Bacterial meningitis and meningococcal septicaemia in children - management in secondary care

(Adapted from NICE Guidelines June 2010 and Meningitis Research Foundation algorithms)

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Background

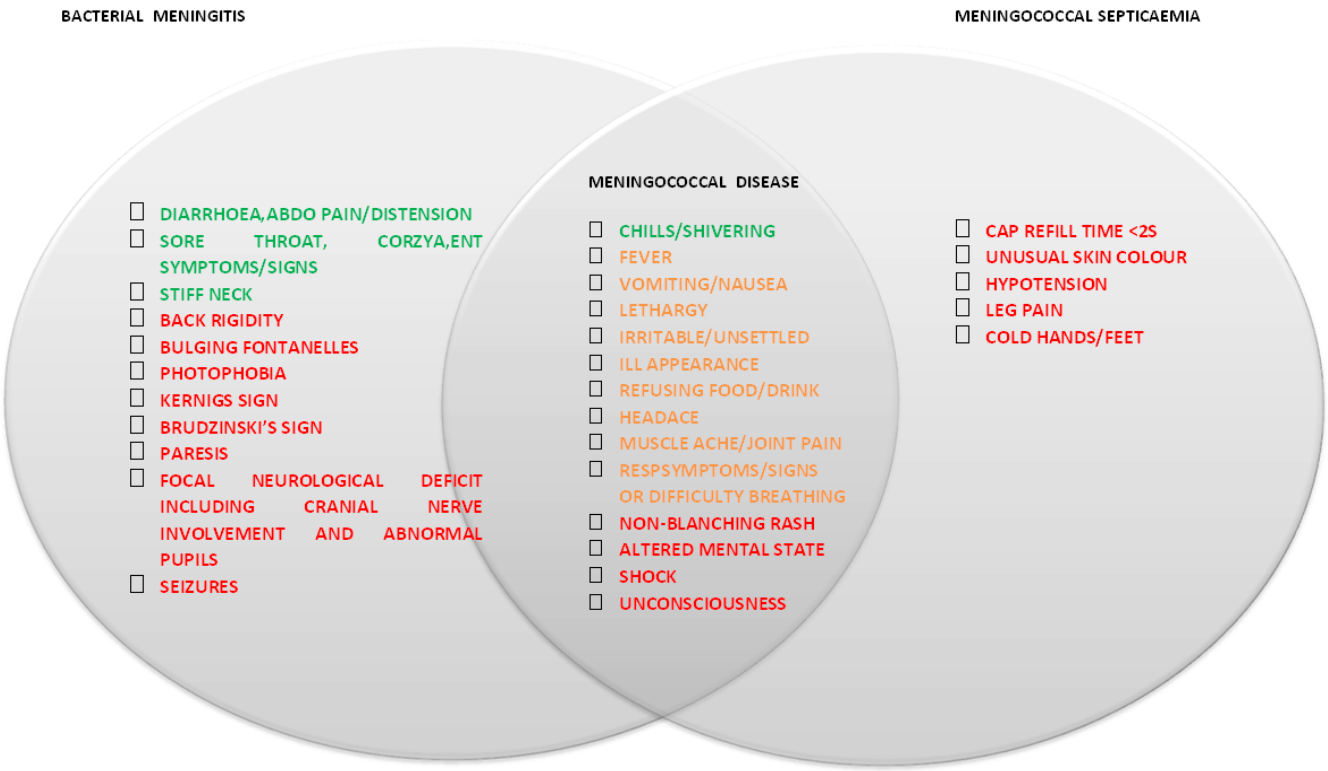
Meningococcal disease is the leading cause of death in early childhood.

-15% presents as meningitis
- 25% presents as septicaemia
- 60% presents as a combination of both

Bacterial meningitis and meningococcal septicaemia are managed in different ways, therefore it is important that healthcare professionals are able to recognise them and manage them accordingly.

Assessment

RECOGNITION OF SIGNS & SYMPTOMS OF BACTERIAL MENINGITIS AND MENIGOCOCCAL SEPTICAEMIA



LESS COMMON NON -SPECIFIC SIGNS/SYMPTOMS
COMMON NON-SPECIFIC SIGNS /SYMPTOMS
MORE SPECIFIC SIGNS/SYMPTOMS

MANAGEMENT OF BACTERIAL MENINGITIS IN CHILDREN AND YOUNG PEOPLE

SYMPTOMS AND SIGNS OF BACTERIAL MENINGITIS

Y

CHECK ABC; GAIN VASCULAR ACCESS

SIGNS OF RAISED INTRACRANIAL PRESSURE OR SHOCK?

N

PEFORM DIAGNOSTIC TESTS (1). CORRECT ANY DEHYDRATION

CONTRAINDICATION TO LUMBAR PUNCTURE (2)?

N → PERFORM LUMBAR PUNCTURE
See LP proforma

Y

< 3 MONTHS OLD?

Y

LUMBAR PUNCTURE SUGGESTS MENINGITIS
NEONATES (28 DAYS OLD) ≥20 CELLS/µL
OLDER CHILDREN > 5 CELLS/µL OR > 1 NEUTROPHILS/µL

EMPIRICAL ANTIBIOICS FOR SUSPECTED MENINGITIS

IV CEFOTAXIME +/ - AMOXICILLIN
(can replace cefotaxime with ceftriaxone if no contraindications)

MUST NOT DELAY ANTIBIOTICS

Y / N

- **Add vancomycin** if recently overseas or prolonged or multiple antibiotic exposure within last 3 months
- **Consider TB meningitis** if raised CSF/WBC and risk factors for TB
- **Consider Herpes simplex meningoencephalitis.** If HSV in differential give aciclovir.

EMPIRICAL ANTIBIOICS &TREATMENT FOR SUSEPCTED MENINGITIS

- ☐ IV CEFTRIAXONE UNLESS CONTRAINDICATED (3)
- ☐ STEROIDS: Dexamethasone 0.15mg/kg to max dose of 10mg , QDS x 4 days if ≤12h from first antibiotics AND LP shows:
  - frankly purulent CSF
  - raised CSF WBC and protein > 1g/L
  - CSF WBC count > 1000 µL
  - Bacteria on gram stain

MUST NOT DELAY ANTIBIOTICS

Reduced or fluctuating conscious level or focal neurological signs?

N

Y → PERFORM CT SCAN

FLUIDS

- Full maintenance fluids: enteral feeds if tolerated or isotonic IV fluids e.g. 0.9% sodium chloride or 0.9% sodium chloride with 5% glucose
- Do not restrict fluids unless there is evidence of increased ADH or RICP
- Monitor fluid administration, urine output, electrolytes and blood glucose

- Close monitoring for signs of RICP, shock and repeated review
- See meningococcal disease algorithm if signs found

Specific pathogen identified?

Y

ANTIBIOTICS FOR CONFIRMED MENINGITIS

- Meningococcus: IV ceftriaxone x 7 days
- H. Influenza: IV ceftriaxone x 10 days
- S.pneumonia: IV ceftriaxone x 14days
- Group B Strep: IV cefotaxime x 14 days
- L.Monocytogenes: IV amoxicillin x 21days + IV gentamicin for at least first 7 days

Unless directed otherwise by antibiotic sensitivities
Duration may be dictated by clinical response – d/w infectious disease specialist

N → Antibiotics for unconfirmed meningitis

< 3 months old?

Y → IV cefotaxime (or ceftriaxone unless contraindicated) + amoxicillin IV for x 14 days + discuss at weekly micro meeting

N → Ceftriaxone for x 10 days + discuss at weekly micro meeting

BOX 1: DIAGNOSTIC TESTS

- ☐ FBC, U+E LFT
- ☐ CRP
- ☐ COAGULATION SCREEN
- ☐ BLOOD CULTURE
- ☐ WHOLE BLOOD (EDTA) FOR PCR N.MENINGITIDES/ S.PNEUMONIAE
- ☐ BLOOD GLUCOSE
- ☐ BLOOD GAS

LP IF INDICATED

- ☐ MC&S
- ☐ PROTEIN
- ☐ GLUCOSE
- ☐ SEND SAVE CSF TO HOLD FOR PCR N.MENINGITIDES / S.PNEUMONIAE IF CSF CULTURE IS NEGATIVE.

BOX 2: CONTRAINDICATIONS TO LP

- ☐ CLINICAL OR RADIOLOGICAL SIGNS OF RAISED ICP (reduced LOC/ GCS <8 or drop >3, bradycardia and hypertension, focal neuro signs, abnormal posturing, unequal dilated or poorly responsive pupils, papilloedema, abnormal dolls eye movements)
- ☐ SHOCK
- ☐ AFTER CONVULSIONS UNTIL STABILISED
- ☐ COAGULATION ABNORMAL (deranged clotting study, platelet count < 100, on anticoagulant
- ☐ RESP INSUFFICIENCY
- ☐ SPREADING PURPURA
- ☐ LOCAL SUPERFICIAL INFECTION AT LP SITE

(can perform delayed LP in children with suspected bacterial meningitis when contraindications no longer present)

BOX 3: CONTRAINDICATIONS TO CEFTRIAXONE

- ☐ Simultaneous administration of Calcium containing infusions but can be given sequentially as long as infusion line flushed between infusions or different infusion line used.

Children younger than 3 months:

- ☐ Prematurity
- ☐ Jaundice
- ☐ Acidosis

BOX 4: INDICATIONS FOR CT SCAN IN CHILDREN WITH SUSPECTED BACTERIAL MENINGITIS

- Cannot reliably assess raised ICP- should be assessed clinically
- Detect other intracranial pathologies, if GCS <8 or focal neurological signs in the absence of an explanation for clinical features
- Do not delay treatment to undertake a CT scan
- Clinically stabilise child before CT scanning
- Consult an anaesthetist, paediatrician or intensivist.

MANAGEMENT OF MENINGOCCOCAL DISEASE IN CHILDREN AND YOUNG PEOPLE

Call consultant in ED, Paediatrics, Anaesthesia or HDU
Assess for shock/raised ICP
Do not perform LP

Give IV ceftriaxone 80mg/kg OD without delay X 7days (do not use ceftriaxone at the same time as calcium containing solutions, use cefotaxime 50mg/kg qds instead in this event)

Bacterial Meningitis algorithm

SIGNS OF SHOCK?

- Tachycardia
- CRT >2 s
- Cold hands/feet; pale or blue skin
- Resp distress/ 02 sats < 95% in air
- Altered mental state/ decreased conscious level
- Decrease urine output (<1ml/kg/hr)
- Hypotension
- Hypoxia on ABG
- Base deficit (worse than ~5mmol/l)
- Increased lactate (>2mmol/l)

N

SIGNS OF RAISED ICP ?

- Reduced LOC/ GCS <8 or drop >3
- Bradycardia and hypertension
- Focal neuro signs,
- Abnormal posturing
- Unequal dilated or poorly responsive pupils,
- Papilloedema
- Abnormal dolls eye movements)

Y

Do not perform Lumbar puncture; Nil by mouth

Do not perform Lumbar puncture; Nil by mouth

N

Y

BOX 1 BLOODS

- ☐ Glucose
- ☐ FBC, U+E, Ca++, Mg++, Po4
- ☐ CRP
- ☐ Clotting
- ☐ Lactate
- ☐ Blood cultures
- ☐ Whole blood (EDTA) for PCR
- ☐ Blood gas (bicarb, base deficit)
- ☐ X-match

- ABC & High Flow Oxygen (min 10L/min) by face mask
- Measure Glucose
- Insert 2 large IV cannulae and take blood (1)

VOLUME RESUSCITATION

- Immediate bolus of 20ml/kg of 0.9% sodium chloride over 5-10 minutes and reassess immediately
- If shock persists give second bolus of 20ml/kg of 0.9% sodium chloride or 4.5% human albumin solution over 5-10 minutes, and reassess immediately
- Consider urinary catheter to monitor output.

- Use local or national protocols to treat raised intracranial pressure.
- Intubate and ventilate.
- Use local or national protocols to treat seizures.
- **Do not** restrict fluids unless there is evidence of:
  - raised intracranial pressure, **or**
  - increased antidiuretic hormone secretion[1].

Clinical features of meningitis?

N

After 40mls/kg still signs of shock?

N

Y

- Monitor signs of raised ICP or shock
- Perform LP if no contraindications **See LP profrma**

DO NOT DELAY ANTIBIOTICS

Repeat Review

- Immediately give a third bolus of intravenous or intraosseous 20 ml/kg sodium chloride 0.9% **or** 4.5% human albumin solution over 5–10 minutes
- Call for anaesthetic assistance for urgent tracheal intubation and mechanical ventilation (use local or national protocols for intubation)
- Start treatment with vasoactive drugs (use local or national protocols)
- Consult with paediatric intensivist

ANTICIPATE MONITOR AND CORRECT:

- Hypoglycaemia
- Hypokalaemia
- Hypomagnesaemia
- Coagulopathy (FFP 10ml/kg)
- Acidosis
- Hypocalcaemia
- Anaemia

Transfer to Intensive Care by Paediatric Intensive Care Retrieval Team

BACTERIAL MENINGITIS AND MENIGOCOCCAL SEPTICAEMIA

LONG-TERM MANAGEMENT CHECKLIST

(Please circle the correct option when carried out)

1) Formal audiological assessment booked as soon as possible FOR BACTERIAL MENINGITIS, preferably before discharge, within 4 weeks of being fit to test. Not indicated for viral meningitis.

2) If profound deafness, referral for urgent assessment for cochlear implants made

3) Follow-up outpatient clinic booked with a paediatrician 4–6 weeks after discharge from hospital
(Need to consider: hearing loss, orthopaedic complications, skin complications, psychological problems, neurological & developmental problems, renal failure)

4) Testing for immunodeficiency booked if:
   - > 1 episode of meningococcal disease
   - > 1 episode of meningococcal disease caused by serogroups other than B
   - Meningococcal disease AND history of other recurrent serious bacterial infections
   - Meningococcal disease AND family history of meningococcal disease/complement deficiency

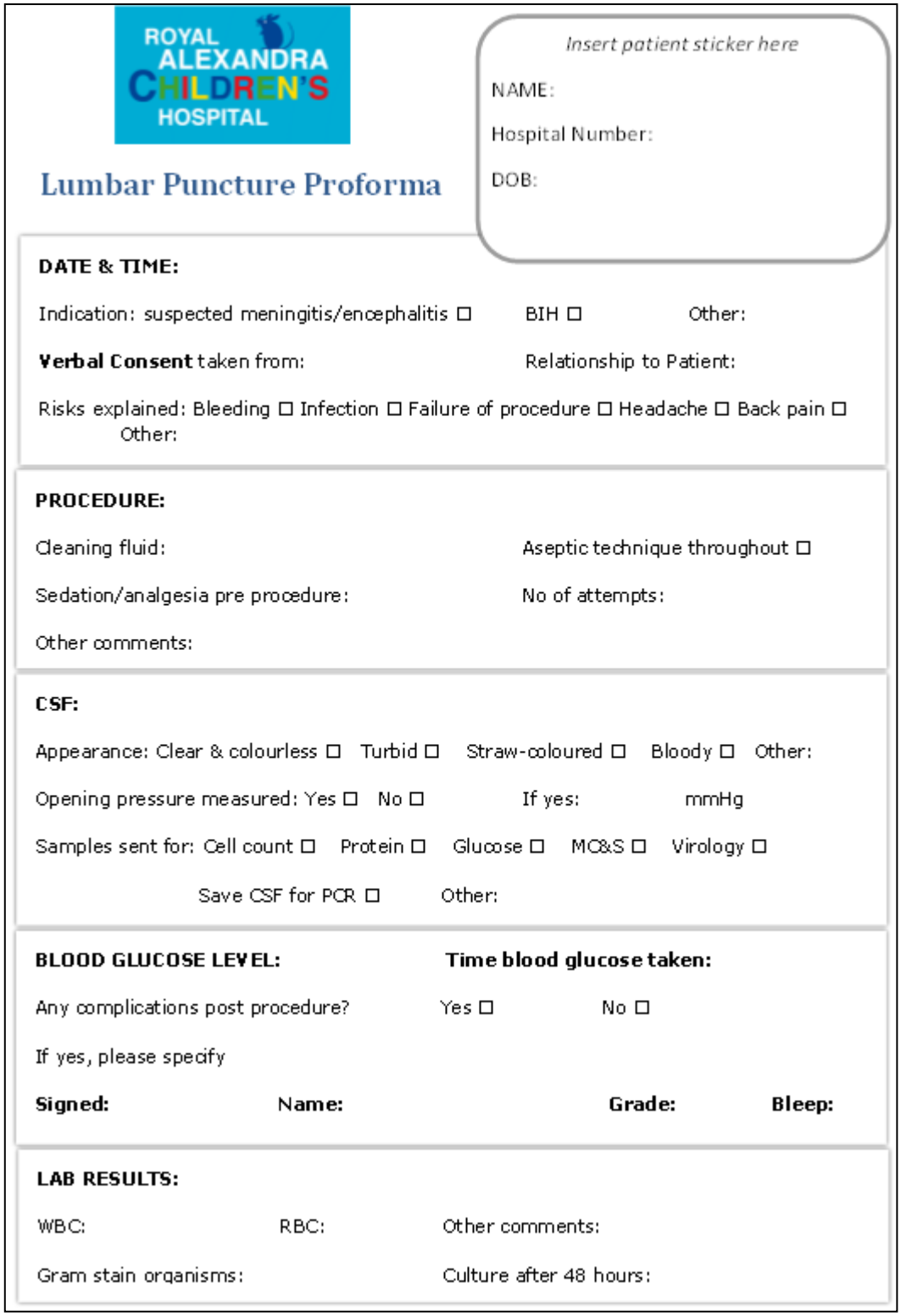
5) Informed the child's or young person's GP / health visitor / school nurse of their bacterial meningitis or meningococcal septicaemia

6) Notified Health Protection Unit – 01273 403 597 (legal requirement)

7) Considered prophylaxis of household contacts of patients – ciprofloxacin is available in the emergency drug cupboard at BSUH (Site Manager can contact the Pharmacist on call if emergency supplies run out)

8) Meningitis Red Book given

Lumbar puncture proforma sticker



ROYAL ALEXANDRA CHILDREN'S HOSPITAL

Lumbar Puncture Proforma

Insert patient sticker here

NAME:

Hospital Number:

DOB:

DATE & TIME:

Indication: suspected meningitis/encephalitis ☐ BIH ☐ Other:

Verbal Consent taken from: Relationship to Patient:

Risks explained: Bleeding ☐ Infection ☐ Failure of procedure ☐ Headache ☐ Back pain ☐
Other:

PROCEDURE:

Cleaning fluid: Aseptic technique throughout ☐

Sedation/analgesia pre procedure: No of attempts:

Other comments:

CSF:

Appearance: Clear & colourless ☐ Turbid ☐ Straw-coloured ☐ Bloody ☐ Other:

Opening pressure measured: Yes ☐ No ☐ If yes: mmHg

Samples sent for: Cell count ☐ Protein ☐ Glucose ☐ MC&S ☐ Virology ☐

Save CSF for PCR ☐ Other:

BLOOD GLUCOSE LEVEL: **Time blood glucose taken:**

Any complications post procedure? Yes ☐ No ☐

If yes, please specify

Signed: **Name:** **Grade:** **Bleep:**

LAB RESULTS:

WBC: RBC: Other comments:

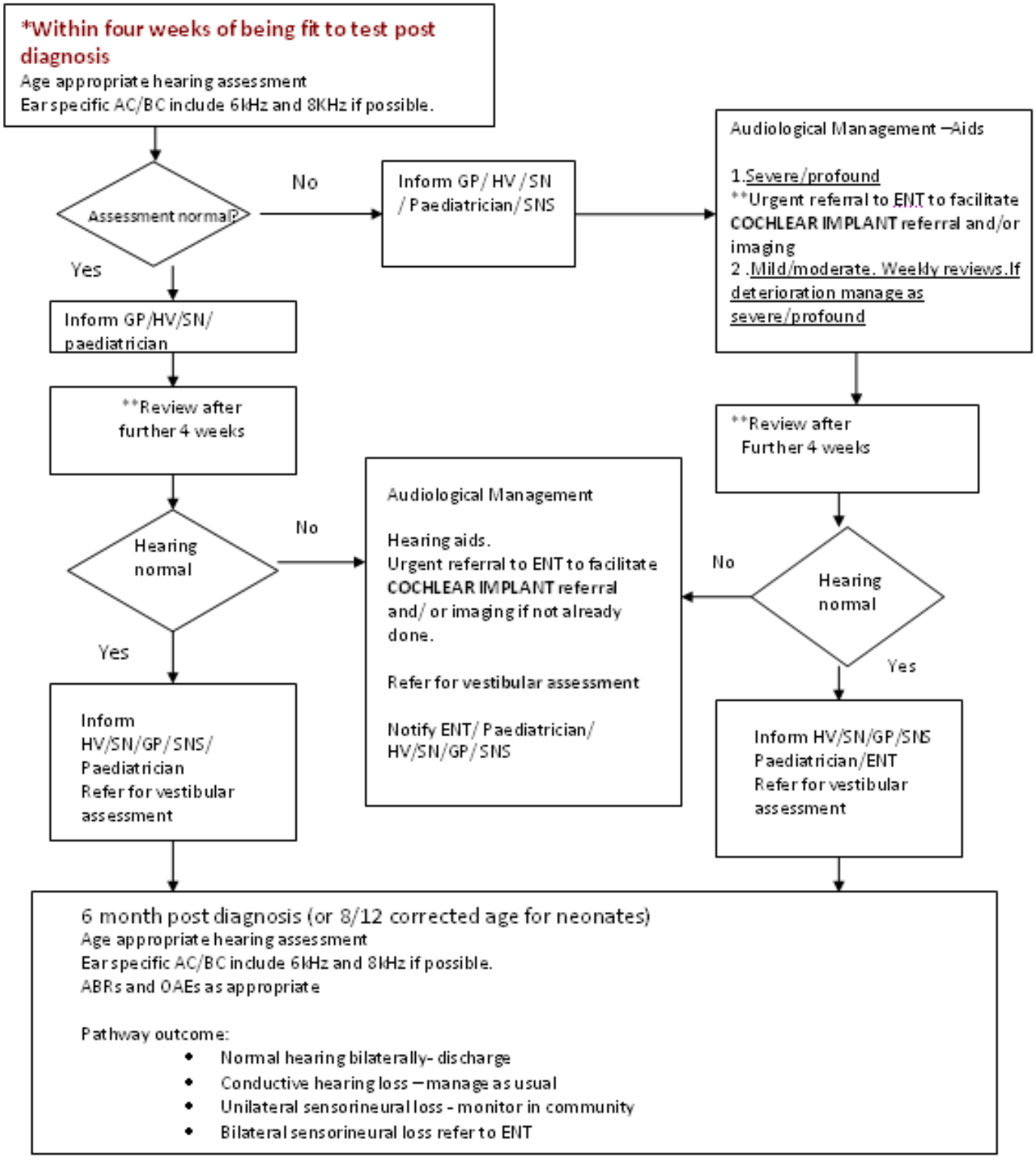
Gram stain organisms: Culture after 48 hours:

AUDIOLOGY PATHWAY FOR BACTERIAL MENINGITIS

(21/07/10 JB/ VS) Audiology Department, RSCH

Risk factors Organism - e.g. pneumococcus
Duration of illness before treatment

Incidence variable 7- 10%



* 10% reversible hearing loss but usually within 2 weeks
** Fibrous ossification early 6-8 weeks

NOTE- All children should have ongoing paediatric assessment to look for abnormal neurology and address developmental, general learning concerns, emotional behavioural problems

Useful links

1) NICE Bacterial Meningitis and meningococcal septicaemia in children 16 years- management in secondary care full guidelines :
   http://www.nice.org.uk/nicemedia/live/13027/49339/49339.pdf

2) NICE Bacterial Meningitis and meningococcal septicaemia in children 16 years- management in secondary care Quick Reference guidelines :
   http://www.nice.org.uk/nicemedia/live/13027/49341/49341.pdf

3) Meningitis Research Foundation Algorithms

   Bacterial Meningitis : http://www.meningitis.org/assets/x/53067
   Meningococcal disease: **http://www.meningitis.org/assets/x/50150**