IAP Karnataka

PEDIATRIC CLINICAL EXCELLENCE

A structured learning initiative to strengthen diagnosis, management & outcomes in pediatric practice

Module 1

Foundations of Pediatric Cough

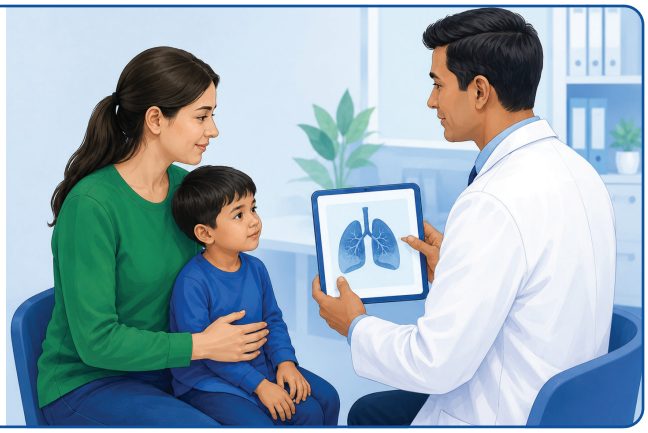
Evaluation, Assessment & Guideline-Based Management

Contents

Module Overview

Module Description

Develop a systematic approach to evaluating pediatric cough by understanding cough mechanisms, recognizing diverse clinical presentations, implementing infection prevention strategies, and applying evidence-based guideline recommendations to support accurate diagnosis and appropriate management.



Learning Objectives

On completing this module, the participant will be able to:

1. **Describe** the epidemiology, pathophysiology, and classification of pediatric cough.
2. **Perform** a systematic clinical assessment and identify red flags requiring further evaluation or referral.
3. **Differentiate** common causes of pediatric cough using a phenotype-based diagnostic approach.
4. **Implement** infection prevention and antimicrobial stewardship principles in pediatric practice.
5. **Apply** evidence-based principles to the evaluation and management through case-based discussion.

CHAPTER 1 Understanding Pediatric Cough

1.1 Burden and Epidemiology

Cough is among the most frequent clinical presentations in children prompting visits to pediatricians, with a symptom burden that extends well beyond the consultation room. The table below consolidates the key epidemiological markers.

Indicator	Finding	Source
Prevalence in preschoolers	~35% report cough at any given time in a month	[1]
Chronic cough — India	~1% of pediatric population	[1]
Chronic cough — Eastern Europe	~9%	[1]
Chronic cough — China	5–12%, higher in polluted areas	[1]
COVID-19 impact	Noticeable rise in health-seeking behavior for chronic cough	[4]
Commonest cause (acute)	Viral upper respiratory tract infection	[2][4]

Table 1. Key Epidemiological Markers of Pediatric Cough

Coughing significantly affects a child's sleep, daily activity, and school attendance while generating considerable caregiver distress; prompt evaluation and management of chronic cough can substantially improve quality of life and reduce parental burden.[4]

1.2 Physiology of the Cough Reflex

Cough is an inherent physiological reflex characterized by forceful exhalation that clears airway secretions and foreign substances while mitigating bronchospasm. Children are not miniature

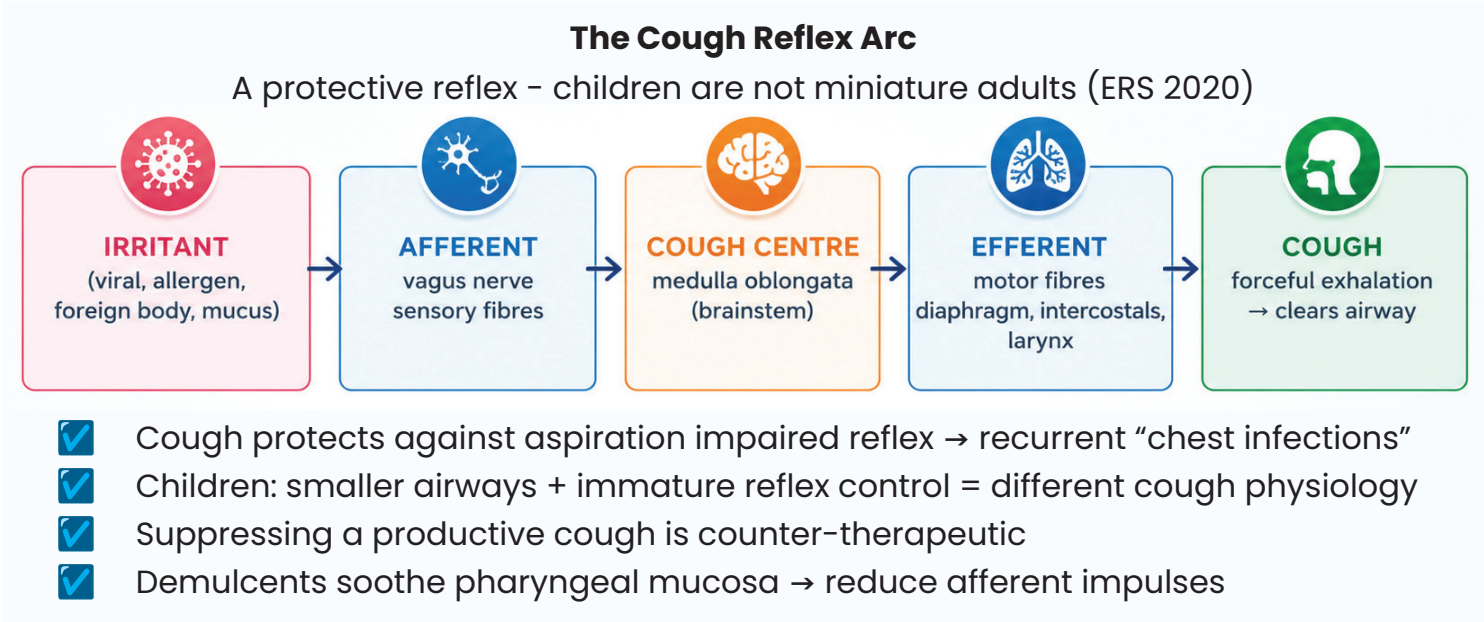


Figure 1. The cough reflex arc and key pediatric clinical pearls.

Sources: IAP 2022 ERS 2020 ADEX 2.0

adults — maturation-related differences in airway structure, respiratory muscles, chest wall composition, and reflex control all shape pediatric cough physiology.[1][4]

1.3 Pathophysiology of Cough and Mucus Clearance

Three pathophysiologic mechanisms drive most pediatric cough presentations. Recognition of these pathways is essential because phenotype-directed therapy requires matching the drug class to the dominant mechanism.

Mechanism	What Happens	Targeted Therapy	Source
Mucus hypersecretion	Chronic irritation → mucus overwhelms mucociliary clearance → plugs → vicious cycle	Mucoactive agents (ambroxol, guaifenesin, acetylcysteine)	[4]
Bronchospasm	Smooth muscle constriction of small airways → airflow limitation + stretch receptor activation	Bronchodilators (salbutamol, levosalbutamol, terbutaline)	[4]
Pharyngeal irritation	Inflamed mucosa → heightened afferent impulses to cough centre	Demulcents; antitussives for dry cough	[3]

Table 2. Pathophysiologic Mechanisms and Targeted Therapies

Clinical Pearl

Suppressing a productive cough is counter-therapeutic — antitussives must NOT be used when mucus is being expelled, as cough in that setting serves the vital purpose of clearing the airway

1.4 Classification of Cough

Cough is classified by duration and by acoustic character. Standardized classification across these temporal categories allows clinicians to triage children efficiently.

Category	Duration	Typical Cause	Initial Action
Acute	< 3 weeks	Viral URTI (rhinovirus, RSV, adenovirus, etc.)	Reassure; self-care; safety-net
Prolonged acute	3–8 weeks	Post-viral; evolving chronic etiology	Continue observation; re-evaluate
Chronic	> 4 weeks (ERS) / > 3 weeks (IAP)	Asthma, PBB, post-infectious, foreign body, TB, CF	Full pediatric chronic cough protocol

Table 3. Temporal Classification of Pediatric Cough

Note: IAP adopts a slightly shorter chronic threshold (>3 weeks) on the rationale that most acute respiratory illnesses settle within a week and persistence beyond three weeks warrants a change in diagnostic thinking. The ERS threshold of four weeks is the more widely adopted international standard.[1][3]

1.5 Wet versus Dry Cough

The distinction between wet and dry cough is fundamental to pediatric assessment because it localizes pathology and directs therapy. Parents frequently misinterpret noisy breathing or vibratory chest sensations as "cold and cough," so the clinician must first confirm what the caregiver means.[3]

Feature	Dry Cough	Wet Cough
Anatomic site	Upper airway	Lower airway
Common causes	Viral pharyngitis, postnasal drip, allergic, habit/tic, ACE-inhibitor	Bronchitis, PBB, bronchiectasis, CF, aspiration, foreign body
Auscultation	Usually clear; may have upper airway sounds	Noisy chest; crackles may be present
Sputum culture	Not indicated	Should be attempted (ERS)
Antitussive role	Preferred when QoL affected	CONTRAINDICATED — cough clears airway
First-line therapy	Demulcents, antitussive if > 4 yr	Antibiotic trial if > 4 wk; treat underlying cause

Table 4. Wet versus Dry Cough — Clinical Differentiation

1.6 Specific versus Non-specific Cough

Paediatric chronic cough is best considered as a symptom of an underlying disease. The diagnostic task is to distinguish specific cough — associated with pointers to an identifiable cause — from non-specific cough, in which no specific pointers are detected.[1]

NON-SPECIFIC COUGH	SPECIFIC COUGH
☑ No specific pointers detected	☒ Specific cough pointers present (see Ch 2)
☑ Normal CXR and spirometry	☒ Investigate + refer
☑ Observe up to 4 more weeks	☒ Identifiable underlying cause
☑ Reassure; safety-net	☒ Cause-specific treatment

1.7 Common Etiologies Across Age Groups

The etiologic spectrum of pediatric cough varies substantially with age. Sudden onset cough in an otherwise healthy preschool child should raise concern for foreign body aspiration and warrants bronchoscopy.[1]

Age Group	Common Causes	Watch For
Early infancy (< 6 mo)	Congenital heart disease, aspiration (malformations, GERD), cystic fibrosis	Cough is uncommon — proactively rule out serious illness
Infants & toddlers	Viral URTI/bronchiolitis, foreign body, pertussis	Sudden onset → foreign body
Preschool (2–5 yr)	Viral URTI, reactive airway disease, adenoiditis, PBB	Persistent wet cough > 4 wk → PBB

Age Group	Common Causes	Watch For
School-age (6–12 yr)	Asthma, post-infectious, allergic, habit/tic cough	Atopy history; nocturnal pattern
Adolescents	Asthma, GERD, ACE-inhibitor, somatic cough	Medication history; psychosocial factors

Table 5. Age-Stratified Etiologies of Pediatric Cough

Protracted Bacterial Bronchitis (PBB) — Defining Criteria

PBB is defined by the ERS statement by the presence of all three criteria below; PBB may be a precursor of bronchiectasis and warrants timely recognition.[1]

1. **Continuous chronic wet/productive cough** — > 4 weeks' duration
2. **Absence of specific cough pointers** — No red flags suggesting other cause
3. **Resolution with antibiotics** — Cough resolves following 2–4 week course of appropriate oral antibiotic

1.8 Clinical Impact on Children and Caregivers

The etiologic spectrum of pediatric cough varies substantially with age. Sudden onset cough in an otherwise healthy preschool child should raise concern for foreign body aspiration and warrants bronchoscopy.[1]

Why it Matters

Children with persistent cough experience disrupted sleep, reduced activity, and impaired school performance.
Parents report concern about serious illness, exhaustion, sleep disruption, social embarrassment, and annoyance to family.
Individuals report on average EIGHT adverse symptoms associated with chronic cough.
Prompt diagnosis and cause-specific treatment enhance quality of life, reduce parental stress, and minimize financial burden of recurrent consultations.

CHAPTER 2 Clinical Assessment and Diagnostic Approach

2.1 Structured History Taking

A structured history remains the cornerstone of pediatric cough evaluation, frequently yielding a provisional diagnosis that targeted examination can confirm. The IAP guideline provides a structured set of questions that translate symptom patterns into diagnostic hypotheses.[3]

Question	If YES → Suggests
Is cough the predominant symptom?	Airway disease
Is it dry or wet?	Dry → upper airway; Wet → lower airway
Past history of recurrent cough?	Reactive airway disease
Personal / family history of atopy?	Atopic disease (asthma, allergic rhinitis)
Worse soon after lying down?	Postnasal drip
Worse late night / early morning?	Reactive airway disease
Sudden onset?	Inhaled foreign body (especially toddlers)
Onset over a few hours?	Reactive airway disease
Recurrent episodic?	Asthma
Progressively worsening?	Pertussis, mediastinal mass
High fever then cold/cough?	Viral infection
Cold/cough then high fever?	Viral infection (prodrome + flare)

Table 6. IAP Structured History — Questions and Diagnostic Interpretation

2.2 Focused Physical Examination

Physical examination should be anatomically informed, correlating symptom and sign clusters with likely sites of pathology. The IAP anatomical localization framework is summarized below. [3]

Sign	Airway	Parenchyma	Pleura	Interstitium	Heart
Cough	+	+	+	+/-	+
Fever	+/-	+	+	+	+/-
Breathlessness	+/-	+	+	+	+/-
Chest pain	-	+/-	+	+	-
Distribution	Generalized	Localized	Localized	Generalized	Gen/Loc

Sign	Airway	Parenchyma	Pleura	Interstitium	Heart
Audible sound	Stridor / wheeze	Grunt	-	-	-
Retractions	Suprasternal/ subcostal	Intercostal	-	-	Intercostal/ subcostal

Table 7. Anatomical Localization of Respiratory Signs (IAP)

2.3 Identification of Cough Phenotypes

A phenotype-based approach (ADEX 2.0) matches management to the dominant clinical pattern rather than applying a uniform algorithm.[4]

Phenotype	Key Features	First-Line Therapy
Acute viral URTI	Acute (< 3 wk), preceding URTI, dry→productive	Reassurance; self-care
Chronic wet cough (no pointers)	> 4 wk wet, normal CXR/spirometry	2-week antibiotic trial (amoxicillin-clavulanate)
Chronic wet cough (with pointers)	Wet + feeding difficulty / clubbing / etc.	Investigate (bronchoscopy, CT) + refer
Dry cough affecting QoL	Dry, persistent, sleep disruption	Antitussive (age-restricted);
Wet bronchospastic cough	Wet + wheeze	Bronchodilator ± mucoactive
Allergic cough	Atopy, postnasal drip, sneezing	Second-generation antihistamine
Asthmatic cough	Recurrent, nocturnal, atopy, reversibility	Inhaled bronchodilator + ICS

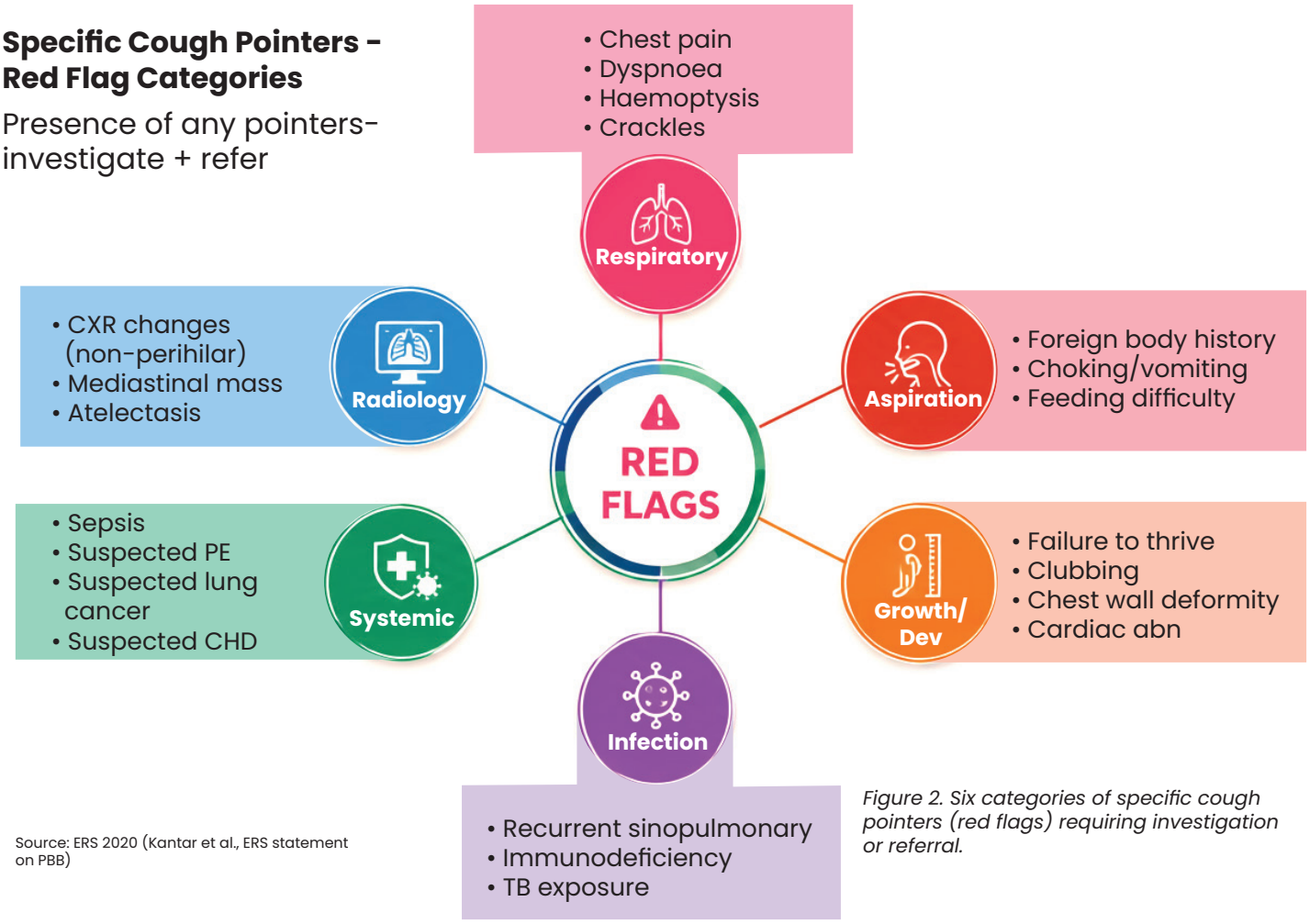
Table 8. Pediatric Cough Phenotypes and First-Line Therapy

2.4 Red Flag Symptoms and Signs

Identification of red flags — termed specific cough pointers in the ERS guideline — is the single most important step in stratifying risk. The presence of any pointer shifts evaluation from watchful waiting to active investigation and frequently to specialist referral.[1]

Specific Cough Pointers – Red Flag Categories

Presence of any pointers- investigate + refer



Source: ERS 2020 (Kantar et al., ERS statement on PBB)

Figure 2. Six categories of specific cough pointers (red flags) requiring investigation or referral.

Urgent Referral Triggers

NICE NG120: Refer to hospital if symptoms suggest sepsis. Reassess if symptoms worsen rapidly.

ADEX 2.0: Refer to pulmonologist if wet cough persists after 2 weeks of antibiotic therapy.

ERS 2020: Sudden onset cough in preschool child → foreign body → bronchoscopy.

IAP 2022: Persistent cough ≥ 2 weeks ± fever/weight loss → screen for tuberculosis.

2.5 Differential Diagnosis Based on Cough Characteristics

Cough Pattern	Likely Diagnoses
Wet cough	Bronchitis (viral/allergic/bacterial) · PBB · Bronchiectasis · Cystic fibrosis · Aspiration · Foreign body
Dry cough	Viral pharyngitis/URTI · Reactive airway disease · Asthma · Postnasal drip · Allergic · Habit/tic · ACE-inhibitor · Somatic cough
Nocturnal — soon after lying down	Postnasal drip

Cough Pattern	Likely Diagnoses
Nocturnal — late night/early morning	Reactive airway disease
Sudden onset (toddler)	Foreign body
Recurrent episodic	Asthma
Progressively worsening	Pertussis · mediastinal mass

Table 9. Pattern-Based Differential Diagnosis

2.6 Appropriate Investigations

Investigations should be selective and guided by clinical phenotype rather than applied reflexively. The table consolidates guidance from all major guidelines.

TEST	WHEN TO USE	DIAGNOSTIC YIELD	SOURCE
Complete blood count	Limited utility; chronic cough with systemic features	Eosinophilia → atopy (non-specific); leukocytosis → bacterial	[3][4]
CRP / Procalcitonin	When bacterial infection suspected	High → bacterial; low → can defer antibiotics	[4]
IgE levels	NOT reliable for diagnosing/ excluding allergic cough	Affected by pollution, steroid use — misleading	[4]
Sputum culture (If available)	Wet cough; chronic wet cough	Identifies bacterial pathogen (PBB, bronchiectasis)	[1]
Tuberculin test	NOT recommended for TB diagnosis	Use GeneXpert, AFB culture instead	[3]
Chest X-ray (Only when warranted)	Chronic cough; red flags; suspected TB/foreign body/mass	Identifies consolidation, effusion, mass, FB, TB changes	[1][3][4]
Spirometry (Only when warranted)	Chronic cough in cooperative children (≥ 5 yr)	Asthma (reversibility); airflow obstruction	[1][3]
CT chest	NOT routine; reserved for suspected uncommon conditions	Bronchiectasis, interstitial disease, mediastinal mass	[1][3]

Table 10. Investigations in Pediatric Cough — When and Why

2.7 Indications for Referral

Trigger	Action	Source
Symptoms suggesting sepsis	Refer to hospital immediately	[2]
Foreign body suspected (sudden onset, preschool)	Refer to pediatric pulmonologist for bronchoscopy	[1]
Wet cough persists > 2 wk after antibiotics	Refer to pediatric pulmonologist	[4]
Wet cough + specific indicators (clubbing, feeding difficulty)	Refer to pediatric pulmonologist for flexible bronchoscopy, chest CT, aspiration/immunology workup	[4]
Cough ≥ 2 wk ± fever/weight loss	Screen for tuberculosis	[3]
Symptoms worsen rapidly / significantly	Refer to pediatric pulmonologist to reassess; consider pneumonia, sepsis	[2]

Table 11. Referral Thresholds Across Guidelines

2.8 Diagnostic Algorithm for Pediatric Cough

The algorithm below represents a single practical pathway applicable in office practice.

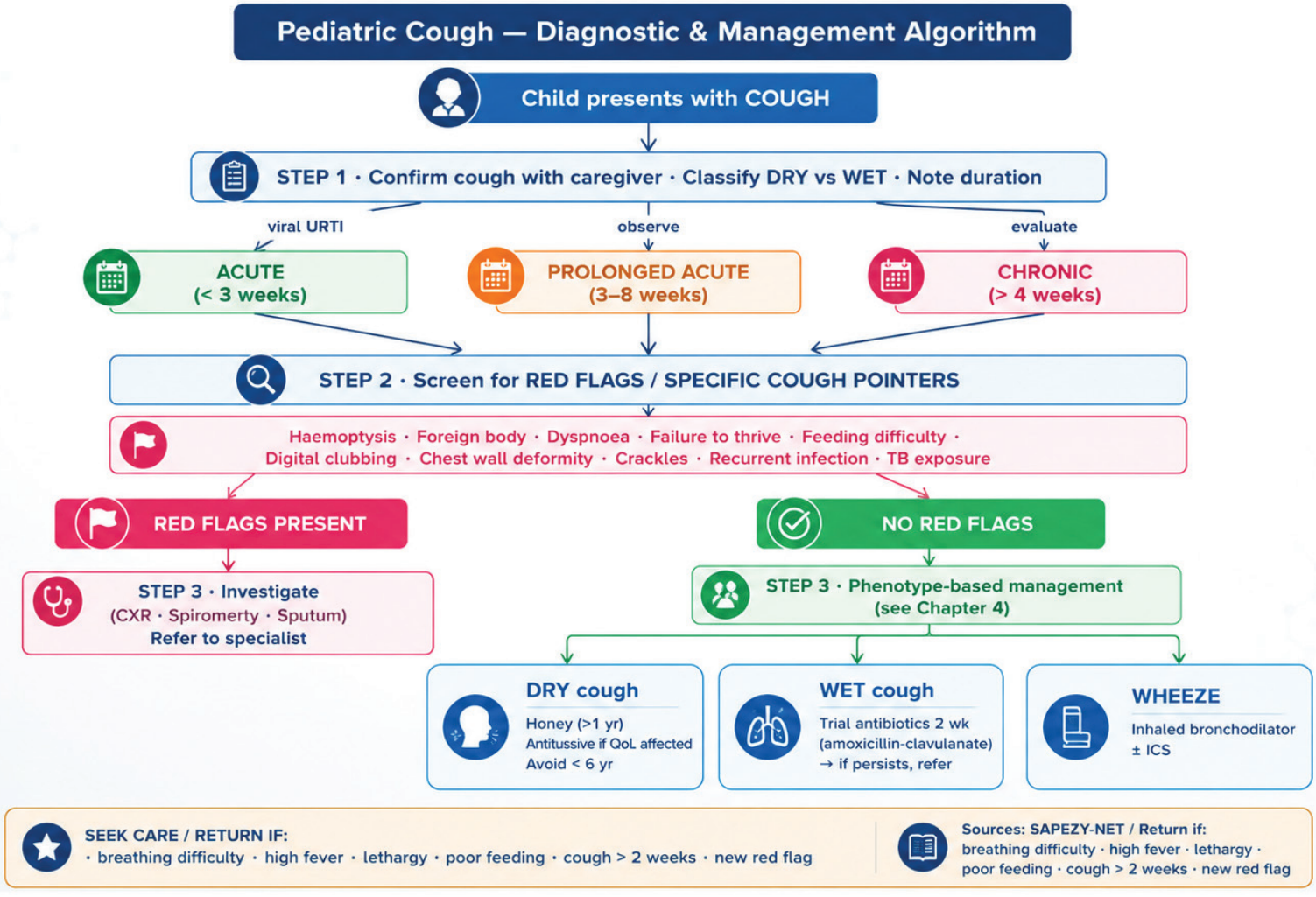


Figure 3. Pediatric cough diagnostic and management algorithm (synthesized from IAP, NICE, ERS, ADEX 2.0).

CHAPTER 3 Infection Prevention and Rational Office Practice

3.1 Respiratory Infection Transmission

Acute cough in children is most commonly caused by viral upper respiratory tract infection. The table lists the principal pathogens and transmission routes.

Pathogen	Notes
Rhinovirus	Commonest cause of common cold
Respiratory syncytial virus (RSV)	Leading cause of bronchiolitis in infants
Parainfluenza	Croup (laryngotracheobronchitis)
Adenovirus	Pharyngitis, conjunctivitis
Influenza	Seasonal; vaccine-preventable
Human metapneumovirus	Young children; similar to RSV
Coronavirus	Including SARS-CoV-2
Enterovirus	Occasionally implicated in summer

Table 12. Common Viral Pathogens in Pediatric Acute Cough

Improved parent education and awareness may reduce unnecessary antibiotic usage and thereby lower the risk of antimicrobial resistance — a principle that links infection prevention directly to antimicrobial stewardship.[4]

3.2–3.4 Clinic Hygiene, Hand Hygiene, and Environmental Cleaning

Standard precautions for respiratory infections form the operational core of clinic-based infection prevention. The following principles, derived from the IAP framework of "office practice," represent consensus good practice for pediatric clinic settings.[3]

Standard Precautions in Pediatric Office Practice

Hand hygiene before and after every patient contact (WHO 5 moments).
Respiratory/cough etiquette: masking of symptomatic patients; appropriate tissue disposal.
Environmental cleaning of high-touch surfaces (examination tables, doorknobs, waiting area seating).
Patient flow management: separate febrile children with respiratory symptoms from well-child visits, particularly infants presenting for routine immunization.
Triage at entry: identify febrile coughing children early; offer masks; expedite rooming.
Adequate ventilation in waiting and examination rooms.

3.5 Vaccination and Preventive Strategies

Vaccination against vaccine-preventable respiratory pathogens per standard practice is an integral preventive strategy. This includes the primary DTwP/DTaP series (at 6, 10, 14 weeks) and boosters (at 16–18 months and 4–6 years), followed by Tdap at 10 years and

Td/Tdap at 16–18 years to maintain pertussis immunity.[5] Annual influenza vaccination (now updated to trivalent vaccines) is recommended starting at 6 months of age, alongside pneumococcal conjugate vaccines (PCV) administered at 6, 10, and 14 weeks with a booster at 15 months.[5] Meningococcal vaccines are recommended only in special situations.[5] The ADEX 2.0 consensus emphasizes that improved parent education and awareness may reduce antibiotic usage and thereby limit antimicrobial resistance.[4]

3.6 Parent Education and Counselling

Parent education is both a therapeutic and a preventive intervention. The following table consolidates counselling pearls from NICE, IAP, and ADEX 2.0.

Topic	Message	Source
Natural history	Acute cough usually resolves in 3–4 weeks; majority of URTI cough resolves within 2 weeks	[2][3]
Self-care	Hydration; propped-up position; open ventilation; warm saline gargles	[2][3]
Red flags	Breathing difficulty, high fever, lethargy, poor feeding, cough > 2 weeks → return promptly	[2][3]
Antibiotics	Not needed for viral URTI; risks: diarrhoea, nausea, resistance	[2][4]
Cough remedies	Use cautiously; for symptom relief, NOT cure; avoid OTC in < 6 yr	[3]
Long-term conditions	Counsel on adherence for TB, asthma; proper inhaler technique	[3]

Table 13. Parent Counselling — Key Messages

3.7 Principles of Antimicrobial Stewardship

Antimicrobial stewardship is central to rational office practice. General practices as a consistent set of principles — synthesized as Do's and Don'ts below.

DON'T	DO
❌ Offer antibiotics for acute cough with URTI in children not systemically very unwell	✅ Reassure that acute viral cough resolves in 3–4 weeks
❌ Prescribe antibiotics for uncomplicated viral coughs	✅ Reserve antibiotics for bacterial pharyngitis, sinusitis, otitis, pneumonia, TB
❌ Continue antibiotics beyond 2 weeks of non-response without specialist involvement	✅ Give back-up (delayed) antibiotic prescriptions when appropriate
❌ Use codeine-containing cough medicines in children < 12 yr	✅ Monitor liver/kidney function during prolonged antibiotics
❌ Use OTC antitussives in children < 6 yr	✅ Educate parents on natural history and red flags
❌ Use systemic steroids routinely for cough	✅ Symptomatic treatment only

Note: Antibiotics make little difference to acute bronchitis symptom duration (on average shortening cough by ~half a day) and carry possible adverse effects particularly diarrhoea and nausea.[2]

3.8 Rational Prescribing in Office Practice

Rational prescribing requires matching drug class to cough phenotype, respecting age-related safety restrictions, and avoiding irrational polypharmacy.

Drug Class	Examples	Indication	Age Restriction / Safety
Antitussives	Dextromethorphan, levodropropizine	Dry cough affecting QoL	> 4 yr (IAP); not for productive cough; avoid < 6 yr OTC
Expectorants	Guaifenesin	Productive loose cough	≥ 12 yr per NICE for OTC
Mucolytics	Ambroxol, bromhexine, acetylcysteine	Bronchiectasis, CF, viscous mucus	GI irritant — give with food; age-appropriate dosing
Bronchodilators	Salbutamol, levosalbutamol, terbutaline	Wheeze/ bronchospasm only	Use with age-appropriate dosing
Antihistamines (2nd gen)	Cetirizine, loratadine	Allergic cough, postnasal drip	Not for dry cough monotherapy; caution re: dryness

Table 14. Drug Classes in Pediatric Cough — Indications and Safety Restrictions

CHAPTER 4 Case-Based Clinical Integration

Case Study · Evaluating An Acute Cough In A Preschool Child

A 4-year-old boy is brought to the clinic with a 5-day history of cough, low-grade fever, rhinorrhoea, and reduced appetite following an upper respiratory tract infection. The cough is initially dry but has become intermittently productive. He remains active, has no breathing difficulty, and is feeding adequately. Examination reveals normal oxygen saturation, mild nasal congestion, scattered upper airway sounds, and no focal chest findings. Parents are concerned about pneumonia and request antibiotics and cough medication.

The following discussion pointers apply the framework developed across Chapters 1–4 to this representative presentation.

#	Pointer	Application to Case	Source
1	Structured history & assessment	Confirm cough (vs noisy breathing). Duration 5 d → acute. Sequence: URTI prodrome then cough → viral infection. Not systemically unwell; no atopy/recurrence.	[2][3]
2	Identify cough phenotype	Acute viral URTI cough, evolving from dry to partially productive. No wheeze → not bronchospastic. No allergy features → not allergic phenotype.	[4]
3	Recognize absence of red flags	No dyspnoea, haemoptysis, failure to thrive, feeding difficulty, choking, clubbing, chest wall deformity, or crackles. SpO_2 normal. → Manage in office.	[1]
4	Differential diagnosis	Viral URTI (most likely) · Acute bronchitis · Early bacterial LRTI (less likely) · Reactive airway disease (less likely) · Pneumonia (unlikely).	[2][3]
5	Need for investigations	Diagnosis by history + exam; investigations NOT needed. CBC limited utility; CXR not indicated acutely; ERS chronic protocol not applicable.	[2][4]

#	Pointer	Application to Case	Source
6	Apply IAP / NICE / ERS	NICE: no antibiotic, no bronchodilator/ steroid/mucolytic (no asthma). IAP: supportive, home remedies, avoid OTC < 6 yr. ERS: chronic protocol N/A; no specific pointers present.	[1][2][3][4]
7	Symptomatic management & counselling	Hydration, propped-up position. Paracetamol for low-grade fever. Counsel: cough resolves within 2 wk; pneumonia unlikely given no red flags.	[2][3]
8	Antibiotic stewardship	NICE: do NOT offer antibiotic — not systemically unwell, not higher risk. ADEX 2.0 Statement 15 (100% consensus): no antibiotics for uncomplicated viral cough. IAP: supportive only. Counsel on antibiotic risks.	[2][3][4]
9	Safety-netting & follow-up	Return if: breathing difficulty, high fever, lethargy, poor feeding, cough > 2 wk, or new red flag. Routine follow-up not required if symptoms resolve as expected.	[2][3]

Key Take-Home Messages from this Case

Most acute pediatric cough is viral and self-limiting; antibiotics are rarely indicated in the absence of red flags or systemic illness.
Always look for specific cough pointers; their presence changes the management pathway entirely.
Hydration, and reassurance form the foundation of symptomatic care.
Counsel parents on natural history, red flags, and safety-netting — this is core, not optional.
Apply IAP, NICE, and ERS recommendations contextually: NICE for acute cough, ERS for chronic cough, IAP for office practice.

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Suggested Further Reading

• Bavdekar SB, Vora A, Karekar S. Pediatric cough as a symptom: Tips for management. Indian J Child Health. 2022;9(9):158–63.