

Evaluation of Chronic Cough in the Pediatric Patient

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Disclosure

None of the faculty or planners associated with this activity have any relevant financial relationship to disclose.

Objectives

- Define chronic cough
- Know the most common causes of chronic or persistent cough
- Recognize abnormal physical exam findings, radiologic imaging findings, and symptoms which may accompany chronic cough associated with lung disease

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Mechanics of Cough: Six Phases

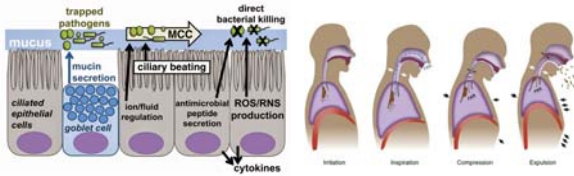
- Irritation phase – stimulation of irritant receptors in the tracheobronchial tree
- Inspiratory phase – deep breath, ~ 1.5-2 times tidal volume
- Glottic closure – allows intrathoracic pressure to build
- Compression phase – contraction of intercostal and abdominal musculature
- Expulsive phase – glottis opens, airflow out creates shearing forces to remove and expel mucus. est. 25,000 cm/sec (~3/4 speed of sound)
- Relaxation phase – decreased intrathoracic pressure with relaxation of intercostal and abdominal musculature

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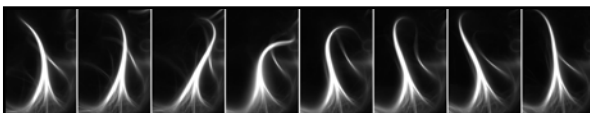
Cough is a good thing.

- Important component of intrinsic lung defense
- Ineffective or weak cough impairs effective airway clearance



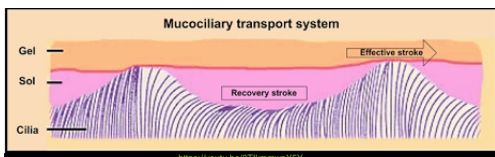
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Waveform sliding motion:

- Bend
- Effective stroke (vertical) – propel mucus proximally
- Recovery stroke (horizontal) – allows cilia to stand upright



NTE



Defining Chronic Cough

Other descriptive terms: recurrent cough, persistent cough

- Variable definitions for “chronic cough”
 - Daily cough at least 3-8 weeks duration, depending on what you read
 - Continuous, without cessation of cough for 3 consecutive days
- “Acute cough” is under 3 weeks duration
- Take a good history
 - Including birth history, significant respiratory illnesses during infancy and the neonatal period
- Pay close attention for RED FLAGS

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Taking a History. ¹

- How and when the cough started?
- Is the cough an isolated symptom?
- What triggers the cough?
- Does the cough disappear when the child goes to sleep?
- What treatments have been tried? Were they beneficial?
- What other medication is used?
- Is there family history of respiratory, allergic or infectious disease?
- Does the child smoke? Does the family smoke? Is there any evidence of environmental pollutant at home?
- How disruptive is the cough?
- Is there evidence of obstructive sleep apnea? Tonsil size?

9 October 31, 2013 | 1. Shields, C.M. Doherty / Paediatric Respiratory Reviews 14 (2013) 100-106 © 2013 Kaiser Foundation Health Plan, Inc. For internal use only. KAISER PERMANENTE.

RED FLAGS!

- Persistent purulent, productive cough occurring daily
- Cough starting in the neonatal period
- Hemoptysis
- Weight loss, poor growth, malabsorption symptoms
- Digital clubbing
- Started following a choking episode or foreign body suspected
- Progressive worsening
- Associated with dyspnea, either chronic or exertional

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Extended List of Cough Pointers

Systemic

- Cardiac abnormalities
- Digital clubbing
- Failure to thrive
- Medications associated with cough
- Neurodevelopmental abnormality
- Fever
- Immunodeficiency
- Feeding difficulties
- History of contacts (eg, TB)

Anne Chang, et al. Management of Children With Chronic Wet Cough and Protracted Bacterial Bronchitis. CHEST Guideline and Expert Panel Review. Chest 2017; 151(4):884-890.

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Extended List of Cough Pointers continued...

Pulmonary

- Chest pain
- Daily moist or productive cough
- Hemoptysis
- Abnormal cough characteristics
- Recurrent pneumonia
- Hypoxia/cyanosis
- H/o previous lung disease
- Exertional dyspnea
- Dyspnea at rest or tachypnea
- Chest wall deformity
- Auscultatory findings
- Chest radiograph abnormalities
- Pulmonary function test abnormalities

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Chronic Cough

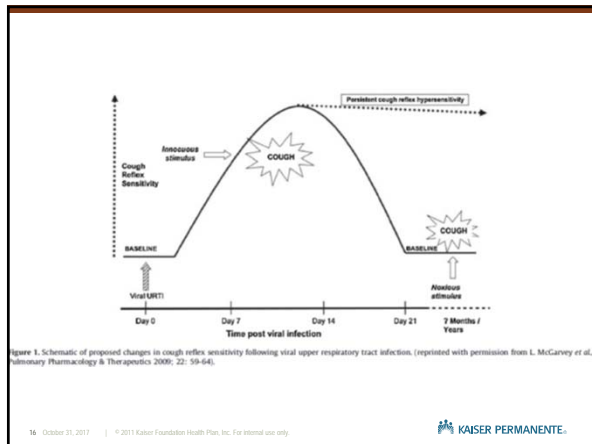
- Upper Airway Cough Syndrome
- Protracted Bacterial Bronchitis (PBB)
- Asthma
- Airway Abnormalities
- Bronchiectasis and Chronic Suppurative Lung Diseases
- Psychogenic Cough and miscellaneous others

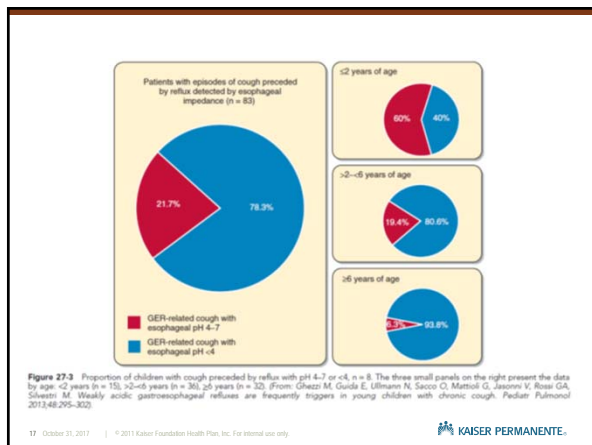
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Upper Airway Cough Syndrome

- Hypersensitive laryngeal irritant receptors, typically following an initial inflammatory event (eg, viral upper respiratory infection)
- Noxious stimuli continues (postnasal drip, gastric reflux, environmental triggers) which triggers cough
- Postnasal drip most commonly associated
- Identify associated signs and symptoms
 - Nasal congestion, frequent throat clearing
 - Heartburn, epigastric pain, acid brash
- Tx: targeted therapy to address underlying contributors of inflammation
 - Hydration, cough drops/throat lozenges, nasal saline rinse/spray, antihistamines, nasal steroid spray, H2 blockers, PPI
 - Consider allergy workup

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If you have a bad cough take laxatives. Then you will be afraid to cough.

your cards

Wordilly Durdillies. by Spik-

COUGH! OO-ER!

A COMPUTER HACKER.

BAD COUGH FOR WEEKS

ABS NOW IN PERFECT SHAPE

Protracted Bacterial Bronchitis (PBB)

- Usually preschool/early school-aged children, following initial respiratory illness
- Daily wet, productive cough >4 weeks
- Absence of other specific cough pointers/red flags
- Resolution with amoxicillin-clavulanate (Augmentin) x 2-4 weeks.
 - Start with 14 day course. Expect complete resolution of the cough within that time. If significantly improved cough but not resolved, then can extend the course an additional 7-14 days
- Implicated respiratory bacteria: *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Moraxella catarrhalis*

Anne Chang, et al. Management of Children With Chronic Wet Cough and Protracted Bacterial Bronchitis. CHEST Guideline and Expert Panel Review. Chest 2017; 151(4):884-890.

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Asthma

- Cough, non-productive or productive, though typically dry
- May be associated with wheeze, chest tightness, shortness of breath
- Triggers/Timing
 - Exercise, temperature, weather change, laughing, colds/respiratory illnesses, co-morbid atopy or GERD
- Relieved by beta-2 agonist bronchodilators and systemic steroids
- Consider chest x-ray, pulmonary function testing
- Refer to NHLBI EPR-3 guidelines

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Airway abnormalities

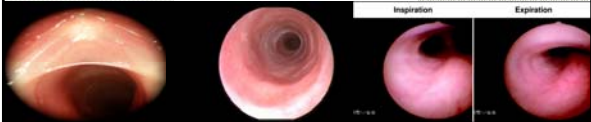
Stenosis

- Subglottic stenosis
- Tracheal web
- Vascular compression – ring or sling
- Mediastinal mass
- Tracheal ring



Malacia

- Congenital tracheomalacia or bronchomalacia
- Hx trachea-esophageal fistula



Bronchiectasis and Chronic Suppurative Lung Disease

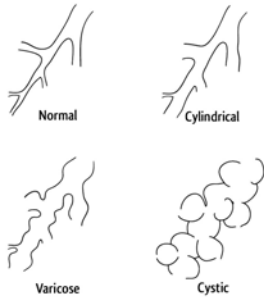
- Non-cystic fibrosis bronchiectasis:
 - Chronic pulmonary aspiration
 - Primary ciliary dyskinesia
 - Immunodeficiency, primary or secondary
 - Post-infectious
 - ... and others
- Cystic fibrosis

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Bronchiectasis

Abnormal dilation of the airways resulting from loss of structural support and architecture



Types:

- Cylindrical or Tubular
- Varicose
- Saccular or Cystic

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Other Cough

- Psychogenic cough (aka – habit cough)
 - *Diagnosis of exclusion – first rule-out other causes
 - Typically follows a cold/URI
 - Repetitive, monotonous, nonproductive
 - Disruptive, but not to the patient (la belle indifference)
 - Distractibility
 - Absent during sleep
 - Non-responsive to bronchodilators and steroids
- Infection associated with prolonged cough duration
 - Respiratory syncytial virus, other respiratory viruses
 - Bordetella pertussis, mycoplasma pneumoniae, chlamydia

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So How Should I Approach This Chronic Cough???

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Children With Chronic Cough

When Is Watchful Waiting Appropriate? Development of Likelihood Ratios for Assessing Children With Chronic Cough

Anne B. Chang, PhD; Peter I. Brent Masters, PhD; Louis and Peter S. Morris, PhD

BACKGROUND: Chronic cough is associated with poor quality of life and may signify a serious underlying disease. Differentiating nonspecific cough (when watchful waiting can be safely undertaken) from specific cough (treatment and further investigations are beneficial) would be clinically useful. In 326 children, we aimed to (1) determine how well cough pointers (used in guidelines) differentiate specific from nonspecific cough and (2) describe the clinical profile of children whose cough resolved without medications (spontaneous resolution).

METHODS: A dataset from a multicenter study involving children newly referred for chronic cough (median duration, 3.4 months) was used to determine the sensitivity, specificity, predictive values, and likelihood ratios (LRs) of cough pointers (symptoms, signs, and simple investigations [chest radiography, spirometry]) recommended in guidelines.

RESULTS: The pretest probability of specific cough was 88%. The absence of false-positive results meant that most pointers had strongly positive LRs. The most sensitive pointer (wet cough) had a positive LR of 26.2 (95% CI, 3.8-181.5). Although the absence of other individual pointers did not change the pretest probability much (negative LR close to 1), the absence of all pointers had a strongly negative LR of 0 (95% CI, 0-0.03). Children in the resolved spontaneously group were significantly more likely to be older, to be non-Indigenous, and to have a dry cough and a normal chest radiograph.

CONCLUSIONS: Children with chronic dry cough without any cough pointers can be safely managed using the watchful waiting approach. The high pretest probability and high positive LRs of cough pointers support the use of individual cough pointers to identify high risk of specific cough in pediatric chronic cough guidelines.

TRIAL REGISTRY: Australian New Zealand Clinical Trials Registry; No: 12607000526471; URL: www.anzctr.org.au

October 31, 2017

CHEST 2015; 147(3):745-753

Chronic cough postacute respiratory illness in children: a cohort study

- ~20% children had persistent cough by day 28
- Cough > 28 days without a period of resolution for 3 consecutive days should be further evaluated
- ~47% had PBB
- ~30% had chronic respiratory illness:
 - Asthma, tracheobronchomalacia, obstructive sleep apnea, aspiration disorder or bronchiectasis

Results 2586 children were screened and 776 (30%) were ineligible; 839 children (median age=2.3 years, range=0.5 months to 14.7 years, 60% male) were enrolled over 2 years. Most children (n=627, 74.8%) had cough duration of <7 days at enrolment. At day 28, 171/839 (20.4%, 95% CI 17.7 to 23.1) children had persistent cough irrespective of cough duration at enrolment. The cough was wet in 59/171 (34.5%), dry in 45/171 (26.4%) and variable in 28/171 (16.1%). Of these 117 children, 117 (68.4%) were reviewed by a paediatric pulmonologist. A new and serious chronic lung disease was diagnosed in 36/117 (30.8%) children; 55/117 (47.0%) were diagnosed with protracted bacterial bronchitis.

Conclusions When chronic cough develops post-ARI, clinical review is warranted, particularly if parents report a history of prolonged or recurrent cough. Parents of children presenting acutely to ED with cough should be counselled about the development of chronic cough, as an underlying respiratory condition is not uncommon.

O'Grady K-AF, et al. Arch Dis Child 2017;0:1-5. doi:10.1136/archdischild-2017-312848

M.D. Shields, G.M. Doherty/Pediatric Respiratory Reviews 14 (2013) 100-106

103

Table 1

Summary findings from three studies comprehensively investigating children with chronic cough.

Study	Marchant JM et al Chest 2006; 129(5): 1132-1141	Khoshoov V et al Chest 2009; 136: 811-815	Aniloy 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, IgG, allergy tests, HRCT, pH studies, mycoplasma/pertussis tests	CXR, FEV1, ENT assessment, bronchoscopy/BAL Sweat test, IgG, allergy tests, HRCT, pH studies, mycoplasma/pertussis tests	CXR, FEV1, ENT assessment, bronchoscopy/BAL, IgG, 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% (7 habitual cough)	Asthma - 25% PBB - 23% UACS - 20% PBB + asthma - 12% UACS + asthma - 7% GORD - 5% Bronchiectasis - 3% Natural resolution 2% Others - 10, mycoplasma

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OTC Cough Medications

- None are proven effective compared to placebo in children
- Not for use in children under 6 years old as recommended by AAP
- Be aware of potential toxicities and management of overdose
- Recommended reading:
 - Jennifer A. Lowry, MD, J. Steven Leeder, PharmD, PhD. "Over-the-Counter Medications: Update on Cough and Cold Preparations". *Pediatrics in Review* 2015;36:286. DOI: 10.1542/pir.36-7-286

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Take Away Points

- Cough > 4 weeks duration without a period of resolution for 3 consecutive days should be further evaluated – have them seen by a pediatrician.
- Upper airway cough syndrome, GERD, PBB and asthma are among the most common diagnoses
- Red flags & specific cough pointers should prompt additional investigation and monitoring
- Evidence suggests chronic dry cough without any specific cough pointers can be safely managed using the watchful waiting approach

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1. Shields, G.M. Doherty. Chronic cough in children. *Paediatric Respiratory Reviews* 14 (2013) 100–106
 2. Anne Chang, et al. Management of Children With Chronic Wet Cough and Protracted Bacterial Bronchitis. CHEST Guideline and Expert Panel Review. *Chest* 2017; 151(4):884-890.
 3. Anne Chang, et al. Children With Chronic Cough: When Is Watchful Waiting Appropriate? Development of Likelihood Ratios for Assessing Children With Chronic Cough. *CHEST* 2015; 147(3):745- 753
 4. Anne Chang, et al. A Cough Algorithm for Chronic Cough in Children: A Multicenter, Randomized Controlled Study. *Pediatrics* 2013;131:e1576–e1583
 5. O'Grady K-AF, et al. Chronic cough postacute respiratory illness in children: a cohort study. *Arch Dis Child* 2017;0: 1-5. doi: 10.1136/archdischild-2017-312848
- Additional resources:
 - Jennifer A. Lowry, MD, J. Steven Leeder, PharmD, PhD. "Over-the-Counter Medications: Update on Cough and Cold Preparations". *Pediatrics in Review* 2015;36:286.

33

