

Table S1 Description of diagnostic criteria

Cause of chronic cough	Description of diagnostic criteria in our study
Eosinophilic bronchitis	Normal pulmonary ventilation function, a lack of airway hyperresponsiveness, and normal average weekly peak expiratory flow variation Sputum eosinophil count $\geq 25\%$ Cough improved after treatment with corticosteroids
Cough variant asthma	Evidence of variable airflow limitation [positive bronchial challenge test (fall in FEV1 from baseline of $\geq 20\%$ with 12.8 μmol of methacholine or with 7.8 μmol of histamine), or positive bronchodilator reversibility test (increase in FEV1 $\geq 12\%$ and 200 mL from baseline)] Cough resolved after anti-asthma treatment
Gastroesophageal reflux cough	24-h ambulatory esophageal pH monitoring or multi-channel intraluminal impedance-pH monitoring shows a DeMeester score of ≥ 12.7 and symptom association probability of $\geq 80\%$ Cough resolved or disappears after anti-reflux treatment
Upper-airway cough syndrome	History and clinical manifestations of nasal and/or throat conditions Auxiliary tests support nasal and/or throat conditions Cough improved after specific therapy targeted to upper-airway cough syndrome
Chronic bronchitis	Chronic cough and sputum production for at least 3 months per year for two consecutive years Other causes of chronic cough have been excluded Cough improved with using of mucolytic therapy and judicious using of antibiotic therapy
Bronchiectasis	Chest HRCT showed bronchial enlargement and distortion Cough improved with treatment directed at bronchiectasis
Atopic cough	Normal pulmonary ventilatory function and bronchial responsiveness Lack of sputum eosinophilia Evidence of atopy Response to corticosteroids or antihistamine treatment
Postinfectious cough	Chronic cough after common cold or acute upper respiratory tract infection Cough gradually resolved with symptomatic treatment
Obstructive sleep apnea syndrome	History of snoring, sleep disturbance at night, and excessive daytime sleepiness Positive polysomnography Cough improved with the treatment with nasal continuous positive airway pressure during sleeping
Mucous cyst of salivary gland	Chronic cough and white frothy sputum Neoplasm in root of tongue on nasopharyngoscopy Pathology revealed mucous cyst of salivary gland Cough improved with resection of the neoplasm
Laryngocarcinoma	Neoplasm in laryngopharynx with bronchoscopy/nasopharyngoscopy Pathology revealed Laryngocarcinoma Cough improved after laryngocarcinoma operation
Vocal cord dysfunction	Vocal fold narrowing (adduction) on laryngoscopy during a symptomatic episode Cough improved with speech pathology techniques designed to relieve glottal constriction during inspiration and to recognize and alter the response to precipitants
Laryngeal amyloidosis	Nasopharyngoscopy revealed the presence of a mass, arising from the right false vocal cord Pathology revealed amyloidosis Cough improved after laryngeal amyloidosis resection
Protracted bacterial bronchitis	Chronic productive cough or dry cough Normal chest HRCT Routine sputum culture for bacteria could be positive Cough improved with more than 2 weeks of antibiotic treatment
Diffuse panbronchiolitis	Symptoms, signs related with nasosinusitis Mild dilation of the bronchiolar passages and a "tree-in-bud" pattern on chest HRCT Improvement in cough after long-term therapy with macrolide antibiotics
Fungus-associated cough	Environmental fungi were positive in the cultured sputum Cough improved with antifungal drugs
Bronchial tuberculosis	Swollen mucosa, mucosal granularity, ulceration, or bronchial scarring on bronchoscopically visible lesions of trachea, main bronchi and/or upper bronchi Bronchial washings are smear-positive for acid-fast bacilli Cough improved with anti-tuberculosis treatment
Bronchial foreign body	Foreign body was found in bronchus according to bronchoscopy Cough improved after foreign body removed
Broncholithiasis	Chest HRCT showed bronchus intermedius calcified nodes Visible stones on Bronchoscopy Cough improved after endoscopic removal
Bronchial adenoid cystic carcinoma	Chest HRCT revealed thickening of right main bronchus and middle bronchial wall Neoplasm in right main bronchus was observed with bronchoscopy Biopsy pathology revealed adenoid cystic carcinoma Cough improved with operative treatment
Kartagener syndrome	History of chronic sinusitis, Bronchiectasis and situs inversus on chest CT Dextrocardia
Relapsing polychondritis	CT or PET-CT showed thickening, calcification or metabolic enhancement of cartilages in nose, ear, rib, etc. Auricular cartilage biopsies showed cartilage inflammation Cough improved after treatment with oral steroids
Sarcoidosis	Normal pulmonary ventilation function; diffusion capacity was decreased mildly Pathologic confirmation from the lymph nodes sampled via endobronchial ultrasound with transbronchial needle aspiration Cough improved after treatment with oral steroids
Postoperative cough	Chronic cough after thoracic surgery Cough could not be explained by other cause of chronic cough
Interstitial lung disease (early)	Cough without dyspnea, local Velcro rales might exist HRCT showed a little ground glass shadow Diffusion capacity was decreased mildly or normal Cough improved with oral corticosteroids
Atypical pneumoconiosis	Long term exposure to sand weather in Northwest China Chest CT scan showed bilateral diffuse nodules Pathological change of sand nodules was identified by transbronchial lung biopsy Other cause of chronic cough was excluded
Cryptogenic organizing pneumonia	HRCT showed pulmonary nodules and ground glass lesions Pathological examination confirms the diagnosis Cough resolved with corticosteroids therapy
Somatic cough syndrome	Cough occurs only during the daytime, and disappears when focusing and when asleep Multiple psychogenic factors such as sensation, belief, mood, learning, and habit can stimulate the cough Excessive thoughts, feelings, or behaviors related to cough Cough improved with suggestion therapy, hypnosis or psychologist psychotropic drugs
Hyperventilation syndrome	Patients presented with cough as well as symptoms related with typical hyperventilation syndrome symptoms The total score of the Nijmegen Symptomatic Questionnaire was ≥ 23 points Cough resolved after treatment with breathing exercise or psychotherapy
ACEI-induced cough	Cough relieved after withdrawal of ACEI
Arrhythmia related cough	Cough with post sternal thump and premature beats as shown by auscultation and 24 h-electrocardiogram examination Cough relieved with the treatment of arrhythmia drugs
Herniated cervical intervertebral disc	Chronic cough accompanied by pain in neck, shoulder, or upper back, and numbness or tingling in the arm Herniated cervical intervertebral disc was confirmed with magnetic resonance imaging Cough relieved after treatment of herniated cervical intervertebral disc
Goiter related cough	The diagnosis of goiter is exclusive diagnosis Cough relieved after goiter was treated
Occupational cough	The cough symptoms appear in the workplace and improve after withdrawal from the workplace
Styloid process syndrome	X ray confirmed long styloid process Cough resolved after surgery
Hypereosinophilic syndrome	The chest CT showed scattered nodules in both lungs, cardiac enlargement The eosinophil percentage in the peripheral blood and sputum was markedly increased PDGFRA fusion gene could be positive Cough improved with corticosteroids and response to Imatinib
Catamenial cough	Cough occurred or was worse during menstrual period Other causes were excluded Cough improved after endocrine regulation therapy
Langerhans cell histiocytosis	Chest HRCT showed nodular cystic reticulation, mediastinal lymph node enlargement Diffusion capacity was impaired Bronchoscopic biopsy specimen confirmed the diagnosis
Cardiogenic cough	Cough accompanied with signs related with heart failure, which were indicated by electrocardiography, cardiac ultrasonography Cough relief after treatment directed to heart failure

All subjects presented chronic cough as the sole or predominant symptom.

Table S2 Spectrum and characteristic of chronic cough in different causes

Variables	Common causes, n=1,055	UC, n=173	OCC, n=330	Rare causes, n=235	P value
Female	51.7	48.0	47.9	54.9	0.317
Age (years)	42.1±13.8*	41.1±12.8*	45.1±14.4 [#]	48.2±15.1 [#]	<0.001
Duration (months)	24 (8 to 84)*	36 (12 to 96) ^{*#}	36 (12 to 120) ^{#&}	24 (10 to 72)*	0.001
Non-productive cough	55.1*	72.8 [#]	46.8*	50.0*	<0.001
Timing of cough					
Daily cough	85.0*	91.7*	89.2*	89.3*	0.031
Nocturnal cough	43.5*	35.9*	39.4*	37.9*	0.138
Morning cough	40.3*	46.5 [#]	45.5 [#]	52.7 [#]	0.007
Cough before sleep	54.8*	56.0 [#]	58.2 [#]	66.2 [#]	0.028
Concomitant symptoms					
Laryngeal paresthesia	28.1*	41.1 [#]	32.8 [#]	41.5 [#]	<0.001
Sneezes	40.2*	27.1 [#]	31.1 [#]	34.6 [#]	0.001
Nasal congestion	35.7*	37.6*	31.0*	36.5*	0.356
Postnasal dripping	26.4*	18.8*	21.9*	29.3*	0.044
Runny nose	30.7*	18.9 [#]	27.1 [#]	27.9 [#]	0.017
Throat clearing	35.5*	31.8*	30.7*	34.8*	0.405
Chest tightness	25.9 [#]	25.3 [#]	21.5 [#]	34.1*	0.015
Shortness of breath	26.5*	17.2*	24.3*	28.5*	0.047
Previous diagnosis					
Pharyngitis	44.5*	45.5*	41.6*	39.0*	0.503
Rhinitis	27.6*	18.5*	22.1*	18.8*	0.016
Acute bronchitis	26*	23.7*	25.7*	20.3*	0.453
Chronic bronchitis	32*	32.6*	31.4*	33.5*	0.973
Pneumonia	8.5*	6.1*	10.8*	13.1*	0.129
Previous treatment					
Antibiotic	78.1	78.4	84.8	80.3	0.104
Oral corticosteroids	18.4	26.7	17.0	20.0	0.108
Inhaled corticosteroid	29.2	39.4	29.7	34.8	0.703
Antitussive	73	78.8	74.5	74.6	0.561
Traditional Chinese medicine	67.1*	69.9 [#]	66.7 [#]	56.8 [#]	0.037
Anti-allergic agents	47.4*	52.6*	37.5 [#]	39.7 [#]	0.040

Data were presented as percentage, mean ± SD, or median (IQR). *, a subset of different causes of chronic cough categories whose column data do not differ significantly from each other at the 0.05 level.; #, a subset of different causes of chronic cough categories whose column data do not differ significantly from each other at the 0.05 level; &, a subset of different causes of chronic cough categories whose column data do not differ significantly from each other at the 0.05 level. P values for post-hoc test was adjusted with Bonferroni method. OCC, other common causes; UC, unexplained cough.