Chronic cough in Pediatrics

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Burden of chronic cough in children

- Cough:
  - Most common presenting symptom in primary care[1]

- Chronic cough associated with:
  - Unrecognized impaired quality of life (QoL)[2,3]

    -Child: Ability to sleep, play, attend school

    -Parents: Distress and anxiety
  - Lead to multiple physicians visits[4]:

    -80% referred children: >= 5 visits in 12 months

    -53% referred children: >= 10 visits in 12 months
  - Inappropriate use of medications (+ side effects)[5]

[1] Irwin, *Chest* 2006;[2] Chang *Chest* 2012; [3] Cornford *Fam Pract* 1993; [4] Marchant, *Chest* 2008; [5] Thomson *J Pediatr Child Health* 2002

Chronic cough: frustrating

- What is normal? => discrepancy between clinicians and parents[1]
  - Frequency:
    - Normal children: cough 11 times/day[2] (up to >30 times a day)
    - Chronic bronchitis: 500-1000 times/day
    - URTI: increased cough frequency and severity
  - Duration:
    - Chronic cough: > 3[3], > 4[4], > 8[5,6] weeks
  - Differentiating:
    - Acute recurrent cough
      - Normal preschool children: 6-10 respiratory infection a year[6]
    - Chronic cough
- Many causes

[1] Shields, *Pediatr Respir Rev* 2013; [2] Munyard, *Arch Dis Child* 1996; [3] Marchant *Chest* 2006; [4] Chang *Chest* 2012;[5] Koshoo *Chest* 2009; [6] Shields, T*horax* 2008 [7] Alviani *Arch Dis Child Educ Pract Ed* 2017

=> Chronic cough in children: Increasing interest

⇒ 2017

Use of Management Pathways or Algorithms in Children With Chronic Cough
CHEST Guideline and Expert Panel Report

Anne B. Chang, MBBS, PhD, MPH; John J. Oppenheimer, MD; Miles M. Weinberger, MD, FCCP; B
Kelly Weir, BSpThy, MSpPath, PhD, CPSP; Cameron C. Grant, MBChB, PhD; Richard S. Irwin, MD, M
of the CHEST Expert Cough Panel

Chronic cough postacute respiratory illness in children: a cohort study

Kerry-Ann F O'Grady,[1] Benjamin J Prescher,[1] Vikas Goyal,[1,2] Natalie Phillips,[3]

Management of Children With Chronic Wet Cough and Protracted Bacterial Bronchitis
CHEST Guideline and Expert Panel Report

Anne B. Chang, MBBS, PhD, MPH; John J. Oppenheimer, MD; Miles M. Weinberger, MD, FCCP; Bruce K. Rubin, MD; Cameron C. Grant, MBChB, PhD; Kelly Weir, BSpThy, MSpPath, PhD, CPSP; and Richard S. Irwin, MD, Master FCCP; on behalf of the CHEST Expert Cough Panel

⇒ General Practice

Fifteen-minute consultation: a structured approach to the management of chronic cough in a child

Cherry Alviani,[1] Gary Ruiz,[1] Atul Gupta[1,2]

⇒ Belgium

Prolonged Cough in Pediatric Population First Line Care, Belgian Guidelines

Sophie Leconte[1,2,*], Stéphanie Valentin[1], Estelle Dromelet[1] and Michel De Jonghe[1]

[1]*Centre académique de médecine générale, Université catholique de Louvain, Bruxelles, Belgium*
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⇒ Liège

VIGNETTE DIAGNOSTIQUE DE L'ÉTUDIANT
Mise au point d'une toux chronique

R. Louis (1)

- Personal interest in chronic cough/ asthma misdiagnosis

Chronic cough and wheeze in children: do they all have asthma?

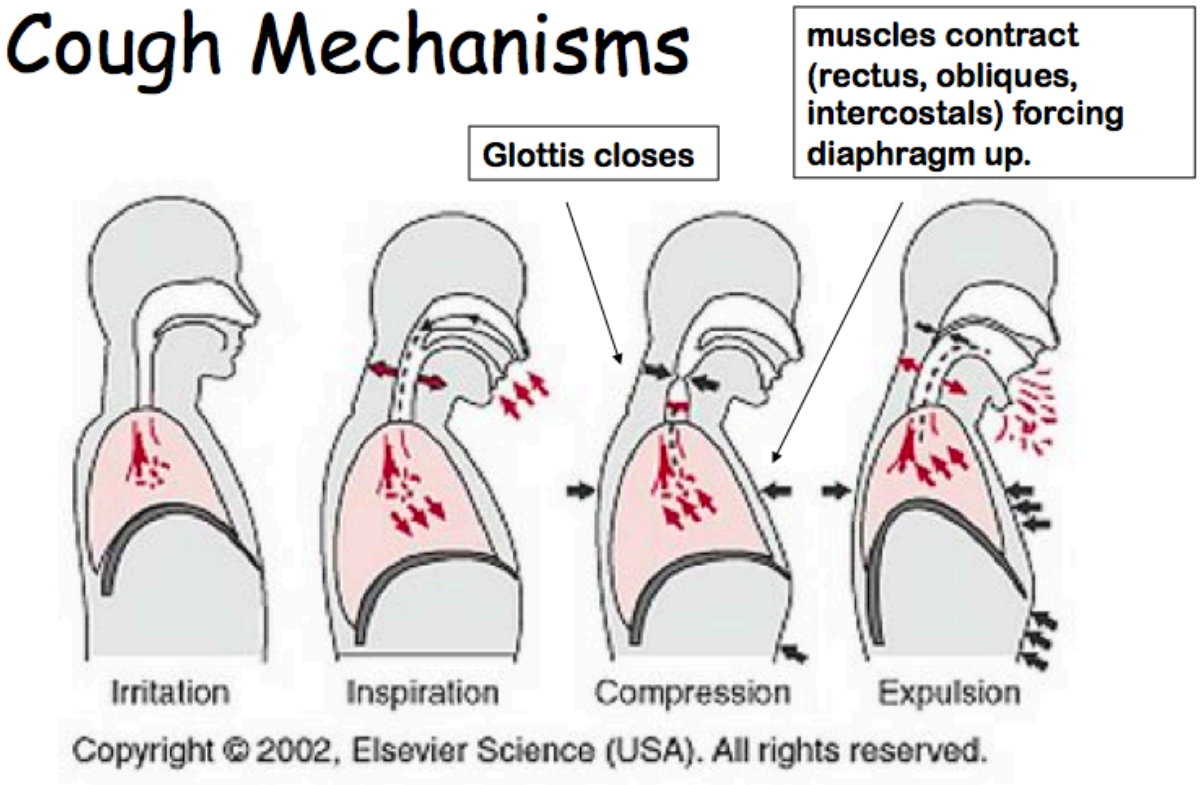
M. Seear, D. Wensley

Eur Respir J 1997; 10: 342–345
DOI: 10.1183/09031936.97.10020342

Cough: physiopathology

- Important airway protective refexes
- Control: voluntary + involuntary
- Receptors:
  - Localisation: pharynx, larynx, tracheobronchial tree
  - Stimulation: change in temperature, chemical, mechanical stresses

- Response: cough
  - Deep inspiration
  - Closure of the glottis
  - Contraction of respiratory muscles
  - Open of the glottis
  - Expulsion of air, mucous, potential foreign body

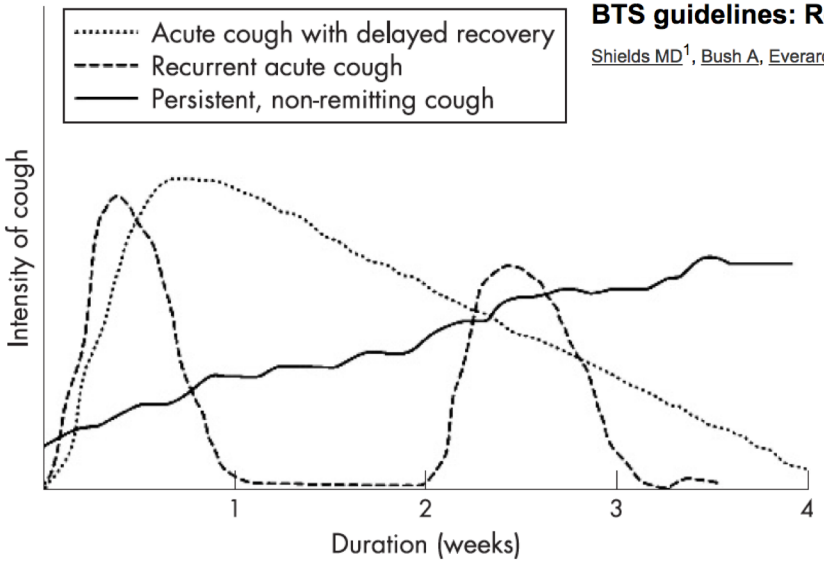


Cough: Definitions

Thorax. 2008 Apr;63 Suppl 3:iii1-iii15. Epub 2007 Sep 28.

BTS guidelines: Recommendations for the assessment and management of cough in children.

Shields MD[1], Bush A, Everard ML, McKenzie S, Primhak R; British Thoracic Society Cough Guideline Group.



1/10 healthy children: prolonged (> 3 weeks) acute cough after URTI

Table 1 Cough definitions[4 5 18]

Cough	A forced expulsive manoeuvre which starts against a closed glottis, associated with a characteristic sound.
Acute cough	A recent onset cough lasting less than 3 weeks.
Prolonged acute cough	Cough lasting at least 3 weeks, which is 'relentlessly progressive' and may warrant early investigations.
Recurrent cough	Repeated (greater than two per year) cough episodes that each last more than 14 days.
Chronic cough	A non-resolving daily cough lasting longer than 4–8 weeks.[4 18] There is no exact consensus on the duration in children.
Specific cough	A cough with a specific underlying cause.

Alviani *Arch Dis Child Educ Pract Ed* 2017

Chronic cough in Pediatrics: Etiologies

Box 1 Conditions causing chronic cough.[4 5]

Infections:
- Viral respiratory tract infections
- Postinfectious illness (including *Mycoplasma*, pertussis and chlamydia)
- Tuberculosis

Atopic conditions:
- Asthma
- Allergic rhinitis

Chronic suppurative lung disease:
- Cystic fibrosis
- Primary ciliary dyskinaesia
- Immune deficiencies
- Other causes of bronchiectasis
- Protracted bacterial bronchitis

Inhaled foreign body

Airway lesions:
- Compression, for example lymph nodes, vascular ring
- Airway malacia

Upper airway disease:
- Upper airway cough syndrome (formerly known as postnasal drip syndrome)
- Adenotonsillar hypertrophy
- Rhinosinusitis or rhinitis
- Nasal polyps

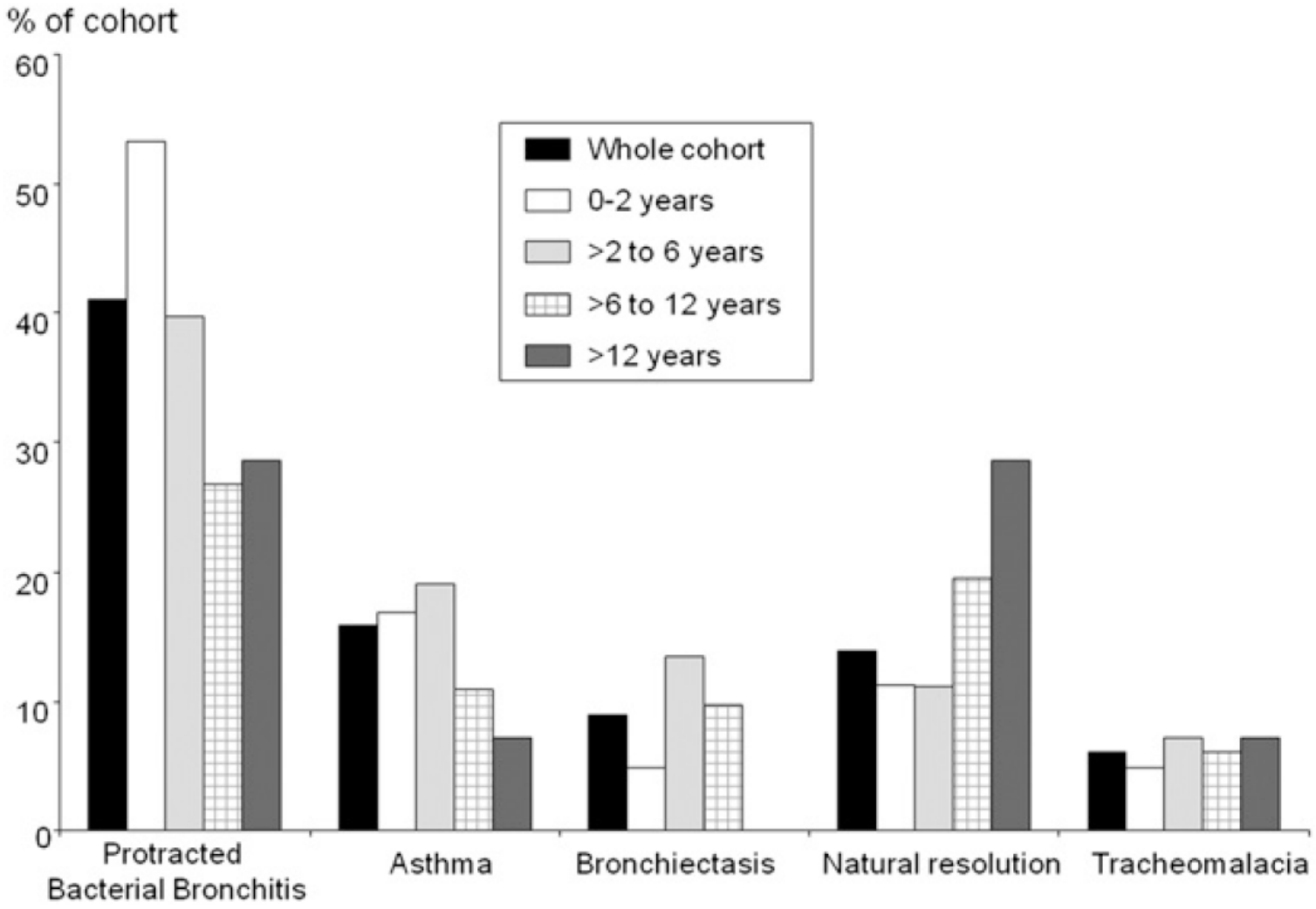
Recurrent aspiration (from oesophageal or swallowing problems):
- Gastro-oesophageal reflux disease(GORD)
- Neuromuscular disease
- Tracheo-oesophageal fistula

Interstitial lung disease

Other:
- Environmental exposure to tobacco smoke or other chemical irritants
- Psychogenic cough
- Cardiac disease
- Medication related (e.g. ACE inhibitors)

Alviani C, *et al*. *Arch Dis Child Educ Pract Ed* 2017;**0**:1–6. doi:10.1136/archdischild-2017-313496

Chronic cough: 5 most frequent diagnoses



Chang 2012[11]

3 studies: aetiology of chronic cough

Study	Marchant JM et al Chest 2006; 129(5): 1132-1141	Khoshoo V et al Chest 2009; 136: 811-815	Asilsoy S et al Chest 2008; 134: 1122-1128
Country	Australia	USA	Turkey
Number	108 children referred to tertiary respiratory centre	40 children referred to pulmonary clinic	108 children referred to Children's Hospital & Research Centre
Average age of child when studied (years)	Median 2.6 years	Mean 7.8 years	Mean 8.4 years
Definition of chronic cough (greater than)	3 weeks	8 weeks	4 weeks
Average length of coughing at referral	Median 6 months	18 weeks	4.16 months
Evaluations undertaken	CXR, FEV1, ENT assessment, bronchoscopy/BAL Sweat test, IgGs, allergy tests, HRCT, pH studies, mycoplasma/pertussis tests	CXR, FEV1, ENT assessment, bronchoscopy/BAL Sweat test, IgGs, allergy tests, HRCT, pH studies, mycoplasma/pertussis tests	CXR, FEV1, ENT assessment, bronchoscopy/BAL, IgGs, allergy tests, HRCT, gastroesophageal scintigraphy, mycoplasma/pertussis tests
Final diagnosis	PBB – 40% Natural Resolution – 22% Bronchiectasis – 6% Asthma – 4% UACS – 3% GORD – 3% Habit – 1%	GORD – 27% UACS – 23% Asthma – 13% Infection – 5% Aspiration – 2% Multiple aetiologies – 20% All tests normal – 10% (? habitual cough)	Asthma – 25% PBB – 23% UACS – 20% PBB + asthma – 12% UACS + asthma - 7% GORD – 5% Bronchiectasis – 3% Natural resolution 2% Others – TB, mycoplasma

[1] Shields, *Pediatr Respir Rev* 2013

TABLE 1] Prospective Studies That Have Described Various Etiologies of Chronic Cough in Children (Key Questions 1 and 2)

Study/Year	Country	Setting	Method of Assessment	Inclusion Criteria, Exclusion	No. Enrolled/ No. Completed/ Age	Top 3 Most Common Diagnoses
Asilsoy et al[22]/ 2008	Turkey	Single center, pediatric outpatients	ACCP guideline[14]	> 4 wk cough Exclusion: none reported	108/108 Mean = 8.4 y Range = 6-14 y	Asthma/asthma-like n = 27 (25%) PBB = 25 (23%) UACS = 22 (20%)
Chang et al[1]/ 2012	Australia	Multicenter, Respiratory outpatients	Modified ACCP[14] and TSANZ[23] guidelines	Age < 18 y cough > 4 wk duration, newly referred Exclusion: chronic respiratory illness	346/346 Mean = 4.5 y, SD, 3	PBB = 142 (41%) Asthma = 55 (16%) Resolved without specific diagnosis = 48 (14%)
Dani et al[26]/ 2002	India	Single center, pediatric outpatients	Sequential routine investigations: full blood count, erythrocyte sedimentation rate, Mantoux test, sputum, throat swab, chest radiograph Further investigations (eg, HIV, CT imaging, bronchoscopy, barium swallow) when indicated	Consecutive, immune-competent, age 1-12 y Chronic cough > 3 wk, unknown etiology Exclusion: heart disease	94 Age NR	Asthma = 35 (37%) Tuberculosis = 21 (22.3%) Pulmonary eosinophilia = 9 (9.5%) Sinusitis = 9 (9.5%)
Gedik et al[34]/ 2015	Turkey	Single center, pediatric or allergy outpatients	ACCP guideline[14]	Age < 17 y, persistent cough > 4 wk Exclusion: known chronic respiratory, neuromuscular, growth, cardiac problems; genetic syndromes; prematurity	563/563 Follow-up: NR Mean age = 5.4 y, SD, 3.8	Asthma = 140 (25%) Asthma-like = 107 (19%) PBB = 67 (12%)
Karabel et al[5]/ 2014	Turkey	Single center, respiratory outpatients	ACCP guideline[14]	> 4 wk cough Exclusion: neuromuscular, cardiac, syndromes, respiratory tract infection last 4 wk	270/270 Mean = 6.5 y range = 7 mo-17 y	Asthma = 73 (27%) Asthma-like = 42 (15.5%) GERD = 27 (10%)
Khoshoo et al[27]/ 2009	USA	Single center, pediatric outpatients	Chest radiograph, bronchoscopy, PFT with methacholine, sweat test, pH- or impedence-metry, skin testing, Ig levels Ohers also had: Barium meal or swallow, CT chest/sinus, laryngoscopy, Mantoux test	> 8 wk cough, born full term, neurodevelopmentally normal, no smoke exposure, no history of febrile or respiratory illness, no cardiac illness Exclusion: asthma, RAD, cystic fibrosis (unless able to do PFT/airway hyperreactivity)	40/40 Mean age = 7.8 y (range = 5-12 y)	GERD = 11 (27.5%) Asthma/cough variant asthma = 11 (27.5%) Allergy = 9 (22.5%)
Marchant et al[28]/ 2006	Australia	Single center, respiratory outpatients	Modified ACCP 1998[29] guideline	> 3 wk cough, age < 18 y, newly referred Exclusion: NR	108/103 Median = 2.6 y IQR = 1.2-6.9	PBB = 43 (40%) Resolved without specific diagnosis = 24 (22%) Bronchiectasis = 6 (5.6%)
Rehman et al[30]/ 2009	Pakistan	Single center, pediatric outpatients	Locally designed algorithm with Mantoux test	Age 6-59 mo > 4 wk cough Exclusion: use of ACE inhibitors	172/161 Summary NR	Asthma = 61 (38%) Postviral = 21 (13%) Tuberculosis = 14 (9%)
Usta et al[31]/ 2014	Turkey	Single center, pediatric allergy outpatients	British Thoracic Society guideline	Inclusion: NR Exclusion[b]	156/156 Mean = 8.4 y SD, 2.6	Postnasal drip + asthma = 30 (19%) Postnasal drip = 29 (19%) Asthma = 19 (12%) PBB = 19 (12%)
Yilmaz et al[32]/ 2014	Turkey	Single center, pediatric asthma, allergy outpatients	CHEST guidelines but evaluated by allergists skin prick test (house dust mites, pollen, alternaria, animal dander, latex), full blood count	Age < 18 y, chronic cough > 4 wk (nonspecific isolated dry cough) Exclusion: specific cough pointer present, wet cough, chest radiograph or PFT results abnormal, characteristic cough pattern, chronic respiratory illness, use of ICS, LTRA, ACE inhibitor	119/109 Median = 5 y IQR, 3.5-9	Resolved without prescription = 23 (21%) Rest were treated with ICS for 2 wk: 24 (22%) responded, 62 (57%) partially responded

Thorax. 2008 Apr;63 Suppl 3:iii1-iii15. Epub 2007 Sep 28.

BTS guidelines: Recommendations for the assessment and management of cough in children.

Table 3 Patterns, causes and potential investigations of chronic or frequently recurrent cough in otherwise healthy children

	Pattern	Cause	Potential investigations
Frequently recurring viral bronchitis	Episodic, frequent in winter, associated with "head colds", may occur "back-to-back"	Viral infections Crowded living conditions, ETS and attendance in child care nursery	None Chest radiography Examine during a period when symptom-free
Postviral cough	Troublesome cough (day and night) following a respiratory infection and slowly resolving over next 2–3 months	Viral respiratory infections, *Chlamydia* and *Mycoplasma* infections	None, chest radiography, serology Consider trial of asthma therapy (some mild asthmatics have prolonged recovery from each viral infection)
Pertussis and pertussis-like illness	Troublesome spasmodic cough after initial respiratory infection which slowly resolves over 3–6 months. Vomiting clear tenacious mucus. Older child may complain of difficulty catching breath	*Bordetella pertussis,* parapertussis, adenovirus, influenza, parainfluenza	Nil Chest radiograph, positive serology or culture may be helpful in reducing requirements for further investigation
Cough variant asthma	Isolated cough (no wheezing) due to asthma. Confidence in diagnosis increased when strong atopic background present and cough responds rapidly to anti-asthma medication but relapses when stopped	Asthma	None, chest radiograph. Is airways obstruction present and reversible? BHR or BDR tests, Is there eosinophillic inflammation? Induced sputum, allergy tests, FeNO, response to asthma medication
Allergic rhinitis, postnasal drip and sinusitis – cough likely due to concomitant tracheobronchial inflammation	Not fully accepted as a cause of cough. Cough when "head hits the pillow" or constant throat clearing by day. May have transverse nasal crease of "allergic salute"	Causes of allergic rhinitis	ENT examination, often no investigations needed Chest radiography, allergy tests Response to antirhinitis treatment within 2 weeks CT scan of sinuses
Psychogenic cough	Usually an older child/adolescent (1) Tic-like "habit cough" persisting after head cold or during times of stress (2) Bizarre disruptive honking cough with child exhibiting "la belle indifference". Cough goes away with concentration or sleep	Underlying stress Bizarre honking cough usually serving a purpose with some secondary gain	It is important to do investigations to assure the doctor and parent that no major disease is being missed. However, it is important not to keep performing futile investigations that may reinforce the underlying problem

ETS, exposure to environmental tobacco smoke; FeNO, fractional exhaled nitric oxide concentration; BDR, bronchodilator responsiveness; BHR, bronchial hyperreactivity.

Table 4 Potentially serious lung disorders with chronic coughing

Condition	Investigations
Cystic fibrosis	Sweat test, nasal potential difference, assessment of pancreatic function, genotyping
Immune deficiencies	Differential white cell counts, immunoglobulin levels and subsets, functional antibody responses and lymphocyte subset analysis
Primary ciliary disorders	Screening FnNO, saccharine test, cilial ultrastructure and function, culture of ciliated epithelium
Protracted bacterial bronchitis	Chest radiography, sputum for culture, exclusion of other causes in this table. Response to 4–6 weeks antibiotic and physiotherapy HRCT scan
Recurrent pulmonary aspiration: Laryngeal cleft or 'H' type tracheo-oesophageal fistula Post-TOF repair with swallowing incoordination Neuromuscular or neurodevelopmental disorder GOR, hiatal hernia	Barium swallow, videofluoroscopy, 24 h pH studies, milk isotope scan, fat-laden macrophage index* on bronchalveolar lavage if bronchoscopy indicated. Oesophagoscopy with biopsy may be indicated. NB. There is little evidence that GOR alone is a cause of cough in otherwise healthy children
Retained inhaled foreign body	Chest radiography and HRCT scan may show focal lung disease Rigid bronchoscopy is both diagnostic and therapeutic and is almost always indicated if the history is suggestive of inhaled retained foreign body
Tuberculosis	Chest radiography, Mantoux, early morning gastric aspirates and gamma interferon tests
Anatomical disorder (eg, bronchomalacia) or lung malformation (eg, cystic congenital thoracic malformation)	Bronchoscopy and CT scan
Interstitial lung disease	Spirometry (restrictive defect), chest radiography and HRCT scan, lung biopsy

Thorax. 2008 Apr;63 Suppl 3:iii1-iii15. Epub 2007 Sep 28.

BTS guidelines: Recommendations for the assessment and management of cough in children.

Table 2 Possible diagnosis and specific investigations to be considered

Specific pointers to diagnosis	Suggested specific diagnosis	Investigations
Sudden onset cough	Inhaled foreign body	Bronchoscopy
Barking/brassy cough	Airway malacia	Bronchoscopy
Paroxysmal cough with classic inspiratory 'whoop'	Pertussis syndrome	Serology for *Bordetella*, *Mycoplasma*, *Chlamydia*
Wheezing episodes/atopy/exertional dyspnoea/chest hyperinflation/pectus deformity	Asthma	Spirometry (±bronchodilator responsiveness)
Rhinitis, allergic salute, throat clearing	Allergic rhinitis	Allergy testing; trial of treatment
Choking with feeds/chesty post feeds/neurodevelopmental abnormality	Recurrent aspiration	CXR, barium swallow/pH/impedance studies, videofluoroscopy, bronchoscopy and BAL
Wet cough, poor growth, features of malabsorption, nasal polyps, purulent sputum, finger clubbing	Bronchiectasis (various causes, eg, cystic fibrosis, primary ciliary dyskinaesia)	CXR, sweat test, genotyping, sputum culture, HRCT, nasal brushings, bronchoscopy
Recurrent infections, wet cough	Immune deficiency	Immune function tests
Progressive cough, weight loss, fever, night sweats and haemoptysis	Tuberculosis	CXR, Mantoux test, gastric aspirate for acid-fast bacilli, sputum culture
Dry cough and breathless	Interstitial lung disease	CXR, spirometry, HRCT, lung biopsy
Abnormal cardiac examination, exertional dyspnoea, hypoxaemia	Cardiac disease	CXR, echocardiogram, cardiology referral
Honking, bizarre cough/cough disappears in sleep	Psychogenic cough	CXR, spirometry, avoid over-investigation which may reinforce problem
Mucopurulent drainage, chronic nasal obstruction, facial pain or pressure	Sinusitis	Imaging of the sinuses and/or an empirical trial of treatment
Medication history (ACE inhibitors/illicit drugs)	Drug reaction	Change/stop drug Measure level

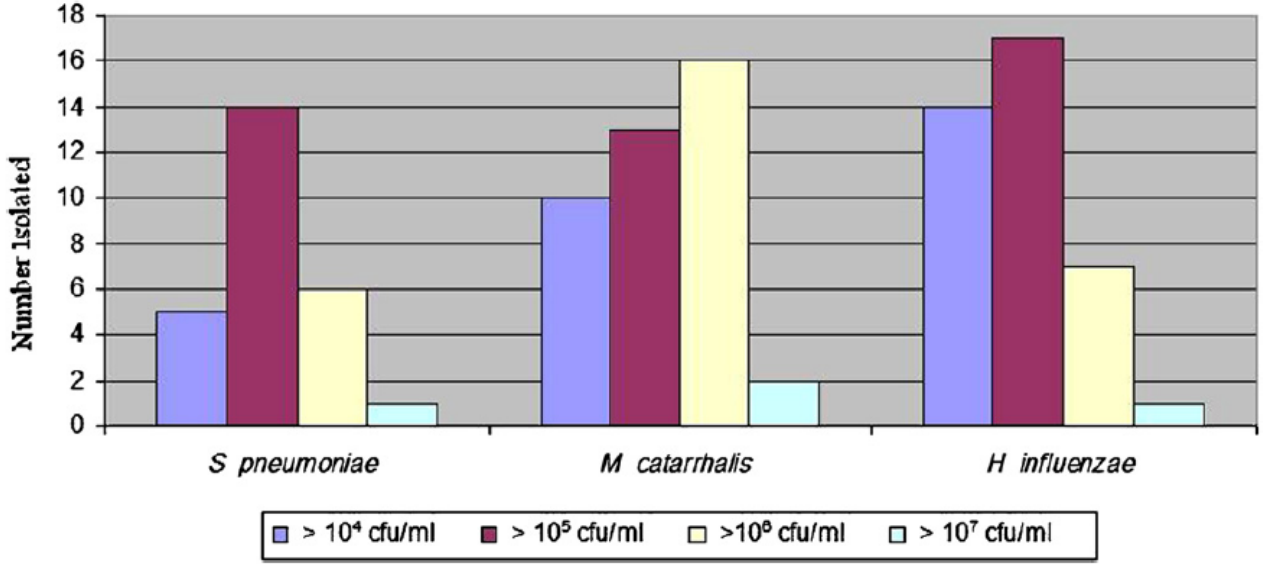
BAL, bronchoalveolar lavage; CXR, chest X-ray; HRCT, high-resolution CT.

Arch Dis Child Educ Pract Ed. 2018 Apr;103(2):65-70. doi: 10.1136/archdischild-2017-313496. Epub 2017 Aug 5.

Fifteen-minute consultation: A structured approach to the management of chronic cough in a child.

Protracted Bacterial Bronchitis (PBB)

- Persistent and recurrent bacterial infection of the conducting airways
- Pathogens:
  - Haemophilus Influenzae
  - Streptococcus pneumoniae
  - Moraxella Cararrhalis



Chang 2008, Kompare 2012, Craven 2013

Clinical features

- Usually <6 years old, median age 3 years
- Chronic wet cough
  - Changing posture
  - At night
  - At exercise
- « Short of breath at exercise »
- Rattling breathing (can be reported as wheeze)
- Lack of energy

Chang 2008, Craven 2013

Diagnostic criteria

- Pediatric condition
- Chronic (>4 weeks) wet cough with our without rattling breathing
- Resolution with 2-4 weeks oral antibiotic
- Absence of alternative specific cause of cough

- <u>=>Diagnostic:</u>
  - Clinical + response to Ab OR
  - Bronchoscopy

Donnelly 2007,Chang 2008, Craven 2013

Diagnostic

- Response to Antibiotics:
  - Partial /transient with short courses (5-7 days)
  - Resolution with long courses (min 10-14 days)
- Chest X-Ray: often normal / peribronchial wall thickening
- CT scan: exclude bronchiectasis
- Cough swab: low sensitivity
- Bronchoscopy:
  - Secretions
  - Oedematous collapsable bronchi
- BAL: positive culture for typical pahtogens, neutrophilic inflammation

Chang 2008, Craven 2013

Pathophysiology: The Vicious Circle

- Single or repeated pulmonary insult
- Impaired primary/secondary defense system
- Stasis

⇒ **Bacteria thrive in the airways**

Insult of the airways => impaired mucociliary clearance

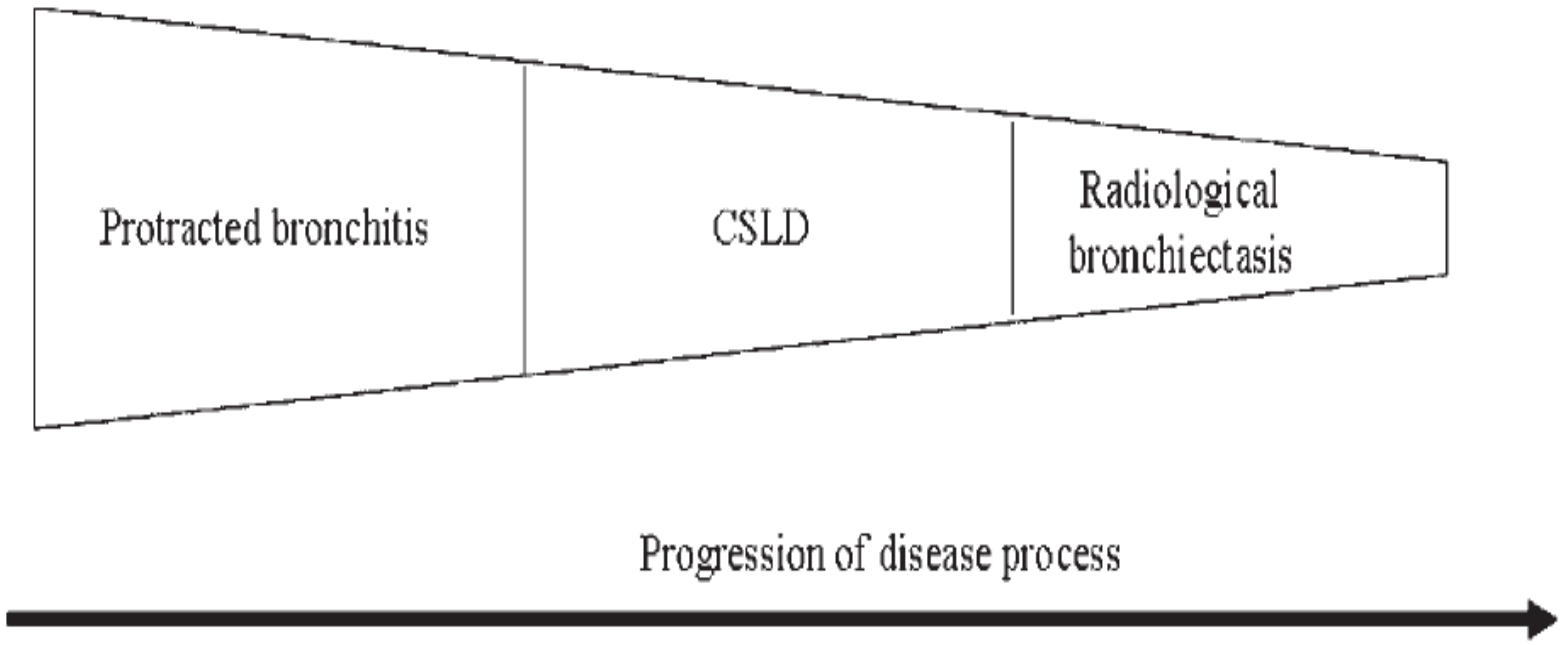
- Bacterial/viral infection in early childhood
- Tracheobronchomalacia
- Aspiration
- Asthma
- Immunodeficiency
- Neuromuscular disease
- Significant medical intervention/ chemotherapy
- Poor social conditions

- **Bacteria secrete biofilm**
  - Attachement
  - Access to nutrients
  - Decrease Ab penetration

- **Vicious circle: self-perpetuating respiratory inflammation and infection => bronchiectasis**

Seear 1997, Donnelly 2007, Chang 2008, Kompare 2012, Craven 2013, BTS guidelines 2013

Natural history of PBB



Chang 2008

PPB: Investigations

- First stage:
  - Chest x-ray
  - Cough swab/ sputum analysis

- Recurrent episodes of PBB:
  => Further antibiotic courses
  => > 3/year: Reconsider diagnosis:
  - Other causes of chronic wet cough?
  - Predisposing factors for PBB? (aspiration!)
  - CSLD/bronchiectasis?
  - Immunodeficiency?

- Investigations:
  => Bronchoscopy,BAL
  => CT scan
  => further investigations for bronchiectasis

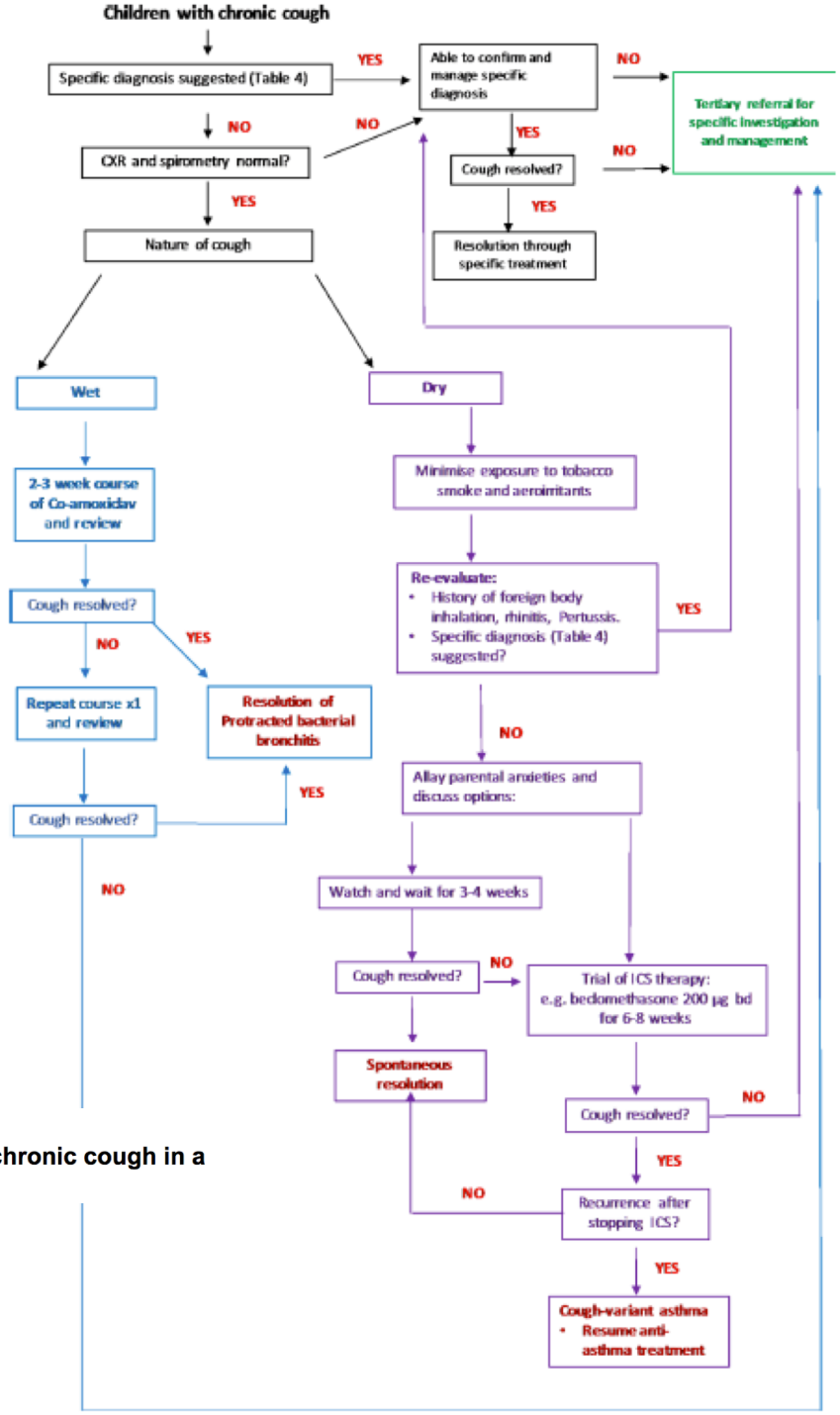
Donnelly 2007,Chang 2008, Craven 2013, Kantar 2017

Chronic cough in Pediatrics: Algorithms

TABLE 2] Summary of Pediatric Chronic Cough Guidelines on the Use of Routine Tests

Study/Year	Country	Society	Suggested Routine Tests
Chang et al[12]/2006	Australia	Thoracic Society of Australia and New Zealand	Yes Spirometry[a] and chest radiography
Chang and Glomb[6]/2006	United States	American College of Chest Physicians	Yes Spirometry[a] and chest radiography
Gibson et al[28]/2010	Australia	Australian Lung Foundation	Yes Spirometry[a] and chest radiography
Kohno et al[29]/2006	Japan	Japanese Respiratory Society	No
Leconte et al[30]/2008	Belgium	Primary care	No Tests based on clinical suspicion
Lu[31]/2014	China	Multiple societies	Yes (based on translated article) Chest radiography
Shields et al[11]/2008	England	British Thoracic Society	Yes Spirometry[a] and chest radiography
Zacharasiewicz et al[32]/2014	Austria	Austrian Society of Pediatrics, Austrian Society Pneumology	Yes Spirometry[a] and chest radiography

[a]Spirometry if age appropriate (usually when aged > 5 years but in some centers, spirometry can be undertaken in children > 3 years).



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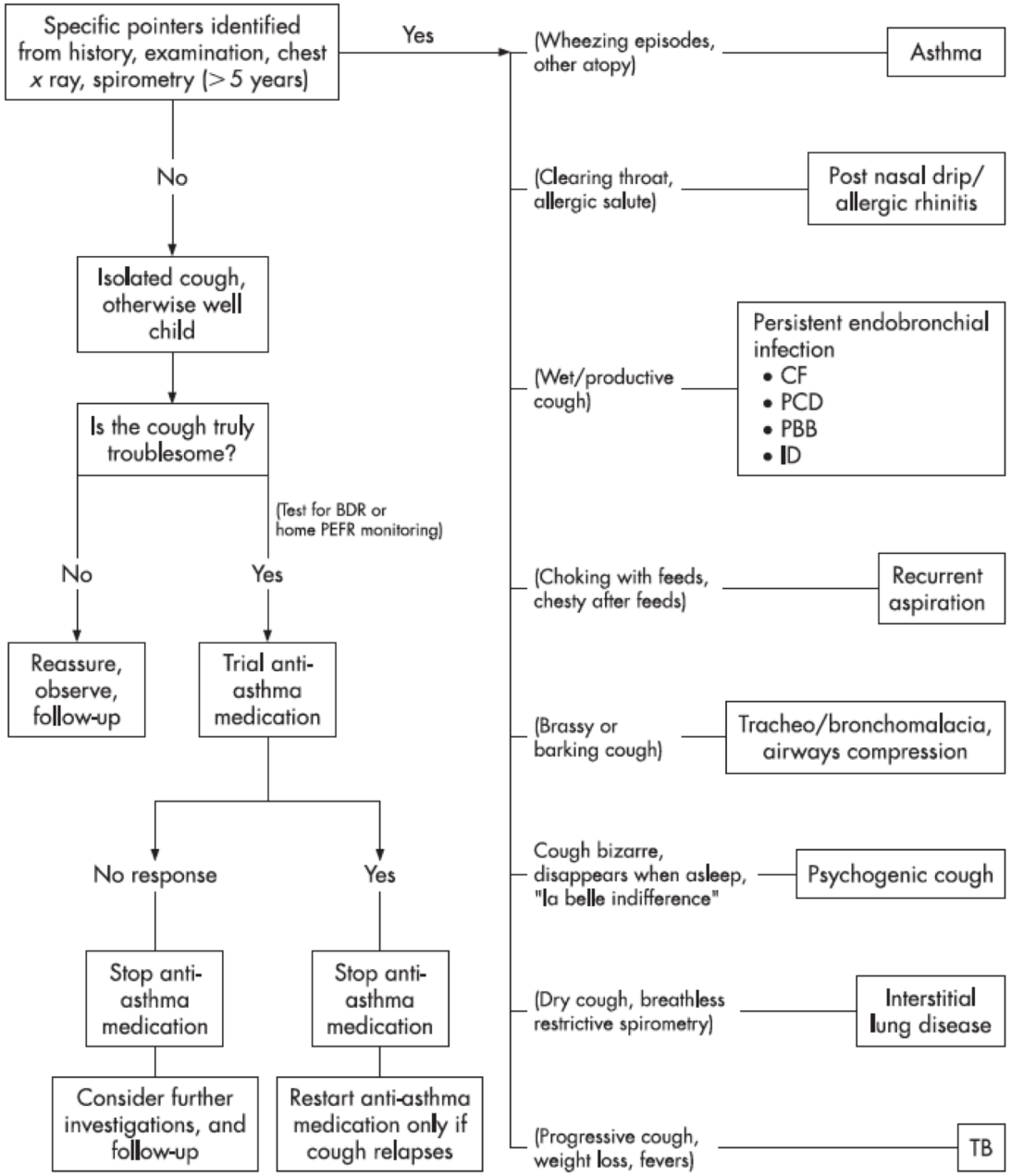
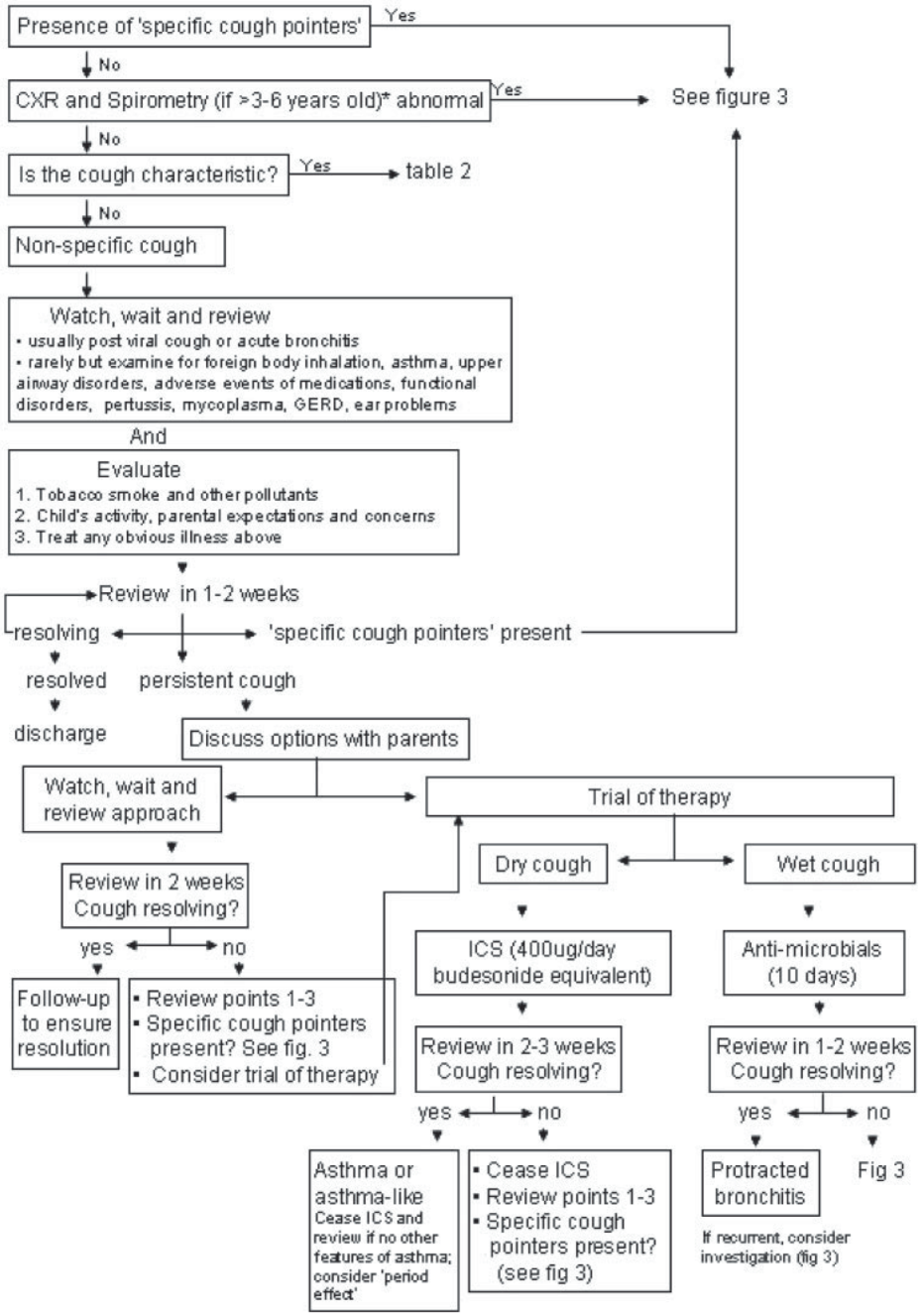


Chest. 2006 Jan;129(1 Suppl):260S-283S. doi: 10.1378/chest.129.1_suppl.260S.

Guidelines for evaluating chronic cough in pediatrics: ACCP evidence-based clinical practice guidelines.



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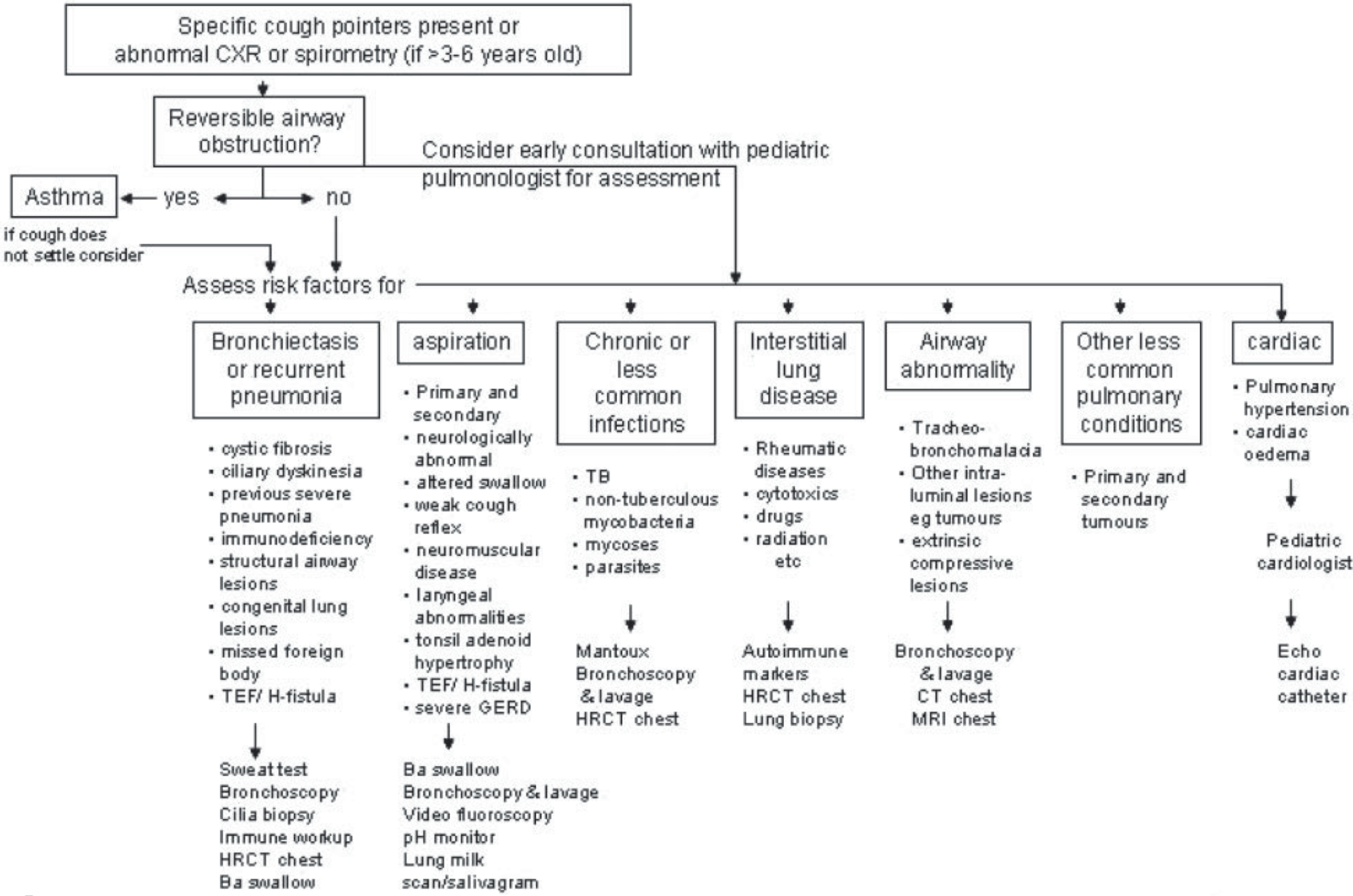

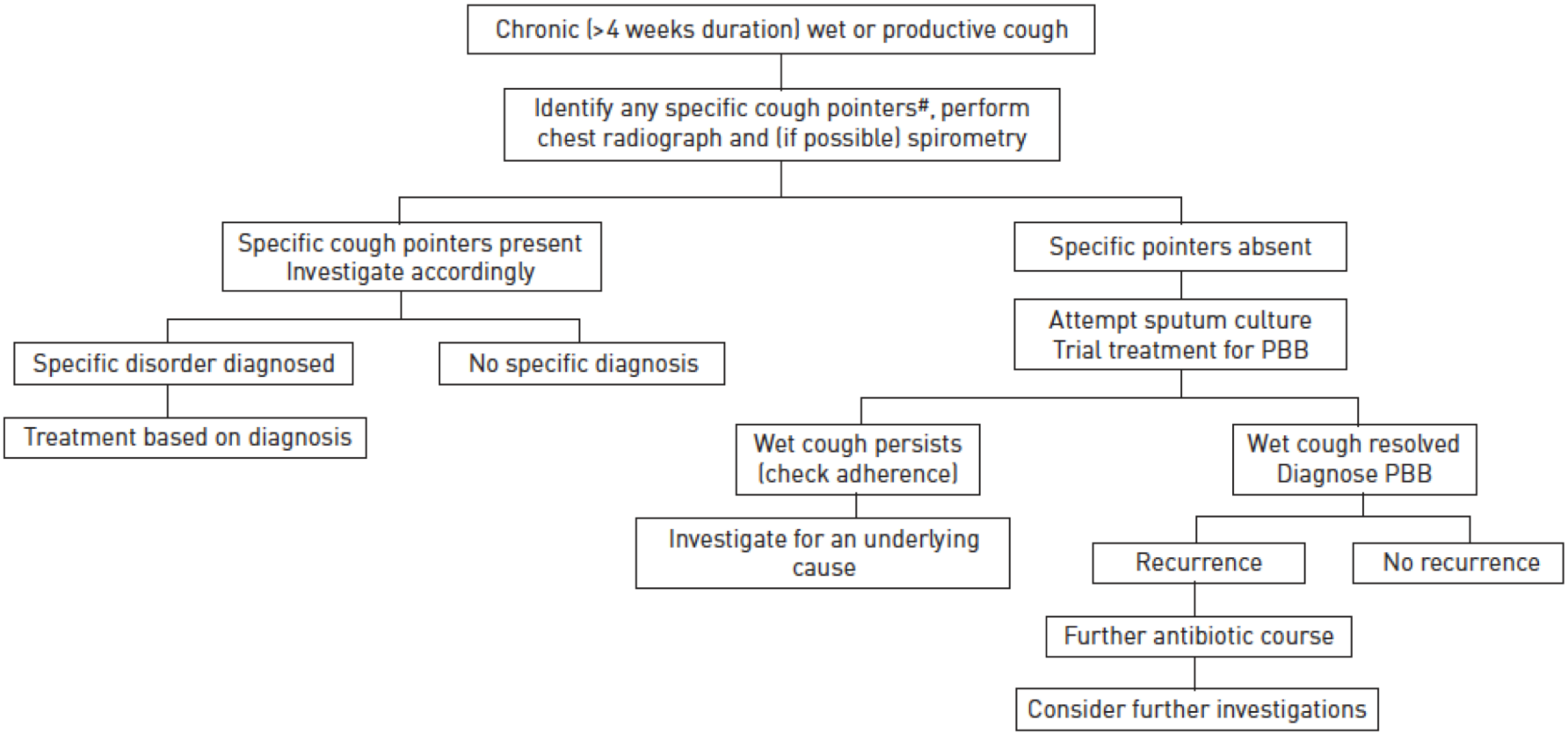

ERS statement on protracted bacterial bronchitis in children

Chronic cough in Pediatrics: Evaluation in Practice

Chronic cough: detailed history

1. How and when the cough started?
2. Is the cough an isolated symptom?
3. What triggers the cough?
4. Does the cough disappear when the child goes to sleep?
5. What is the nature and quality of the cough?
6. What treatments has the child been tried on and how beneficial were they?
7. What other medication is used? e.g. ACE inhibitors
8. Is there a family history of respiratory, allergic or infectious disease?
9. Does the child smoke? Do the parents smoke? Is there evidence of any environmental pollutant at home?
10. How disruptive is the cough?
11. Is there evidence of Obstructive Sleep Apnoea? How large are the tonsils?

[1] Shields, *Pediatr Respir Rev* 2013

Chronic cough: clinical examination

- Full clinical systematic examination
- General health
- Height and weight centile
- Nutritional status
- Chest examination
- ENT examination
- Cardiovascular examination

…Ask the child to cough!

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Chronic cough: red flags

Important:

- Wet/dry cough
  - Wet: mucous hypersecretion
  - Dry: airway irritation/non-airway cause
- Neonatal onset/Sudden onset
- Growth/general status
- Swallowing difficulties
- Dyspnoea
- Recurrent infections
- Progressively more severe cough
- Cough disappear at night

+ Abnormal physical examination!

Box 1. List of some red flag symptoms and signs in chronic cough.

- Coughing started suddenly with a choking episode or an inhaled foreign body is suspected
- Coughing is relentlessly progressive
- There are already specific pointers for an underlying diagnosis including
  - Weight loss, night sweats suggestive of TB
  - Haemoptysis
  - Signs of chronic lung disease or ill-health already present (poor growth, finger clubbing, chest wall abnormality and abnormal lung sounds)
- Coughing with a background history of recurrent pneumonia
- Cough starting in neonatal period
- Swallowing difficulties
  - With craniofacial abnormality
  - With neuromuscular disorder
- Dyspnoea – chronic or exertional
- Wet cough lasting more than 3-4 weeks

[1] Shields, *Pediatr Respir Rev* 2013

Chronic cough: red flags

TABLE 1] Extended List of Cough Pointers (Modified From Previous Papers)[6,12,23]

Systemic	Pulmonary
• Cardiac abnormalities	• Chest pain
• Digital clubbing	• Daily moist or productive cough
• Failure to thrive	• Hemoptysis
• Medications or drugs associated with chronic cough (angiotensin-converting enzyme inhibitors, illicit drug use)	• Abnormal cough characteristics (brassy, plastic bronchitis, paroxysmal with/without posttussive vomiting, staccato, cough from birth)
• Neurodevelopmental abnormality	• Recurrent pneumonia
• Fever	• Hypoxia/cyanosis
• Immune deficiency (primary or secondary)	• History of previous lung disease or predisposing causes (eg, neonatal lung disease, foreign body aspiration)
• Feeding difficulties	• Exertional dyspnea
• History of contacts (eg, tuberculosis)	• Dyspnea at rest or tachypnea
	• Chest wall deformity
	• Auscultatory findings (eg, stridor, wheeze, crackles)
	• Chest radiograph abnormalities
	• Pulmonary function test abnormalities

Chronic cough: baseline investigations

- Chest radiograph
- Spirometry with or without test of bronchodilatator responsiveness (BDR)
- Sputum analysis
- (Allergy testing)

Complete investigations if red flags

Thorax. 2008 Apr;63 Suppl 3:iii1-iii15. Epub 2007 Sep 28.

BTS guidelines: Recommendations for the assessment and management of cough in children.

Chronic cough in Pediatrics: Management

Chronic cough: management

- Treatment of specific diagnosis if found
- Remove from exposure to aeroirritants
- Non-specific isolated cough in an otherwise well child:
  - Parental reassurance
  - FU after 6-8 weeks: cough resolved? No specific pointers?
- Empirical trial:
  - Not recommended, unlikely beneficial (Cochrane review)
  - If trial: time-limited
    - Anti-asthma: ICS,beta-2 agonist, leukotriene receptors antagonis
    - Anti-allergic rhinitis: anti-histamines
    - Anti-gastro-oesophageal reflux treatment

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BTS guidelines: Recommendations for the assessment and management of cough in children.

- Trial of anti-asthma therapy:
  - Attempt to document bronchial hyperresponsiveness (spirometry + BDR, response to salbutamol)
  - Adequate doses, clear outcome, defined period 8-12 weeks then stop
    - No response: asthma unlikely
    - Response and early relapse of cough: cough-variant asthma likely

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BTS guidelines: Recommendations for the assessment and management of cough in children.

Chronic cough in Pediatrics: Take Home messages

Take Home Messages

- Definition chronic cough in children: > 4 weeks[1]
- Delayed diagnosis may cause respiratory morbidity
- Early diagnosis of underlying chronic disease:
  - Appropriate management: cough may resolve
  - Improved QoL
- Use of cough algorithms: can lead to earlier diagnosis

- => **Recommendations[1]:**
  - Use of pediatric-specific cough management protocols or algorithms
  - Basing management on clinical history, physical examination, cough characteristics, red flags
  - Baseline investigations:
    - Chest X-Ray, spirometry (+ BDR)
    - To consider: sputum analysis, allergy testing, bronchoscopy, Chest CT, Mantoux
  - Empirical treatment trial:
    - Based on features consistent with hypothesized diagnosis
    - Limited duration, aim to confirm or refute diagnosis


THANK
YOU