

Bronchiectasis

Have I got the right topic?

Age from 1 year onwards

This CKS topic covers the detection and management of bronchiectasis not related to cystic fibrosis in children and adults in primary care.

This CKS topic does not cover bronchiectasis caused by cystic fibrosis.

There are separate CKS topics on [Chronic obstructive pulmonary disease](#) and [Asthma](#).

The target audience for this CKS topic is healthcare professionals working within the NHS in England, and providing first contact or primary health care.

How up-to-date is this topic?

Changes

Version 1.0, revision planned in 2014.

March to April 2010 — This is a new CKS topic. The evidence-base has been reviewed in detail, and recommendations are clearly justified and transparently linked to the supporting evidence.

Goals and outcome measures

Goals

- To recognize features of bronchiectasis
- To identify and treat exacerbations effectively
- To refer appropriately for definitive diagnosis, investigation and treatment
- To inform effective shared care

Background information

What is it?

- **Bronchiectasis is a permanent dilatation and thickening of the airways** associated with chronic cough, sputum production, and recurrent infections.
 - Focal bronchiectasis describes bronchiectasis that is limited to one area of lung.
 - Diffuse bronchiectasis describes bronchiectasis that is widespread.

[[Barker, 2002](#); [Rosen, 2006](#); [O'Donnell, 2008](#); [Murray and Hill, 2009](#)]

What causes it?

- **Bronchiectasis is caused by chronic inflammation of airways** associated with a wide range of diseases.
 - Inflammation destroys the elastic and muscular components of the bronchi and the surrounding contractile lung tissue widens the airways.
 - Mucus collecting in the dilated airways is prone to further infection resulting in a cycle of recurrent infection and progressive airway injury.
- **Focal bronchiectasis** may be due to:
 - Bronchial obstruction, such as by a foreign body, tumour, or compression by peribronchial lymph nodes.
 - Prior severe respiratory infection.
- **Diffuse bronchiectasis** may be caused by:
 - Infection, such as whooping cough, measles, or pneumonia.
 - Rheumatoid arthritis.
 - Allergic bronchopulmonary aspergillosis (ABPA).
 - Immunodeficiency, such as common variable immunodeficiency [hypogammaglobulinaemia] and HIV infection.
 - Cystic fibrosis.
 - Primary ciliary dyskinesia.
 - Inflammatory bowel disease.
 - Aspiration, for example from gastro-oesophageal reflux.
 - Other congenital disorders such as alpha 1-antitrypsin deficiency; Young's syndrome (characterized by bronchiectasis, rhinosinusitis, and reduced fertility caused by abnormally viscous mucus); and Marfan's syndrome (a genetic disorder of connective tissue).
- A UK study of 150 adults with bronchiectasis examined the prevalence of the underlying cause [[Pasteur et al, 2000](#)]. It found:
 - No cause or association in over 50% of people.

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- o Bronchiectasis following a childhood chest infection in 30% of people.
- o Of the rest, 8% were caused by an immune defect, 7% by ABPA, 4% by aspiration, 3% by Young's syndrome, 3% by cystic fibrosis, 3% by rheumatoid arthritis, 1.5% by ciliary dysfunction, and less than 1% by miscellaneous causes.

[[Pasteur et al, 2000](#); [DTB, 2003](#); [Rosen, 2006](#); [ten Hacken et al, 2007](#); [Murray and Hill, 2009](#)]

How common is it?

- **It is estimated that around 1 in 1,000 adults in the UK have bronchiectasis** [[DTB, 2003](#); [ten Hacken et al, 2007](#)].
 - o **It may be more common in women than in men** but evidence for this is limited to a number of case series. A number of recent case series found that approximately 70% of people with bronchiectasis were women [[King et al, 2006](#)].
 - o **Bronchiectasis may be under-diagnosed.** A quarter of people diagnosed as having chronic obstructive airways disease by general practitioners may have bronchiectasis [[King et al, 2006](#)].

What is the prognosis?

- **The prognosis for people with bronchiectasis varies widely** from people who have few or no symptoms and a normal life expectancy to others with daily symptoms, progressive loss of lung function, and a reduced life expectancy.
- **Overall prognosis has substantially improved with the advent of vaccination programmes and antibiotics.**
 - o Before 1940, a third of people with bronchiectasis died before the age of 40. By the 1960s the average age of death was around 55 years.
 - o Clinical experience suggests that the prognosis has continued to improve, although CKS was unable to identify evidence to quantify more recent average life expectancy.
- **Prognosis is worse in people:**
 - o With extensive disease.
 - o With frequent exacerbations.
 - o Colonized by *Pseudomonas aeruginosa*.
 - o Who smoke.

[[King et al, 2006](#), [O'Donnell, 2008](#); [Loebinger et al, 2009](#); [Pasteur et al, 2010](#)]

What are the complications?

- **Respiratory complications** include:
 - o Repeated infections and chronic bacterial colonization.
 - o Respiratory failure.
 - o Haemoptysis that can occur at any stage of the disease and may be life-threatening.
- **Right heart failure**, secondary to chronic respiratory disease.
- **Nutritional deficiency**, caused by the chronic inflammatory state, breathlessness, and poor appetite.
- **Osteoporosis**, caused by extensive past use of corticosteroids.
- **Reduced quality of life** caused by:
 - o Anxiety and depression.
 - o Social embarrassment and sexual problems caused by chronic cough.
 - o Chronic tiredness.

[[Ellis et al, 1981](#); [ten Hacken et al, 2007](#); [McLean, 2008](#); [Pasteur et al, 2010](#)]

Management

Bronchiectasis

Scenario: Diagnosis of bronchiectasis

When should I suspect bronchiectasis and how do I make the diagnosis?

- **Suspect bronchiectasis** in:
 - o Adults with a chronic cough, particularly if any of the following factors are found:
 - Daily sputum production.
 - *Pseudomonas aeruginosa* in the sputum.
 - A young age at presentation.
 - A history of symptoms over many years.
 - No history of smoking.
 - o Adults thought to have chronic obstructive pulmonary disease who do not smoke or who have frequent or prolonged exacerbations.
 - o Children or adults with unexplained haemoptysis (usually recurrent blood-streaked sputum).
 - o Children with a chronic cough that is usually productive but may be non-productive.
 - o Children thought to have asthma that responds poorly to treatment.
- **Identify the clinical features of bronchiectasis**, see:
 - o [Clinical features of bronchiectasis — children](#).
 - o [Clinical features of bronchiectasis — adults](#).
- **Exclude [other causes for chronic cough](#)** based on clinical features and chest X-ray appearance.
- **Refer to a respiratory physician** to [confirm the diagnosis and determine the underlying cause](#) of bronchiectasis.

Basis for recommendation

This information is based on expert opinion from the British Thoracic Society [[Pasteur et al. 2010](#)].

What are the clinical features of bronchiectasis in children?

- **There may be a history** of:
 - o Failure to thrive.
 - o Recurrent lower respiratory tract infections.
- **Symptoms of bronchiectasis** include:
 - o Chronic cough — usually productive but may be unproductive.
 - o Wheeze.
 - o Haemoptysis (usually blood-streaked sputum).
 - o Exertional breathlessness.
- **Signs of bronchiectasis** include:
 - o Persistent inspiratory crackles.
 - o Finger clubbing, cyanosis, and hyperinflation — these are uncommon in bronchiectasis that is not due to cystic fibrosis.
 - o Signs of malnutrition.

Basis for recommendation

Clinical features of bronchiectasis in children are based on expert opinion of the British Thoracic Society [[Pasteur et al. 2010](#)].

What are the clinical features of bronchiectasis in adults?

- **There may be a history** of:
 - o A severe lower respiratory tract infection in early childhood.
 - o Recurrent lower respiratory tract infections.
- **Symptoms of bronchiectasis** include:
 - o **Cough** — in over 90% of adults.
 - Cough with daily sputum production — present in 75–100% of adults.
 - Cough with intermittent sputum production — present in 12–20% of adults.
 - Cough that is unproductive — present in 5–8% of adults.
 - o **Breathlessness** — present in 72–83% of adults.
 - o **Haemoptysis** — occurs in 51–45% of adults.
 - Blood-stained sputum in 27% of adults.
 - Frank bleeding in 20% of adults.
 - Massive haemoptysis (over 235ml) in 4% of adults.
 - o **Chest pain** present between exacerbations and is usually non-pleuritic — present in 31% of adults.
- **Signs of bronchiectasis** include:
 - o **Course crackles in early inspiration** commonest in the lower lung fields — present in approximately 70% of adults.
 - o **Wheeze** — present in 34%

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Scenario: Diagnosis of bronchiectasis

- o **Large airway rhonchi** (low pitched snore-like sounds) — present in 44% of adults.
- o **Finger clubbing** — occurs infrequently.

Basis for recommendation

The prevalence of clinical features of bronchiectasis in adults is based on evidence summarized by the British Thoracic Society [[Pasteur et al, 2010](#)].

What other causes for chronic cough should I consider?

- **Chronic cough is a characteristic feature of many disorders**, many of which are more common than bronchiectasis.
- **Common causes of chronic cough** to consider include:
 - o Smokers cough.
 - o Asthma.
 - o Chronic obstructive pulmonary disease.
 - o Angiotensin converting enzyme inhibitors.
 - o Upper airway cough syndrome, previously known as postnasal drip syndrome.
 - o Gastro-oesophageal reflux disease.
- **Less common but serious causes of chronic cough** to consider include:
 - o Lung cancer.
 - o Pulmonary fibrosis.
 - o Tuberculosis.
 - o Foreign bodies.

Basis for recommendation

Information on differential diagnosis is based on expert opinion in review articles and a text book [[Rosen, 2006](#); [Chung and Pavord, 2008](#); [Lane, 2003](#)].

What investigations should be undertaken in primary care for a person with suspected bronchiectasis?

- **Arrange a chest X-ray** in all people suspected of having bronchiectasis.
 - o Chest X-rays are abnormal in 90% of people with bronchiectasis but radiological findings are not usually diagnostic.
 - o The main value of a chest X-ray is to exclude other causes of chronic cough such as lung cancer.
- **Consider undertaking further investigations** to exclude other causes of chronic cough, guided by clinical findings.
- **Refer to a respiratory physician to [confirm the diagnosis and determine the underlying cause of bronchiectasis](#).**

Basis for recommendation

The recommendation to order a chest X-ray in all people with suspected bronchiectasis is based on expert opinion. There is expert consensus:

- That chest X-rays lack sensitivity and specificity to diagnose bronchiectasis.
- The main role is to exclude other causes for symptoms in people suspected of having bronchiectasis.

[[Barker, 2002](#); [Rosen, 2006](#); [ten Hacken et al, 2007](#); [O'Donnell, 2008](#); [Pasteur et al, 2010](#)]

How is bronchiectasis confirmed and the underlying cause determined in secondary care?

- **High-resolution CT scan is the investigation of choice to establish the diagnosis of bronchiectasis.**
- **Investigations to determine the underlying cause of bronchiectasis** recommended by the British Thoracic Society include:
 - o **Sweat chloride testing for cystic fibrosis** for all children and adults up to 40 years of age and adults over 40 years of age who have clinical features associated with cystic fibrosis.
 - o **Screening for a gross antibody deficiency** (serum immunoglobulin [Ig] G, IgA, IgM and serum electrophoresis) for all people with confirmed bronchiectasis.
 - o **Investigations of immunological disorders** such as IgE, alpha 1-antitrypsin level, and aspergillus precipitins for people with clinical features or risk factors for immunological disorders.
 - o **Bronchoscopy** is occasionally indicated for investigation of lower respiratory tract infections and bronchial obstruction for example for suspected foreign body aspiration in children.
 - o **Gastrointestinal** investigations such as 24 hour pH monitoring for people suspected of having bronchiectasis secondary to gastric aspiration.

Basis for recommendation

Investigations to make a diagnosis of bronchiectasis

- The recommendation for high-resolution CT scan to establish the diagnosis of bronchiectasis is based on evidence of [[Grenier et al, 1986](#)]:

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Scenario: Diagnosis of bronchiectasis

- o A specificity and sensitivity of over 90% when compared with the gold standard of bronchography.
- o A lower risk of adverse effects compared to bronchography.

Investigations to determine the underlying cause of bronchiectasis

- Recommended investigations of the underlying cause of bronchiectasis are based on expert opinion of the British Thoracic Society [[Pasteur et al, 2010](#)].

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Scenario: Infective exacerbation

How do I know my patient has an infective exacerbation of bronchiectasis?

- **Diagnose an infective exacerbation of bronchiectasis when there is:**
 - **Systemic upset**, and/or
 - **Worsening cough with increased sputum volume, viscosity, or purulence** with or without increasing wheeze, breathlessness or haemoptysis.
- The presence of either mucopurulent sputum or a respiratory pathogen from a sputum culture without a deterioration in symptoms is not an indication for antibiotics.

Basis for recommendation

Diagnostic criteria for infective exacerbations of bronchiectasis are based on expert opinion of the British Thoracic Society [[Pasteur et al. 2010](#)].

When should I admit someone with an acute exacerbation?

The British Thoracic Society recommend:

- **Arranging hospital admission for adults** who:
 - Are unable to cope at home.
 - Are cyanosed or confused.
 - Have a respiratory rate more than 25 breaths per minute.
 - Have signs of cardiorespiratory failure such as marked breathlessness, rapid respiration, laboured breathing, cyanosis, worsening peripheral oedema, or low oxygen saturation.
 - Have a temperature equal to or greater than 38°C.
 - Are unable to take oral therapy.
 - Fail to respond adequately to oral therapy.
- **Arranging hospital admission for children** who:
 - Are cyanosed.
 - Have a raised respiratory rate and increased work of breathing.
 - Have signs of cardiorespiratory failure such as marked breathlessness, rapid respiration, laboured breathing, cyanosis, worsening peripheral oedema, or low oxygen saturation.
 - Have a temperature equal to or greater than 38°C.
 - Are unable to take oral therapy.
 - Fail to respond adequately to oral therapy.

Basis for recommendation

Admission criteria for people with an infective exacerbations of bronchiectasis are based on expert opinion of the British Thoracic Society [[Pasteur et al. 2010](#)].

How do I manage an infective exacerbation of bronchiectasis in primary care?

- **Send sputum for culture and sensitivity testing before starting antibiotics** (even in people taking long-term macrolide antibiotics).
 - Collect expectorated sputum after deep coughing. A pharyngeal swab after coughing may be necessary in very young children.
 - Ensure prompt transport of specimens to the laboratory, as *Haemophilus influenzae* and *Streptococcus pneumoniae* may die if the specimen is not processed within 3 hours.
- **Prescribe an antibiotic for 14 days.**
 - For further information, see [Antibiotic choice](#).
- **Ensure that an airway clearance technique taught by a physiotherapist is used to clear the chest** during the exacerbation.
 - Arrange an urgent appointment with a physiotherapist for people who have not been taught this and for people who cannot manage this alone.
- **Review the person's response to treatment when sputum culture and sensitivity results are available.**
 - For people who are responding well, continue with the prescribed antibiotic. Do not change treatment based on culture results.
 - For people who have not responded well to treatment, prescribe a different antibiotic. The choice of antibiotic should be guided by the results of sputum culture and sensitivity testing.
- **If the person deteriorates at any stage after starting treatment**, re-assess to see if [hospital admission](#) is indicated.

Basis for recommendation

Sputum culture

Bronchiectasis

Scenario: Infective exacerbation

- Experts recommend that samples should be collected even in people taking long-term macrolide antibiotics, as the doses used are low and have little effect on actual pathogens isolated [[McLean, 2008](#)].

Antibiotics

- Recommendations on the use of antibiotics are based on expert opinion of the British Thoracic Society [[Pasteur et al, 2010](#)].

Physiotherapy

- It is not possible to assess the effectiveness of physiotherapy for people with bronchiectasis from the limited available [evidence](#).
- It is widely believed by experts that airway clearance techniques are an important component of managing people with bronchiectasis [[Pasteur et al, 2010](#)].

Which antibiotic should I prescribe for an infective exacerbation of bronchiectasis?

- **Previous microbiology cultures, when available, should guide antibiotic choice.**
 - o For more information, see [Table 1](#).
- **When previous microbiology cultures are not available:**
 - o Prescribe according to local protocols where available, *or*
 - o Prescribe amoxicillin 500mg three times a day (for 14 days). Clarithromycin 500mg twice a day or erythromycin 500mg four times a day (for 14 days) are alternatives for people allergic to penicillin.

Table 1. Recommended antibiotics (with doses for adults) for acute exacerbations of bronchiectasis if sputum results from a previous sputum sample are available. For children's doses, see the BNF (British National Formulary).

Organism	First-line antibiotic	Second-line antibiotic	Duration
<i>Streptococcus pneumoniae</i>	Amoxicillin 500 mg TDS	Clarithromycin 500 mg BD	14 days
<i>Haemophilus influenzae</i> (beta-lactamase negative)	Amoxicillin 500 mg TDS <i>or</i> Amoxicillin 1 g TDS <i>or</i> Amoxicillin 3 g BD	Clarithromycin 500 mg BD <i>or</i> Ciprofloxacin 500 mg BD*	14 days
<i>Haemophilus influenzae</i> (beta-lactamase positive)	Co-amoxiclav 625 mg TDS	Clarithromycin 500 mg BD <i>or</i> Ciprofloxacin 500 mg BD*	14 days
<i>Moraxella catarrhalis</i>	Co-amoxiclav 625 mg TDS	Ciprofloxacin 500 mg BD†	14 days
<i>Staphylococcus aureus</i> (MSSA)	Flucloxacillin 500 mg QDS	Clarithromycin 500 mg BD	14 days
<i>Staphylococcus aureus</i> (MRSA)	Rifampicin‡ PLUS trimethoprim 200 mg BD	Rifampicin‡ PLUS doxycycline§ 100 mg BD	14 days
Coliforms (such as <i>Klebsiella</i> or enterobacter)	Ciprofloxacin 500 mg BD	Intravenous antibiotics	14 days
<i>Pseudomonas aeruginosa</i>	Ciprofloxacin 500 mg BD† <i>or</i> Ciprofloxacin 750 mg BD	Intravenous antibiotics	14 days

* Ciprofloxacin is not recommended as a second-line choice for *Haemophilus influenzae* infection in children.
† Ciprofloxacin is recommended as a second-line choice for *Moraxella catarrhalis* or *Pseudomonas aeruginosa* infection in children (benefits thought to outweigh theoretical risk of arthropathy). See the BNF (British National Formulary) for dosage in children.
‡ For adults weighing < 50 kg, give rifampicin 450 mg OD. For adults weighing > 50 kg, give rifampicin 600 mg OD. See the BNF for dosage in children.
§ Doxycycline is not recommended as a second-line choice for children with MRSA. Seek specialist advice if first-line treatment is contraindicated.

Data from: [[Pasteur et al, 2010](#)]

Bronchiectasis

Scenario: Infective exacerbation

Recommendations on the use of antibiotics are largely based on expert opinion of the British Thoracic Society [[Pasteur et al, 2010](#)].

Choice of antibiotic

- Recommended antibiotics reflect the likely pathogens. The commonest bacteria isolated during infective exacerbation in bronchiectasis in order of frequency are: *Haemophilus influenzae*, *Pseudomonas aeruginosa*, *Moraxella catarrhalis*, *Streptococcus pneumoniae*, *Staphylococcus aureus* (presence of which raises the suspicion of cystic fibrosis) and Mycobacterium. Sometimes no organism is found [[O'Donnell, 2008](#)].
 - o Amoxicillin is a reasonable first-line empirical choice in the absence of previous sputum results as it has good activity against *H influenzae* and *S pneumoniae* [[Murray and Hill, 2009](#); [Pasteur et al, 2010](#)]. In addition it is usually well tolerated and is inexpensive.
 - o Clarithromycin and erythromycin are recommended as alternatives for people with penicillin allergy [[Murray and Hill, 2009](#); [Pasteur et al, 2010](#)]. They are active against *H influenzae*, *S pneumoniae*, *S aureus* (methicillin sensitive) and *M catarrhalis*. However, resistance to *H influenzae* is increasing [[Bryskier and Butzler, 2003](#)].
 - Clarithromycin causes fewer gastrointestinal adverse effects than erythromycin [[DTB, 1991](#)], and adherence may be easier because of the twice-daily regimen.
 - Erythromycin is cheaper than clarithromycin, particularly for the suspension formulations [[Prescription Pricing Division, 2010](#)]. It is the macrolide of choice in pregnant or breastfeeding women [[Trent Drug Information Service, 2001](#); [NTIS, 2008b](#)].
- The recommendation to not switch antibiotic on the basis of culture results unless there also is a lack of clinical response is based on expert opinion. This is because some people may respond to antibiotic treatment despite resistance to that drug in vitro [[Murray and Hill, 2009](#); [Pasteur et al, 2010](#)].

Duration of antibiotic treatment

- The duration of treatment is based on expert opinion of the British Thoracic Society [[Pasteur et al, 2010](#)].

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Scenario: Chronic disease management of bronchiectasis

Who should be followed-up in secondary care?

- **The British Thoracic Society recommend regular follow-up in secondary care for all children with bronchiectasis and adults with:**
 - Chronic colonization with *Pseudomonas aeruginosa*, opportunist mycobacteria, or methicillin-resistant *Staphylococcus aureus* (MRSA).
 - Deteriorating bronchiectasis with declining lung function.
 - More than three infective exacerbations a year.
 - Bronchiectasis requiring prophylactic antibiotics.
 - Bronchiectasis associated with rheumatoid arthritis, immune deficiency, inflammatory bowel disease, primary ciliary dyskinesia, and allergic bronchopulmonary aspergillosis.
 - Advanced disease including those people who are being considered for transplantation.
- **Secondary care follow-up for adults with less severe disease is at the discretion of the specialist.**
 - **Follow-up is likely to be exclusively in primary care** if the disease is stable, with little exercise limitation and few exacerbations.
 - **Follow-up is usually shared between primary and secondary care** for people with intermediate disease severity.

Basis for recommendation

Recommendations on who should receive follow-up in secondary care are based on expert opinion of the British Thoracic Society [[Pasteur et al, 2010](#)].

What follow-up is recommended for people with bronchiectasis in primary care?

- **Ensure all children with bronchiectasis** are followed-up by a specialist.
- **Ensure all adults with bronchiectasis are offered an annual review** in primary care and ask about:
 - Smoking.
 - The number of exacerbations in the last year.
 - Breathlessness associated with activities of daily living.
 - Sputum volume and character.
- **Send sputum for culture and sensitivity if it has become persistently purulent** between exacerbations to assess for chronic bacterial colonization.
- **Ensure specialist follow-up for adults with:**
 - Chronic colonization with *Pseudomonas aeruginosa*, opportunist mycobacteria or methicillin-resistant *Staphylococcus aureus* (MRSA).
 - Deteriorating symptoms.
 - More than three infective exacerbations a year.
 - Bronchiectasis requiring long-term prophylactic antibiotics.
 - Bronchiectasis associated with rheumatoid arthritis, immune deficiency, inflammatory bowel disease, primary ciliary dyskinesia, and allergic bronchopulmonary aspergillosis.
 - Advanced disease.
- **Ensure all people with bronchiectasis:**
 - **Know how to recognize exacerbations** and understand the condition. A patient information leaflet on [understanding bronchiectasis](#) is available from the British Lung Foundation.
 - **Have a record of sputum cultures from previous exacerbations** to guide future treatment of exacerbations.
 - **Have been taught an airway clearance technique by a physiotherapist** for daily use by people with a chronic productive cough, and intermittent use by people with a productive cough during exacerbations.
- **Ensure people with bronchiectasis and breathlessness associated with activities of daily living** have been offered pulmonary rehabilitation.
 - Refer to a specialist to arrange this if they have not.
- **Ensure that people who have been advised to start antibiotics themselves for exacerbations:**
 - Understand when it is appropriate to start treatment and the importance of collecting sputum before starting treatment.
 - Have sputum collection pots and a repeat prescription for antibiotics.
- **Offer immunization** against *Streptococcus pneumoniae* and seasonal influenza.
- **Offer people who smoke advice and support to stop**, for further information see the CKS topic [Smoking cessation](#).
- Do not routinely repeat chest X-rays.
- Routine annual spirometry is not recommended for people with disease that is stable, little exercise limitation, and few exacerbations.

Basis for recommendation

Bronchiectasis

Scenario: Chronic disease management of bronchiectasis

Recommendations on who should receive follow-up in secondary care

- These recommendations are based on expert opinion of the British Thoracic Society [[Pasteur et al, 2010](#)].

Record of sputum cultures from previous exacerbations

- Experts consider treatment of exacerbations is more likely to be effective when based on previous sputum cultures results [[Pasteur et al, 2010](#)].

Physiotherapy

- It is not possible to assess the effectiveness of physiotherapy for people with bronchiectasis from the limited available [evidence](#).
- It is widely believed by experts that airway clearance techniques are an important component of managing people with bronchiectasis [[Pasteur et al, 2010](#)].

Pulmonary rehabilitation

- Pulmonary rehabilitation is recommended for people with bronchiectasis associated with exercise limitation based on limited evidence summarized by the British Thoracic Society [[Pasteur et al, 2010](#)]:
 - o A Cochrane systematic review that showed that inspiratory muscle training improved exercise endurance and health related quality of life.
 - o Further evidence from a randomized controlled trial that compared exercise capacity in three groups of people. The first group received 8 weeks of a high intensity pulmonary rehabilitation programme with inspiratory muscle training; the second group received pulmonary rehabilitation with sham inspiratory muscle training; and a control group received no rehabilitation.
 - There was a statistically significant improvement in exercise capacity in both groups receiving pulmonary rehabilitation.
 - This improvement was maintained in the group receiving additional inspiratory muscle training but not in the group that received sham inspiratory muscle training.

Immunizations

- There is a lack of [evidence](#) on the benefit of vaccination in patients with bronchiectasis [[ten Hacken et al, 2007](#)] and the recommendation to offer people with bronchiectasis immunization against seasonal influenza and *Streptococcus pneumoniae* is based on expert opinion from the British Thoracic Society [[Pasteur et al, 2010](#)].

Smoking cessation advice

- Recommendations on smoking cessation advice are based on accepted good clinical practice.

What treatments for bronchiectasis may be initiated in secondary care?

The British Thoracic Society recommend that:

- **All people with bronchiectasis should be referred to a respiratory physiotherapist** to be taught an airway clearance technique.
 - o People with a chronic productive cough should use the technique every day.
 - o People who have a productive cough during exacerbations can use the technique intermittently (during an exacerbation).
- **All people with bronchiectasis who have breathlessness associated with activities of daily living** should be offered pulmonary rehabilitation.
- **All people having three or more exacerbations a year, and people with fewer exacerbations causing significant morbidity**, should be considered for long-term prophylactic treatment with antibiotics.
 - o Nebulized antibiotics should be considered in adults chronically colonized with *Pseudomonas aeruginosa*.
 - o Nebulized antibiotics should be considered in children with frequent recurrent exacerbations, or deteriorating bronchiectasis despite oral antibiotics, or if oral antibiotics are not appropriate.
- **Long-term treatment with theophylline, aminophylline, inhaled beta-2 agonists, or inhaled anticholinergic bronchodilators** should only be prescribed for people after a trial of therapy has demonstrated improvement of symptoms or lung function.
- **Lung resection surgery** may be considered in people with localized disease when symptoms cannot be controlled by medical treatment.

Basis for recommendation

Physiotherapy

- It is not possible to assess the effectiveness of physiotherapy for people with bronchiectasis from the limited available [evidence](#).
- It is widely believed by experts that airway clearance techniques are an important component of managing people with bronchiectasis [[Pasteur et al, 2010](#)].

Pulmonary rehabilitation

- Pulmonary rehabilitation is recommended for people with bronchiectasis associated with exercise limitation based on limited evidence summarized by the British Thoracic Society [[Pasteur et al, 2010](#)]:
 - o A Cochrane systematic review that showed that inspiratory muscle training improved exercise endurance and health related quality of life.

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Scenario: Chronic disease management of bronchiectasis

- o Further evidence from a randomized controlled trial that compared exercise capacity in three groups of people. The first group received 8 weeks of a high intensity pulmonary rehabilitation programme with inspiratory muscle training; the second group received pulmonary rehabilitation with sham inspiratory muscle training; and a control group received no rehabilitation.
 - There was a statistically significant improvement in exercise capacity in both groups receiving pulmonary rehabilitation.
 - This improvement was maintained in the group receiving additional inspiratory muscle training but not in the group that received sham inspiratory muscle training.

Prophylactic antibiotics

- Limited [evidence](#) from studies of long-term antibiotics suggest small clinical benefits, and no benefit in terms of exacerbation rates or lung function.
- Recommendations on who should receive long-term antibiotics are based on expert opinion of the British Thoracic Society [[Pasteur et al, 2010](#)].

Bronchodilators

- Recommendations on the use of bronchodilators are based on expert opinion of the British Thoracic Society [[Pasteur et al, 2010](#)].
- It is unclear from the limited available [evidence](#) whether bronchodilators are beneficial in treating people with bronchiectasis.

Lung resection surgery

- Recommendations on lung resection surgery are based on expert opinion of the British Thoracic Society [[Pasteur et al, 2010](#)].

What treatments are not recommended for bronchiectasis?

- The British Thoracic Society recommend that the following treatments should not be used for the treatment of bronchiectasis:
 - o Mucolytics.
 - o Inhaled corticosteroids.
 - o Oral corticosteroids.
 - o Leukotriene receptor antagonists.

Basis for recommendation

Mucolytics

- There is insufficient [evidence](#) to determine whether mucolytics are of benefit for people with bronchiectasis.
- Experts recommend that these should not be routinely prescribed for the treatment of bronchiectasis [[Pasteur et al, 2010](#)].

Inhaled corticosteroids

- There is insufficient [evidence](#) to determine whether inhaled corticosteroids are of benefit for people with bronchiectasis.
- Experts recommend that these should not be routinely prescribed for the treatment of bronchiectasis [[Pasteur et al, 2010](#)].

Oral corticosteroids

- There is insufficient [evidence](#) to determine whether oral corticosteroids are of benefit for people with bronchiectasis.
- Experts recommend that these should not be routinely prescribed for the treatment of bronchiectasis [[Pasteur et al, 2010](#)].

Leukotriene receptor antagonists

- There is insufficient [evidence](#) to determine whether leukotriene receptor antagonists are of benefit for people with bronchiectasis.
- Experts recommend that these should not be routinely prescribed for the treatment of bronchiectasis [[Pasteur et al, 2010](#)].

Bronchiectasis

Prescribing information

Amoxicillin

- Amoxicillin is usually well tolerated but nausea, vomiting, or diarrhoea can sometimes occur.
- Some people are allergic to penicillin antibiotics (including amoxicillin). Advise people to seek urgent medical advice if they get a rash, swelling of the face, hands or feet, or feel short of breath.
- Antibiotics may cause the combined oral contraceptive pill or patch to fail during the first few weeks of treatment. Advise women to use additional contraception during the course of treatment and for 7 days afterwards. If this 7-day period runs beyond the end of the pack of contraceptive pills, advise the woman to start a new pack without a break (omitting any inactive tablets).

Basis for recommendation

- These recommendations are based on information from the manufacturer [[ABPI Medicines Compendium, 2008a](#)], *Stockley's drug interactions* [[Baxter, 2008](#)] and the Faculty of Sexual and Reproductive Healthcare, formerly the FFPRHC [[FFPRHC, 2005](#); [FFPRHC, 2007](#)].

Clarithromycin and erythromycin

- Clarithromycin is better tolerated than erythromycin, but nausea, vomiting, or diarrhoea can sometimes occur.
- Clarithromycin and erythromycin should be used with caution in people with:
 - o Severe renal impairment
 - If eGFR less than 30 mL/minute/1.73 m² use half the clarithromycin dose (i.e. reduce from 500 mg to 250 mg twice a day).
 - If eGFR less than 15 mL/minute/1.73 m² use a maximum of 1.5 g erythromycin per day (risk of ototoxicity).
 - o Liver disease — consider avoiding clarithromycin and erythromycin. Clarithromycin and erythromycin can cause hepatic dysfunction. Hepatic failure has been reported very rarely in people with liver disease who took clarithromycin.
- Consider the possibility of drug interactions before prescribing clarithromycin or erythromycin:
 - o Aminophylline or theophylline — check theophylline levels 48 hours after starting erythromycin and adjust the dose accordingly. Interaction is less likely with clarithromycin unless the person's theophylline levels are at the higher end of the therapeutic range.
 - o Carbamazepine — use azithromycin instead (interaction unlikely) or consider reducing the dose of carbamazepine by 30–50% during treatment clarithromycin and advise people to report symptoms of toxicity (e.g. dizziness, diplopia, ataxia, confusion). Clarithromycin and erythromycin inhibit cytochrome P450 enzyme CYP3A4, resulting in reduced carbamazepine metabolism.
 - o Warfarin — this is an established but unpredictable interaction. Monitor INR and adjust the warfarin dose accordingly.
 - o Atorvastatin or simvastatin — use azithromycin instead but advise patients to report muscle symptoms (interaction unlikely) or stop atorvastatin or simvastatin for the duration of treatment with clarithromycin or erythromycin (inhibits metabolism of atorvastatin and simvastatin via CYP3A4) .
 - o Drugs that prolong QT interval (such as antiarrhythmics, antipsychotics, tricyclic antidepressants) — seek advice from a microbiologist regarding a suitable alternative antibiotic. All macrolides can prolong the QT interval. Concomitant use of two drugs that prolong the QT interval is not recommended.
 - o Drugs that cause hypokalaemia (such as diuretics, corticosteroids, short-acting beta₂-agonists) — hypokalaemia is a risk factor for QT prolongation.
 - o Contraceptives — antibiotics may cause the combined oral contraceptive pill or patch to fail during the first few weeks of treatment. Advise women to use additional contraception during the course of treatment and for 7 days afterwards. If this 7-day period runs beyond the end of the pack of contraceptive pills, advise the woman to start a new pack without a break (omitting any inactive tablets).

Basis for recommendation

These recommendations are based on information from *Stockley's drug interactions* [[Baxter, 2008](#)], the Medicines and Healthcare Regulatory Agency (MHRA), formerly the CSM [[CSM, 1996](#); [CSM, 2004](#); [MHRA, 2008](#)], the Faculty of Sexual and Reproductive Healthcare, formerly the FFPRHC [[FFPRHC, 2005](#); [FFPRHC, 2007](#)], and the *Drug & Therapeutics Bulletin* [[DTB, 1991](#)].

Antibiotic choice in pregnancy and breastfeeding

Pregnancy

- The following antibiotics can be used by a pregnant woman for an exacerbation of bronchiectasis:
 - o Penicillins (such as amoxicillin, co-amoxiclav, flucloxacillin)
 - o Erythromycin
- The following antibiotics should not be used by a pregnant woman:
 - o Clarithromycin
 - o Ciprofloxacin

Bronchiectasis

Prescribing information

- o Doxycycline

Breastfeeding

- The following antibiotics can be used by a woman who is breastfeeding for an exacerbation or bronchiectasis:
 - o Penicillins (such as amoxicillin, co-amoxiclav, flucloxacillin)
 - o Erythromycin (avoid if neonate is jaundiced)
- The following antibiotics may be used by a woman who is breastfeeding if the benefits are thought to outweigh the risks:
 - o Clarithromycin (off-label use; avoid if neonate is jaundiced)
 - o Ciprofloxacin (off-label use)
- The following antibiotics should not be used by a woman who is breastfeeding:
 - o Doxycycline

Basis for recommendation

- Penicillins
 - o The available data on the use of penicillins in pregnancy do not suggest they are associated with an increased risk of congenital abnormalities above the background rate for the population [[NTIS, 2008b](#)].
 - o Only low levels of penicillins are found in breast milk and their use during breastfeeding is well established [[Trent Drug Information Service, 2007](#)].
- Erythromycin
 - o Data from more than 7000 pregnancies does not indicate that erythromycin is associated with an increased risk of congenital malformations and other adverse fetal effects. A recent study has suggested a possible increased risk of cardiovascular malformation and pyloric stenosis; however causality has not been established and the individual risk, if any, is thought to be low [[NTIS, 2008a](#)].
 - o Only low levels of erythromycin are found in breast milk and its use during breastfeeding is well established [[NPIS, 2010a](#)]. However, erythromycin should be avoided if the neonate has jaundice. There are case reports of pyloric stenosis in breastfed neonates whose mothers were taking erythromycin, but causality has not been established [[Schaefer et al, 2007](#)].
- Clarithromycin
 - o There are less data available on pregnancy outcomes with clarithromycin than erythromycin, therefore erythromycin is preferred if a macrolide is required during pregnancy. One study has reported an increased risk of spontaneous abortion in utero, but this finding has not been replicated [[NTIS, 2008c](#)].
 - o Use of clarithromycin is less well established than use of erythromycin in breast feeding, although the available data suggests that only low levels are found in breast milk [[Trent Drug Information Service, 2001](#); [NPIS, 2009](#)].
- Ciprofloxacin
 - o There are limited data available on quinolones in human pregnancy. Due to limited data and the theoretical risk of arthropathy in the infant (extrapolated from arthropathy in animal studies), use of quinolones in pregnancy is not generally recommended except for the treatment of serious of life-threatening conditions unresponsive to standard antibiotic therapy [[NTIS, 2008b](#)].
 - o Ciprofloxacin is excreted into breast milk but in only low levels that are not thought to be harmful (theoretical risk of arthropathy in the infant). It is possible that the calcium in breast milk could prevent the infant absorbing the ciprofloxacin, since ciprofloxacin is known to chelate with metal ions, but there are no data to prove or disprove this theory [[NPIS, 2010b](#)].
- Doxycycline
 - o Due to the risk of its deposition in developing bone and teeth, doxycycline should not be given to women who are pregnant or breastfeeding [[ABPI Medicines Compendium, 2008b](#); [NTIS, 2008b](#)]. However, it is possible that the risk in breastfeeding is reduced because calcium in breast milk is likely to chelate the doxycycline and prevent absorption [[NPIS, 2010c](#)].

Bronchiectasis

Appendices

Evidence

References

All references with links to [Free Full-text] are freely available online to users in the UK. Links to PubMed abstracts are also provided where available. CKS is not responsible for the content of external sites.

Free Full-text links are to dynamic documents that may have been updated since they were originally cited in the CKS topic. All links are checked regularly by CKS Information Specialists and updated to the latest version. Changes in the content of updated documents will not be reflected in the CKS topic text until the next revision.

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Supporting evidence

The evidence on treatments that could potentially be initiated in primary care has been reviewed and summarized in this section.

Evidence on vaccinations in people with bronchiectasis

There are no randomized controlled trials evaluating the efficacy of influenza vaccine or pneumococcal vaccine for people with bronchiectasis.

Influenza vaccine

- One Cochrane systematic review (search date to July 2006) found no randomized controlled trials evaluating the efficacy influenza vaccine for people with confirmed bronchiectasis [[Chang et al. 2007](#)]. Studies evaluating people with cystic fibrosis were excluded.

Pneumococcal vaccine

- One Cochrane systematic review (search date to July 2006) found no randomized controlled trials evaluating the efficacy pneumococcal vaccine for people with confirmed bronchiectasis [[Chang et al. 2009](#)]. Studies evaluating people with cystic fibrosis were excluded.

Evidence on bronchodilators for bronchiectasis

It is unknown whether bronchodilators are beneficial or not in the management of people with bronchiectasis. There are no randomized controlled trials evaluating the efficacy of inhaled short-acting beta2-agonists, inhaled long-acting beta2 agonists, inhaled anticholinergics, oral methylxanthines or oral leukotriene-receptor antagonists in bronchiectasis.

Short-acting beta2-agonists

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- One Cochrane systematic review (search date to May 2008) found no randomized controlled trials evaluating the efficacy of inhaled short-acting beta₂-agonists in people with confirmed bronchiectasis [[Franco et al., 2003](#)]. Studies evaluating people with cystic fibrosis were excluded.

Long-acting beta₂-agonists

- One Cochrane systematic review (search date to August 2008) found no randomized controlled trials evaluating the efficacy of inhaled long-acting beta₂-agonists in people with confirmed bronchiectasis [[Sheikh et al., 2001](#)]. Studies evaluating people with cystic fibrosis were excluded.

Anticholinergics

- One Cochrane systematic review (search date to May 2005) found no randomized controlled trials evaluating the efficacy of inhaled anticholinergics in people with confirmed bronchiectasis [[Lasserson et al., 2001a](#)]. Studies evaluating people with cystic fibrosis were excluded.

Methylxanthines

- One Cochrane systematic review (search date to July 2008) found no randomized controlled trials evaluating the efficacy of oral methylxanthines in people with confirmed bronchiectasis [[Steele and Greenstone, 2000](#)]. Studies evaluating people with cystic fibrosis were excluded.

Leukotriene-receptor antagonists

- One Cochrane systematic review (search date to April 2009) found no randomized controlled trials evaluating the efficacy of oral leukotriene-receptor antagonists in people with confirmed bronchiectasis [[Corless and Warburton, 2000](#)]. Studies evaluating people with cystic fibrosis were excluded.

Evidence on inhaled corticosteroids for bronchiectasis

There is inadequate evidence to recommend the routine use of inhaled corticosteroids in adults with stable state bronchiectasis. Only marginal benefits were found in trials using high-dose inhaled corticosteroids.

- One Cochrane systematic review of inhaled corticosteroids for bronchiectasis (search date to September 2007) identified six small randomized controlled trials (RCTs) that fulfilled the inclusion criteria (303 participants) [[Kapur et al., 2009](#)]. All studies were conducted in adults with stable bronchiectasis that had been diagnosed by bronchography or high resolution CT of the chest. Studies evaluating people with cystic fibrosis were excluded.
 - o Quality of the included studies
 - All studies were randomized but allocation concealment was unclear. Five studies were double blind and used a placebo control and one study was a dose-ranging study. Sample size was generally small, varying from 20 to 93 participants. There was no heterogeneity between studies.
 - o Short-term efficacy (6 months or less)
 - Pooled data from three RCTs (101 participants) showed a small improvement in mean FEV₁ (forced expiratory volume in the first second) in those taking inhaled corticosteroids compared with placebo (fixed mean difference 0.09, 95% CI 0.003 to 0.15). There was also a small improvement in mean FVC (forced vital capacity) in those taking inhaled corticosteroids compared with placebo (fixed mean difference 0.09, 95% CI 0.02 to 0.16). However, if the study without a placebo control was excluded, the trend was not significant.
 - Pooled data from two RCTs (44 participants) showed a trend towards improved peak flow volumes with inhaled corticosteroids (fixed mean difference 26.23, 95% CI -5.84 to 58.31) but this was not statistically significant.
 - Data on exacerbations was only available from one study (93) participants which showed no difference between groups (fixed mean difference 0.09, 95% CI -0.71 to 0.79).
 - o Long-term efficacy (more than 6 months)
 - Data was only available from one study (86 participants) which found no significant difference between inhaled corticosteroids and placebo for FEV₁, FVC, or exacerbations.
 - o Harms
 - Harms were not reported in this meta-analysis.
 - However, high daily doses of inhaled corticosteroids were used: most studies used fluticasone 1000 micrograms per day, one used beclometasone 1500 micrograms per day, and one used beclometasone 800 micrograms per day.
 - o Authors' conclusions
 - The authors concluded that there is insufficient evidence to recommend the routine use of inhaled corticosteroids in adults with stable state bronchiectasis. If a therapeutic trial is being considered in adults with difficult to control symptoms, this must be balanced against the adverse effects, especially if high doses are used.

Evidence on oral corticosteroids for bronchiectasis

It is unknown whether oral corticosteroids are beneficial or not in bronchiectasis. There are no randomized controlled trials evaluating the efficacy of oral corticosteroids in bronchiectasis.

- One Cochrane systematic review (search date to May 2007) found no randomized controlled trials evaluating the efficacy of oral corticosteroids in people with confirmed bronchiectasis [[Lasserson et al., 2001b](#)]. Studies evaluating people with cystic fibrosis were excluded.

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Evidence on mucolytics for bronchiectasis

There is inadequate evidence to determine whether mucolytics are of use in bronchiectasis. The available evidence suggests that nebulized rhDNase may worsen FEV₁. Oral bromhexine and inhaled mannitol are not available in the UK.

- One Cochrane systematic review of mucolytics for bronchiectasis (search date to January 2008) identified three small randomized controlled trials (RCTs) that fulfilled the inclusion criteria [[Crockett et al. 2001](#)]. Studies evaluating people with cystic fibrosis were excluded.
 - o Quality of the included studies
 - All studies were randomized and double-blind, but methodological quality was poor. Sample size varied from 77 to 349 participants. It was not possible to pool the data for meta-analysis.
 - o Bromhexine (not available in the UK) compared with placebo
 - One RCT was identified (88 participants) that compared oral bromhexine 30 mg three times a day with placebo.
 - There was no difference between bromhexine and placebo for FEV₁ (forced expiratory volume in the first second).
 - The following parameters were improved with bromhexine compared with placebo: difficulty in expectoration (weighted mean difference on day 10 -0.45, 95% CI -0.89 to -0.03), percentage change in sputum production (weighted mean difference on day 16 -21.5, 95% CI -38.9 to -4.1), cough score (weighted mean difference on day 13 -0.48, 95% CI -0.89 to -0.06).
 - Harms were not reported in this study.
 - o Recombinant human DNase (rhDNase; dornase alfa) compared with placebo
 - Two RCTs were identified that compared nebulized rhDNase with placebo.
 - One small study (77 participants) found no difference in FEV₁ or FVC on day 15 for rhDNase compared with placebo. (Weighted mean differences could not be estimated in this review.)
 - A larger study (349 participants) found that FEV₁ was worse with rhDNase compared with placebo (mean percentage decline -1.7% with placebo and -3.6% with rhDNase). Standard deviations not reported.
 - Harms: adverse effects, including influenza-like symptoms were more common with rhDNase.
 - o Authors conclusions
 - There is not enough evidence to evaluate the routine use of mucolytics for bronchiectasis.
- One Cochrane systematic review of inhaled hyperosmolar agents for bronchiectasis (search date to October 2007) identified two small RCTs using inhaled mannitol that fulfilled the inclusion criteria [[Wills and Greenstone, 2006](#)]. Studies evaluating people with cystic fibrosis were excluded.
 - o Quality of the included studies
 - Both studies were randomized cross-over studies. One was a single-dose study compared with usual care, the other was double-blind and placebo-controlled but is only published as an abstract. Sample size was very small, from 11 to 17 participants.
 - o Inhaled mannitol (not available in the UK) compared with placebo
 - A single-dose study, found that tracheobronchial clearance (measured by percentage cleared radioactivity) was greater with inhaled mannitol than after usual care (coughing and inspiratory manoeuvres).
 - A double-blind placebo-controlled study comparing inhaled mannitol or placebo twice a day for two weeks (17 participants) found no difference in FEV₁ between treatments. However, quality of life scores were improved with mannitol.

Evidence on antibiotics for bronchiectasis

There are insufficient data to guide the choice of empirical antibiotic or the duration of treatment for an acute exacerbation of bronchiectasis. Limited data from studies of long-term antibiotics suggest only small clinical benefits, and no benefit in terms of exacerbation rates or lung function.

Short-term use of antibiotics during exacerbations.

- CKS found no RCTs on antibiotics for acute exacerbations of bronchiectasis.

Long-term use of antibiotics.

- One Cochrane systematic review of prolonged use of oral antibiotics for purulent bronchiectasis in children and adults (search date to January 2008) identified nine small randomized controlled trials (RCTs) that fulfilled the inclusion criteria (378 participants) [[Evans et al. 2007](#)]. All studies were conducted in adults with stable bronchiectasis that had been diagnosed by bronchography or high resolution CT of the chest. Studies evaluating people with cystic fibrosis were excluded.
 - o Quality of the included studies
 - Seven studies were randomized, double-blind and placebo-controlled. Two were cross-over studies. Sample size varied from 12 to 122 participants.
 - There was significant heterogeneity between studies. Only limited meta-analysis could be undertaken because of differences in outcome reporting between studies.

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- Study regimens included twice daily nebulized tobramycin; twice daily oral amoxicillin, erythromycin, or roxithromycin; and twice weekly azithromycin, oxytetracycline or penicillin. Study durations varied between 4 weeks and 1 year.
- o Efficacy
 - Pooled data from two RCTs (110 participants) found a small benefit for antibiotics in terms of clinical response rates compared with placebo (Peto Odds Ratio 3.37, 95% CI 1.60 to 7.09).
 - Pooled data from three RCTs (120 participants) found no significant difference between long-term antibiotics and placebo for exacerbation rates (Peto Odds Ratio 0.96, 95% CI 0.27 to 3.46).
 - Pooled data from two RCTs (40 participants) found no significant difference between long-term antibiotics and placebo for FEV1 (mean difference -1.05%, 95% CI -6.83 to 4.93).
- o Harms
 - There was no difference in the rates of rash and diarrhoea between antibiotics and placebo in two studies.
 - Two studies of nebulized tobramycin reported more dyspnoea, wheezing, and chest pain with tobramycin than with placebo.
- o Authors' conclusions
 - The available evidence shows a small benefit for the use of long-term antibiotics in bronchiectasis.

Evidence on physiotherapy for bronchiectasis

It is not possible to assess the effectiveness of physiotherapy for people with bronchiectasis from the limited available evidence.

- One Cochrane systematic review of bronchopulmonary hygiene physical therapy methods (search date to January 2007) identified seven small trials with a total of 126 participants. All but one were of crossover design. The results could not undergo meta-analysis as trials addressed different patient groups and outcomes.
- Due to small sample size and the overall poor quality of the trials, there is insufficient evidence to support or refute the use of bronchopulmonary hygiene physical therapy in bronchiectasis [[Jones and Rowe, 1998](#)].

Search strategy

Scope of search

A literature search was conducted for guidelines, systematic reviews and randomized controlled trials on primary care management of bronchiectasis, with additional searches for evidence in the following areas:

- Oral antibiotics for acute exacerbations

Search dates

Date unrestricted - January 2010

Key search terms

Various combinations of searches were carried out. The terms listed below are the core search terms that were used for Medline and these were adapted for other databases. Further details are available on request.

- bronchiectasis/, bronchiectasis.tw.
- oral antibiotics.tw., antibiotics.tw.

Table 2. Key to search terms.

Search commands	Explanation
/	indicates a MeSH subject heading with all subheadings selected
.tw	indicates a search for a term in the title or abstract
exp	indicates that the MeSH subject heading was exploded to include the narrower, more specific terms beneath it in the MeSH tree
\$	indicates that the search term was truncated (e.g. wart\$ searches for wart and warts)

Sources of guidelines

- [National Institute for Health and Clinical Excellence \(NICE\)](#)
- [Scottish Intercollegiate Guidelines Network \(SIGN\)](#)
- [National Guidelines Clearinghouse](#)

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- [New Zealand Guidelines Group](#)
- [British Columbia Medical Association](#)
- [Canadian Medical Association](#)
- [Institute for Clinical Systems Improvement](#)
- [Guidelines International Network](#)
- [National Library for Health Guideline Finder](#)
- [National Health and Medical Research Council \(Australia\)](#)
- [Alberta Medical Association](#)
- [University of Michigan Medical School](#)
- [Michigan Quality Improvement Consortium](#)
- [Royal College of Nursing](#)
- [Singapore Ministry of Health](#)
- [Health Protection Agency](#)
- [National Resource for Infection Control](#)
- [CREST](#)
- [World Health Organization](#)
- [NHS Scotland National Patient Pathways](#)
- [Agency for Healthcare Research and Quality](#)
- [TRIP database](#)
- [Patient UK Guideline links](#)
- [UK Ambulance Service Clinical Practice Guidelines](#)
- [RefHELP NHS Lothian Referral Guidelines](#)
- Medline (with guideline filter)

Sources of systematic reviews and meta-analyses

- [The Cochrane Library](#):
 - o Systematic reviews
 - o Protocols
 - o Database of Abstracts of Reviews of Effects
- Medline (with systematic review filter)
- EMBASE (with systematic review filter)

Sources of health technology assessments and economic appraisals

- [NIHR Health Technology Assessment programme](#)
- [The Cochrane Library](#):
 - o NHS Economic Evaluations
 - o Health Technology Assessments
- [Canadian Agency for Drugs and Technologies in Health](#)
- [International Network of Agencies for Health Technology Assessment](#)

Sources of randomized controlled trials

- [The Cochrane Library](#):
 - o Central Register of Controlled Trials
- Medline (with randomized controlled trial filter)
- EMBASE (with randomized controlled trial filter)

Sources of evidence based reviews and evidence summaries

- [Bandolier](#)
- [Drug & Therapeutics Bulletin](#)
- [MeReC](#)
- [NPCi](#)
- [BMJ Clinical Evidence](#)
- DynaMed
- [TRIP database](#)
- [Central Services Agency COMPASS Therapeutic Notes](#)

Sources of national policy

- [Department of Health](#)

Sources of medicines information

The following sources are used by CKS pharmacists and are not necessarily searched by CKS information specialists for all topics. Some of these resources are not freely available and require subscriptions to access content.

- [British National Formulary](#) (BNF)
- [electronic Medicines Compendium](#) (eMC)
- [European Medicines Agency](#) (EMA)

Bronchiectasis

Appendices

- [LactMed](#)
- [Medicines and Healthcare products Regulatory Agency](#) (MHRA)
- [Renal Drug Handbook](#)
- [REPROTOX](#)
- [Scottish Medicines Consortium](#)
- [Stockley's Drug Interactions](#)
- [TERIS](#)
- [TOXBASE](#)
- [Micromedex](#)
- [UK Medicines Information](#)