Clinical Guidance

Paediatric Critical Care: Pertussis Infection

Summary
Pertussis guidance reviewing pathophysiology, clinical presentation, DGH treatment, Indications for early referral, PICU management and public health.

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Change History

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<td>Aug ’15</td>
<td>Health Protection Agency changed to Public Health. Advice on ECMO and Leucofilter changed.</td>
<td>Evelina CGG</td>
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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.

Glossary: WCC- white cell count, FBC- full blood cell, PCR- polymerase chain reaction- virology test, NPA- nasopharyngeal aspirate, BAL- bronchoalveolar lavage, CVS- cardiovascular, RBC- red blood cells, HFOV High frequency oscillation ventilation
Paediatric Critical Care

Pertussis infection

Broad spectrum of disease severity.

Bordetella Pertussis:
- Gram-negative coccobacillus producing potent endotoxins.
- Endotoxin-mediated vascular endothelial damage, lymphocyte deformity with abnormal rolling, toxin-mediated leukocytosis & hyperviscosity syndrome.
- Consequent microvascular thrombosis with pulmonary hypertension, necrotising bronchiolitis/pneumonia, myocardial dysfunction and encephalitis.

References

Clinical presentation
Infants: respiratory illness, apnoea alone, seizures
- Highest risk for severe disease < 3 months / unimmunised
- Reducing risk with repeat immunization

Early recognition, aggressive management and early referral of infants is essential

Older children: respiratory illness with inspiratory ‘whoop’, post-tussive vomiting, prolonged spasmodic cough

Suspect in respiratory illness and:
- leukocytosis with lymphocytosis (WCC ≥20 with ≥ 50% lymphocytes) or isolated lymphocytosis
- known/suspected contact with carrier of pertussis

Differential diagnoses: Bronchiolitis, pneumonia, parapertussis, encephalitis, sepsis. Co-infection with respiratory virus is seen frequently (16-23%);

Initial management at local hospital
Admit all infants < 3 months with suspected pertussis
(lymphocytosis) for observation & repeat FBC.

- Early symptoms may be mild.
- This group frequently develop severe disease

All suspected cases:
- Isolation until macrolide antibiotic treatment completed
- Notify local health protection team (HPT): see below
- Staff: consider their own immunisation status (see below)

Baseline investigations:
- ≤12 months: Pernasal swab for PCR
- >12 months: Pernasal swab for culture if < 2 weeks since onset of symptoms OR bloods for serology if ≥2 weeks since onset of symptoms (and > 1y post pertussis immunization)
- NPA and BAL for other respiratory pathogens
- FBC with differential: Repeat every 6 hours if WCC rising or deteriorating clinical condition
- Chest X-ray (pneumonic changes)
- ECG (ischaemic changes, pulm. hypertension, right heart strain)

Treatment
- Azithromycin 10mg/kg once daily enterally for 3 days
  - If concerns about enteral absorption then give clarithromycin IV (7.5mg/kg IV BD).
- Co-amoxiclav empirically to cover other respiratory pathogens
- Consider broader cover for those presenting with apnoea/seizures

General management
- Fluid restrict to 2ml/kg/hr; Enteral feeds preferable
- Close observation of respiratory and cardiovascular status

Indications for early PICU referral
- Infants ≤ 3 months with clinical or laboratory deterioration
- WCC ≥ 30 on admission or rapidly rising WCC (>10 /6hr)
- Respiratory failure/frequent apnoea
- Pneumonic changes on CXR
- Persistent tachycardia/ cardiovascular instability

PICU management

Highest risk group are those with pneumonia.
- Ventilatory management as for ARDS (see ARDS guideline)
  - ECHO – assess cardiac function and pulmonary artery pressures
  - Monitor WCC 6 hourly
  - Baseline head ultrasound (possibility of ECMO)

Urgent double volume exchange transfusion to reduce WCC if:
- WCC ≥ 30 and rapidly rising
- WCC ≥ 30 with pneumonia or CVS instability
- WCC ≥ 50

Double volume exchange transfusion:
ECMO centre should be fore-warned of child’s condition
- 200ml/kg in 20ml aliquots over 2 hrs
- Replace whole blood with packed RBCs + crystalloid fluid – target HCT of 0.4-0.45.
- Target final WCC of < 20
- Repeat FBC 2 hours after completion, then 6 hourly

Success relies on procedure being carried out before the infant is severely compromised

If cardiorespiratory failure is refractory to above, urgent referral to an ECMO centre. ECMO not offered to children < 6 weeks of age as very poor outcome

Lack of evidence to support improved outcome with the following therapies: HFOV, Nitric oxide, Surfactant, Steroids, Immunoglobulins, Bronchodilators

Specialist interventions
ECMO. Case fatality rate 70% (84% if <6 weeks old). Consider adding leukocyte filter to circuit. (80% survival in small case series)

Leukapheresis. Effective at rapid white cell count reduction.
Perform with ECMO support. Often need >1 leucofilter as clots with high WCC.

Public health
Highly contagious. Incubation period 5-21 days.
- Notify local HPT of all suspected cases (S/E London 0203 764 0804)
- If onset of symptoms <21 days ago, all vulnerable close contacts require chemoprophylaxis (vulnerable = partially or unimmunized infants and children up to 10 years; adults working in healthcare, social care, child care; immunocompromised individuals; women in last month of pregnancy).
- Prophylaxis: Azithromycin 10mg/kg once daily enterally for 3 days.
- Erythromycin is recommended macrolide in pregnancy
- For healthcare worker related exposure- contact occupational health

Outcome
Mortality rates of 40-70% for infants requiring PICU care

References