Paediatric Critical Care: Time Critical Neurosurgical Transfer

Summary
This guideline is for the management of patients with intracranial pathology and raised intracranial pressure requiring emergency transfer to a neurosurgical centre. The goal is for a quick and safe transfer. A practical checklist is also provided.

This clinical guideline has been produced by the South Thames Retrieval Service (STRS) at Evelina London for nurses, doctors and ambulance staff to refer to in the emergency care of critically ill children.

This guideline represents the views of STRS and was produced after careful consideration of available evidence in conjunction with clinical expertise and experience. The guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient.

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<th>Change History</th>
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<tr>
<td>Date</td>
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<td>03/19</td>
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Paediatric Critical Care

Time Critical Neurosurgical Transfer

- CT scan should be done within 30 minutes of the suspicion of mass lesion
- Delay in the transfer to a neurosurgical centre risks serious brain injury or death
- Transfer for emergency neurosurgery should normally be performed by the local team NOT STRS
- Departure to neurosurgical centre should occur within a MAXIMUM of 60 minutes from end of scan

Responsibilities of Paediatric Team
- CONSULTANT should be present
- Commence resuscitation and inform anaesthetic team ASAP
- Organise URGENT CT, report and send to neurosurgeon
- Referral to neurosurgery – ‘Is this a time critical lesion?’
- Referral to STRS
- Contact emergency ambulance service via 999 stating ‘Paediatric neurosurgical critical care transfer’ with ETD
- Support anaesthetic team: nurse or Dr in transfer team

Responsibilities of STRS and receiving PICU
- Secure bed on PICU and facilitate neurosurgical referral
- Advise DGH on patient management
- Encourage swift transfer

Stabilisation Priorities: SAFE but SWIFT transfer: do not delay for unnecessary procedures

AIRWAY
- Need for intubation to be determined by local team
- ETT secured (oral/nasal correct size and position)
- Avoid nasal if possible basal skull fracture or coagulopathy
- C spine immobilisation for any trauma patient, keep midline
- Gastric tube on free drainage if ventilated

BREATING
- Monitor end tidal CO₂ (aim 4-5 kPa)
- Urgent CXR post intubation for tube position/complications
- Exclude tube problems if hypoxia or hypercapnia
- Standard settings for ventilator: PEEP 5 / rate 15 to 20 / Insp time 1.0 sec, PIP to move chest

CIRCULATION
- Two patent well-secured intravenous lines
- Do NOT delay for difficult central or arterial access
- Consider intravenous line
- Maintain BP around age appropriate targets* (see right)
- Use fluid bolus and peripheral dopamine to maintain BP
- If CVL in place use noradrenaline to support BP if needed

INTRACRANIAL HYPERTENSIVE CRISIS
- BRADYCARDIA/HYPERTENSION/PUPIL DILATATION
  - Ensure end tidal CO₂ between 4-5 kPa
  - Give 3 mls/kg of hypertonic sodium chloride (2.7 or 3%)* if necessary
  - Sedate
  - Do not delay urgent transfer: keep moving

DISABILITY and everything else
- MONITOR PUPIL RESPONSE @ 15 mins intervals minimum
- Do not tape over the eyelids
- Sedate adequately
- Keep midline and elevate bed to 30 degree angle
- Phenytin load if seizure noted
- Trauma patients: other injuries excluded/stabilised/sutured

TRANSFER TO AMBULANCE and onward journey
- Child secured on ambulance trolley
- Ambubag and mask on trolley
- Drugs for transfer (sedation/muscle relaxation)
- FULL portable oxygen cylinder on trolley + spare
- Switch to vehicle oxygen supply ASAP
- Request as smooth a journey as possible
- Seatbelts worn when vehicle moving

Print drug calculator for patient weight from STRS website

Hypertonic sodium chloride: most departments have 2.7%, if not available make up 3% with below recipe:

3% sodium chloride – Discard 36mls from 500ml bag 0.9% sodium chloride and insert 36mls of 30% sodium chloride into bag
Dosage – 3-5mls/kg over 20 minutes
PAEDIATRIC TIME-CRITICAL NEUROSURGICAL TRANSFER CHECKLIST
This checklist will assist you to carry out the time-critical transfer in a safe and timely manner

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<thead>
<tr>
<th>AIRWAY</th>
<th>DISABILITY AND EXPOSURE</th>
<th>PREPARATION, PACKAGING &amp; TRANSFER</th>
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<tbody>
<tr>
<td>□ ETT secure (correct size &amp; length/avoid nasal)</td>
<td>□ CT Head &lt;30min</td>
<td>□ Request urgent 999 Ambulance transfer (Category RED1 or RED2)</td>
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<td>□ Position of ETT and NGT confirmed (ETT tip at T2 on CXR ideal for transfer)</td>
<td>□ Adequate sedation and muscle relaxants</td>
<td>□ Emergency airway &amp; breathing equipment portable suction/liquids/drugs/adequate O2</td>
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<td>□ Appropriate HME filter for patient size</td>
<td>□ Position head tilt 20-30°</td>
<td>□ Ensure patient &amp; equipment is adequately secured to ambulance trolley</td>
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<td>□ C-spine immobilised</td>
<td>□ 15min pupillary monitoring</td>
<td>□ Ensure smooth journey due to effects on haemodynamics and ICP</td>
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<td>□ Orogastric tube on free drainage</td>
<td>□ C-spine protection (if necessary)</td>
<td>□ Travel safe – seatbelt on at all times</td>
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<td>□ Identify and treat seizures</td>
<td>□ Transfer letter with photocopy of relevant notes, results, drugs charts, anaesthetic charts etc</td>
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<td>□ Maintain normal blood glucose</td>
<td>□ PACS/copy of all imaging</td>
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<td></td>
<td>□ Aim plasma sodium &gt;140 mmol/L</td>
<td>□ Document and highlight any safeguarding issues</td>
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<td>□ Keep parents up to date</td>
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<td>□ Intracranial hypertensive crisis – Bradycardia/hypertension/pupillary dilatation</td>
<td>□ Phone receiving team with ETA and inform them if there are any changes in the patient’s condition or you are concerned that the patient is deteriorating further</td>
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<td>□ Aim pCO₂/ETCO₂ 4-5kPa</td>
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<td>□ Hypertonic sodium chloride (HTC 2.7 or 3%) 3ml/kg over 15min</td>
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<td>□ Repeat HTC if required</td>
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<td>□ Mannitol 0.25-0.5g/kg (If no HTS)</td>
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<td>□ Sedate adequately (bolus pre-suction)</td>
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<td>□ Keep moving – don’t delay</td>
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<td>□ Maintain normothermia - regular/core temperature monitoring</td>
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<td>□ Secondary survey (if trauma)</td>
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