / MR581).

The volumetric infusion pumps in this unit have a default setting of 75mmHg when turned on. This level needs to be reset to an appropriate alert limit (about 30mmHg above baseline pressure) when commencing an infusion and at the beginning of each shift. The pump pressure also needs to be *re zeroed* at the beginning of each shift after any significant changes or trend in pressure reading is noted, the site is examined and concerns discussed with the RN transferring care. It should be remembered that low infusion volumes require tighter alarm alerts to detect early extravasation.

Management of IV cannula without infusion

Infants on enteral feeds who are receiving antibiotics or other medication may have a cannula sited without the need for a continuous infusion – see *Management of IV cannula and administration of antibiotics (intranet)*. Ensure all medications are re constituted and / or diluted appropriately - see *medication protocols*.

Consequences

The main complications of short peripheral venous access cannulae in paediatric populations are phlebitis (13%), colonisation (11.8%) and extravasation (28%) (CDC, 1996). Available evidence suggests that catheter related infections are low (<1.9%) because of shorter vessel dwell time, although, it is an area that has not been well studied. Results of studies that have reviewed catheter-related infections in paediatric and neonatal populations show that coagulase-negative staphylococci (*staphylococcus epidermis*) is the most predominate organism (CDC 1996; Shimandle et al 1999; Almonte et al 1999).

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