Whittington Health NHS

Bacterial Meningitis and Petechial Rashes in Children

Subject:	Bacterial Meningitis and Petechial Rashes in Children
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Policy Executive Owner:	Dr G. Armstrong
Designation of Author:	Dr G Armstrong, Consultant Paediatrician Dr M Kelsey, Consultant Microbiologist Maxine Phelops, Paediatric Pharmacist Dr S De and Dr K Jamieson
Name of Assurance Committee:	As above
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Version Control Sheet

Version	Date	Author	Status	Comment
2	August 2010	Dr G Armstrong, Consultant Paediatricians Dr M Kelsey, Consultant Maxine Phelops, Paediatric Pharmacist **Ai-Nee Lim, Antimicrobial Pharmacist** **Dr S De, Microbiology** **Dr K Jamieson, Paediatrics**	Inactive	Generic review
3	August 2011		Inactive	Amendment page 6 re non adherence to: NICE guideline
4	July 2014		Active	Added in advice on CSF interpretation & referenced TB guideline Doses of antibiotics updated.

➢ Criteria for use

- **Children (0-16 years) with suspected or confirmed bacterial meningitis, admitted from the community**
- **Children (0-16 years) with a fever and a petechial rash, but who are not in septic shock.**

➢ Background/ introduction

- The epidemiology of bacterial meningitis as changed in the past two decades following the introduction of H. influenza type B, Meningococcus C and Pneumococcal vaccines.
- There is currently no universal vaccine programme against Meningococcus B, although this is being introduced and individuals may have been vaccinated on a case-by-case basis, and it is the leading infectious cause of death in early childhood.
- Bacterial meningitis and meningococcal septicaemia can present separately or together and it is important to understand how two manage these two different conditions.
- Children with early meningococcal disease may present with a petechial rash, but appear otherwise well and care needs to be taken not to miss a significant infection.
- The NICE guidance “Bacterial meningitis and meningococcal septicaemia June 2010” informs this guide line, but there are some local policy differences.
- For treatment of susepected or proven TB meningitis see separate Whittington Guideline

	Please see Whittington Health Guideline: “**Tuberculosis Treatment and Chemoprophylaxis (adults and paediatrics) guideline**”

➢ Inclusion/ exclusion criteria

- **Inclusion**
  - Any child with suspected or confirmed bacterial meningitis, who is admitted to hospital from the community.
  - Any child who presents to hospital with a fever and a petechial rash, but who does not have any signs of septic shock
- **Exclusion**
  - Any infant being cared for on the Neonatal Intensive Care Unit, who has not been discharged from hospital since birth.
  - Any child with suspected or confirmed meningococcal septicaemia – refer to following guideline instead.

Please see Whittington Health Guideline:
"Early management of meningococcal disease in children"

➢ Clinical management of Meningitis

Clinical Presentation of Meningitis

- Signs / Symptoms
  - *Specific:* Stiff neck; Altered mental state; Back rigidity; Bulging fontanelle; Photophobia; Kernig's sign; Brudzinski's sign; Unconsciousness; Paresis; Focal neurological deficit; Seizures; Shock.
  - *Non*-specific: Fever; Vomiting; Lethargy; Irritability; Refusing food/drink; Breathing difficulty; Headache; Unwell appearance; Chills/rigors; Diarrhoea, Coryzal illness.
- If Meningitis suspected contact Paediatric SpR on bleep 3111 to urgently assess child

Investigations

- Immediate
  - *Blood*
    - Full blood count (FBC) and differential white cell count (WCC)
    - Urea & electrolytes (U&Es)
    - Calcium
    - Phosphate
    - Alkaline phosphatase
    - Liver function test
    - Magnesium
    - Blood glucose
    - Clotting screen
    - Blood culture – Minimum paediatric volume should be 3-5 mls. If the child is over 12 years, please use adult bottles

- Polymerase chain reaction (PCR) for Meningococcal infection; at least 2.4 mls in EDTA tube and must include full clinical details.

- *Lumbar puncture:*

Relative contraindications to lumbar puncture

- Any signs of raised intracranial pressure i.e. Inappropriately low pulse, elevated blood pressure, and irregular respirations (all signs of impending brain herniation) **– see below**
- Prolonged or focal seizures.
- Focal neurological signs, e.g. asymmetry of limb movement and reflexes, ocular palsies.
- A widespread purpuric rash in an ill child. In this case intravenous antibiotics should be given immediately after a blood culture.
- Glasgow Coma Scale – score of less than 13.
- Pupillary dilatation.
- Impaired oculocephalic reflexes (doll's eye reflexes)
- Abnormal posture or movement decerebrate or decorticate posturing or cycling movements of the limbs
- Coagulation disorder
- Papilloedema
- Hypertension

If not contraindicated (see above), collect CSF for:

- *Microbiology* (2 plain 'universal' containers) for:
  - Microscopy (including differential WCC and gram stain)
  - Culture & sensitivity
  - Rapid antigen screen if no organisms seen and pleocytosis
- *Biochemistry* (1 plain bottle & 1 fluoride/oxalate bottle) for:
  - Protein
  - Glucose

See Appendix – "*Whittington Hospital guide to CSF MC&S in paediatrics*" for minimum sample requirements and results interpretation.

- Non-immediate
  - *Microbiology*
    - Throat swab (request form should indicate "?bacterial meningitis")
    - Urine for microscopy, culture & sensitivity
  - *Radiology*
    - Chest X-ray
    - CT head (if any signs of raised intracranial pressure - see below)

Management

- Immediate treatment
  - Obtain IV access (if not already secured)
  - Give Dexamethasone 0.15mg/kg (maximum 10mg) IV QDS for 4 days [1, 4]) – see box below
  - Give 1st dose antibiotics
    - **< 3months – Cefotaxime & Amoxicillin**
    - **> 3 months – Ceftriaxone**

0-3mths:	**Cefotaxime** <7 days – 50mg/Kg BD ≥7 days – 50mg/Kg TDS + **Amoxicillin** up to 7 days – 100mg/kg BD >7 days – 100mg/kg TDS ≥ 1month – 50mg/kg every 4-6 hours (max. 2g every 4 hours)
>3mths:	**Ceftriaxone 80mg/kg once daily (max 4g/day)**

NB Can give Ceftriaxone < 3 months if infant is not jaundiced

  - If overseas travel add Vancomycin
  - Consider Aciclovir & Clarithromycin if any suggestion of meningo-encephalitisMonitor for evidence of:
    - Shock - if present give 20ml/kg 0.9% Saline IV over 5-10 minutes and contact paediatric consultant on call for further advice.
    - Raised ICP – if present contact paediatric consultant on call for further advice.
    - Seizures – if present manage as per APLS seizure guideline.

- Ongoing treatment
  - General:
    - Hand washing between patients
    - Nurse in isolation cubicle for first 24 hours of treatment
    - Consider nursing in paediatric HDU.
    - Anticipated length of stay 1 to 3 weeks
    - Measure head circumference daily in infants

  - Antibiotics:
    - Usual duration of treatment (confirmed):

Streptococcus pneumoniae	14 - 21 days
Haemophilus influenzae	10 - 14 days
Neisseria meningitidis	5 - 10 days
Group B streptococcus	14 days
Listeria monocytogenes	21 days
Gram negative organisms	21 days

- Unconfirmed meningitis (i.e. high clinical suspicion but no CSF culture result) treat for 14 days if < 3 months and 10 days if >3 months.
- Antibiotics must be administered intravenously for the whole duration of treatment.
- A silastic long line when the child is stable may help venous access difficulties.
- NB if treating TB see separate guideline (as per introduction section)

- Dexamethasone

NB: Guidelines for use for Dexamethasone:

- Use in children > 2 months old.
- Administer at or before first antibiotic dose.
- Use only if diagnosis of meningitis strongly suspected or proven.
- Do not use if likely diagnosis Meningococcal Septicaemia.
- Give first dose up to 12hrs after diagnosis, even if antibiotics already commenced.
- Stop if diagnosis becomes unlikely, e.g. child better and negative cultures at 48hrs.
- Do not use in partially treated meningitis with negative blood and CSF cultures.
- Consider stopping if gastro-intestinal bleeding present.

- Fluids
  - Commence at maintenance rate of 1.5L/m^2 /24hrs.
  - **DO NOT ROUTINELY RESTRICT FLUID.** Hyponatraemia may be due to <u>appropriate</u> secretion of antidiuretic hormone (ADH) because of hypovolaemia.
  - Monitor weight, urinary and blood osmolality to detect inappropriate ADH secretion and adjust infusion rate accordingly.
  - Monitor blood pressure (BP) and perfusion.

➢ Clinical management of petechial rash and fever

Clinical presentation of petechial rash

- Child presents with fever or history of fever
- Clinical examination shows non-blanching petechial rash
- Child has no evidence of shock, spreading purpuric rash or septicaemia. If any of above are present, refer to following guideline.

	Please see Whittington Health Guideline: "**Early management of meningococcal disease in children"**

- Child has no evidence of meningitis. If any signs present refer to rest of this guideline (above).

Investigations

- Blood
  - Full blood count
  - Urea & electrolytes (U&E)
  - CRP
  - Blood culture – Minimum paediatric volume should be 3 - 5 mls. If the child is over 12 years, please use adult bottles
  - Blood Glucose
  - Blood Gas
  - Polymerase chain reaction (PCR) for Meningococcal infection; at least 2.4 mls in EDTA tube and must include full clinical details
  - Coagulation screen - only if any other evidence of clotting derangement (e.g. bruising, mucosal bleeding)*

Footnote* - This is not in line with the NICE guideline, but follows the recommendation of local haematology and microbiology departments and is with the agreement of the paediatric department.

Management

- Immediate Management
  - Obtain IV access (if not already secured)
  - Give 1st dose Ceftriaxone 80mg/kg
    (If child less than 3 months old and/or jaundiced use Cefotaxime)
  - Admit to ward for observation and to continue course of antibiotics.

- Ongoing treatment
    - If child remains clinically stable with no evidence of shock, sepsis, meningitis or meningococcal disease by time of consultant ward round, then can be discharged on ambulatory Ceftriaxone, pending final blood culture results.

	Please see Whittington Health Guideline: **'Ceftriaxone – Supply and Administration to Discharged Paediatric Patients'**

    - If blood cultures are negative at 48 hours and there is low clinical suspicion for meningococcal disease, then antibiotics can be stopped at this point.
    - Follow up is not required for patients where antibiotics are stopped at 48 hours.

➢ Further information – Bacterial Meningitis

Prophylaxis

	Please see Whittington Health Guideline: **'Meningitis - Prophylaxis for Contacts'**

Follow Up

- All children must be referred for hearing assessment **before** discharge.
    - Camden & Islington children should be referred to Audiology at the Northern Health Centre.
    - Haringey children should be referred to the Audiology Dept at St. Anne's Hospital
    - Other boroughs: children should be referred to appropriate local service
- General Paediatric consultant follow-up should also be arranged.

➢ Contacts (inside and outside the Trust including out-of-hours contacts)

- On-call Paediatric registrar – bleep 3111 (24 hour cover)
- On-call Paediatric consultant – via switchboard
- On-call Microbiology registrar – bleep 3069 (working hours)
  – mobile via switchboard (out of hours)
- On-call Microbiology consultant – via switchboard

➢ References (evidence upon which the guideline is based)

1. NICE clinical guideline 102. Bacterial meningitis and meningococcal septicaemia: June 2010
2. M. Levin, R.S. Heyderman (1991). Bacterial meningitis; Recent advances in Paediatrics; 9:1-19
3. N.J. Klein, R.S. Heyderman, M. Levin (1992). Antibiotic choices for meningitis beyond the neonatal period. Archives of Disease in Childhood; 67:157-161.
4. Odis C.M, Faingezicht I., Paris M. et al (1991). The beneficial effects of early dexamethasone administration in infants and children with bacterial meningitis. N. England J. Med.; 324:1525-31.
5. Powell, K.R., Sugarman, L.I. et al (1990). Normalisation of plasma arginine vasopresin concentrations when children with meningitis are given maintenance plus replacement fluid therapy. J. Paediatrics; 117-4; 515-522.
6.

➢ Compliance with this guideline (how and when the guideline will be monitored e.g. audit and which committee the results will be reported to)

This guideline is not intended to be routinely audited owing to the very small number of cases that the guideline will apply to.

Whittington Hospital guide to cerebrospinal fluid (CSF) microscopy and culture in paediatrics

When CSF has been taken, contact microbiology and biochemistry laboratories for urgent processing. Samples such as blood cultures taken concurrently can be delivered to the laboratory at the same time.

Volume of CSF required:	**Microbiology:**	Fill 3 universal containers each with 10 drops of CSF (minimum 6 drops) N.B. If TB meningitis suspected, requires >3ml (contact microbiology)
	Protein/glucose:	1 universal container (6 drops CSF) + 1 fluoride/grey top (4 drops CSF)

Stages of CSF microscopy/culture:

1. Cell counting and culture

- All samples

2. If cell count abnormal

- Differential count of white blood cells is performed (% of neutrophils/polymorphonuclear vs. lymphocytes/mononuclear cells)
- Gram staining of CSF (looking for bacteria/fungi)
- Enrichment culture
- Possibility of polymerase chain reaction (PCR) testing

3. Culture reports

- DIRECT (all samples) - Culture plates evaluated on two subsequent mornings after microscopy
- ENRICHMENT – broth evaluated on third morning after microscopy

4. PCR reports (if performed)

- VIRAL – usually available on 2nd-3rd working day after sending to reference laboratory
- BACTERIAL – Variable (between 3-7 days after sending depending on assay requested)

Normal laboratory CSF leukocyte/WBC counts by age
(UK Health Protection Agency guidelines)

<1 week:	**<30/ml**
≥1 week-1 month:	**<20/ml**
≥1 month-4 years:	**<20/ml**
≥5 years – 12 years:	**<10/ml**
≥12 years:	**<5/ml**

- 1 extra white cell per 500 red cells are counted as normal
- e.g. 1 month-old with 1200 red cells in CSF → max. upper limit of normal WBC = 22/ml

Normal laboratory CSF biochemistry values

	Protein:	**Glucose ratio (CSF:blood)**
≤6 days old:	<0.7g/L	≥0.6 or ≥2.5mmol/L
Others:	<0.4g/L	≥0.6 or ≥2.5mmol/L

Indications for further discussion with microbiologist and/or consultant paediatrician:

- If WBC count is calculated as abnormal or borderline
  - e.g. If >1 month and CSF WBC count 10-20/ml (after correction for red cells)
- If CSF protein/glucose is abnormal
- If CSF >12 hours-old (microscopy may be inaccurate)
- If child is immunosuppressed or *M. tuberculosis* infection suspected
- If child has signs of meningism
- If child has any signs of encephalitis:
  - Seizures, focal neurological abnormality, altered mental state, reduced GCS
- If child has been started on aciclovir or other antivirals
- If CSF taken after antimicrobials commenced

To be completed and attached to any procedural document when submitted to the appropriate committee for consideration and approval

		Yes/No	Comments
1.	**Does the procedural document affect one group less or more favourably than another on the basis of:**		
	• Race	No	
	• Ethnic origins (including gypsies and travellers)	No	
	• Nationality	No	
	• Gender	No	
	• Culture	No	
	• Religion or belief	No	
	• Sexual orientation including lesbian, gay and bisexual people	No	
	• Age	No	
	• Disability - learning disabilities, physical disability, sensory impairment and mental health problems	No	
2.	**Is there any evidence that some groups are affected differently?**	No	
3.	**If you have identified potential discrimination, are any exceptions valid, legal and/or justifiable?**	No	
4.	**Is the impact of the procedural document likely to be negative?**	No	
5.	**If so can the impact be avoided?**	N/A	
6.	**What alternatives are there to achieving the procedural document without the impact?**	N/A	
7.	**Can we reduce the impact by taking different action?**	N/A	

If you have identified a potential discriminatory impact of this procedural document, please refer it to the Director of Human Resources, together with any suggestions as to the action required to avoid/reduce this impact.
For advice in respect of answering the above questions, please contact the Director

of Human Resources.

Checklist for the Review and Approval of Procedural Document

To be completed and attached to any procedural document when submitted to the relevant committee for consideration and approval.

	Title of document being reviewed:	Yes/No	Comments
1.	**Title**		
	Is the title clear and unambiguous?	Yes	
	Is it clear whether the document is a guideline, policy, protocol or standard?	Yes	
2.	**Rationale**		
	Are reasons for development of the document stated?	Yes	
3.	**Development Process**		
	Is it clear that the relevant people/groups have been involved in the development of the document?	Yes	
	Are people involved in the development?	Yes	
	Is there evidence of consultation with stakeholders and users?	Yes	
4.	**Content**		
	Is the objective of the document clear?	Yes	
	Is the target population clear and unambiguous?	Yes	
	Are the intended outcomes described?	Yes	
5.	**Evidence Base**		
	Are key references cited in full?	N/A	
	Are supporting documents referenced?	N/A	
6.	**Approval**		
	Does the document identify which committee/ group will approve it?	Yes	
7.	**Dissemination and Implementation**		
	Is there an outline/plan to identify how this will be done?	Yes	
8.	**Document Control**		
	Does the document identify where it will be held?	Yes	

	ment being reviewed:	Yes/No	Comments
9.	**Process to Monitor Compliance and Effectiveness**		
	Are there measurable standards or KPIs to support the monitoring of compliance with and effectiveness of the document?	Yes	
	Is there a plan to review or audit compliance with the document?	Yes	
10.	**Review Date**		
	Is the review date identified?	Yes	
	Is the frequency of review identified? If so is it acceptable?	Yes	
11.	**Overall Responsibility for the Document**		
	Is it clear who will be responsible for co-ordinating the dissemination, implementation and review of the document?	Yes	

Executive Sponsor Approval			
If you approve the document, please sign and date it and forward to the author. Procedural documents will not be forwarded for ratification without Executive Sponsor Approval			
Name		Date	
Signature			
Relevant Committee Approval			
The Director of Nursing and Patient Experience's signature below confirms that this procedural document was ratified by the appropriate Governance Committee.			
Name		Date	
Signature			
Responsible Committee Approval – only applies to reviewed procedural documents with minor changes			
The Committee Chair's signature below confirms that this procedural document was ratified by the responsible Committee			
Name		Date	
Name of Committee		Name & role of Committee Chair	
Signature			

Tool to Develop Monitoring Arrangements for Policies and guidelines

What key element(s) need(s) monitoring as per local approved policy or guidance?	Who will lead on this aspect of monitoring? Name the lead and what is the role of the multidisciplinary team or others if any.	What tool will be used to monitor/check/observe/Assess/inspect/ authenticate that everything is working according to this key element from the approved policy?	How often is the need to monitor each element? How often is the need complete a report ? How often is the need to share the report?	What committee will the completed report go to?
Element to be monitored	**Lead**	**Tool**	**Frequency**	**Reporting arrangements**
General adherence to correct antibiotic usage by paediatric & ED staff	Lead Paediatric Pharmacist and Antimicrobial Pharmacist with support from Paediatric Consultant and Consultant Microbiologist	Inpatient cases reviewed at weekly grand round on Ifor ward jointly between microbiology & paediatric consultants with pharmacy input	Not required. This guideline is not intended to be routinely audited owing to the very small number of cases that the guideline will apply to.	Not required