

Haemoptysis

Definition / Supporting Information

Haemoptysis is the spitting or coughing of blood from a source that originates from below the glottis. It can vary between blood streaked sputum to massive bleeding, which may cause life-threatening sequelae due to airway obstruction, hypoxaemia and / or haemodynamic instability.

Haemoptysis should be differentiated from haematemesis (vomiting of blood) and pseudo-haemoptysis (coughing of blood from a source somewhere other than below the glottis). Pseudo-haemoptysis may occur when vomited blood is aspirated into the lungs or bleeding from the mouth stimulates a cough reflex or material is seen on coughing which has the appearance of blood but is not (eg, infection with *Serratia marcescens*).

Keywords / also known as: bloody sputum, coughing of blood

Essential History

Although massive haemoptysis is unusual, evaluation should progress only after the ABCs (airway, breathing, and circulation) of resuscitation have been addressed.

Ask about:

- Recent trauma
- Easy bruising
- Previous heart disease or surgery
- Medication use (such as anticoagulants or the oral contraceptive pill)
- Substance abuse
- Family history of bleeding disorders
- Surgical procedures
- Pica (eg, ingestion of parasites)
- Association with menstruation (catamenial haemoptysis) or menstrual irregularities (eg, with coagulopathies)
- Overseas travel / contact with chronic infectious diseases / animals (eg, sheep)
 - Mycobacterial, mycotic, or parasitic lung infections
- Prolonged cough with fever
- Unexplained weight loss
- Family history or history of contact with tuberculosis
- Recurrent chest infections, sinus infections, and chronic sputum production
 - Bronchiectasis from cystic fibrosis (CF)
 - Foreign body aspiration
 - Ciliary dyskinesias

- Immunodeficiency disorders
- Other chronic lung diseases

‘Red Flag’ Symptoms and Signs

Ask about:

- A history of acute pleuritic chest pain, recent air travel, chest or long bone trauma, oral contraceptive use or recent termination of pregnancy, or the presence of a pleuritic rub on auscultation
 - Suggests pulmonary embolic event or other pleural-based lesion
- Changes in urine colour / blood in the urine
- Chest pain
 - May be pleuritic in nature
- Asthma symptoms not responsive to therapy
- Weight loss
- Arthralgias
- Fever
- Night sweats
- Shortness of breath (see Dyspnoea)

Look for:

- Evidence of respiratory distress
 - Dyspnoea
 - Tachypnoea
 - Unilateral decreased breath sound
 - Foreign body aspiration
 - Evidence of shock
 - Tachycardia
 - Prolonged capillary refill time
 - Hypotension (N.B. this is a late, pre-terminal sign of decompensated shock)
 - Tachypnoea
 - Lethargy
 - New murmur or heart sound
 - Pulmonary hypertension
 - Faltering growth - measure height, weight and head circumference
 - Evidence of trauma to the thorax, which may be subtle
 - Clubbing
 - Bronchiectasis
 - Lymphadenopathy and / or hepatomegaly / splenomegaly

- Lymphoproliferative disease
- Facial / cutaneous features
 - Cutaneous telangiectases and a murmur or bruit over the lung fields
 - Hereditary haemorrhagic telangiectasia (Rendu–Osler–Weber syndrome)
 - Saddle nose and stridor (suggestive of subglottic stenosis)
 - Wegener’s granulomatosis

Differential Diagnosis / Conditions

- Infection
 - Bronchitis
 - Lung abscess
 - Pneumonia and other bacterial, viral, parasitic, and fungal lower respiratory tract infections, including tuberculosis, echinococcus, and paragonimiasis
 - Consider pulmonary tuberculosis, if systemic manifestations such as fever, night sweats, anorexia (see Appetite Loss), and weight loss
- Congenital malformations such as airway haemangioma, or vascular or cystic pulmonary malformations
- Bleeding diathesis
 - Von Willebrand’s disease, thrombocytopenia, disseminated intravascular coagulopathy, anticoagulant therapy
- Trauma
 - Inhalation injury
 - Foreign body aspiration
 - Symptoms can occur weeks to months after the initial event
 - Lung contusion and / or laceration
 - Iatrogenic
 - Traumatic intubation, suction catheters, bronchoscopy and endobronchial manoeuvres
- Primary pulmonary neoplasms (adenoid, carcinoid)
 - These are unusual in children
 - Consider particularly in the absence of features suggestive of infection or inflammation
- Diffuse pulmonary haemorrhage
 - With vascular inflammation
 - Idiopathic pulmonary capillaritis, systemic lupus erythematosus, Churg-Strauss syndrome, Henoch-Schonlein purpura, granulomatosis with polyangiitis, Goodpasture’s syndrome
 - Without vascular inflammation
 - Idiopathic pulmonary haemosiderosis, Heiner’s syndrome (pulmonary haemosiderosis associated with cow’s milk allergy, usually in infancy),

acute idiopathic pulmonary haemorrhage of infancy, medications (amiodarone hydrochloride, propylthiouracil, penicillamine)

- Other causes include:
 - Pulmonary embolism
 - Catamenial haemoptysis (association with menstruation)
 - Factitious haemoptysis

Pre-existing medical conditions

- Cystic fibrosis
 - The most common chronic disease associated with haemoptysis
- Bronchiectasis
- Primary ciliary dyskinesia
- Congenital heart disease
 - Less common cause of haemoptysis with advances in corrective cardiac surgery
 - For example, right-ventricular outflow obstruction with increased bronchial arterial circulation
- Primary or secondary pulmonary hypertension can lead to haemoptysis as a result of thromboembolic events
- Pulmonary vascular obstructive disease
 - Haemoptysis occurs because of pulmonary hypertension as well as thrombosis
 - These vascular changes take years to develop and are usually first observed in adolescents
- Less common causes
 - Sickle cell anaemia
 - Acute chest syndrome or pulmonary infarction
 - Aspergillosis in association with CF or asthma

Investigations

Evaluation should progress only after the ABCs (airway, breathing, and circulation) of resuscitation have been addressed. Investigations should be guided by clinical presentation and based on the history and examination findings.

To be undertaken by non-specialist practitioners (eg, General Practitioner (GP) Team):

- Record oxygen saturation
- Refer to specialist practitioners (eg, Emergency Department / Paediatric / Paediatric Respiratory Team(s)) for investigation
 - Arrange emergency transport for children with any signs of shock

To be undertaken by specialist practitioners (eg, Emergency Department / Paediatric / Paediatric Respiratory Team(s)):

- Cross match blood and secure venous access if massive haemoptysis
- Capillary or venous blood gas measurement if the patient is unwell
 - May aid decisions about need for intensive care
- Urinalysis or specific serological markers
 - To determine whether the child has an immunological disease involving the basement membranes of both the kidneys and the lungs
- Full blood count with eosinophil count
 - To differentiate bacterial from parasitic pneumonia
- Check clotting, ferritin, CRP, electrolytes, and liver function tests
- Skin tests
 - Should be performed for suspected tuberculosis
 - Other skin tests, or serological testing for fungi or other infectious agents, should be guided by clinical acumen.
- Pulmonary fluid culture
 - If sputum is produced or bronchoscopy and bronchoalveolar lavage is performed, it should be cultured and examined for:
 - Bacteria
 - Viral PCR
 - Fungi
 - Ova
 - Parasites
 - Mycobacteria
 - Should be stained for the presence of haemosiderin-laden macrophages
- If warranted, early-morning gastric aspirates can be cultured and stained for micro-organisms and macrophages.

Imaging

- Chest X-ray
 - Should be done when the child is stable
 - Significant findings on chest film include:
 - Hilar adenopathy
 - Air–fluid level in an abscess
 - Mass
 - Cavitory lesion
 - Mediastinal widening
 - Alveolar infiltrates (eg, in autoimmune diseases)
 - Thickening of the bronchial walls with ring shadows and tramlines suggests bronchiectasis.

- Abnormal cardiac silhouette
- Consolidation
- A normal x-ray does not exclude the chest as the source of bleeding
 - Additional imaging (such as computed tomography) may be required
- If a foreign body is suspected, views that may help to localise the foreign body include:
 - Inspiratory and expiratory films
 - Left and right lateral decubitus films
 - Fluoroscopy
- If a foreign body is causing airway obstruction, the side of the thorax that does not deflate normally on expiration or when dependent is the side with the foreign body.
 - May show nothing abnormal if the foreign body is embedded in the mucosa of the airway or obstruction is partial.
- Computed tomography (CT) to:
 - Identify airway abnormalities
 - Elucidate abnormalities seen on chest radiographs
 - Define mediastinal structures
 - Detect parenchymal disease
 - Help to categorise congenital pulmonary malformations and pulmonary vasculitis syndromes
 - Provide a road map for subsequent bronchoscopy
 - High-resolution CT has replaced bronchography for diagnosing bronchiectasis.
- Magnetic resonance imaging (MRI) is appropriate for:
 - Evaluating possible congenital vascular malformation
 - Differentiation of structures within the mediastinum and hilum

Diagnostic procedures

- Consider bronchoscopy, either rigid or flexible, if:
 - Diagnosis is in question
 - Massive haemoptysis
 - Incomplete response to therapy

Treatment Approach

Evaluation should progress only after the ABCs of resuscitation have been addressed.

To be undertaken by non-specialist practitioners (eg, GP Team):

- Evaluate for the presence of shock
 - Administer oxygen if present

- Refer to paediatric specialist
- Arrange emergency transfer to specialist care if any evidence of shock or altered mental status (see Altered Conscious Level)

To be undertaken by specialist practitioners (eg, Emergency Department / Paediatric / Paediatric Respiratory Team(s)):

- Treatment for haemoptysis is typically directed at the underlying disease process
- Cystic fibrosis (CF) [[NICE guideline NG78](#)]
 - Usually in association with pulmonary infective exacerbation causing vascular erosion
 - Mild haemoptysis can be treated with medical therapies, which include:
 - Bed rest
 - Intravenous or oral antibiotics
 - Withholding of chest physiotherapy
 - Administration of phytomenadione
 - Massive or recurrent haemoptysis in CF and other diseases is now treated with bronchial artery embolisation
 - Despite a moderately high rate of recurrent bleeding, embolisation can relieve symptoms for a significant period
 - Multi-professional evaluation by Paediatric Respiratory, Thoracic Surgery, and Interventional Radiology Teams should occur before this
- Bronchiectasis
 - Management is similar to that for CF
- Tuberculosis (TB) [[NICE guideline NG33](#)]
 - Haemoptysis seldom is encountered in children with primary pulmonary tuberculosis
 - Most commonly seen in adolescents who have cavitary pulmonary TB disease
 - Management involves treating the underlying TB and if haemoptysis is significant then urgent imaging (computed tomography angiogram (CT angiogram) / fiberoptic bronchoscopy), Multidisciplinary Team (MDTs) evaluation and treatment with bronchial artery embolisation
- Acute exacerbations of idiopathic pulmonary haemosiderosis
 - High-dose oral or intravenous corticosteroids
 - Long-term immunosuppressive therapy
 - Options include azathioprine, hydroxychloroquine sulfate, mycophenolate mofetil and cyclophosphamide
- Heiner's syndrome
 - Although the mechanism whereby milk causes multi-system damage is unclear, elimination of milk from the diet results in dramatic improvement

When to Refer

Refer all children with true haemoptysis to specialist practitioners.

- Refer urgently (arrange emergency transport) if:
 - Evidence of haemodynamic instability (see Shock)
 - Mental status changes (see Altered Conscious Level)
 - Inability to protect airway
- If evidence for aspiration is definitive, refer to Paediatric Surgery or ENT Team for rigid bronchoscopy
- If the diagnosis is uncertain, refer to a paediatric respiratory specialist or other clinician skilled in the use of the fiberoptic / rigid bronchoscope to determine whether a foreign body is present

When to Admit

- Evidence of haemodynamic instability (see Shock)
- Mental status changes (see Altered Conscious Level)
- High suspicion of tuberculosis
- Known heart disease
- Chronic lung disease (eg, CF, ciliary dyskinesias, immunodeficiencies)
- High suspicion of pulmonary neoplasm
- Sickle cell anaemia, vaso-occlusive crisis, or acute chest syndrome
- Inability to protect airway
- Risk of pulmonary embolism
- Lung abscess
- Children < 1 year of age
- Foreign body aspiration
- Pulmonary hypertension

‘Safety Netting’ Advice

- Children with mild haemoptysis who are not admitted to hospital need close outpatient follow-up.
- Any recurrence or progression of symptoms should prompt urgent medical reassessment.
- Prognosis and patient safety advice will depend on the underlying cause of haemoptysis.

Patient / Carer Information

****Please note: whilst these resources have been developed to a high standard they may not be specific to children.***

- [Coughing up blood \(blood in phlegm\)](#) (Web page), the NHS website
- [Coughing up blood \(haemoptysis\)](#) (Web page), Patient

Resources

National Clinical Guidance

[Bronchiectasis \(non-cystic fibrosis\), acute exacerbation: antimicrobial prescribing](#) (Web page), NICE guideline NG117, National Institute for Health and Care Excellence

[Tuberculosis](#) (Web page), NICE guideline NG33, National Institute for Health and Care Excellence

[Cystic fibrosis: diagnosis and management](#) (Web page), NICE guideline NG78, National Institute for Health and Care Excellence

[Guideline for non-CF bronchiectasis](#) (Web page - archived), British Thoracic Society

Suggested Resources

****Please note: these resources include links to external websites. These resources may not have national accreditation and therefore PCO UK cannot guarantee the accuracy of the content.***

[Bronchiectasis](#) (Web page), NICE clinical knowledge summary, National Institute for Health and Care Excellence

[Cough](#) (Web page), NICE clinical knowledge summary, National Institute for Health and Care Excellence

[Pulmonary embolism](#) (Web page), NICE clinical knowledge summary, National Institute for Health and Care Excellence

[Cow's milk protein allergy in children](#) (Web page), NICE clinical knowledge summary, National Institute for Health and Care Excellence

Shnayder R, Needleman JP, Hemoptysis. *Pediatr Rev.* 2018;39(6):319-321 [[PubMed](#)]

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Godfrey S. Pulmonary haemorrhage/haemoptysis in children. *Pediatr Pulmonol.* 2004;37(6):476-484 [\[PubMed\]](#)

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