

Peritoneal Dialysis – Nursing Management of Infants

Procedure Responsibilities and Authorisation

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Target Audience	Waikato DHB Staff working in NICU
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Procedure Review History

Version	Updated by	Date Updated	Summary of Changes
3	Joyce Mok	Dec 2013	Updated
4	Jayne Bennett	Mar 2017	3 yearly update
5	Richard Pagdanganan	April 2020	3 yearly update

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Peritoneal Dialysis – Nursing Management of Infants

1 Overview

1.1 Purpose

To provide guideline for the management of infants who require peritoneal dialysis, which removes fluids and toxins from the blood and regulate electrolyte levels to avoid haemodynamic instability.

1.2 Scope

Waikato DHB Staff working in NICU.

1.3 Patient group

- Indications for peritoneal dialysis: Peritoneal dialysis is generally used for acute renal failure. Possible causes include acute tubular necrosis, prematurity and renal vein thrombosis. Acute renal failure when complications of acute renal failure are not medically manageable, and are manifested by:
 - Fluid overload, acidosis, hyperkalaemia
 - Cardiac arrhythmia with hyperkalaemia
 - High levels of dialyzable toxins e.g. creatinine, urea, potassium, sodium
 - Refractory acidosis

1.4 Exceptions / contraindications

- Peritoneal dialysis is contraindicated in infants who have:
 - Recent extensive abdominal surgery
 - Existing peritonitis
 - Abdominal pathology e.g. adhesions, colostomy
 - Diaphragmatic tears
 - Congenital diaphragmatic hernia
 - Abdominal wall defects – omphalocele, gastroschisis
 - Bladder exstrophy

1.5 Definitions

Dialysate (PD fluid)	It is the fluid infused into the peritoneal cavity and contains salts and a higher concentration of glucose relative to the patient's own blood. The highly osmolar dialysis solution causes water to move from the patient's circulation through the semi-permeable peritoneal membrane and into the dialysate fluid within the peritoneal cavity by the process of osmosis. After a prescribed dwell time, the fluid is drained via the catheter, thus removing excess water, electrolytes and waste products from the body.
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Dialysis cycle	The dialysate is infused regularly and drained from the peritoneal cavity until removal is complete and fluid, electrolytes and acid-base balance has been restored. Dialysis cycle consists of dialysate in time, dwell time and out time (infusion-dwell-out cycles).
Peritoneal dialysis (PD)	It offers a nonvascular route of renal replacement therapy for paediatric patients including newborn infants with renal failure and certain metabolic disturbances. It corrects electrolyte imbalance by removing extra fluid and waste products from the blood. It is also a process which works through a combination of diffusion and osmosis. A peritoneal catheter known as a Tenckhoff catheter is inserted surgically into the peritoneal cavity, in which the dialysate solution is introduced.

2 Clinical Management

2.1 Competency required

Registered Nurse who has completed Level 3 ventilator orientation

NB: All procedures involving the catheter, fluid, lines and drainage system, including urine collector for waste drainage, must be performed using sterile technique as per NICU CVL procedures.

2.2 Equipment

Note: some equipment are not kept in NICU, please borrow from other wards as indicated

- Surgical equipment (Surgeon brings in)
- Paediatric peritoneal catheter (Tenckhoff) (Surgeon brings in)
- Trolley for sterile procedures
- Neonatal tray
- Sterile gown pack
- Sterile gloves
- Masks & cap
- Alcohol-free chlorhexidine cleansing agent – for skin
- Local anaesthesia, e.g. 1% xylocaine
- Syringes and needles: x 2 each - 1ml syringe, 2ml syringe, 5ml syringe, 10ml syringe, 30ml syringe, 25G needle, drawing needle, filter needle.
- Medi Temp II blood warmer and cassette
- Chlorhexidine with alcohol cleansing agent for lines
- In-line burette set
- Intravenous infusion pump
- Two 3-way adaptors
- Luer plug
- MiniCap (in a blue plastic container in hallway store room) (M3 Renal Ward has stock)
- Precision 400 urine collector (from E4)

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- Wide bore extension line (IV trolley or store room)
- High pressure line (from ICU)
- Blue multi-purpose connector
- Dialysate solution e.g. 4.25% or 1.5% (to order: send a requisition form to PROPHARMA)

2.3 Procedure

2.3.1 Assisting with insertion of catheter

Preparation

- Medical staff to obtain consent from parents.
- Parents must be fully informed of the progress and the condition of the infant at any time. *Rationale:* To ensure parents are informed of and understand reasons for the procedure because the infant is usually in a critical condition.
- Nil by mouth as per the surgeon's advice - if not done prior to the procedure.
- Weigh the infant if conditions allow to obtain a pre-dialysis weight.
- Assess and record infant's vital signs: BP, peripheral temperature, axilla temperature, SpO₂, ABG, BSL, abdominal girth and level of consciousness.
- Insert and leave orogastric tube in situ to decompress infant's stomach: to prevent trauma to stomach when peritoneal catheter is being placed.
- Position infant in supine position with the head of bed slightly elevated to provide easy access to the peritoneal cavity.
- Monitor continuously infant's condition and vital signs to assess infant's tolerance of the procedure.
- Infant may be catheterised to empty the bladder for accurate measurement of urine output and to reduce the risk of bladder perforation during insertion of the peritoneal catheter.
- Assist with abdominal X-ray to confirm the position of Tenckhoff catheter.

2.3.2 Setting up the dialysis system and fluid

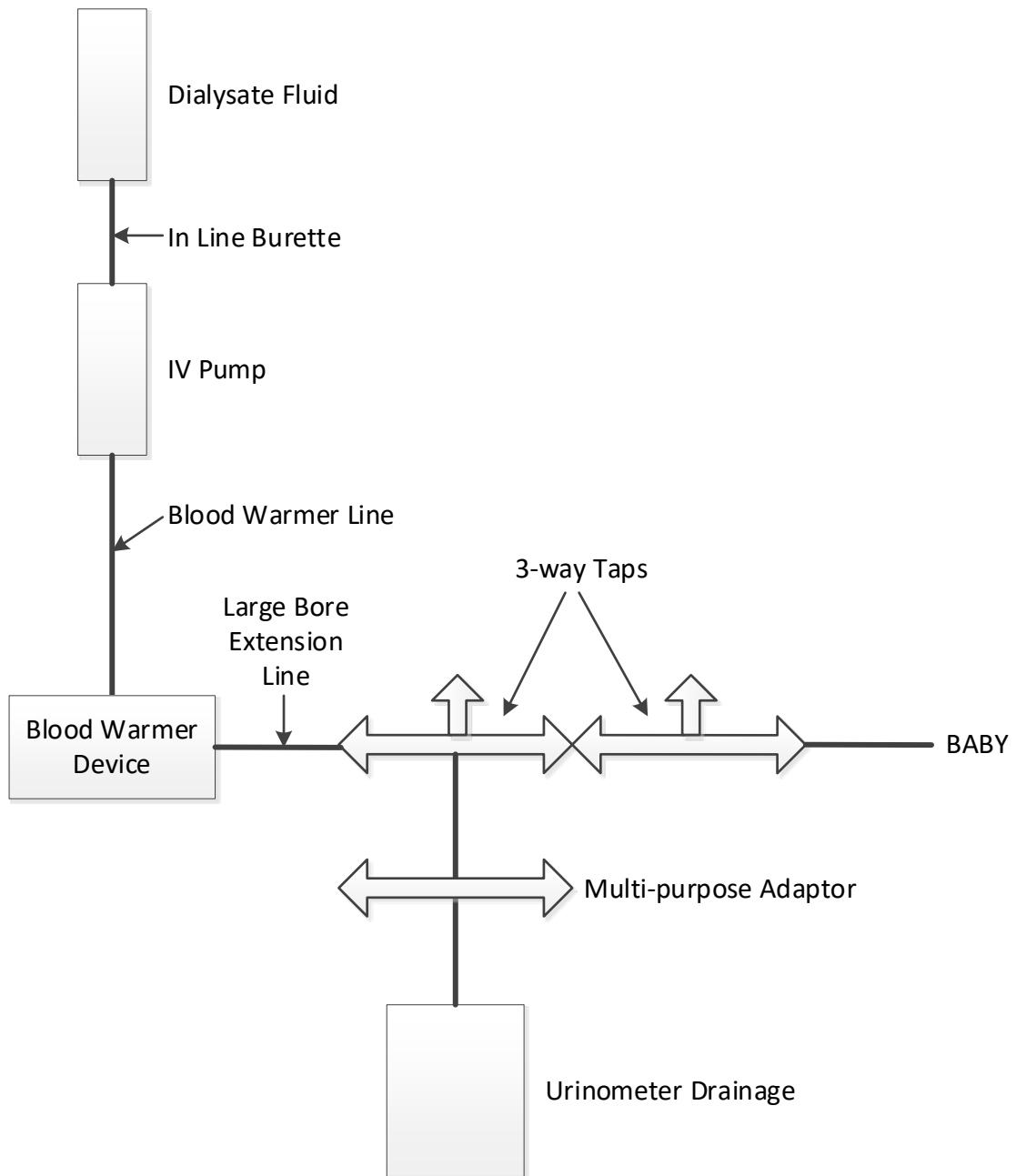
- Put on cap and mask.
- Perform hand hygiene.
- Put on gown and gloves.
- Use sterile technique to set up the drainage system as shown in the diagram (on next page).

Maintain a closed system all the time: to prevent air getting into the system and reduce risk of contamination.

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Peritoneal Dialysis System



- Any procedure involving the catheter and/or lines must be performed using sterile technique to prevent contamination of the catheter and the solution that could cause peritonitis.
- Check dialysate (PD fluid).
- Warm the PD fluid to body temperature through the Blood Warmer to prevent hypothermia and reduce vasoconstriction of the peritoneal capillaries

Rationale: Dilated capillaries enhance blood flow to the peritoneal membrane surface, thus increasing waste clearance into the peritoneal cavity.

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2.3.3 Management of peritoneal dialysis

Prescriptions as per [Peritoneal Dialysis for Neonates protocol \(2851\)](#).

Dialysis as prescribed by medical staff (NNP/CNS/Registrar):

- Volume of cycles:
 - Range from 10ml/kg to 30 mL/kg weight.
 - 30ml/kg is required to really be effective in infant with complete renal failure. (Volumes <20ml/kg are unlikely to be effective). Sometimes this volume causes pulmonary and circulatory embarrassment.
- Frequency
 - As rapid as possible to begin with, i.e. 10mls in, 10 minutes dwell, and 10 minutes out.
 - When under control, space the interval to 15, 15, and 15; or 20, 20 and 20.
- Cycle: in, dwell and drain time
- Concentration of fluid

Fluid infusing dialysate

- Run the PD fluid as prescribed and rate is adjusted according to prescribed run-in time.
- May have to adjust the first few cycles according to the infant's tolerance of the procedure.
- Assess infant's condition such as:
 - Increase of respiratory embarrassment due to distension of abdomen by P. D. fluid
 - Respiratory status, e.g. apnoea, drop in SpO₂, or increase in O₂ requirement
 - Signs of pulmonary or circulatory embarrassment such as infant deteriorates during each in-cycle
 - Check catheter patency by running 1 or 2 cycles straight in and out.

2.3.4 Observations and management of complications

Complications include

- peritonitis
- pain
- bowel perforation
- bleeding
- catheter malfunction
- respiratory distress
- umbilical / inguinal hernia

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1. Peritonitis

Signs and symptoms:

- Cloudy dialysate return
- Abdominal tenderness
- Pyrexia
- Inflammation of catheter site
- Septicaemic shock

Prevention:

- Sterile technique for all fluid and line changes, and site dressings.

Management:

- Send P.D. fluid for culture and sensitivity
- Blood tests (CBC, differential count and culture)
- Haemodynamic monitoring (observe for signs of shock)
- Antibiotics may be given intravenously and/or add to Dialysate
- P.D. may be discontinued

2. Pain

Signs and symptoms:

- Increased BP
- Increased/decreased heart rate
- Increased respiratory rate
- Abdominal tenderness

Assessment of infant's response related to pain, which may be due to:

- Fluid volume is too much
- Fluid temperature is too hot or too cold
- Infant's position is uncomfortable – too supine or erect when fluid dwelling
- Rapid instillation
- Incisional pain
- Infection
- Constipation

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Management:

- Assess pain and sedation score as per [Neonatal pain and sedation: Assessment and nursing management](#) (Ref. 1684)
- Administer sedation or analgesia as prescribed by the CNS/NNP/Registrar
- Correct any fluid problem: volume, temperature
- Position infant to maximise comfort

3. Respiratory distress

If infant suffers from severe respiratory distress during dwell time, inform medical staff immediately because the fluid needs to be drained immediately.

4. Bowel perforation

Signs and symptoms:

- Faecal return
- Watery diarrhoea
- Pain
- Sepsis
- Shock

Management:

- Stop dialysis immediately.
- Inform medical staff and surgeon immediately.

5. Bleeding

Site of bleeding may be

- From catheter site
- Noticed in drainage
- Internal bleeding

Management:

- Inform medical staff – a suture may be required if bleeding is from catheter or incision site.
- Blood stained drainage – it is not unusual for first few returns following insertion, continue to monitor but must report any increase.
- Blood tests, e.g. CBC

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6. Catheter malfunction

Catheter malfunction may be due to kinks, blockage or improperly positioned catheter, and can cause dialysate instillation or drainage to be slow or absent.

Note: Do not milk or fiddle with tubing to encourage drainage as this in fact may cause air locks

Signs and symptoms:

- Slow run-in or drain out
- Leakage around site

Management:

- Check lines and catheter for kinks or obstruction.
- Gently put tension on the catheter, this may shift catheter away from omentum and allow run in or drain out.
Accumulation of fibrin may obstruct the catheter. If fibrin is noticed in drainage a fibrin clot may have formed, so a sterile flush may be required. **Note: Sterile flush is done by medical staff.**
- Reposition the infant – may improve the run in and/or drainage of fluid.
- Occasionally the catheter may need to be replaced.

7. Line disconnections

- Send PD specimen for urgent culture and sensitivity.
- Replace new extension set using sterile technique.
- Commence IV/IP antibiotics as prescribed.

8. Migrate of PD catheter

Signs and symptoms:

- Good inflow but poor outflow
- Abdomen becomes distended

Management:

- Inform medical staff and surgeon

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2.3.5 Monitoring

- Continuous monitoring of vital signs: TPR, SpO₂, BP, peripheral temperature, pain assessment.
- Record amount of inflow and outflow of PD fluid to detect peritoneal fluid overload
- Colour of fluid
- Leakage around the site
- Assess fluid re-absorption
 - peripheral and dependent oedema
 - failure to drain out all of dwell volume
- Observe for signs of dehydration: poor skin turgor, sunken eyes
- Leakage of fluid due to cracks in line or poor connection – leaks constitutes to possible contamination

Special note for recording:

SAMPLE
NICU PERITONEAL DIALYSIS
RECORD SHEET

Patient Sticker: _____ Date: _____

order: - 30ml x 23 minutes
Dwell time: 20
20 minutes

Cycle No.	Solut'n	IN			DWELL			OUT			TOTAL OUT		Urine	Remarks	
		Start Time	Volume (l)	Cum. Total	Start Time	Dwell Time	Finish Time	Finish Time	Burette Reading	Volume (l)	Cum. Total	Balance (a - b)			Cum. Balance
1	2.5%	1000	20	20	1020	20	1040	1100	30	30	30	-10	-10		
2	2.5%	1100	20	40	1120	20	1140	1200	10	10	40	+10	0		
	2.5%	1200	20	60	1220	20	1240	1300	40	40	80	-20	-20		

- In time = the time prescribed amount of PD fluid should be infused over
- Dwell time = the length of time the PD fluid stays in the peritoneal cavity
- Out time = amount of time to allow fluid to drain from the peritoneal cavity
- Start = clock time
- Finish time = clock time
- Balance = the balance is calculated at the end of each cycle. It is the amount of dialysis fluid drained out versus the amount drained in.

A negative balance if you recover more fluid than was instilled with the exchange (i.e. drained out > drained in).

A positive balance if infant retains fluid at the end of an exchange (i.e. drained out < drained in)

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2.3.6 Tenckhoff Catheter Site Dressings

- Check with surgeon when dressing needs change: Initial dressing at 72 hours post-insertion and requires replacing only once weekly, provided it remains dry and intact.
- The catheter should be immobilised at skin level to prevent irritation and leaking around the site.

Equipment

- Dressing pack
- Alcohol-free chlorhexidine cleansing agent – for skin & catheter site
- Cap & Mask
- CVL gown pack
- Sterile gloves
- Duoderm
- Allevyn

1. Preparations

- Put on cap and mask, perform hand hygiene
- Prepare equipment and trolley
- Assistant nurse to loosen existing dressing
- Perform hand hygiene and don gown and gloves as per NICU [CVL & UVC management](#) (Ref. 4936)

2. Changing dressing

- Use forceps to remove dressing
- Clean around catheter site with alcohol-free Chlorhexidine cleansing agent
- Allow to dry thoroughly
- Seal area with duoderm and date.
- Apply Allevyn if wound site is moist or leaking to prevent skin breakdown and reduce risk of infection.
- If wound site is moist, discuss with surgeon/medical team whether a waterproof dressing is appropriate.

3. Securing catheter

Immobilise catheter at skin site with duoderm to prevent dislodgement of catheter.

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2.3.7 Change of fluid, lines and drainage system including urinometer

- The infant's PD giving set must be a closed circuit and use sterile techniques for lines and fluid change according to NICU [CVL & UVC management](#) (Ref. 4936)

Note:

- Change the fluid and lines every 3rd day.**
- Check there is approximately 200ml of PD solution left in the bag to enable sufficient fluid for at least one cycle while the lines and fluid are being prepared.**

Equipment

- Dressing pack
- Cap and mask
- CVL gown pack
- Sterile gloves
- Chlorhexidine in alcohol cleansing agent
- Correct fluid

1. Checking

Check fluid for concentration, strength, expiry date, clarity of solution, volume and medication against prescription chart and infant's I.D.

2. Preparations

- Put on cap and mask.
- Perform hand hygiene.
- Prepare trolley and equipment.
- Perform hand hygiene.
- Don gown and glove.
- Change lines, fluid and add medication as per NICU [CVL & UVC management](#) (Ref. 4936)

3. Aftercare

- Dispose of used equipment.
- Perform hand hygiene.
- Document on fluid chart, drug chart and clinical notes.

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2.3.8 Catheter removal by surgeon

Equipment

- Neonatal tray
- Sterile gloves and gowns pack
- Masks
- Alcohol-free chlorhexidine cleansing agent
- Suturing material
- Opsite

2.3.9 Management of wound

- Cover with clean, dry dressing.
- Re-dress daily and PRN until area is healed.
- Check with surgeon and document when dressing can be removed.

3 Audit

3.1 Indicators

- There is documented evidence of parental consent.
- There is documented evidence of physiological testing as per 2.3.5.
- There is a signed prescription for dialysate including volume per cycle.

4 Evidence base

4.1 Bibliography

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4.2 Associated Waikato DHB Documents

- Waikato DHB NICU Nursing Procedure: [CVL & UVC management](#) (Ref. 4936)
- Waikato DHB NICU Medical Protocol: [Peritoneal Dialysis for Neonates](#) (Ref. 2851)
- Waikato DHB NICU Nursing Guideline: [Neonatal pain and sedation: Assessment and nursing management](#) (Ref. 1684)

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