

# LRI Children's Hospital

## Lumbar Puncture

Staff relevant to:	Medical & Nursing Professionals who care for children & young people requiring a lumbar puncture.
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Written by: Reviewed by:	Dr M. Joshi & A.Rosak Dr B Rai, Dr M Joshi, Dr H Kamasani (September 2024)
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### 1. Introduction and Who Guideline applies to

To provide guidance for medical and nursing staff providing care for a child who requires a lumbar puncture.

This guideline needs to be used in conjunction with relevant infection control and consent policies to ensure the child receives safe care and children and families are able to understand the reasons for care to facilitate co-operation.

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## 2. Procedure

Explain the procedure to parents and child.  
 Discuss the benefits and risks of lumbar puncture.  
 Provide lumbar puncture information leaflet (UHL) if available.  
 Obtain consent.

### Indication for lumbar puncture procedure:

- Suspected meningitis/encephalitis- for diagnosis
- As part of neuro-metabolic investigations
- For diagnosis of Benign (Idiopathic) Intracranial Hypertension (BIH) - also work as therapeutic. [UHL Single Front Door for Children Guideline Swollen Optic Discs Pathway](#)
- Intrathecal chemotherapy

### Contraindication for lumbar puncture procedure:

- Signs suggesting raised intracranial pressure
  - reduced or fluctuating level of consciousness (Glasgow Coma Scale score less than 9 or a drop of 3 or more)
  - relative bradycardia and hypertension
  - focal neurological signs
  - abnormal posture or posturing
  - unequal, dilated or poorly responsive pupils
  - papilloedema
  - abnormal 'doll's eye' movements
- Shock
- Extensive or spreading purpura
- After convulsions until stabilised
- Coagulation abnormalities
  - coagulation results (if obtained) outside the normal range
  - platelet count below 100 x 10<sup>9</sup>/litre
  - receiving anticoagulant therapy
- Local superficial infection at the lumbar puncture site
- Respiratory insufficiency (lumbar puncture is considered to have a high risk of precipitating respiratory failure in the presence of respiratory insufficiency).

## 2.1 Procedure Equipment:

<b>Trolley</b>	<ul style="list-style-type: none"> <li>• Cleaned with Chlor-Clean</li> <li>• Allow to dry</li> </ul>
<b>Lumbar Puncture Needles</b>	<ul style="list-style-type: none"> <li>• Commonly available needles are 40 mm, 88 mm or 120 mm in length.</li> <li>• Chose based on the build of the child and thickness of fat overlying the spine area.</li> </ul>
<b>Sterile dressing pack</b>	<ul style="list-style-type: none"> <li>• Single use commonly available dressing pack with sterile drape, cotton gauge and hand towel.</li> </ul>
<b>Specimen Bottles</b>	<ul style="list-style-type: none"> <li>• x 4 white top sterile bottles (labelled 1,2,3,4)</li> <li>• Yellow top blood bottle (glucose)</li> </ul>
<b>Sterile manometer if required</b>	<ul style="list-style-type: none"> <li>• It comes in two parts with reading continuing on the other. Join both of them beforehand. Turn the knob few times to loosen it for smooth operation, before finally attaching it to LP catheter</li> </ul>
<b>Local Anaesthetic</b>	<ul style="list-style-type: none"> <li>• Amethocaine (Ametop® gel) (max application time 45 minutes) then wipe off prior to chlorhexidine spray</li> <li>• Ethyl Chloride spray</li> </ul>
<b>70% alcohol/2% Chlorhexidine (ChloraPrep)</b>	<ul style="list-style-type: none"> <li>• For site cleansing</li> </ul>
<b>Sterile Water</b>	<ul style="list-style-type: none"> <li>• To cleanse site following procedure</li> </ul>
<b>OpSite spray &amp; spot plaster</b>	<ul style="list-style-type: none"> <li>• To stop leaking of csf after the procedure</li> </ul>
<b>Sterile Gloves</b>	<ul style="list-style-type: none"> <li>• Chose based on your hand size. Have 2<sup>nd</sup> pair of sterile gloves available alongside.</li> </ul>
<b>Personal Protection Equipment</b>	<ul style="list-style-type: none"> <li>• Appropriate for child's condition</li> </ul>
<b>Nurse &amp; Assistant</b>	<ul style="list-style-type: none"> <li>• Experienced in holding a child for this procedure</li> </ul>
<b>Bed or treatment couch</b>	<ul style="list-style-type: none"> <li>• With adjustable height mechanism</li> </ul>
<b>Entonox</b>	<ul style="list-style-type: none"> <li>• Nurse assessed as competent to use, if appropriate for child</li> </ul>
<b>Oxygen saturation monitor if indicated</b>	<ul style="list-style-type: none"> <li>• With appropriate sized probe for child</li> </ul>
<b>Oxygen &amp; suction readily available</b>	<ul style="list-style-type: none"> <li>• In case of collapse/deterioration of child/infant.</li> </ul>

## 2.2 Procedure/process for Lumbar Puncture

1. Ensure child is cannulated prior to procedure and liaise with medical staff re-timing of procedure to allow application of local anaesthetic to the child's back.
2. Ensure baseline observation are recorded and documented prior to procedure.
  - Temperature
  - Pulse
  - Respirations
  - Blood Pressure
  - Neurological status
3. Attach oxygen saturation probe appropriate for size/age of child to ensure continuous monitoring during procedure if clinically indicated.
4. Explain procedure and holding technique to parents and child, including risk of marking. Support parents in making decision about whether to be present during the procedure and how they can support their child.
5. Lumbar puncture may be performed with the child lying on their side or sitting up.
6. Position child on their side in lateral recumbent position.
7. Neck should be in flexed position, with chin on chest.
8. Knees pulled up towards chest and buttocks held to keep back flexed.
9. Back should be at edge of bed/couch to allow ease of access to lumbar space.
10. Once in position, medical staff will identify puncture site and clean with ChloroPrep (70% alcohol & 2% Chlorhexidine).
11. Site -spinal cord terminates around the level of L1–L2 (L3 in neonates). Imaginary line between the top of the iliac crests intersects the spine at approximately the L3-4 interspace. Aim for the L3-4 or L4-5 interspace.
12. If pressure needs to be measured, this should be done before samples are obtained by attaching the manometer to the LP needle, record the height to which the fluid rises.
13. Allow skin to dry naturally without fanning, blotting or blowing the skin.
14. Drying time is essential to avoid chemical toxicity to the meninges from chlorhexidine.

15. Consider giving lidocaine 1 % injection ( 10 mg of Lidocaine hydrochloride per 1 ml solution) at dosages ranging from 0.1 ml/kg to max 0.4 mls/kg prior to inserting LP needle, when performing the procedure, especially involving manometry in poorly co-operative child. This has been used and reported safe in various cohorts of paediatric patients.
  - Prepare the area of lumbar puncture aseptically, chose the site of injection, preferably same as you would use for your LP needle insertion.
  - Use blue intramuscular needle for injecting Lidocaine.
  - After inserting needle, and before injecting lidocaine, withdraw the plunger and see if you are getting any back flow of the blood. If there is no backflow then it is safe to inject lidocaine immediately afterwards. It avoids the risks of Lidocaine inadvertently injected in the blood stream.
  - Aim to infiltrate the subcutaneous tissue and overlying skin with lidocaine whilst withdrawing the needle outside after insertion.
  - Wait for roughly 1-2 minute before you insert final LP needle.
16. Obtain CSF samples once needle insitu.
17. Ensure blood glucose sample is also obtained to allow comparison (CSF glucose reading should be 2/3 of blood level)
18. White top bottles used in number sequence and yellow blood bottle for glucose estimation.
19. Remove needle.
20. Explain the need to lie flat for one hour post procedure to child and parents. Observe puncture site for leakage.
21. Apply Opsite spray to seal puncture site.
22. Apply spot plaster
23. Clean area with plain water to remove residue of skin prep.
24. Give fluids & analgesia as required (child may have headache +/- soreness at puncture site).
25. Apply further dressing if needed and inform medical staff. Plaster can be removed after 4 hours if there is no leakage.
26. Ensure specimens are correctly labelled and sent promptly to the laboratory.
27. Document in child's notes. Lumbar puncture procedure stickers are available which should be used.

## 2.3 Traumatic Tap

Blood stained CSF is indicative of subarachnoid haemorrhage (SAH) or Traumatic Tap. In this situation clinical symptoms of SAH may point towards necessary investigation. If a child has uniformly blood stained CSF in a non-traumatic tap then intracranial haemorrhage should be considered and excluded by CT Head.

No set number of RBCs in the CSF has been proven to certainly diagnose either of these, but a decreasing number of RBC from 1st to 3rd or 4th bottle, points more towards traumatic than actual presentation with SAH. Few studies have claimed up to 70 percent reduction in the number of RBC from bottle 1 to 4 in SAH negative patients whereas no more than 30 percent reduction in RBC numbers were seen in radiographically proven SAH cases.

We aim to look for >30 % reduction in the number of RBC from 1<sup>st</sup> to last bottle with no concerning clinical features suggestive of subarachnoid haemorrhage to rule out sub arachnoid haemorrhage.

Inform microbiology lab of the traumatic tap and request counting of RBCs in 1st and 3rd or final bottles (You can do so by documenting “traumatic tap” in clinical detail’s section of the ICE request form) and interpret the results cautiously in the context of symptoms of SAH. This does not rule out further development of spinal hematoma though.

Traumatic LP is the second possibility and is estimated to occur in 10-30 % of the routine LP. A traumatic tap resulting in blood-stained CSF is most often due to puncture of the dorsal or ventral epidural venous plexuses and usually has no consequence. Bloods collecting in the subarachnoid space normally gets washed away by the flow of the CSF, but occasionally can form clots and compress nearby spinal cord leading to Cauda equine syndrome.

If the tap was haemorrhagic than careful neurological observation of the lower limbs, bladder and bowel function is important for at least next 12-24 hours in early diagnosis of any spinal cord compression. If spinal cord compression is suspected then arrange MRI immediately and consult neurosurgical team at queen's medical centre, Nottingham. Arrange blood test to check FBC and coagulation screen as patient with coagulopathy have worse neurological outcome following spinal hematoma.

## 2.4 Documentation:

Document clearly in the patient's clinic note about the

- verbal consent
- procedure
- sedation or any anaesthesia required
- which lumbar space used
- number of attempts taken
- colour of CSF
- any obvious trauma (If there is any trauma then please follow the plan suggested in traumatic tap section)
- investigations ordered on that particular CSF sample

Alternatively you can fill in lumbar puncture sticker available in each ward, and attach it in patient's clinical note.

**Lumbar Puncture**

5 No.: \_\_\_\_\_  
 Patient's name: \_\_\_\_\_  
 Attach patient's sticker here  
 Date of birth: \_\_\_\_\_

Date: \_\_\_\_\_ Time: \_\_\_\_\_

Indication for LP: \_\_\_\_\_

Procedure including risks and benefits explained: Yes  No

Information pamphlet given: Yes  No

Verbal consent obtained: Yes  No

Performed by: \_\_\_\_\_

Performed using aseptic technique: Yes  No

Attempt Number:	1	2	3
Successful:	Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
If No, Why:			
Colour of fluid:			
Spinal Space Used:			
Blood Glucose:			
Specimen Sent For:	MC&S <input type="checkbox"/> Virology <input type="checkbox"/> Protein <input type="checkbox"/> Glucose <input type="checkbox"/>		
Other (please print clearly):			

### 3. Education and Training

Clinician/health professional performing lumbar puncture procedure should have achieved competency as a part of their curriculum requirement / training in form of worked based assessment (e.g. DOPS). If not then must be supervised and assisted by clinician having competency in performing lumbar puncture procedure.

### 4. Monitoring Compliance

What will be measured to monitor compliance	How will compliance be monitored	Monitoring Lead	Frequency	Reporting arrangements
Clinical Audit of documentation (record of procedure) in clinical notes	Retrospective notes audit about documentation.	Dr M Joshi	3 yearly	Presentation in clinical audit meeting

### 5. Supporting References

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### **Related documents:**

[UHL Intravenous Policy B25/2010](#)

[UHL Infection Prevention Policy B4/2005](#)

[UHL Personal Protective Equipment Guideline B9/2004](#)



## 6. Key Words

CSF, Cerebral Spinal Fluid, Lumbar puncture, Subarachnoid haemorrhage, SAH, Traumatic tap

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**The Trust recognises the diversity of the local community it serves. Our aim therefore is to provide a safe environment free from discrimination and treat all individuals fairly with dignity and appropriately according to their needs. As part of its development, this policy and its impact on equality have been reviewed and no detriment was identified.**

Contact & review details	
<b>Guideline Lead (Name and Title)</b> Dr M Joshi – Consultant Paediatrics	<b>Executive Lead</b> Chief Medical Officer
<b>Details of Changes made during review:</b> Added hyperlink for UHL Single Front Door for Children Guideline Swollen Optic Discs Pathway	