Worcestershire Acute Hospitals NHS Trust

GUIDELINES / STANDARDS FOR THE MANAGEMENT OF CHILDREN & YOUNG PEOPLE WITH WET COUGH/PBB AND BRONCHIECTASIS

This guidance does not override the individual responsibility of health professionals to make appropriate decision according to the circumstances of the individual patient in consultation with the patient and /or carer. Health care professionals must be prepared to justify any deviation from this guidance.

This guideline is for use by the following staff groups:

Lead Clinician(s)

Jo Colley	Specialist Physiotherapist
Dr Clare Onyon	Consultant Paediatrician
Dr Paul Watson	Consultant Paediatrician
Alex MacDonald/Nicki Wedgbury	Respiratory Nurse Specialists
Dr Hugh Morton	Consultant Microbiologist

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Review Date: This is the most current document and should be used until a revised version is in place	14th February 2027

Key amendments to this guideline

Date	Amendment	Approved by:
14th February 2024	New Guideline	Paediatrics Governance and MSC

1. Respiratory Team Contacts:

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Team Mobile 07775 682570
(only on during working hours, Monday – Friday 8.30am – 4.30pm)

Out of Working Hours Contact

All bronchiectasis patients have open access to Riverbank Ward, where advice can be sought from medical professionals.

A member of the respiratory team should be informed of any contact with a bronchiectasis patient so that they can be followed up as appropriate

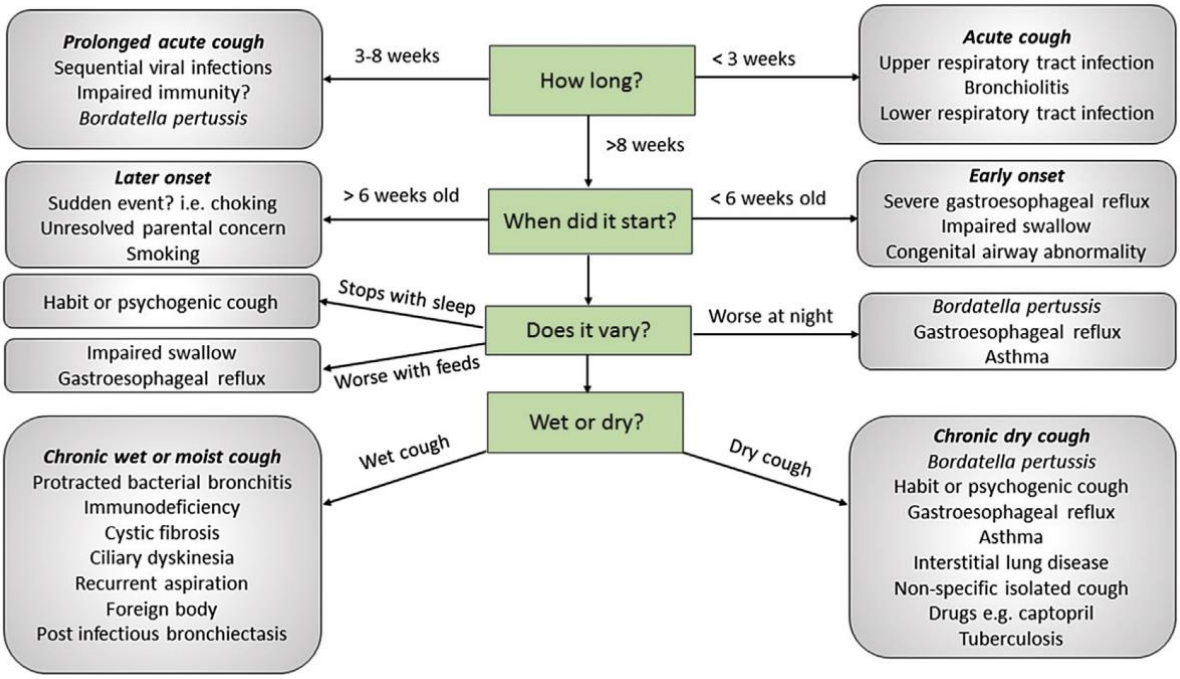
2. Introduction:

Cough is a common source of referral to secondary and tertiary care centres, and careful questioning and assessment is required to determine if patients need investigation and treatment.

It can be “normal” for children to cough for 14-21 days following a lower respiratory tract infection. Viral infections are very common in childhood and some normal children have around 10 infections per year. Thorough history and assessment of the cough can help guide the need for further investigations:

- When did it start?
- How long has it gone on for?
- Is it wet or dry?
- When does it occur?

The following diagram is a useful tool to assist in decision making of diagnosis and treatment, and the need for investigations.



(Hine,C. Gilchrist, F., & Carroll, W. 2017)

3. Persistent wet cough/ Protracted Bacterial Bronchitis:

3.1 Definition:

Protracted Bacterial Bronchitis (PBB) can be clinically defined when all 3 of the following criteria are fulfilled:

1. **an isolated chronic wet or productive cough > 4 weeks duration**
2. **absence of symptoms or signs (i.e. specific cough pointers) suggestive of other causes of wet or productive cough**
3. **cough usually responds to 2-4 weeks of an appropriate oral antibiotic**

- Chronic cough in childhood is related to a considerable morbidity and decreased quality of life, affecting the child's sleep, play and school performance. It can also cause anxiety for parents.
- There have been links made with a later diagnosis of bronchiectasis therefore early intervention to break the vicious cycle of infection, inflammation and impaired muco-ciliary clearance is recommended.
- PBB is often misdiagnosed as asthma, which has led to inappropriate use of inhaled corticosteroids.
- There is a predominance of boys compared to girls, and those between 1 and 2 years of age who attended childcare.
- It is also recognised in children >12 years of age.

3.2 Presentation:

Patients are usually referred by the GP following a prolonged episode >4 weeks of a wet cough. Patients/parents will generally describe a history of persistent wet cough which occurs at night or during the day and has not been responsive to inhalers. A short course of antibiotics may have been given by the GP but the cough has not resolved.
It is important to rule out any other underlying disease or specific cough pointers e.g. coughing with feeding, digital clubbing, see box 3.3

3.3 Specific Cough Pointers:

Symptoms:
Chest pain
History suggestive of inhaled foreign body (witnessed or sudden onset choking episode)
Dyspnoea
Haemoptysis
Faltering Growth
Feeding difficulties (including choking/vomiting)
Cardiac or neurodevelopmental abnormalities
Recurrent sinopulmonary infections
Immunodeficiency
History of TB exposure or epidemiological risk factors for exposure to tuberculosis

Signs:
Respiratory distress
Digital clubbing
Chest wall deformity
Auscultatory crackles

Tests:
Chest radiographic changes (other than perihilar changes) Lung function abnormalities

3.4 Microbiology:

Sputum specimen or cough swab should be performed on assessment and at each clinic visit if there is a history of prolonged wet cough. Most common organisms found are *Haemophilus influenzae, Streptococcus pneumoniae* and *Moraxella catarrhalis* The presence of *H. influenzae* in the lower airways and >3 episodes of infection in a year has been suggested as a significant risk factor in developing bronchiectasis

3.5 Chest X-Ray:

Chest X-ray should be performed to rule out other pathology. Usually the CXR is normal, or peribronchial changes may be present.

3.6 Initial Assessment:

- Height, weight, and oxygen saturations
- All patients to have cough swab or sputum sent for MC&S. For cough swabs, please add in the clinical details that they are non-CF and *Burkholderia cepacia* plate is not required

3.7 Antibiotic Treatment:

First-line treatment should be influenced by the results of respiratory sample culture and sensitivity testing.

If respiratory culture results are not available, or are not interpretable (e.g. they isolate normal respiratory tract flora or demonstrated mixed growth), then a 2-4 week course of co-amoxiclav should be offered. In cases of penicillin allergy, azithromycin is an alternative (see below for dosing regimens).

Duration

An initial 2 week course of antibiotics targeted to common respiratory bacteria and local antibiotic sensitivities is recommended. If the cough resolves in this time period, the diagnosis of PBB can be made. Where the cough persists following an initial 2-week course, this should be extended for a further 2 weeks.

Some children may benefit from a 4 week course for a longer cough-free period

Pathogen-directed antibiotic prescribing

If *H. influenzae* is isolated, sensitivity to amoxicillin and co-amoxiclav is typically reported as either “I”, which indicates “susceptible, increased exposure”, meaning that high-dose therapy may be effective, or “R”, meaning “resistant”.

H. influenzae

Antibiotic tested	Sensitivity result	Treatment of choice
Amoxicillin	I	amoxicillin (see below for dosing schedule)
Amoxicillin Co-amoxiclav	R I	Co-amoxiclav (see below for dosing schedule)
Amoxicillin Co-amoxiclav	R R	If aged <12, options are either azithromycin or co-trimoxazole, based on sensitivity results (discuss with the laboratory as needed). Doxycycline if age ≥12 and the isolate is sensitive to tetracyclines.

If the patient has a penicillin allergy, follow the advice for amoxicillin/co-amoxiclav=R.

S. pneumoniae

These organisms are usually either reported as “S” (sensitive) or “R” (resistant). Sensitivity to penicillin indicates sensitivity to amoxicillin. Sensitivity to erythromycin indicates sensitivity to clarithromycin and azithromycin.

S. pneumoniae isolates are sometimes reported as “I” (susceptible, increased exposure”) to penicillin and amoxicillin. In this scenario, high-dose amoxicillin (follow the schedule for *H. influenzae*) may be effective. Note that, due to the mechanism of resistance, **there is no advantage in giving co-amoxiclav to patients with penicillin or amoxicillin I isolates**. If high-dose treatment with amoxicillin fails, an alternative agent should be chosen (discuss with microbiology as needed).

S. pneumoniae

Antibiotic tested	Sensitivity result	Treatment of choice
Penicillin (and/or amoxicillin)	S	amoxicillin
Penicillin (and/or amoxicillin)	I	amoxicillin (see H. influenzae amoxicillin dosing)
Erythromycin (for penicillin allergic patients or those failing therapy with amoxicillin)	S R	azithromycin Discuss with microbiology

M. catarrhalis

These organisms are almost always sensitive to co-amoxiclav and also to erythromycin. Sensitivity to erythromycin indicates sensitivity to clarithromycin and also azithromycin. They are invariably resistant to penicillin and amoxicillin due β-lactamase production.

Either co-amoxiclav or azithromycin may be chosen, following clinical assessment.

Other pathogens

These should be dealt with on a case-by case basis, discussing with microbiology as needed.

BNFc doses for amoxicillin

Amoxicillin	1 to 11 months	1-4 years	5-11 years	12-17 years
Oral	125mg TDS Increased to 30 mg/kg TDS for *H. influenzae* infection	250mg TDS Increased to 30 mg/kg TDS for *H. influenzae* infection	500mg TDS Increased to 30 mg/kg TDS for *H. influenzae* infection	500mg TDS Increased to 1g TDS for *H. influenzae* infection

BNFc doses for co-amoxiclav

Co-amoxiclav	2-23 months	2-6 years (13-21kg)	7-12 years (22-40kg)	12-17 years (>41 kg)
Oral suspension 400/57 (augmentin duo)	0.15 - 0.30ml/kg BD (use higher dose for H. influenzae infection)	2.5 – 5 mls BD (use higher dose for *H. influenzae* infection)	5-10 ml BD (use higher dose for *H. influenzae* infection)	10ml BD, (increased to TDS with *H. influnzae* infection)
Tablets				250/125 TDS (or 500/125 TDS with *H. influenzae* infection)

For patients with penicillin allergy or second line antibiotic: (2-week course)

^Azithromycin	6mths-18yrs	10mg/kg (max 500mg per dose)	OD	Cap/tab 250mg, 375mg, 500mg Suspension 200mg/5ml

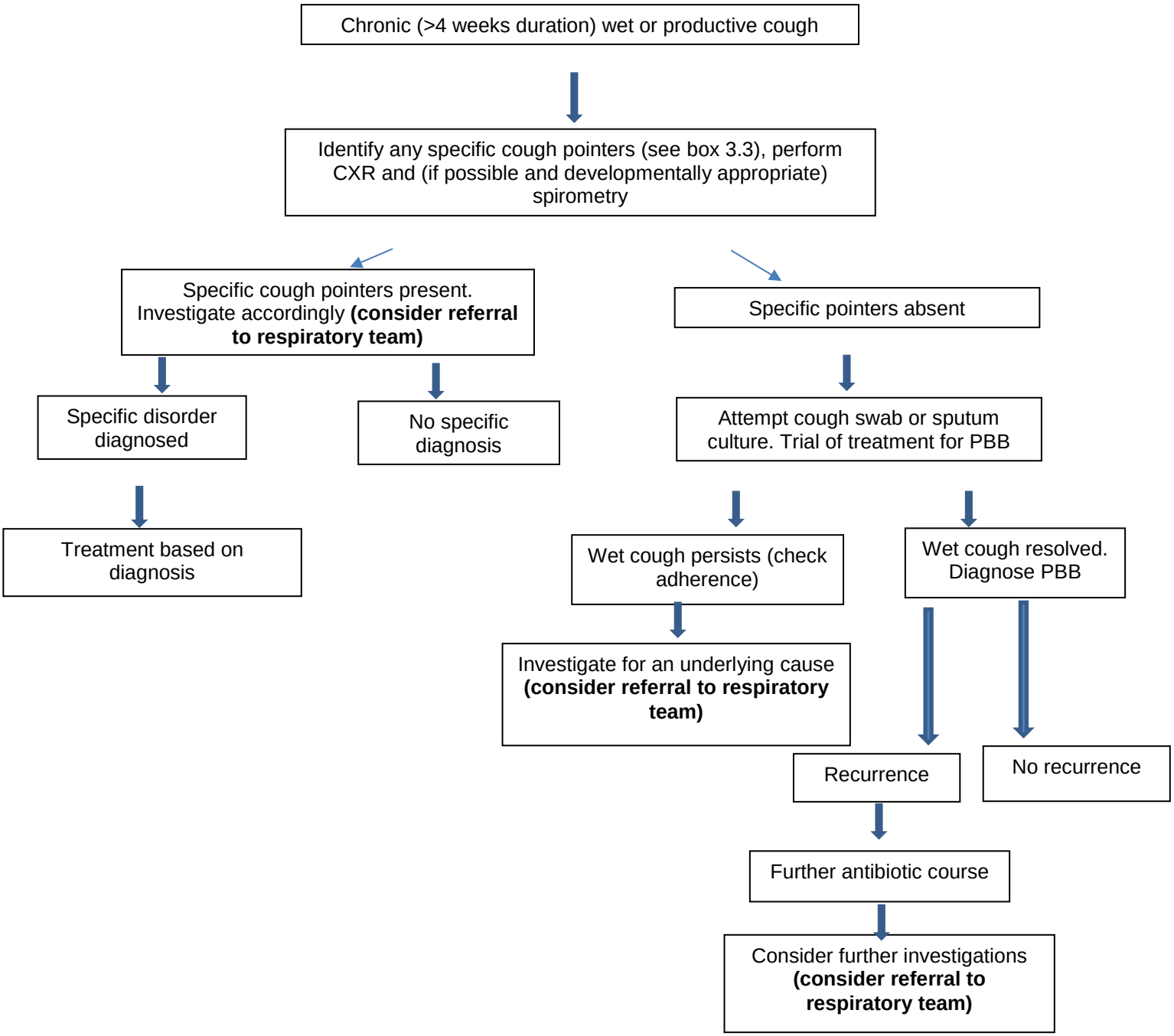
3.8 Further investigations may be required if the cough persists despite a 4 week course of antibiotics

- Full Blood Count
- Functional antibodies

- Immunoglobulins
- Vitamin D status.
- Consider sweat test (referral via BCH) or CFTR genetics

Patient information leaflet on PBB may be given to patient and family if appropriate (see Appendix 1)

3.9 Possible approach to managing a child with > 4 weeks wet cough (Adapted from Kantar, A, Chang, A.B, Shields, M.D. et al 2017)



4. Bronchiectasis:

4.1 Introduction:

Bronchiectasis is a chronic pulmonary disorder and is an umbrella term for a clinical syndrome of recurrent or persistent wet/productive cough, airway infection and inflammation, and abnormal bronchial dilatation on chest computed-tomography (CT) scans, which if detected early may be reversible over time with effective treatment (ERS 2021).
The pathophysiology of bronchiectasis is complex; however, the common features are:

- Airway infection causing inflammation
- Impaired mucociliary clearance and airway destruction
- Further infection secondary to damaged airways

4.2 Diagnosis:

In children/adolescents with suspected or confirmed bronchiectasis, these standard tests should be undertaken:

- Chest HRCT (for diagnosis)
- Sweat test and/or CF and ciliopathy genetics
- Lung function (in children >5 years)
- Full blood count
- Immunological tests (total IgG, IgA, IgM, IgE, functional antibodies, spIgE for aspergillus consider HIV testing)
- Vitamin D status
- Lower airway bacteriology (sputum)

4.3 Additional tests may be required based on clinical presentation:

- In-depth immunological assessments (in consultation with a paediatric immunologist)
- Diagnostic bronchoscopy with bronchoalveolar lavage (BAL) analysis (microbiology)
- Tests for airway aspiration, Primary Ciliary Dyskinesia (PCD) and gastro-oesophageal reflux (GORD)
- If aminoglycoside antibiotics (i.e. tobramycin, gentamicin, amikacin) are thought possible future treatment options, consider testing for mitochondrial gene mutations (e.g. m.1555A>G) that confer a high risk of aminoglycoside-induced ototoxicity.

4.4 HRCT chest diagnosis:

- Recommendations suggest that early scanning to diagnose bronchiectasis early is key
- ERS guidance suggests that paediatric derived BAR (broncho-arterial dilatation), defined by ratio of inner diameter of the airway to the outer diameter of the adjacent artery >0.8 is used to define abnormality (instead of the cut-off of >1-1.5 used in adults).

Repeat chest HRCT scans should be based on the individual with regards to clinical status and setting, and should be used to guide change in management (ERS, 2021). It should be considered at 5 years to review progression.

4.5 Chest X-rays:

Chest x-rays should not be done routinely in children and young people with bronchiectasis and are inadequate to make the diagnosis.

A chest x-ray can be considered if a patient with bronchiectasis is unwell or the x-ray is likely to influence patient management.

Referral to Birmingham Children's Hospital (BCH) should be considered at diagnosis particularly if they require bronchoscopy or more in-depth investigation.

An information leaflet about Bronchiectasis is available (see Appendix 2)

4.6 Outpatients:

Recommendations are that children with bronchiectasis should be reviewed every 3-6 months in out-patient clinics. This may be shared with BCH if the patient is under the care of both teams.

Multidisciplinary bronchiectasis clinics are run 4 times a year by the MDT at Worcester Children's Clinic and we will endeavour to book patients into these clinics. If patients are unable to attend specific bronchiectasis clinics, they will be seen in respiratory clinics and efforts will be made by the MDT to liaise with the patient/family to ensure full access to the team.

- Height, weight and oxygen saturations should be measured at each clinic visit
- All patients to have cough swab or sputum sent at each visit. For cough swabs, please add in the clinical details that they are non-CF and B. Cepacia plate is not required
- Patients to have lung function at each visit from reception class age. (see Trust Spirometry Guideline)
- During the transition period, patients are offered to attend part of the appointment without their parents being present
- Respiratory physiotherapist and specialist nurse are available to assess airway clearance and review inhaler technique.
- Blood tests can be performed if required.

4.7 Home and Community Visits:

Home visits are not done routinely but can be a good opportunity to involve both parents and the child. The team will endeavour to make appointments at a time convenient to the family and school aged children can be seen before or after school. Additional contact, support, and follow up are also maintained by telephone on a two-way basis. Home visits should not be allowed to be a substitute for regular clinic attendance.

. The purpose of visits may involve:

- Monitoring and assessment including measurement of SpO2, lung function and collection of microbiological specimen e.g. sputum, cough swabs.

- Education on inhaled medication use and regimens

- Nursery, pre-school and school visits to provide education to staff and carers, provide a care plan for the establishment and address any issues
- Flush portacaths / change portacath needles (nurses only)
- Assessment and review of airway clearance techniques advice on exercise, posture correction and stress urinary incontinence (physio only)

4.8 Definition of Exacerbation:

- Increased respiratory symptoms i.e. Increased cough +/- increased sputum quantity +/- purulence for ≥ 3 days
- Systemic symptoms (fever, fatigue, malaise, change in child's behaviour, appetite) may also represent an exacerbation
- Presence of dyspnoea +/- hypoxia should be considered a severe exacerbation

4.9 Admission:

Children are usually admitted for intravenous antibiotics:

- Because of chest exacerbation which has not responded to oral antibiotics
- As part of a 'regular' antibiotic regime

Admission procedure:

- Clerk and examine
- Baseline weight, height and oxygen saturations
- Write up drug chart before parents leave and check availability of medications
- Check latest sputum culture or cough swab (usually from last clinic visit) and antibiotic sensitivities.
- Insert cannula or long line (Vascuport needles can be inserted by some ward nurses or respiratory specialist nurses). If long line needed consider local anaesthetic cream to chosen sites (not all patients require a long line- some may prefer a cannula, discuss with team). Entonox can also be considered for older children. Heparin should not be used for long lines or cannulas.
- Physiotherapy once or twice daily depending on routine and need
- Lung function is usually done at the beginning, middle and end of intravenous antibiotic courses by the respiratory physio or nurse specialist
- Sputum or cough swab for MC&S (For cough swabs, please add in the clinical details that they are non-CF and *B. cepacia* plate is not required). To be repeated at the middle and end of admission.
- MRSA swabs should be considered on admission
- Review on the ward is usually at least twice a week by the respiratory consultant
- Weight should be repeated in the middle and at the end of the admission

Whilst on the ward, bronchiectasis patients are allowed to visit all communal areas. If the patient is known to have pseudomonas they must not be in contact with any patient with CF or bronchiectasis.

5. Antibiotics:

5.1 Oral antibiotics (Adapted from WMSCPCFN Guidelines for the Management of Children with Cystic Fibrosis, pg.14) Note that these doses are slightly different that those

The treatment antibiotic of choice for a chest exacerbation is a 14-day course of co-amoxiclav, but treatment should be based on the patient's microbiology cultures where possible.

If *H. influenzae*, *S. pneumoniae* or *M. catarrhalis* have been isolated from cultures, see the advice about interpretation of antibiotic sensitivity results and antimicrobial prescribing in section 3 of this document, "Persistent wet cough / Protracted Bacterial Bronchitis".

BNFc doses for co-amoxiclav

Co-amoxiclav	2-23 months	2-6 years (13-21kg)	7-12 years (22-40kg)	12-17 years (>41 kg)
Oral suspension 400/57 (augmentin duo)	0.15 - 0.30ml/kg BD (use higher dose for H. influenzae infection)	2.5 – 5 mls BD (use higher dose for *H. influenzae* infection)	5-10 ml BD (use higher dose for *H. influenzae* infection)	10ml BD, (increased to TDS with *H. influnzae* infection)
Tablets				250/125 TDS (or 500/125 TDS with *H. influenzae* infection)

Other agents

^Azithromycin	6mths-18yrs	10mg/kg (max 500mg per dose)	OD	Cap/tab 250mg Suspension 200mg/5ml
Ciprofloxacin*	1mth –18yrs	20mg/kg (max 750mg per dose)	BD	Tab 100mg, 250mg Suspension 250mg/5ml

Azithromycin to be given as a 2 week course in the first instance

*Ciprofloxacin should be respiratory consultant/ team decision only

5.2 Specific antibiotic regimes:

First isolation of *Pseudomonas aeruginosa* from sputum/cough swab:
If asymptomatic:
i) Oral CIPROFLOXACIN for 4 weeks, and
ii) Nebulised COLOMYCIN for a minimum of 3 months.
Sputum or cough swabs to be done at 1 month (end of ciprofloxacin), 3 months (end of colomycin) and 4 months (to ensure no regrowth off treatment).

If symptomatic or failure to eradicate with oral antibiotics:
i) IV Tazocin (piperacillin-tazobactam; first-line) for 2 weeks or IV ceftazidime and tobramycin (second line) and
ii) Start and continue nebulised colomycin for at least 3 months. Sputum/swab regime as above.
Follow up 1 month later for further cough swab off treatment.

Staphylococcus aureus
First-line therapy, if tolerated and organism sensitive:

Oral flucloxacillin for 14 days
For children who cannot tolerate the taste of flucloxacillin and/or cannot take tablets, oral co-amoxiclav is an alternative.

Note that neither flucloxacillin, nor co-amoxiclav, are active against MRSA. Contact microbiology to discuss further.

Antibiotic prophylaxis - indicated for some children (i.e. 3 or more exacerbations in one year despite optimal therapy)

Antibiotic	Comments	Age/weight	Dose	Frequency	Availability
Co-trimoxazole	prophylaxis	> 2/3 years	24mg/kg (max 960mg/dose)	OD or BD	Tab 480mg Susp 240mg/5ml, 480mg/5ml
Azithromycin	Used if other problems, severe lung disease, or don't tolerate other antibiotics	6months – 18yrs OR 15-40kg OR >40kg	10mg/kg (max 500mg/dose) OR 250mg OR 500mg	OD three times a week usually M/W/F	Cap/tab; 250mg Susp; 200mg/5ml

5.3 Intravenous antibiotics:

An IV antibiotic regime may be suggested in the latest outpatient entry. Otherwise stop
oral antibiotics and give first line regime, heeding any past allergic reactions and current sputum sensitivities. Courses usually last 10-14 days

First line regime:

Sputum culture	Antibiotics
Pseudomonas aeruginosa	Tazocin (piperacillin-tazobactam)
Never isolated *Pseudomonas aeruginosa*	Co-amoxiclav

IV antibiotic doses:

Antibiotics	**Age/weight**	**Dose (per kg)**	**Frequency**	**Max**
Co-amoxiclav	1mth-18yrs	30mg/kg	TDS	1.2g per dose
Flucloxacillin First line for *S. aureus* (Do not use for MRSA infections)	21 days – 18 years	50 mg/kg	QDS	2g per dose
Tazocin (Piperacillin with tazobactam) - *First line* *Antipseudomonal* *Note contains penicillin*	1mth-18yrs	90mg/kg	QDS	4.5g per dose
Ceftazidime	1mth – 18yrs	50mg/kg	TDS	3g per dose
Tobramycin *Levels needed before 2nd dose* *(second line)*	1mth- 18yrs	10 mg/kg*	OD	660mg per dose

*preferably use the dose which most recently gave satisfactory levels

Administration and monitoring levels

- Tobramycin is given once daily and is made up dose to 30 ml with 0.9 % sodium chloride and infuse via pump over 30 minutes

- Round up the antibiotic dose to a sensible value and try to use whole vials especially with ceftazidime (this does not apply to tobramycin or amikacin where the dose is decided by levels)

Tobramycin safety

For patients being considered for tobramycin therapy (or another aminoglycoside such as gentamicin or amikacin) testing for mitochondrial gene mutations (e.g. m.1555A>G) that confer a high risk of aminoglycoside-induced ototoxicity should be considered. Be especially careful about giving tobramycin to patients with a family history of aminoglycoside-induced hearing loss.

TOBRAMYCIN LEVELS. **Once daily regime** trough levels pre second dose (preferably immediately before dose due) (*not taken via Vascuport or percutaneous longline*) and then weekly. Levels should be taken and dose given.

~ aim for: pre dose level: **<1mg/l**

If levels are high reduce dose by 10-20%.
Repeat levels and ensure level is <1mg/L before giving another dose.
After tobramycin is re-prescribed at reduced dose, repeat levels the following day pre-dose to ensure that reduction has been successful.

During a 2 week course, more frequent repeat levels should be considered in those with acute pyrexial illness, vomiting, diarrhoea and any other reason for dehydration or renal impairment

Hearing test on discharge should be considered if tobramycin used and should be arranged if pre-dose levels are raised. If the patient has a family history of aminoglycoside-induced hearing loss and/or a positive genetic test for a mutation conferring increased risk of aminoglycoside-induced hearing loss (e.g. m.1555A>G), tobramycin should NOT be given.

5.4 Step wise Management of Bronchiectasis (adapted from BTS guidelines, 2019)

Step 1

- Treat underlying cause
- Airway Clearance techniques
- Annual Influenza Vaccination
- Pneumococcal booster (PCV13 or PPV23)
- Prompt antibiotic treatment for exacerbations
- Management plan for patient and family

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Step 2
If 3 or more exacerbations/year despite step 1

- Physiotherapy reassessment and consider nebulised sodium chloride (6% or 7% usually. Consider 3% initially if increased concern of bronchospasm)

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Step 3
If 3 or more exacerbations/year despite step 2

- If pseudomonas aeruginosa, long term inhaled anti-pseudomonal antibiotic or alternative long term macrolide
- If other potentially pathogenic micro-organisms, long term macrolides or alternative long term oral or inhaled targeted antibiotic
- If no pathogen, long term macrolides

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Step 4
If 3 or more exacerbations/year despite step 3

- Long term macrolide and long term inhaled antibiotic

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Step 5
If 5 or more exacerbations/year despite step 4

- Consider regular IV antibiotics every 2-3 months

5.5 Inhaled Medication:

When admitted, patient should bring their own nebulisers and compressors, but if they have not got one or have not brought their own, the team will provide a compressor. For nebulized antibiotics, a filtered nebulizer set should be used (eg Pari Filter Set) or elephant tubing out of the window.

Nebuliser trials

- First administration of nebulised sodium chloride (usually 6% or 7% depending on availability) and Colomycin should be observed in clinic to ensure there are no adverse reactions. Details of nebuliser trials need to be sent to patients GP (see CF Guideline appendix for nebuliser trial proformas)

- Lung function should be done before and after administration of these medications where possible to ensure no bronchoconstriction.

- Nebuliser compressor units (most commonly Pari-Turbo boy) will be supplied by the team. Presently there is no servicing contract therefore units will need to be replaced when faulty

Bronchodilators

Salbutamol, if indicated, should be given before chest physiotherapy, usually twice a day. Salbutamol should be given by MDI and spacer.

Inhaled corticosteroids

Before starting inhaled steroids, lung function with reversibility should be considered.
Children taking inhaled Flixotide or Seretide should continue with them at their usual (bd) dose.

6. Vaccinations:

6.1 Flu vaccine:

All children with bronchiectasis should have an annual flu vaccine. This is usually prescribed by the patient's own GP and done in the GP setting or is done as part of the routine immunisation programme in school for primary school age children.

Age 6 months to 2 years the IM vaccination (inactivated quadrivalent influenza vaccine) should be offered. Those who have not received influenza vaccine previously should be offered a second dose of vaccine, at least four weeks later.

Children aged two to 18 years of age should be offered the nasal flu vaccination (Live attenuated Intransal Vaccination or LAIV). For primary school children this can be given at school as part of the usual immunisation programme. Those children who have never received influenza vaccine before and are aged between two and less than nine years should be offered a second dose at least four weeks later.

See BNFc for doses.

Contraindications to the nasal flu vaccination (LAIV):

High dose systemic steroids for over a month: Individuals treated with systemic steroids for more than a month at a dose equivalent to prednisolone at 20mg or more per day or a dose of 1mg or more per kg per day should not be given the nasal flu vaccination. Inhaled steroids are not a contraindication.

Increased wheeze or required additional bronchodilator treatment in the previous 72 hours. These children should be offered a suitable inactivated IM influenza vaccine to avoid a delay in protection

Cautions / contraindications to all flu vaccinations

For children who have required **admission to intensive care for a previous severe anaphylaxis to egg** should be given nasal LAIV in the hospital clinic setting. Alternatively, children over 9 years with severe anaphylaxis to egg can be given the quadrivalent inactivated egg-free vaccine.

None of the influenza vaccines should be given to those who have had: **a confirmed anaphylactic reaction to a previous dose of the vaccine.**

Please see the Green Book for immunisation for the most up to date advice on flu vaccination. https://www.gov.uk/government/collections/immunisation-against-infectious-disease-the-green-book

6.2 Pneumococcal Vaccination:

Children and adults with chronic respiratory disease, such as bronchiectasis, are identified to be in a clinical risk group for pneumococcal infection and should receive an additional single dose of PPV23 (pneumococcal polysaccharide vaccination = pneumovax 23)

The clinical risk group includes:

- Bronchiectasis and cystic fibrosis
- Interstitial lung fibrosis
- children with respiratory conditions caused by aspiration or a neurological disease such as cerebral palsy with a risk of aspiration)
- Bronchopulmonary dysplasia (BPD)
- Asthma – only if taking a dose of systemic steroids for more than a month at a dose equivalent to 20mg or more of prednisolone a day or for children <20kg a dose of 1mg/kg or more per day

Children from birth to 2 years with bronchiectasis or another at risk condition: should be given PCV13 (pneumococcal conjugate vaccine = prevenar 13) according to the routine immunisation schedule at 8 weeks, 16 weeks and 12 months. **At the age of 2 years and at least 2 months after the last dose of PCV13 (prevenar) given as part of the standard immunisation schedule, a single dose of PPV23 (pneumovax) should be given**

Children from 2 – 10 years with bronchiectasis or another at risk condition: Children who have completed the routine PCV13 (prevenar) immunisation schedule should be given a single dose of PPV23 (pneumovax). This must be at least 2 months after the last dose of PCV13 (prevenar).

Children who are previously unvaccinated or partially unvaccinated should have one dose of PCV13 (prevenar) followed by a single dose of PPV23 at least 2 months later.

Children and young people over 10 years with bronchiectasis or another at risk condition: Children and young people first presenting at the age of 10 years or above should have a single dose of PPV23 (pneumovax) regardless of their previous immunisation history.

Please see the Green Book for immunisation for the most up to date advice on pneumococcal vaccination. https://www.gov.uk/government/collections/immunisation-against-infectious-disease-the-green-book

7. Chest physiotherapy

7.1 Airway Clearance Techniques

A physiotherapist is available in clinic to assess all patients and discuss and review their physiotherapy management. The airway clearance techniques (ACT) vary within age groups and are always assessed on an individual basis:

	Babies 0-3 years	3-5 years	5 years and above
Postural drainage (no head-down position)	•		
Percussion	•		
Gym Ball bouncing	• (with parents)	• (with parents)	•
Bubble PEP		•	•
Oscillatory PEP (acapella, aerobika, cornet, flutter)			•
Active Cycle of Breathing Techniques (ACBT)			•
Autogenic Drainage (AD)			•
HFCWO (vest)			•

Techniques taught may include modified gravity assisted positioning (no head down position) and percussion in 5 positions (alternate side ly, prone, supine and upright) – the upright position is dropped once the child is walking independently.

Gym ball bouncing with the baby/child positioned safely on the parents lap can be used to encourage change in lung volumes.

Begin with blowing games and Bubble PEP. Encourage deep inspiration and a long breath out as able.

Encourage more independent treatments using a full variety of airway clearance devices and techniques as appropriate (with family support /supervision).

The frequency and duration of ACT will alter depending on infective exacerbations, severity of disease and individual circumstances. In the majority of cases twice a day for 15-20 minutes is the minimum recommended.

Airway clearance techniques taught include:

- **Active Cycle of Breathing Techniques** (ACBT) – Combination of thoracic expansion exercises, breathing control, and forced expiration techniques.
- **Blowing games -** ideas include blow football, blow painting, bubbles and whistles. Bubble PEP requires blowing into a volume of water (10-20cms) via a 40cm tube to create bubbles. The inner diameter of the tube should be 8mm (use suction tubing).

The water provides resistance to expiration and therefore creates positive expiratory pressure and oscillation in the airways to mobilise secretions.

- **Oscillating PEP devices (e.g. Acapella, Aerobika, Cornet, Flutter):** Creates positive expiratory pressure and oscillation on exhalation to prevent premature airway closure, mobilise secretions, improve airway patency and reduce sputum viscosity.

- **Autogenic Drainage (AD) –** Uses controlled breathing which aims to attain the highest expiratory airflows to move secretions from peripheral to central airways while avoiding coughing and significant airway closure/or compression. Breathing is usually from low to high lung volume where secretions are expectorated.

- **HFCWO (Vest)** – **High Frequency Chest Wall Oscillations**. Extra thoracic oscillations are generated by forces external to the respiratory system. An inflatable jacket or strap fits around the chest, oscillations are transmitted to the chest wall at approx. 14Hz. This enhances mucociliary transport by creating a cough-like expiratory flow bias that shears mucus from the airway walls. There is no clear evidence between HFCWO and other airway clearance techniques and cost of this device can be prohibitive. However, it should be considered where adherence to other airway clearance techniques is problematic or for children unable to follow instruction with airway clearance.

Physiotherapy and inhaled medications Inhaled medication should be co-ordinated with physiotherapy
Bronchodilators - pre-physiotherapy if necessary and benefit shown.

Nebulised sodium chloride (3%, 6% or 7%) Immediately pre-physiotherapy but post bronchodilator. Can also be given during airway clearance if combined with PEP or oscillating PEP. This can save the patient time, but may reduce the total lung deposition
.

Steroid Inhalers – Usually taken post physiotherapy treatment. NB rinse mouth after taking a steroid or combination inhaler.

Inhaled antibiotics - Post-physiotherapy. Either dry powder inhalers or nebuliser

Exercise
The importance of exercise throughout the patient's life is highlighted in clinic, on the ward and at home visits. Exercise needs to be done consistently, easily fit into the patient's lifestyle, be social, give positive feedback and have realistic goals. The aim is to exercise to a target heart rate of 65% of maximal heart rate for the child's age.

8.Transition:

Children with bronchiectasis will be seen by the paediatric team until they are 17 Years old

It is recommended that children are transitioned to adult care if:

- They have challenging microbiology (NTM, pseudomonas)
- They have 3 or more exacerbations in a year
- They are requiring prophylactic antibiotics
- Other complex diseases are present e.g. RA, Kartageners', immunodeficiency, ABPA or IBD)
- Lung function is deteriorating or with severe disease

The main contact for bronchiectasis adult care at WRH is Dr Jamie Johnstone

With stable bronchiectasis and none of the above concerns, patients will be discharged back to their GP for on-going support.

Please complete the transition document (appendix 3) and ensure all relevant investigations have been completed.

Seeking Microbiology advice

If urgent, between 9am – 5pm, Monday-Friday (excluding bank holidays) please telephone extension 30661 and ask to speak to the duty microbiologist.

If urgent between 5pm and 9am or on bank holidays, please telephone switchboard and ask for the duty microbiologist. Note the on-call service is shared with colleagues from Hereford Hospital who may not have access to results. Please make sure you are familiar with all recent culture results.

For non-urgent advice, please e-mail wah-tr.microbiologyadvice@nhs.net. The team aim to respond to queries within 48 hours.

Monitoring

Page/ Section of Key Document	Key control:	Checks to be carried out to confirm compliance with the Policy:	How often the check will be carried out:	Responsible for carrying out the check:	Results of check reported to: *(Responsible for also ensuring actions are developed to address any areas of non-compliance)*	Frequency of reporting:
	WHAT?	**HOW?**	**WHEN?**	**WHO?**	**WHERE?**	**WHEN?**
3.1	1. Patients referred with wet cough > 4 weeks to have CXR and trial of recommended antibiotics to diagnose Persistent Bacterial Bronchitis (PBB). (in the absence of other cough pointers)	Audit of patients with wet cough	Yearly.	Paediatric Respiratory team	Audit reported to paediatric respiratory MDT meeting	Annually
4.	2. Patients with suspected bronchiectasis will have the appropriate tests and diagnostic procedures and be managed by the respiratory MDT	Audit of bronchiectasis service, in association with national paediatric bronchiectasis audit	Yearly	Paediatric Respiratory team	Audit reported to paediatric respiratory MDT meeting.	Annually

9. References:

BNFc www.bnfc.nice.org.uk > last accessed 08/04/22

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Department of Health The Green Book. Available at: https://www.gov.uk/government/publications/immunisation-against-infectious-disease-the-green-book-front-cover-and-contents-page > last accessed 08/04/22

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Hill, A.T., Sullivan, A.L., Chalmers, J.D., De Soyza, A., Elborn, J.S., Floto, R.A., Grillo, L., Gruffydd-Jones, K., Harvey, A., Haworth, C.S. and Hiscocks, E., 2019. British Thoracic Society Guideline for bronchiectasis in adults. *Thorax*, *74*(Suppl 1), pp.1-69.

Hine, C., Gilchrist, F. and Carroll, W., 2017. Chronic cough in children. *Paediatrics and Child Health*, *27*(3), pp.121-127.

Kantar, A., Chang, A.B., Shields, M.D., Marchant, J.M., Grimwood, K., Grigg, J., Priftis, K.N., Cutrera, R., Midulla, F., Brand, P.L. and Everard, M.L., 2017. ERS statement on protracted bacterial bronchitis in children. *European Respiratory Journal*, *50*(2).

Ruffles, T.J., Goyal, V., Marchant, J.M., Masters, I.B., Yerkovich, S., Buntain, H., Cook, A., Schultz, A., Upham, J.W., Champion, A. and Versteegh, L., 2021. Duration of amoxicillin-clavulanate for protracted bacterial bronchitis in children (DACS): a multi-centre, double blind, randomised controlled trial. *The Lancet Respiratory Medicine*, *9*(10), pp.1121-1129.

Worcestershire Acute Hospitals NHS Guideline, last updated 2020 *"Guidelines/Standards for the Management of Children and Young People with Cystic Fibrosis*"

Worcestershire Acute Hospitals NHS Trust 2019 Guideline *Undertaking spirometry testing in Paediatrics.*

Wurzel, D.F., Marchant, J.M., Yerkovich, S.T., Upham, J.W., Mackay, I.M., Masters, I.B. and Chang, A.B., 2014. Prospective characterization of protracted bacterial bronchitis in children. *Chest*, *145*(6), pp.1271-1278.

Contribution List

Key individuals involved in developing the document

Name	Designation
Jo Colley	Respiratory Physiotherapist
Clare Onyon	Consultant Paediatrician
Hugh Morton	Consultant Microbiologist
Paul Watson	Consultant Paediatrician
Swathi Sanapala	ST6 Paediatrics

Circulated to the following individuals for comments

Name	Designation
Louise Williams	Lead Pharmacist
Nicki Wedgbury	Specialist Respiratory Nurse
Alex Macdonald	Specialist Respiratory Nurse

Circulated to the following CD's/Heads of dept for comments from their directorates / departments

Name	Directorate / Department

Circulated to the chair of the following committee's / groups for comments

Name	Committee / group

10. Appendices:

Appendix1: https://www.worcsacute.nhs.uk/~documents/documents/patient-information-leaflets-a-z/protracted-bacterial-bronchitis-pbb-in-children/?layout=default

Appendix 2: https://www.worcsacute.nhs.uk/documents/documents/patient-information-leaflets-a-z/2473-bronchiectasis-in-children

Appendix 3: Transition Document: Respiratory Paediatric Care to Adult Care.

Date:

Patient Name:				
Date of Birth:				
Address:				
Referring Consultant:				
Diagnosis and Investigations:				
Blood Tests:				
Lung Function:				
Examination findings:				
Drug Therapy:				
Organisms:				

Allergies and Reactions:
Hospitalisation:
Physiotherapy:
Family Background:
Education:
Summary of clinical status:

Supporting Document 1 - Equality Impact Assessment Tool

To be completed by the key document author and included as an appendix to key document when submitted to the appropriate committee for consideration and approval.

Please complete assessment form on next page;

Worcestershire Acute Hospitals NHS Trust

Worcestershire Acute Hospitals NHS Trust

Herefordshire & Worcestershire STP - Equality Impact Assessment (EIA) Form
Please read EIA guidelines when completing this form

Section 1 - Name of Organisation (please tick)

Herefordshire & Worcestershire STP		Herefordshire Council		Herefordshire CCG	
Worcestershire Acute Hospitals NHS Trust	x	Worcestershire County Council		Worcestershire CCGs	
Worcestershire Health and Care NHS Trust		Wye Valley NHS Trust		Other (please state)	

Name of Lead for Activity	**Dr Clare Onyon**

Details of individuals completing this assessment	**Name**	**Job title**	**e-mail contact**
	Jo Colley	**Senior Physiotherapist**	**Joanne.colley@nhs.net**
Date assessment completed	**26/4/24**		

Section 2

Activity being assessed (e.g. policy/procedure, document, service redesign, policy, strategy etc.)	**Title:** **Management of Children and Young People with Wet Cough/PBB and Bronchiectasis**				
What is the aim, purpose and/or intended outcomes of this Activity?	Standardised care for children with wet cough and bronchiectasis, improvement of antibiotic stewardship				
Who will be affected by the development & implementation of this activity?	❑x ❑x ❑x ❑	Service User Patient Carers Visitors	❑x ❑x ❑ ❑	Staff Communities Other _____	
Is this:	❑ Review of an existing activity ❑x New activity ❑ Planning to withdraw or reduce a service, activity or presence?				

What information and evidence have you reviewed to help inform this assessment? (Please name sources, eg demographic information for patients / services / staff groups affected, complaints etc.	See reference list
Summary of engagement or consultation undertaken (e.g. who and how have you engaged with, or why do you believe this is not required)	Paediatric clinicians Microbiology consultant Pharmacy
Summary of relevant findings	Increasing evidence of need for early assessment and correct antibiotic prescribing to prevent chronic disease

Section 3

Please consider the potential impact of this activity (during development & implementation) on each of the equality groups outlined below. **Please tick one or more impact box below for each Equality Group and explain your rationale**. Please note it is possible for the potential impact to be both positive and negative within the same equality group and this should be recorded. Remember to consider the impact on e.g. staff, public, patients, carers etc. in these equality groups.

Equality Group	Potential positive impact	Potential neutral impact	Potential negative impact	Please explain your reasons for any potential positive, neutral or negative impact identified
Age		x		
Disability		x		
Gender Reassignment		x		
Marriage & Civil Partnerships		x		
Pregnancy & Maternity		x		
Race including Traveling Communities		x		
Religion & Belief		x		
Sex		x		
Sexual Orientation		x		
Other Vulnerable and Disadvantaged Groups (e.g. carers; care leavers; homeless; Social/Economic		x		

Equality Group	Potential positive impact	Potential neutral impact	Potential negative impact	Please explain your reasons for any potential positive, neutral or negative impact identified
deprivation, travelling communities etc.)				
Health Inequalities (any preventable, unfair & unjust differences in health status between groups, populations or individuals that arise from the unequal distribution of social, environmental & economic conditions within societies)		X		

Section 4

What actions will you take to mitigate any potential negative impacts?	Risk identified	Actions required to reduce / eliminate negative impact	Who will lead on the action?	Timeframe
	N/A	.		
How will you monitor these actions?				
When will you review this EIA? (e.g in a service redesign, this EIA should be revisited regularly throughout the design & implementation)				

Section 5 - Please read and agree to the following Equality Statement

1. Equality Statement

1.1. All public bodies have a statutory duty under the Equality Act 2010 to set out arrangements to assess and consult on how their policies and functions impact on the 9 protected characteristics: Age; Disability; Gender Reassignment; Marriage & Civil Partnership; Pregnancy & Maternity; Race; Religion & Belief; Sex; Sexual Orientation

1.2. Our Organisations will challenge discrimination, promote equality, respect human rights, and aims to design and implement services, policies and measures that meet the diverse needs of our service, and population, ensuring that none are placed at a disadvantage over others.

1.3. All staff are expected to deliver services and provide services and care in a manner which respects the individuality of service users, patients, carer's etc, and as such treat them and members of the workforce respectfully, paying due regard to the 9 protected characteristics.

Signature of person completing EIA	
Date signed	26/4/24
Comments:	
Signature of person the Leader Person for this activity	Clare Onyon
Date signed	26/4/24
Comments:	

Supporting Document 2 – Financial Impact Assessment

To be completed by the key document author and attached to key document when submitted to the appropriate committee for consideration and approval.

	Title of document:	Yes/No
1.	Does the implementation of this document require any additional Capital resources	No
2.	Does the implementation of this document require additional revenue	No
3.	Does the implementation of this document require additional manpower	No
4.	Does the implementation of this document release any manpower costs through a change in practice	No
5.	Are there additional staff training costs associated with implementing this document which cannot be delivered through current training programmes or allocated training times for staff	No
	Other comments:	

If the response to any of the above is yes, please complete a business case and which is signed by your Finance Manager and Directorate Manager for consideration by the Accountable Director before progressing to the relevant committee for approval.