Sheffield Children’s NHS Foundation Trust

Yorkshire & Humber
Infant & Children’s Transport Service
‘Embrace’

Embrace Transfer Guidelines for Surgical Newborns
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INTRODUCTION

REFERRAL AND ADDITIONAL ADVICE AND GUIDANCE

Advice can be sought from the surgical teams at Leeds General Infirmary, Sheffield Children's Hospital and Hull Royal Infirmary at any time. However if transfer is likely then please contact Embrace on 0845 147 247 2. The Registrar and/or Consultant in General Surgery will be conferenced into the call. If intensive care is required the NICU consultant will also be asked to join the call to provide advice. General Surgical patients will not be refused without discussion with the General Surgical Consultant on call and the Consultant will always be contacted for decisions about patient transfer after 2200 hours.


Time critical surgical neonatal patients will routinely be transferred by Embrace. In exceptional circumstances, when a transport team is not immediately available, the referring hospital team may be required to transfer the patient. Guidance is available (appendix 2).

1. GENERAL STABILIZATION PROCEDURES FOR ALL BABIES

1.1 Pain assessment

- Consider IV paracetamol and/or morphine infusion

1.2 Gastro-intestinal problems

- Keep nil by mouth
- Indwelling 8 or 10 g gastric tube (Replogle tube if available for suspected oesophageal atresia/ trachea-oesophageal fistula (OA/TOF))
  - Position confirmed by X-ray or acid positive pH paper
  - On free drainage
  - Frequent aspiration
  - If baby premature and small, consider smaller size gastric tube
- IV fluid management
  - Remember maintenance fluids and replacement fluids for losses
  - Maintenance - 10% glucose with additives or 10% glucose and 0.45% sodium chloride
  - Embrace Team do not infuse TPN during transfer but are happy to take unopened bags to receiving unit (please package appropriate paperwork and a copy of the prescription)
  - Losses from gastric tubes – If rate of loss is greater than 20 ml/kg over 24 hours replace with 0.45% sodium chloride or 0.9% sodium chloride (with 20mmol/litre potassium chloride)
  - Please discuss with accepting surgical consultant
  - Fluid boluses for hypovolaemia - use 0.9% sodium chloride or 4.5% human albumin solution (babies will be losing protein-rich fluid from gut)
- Beware of excessive fluid losses, e.g. in gastroschisis, exomphalos and necrotising enterocolitis (NEC)

1.3 X-ray and radiology
- X-rays and radiology images to be sent to receiving unit by PACS
- Alternatively hard copies or a CD must be transferred with the baby

1.4 Drugs
- Morphine infusion preferred for sedation and/or analgesia
- Ensure Vitamin K has been prescribed and administered IM or IV prior to transfer in all surgical babies. Document this clearly

1.5 Parents
- Ensure maternal blood is taken for cross-matching – appropriate bottle, fully labelled by hand (appendix 1)
- Written consent will be obtained by Consultant Surgeon upon arrival at receiving hospital. Consent will be taken by telephone in case parents not able to travel to receiving hospital
- Please ensure contact details are documented clearly

1.6 Embrace Team
- It may not be possible to achieve total stability before transfer in critically ill infants. Resuscitation must take place, but if the baby cannot be stabilised without surgical intervention, there may be occasions where it is better to transfer the baby urgently without achieving total stability. This is a difficult judgment and must be discussed with the Consultant Surgeon / Neonatologist at the receiving hospital

1.7 During transfer
- Avoid hypothermia in all circumstances - minimum interference reduces temperature stress on infant
- Continually assess circulatory status
- Consider further fluid boluses
- Consider inotropes

2. SPECIFIC CONDITIONS

2.1 Oesophageal atresia / tracheo-oesophageal fistula (OA/TOF)

Airway and breathing:
- Avoid ventilation if possible - inspiratory gases take path of least resistance (= through fistula) and may cause significant abdominal distension (or perforation). This can lead to a life threatening splinting of the diaphragm and failure to ventilate/oxygenate
- If ventilation needed - urgent consultation with Consultant Neonatologist / Surgeon on-call
- Transfer as soon as possible to avoid prolonged ventilation prior to surgery
Circulation:
- Two points of venous access
- Continue maintenance fluids
- Insert Replogle tube (or 10G gastric tube)
  - In pouch
  - On continuous drainage + aspirate and flush at least every 10 minutes:
    - To keep upper pouch empty and prevent overflow or tracheal compression
    - Must be done, even if infant does not appear to have excess secretions
  - Suction mouth with standard suction catheter if secretions present every 20-30 minutes

Drugs:
- Start first line antibiotics e.g. IV Amoxicillin + Gentamicin
- If ventilated, commence morphine infusion for sedation and consider muscle relaxation for transfer

During transfer:
- Baby to be nursed prone if possible
- Try to keep infant comfortable (crying promotes gastric distension and subsequent regurgitation / aspiration)
- Attach Replogle tube to Atrium drain on continuous suction (Appendix 3)
- If excess secretion, may need to stop to flush tube with sodium chloride and use “bulb” mechanism for further suction

2.2 Abdominal wall defects: gastroschisis / exomphalos / ectopic bladder

Airway and breathing:
- These infants rarely need intubation and ventilation for transfer unless co-morbidities lead to respiratory compromise

Circulation:
- Two points of venous access
- Continue maintenance fluids
- Nil by mouth
- Gastric tube on free drainage
- Continual assessment of circulatory status - remember excessive fluid loss common
- Fluid boluses to be given as 4.5% HAS if available - if not 0.9% sodium chloride

Drugs:
- Start first line antibiotics plus metronidazole (e.g. IV Amoxicillin + Gentamicin plus Metronidazole)

Exposed viscera:
- Cover with plastic/cling-film (does not need to be sterile)
- Contra-indicated: cotton wool and sodium chloride soaks
- Exomphalos with intact sac must be handled with extreme care to prevent rupture, avoid pressure and kinking, and prevent stool contamination of the defect
- Ectopic bladder - gelapersm is more gentle
During transfer:
  o Nurse baby on side as this relieves tension on the mesentery
  o Close observation of viscera - if circulation appears to be compromised, then reposition viscera in relation to infant (inspect base of viscera mass)
  o Consider administration of fluid boluses
  o Consider supplementary oxygen
  o Regular temperature, pulse, respiration rate and BP monitoring

2.3 Abdominal distension / suspected bowel obstruction

Airway and breathing:
  o Consider intubation and ventilation if abdominal distension compromising respiratory status
  o If ventilation problematic and chest movement difficult to achieve despite high pressure, discuss with consultant surgeon re abdominal drain
  o Check blood gas including lactate

Circulation:
  o Two points of venous access
  o Continue maintenance fluids
  o Nil by mouth
  o 8-10g gastric tube:
    ▪ Free drainage + intermittent gastric suction
    ▪ Record amount and type of fluid aspirated
    ▪ If rate of loss is greater than 20 ml/kg over 24 hours replace with 0.45% sodium chloride or 0.9% sodium chloride (with 20mmol/litre potassium chloride) Please discuss with accepting surgical consultant
    ▪ Assess and correct shock with fluid boluses
  o May need inotropes

Other:
  o AP and lateral shoot-through X-rays (lateral only if perforation suspected)
  o Do not instrument the anus (e.g. washouts, rectal thermometers) as this may obscure lower GI contrast appearances of Hirschsprung's.

During transfer:
  o Nurse in supine position.
  o If abdominal distension significant - close observation for hypoxia (due to splinting effect) and raise head of mattress to try and improve respiratory status.

2.4 Necrotising enterocolitis (NEC)

Airway and breathing:
  o Ventilate if hypotensive or acidotic

Circulation:
  o Two points of venous access
  o Continue maintenance fluids
  o Nil by mouth
    ▪ 8-10g gastric tube
    ▪ Free drainage
  o Fluid boluses after assessment of circulatory status
  o Check FBC, clotting and consider administration of FFP extra Vitamin K/platelets/blood
If UAC/UVC in situ, do not remove

Drugs:
- Start first line antibiotics plus metronidazole (e.g. IV Amoxicillin + Gentamicin plus Metronidazole)
- Remember pain relief - may need morphine bolus and then continuous infusion and/or IV paracetamol

Other:
- AP and lateral shoot through X-rays (lateral only if perforation suspected)

2.5 Congenital diaphragmatic hernia

Usually antenatally diagnosed with planned delivery in a tertiary centre.

Airway and breathing:
- Insert a 8-10 g gastric tube immediately, aspirate and leave on free drainage
- Intubate as soon as diagnosis is made, without using bag and mask ventilation, using adequate sedation and muscle relaxation
- "Gentle ventilation" to avoid barotrauma or pneumothorax (no hyperventilation). This technique will necessitate relatively higher CO₂ levels to be tolerated.
- Surfactant not indicated, unless less than 33 weeks gestation
- Monitor pre- and post-ductal saturations
- Ventilate in 100% O₂ regardless of saturations
- May require nitric oxide for pulmonary hypertension

Circulation:
- At least two points of venous access
- UVC and UAC desirable
- Continue maintenance fluids
- Nil by mouth
  - 8-10 g gastric tube
  - On continuous drainage
  - Aspirate at least every 10 minutes to decompress stomach
- Achieve good blood pressure with use of inotropes

Drugs:
- Consider early use of inotropes - dopamine and dobutamine to support blood pressure
- Commence on morphine infusion
- Commence on atracurium infusion or regular pancuronium

During transfer:
- Nitric oxide
- Keep baby sedated and muscle relaxed
- Maintain good BP - preferably with arterial monitoring
  - Adjust inotropes to achieve this
- Carefully observe for the possible occurrence of pneumothorax (unaffected side)

2.6 Pneumothorax / pneumomediastinum

Airway and breathing:
If under tension the air leak must be drained by needle thoracocentesis.

Maintain airway patency and support respiratory drive prior to considering formal drainage, unless

Pneumothorax which is not under tension and causing minimal symptoms:
  - Formal drainage **must** be done if ventilated or on CPAP because risk of tension is significant
  - Seldinger drain catheter placement is preferred
  - Secure catheter with large Opsite dressing
  - Use Atrium pneumostat in transit

Tension pneumothorax during transfer:
  - = Catastrophic event causing sudden and severe deterioration
  - Perform needle thoracocentesis aspiration **immediately**

Pneumomediastinum:
  - Chest drain has very limited value
  - Place infant in ambient oxygen concentration of 100% to enhance absorption of gas collection

Circulation:
  - Two points of venous access

Drugs:
  - Remember analgesia for insertion and post-insertion of drains.

During transfer:
  - Chest drain catheter must be securely fixed in position prior to transfer - large Opsite dressing
  - Chest drain catheter must be attached to an Atrium pneumostat

### 2.7 Choanal atresia

Airway and breathing:
  - If bilateral, infant is unable to breathe through nose
  - Oro-pharyngeal airway (appropriately sized Guedel) **must** be provided - secure in place with tape

Circulation:
  - Two points of venous access
  - Consider maintenance fluids
  - Avoid feeding if concerns about airway patency or respiratory distress prior to transfer and elevate head of mattress slightly to reduce risk of vomiting

During transfer:
  - Close observation of breathing pattern during transfer is essential

### 2.8 Pierre Robin / micrognathia

Airway and breathing:
  - If significant respiratory distress, then place oro-pharyngeal airway (appropriately sized Guedel) or consider naso-pharyngeal airway; secure for transfer.
  - If endotracheal intubation is considered, this **must** be discussed with Transport Consultant before any attempt is made. This can be extremely
difficult - ask for help from referring unit Consultants in neonatology/paediatrics, anaesthetics, ENT

During transfer:
   o Nurse and transfer infant in prone position, as this usually improves airway patency

2.9 Neural tube defects: meningocele / encephalocele

Airway and breathing:
   o Maintain open airway
   o Ventilation not usually required
   o If associated hydrocephalus and large head size, airway positioning is important

Drugs:
   o Start first line antibiotics e.g IV Amoxicillin + Gentamicin

Other:
   o Nurse infant in prone position to prevent pressure on lesion
   o Sterile dressing if sac is ruptured
   o Cover back in cling film to prevent stool contamination - can use Gelaperm/gauze and light bandage

During transfer:
   o Nurse infant in prone position to prevent pressure on lesion
Appendix 1

Preparing a neonatal patient for emergency transfer

The transport medicine environment is challenging. For transfer to occur safely your patient may need interventions that would not be performed if the patient remained in your hospital. To minimise the time the Embrace team needs to prepare the patient for transport, please consider the following check list before the team arrives.

(*as appropriate)

**Documentation and communication**

- Be prepared to verbally handover to the Embrace team
- Update the parents on the baby’s condition and the plans for transfer
- Photocopies of recent relevant notes, recent investigation results, drug chart, TPN prescription*, Badger summary or transfer letter with relevant history
- Highlight/document any social concerns*
- Transfer radiology by PACS (CD or hard copy are alternatives)
- Maternal blood sample fully labelled
  - First name
  - Last name
  - Date of birth
  - NHS number
  - Date & time of sample
  - Name and signature of person taking sample

**Patient preparation**

- ETT secured with NEO-fit and position confirmed on CXR (T2 ideal for transfer)
- Stabilised on pressure control mode of ventilation (without volume guarantee) e.g.SIMV
- Recent blood gas and blood glucose *
- Naso-gastric tube in situ and secured*
- Minimum 2 points of IV access
- If umbilical lines are indicated:
  - Double lumen UVC
  - UVC position checked – not in heart or liver
  - UAC position checked – ‘high’ (T6-T9) or ‘low’ (below L3)
- Maintenance fluids and all other infusions must be in 50ml fully labelled syringes
- TPN cannot be infused during transfer but unused bags can be taken by the transport team
- Complete urgent transfusion of blood products (cannot be infused during transfer)
- Maintain temperature above 36.5 °C (unless therapeutically cooled)
- Follow TOBY guidance for passive therapeutic cooling including rectal temperature monitoring

**On arrival, the Embrace team will:**

- Introduce themselves, take handover and assess the patient
- Review copies of patient documentation, charts and drug card
- Contact the Embrace Consultant as required
- Ensure patient is prepared for transfer
  - Transport monitoring
  - Ensure ETT and IV access are correctly positioned and well secured
  - Check all infusions and swap to transport pumps
  - Stabilise on transport ventilator and perform a blood gas
  - Transfer to the transport incubator/baby pod and secure baby and equipment
- Communicate with parents and discuss travel arrangements
- One parent may be able to travel with their baby but mothers must be:
  - Discharged fully from in-patient maternal care
  - At least 24 hours post vaginal delivery
  - At least 72 hours post LSCS
  - Physically able to walk and climb steps into ambulance independently

For further information or assistance please call Embrace to speak directly to a Transport Consultant

0845 147 2472
Appendix 2

Preparing a patient for a time critical one-way transfer by the referring hospital team

The transport medicine environment is challenging particularly for time critical transfers. For transfer to occur safely your patient may need interventions that would not be performed if the patient remained in your hospital. To minimise the time needed to prepare the patient for transport, please consider the following check list.

Remember to always involve Embrace from the time of seeking specialist advice in order to facilitate the most efficient and appropriate transfer for your patient.

(*as appropriate)

Documentation and communication

☐ Update the parents on the baby’s condition and the plans for transfer
☐ Photocopies of recent relevant notes, recent investigation results, drug chart*
☐ Highlight/document any social concerns*
☐ Transfer radiology by PACS (CD or hard copy are alternatives)
☐ Maternal blood sample fully labelled (babies under 3months) *
  ▪ First name
  ▪ Last name
  ▪ Date of birth
  ▪ NHS number
  ▪ Date & time of sample
  ▪ Name and signature of person taking sample

Patient preparation

☐ ETT secured and position confirmed on CXR (T2 ideal for transfer)
☐ On transport ventilator with continuous ETCO₂ monitoring
☐ Recent blood gas demonstrates adequate gas exchange and normal blood glucose
☐ Adequate analgesia, sedation and muscle relaxation*
☐ Gastric tube*
☐ Minimum 2 points of IV access and well secured
☐ Maintenance fluids and all other infusions must be in 50ml fully labelled syringes
☐ Pupillary responses monitored and recorded regularly
☐ Seizures controlled and metabolic causes excluded
☐ Maintain temperature above 36.5 °C (unless therapeutically cooled)
☐ Adequate patient monitoring for transport – ECG, BP, SaO₂, ETCO₂, Temp
☐ Patient and equipment adequately secured for transport
☐ Ensure emergency airway, breathing equipment and adequate gases available
☐ Ensure emergency fluids and drugs are available for transport

For further information or assistance please call Embrace to speak directly to a Transport Consultant

0845 147 2472
Appendix 3

**TOFS = REPLOGLE = ATRIUM (mini 500)**

NNU continuous Replogle suctioning pressure equates to 3-4 cmh20
Transport options until now
Intermittent @ either 80mmhg-Lowest Laerdal suction OR manual aspiration

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*Atrium mini 500 = attenuated suction pressure 20cmH2O*

Instructions for assembly overleaf  

- Attach rubber tubing (*this is in the box & latex free*) to Atrium chest drain and the end of the replogle tube.

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JH Dec 2010
Then either

- Attach to portable suction unit with suction tubing to the suction entry port on the top of the Atrium drain and set to 80mmHg and apply continuous suction. (suction unit may eventually cut out if it gets hot, leave for a few minutes then restart)

Or

- Attach a suction bulb to the suction entry port on the top of the Atrium drain and manually squeeze intermittently as required.

Remember Position & secure your equipment where you can reach it without unbuckling & leaving your seat… You still need to flush with saline.