NETS WA
Newborn Emergency Transport Service

Surgical Conditions

Scope (Staff):	Nursing and Medical Staff
Scope (Area):	NETS WA

Child Safe Organisation Statement of Commitment

CAHS commits to being a child safe organisation by applying the National Principles for Child Safe Organisations. This is a commitment to a strong culture supported by robust policies and procedures to reduce the likelihood of harm to children and young people.

This document should be read in conjunction with this disclaimer

Contents

Aim

To summarise the transport considerations for the safe retrieval of neonates with surgical conditions.

Risk

Inter-hospital transport of critically ill infants poses a risk of adverse transport related events due to the technical challenges of safely supporting these infants during

transport and/or the interruption in continuity of care intrinsic to inter-facility transfer. A balance is required between expedited retrieval with careful consideration of optimising the management of the infant.

Key points

- Neonates with suspected surgical conditions retrieved by NETS WA are admitted to ward 3B, PCH.
- The exact timing and urgency will depend on the location of the neonate, clinical circumstances, and suspected diagnosis. Some transports may be **time-critical** and others may be elective retrievals.
- Radiology – ensure the referral hospital has loaded any x-rays/imaging onto PACS so they can be reviewed by the receiving neonatal and surgical team. If they cannot be uploaded, then a hard copy or CD must be transferred with the baby
- Surgery- ensure that the referral has been discussed with the on-call surgical team and the accepting medical team before the retrieval is activated
- Maternal blood – Ensure the referral team has taken a maternal blood sample for cross match and completed a pathology request form (2 purple EDTA tubes).
    - Maternal details on the sample MUST be hand labelled and include the Mothers UMRN, first name, surname, DOB and the collectors' initials, date, and time of collection.
    - Pathology request form - the person collecting the sample MUST sign the collector's declaration on request form and complete all relevant sections on the form.

Sample for cross match for surgical infants should be sent to the laboratory at Perth Children's Hospital only. The cross match performed at labs at other hospital sites (including KEMH) are not acceptable for issuing blood products at PCH

Necrotising Enterocolitis and Bowel Obstruction

- Necrotising enterocolitis is the most common gastrointestinal emergency in neonates. It is the second most referred gastrointestinal surgical condition (after bilious vomiting) for neonatal transport teams.
- Given the complexity of the condition, it is challenging to manage the logistics during neonatal transport across units with varying capacities and level of care. Ranging from the highest level at KEMH requiring assistance with definitive surgical management to regional ward based/midwife run other units in WA.

- In critically unwell infants, further discussions between the surgical team and neonatologists at KEMH/PCH/NETS WA **MUST** occur to decide on the best management as well as timing of retrieval.
- At KEMH hospital - If the infant is clinically unstable for transfer, the surgeons will decide whether to do a peritoneal drain to decompress the bowel, or whether a laparotomy is needed as soon as possible.
    - If the infant has a peritoneal drain inserted at KEMH, the infant will then be transferred to PCH as soon as their clinical condition allows. Timing of this transfer will depend on the availability of beds in 3B.
    - If laparotomy is needed, the infant will be transferred to 3B PCH. This will require Priority 1 or same day transfer for definitive surgical management.

Metropolitan Area - Consider urgent transfer of infants with suspicion of NEC if the infant already shows signs of Mild-Moderate (Grade II) disease. Discuss with the surgical and neonatal team at PCH

Regional Areas - All infants with suspected NEC and relevant risk factors at a regional centre requires urgent transfer to 3B PCH for further medical and surgical management.

Management

- Prevent progression of the disease and treat symptoms. Keep parents up to date about the current and expected management.
- Maintain adequate airway, breathing and circulation. Intubate and ventilate if the infant is haemodynamically unstable or having frequent apnoea/bradycardia or severe acidosis.
- Monitor vital signs, blood pressure, peripheral circulation, and fluid balance (urine output). Consider inotropes if ongoing concerns with haemodynamic compromise.
- Nurse supine to prevent pressure on abdomen when prone. Monitor for pain and use Morphine and/or Paracetamol for analgesia.
- Keep nil by mouth and insert an oral or nasogastric tube for free drainage - minimum size 6, may need an 8FG. Document the volume of fluid loss and consider replacement of fluids if loss has been >10 ml/kg/hour over the last 12-hour period, especially if out on regional transport.
- IV Fluids (glucose or glucose/saline). TPN cannot be infused during retrieval (but can be left connected to the IV cannula/ PICC line (clamped) so can continue on arrival at PCH). If TPN is via a PICC line ensure the line has fluids running through it at least >0.5ml/hour to keep patent.

- Administer antibiotics - cover gram positive, gram negative and anaerobic organisms (usually Vancomycin, Gentamicin and Metronidazole). Use of a single agent i.e., Tazocin is also acceptable.
- Check bloods taken - blood culture, FBC, CRP, coagulation, U & E, electrolytes blood gas, glucose and blood group and hold (do bloods if not done by referring hospital).
- Correction of coagulopathy and/or thrombocytopenia.
- Look at the latest x ray abdomen both AP and decubitus views. If signs of pneumoperitoneum or bowel obstruction, urgently discuss with NETS-WA consultant and surgical team before departure.
- If transporting by air, a sea level cabin is recommended to prevent abdominal air expansion at altitude and the risk of respiratory embarrassment. Discuss cabin requirements with the flight crew and NETS-WA team prior to departure.

Congenital Diaphragmatic Hernia

- Most cases of Congenital Diaphragmatic Hernia (CDH) are antenatally diagnosed with the birth planned at KEMH. As surgery is NOT considered urgent, it may take several days for the neonate to be physiologically stable enough for transfer from KEMH to PCH.
- Neonates with undiagnosed CDH who are not born at KEMH should be transferred to PCH as urgently as possible.
- These infants are often unstable and challenging to transfer and may need Nitric Oxide (NO) therapy and/HFOV. NETS can retrieve with NO from all locations in WA, and with HFOV (Fabian) from metro locations only.

Management

- Always intubate and use volume targeted ventilation with a TV of 4-5mLs/kg to minimise barotrauma. An arterial pCO2 (partial pressure of carbon dioxide) between 45 and 60mm Hg and a pH between 7.25 and 7.40 should be targeted in all newborn infants with CDH. Supplemental oxygen should be titrated to achieve a preductal saturation of at least 85%, but not >95%. If requiring higher pressures i.e. PIP>25 cm H20 on conventional ventilation, consider using HFOV. Consider inhaled nitric oxide at 20ppm, if resistant pulmonary hypertension to optimal ventilation and lung recruitment.
- All infants with CDH requiring mechanical ventilation should have adequate sedation and analgesia with a combination of Intravenous opioid (morphine or fentanyl) and a short-acting benzodiazepine (midazolam) to reduce opioid dosing requirements.

- Bag and mask ventilation and non-invasive ventilation are contraindicated in infants with CDH, as they lead to bowel distension and further respiratory compromise.
- Insert large-bore oral or nasogastric tube to decompress the stomach and small bowel. 8FG <34 weeks and 10FG ≥34 weeks
- Give fluid bolus if needed (not more than 20mL/kg), and inotropes to maintain systemic blood pressure, capillary refill, <3 seconds, lactates <3 mmol/l and urine output >1ml/kg/hour. For fluid and inotrope resistant hypotension, consider using steroids (Hydrocortisone).
- Consider Alprostadil (Prostaglandin E1) infusion for possible duct dependent lesions or resistant pulmonary hypertension with higher supra-systemic right ventricular pressures.
- Muscle relaxants can be considered as a last resort option in resistant cases of pulmonary hypertension with patient-ventilator asynchrony, however, should be used with utmost caution as can lead to systemic hypotension. Always discuss with the NETS WA Consultant prior to commencement.

Gastroschisis

- Most Gastroschisis are antenatally diagnosed with the birth planned at KEMH. Notify the surgical team at PCH of impending admissions. See Neonatology Gastroschisis guideline for management at birth.
- Place the neonate in two impermeable bags:
    - 1st bag to cover the legs and buttocks only - to keep urine and faeces separate.
    - Place the 2nd bag over the 1st and right up to under the armpits to cover the exposed bowel. Do not cover the bowel with saline soaked gauze.
- Position patient on their right-hand side. Monitor lower limb perfusion (capillary refill, colour and warmth). Assess colour and perfusion of the exposed bowel every 15 minutes. If discoloration of bowel is noticed, reposition the infant and/or reposition the exposed bowel. If this occurs during the journey and there is still a distance to travel, contact the NETS WA and Surgical Consultants who may recommend using a gloved little finger to widen the defect for improving perfusion to bowel.
- Insert size 8F or 10F NGT and leave on free drainage and aspirate every 15 minutes. Beware of bile aspiration. Replace NG losses with normal saline if >10ml/kg/12 hrs.
- Pay meticulous attention to thermoregulation as the neonate is at risk of hypothermia due to the exposed bowel.

- If requiring respiratory support, consider humidified high flow oxygen, otherwise consider intubation. Try to avoid CPAP.
- Establish 2 x Peripheral IV access. Arterial access is not routinely required. Avoid Umbilical access.
- Start maintenance fluids at 80-100mLs/kg/day. In addition, start 10mLs/kg/hr normal saline to cover fluid losses. This should continue until the silo has been applied or a formal reduction of the gastroschisis is achieved, whichever occurs first. May require fluid bolus if circulatory status is compromised (10mLs/kg normal saline).
- Commence IV antibiotics - Piperacillin Tazobactam as monotherapy
- Assess pain responses and ensure adequate analgesia (IV Morphine/ Fentanyl/Paracetamol)

Before departure

- Consider repeating blood gas before leaving referring hospital (Monitor Lactate).
- A silo may have been placed by the surgical team at KEMH prior to transporting to PCH. Do not secure the silo to the top of the transport cot in case of sudden acceleration or deceleration forces during the transport which may cause silo dislodgement. Support the silo in place by a material roll ensuring the bowel is always visible.

Exomphalos

- Exomphalos may not require an urgent transport as the protective membrane prevents heat and fluid loss but this will depend on the location of birth.
- Ensure careful clamping of the cord, at least 10cm away from organs within exomphalos, to avoid damaging any bowel that may be present in it.
- Other congenital abnormalities are more likely with exomphalos than with gastroschisis.
- Infants should be transported urgently to PCH if the protective membrane ruptures.

Myelomeningocele

Can be open or closed lesions. Surgical closure is usually recommended for open lesions within the first 24 hours in order to prevent infection and trauma to the exposed tissues. Contact neurosurgeon on-call and discuss timing of transport for an infant with a Myelomeningocele (usually this is not a middle of the night emergency but will depend on the location of birth).

Management

- Examine the lesion for its size, location on the vertebral column, whether it is open or covered defect, any CSF leak and lower limb movements.
- Position prone, not dressed and with a loose nappy. Ensure gentle handling and avoid placing clothing or blankets on or near the lesion (to help maintain integrity of the lesion ensuring there is no undue pressure or injury to the lesion and exposed nerve tissue).
- If supine positioning is unavoidable (e.g. for urgent intubation) a foam mattress with cutout area could be temporarily used.
- Keep baby NBM for transport
- These infants are at risk of hypothermia. Monitor frequently and maintain temperatures between 36.5-37.5 C during transport using beanies, socks and appropriate incubator heater output.
- Monitor skin integrity over pressure points as these infants are limited in how they can be positioned and may have lower limb immobility, contractures or weakness
- Observe and document the size, colour and perfusion of the lesion with a description of the membrane. Observe for tears in the membrane and monitor leaking of CSF. Inform the neurosurgical team and the medical team at PCH of any tears in the membrane or CSF fluid leakage.
- Avoid using latex to prevent sensitization in later life. Use a silicone-based protective dressing and a non-adherent pad to cover and protect the lesion (Mepilex non-adhesive dressing with adhesive border is ideal). If Mepilex is not available, use a non-stick dressing such as paraffin impregnated gauze and a non-adherent dressing pad to protect the lesion. This type of dressing can be lifted for inspection and replaced without changing. Hold in place with tubular dressing if necessary. Minimal tape should be applied to the skin due to sensitivity to tapes and to prevent dermal stripping.
- The dressing should be protected from soiling to prevent contamination as potential for infection is high.
- These infants can have distended bladder from low urine output. Assess the bladder and ensure passage of urine – this is particularly important to remember in infants nursed prone. If significant abdominal distension, discuss with neurosurgical team about the need for clean intermittent catheterization. Record passage of meconium since birth and assess stooling function. Check for lower limb movements.
- Start broad spectrum antibiotics depending on the advice of the neurosurgeon.

Oesophageal Atresia +/- Tracheoesophageal Fistula

Can present with copious oral secretions post birth, coughing and choking with feeds, aspiration of feeds/ secretions, dusky episodes and/or inability to pass an orogastric tube/ nasogastric tube. See Oesophageal Atresia/Tracheoesophageal Fistula.

There may be history of polyhydramnios during pregnancy. A chest x-ray may confirm an oesophageal atresia with the gastric tube curled up in the oesophageal pouch.

Management

- Keep infant NBM
- Attempt to gently pass a size 10 FG feeding tube (a smaller bore tube may curl in the pouch). If this is met with resistance, an X-ray should be ordered with the feeding tube in place.
- If the X-ray is indicative of an OA, a replogle tube should be inserted to prevent aspiration of secretions (size 8 for babies < 2.5kgs, size 10 for babies >2.5 kgs). Insert the replogle tube orally until resistance is felt (usually around 8-10 cm from lips), then withdraw 0.5cm and secure. Document the length that the replogle is taped at and record in the patient notes. Losses from the replogle tube should be recorded and replaced if excessive. Refer to Appendix 1: Replogle Tube During Transport
- Place the replogle tube on continuous low-pressure suction of -20 to -30mmHg. Adequate timely suctioning (every 15 minutes) of the oral secretions would reduce the need for respiratory support in many of these cases. DO NOT ATTACH ANY HIGH-PRESSURE SUCTION TO THE REPOGLE TUBE
- If the feeding tube can be passed through to stomach but with history of excess of gas being aspirated from stomach, excessive oral frothing/secretions, poor feeding, unexplained desaturations/apnoea's, a high index of suspicion for H-shaped TOF should be kept in mind.
- Nurse prone to prevent aspiration and assist drainage of secretions from the oesophageal pouch. Nurse the neonate with the head of the bed elevated. Avoid using pacifiers as it increases the risk of oral secretions and possible aspiration.
- Avoid respiratory support if possible. Inspiratory gases take the path of least resistance i.e., through the fistula and may cause significant abdominal distension and/or perforation. If ventilation is required, the transport becomes a **time critical retrieval** and possibly a surgical emergency. **Always** discuss with the NETS WA Consultant prior to initiation of any respiratory support and IMMEDIATELY inform the accepting surgical and medical team at PCH. Note:
    - If transport is anticipated for a longer duration, invasive respiratory modality is preferred over non-invasive modalities.

- Consider putting a rectal probe in to facilitate gas evacuation and prevent stomach/intestinal overdistension.

Transport of neonates following surgical procedure

Infants discharged from PCH 3B to another hospital following a surgical procedure may be more at risk of apnoea/ bradycardia during the transfer if transferred <24 hours post anaesthetic, therefore all infants transferred under 24hours must receive full monitoring and be transported by NETS WA Team.

Related CAHS internal policies, procedures and guidelines
Congenital Diaphragmatic Hernia
Exomphalos/Omphalocoele
Gastroschisis
Malrotation/Volvulus of the Intestines Myelomeningocele
Oesophageal Atresia/Tracheoesophageal Fistula
Nurse Led Retrieval
Persistent Pulmonary Hypertension in the Newborn
Neonatal Medication Protocols

References and related external legislation, policies, and guidelines

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This document can be made available in alternative formats on request.

Document Owner:	Neonatology		
Reviewer / Team:	NETS WA		
Date First Issued:	August 2009	Last Reviewed:	July 2024
Amendment Dates:		Next Review Date:	July 2027
Approved by:	Neonatology Coordinating Group	Date:	30/07/2024
Endorsed by:	Neonatology Coordinating Group		
Standards Applicable:	NSQHS Standards:  Child Safe Standards: 1,10		

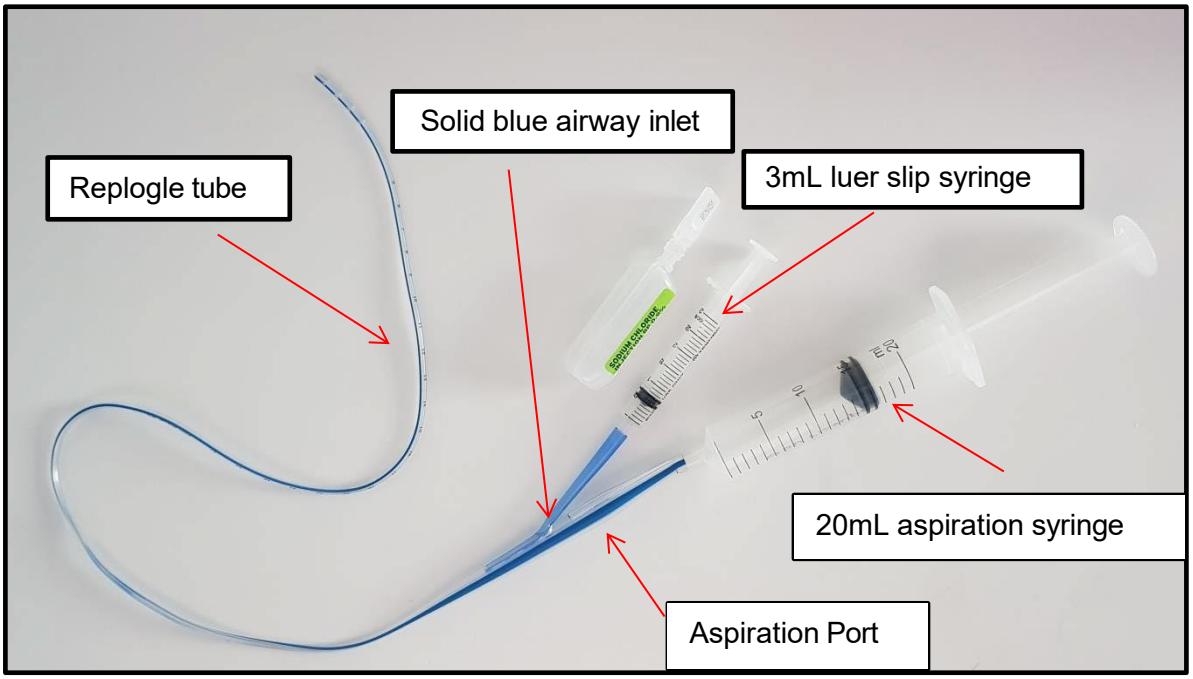
Appendix 1: Replogle Tube during Transport

Indications

A replogle tube is used to drain saliva from the upper oesophageal pouch in infants with suspected oesophageal atresia or distal tracheoesophageal fistula. It is positioned 0.5cm above the end of the pouch. Adequate drainage of the pouch is required to prevent saliva spilling over into the trachea resulting in aspiration.

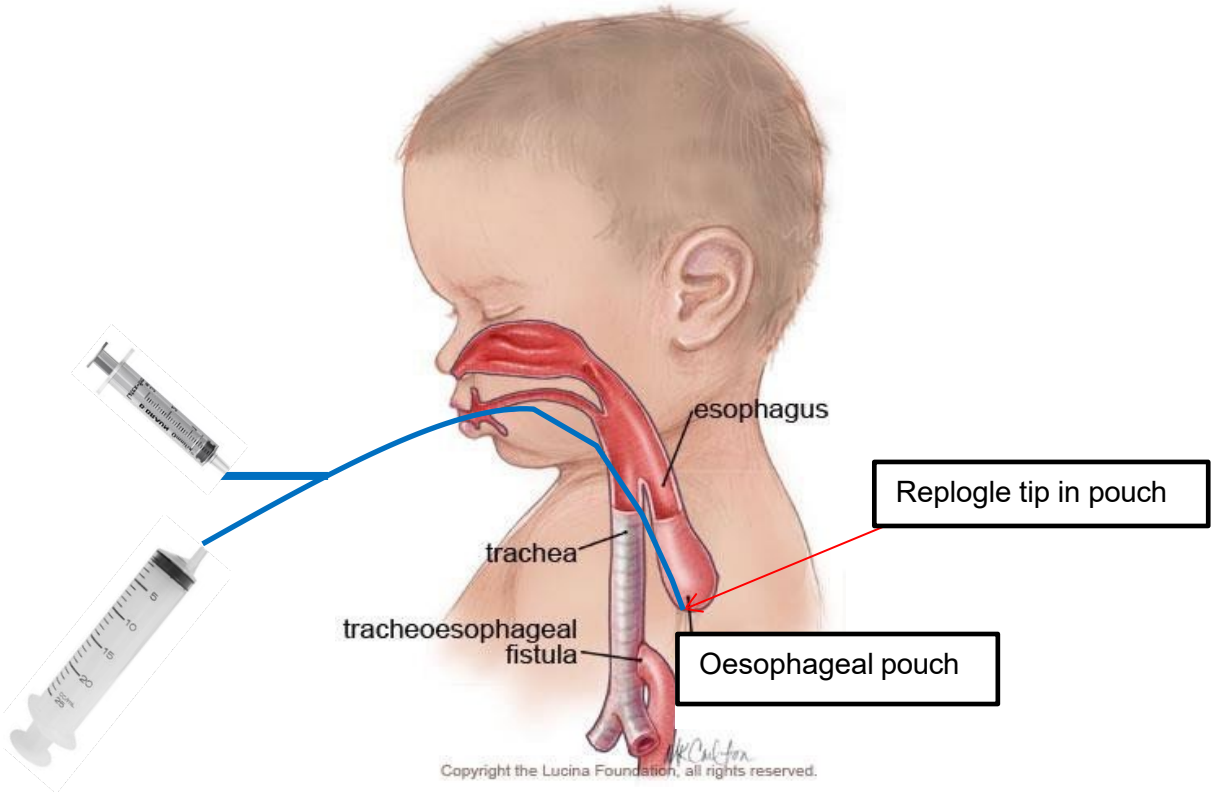
Equipment

- Argyle 8Fg replogle tube (<2.5kg neonate)
- Argyle 10Fg replogle tube (>2.5kg neonate)
- 20mL and 3mL luer slip syringe
- 0.9% NaCl ampules
- 12.5mm brown tape



Procedure

- Choose appropriate size replogle tube based on patient weight.
- Insert replogle tube orally until resistance is felt, then withdraw 0.5cm and secure with brown tape (OGT taping). Ensure length of insertion is recorded. If not tolerated orally, replogle tube can be inserted nasally.
- Attach 20mL luer slip syringe into aspiration port.
- Use 3mL syringe to instil 0.5mL of N/Saline through solid blue airway inlet and follow with enough air to clear Replogle tube (0.5ml to 2ml of air). Then remove 3mL syringe from airway inlet. Aspirate using the 20ml aspiration syringe from aspiration port, ensuring secretions and saline are effectively removed and the replogle tube remains patent.



DO NOT ATTACH REPLOGLE TO THE TRANSPORT SUCTION UNIT

Care of Replogle Tube

- Confirm replogle tube is taped securely at documented length every 15 minutes and record flushes on NETS WA Observation & Management Chart - MR400.01.
- To prevent replogle tube blockage **Repeat procedure step 4 every 15 minutes.** Leave 20mL syringe in place throughout transport. Extra flushes may be required if secretions are thick.
- To prevent aspiration and assist drainage, nurse the infant on an incline.

Troubleshooting

- If there are concerns of replogle tube blockage, ensure airway remains patent by performing naso-pharyngeal suction.
- Flush replogle tube as per step 4. If still no movement of fluid through the tube or no return of saline, flick out replogle tube from infant, flush well with N/Saline, confirm it is patent and then reinsert.