

Management of Meningococcal Disease in Children and Young People

Incorporates NICE Bacterial Meningitis and Meningococcal Septicaemia Guideline CG102. Distributed in partnership with NICE

Edition 8A



Endorsed by



Bacterial meningitis algorithm
www.meningitis.org

MD1 Estimate of child's weight (1–10 yrs)
Weight (kg) = 2 x (age in years + 4)

MD2 Observe HR, RR, BP, perfusion, conscious level
Cardiac monitor & pulse oximetry.

Conscious Level	Normal Values			
	Age	RR/min	HR/min	Systolic BP
Alert	Birth	25-50	120-170	80-90
Responds to Voice	3 m	25-45	115-160	80-90
Responds to Pain	6 m	20-40	110-160	80-90
Unresponsive	12 m	20-40	110-160	85-95
	18 m	20-35	100-155	85-95
	2 y	20-30	100-150	85-100
	3 y	20-30	90-140	85-100
	4 y	20-30	80-135	85-100
	5 y	20-30	80-135	90-110
	6 y	20-30	80-130	90-110
	8 y	15-25	70-120	90-110
	12 y	12-24	65-115	100-120
	>14 y	12-24	60-110	100-120

N.B. Low BP is a pre-terminal sign in children

MD3 Take bloods for Blood gas (bicarb, base deficit), Lactate, Glucose, FBC, U&E, Ca⁺⁺, Mg⁺⁺, PO₄, Clotting, CRP, Blood cultures, Whole blood (EDTA) for PCR, X-match. Take Throat swab. If limited blood volume, prioritise blood gas, lactate, glucose, electrolytes, FBC, clotting.

MD4 Intubation (call anaesthetist and consult PICU) see **BM5**
Consider using: Atropine 20 mcg/kg (max 600 mcg) AND Ketamine 1-2 mg/kg in shock or Thiopental (thiopentone) 3-5 mg/kg in RICP AND Suxamethonium 2 mg/kg (caution, high potassium). ETT size = age/4 + 4, ETT length (oral) = age/2 + 12 (use cuffed ET tube if possible). Then: Morphine (100 mcg/kg) and Midazolam (100 mcg/kg) every 30 min.

MD5 Inotropes
Dopamine at 10-20 mcg/kg/min. Make up 3 x weight (kg) mg in 50 ml 5% dextrose and run at 10 ml/hr = 10 mcg/kg/min. (These dilute solutions can be used via a peripheral vein).
Start Adrenaline via a central or IO line only at 0.1 mcg/kg/min.
Start Noradrenaline via a central or IO line only at 0.1 mcg/kg/min. for 'warm shock'.
Adrenaline & Noradrenaline: Make up 300 mcg/kg in 50 ml of normal saline at 1 ml/hour = 0.1 mcg/kg/min.

MD6 Hypoglycaemia (glucose < 3 mmol/l) 2 ml/kg 10% Dextrose bolus IV.

MD7 Correction of metabolic acidosis pH < 7.2
Give half correction bicarb IV.
Volume (ml) to give = (0.3 x weight in kg x base deficit ÷ 2) of 8.4% bicarb over 20 mins, or in neonates, volume (ml) to give = (0.3 x weight in kg x base deficit) of 4.2% bicarb.

MD8 If K⁺ < 3.5 mmol/l
Give 0.25 mmol/kg over 30 mins IV with ECG monitoring.
Central line preferable. Caution if anuric.

MD9 If total Calcium < 2 mmol/l or ionized Ca⁺⁺ < 1.0
Give 0.1 ml/kg 10% CaCl₂ (0.7 mmol/ml) over 30 mins IV (max 10 ml) or 0.3 ml/kg 10% Ca gluconate (0.22 mmol/ml) over 30 mins IV (max 20 ml). Central line preferable.

MD10 If Mg⁺⁺ < 0.75 mmol/l
Give 0.2 ml/kg of 50% MgSO₄ over 30 mins IV (max 10 ml).

MD11 Urgently notify public health of any suspected case of meningitis or meningococcal disease
Prophylaxis of household contacts of MD (goo.gl/1NTbck)
■ Preferred: Ciprofloxacin single dose <5yrs 30 mg/kg up to max 125 mg; 5-12yrs 250 mg; >12yrs 500 mg or
■ Rifampicin bd for 2 days: <1yr 5 mg/kg; 1-12yrs 10 mg/kg; >12yrs 600 mg or
■ Ciprofloxacin, ceftriaxone or azithromycin may be used for pregnant and breast-feeding contacts of cases
For index case not treated with Ceftriaxone, prophylaxis when well enough.
Hib: prophylaxis may be indicated – consult public health

MD12 Antibiotics for confirmed and unconfirmed (but clinically suspected) meningococcal disease: IV Ceftriaxone for 7 days unless contraindicated
BM3 (see bacterial meningitis algorithm for antibiotics against other pathogens)

Based on Early Management algorithm, Dept Paediatrics, Imperial College at St Mary's Hospital as described in Arch Dis Child 1999;80:290 & 2007;92:283 & on NICE CG102 www.nice.org.uk/guidance/cg102

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RECOGNITION
May present with predominant **SEPTICAEMIA (with shock)**, **MENINGITIS (with raised ICP)** or **both**. **Purpuric/petechial non-blanching rash is typical**. Some may have neither shock nor meningitis. Rash may be atypical or absent in some cases.

Call consultant in Emergency Medicine, Paediatrics, Anaesthesia or Intensive Care
Initial assessment looking for shock/raised ICP
Do not perform Lumbar Puncture yet
Give IV Ceftriaxone (80 mg/kg od) without delay **BM3**
Do not use Ceftriaxone at the same time as calcium-containing solutions: in this situation use Cefotaxime (50 mg/kg qds)

SIGNS OF SHOCK? MD2

- Tachycardia
- Capillary refill time > 2 seconds
- Cold hands/feet; pale or blue skin
- Respiratory distress/ oxygen saturation <95% in air
- Altered mental state/decreased conscious level
- Decreased urine output (<1 ml/kg/hr)
- Hypotension (late sign)
- Hypoxia on arterial blood gas
- Base deficit (worse than -5 mmol/l)
- Increased lactate (>2 mmol/l)

NO
Do not perform Lumbar Puncture; Nil by mouth

YES
Do not perform Lumbar Puncture; Nil by mouth

- ABC & High flow Oxygen (minimum 10 l/min) by face mask
- Insert 2 large IV cannulae (or IO); Take bloods, see **MD3**
- Take blood gas (including lactate). Measure glucose.

VOLUME RESUSCITATION

- Immediate bolus of 20 ml/kg of 0.9% Saline over 5-10 minutes and reassess immediately
- If shock persists immediately give second bolus of 20 ml/kg of 0.9% Saline or of 4.5% Human Albumin over 5-10 minutes and reassess immediately
- Observe closely for response/deterioration
- Consider Urinary catheter to monitor output

After 40 ml/kg fluid resuscitation – STILL SIGNS OF SHOCK?
NO Repeated review

YES
WILL REQUIRE URGENT ELECTIVE INTUBATION AND VENTILATION MD4
D/W Paediatric intensivist and Call anaesthetist

- Immediate bolus of 20 ml/kg of 0.9% Saline or 4.5% Human Albumin over 5-10 minutes and reassess immediately; Continue boluses if necessary with repeated clinical and laboratory assessments including blood gas measurements. Fluid resuscitation should be guided by lactate, tachycardia, perfusion, hepatomegaly to avoid fluid overload and determine need for inotropes.
- Start peripheral inotropes (Dopamine); if IO access start Adrenaline **MD5**
- ET Tube (Cuffed if possible) and CXR
- Anticipate pulmonary oedema ensure adequate PEEP (≥5cm H₂O)
- Central venous access
- Urine catheter to monitor urine output
- Start Adrenaline infusion (central) if continuing need for Volume resuscitation & Inotropes
- For warm shock: warm peripheries, bounding pulses and low diastolic pressure, give Noradrenaline (central)

Anticipate, monitor and correct:

- Hypoglycaemia **MD6**
- Acidosis **MD7**
- Hypokalaemia **MD8**
- Hypocalcaemia **MD9**
- Hypomagnesaemia **MD10**
- Anaemia
- If bleeding or performing invasive procedure (i.e. central line insertion) treat coagulopathy with FFP/Cryoprecipitate/platelets

RAISED INTRACRANIAL PRESSURE?

- Reduced or fluctuating level of consciousness (GCS <9 or a drop of 3 or more)
- Relative Bradycardia and Hypertension
- Focal neurological signs
- Abnormal posture or posturing
- Seizures
- Unequal, dilated or poorly responsive pupils
- Papilloedema (late sign)
- Abnormal 'doll's eye' movements

NO
Do not perform Lumbar Puncture; Nil by mouth

YES
Do not perform Lumbar Puncture; Nil by mouth

- ABC & High flow Oxygen (minimum 10 l/min) by face mask
- Insert 2 large IV cannulae (or IO); Take bloods, see **MD3**
- Take blood gas (including lactate). Measure glucose.
- Give 0.25g/kg bolus of 20% Mannitol or 3ml/kg Hypertonic Saline (3% or 2.7% as available) over 5 minutes
- Treat shock if present
- **Call anaesthetist and contact PICU**
- Intubate and ventilate to control PaCO₂ (4-4.5 kPa)
- Urinary catheter and monitor output, NG tube

Do not perform Lumbar Puncture

NEUROINTENSIVE CARE

- 30° head elevation, midline position
- Avoid internal jugular lines
- Repeat Mannitol or hypertonic Saline (3% or 2.7% as available) if indicated
- Sedate (muscle relax for transport)
- Cautious fluid resuscitation (but correct coexisting shock)
- Monitor pupillary size and reaction
- Avoid hyperthermia
- Once patient is stabilised, consider CT scan to detect other intracranial pathology if GCS <9, fluctuating conscious level or focal neurological signs

Do not restrict fluids unless there is evidence of:

- raised intracranial pressure, or
- increased antidiuretic hormone secretion

STEPWISE TREATMENT OF SEIZURES

- IV Lorazepam (0.1 mg/kg) or Midazolam (0.1 mg/kg) bolus
- Consider Paraldehyde (0.4 ml/kg PR)
- Phenytoin (18 mg/kg over 30 min IV with ECG monitoring)

If persistent seizures:

- Thiopental (thiopentone) 4 mg/kg in intubated patients (beware of hypotension)
- Midazolam/Thiopental infusion

Perform delayed LP when stable and no contraindications

GO TO BACTERIAL MENINGITIS ALGORITHM

CLINICAL FEATURES OF MENINGITIS?

NO
Take bloods, see **MD3**
Close monitoring for signs of

- Raised ICP
- Shock

Perform LP if no contraindication
DO NOT DELAY ANTIBIOTICS

Repeated Review
Children with MD can deteriorate rapidly.
Deterioration detected?

Transfer to Intensive Care by Paediatric Intensive Care Retrieval Team

Notify public health, prophylaxis see; MD11 Long-term management: see BM7 on Bacterial Meningitis Algorithm