
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.

Document Detail	
Document type	Clinical Guideline
Document name	Paediatric Critical Care: Pertussis Infection
Document location	GTi Clinical Guidance Database and Evelina London Website
Version	2.0
Effective from	12 September 2018
Review date	12 September 2021
Owner	Jon Lillie, PICU Guideline lead
Author(s)	Shelley Riphagen, STRS lead Jo Dyer, PICU RNP Jon Lillie, PICU Consultant
Approved by, date	Evelina London Clinical Guidelines Group, <i>June 2018</i> Antibiotic Stewardship Committee, <i>July 2018</i>
Superseded documents	PICU: Pertussis Infection v1.0
Related documents	Paediatric ARDS
Keywords	PICU, pertussis, infection, public health, notifiable, disease, paediatric critical care, paediatric intensive care, Bordetella, ARDS, Evelina, Child
Relevant external law, regulation, standards	

Change History		
Date	Change details, since approval	Approved by
Aug '15	Health Protection Agency changed to Public Health. Advice on ECMO and Leucofilter changed.	Evelina CGG

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 leucocytosis & hyperviscosity syndrome.
- Consequent microvascular thrombosis with pulmonary hypertension, necrotising bronchiolitis/pneumonia, myocardial dysfunction and encephalitis.

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 $\geq 50\%$ 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 (symptoms + 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 > 1 y 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.

Performed 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