

## Review and recommendation:

# Airway Disease Education & Expertise (ADEX) NEXT Working Group Recommendations-Persistent (Chronic) Cough in Pediatric Practice

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### Abstract:

**Justification:** Chronic cough is a major health and psycho-socio-economic burden. It is a common reason for the parents to visit a consultant in pediatric practice. Use of appropriate management protocols may reduce the morbidity of chronic cough, lead to earlier diagnosis of chronic underlying illness, reduce unnecessary costs and medications, and improve quality of life. We present here recommendations from the module of 'Airway Diseases Education and Expertise' (ADEX) NEXT that focused on chronic (persistent) cough in children. **Process:** A working committee was formed by the collaboration of Pediatric Allergy Association of India (PAAI) and Indian Academy of Pediatrics (IAP) chapters of Respiratory, Infectious Diseases, Environment, Allergy and Applied Immunology and pediatric association of India (PAI) to develop a training module on chronic cough in children.

### Objectives:

- To meet our need based on socio-economic determinants of our health care resources,
- To produce recommendations that are relevant to the clinical management of "Persistent (Chronic)

Cough" in both primary and secondary care,

- To highlight chronic cough as a clinical and research area of considerable importance

### Recommendations:

Recommendations for diagnosis, management and follow-up of chronic cough are presented in this document. A better compliance by linking education of child, parent and other health care providers, and scientific progress by cooperation between clinicians, scientists, and the pharmaceutical industry with the core aim of developing effective cough therapies is suggested.

**Keywords:** *Chronic cough, Management, Recommendations, Education*

### Introduction

Chronic cough is a major psycho-socio-economic health burden with an increased prevalence from 8% to 20.78% in 17 years between 1999- 2016 year. It is associated with impaired quality of life (QoL) and may signify a serious underlying disease [1]. For the proper management of chronic cough in children, it is considered important to identify the underlying cause (i.e., obtaining the correct diagnosis), as opposed to

empirical treatment [2]. Various factors strengthen the need of correct diagnosis with appropriate treatment. First, chronic cough may indicate the occurrence of a serious underlying airways disease (e.g., bronchiectasis, aspiration lung disease). Early identification and treatment of these conditions prevent further ongoing lung injury [3-5]. Second, the early treatment of children with chronic cough reduces the substantial stress on parents and improves their QoL [6, 7]. Third, the early treatment of cough reduces the economic burden associated with repeated consultations. Moreover, a correct approach to diagnosis significantly reduces the use of unnecessary investigations and medications with consequent severe adverse events (AEs) [2].

Recently, the burden of chronic cough in children and the need for early diagnosis and management were highlighted [8, 9]. Clinicians recognized that early diagnosis and management of chronic productive cough are necessary for future lung health [2]. The use of guidelines, clinical pathways and recommendations, is usually considered an important factor in the improvement of the quality of care and outcomes in the current era of evidence-based medicine [10, 11]. The successful development of clinical guidelines requires various strategies, including validation from experts as well as determination of the quality of the evidence [8, 12]. Training modules always reduce the health care cost by 2/3 [13]. After the success of Airway Diseases Education and Expertise (ADEX) module for United Airway Disease, ADEX NEXT aims to fill the knowledge gap in awareness, diagnosis, management and referral of Pediatric cases with Persistent cough [14].

The ADEX NEXT collaborative panel (Annexure I) was formed by the collaboration of Pediatric Allergy Association of India (PAAI) and Indian Academy of Pediatrics (IAP) chapters, and Pediatric Association of India (PAI). A literature search was done for the period 1993-2017 using PubMed and Google scholar with keywords for chronic cough in children. A total of 123

publications were obtained till April 2017. The abstracts of the articles were reviewed by the panel members. The 36 potentially relevant articles were evaluated to consider for inclusion in ADEX NEXT training module. The articles published, pertaining to chronic cough in children, clinical pathways of chronic cough and, assessment and management were included; the discussions, suggestions and panel consensus were accumulated into a presentation module which was then reviewed by the experts.

### **Aims and Objectives:**

The aim of the ADEX NEXT was to meet our need based on socio-economic determinants of our health care resources and to produce recommendations that are relevant to the clinical management of "Persistent (Chronic) Cough" in both primary and secondary care and to highlight chronic cough as a clinical and research area of considerable importance.

### **Prevalence:**

According to community based survey, it is observed that the parental reported cough as an isolated symptom without colds has a prevalence of 28% in boys and 30% in girls [15]. Prevalence data have reported that 35% of the preschool children report coughs in any given month. A multicenter study of children 7 to 11 years of age observed that 9% children have chronic cough [16]. In the age group of 2 months to 16 years, the prevalence of chronic cough is 21.25% (153/720). Majority of the children had other comorbidities of chronic cough, like snoring, mouth breathing, bruxism and exercise induced asthma. Only 3.2% children had laryngeal dyskinesia [17].

### **Socio Economic Burden:**

Chronic cough has a great impact on psychosocio-economic and causes insomnia, exhaustion, nausea, vomiting, absence from school, rectal prolapse, fecal soiling, urinary incontinence, hernia, subconjunctival hemorrhage, cerebral hypoxic encephalopathy, cough syncope, Parents

feel frustrated, upset, stressed, helpless and financial burden [17, 18]. The personal and medical cost in chronic cough is high approximately 83154 Million/yr. (INR). In a multicenter, randomized controlled study, about 80% of the children have reported five consultation for a chronic cough [7].

### When to Call Chronic Cough in Children:

In 1970, according to Prof. William Wearing any symptom which lasts for more than three months is considered as chronic. In the 80's, Prof. Lin Tussaig reported that any symptoms which lasts for more than three weeks is chronic. In the 90's, according to global initiative for asthma (GINA) any symptoms which lasts for more than two weeks is chronic [19]. Currently, there are no studies available where the correct definition of chronic cough has been defined. Thus, definition of chronic cough in pediatrics is based on the knowledge that respiratory illness has important difference between pediatrics and adults, and the natural history of acute upper respiratory tract infections (URTIs) in children [20]. Depending on the duration of cough, we call it as chronic and in different countries it is variable from 2 weeks and 8 weeks (Table 1). The American College of Chest Physicians (ACCP), Thoracic Society of Australia and New Zealand (TSANZ) defined chronic cough as lasting longer than 4 weeks [2, 21]. In The British Thoracic Society (BTS) chronic cough is defined as lasting longer than 8 weeks [22, 23]. In Belgium it is consider chronic lasting more than 3 weeks. The American Academy of Allergy, Asthma and Immunology (AAAAI), European Academy of Allergy and Clinical Immunology (EAACI), Indian Academy of Pediatrics (IAP), ADEX, Allergic Rhinitis and Co-morbidities Training Module (ARCTM) and Revised National Tuberculosis Control Program (RNTCP) chronic cough is defined as lasting longer than 2 weeks [14, 24-26].

### Recommendation of ADEX NEXT Panel

- The definition of chronic cough should be based on the history, symptoms and duration of cough.

- It is recommended to consider chronic cough if it persists for more than 2 weeks duration.

### Clinical Pointers:

History is of paramount importance in the evaluation of chronic cough. The history examination undertaken needs to include an evaluation of symptoms and signs suggestive of an underlying respiratory or systemic disease (termed 'specific pointers') [27]. The following pointers such as nature of cough and sputum (wet/moist or dry), timing of cough, onset and progression, family history, social history and environmental history, response to previous medications, and where it tickles before cough can help the clinicians in the diagnosis of chronic cough. To recognize the comorbidities of chronic cough like, snoring, mouth breathing, hyperhydrosis and bruxism clinician should ask with leading questions.

### Recommendation of ADEX NEXT Panel:

- Recommendations for important pointers in history are tabulated in (Table 2).
- The differentiation of three distinct cough patterns (i) acute cough with delayed recovery, (ii) recurrent acute cough, and (iii) persistent, non-remitting cough is recommended (Figure 1).

### Physical Examination

The physical examination of ear, nose, throat (ENT), face, chest and neck helps in the diagnosis along with clinical features and associated features like clubbing, growth problem, hyperhydrosis and tickling area of while coughing suggest the line of therapy [27] (Figure 2).

### Recommendation of ADEX NEXT Panel:

- Physical examination of chronic cough should focus on the upper and lower airways.
- It is recommended that the examination of clinical features associated with cough such as respiratory sound and site of pathology is important (Table 3).

- It is recommended to look for 'red flag signs' which require early investigation such as neonatal onset, sudden onset cough, dry cough which disturbs sleep, daily moist or productive cough, feeding difficulties, choking, drooling, failure to thrive (FTT), history of recurrent pneumonia, chest pain, chronic/ exertion dyspnea, hemoptysis, persistent voice change, digital clubbing, auscultatory findings (cardiovascular and respiratory system), abnormal chest X-ray, hypoxia ( $\text{SaO}_2 < 92\%$ ) and cyanosis.
- Associated features with cough should also be evaluated such as snoring (42.45%), mouth breathing (43%), eye rubbing (27.5%), bruxism (17%), sleep disordered breathing (27%), laryngeal dyskinesia (3.2%) and hyperhydrosis (14%).

### Clinical Investigation

The diagnosis of chronic cough is based on the history of symptoms and supported by laboratory tests and investigations. The laboratory investigation contributes 8% for the diagnosis of chronic cough, 92% patients can be diagnosed clinically without any investigation [19].

### Recommendation of ADEX NEXT Panel

- The evaluation of a child with chronic cough should include a detailed history and physical examination. Routine and 'as needed' investigations are tabulated in (Table 4).
- An abnormal chest X-ray indicates specific chronic cough.
- Comparison of inspiration and expiration chest X-ray helps to identify fixed hyperaeration in favor of foreign body aspiration. It also gives a good overview of state of lung volumes and airway caliber. In case of an abnormal chest x-ray or any clinically suspected congenital anomalies, pediatric surgical consultation is recommended. X-ray lateral view of neck for adenoids as supportive to clinical suspicion is not recommended routinely as it does not correlate clinically and exposure to radiation should be considered in children.

Pulmonary functions (Peak Expiratory flow and Spirometry) is recommended to detect the presence or absence of airflow obstruction as well as the potential reversibility of obstruction following the administration of bronchodilators. A positive response to medication indicates asthma. It is recommended that spirometry should be done by a technician proficient in children testing.

Bronchoscopy is recommended when foreign body is suspected by history or chest X-ray. It is beneficial in the evaluation of anatomical abnormality suggested by examination or imaging, chronic suppurative lung disease, or bronchiectasis. It yields low diagnostic value.

### Causes of Chronic Cough

The causes of the chronic cough are divided into two types (i.e., central and peripheral). Central can be due to anxiety or psychologic stress. The peripheral causes can be pulmonary or non-pulmonary. The pulmonary causes includes pathology of upper, lower respiratory tract and pleura. The non-pulmonary causes includes cardiac problems, gastroesophageal reflux problems, drugs (ACE inhibitors, beta blockers) and from extra pulmonary cough receptors, present at external ear, tympanic membrane, Paranasal sinuses, diaphragm pericardium, parietal pleura.

### Recommendation of ADEX NEXT Panel

- The common cause of persistent cough includes allergic rhinitis syndrome (ARS) (70.25%), asthma (45.28%), asthma+ARS (12.27%), pertussis syndrome (2.8%), bronchiectasis (2.8%), somatic cough (Psychogenic) (2.8%) and protracted bacterial bronchitis (PBB) (0.65%).
- ARS is the leading cause of persistent cough in children. The treatment of ARS is recommended with great attention.
- Asthma is the second most common cause of chronic cough. It is recommended that asthma must be managed or treated aggressively so that the child is symptom free.

- A behavioral medicine consultation is recommended to stifle the somatic cough (psychogenic cough).
- ADEX NEXT panel has also responded to recommendations of CHEST-2015-18 in somatic and tic cough (Table 5).
- In wet cough with no other red flag sign, protracted bacterial bronchitis should be considered.

### **Chronic Cough Management:**

The management of chronic cough first requires an accurate underlying diagnosis and then applying appropriate treatment for that condition [18]. Most of the evidence about the management of chronic cough is taken from case series; which suggests that isolated chronic cough is usually due to asthma, and upper airway problems in children. [28]. The use of suitable cough pathways or algorithms is one of the best approaches that has the ability to reduce the morbidity of chronic cough, unnecessary costs and adverse effects from medications used.

### **Recommendation of ADEX NEXT Panel**

- Antitussives are a pertinent choice for the treatment of chronic cough.
- Cough suppressants are not recommended in wet cough.
- The use of central antitussives is recommended in early onset stage of whooping cough, hemoptysis and post-surgery, dry cough with sleep disturbance and pain.
- Opioid central anti-tussives are generally not recommended due to more side effects and cause dependence. Dextromethorphan is the preferred central antitussive due to lack of constipation, CNS depression and dependence.
- It is recommended to avoid the use of codeine in children with chronic cough because it depresses respiratory centre, decreases ciliary activity, increases bronchospasm, and causes dependence

and constipation. The use of dextromethorphan is not recommended in asthma due to propensity for histamine release.

- Bronchodilators (β<sub>2</sub> agonists) are highly recommended in children with wet cough. These increase the ciliary activity, mucus clearance and also increase expiratory flow.
- The use of peripheral antitussives-levodropropizine is recommended in non-productive cough.
- The use of first generation (e.g. Diphenhydramine hydrochloride) and some 2nd generation (Cetirizine, levocetirizine, 30% cross the blood brain barrier) antihistamines is recommended due to their central antitussive action.
- The use of mucolytic and expectorants can be used as facilitates mucus clearance (short-term relief of symptoms) and expulsion of bronchial secretions respectively.
- It is recommended to educate the parents on nonpharmacological options that are available for management of symptoms like honey in nonspecific dry cough, which act as musilage to cover exposed cough receptors in the pharynx, warm water for decreasing gustatory reflex, and vapourub in cough with cold for symptomatic relief to children and their parents to have a more restful night.
- Oxidative stress from air pollution and infections producers airway inflammation can be reduced by the use of antioxidants and probiotics such as (fruits and vegetables, butter, curds, fish, pickles (limited), oils rich in Omega 3 FA - (Fish oil /Flaxseed oil), traditional food) are highly recommended in children with chronic cough. Wine has antioxidant but not recommended for children.
- It is recommended to avoid spicy food, carbonated drinks and fast food, and food with high salt content in allergic cough.
- The use of antimicrobial therapy [Amoxycillin

+ Clavulanic acid, Macrolides (Azithromycin) is recommended if secondary bacterial infections are suspected.

- Postnasal drip syndrome is the main cause of chronic cough. The treatment with ideal combination (Antihistamine + Decongestant) is recommended. If there is no improvement in the condition of the patient after one week then other options (Nasal steroid, cromolyn, ipratropium bromide) are recommended.

- For Cough Variant Asthma, initially the use of bronchodilators ( $\beta_2$ -agonist) for one week is suggested. If the patient does not improve, controllers like inhaled corticosteroids (ICS) or montelukast are added to be followed after a week to assess the response.

- For steroid induced cough from fungal airway infection accompanied by dysphonia alternatively inhaled steroid can be used in higher doses along with specific antibiotics.

- For post viral upper respiratory infection (URI), self-management for less than three weeks is recommended, by which time cough reflex hypersensitivity reaches baseline.

- For lower respiratory tract infection (LRI), supportive antibiotics (macrolides, chloromycetin) are recommended,

- PBB can be similar to asthma. It also does not usually respond to bronchodilators, and auscultation typically reveals a rattling sound reflective of airway secretions (rhonchi) rather than true wheezing. The  $\beta$  lactam antibiotics are recommended.

- For the treatment of tuberculosis, antituberculosis therapy (ATT) is recommended.

- There are no clinically practical definitive diagnostic tests available for sinusitis, so it is difficult to define that the true incidence of chronic bacterial sinusitis as a cause of chronic cough in children. Thus, the use of antibiotics (Amoxicillin, cefuroxime, cefpodoxime), second generation oral

antihistamines for 14-21 days and nasal decongestant (Oxymeta-zoline) is recommended in selected patients with symptoms suggestive of bacterial sinusitis.

- Chest physiotherapy and postural drainage, use of bronchodilators and mucolytic agents are recommended initially for the management of bronchiectasis. Routinely, the use of antibiotics (Amoxiclav and azithromycin) is suggested during exacerbations.

- If the underlying cause of bronchiectasis is CF, then anti-pseudomonal coverage is recommended.

- If congenital anomalies (Laryngotracheomalacia, tracheoesophageal fistula (TEF) H-type, laryngeal cleft, cleft palate, aberrant vessels, bronchogenic cyst, pulmonary sequestration, swallowing muscle discordance, congenital heart disease) are the cause of chronic cough, then treatment as per the cause followed by surgery is recommended.

- GERD (Gastroesophageal Reflux Disease) is one of the common causes of chronic cough in adults in comparison to children. The proton pump inhibitors (PPI), metoclopramide, H<sub>2</sub>-receptor antagonists are recommended.

- Reassurance, counseling, behavioral and suggestion therapy is recommended for the treatment of somatic and tic cough.

- Removal of excessive cerumen or cholesteatoma in the external ear is recommended in irritation of auditory cough receptors.

- For the treatment of drug induced chronic cough, it is recommended to discontinue the drug.

- If cough occurs due to inhaled allergens/irritants such as passive smoking, formal-dehyde, volatile organic compounds (VOC), it is recommended to avoid the child's exposure from potential allergens/irritants with proper environment control.

- The use of chronic cough-Algorithm is recommended (Figure 3).

### Key Messages

- Chronic cough is a major psycho-socio-economic health burden
- Systematic clinical evaluation including environmental history with basic test can contribute 92% in the diagnosis
- Special test are needed in 8% of the children with red flag signs
- Have a high index of suspicion on cough started in early infancy for congenital anomalies
- Always consider foreign body aspiration in children with sudden onset of cough while playing or eating despite absent history
- Always hear the sound of cough - active or passive (by tickling the trachea) to locate the site of pathology. By the sound only, one can diagnose whooping cough, croupy cough and somatic cough.
- Tussiphonography shows a biphasic pattern for normal cough -first diamond when vocal cords are opened, and second when vocal cord closes. Various other vibrations in between can help to diagnose other causes depending on the location and intensity of vibrations. Second diamond is significantly absent in somatic cough, Laryngectomy and Laryngeal paralysis (Table 5)
- New terms- Somatic (psychogenic) Tic (Habit) cough accepted while keeping the time tested clinical clues
- Allergic airway diseases are the major cause for chronic cough. Upper airway allergy has seen to have superseded lower airway allergy over last 18 years
- Central cough suppressants are contraindicated in wet cough and recommended in dry cough with disturbed sleep, early stage of pertussis, hemoptysis, certain surgeries with stitches and painful cough

- Evidence based medicine is always complimentary to our experience and expertise

- Art of medicine should not be sacrificed at the altar of technology

- Always encourage environmental control to minimize the irritants of cough receptors

- Traditional food habits with more of fruits and vegetables should be encouraged

### Conclusion:

The objective of this module meets our need based on socio-economic determinants of our health care resources. Most aspects of chronic cough have been reviewed that will help in better understanding and management of the chronic cough by the primary health care providers for children and the public health officials. It is expected that this module serves as a basis for treatment and management of the chronic cough for primary care providers in children. It is advised that the judgment of the management should be based on the diagnostic and treatment choices available as well as on social determinants like acceptability, availability, affordability and accountability.

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**Table 1: When to Call Chronic Cough**
**21st Century**

> 8wk	(BTS)
> 4wk	(ACCP)
> 4wk	(Australia, New Zealand)
> 3wk	(Belgium)
> 2wk	(AAAAI, EAACI)
> 2wk	(IAP, ADEX, ARCTM, RNTCP)

**BTS:** British Thoracic Society, **ACCP:** The American College of Chest Physicians

**AAAAI:** The American Academy of Allergy, Asthma and Immunology

**EAACI:** European Academy of Allergy and Clinical Immunology

**IAP:** Indian Academy of Pediatrics

**ADEX:** Airway Diseases Education and Expertise

**ARCTM:** Allergic Rhinitis and Co-morbidities Training Module

**RNTCP:** Revised National Tuberculosis Control Program

**Table 2: Clinical Pointers in History**

Dry Cough (Upper airway)	Nature of Cough and Sputum	
	Wet cough (Lower airway)	SPUTUM
<p><b>Throat clearing cough (Hacking/Heckling):</b> Upper airway cough syndrome (Post nasal drip), sinusitis, post viral -Tic (habit) cough - Low Humidity, mouth breathing</p> <p><b>Barking type:</b> Laryngeal (croup syndrome )</p> <p><b>Brassy type:</b> Kak, Kak, Kak - Tracheal</p> <p><b>Honking:</b> Somatic (Psychogenic) <b>Staccato:</b> Chlamydia, Mycoplasma</p>	<ul style="list-style-type: none"> <li>● <b>Paroxysmal</b> no breathing in-between)</li> <li>● Foreign body</li> <li>● Pertussis syndrome</li> <li>● Bronchiolitis</li> <li>● Asthma</li> <li>● Cystic fibrosis</li> <li>● Fungal infections</li> </ul>	<p><b>White sticky/tenacious:</b> Asthma</p> <p><b>Purulent:</b> -aggravates at the beginning of the day - Suppurative lung diseases, Cystic fibrosis with infection</p> <p><b>Bloody:</b> Foreign body, Bronchiectasis, Endobronchial TB, Hemosiderosis</p>

Timing of Cough	
Timing	Type
<ul style="list-style-type: none"> <li>● First hour after meals</li> <li>● Early morning productive cough</li> <li>● Nocturnal: <ul style="list-style-type: none"> <li>◆ Soon after child starts sleeping,</li> <li>◆ Mid night,</li> <li>◆ Late night or early morning,</li> <li>◆ Absent during sleep</li> </ul> </li> <li>● Soon after playing or exercise</li> <li>● Eating cold or spicy</li> <li>● Related to feeding</li> </ul>	<ul style="list-style-type: none"> <li>● Gastroesophageal reflux</li> <li>● Suppurative lung disease</li> <li>◆ Post nasal drip syndrome; sinusitis</li> <li>◆ GERD</li> <li>◆ Asthma</li> <li>◆ Somatic cough, tic cough</li> <li>● Exercise induced asthma</li> <li>● Gustatory reflex (Glosso pharyngeal nerve)</li> <li>● Pharyngeal incoordination (If children swallow &gt;150ml quickly - pharyngeal muscle fatigue causing pharyngeal incoordination - leads to cough even with no aspiration)</li> </ul>

### Onset and Progression of Cough

Type of activity	Complication
<ul style="list-style-type: none"> <li>● Sudden onset while running, laughing, crying</li> <li>● Cough which started with choking spell while eating or playing</li> <li>● Tic (habit) and Somatic (psychogenic) cough</li> <li>● Fever with cold followed by persistent cough and wheeze</li> <li>● Itching of nose, persistent cough, bruxism, blocked nose and rubbing of eyes</li> </ul>	<ul style="list-style-type: none"> <li>● Exercise induced asthma</li> <li>● Foreign body aspiration</li> <li>● Dry honking cough which ceases when patient's attention is distracted</li> <li>● Post Viral RAD</li> <li>● Viral induced asthma phenotype</li> <li>● Cough variant allergic rhinitis</li> <li>● Post nasal drip</li> <li>● Sinusitis</li> </ul>

### Family History

Factors to be consider	Explanation
<ul style="list-style-type: none"> <li>● Allergic symptoms</li> <li>● Consanguinous marriage</li> <li>● Current persistent illnesses in family members or close contacts</li> <li>● Possibility of HIV</li> <li>● History of Smoking usage among family members</li> </ul>	<ul style="list-style-type: none"> <li>● Atopic dermatitis,</li> <li>● Allergic rhinitis,</li> <li>● Asthma in parents or siblings</li> <li>● Cystic Fibrosis</li> <li>● To elucidate any suggestion of contact with a Tuberculosis case</li> <li>● Transmission from mother to child should be assessed</li> <li>● Medications effectivity reduced if exposed to environmental tobacco smoke (ETS)</li> </ul>

### Environmental / Social History

- Exposure to tobacco Smoke (ETS)
- Proximity to factories, busy towns (Automobile Emission), brick kilns
- Inadequate ventilation in home/ class rooms

Outdoor / Indoor Aeroallergens	Outdoor /Indoor Irritants
<ul style="list-style-type: none"> <li>● House Dust Mites</li> <li>● Pollens (Increase in temperature, low humidity)</li> <li>● Fungi (Decrease in temperature high humidity, Thunder storm)</li> <li>● Cockroach</li> <li>● Pet danders</li> </ul>	<ul style="list-style-type: none"> <li>● Smoke (Tobacco- ETS, Mosquito coil, Cooking fuel)</li> <li>● "Volatile organic compounds and for maldehyde (Modern furniture, carpets, draperies)</li> <li>● Cold dry air</li> <li>● Early morning Haze (from S.P.M)</li> <li>● Midday Haze (Ozone)</li> </ul>

### Response to Previous Medications

Medication	Response	Condition
<ul style="list-style-type: none"> <li>● Bronchodilators</li> <li>● Anti-histamines</li> <li>● Steroids</li> <li>● Antibiotics</li> <li>● ACE inhibitors</li> <li>● (Anti-hypertensive)</li> <li>● Suggestion therapy</li> </ul>	<ul style="list-style-type: none"> <li>● Improved</li> <li>● Improved</li> <li>● Improved</li> <li>● Improved</li> <li>● Exaggerated</li> <li>● Improved</li> </ul>	<ul style="list-style-type: none"> <li>● Cough variant asthma, RAD</li> <li>● Allergic rhinitis with post nasal drip</li> <li>● Asthma, Inflammatory lung disorders</li> <li>● Bronchitis, Sinusitis</li> <li>● Dry nocturnal cough at supine position</li> <li>● Psychogenic cough</li> </ul>

**Where Does it Tickle Before Cough**

Cough variant AR	Cough variant Asthma
<ul style="list-style-type: none"> <li>● Tickles in supraglottic (back of throat) area</li> <li>● Occurs as soon as they lie down and go to bed</li> <li>● Usually dry in nature-often with laryngeal component</li> <li>● Responds to Antihistamines (with runny nose)</li> <li>● Tickles in supraglottic (back of throat) area</li> </ul>	<ul style="list-style-type: none"> <li>● Tickles in infraglottic suprasternal area</li> <li>● Occurs early morning 3-5 AM</li> <li>● Usually wet in nature</li> <li>● Responds to Bronchodilators</li> <li>● Tickles in infraglottic suprasternal area</li> </ul>

**TB:** Tuberculosis

**GERD:** Gastroesophageal Reflux Disease

**RAD:** Reactive Airway Disease

**AR:** Allergic Rhinitis

**Table 3: Specific Cough with Associated Clinical Features of Respiratory Tract and Localization**

Respiratory sounds	Site of Pathology
<ul style="list-style-type: none"> <li>● Inspiratory Stridor</li> <li>● Snore</li> <li>● Snuffle / Snort</li> <li>● Wheeze</li> <li>● Rattle</li> <li>● Grunting</li> </ul>	<ul style="list-style-type: none"> <li>● Extrathoracic Airway</li> <li>● Oropharyngeal</li> <li>● Nasal / Nasopharyngeal</li> <li>● Intrathoracic Airway</li> <li>● Either intra / extra thoracic / combined</li> <li>● Parenchymal</li> </ul>

**Routine Tests**

**Special Tests**

**Table 4: Clinical Investigation**

<ul style="list-style-type: none"> <li>● CBC (Complete Blood Count)</li> <li>● ESR (Erythrocyte Sedimentation Rate)</li> <li>● AEC (Absolute eosinophil count - blood DLC eosinophil% maybe adequate)</li> <li>● Nasal smear and sputum for Eosinophilia</li> <li>● X-ray CHEST (25% predictive value)</li> <li>● Mantoux test for TB</li> </ul>	<ul style="list-style-type: none"> <li>● X-ray PNS</li> <li>● P.F.T/Spirometry and Bronchodilators</li> <li>● Allergy Testing (SPT/Immunoassays)</li> <li>● Exhaled Breath NO Test</li> <li>● Chest and Sinus CT (in complicated cases)</li> <li>● Esophageal PH Impedance Monitoring</li> <li>● Barium swallow</li> <li>● Lung Biopsy</li> <li>● Cold Agglutination test</li> <li>● Chest and Sinus CT (in complicated cases)</li> <li>● Sweat test, Saccharin test</li> <li>● Rare: Nasal endoscopy, Methacoline challenge, Immunoglobulins</li> </ul>
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**DLC:** Differential Blood Count

**TB:** Tuberculosis

**PNS:** Paranasal Sinus

**PFT:** Pulmonary Function Test

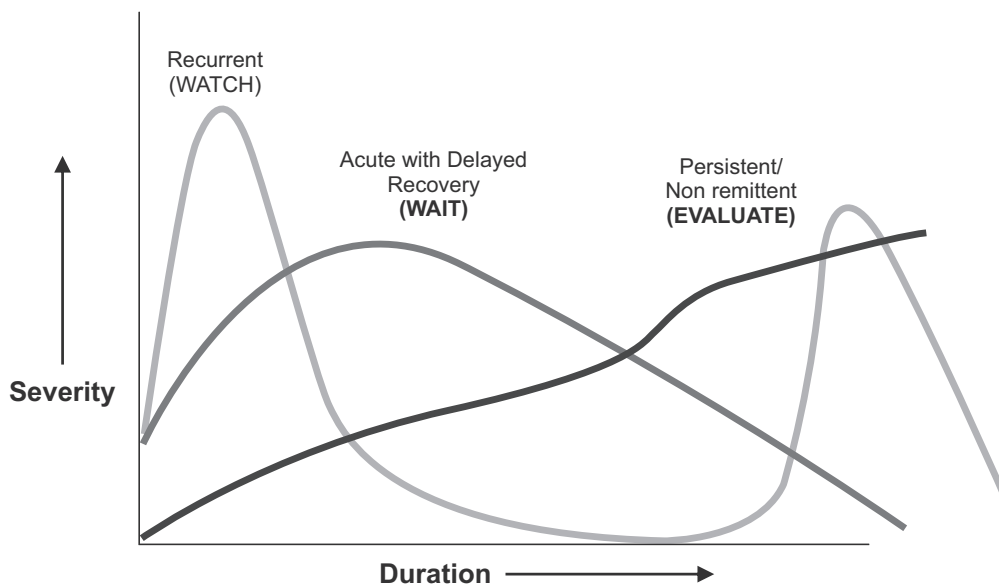
**SPT:** Skin Prick Test

**CT:** Computerized Tomography

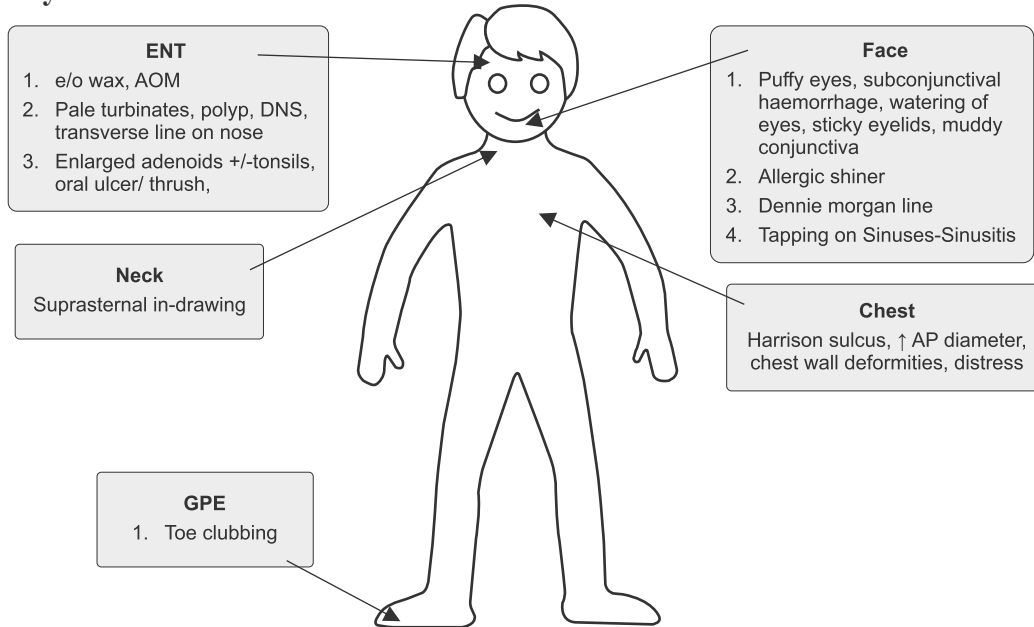
**Table 5: Recommendation of CHEST-2015-2018**

Recommendation	Our Response
<ul style="list-style-type: none"> <li>● Use somatic (Psychogenic) cough, Tic (Habit) cough from July 2018</li> <li>● Diagnosis only after                             <ul style="list-style-type: none"> <li>◆ Exclusion of other diseases</li> <li>◆ Improvement after behaviour changes</li> </ul> </li> <li>● Anxiety, Depression is the result of chronic cough not the cause</li> <li>● Characteristics of cough- Honking type, Absent at night should not be used in clinical diagnosis Described 2000 years ago</li> </ul>	<ul style="list-style-type: none"> <li>● We do agree and can understand the stigma of psychogenic</li> <li>● Unnecessary cost escalation                             <ul style="list-style-type: none"> <li>◆ Art of the practice of medicine cannot be put aside by the altar of technology</li> <li>◆ Why not try behaviour modification before investigations</li> </ul> </li> <li>● Anxiety, Depression can be the cause of somatic cough or the result (vice versa)</li> <li>● These are time tested clinical clues.</li> <li>● What are the new clinical clues?</li> <li>● Tussiphonograph has distinct features with absent second diamond</li> </ul>

**Figure 1: Pattern of Presentation**



**Figure 2: Physical Examination**



**Figure 3: Approach to Persistent Cough in Children – Algorithm**

