1 Introduction

Pertussis (whooping cough) is an acute respiratory infection caused by *Bordatella pertussis*. This exclusively human pathogen affects people of all ages, but young unimmunised infants are at the highest risk of infection and serious complications, including pneumonia, seizures, encephalitis and death. Transmission is via contact with the respiratory secretions of an infected person and the organism is highly contagious; up to 90% of household contacts of an index case will develop the disease. Following an incubation period of 7-10 days, pertussis classically presents with an initial coryzal stage and then a cough that becomes paroxysmal. Paroxysms usually increase in frequency and severity as the illness progresses and persist for 2–6 weeks. They may end in vomiting, cyanosis and/or a characteristic inspiratory whoop. In younger infants, this whoop is often absent and the presentation may be atypical with apnoea. Older individuals often suffer a relatively mild illness but remain highly infectious during the coryzal stage and for the first three weeks after the onset of cough. Symptoms slowly improve in the convalescent phase, which can persist for months.

Pertussis transmission rates peak every 3-4 years, particularly between July and September. The current UK childhood immunisation schedule is highly effective however immunological protection through natural infection or vaccination is not life long. Within 5 years, individuals may again become susceptible to infection, albeit with milder symptoms. The majority of paediatric cases are infected by such individuals, usually a mother or other close contact of an infant who is too young to have been vaccinated. In healthcare settings chains of transmission involving groups of adults with waning immunity and multiple contacts with vulnerable patients can lead to prolonged outbreaks which are challenging and costly to manage. It is not currently national policy to offer pertussis booster vaccination to all health care staff. Therefore specific guidance is required on the use of post-exposure antibiotic chemoprophylaxis and vaccination for those who come into close contact with this organism in hospital and are at the highest risk from the infection or of transmitting it to vulnerable patients. If outbreaks are detected at an early stage, prompt action can limit transmission and protect our patients and staff.

This document updates the previous Trust policy on pertussis and outlines key recommendations on the management of incidents within the Trust. It is based on recent national guidelines produced by the Health Protection Agency (HPA), hereafter
referred to as the HPA Guidelines [1, 2]. A thorough review of recent developments in pertussis was published in 2006 [3]. Specific advice and guidance on the management of this infection is available from the paediatric and adult infectious diseases teams and from Microbiology.

2 Scope

This policy applies to all healthcare professionals working across acute and community services within Newcastle Upon Tyne Hospitals NHS Foundation Trust. This includes medical staff, nurses, allied health professionals and students.

3 Aims

Guidance in this document applies to clinically-suspected, epidemiologically-linked or laboratory-confirmed cases of pertussis within the Trust. Action should not be delayed until the results of laboratory testing are available.

4 Duties (Roles and responsibilities)

- The Chief Executive has overall responsibility for the implementation, monitoring and review of this procedure
- This responsibility is delegated to the Director of Infection Prevention and Control (DIPC)
- The Infection Prevention and Control Committee (IPCC) will review the procedure and any new evidence base within the time frame set out in the procedure
- It is the responsibility of the Trust to ensure that policies, education, training and procedures are in place to minimize the risk of infection
- It is the responsibility of the Trust/line managers and service heads to ensure that policies, procedures and access to education and training are made available to all staff

It is the responsibility of all staff to ensure that they understand and implement this policy and attend training sessions as specified in their role.

5 Definitions

5.1 Case definitions

- **Suspected case:** Any person in whom a clinician suspects pertussis, with an acute, unexplained cough lasting for more than 14 days and at least one of:
  - paroxysms of coughing
  - post-tussive vomiting
  - inspiratory whoop

And
- Absence of laboratory confirmation
- No epidemiological link to a laboratory confirmed case
o **Confirmed case:** Any person with signs and symptoms consistent with pertussis, and *B. pertussis* isolated from a respiratory specimen (culture or PCR) or positive pertussis serology

o **Epidemiologically-linked case:** A suspected case (as above) without laboratory confirmation and contact with a laboratory-confirmed case in the 21 days before onset of symptoms.

o **Infectious period:** From onset of symptoms until 5 days of appropriate antibiotic treatment OR for 21 days from onset of symptoms if appropriate antibiotic therapy has not been completed.

o **Significant exposure:** In the absence of appropriate personal protective equipment:

  o direct face-to-face contact (< 2 metre distance) with an infectious case for a cumulative period greater than 1 hour in 1 day

  o any direct contact with respiratory secretions from an infectious case, such as might be generated in the performance of an aerosol-generating procedure or examination of a patient’s nose or throat.

### 5.2 Abbreviations

5.3  

#### 5.4 BNF: British National Formulary

#### 5.5 DNA: Deoxyribonucleic acid

  o DIPC: Director of Infection Prevention and Control

#### 5.6 HCW: Healthcare worker

#### 5.7 HPA: Health Protection Agency

  o HPU: Health Protection Unit

  o IPCC: Infection Prevention and Control Committee

#### 5.8 IPCT: Infection Prevention and Control Team

#### 5.9 OH: Occupational Health

#### 5.10 PCR: Polymerase chain reaction

  o PPE: Personal protective equipment

  o RVPBRU: Respiratory and Vaccine Preventable Bacteria Reference Unit

#### 5.11 TdaPIPVa: Tetanus toxoid, diphtheria toxoid, acellular pertussis and inactivated polio vaccine

#### 5.12 Td-IPV: Tetanus toxoid, diphtheria toxoid and inactivated polio vaccine.

### 6 Policy

Nosocomial transmission of pertussis between staff, patients and visitors is well-described, disruptive and costly. Case management of pertussis within the Trust should proceed in accordance with HPA Guidelines [1, 2]. This should include provision for the
diagnosis and treatment of those with symptomatic infection, as well as for post-exposure chemoprophylaxis and vaccination of those contacts most at risk from pertussis, or most likely to transmit the infection to vulnerable patients.

6.1 Diagnosis

The positive predictive value of a clinical diagnosis of pertussis is not very high and varies with the age of the patient and over time. Risk assessment therefore depends on a combined review of clinical, epidemiological and laboratory features. However management should not be delayed while awaiting laboratory confirmation.

Clinically-suspected cases of pertussis can be confirmed by the laboratory isolation of its causative organism *B. pertussis* from pernasal swabs or by the detection of its DNA from nasopharyngeal aspirates. Cultures taken early in the catarrhal stage of the illness are more likely to be positive (~55%) but may yield a result up to a week into the paroxysmal stage, or up to 48 h of appropriate antibiotic treatment. Culture can be done locally by Microbiology and is appropriate for those cases (HCW and patients) not requiring hospitalisation and in the first 2 weeks of illness. Turnaround time for results is 4-10 days.

PCR is more sensitive than culture for the diagnosis of pertussis, especially in the latter stages of the illness or when macrolide antibiotics have been given. The RVPBRU at Colindale offers *B. pertussis* PCR and confirmatory culture for acutely ill infants admitted to hospital with a respiratory illness compatible with pertussis. PCR results are available the same day (regular working hours) for samples received by 10 am. This test is not generally available for other cases but may be discussed with RVPBRU (0208 327 7327).

Serology is usually used to confirm the diagnosis of pertussis in symptomatic individuals in situations when culture and PCR are unlikely to yield positive results, particularly beyond the second week of illness. It is commonly done on adults and older children, and may be considered for HCW, in whom pertussis is suspected. Serology in infants is difficult to interpret because of poor antibody responses or confounding by vaccination. RVPBRU offers an assay of anti-pertussis toxin antibody for serological diagnosis on serum samples taken from suspected cases more than 2 weeks after the onset of cough. Until further data are available however, serological testing should only be undertaken on those who are more than a year from a primary or booster dose of pertussis-containing vaccine and any results should be interpreted accordingly.

The negative predictive value of all these tests is comparatively low and therefore a negative test result does not exclude pertussis. Public health interventions should be based on a risk assessment of the clinical and epidemiological factors and should not be delayed until results of laboratory testing are available.
6.2 Exclusion

6.2.1 Patients

Healthcare professionals should advise that children with suspected, epidemiologically-linked or confirmed pertussis within the community should be excluded from schools or nurseries during the infectious period.

Cases who are hospitalised patients should be placed in respiratory isolation during the infectious period. Staff caring for these patients should wear appropriate PPE (surgical mask, gloves and apron).

6.2.2 Staff

Cases who are HCW should be excluded from work during the infectious period.

6.3 Notification / Surveillance

Pertussis remains a notifiable disease under the Health Protection Legislation (England) Guidance 2010 and suspected cases should be notified to the local Health Protection Unit (HPU) of the Health Protection Agency (HPA) (or after April 2013, the Public Health England Centre). This should be done by telephone as soon as is practicable and in writing within 3 days. All diagnostic laboratories are required to report confirmed cases of *B. pertussis* infection to the HPA.

6.3.1 Patients

Patients who are clinically-suspected, epidemiologically-linked or laboratory-confirmed cases of pertussis should be reported to the Trust IPCT.

6.3.2 Staff

Staff members who are clinically-suspected, epidemiologically-linked or laboratory-confirmed cases of pertussis should contact OH for risk assessment.

IPCT and OH will carry out case-finding for coexisting cases among patient and HCW contacts and passive surveillance for further cases that may occur.

If two or more epidemiologically-linked cases occur within one healthcare setting, an outbreak control team should be convened and consideration given to offering
vaccination more widely to susceptible individuals, if transmission is thought to have occurred within the hospital. In this scenario, a wide clinical case definition should be employed in order to ensure that cases are not missed.

Expert advice on outbreak investigation and management is available from the Immunisation, Hepatitis and Blood Safety Department, HPS-Colindale, HPA (020 8200 6868/4400) and on laboratory investigation from the Bordetella Reference Laboratory, RVPBRU (0208 327 7327).

6.4 Contact tracing, post-exposure prophylaxis and vaccination

In light of the evidence summarised in HPA Guidelines [1, 2], the use of post-exposure prophylaxis and vaccination is restricted only to healthcare settings where the risks from pertussis transmission are highest i.e. those where infants, severely immunocompromised children and pregnant women are cared for. In other settings case management and provision of information and advice to contacts is recommended.

6.4.1 Priority groups for contact tracing and prophylaxis

Priority groups for infection control intervention within the Trust are defined as follows:

- **Group 1**: Children under 1 year old who have had fewer than three doses of pertussis vaccine (unimmunised or partially immunised). These are vulnerable individuals most at risk from severe complications

- **Group 2**: Children of any age who are severely immunocompromised

- **Group 3**: Individuals at risk of transmitting pertussis to those in Group 1 and 2, but only if they are unvaccinated against pertussis, or were vaccinated less than 1 week or more than 5 years ago
  - Pregnant women > 32 weeks gestation
  - HCW working with infants, pregnant women or severely immunocompromised children

Contacts with **significant exposure** within the previous 21 days but who are not among the priority groups should be informed and advised to seek medical attention if symptoms develop. No further action is necessary. There is little evidence to suggest that members of other clinical groups such as chronic respiratory, oncology or immunology patients are at additional risk from pertussis. The risk for pregnant women relates to the risk of transmission to newborn infants and not to themselves.
6.4.2 Antibiotic treatment and post-exposure chemoprophylaxis

The primary purpose for treating cases of pertussis with antibiotics is to eradicate *B. pertussis* from the nasopharynx and prevent secondary transmission. Antibiotics are unlikely to have any clinical benefit to the individual unless administered in the early stages of the illness.

Chemoprophylaxis should be offered to those in the priority groups who have had significant exposure to a case inside the infectious period, and considered for those in Group 1 and 2 with any exposure to a case inside the infectious period. Prophylactic and treatment regimens are identical.

Table 1. Recommended antibiotic treatment and post exposure prophylaxis for pertussis by age group (reproduced from [1].

<table>
<thead>
<tr>
<th>Age group</th>
<th>Clarithromycin</th>
<th>Azithromycin</th>
<th>Erythromycin</th>
<th>Co-trimoxazole*2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neonates (&lt;1 month)</td>
<td>Preferred in neonates 7.5mg/kg twice a day for 7 days</td>
<td>10mg/kg once a day for 3 days</td>
<td>Not recommended due to association with hypertrophic pyloric stenosis</td>
<td>Not licensed for infants below 6 weeks</td>
</tr>
<tr>
<td>Infants (1 month – 12 months)</td>
<td>Under 6kg: 7.5mg/kg twice a day for 7 days</td>
<td>1-12 months: 10mg/kg once a day for 3 days</td>
<td>1-12 months: 125mg every 6 hours for 7 days</td>
<td>6 weeks – 6 months: 120mg twice a day for 7 days</td>
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<td></td>
<td>8-11kg: 62.5mg twice a day for 7 days</td>
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<td>6 months – 1 year: 240mg twice a day for 7 days</td>
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<td></td>
<td>&gt; 1 year: 10mg/kg (max 500mg) once a day for 3 days</td>
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<td>12-15kg: 125mg twice a day for 7 days</td>
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<td>20-29kg: 187.5mg twice a day for 7 days</td>
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<td></td>
<td>30-40kg: 250mg twice a day for 7 days</td>
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<tr>
<td>Children</td>
<td>1-2 years: 125mg every 6 hours for 7 days</td>
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<td></td>
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<td></td>
<td>2-8 years: 250mg every 6 hours for 7 days</td>
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<td></td>
<td>&gt; 8 years: 500mg every 6 hours for 7 days</td>
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<td></td>
<td>12-18 years: 960mg twice a day for 7 days</td>
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<tr>
<td>Adults</td>
<td>500mg twice a day for 7 days</td>
<td>500mg once a day for 3 days</td>
<td>500mg every 6 hours for 7 days</td>
<td>960mg twice a day for 7 days</td>
</tr>
<tr>
<td>Pregnant women*</td>
<td>Not recommended</td>
<td>Not recommended</td>
<td>Preferred antibiotic: Not known to be harmful</td>
<td>Contraindicated in pregnancy</td>
</tr>
</tbody>
</table>

* Please note that the doses for treatment and prophylaxis are the same for all ages

a Consider if macrolides contra-indicated or not tolerated

b Depending on risk assessment. Aim is solely to prevent transmission to infant. Begin at least 3 days prior to delivery

Please check drug doses in the BNF or Children’s BNF.
6.4.3 Vaccination

TdaP-IPVa vaccine (Repevax®) is currently the only licensed low-dose acellular pertussis-containing vaccine suitable for children, adolescents and adults in the UK. There is no upper age limit for vaccination.

Immunisation should be strongly considered for those who have received prophylaxis.

- **Group 1**: Infants should complete the primary course with appropriate vaccine according to recommended schedule

- **Group 2**: These children should be discussed with a consultant paediatric immunologist on a case-by-case basis

- **Group 2**: A booster should be offered to those who have not received a vaccine containing pertussis in the previous 5 years and no Td-IPV in the preceding month (when there is an increased risk of hypersensitivity reaction).

6.4.4 Communication

“Inform and advise” letters should be sent out to all contacts. These can be arranged through HPA.

7 Training

There are no specific training needs associated with the implementation of this policy.

8 Equality and diversity

The Trust is committed to ensuring that, as far as is reasonably practicable, the way we provide services to the public and the way we treat our staff reflects their individual needs and does not discriminate against individuals or groups on any grounds. This document has been appropriately assessed.

9 Monitoring compliance

<table>
<thead>
<tr>
<th>Standard / process / issue</th>
<th>Monitoring and audit</th>
<th>Method</th>
<th>By</th>
<th>Committee</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process of case finding</td>
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<tr>
<td>Appropriate prophylaxis</td>
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<td>Monitored by OH,</td>
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<td>IPCC</td>
<td>As required</td>
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<td>IPCC, Clinical</td>
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<td>laboratories</td>
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<td></td>
<td>This is not auditable and will rely on prospective monitoring of cases as and when they occur by OH and IPCC</td>
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<td>IPCC</td>
<td>As required</td>
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</table>
10 Consultation and review

The consultation will include:
HPA laboratories
IPCC
OH
ICD and IPCN

The committee ratifying the policy will be the IPCC

11 Implementation (including raising awareness)

Staff will be and have been made aware through IPC meetings, IPC newsletters and through education during case findings.

12 References

1. HPA guidelines for the public health management of pertussis.  
   http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/WhoopingCough/Guidelines/

2. HPA guidelines for the public health management of pertussis incidents in healthcare settings.  
   http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/WhoopingCough/Guidelines/


13 Associated documentation

This policy should be read in conjunction with other Trust strategies/policies/procedures relating to infection control of respiratory pathogens within our hospitals.
This form must be completed and attached to any procedural document when submitted to the appropriate committee for consideration and approval.

<table>
<thead>
<tr>
<th>Policy Title: Whooping Cough</th>
<th>Policy Author: Dr Ashley Price, DIPC</th>
<th>Yes/No?</th>
<th>You must provide evidence to support your response:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Does the policy/guidance affect one group less or more favourably than another on the basis of the following: (* denotes protected characteristics under the Equality Act 2010)</td>
<td>No</td>
<td></td>
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<tr>
<td>• Race *</td>
<td>No</td>
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<tr>
<td>• Ethnic origins (including gypsies and travellers)</td>
<td>No</td>
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<td>• Nationality</td>
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<td>• Gender *</td>
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<td>• Culture</td>
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<td>• Religion or belief *</td>
<td>No</td>
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<td>• Sexual orientation including lesbian, gay and bisexual people *</td>
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<td>• Age *</td>
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<td>• Disability – learning difficulties, physical disability, sensory impairment and mental health problems *</td>
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<td>• Gender reassignment *</td>
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<td>• Marriage and civil partnership *</td>
<td>No</td>
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<tr>
<td>2. Is there any evidence that some groups are affected differently?</td>
<td>No</td>
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<tr>
<td>3. If you have identified potential discrimination which can include associative discrimination i.e. direct discrimination against someone because they associate with another person who possesses a protected characteristic, are any exceptions valid, legal and/or justifiable?</td>
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<tr>
<td>4(a). Is the impact of the policy/guidance likely to be negative? (If ‘yes’, please answer sections 4(b) to 4(d))</td>
<td>No</td>
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<tr>
<td>4(b). If so can the impact be avoided?</td>
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<tr>
<td>4(c). What alternatives are there to achieving the policy/guidance without the impact?</td>
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<tr>
<td>4(d). Can we reduce the impact by taking different action?</td>
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</table>

Comments: Action Plan due (or Not Applicable): N/A

Name and Designation of Person responsible for completion of this form: David Ashley Price Date: 22/04/2013

Names & Designations of those involved in the impact assessment screening process: David Ashley Price (DIPC), Sheila Waugh (consultant virologist)

(If any reader of this procedural document identifies a potential discriminatory impact that has not been identified on this form, please refer to the Policy Author identified above, together with any suggestions for the actions required to avoid/reduce this impact.)

For advice on answering the above questions please contact Frances Blackburn, Head of Nursing, Freeman/Walker gate, or, Christine Holland, Senior HR Manager. On completion this form must be forwarded electronically to Steven Stoker, Clinical Effectiveness Manager, (Ext. 24963) steven.stoker@nuth.nhs.uk together with the procedural document. If you have identified a potential discriminatory impact of this procedural document, please ensure that you arrange for a full consultation, with relevant stakeholders, to complete a Full Impact Assessment (Form B) and to develop an Action Plan to avoid/reduce this impact; both Form B and the Action Plan should also be sent electronically to Steven Stoker within six weeks of the completion of this form.