Acute Cough

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Cough provides an essential protective function for human airways and lungs.

Without an effective cough reflex, we are at risk for retained airway secretions and aspirated material, predisposing to infection, atelectasis, and respiratory compromise.

At the other extreme, excessive coughing can be exhausting; can be complicated by emesis, syncope,
muscular pain, or rib fractures; and can aggravate abdominal or inguinal hernias and urinary incontinence.

Cough is often a clue to the presence of respiratory disease.

Persistent cough in the absence of other respiratory symptoms commonly causes patients to seek medical attention, accounting for as many as 10–30% of referrals to pulmonary specialists.

Potential Complications From Excessive Cough

RESPIRATORY
- Pneumothorax
- Subcutaneous emphysema
- Pneumomediastinum
- Pneumoperitoneum
- Laryngeal damage

CARDIOVASCULAR
- Cardiac dysrhythmias
- Loss of consciousness

CENTRAL NERVOUS SYSTEM
- Syncope
- Headaches
- Cerebral air embolism

MUSCULOSKELETAL
- Intercostal muscle pain
- Rupture of rectus abdominis muscle
- Increase in serum creatine phosphokinase
- Cervical disc prolapse

GASTROINTESTINAL
- Esophageal perforation

OTHER
- Social embarrassment
- Depression
- Sleep disruption
- Urinary incontinence
- Disruption of surgical wounds
- Subconjunctival hemorrhage
- Petechiae
- Purpura

Cough is usually accompanied by an awareness of airway irritation and the feeling of an “urge to cough,” indicating that cough sensations are processed in the higher brain.

The vocal cords adduct, leading to transient upper-airway occlusion lasting about 200 ms.
Expiratory muscles contract and the intrapleural and intra-alveolar pressures rise rapidly to a range from 40 to 400 cm H_2O. With sudden release of the laryngeal contraction, rapid expiratory flows are generated.

Bronchial smooth muscle contraction together with dynamic compression of airways narrows airway lumens and maximizes the velocity of exhalation (as fast as 50 miles per hour).

Cough can either be reflexively or voluntarily initiated, and habit or behavioral cough is not uncommon, especially in children.

Mechanisms

Cough is a protective reflex that has two main functions:

1) prevent the entry of food and fluid into the lower airways
(mainly achieved by mechanical and chemical stimulation of sensory nerves in the larynx and trachea)

2) help expel mucus from the lower airways
(by mechanical stimulation of sensory nerves in the tracheobronchial tree)

Cough is not a common occurrence in healthy persons, cough occurs when food or fluid ‘‘goes down the wrong way.’’

The cough frequency in health must be extremely low, perhaps one or two coughs a day, otherwise it would be extremely difficult to perform cough challenge studies on healthy persons.

Lung Biology In Health and disease volume 205 , Acute and chronic cough. Anthony E. Redington , Alyn H. Morice, 2005

Sensory Innervation of the Upper Airways

The term upper airways is not a strict anatomical term, but is used more in a functional way, to include the nasal passages, paranasal sinuses, Eustachian tube and middle ear air space, pharynx (nasopharynx, oropharynx, laryngopharynx), larynx, and the extra thoracic portion of the trachea.

The sensory nerve supply to the upper airways is provided by the cranial nerves:

I, olfactory
V, trigeminal
VII, facial
IX, glossopharyngeal
X, vagus

Despite this lack of specialized structure the bare nerve endings serve as transducers for a wide range of stimuli such as physical and chemical stimulation, changes in temperature and pressure, and stimuli that cause tissue damage.

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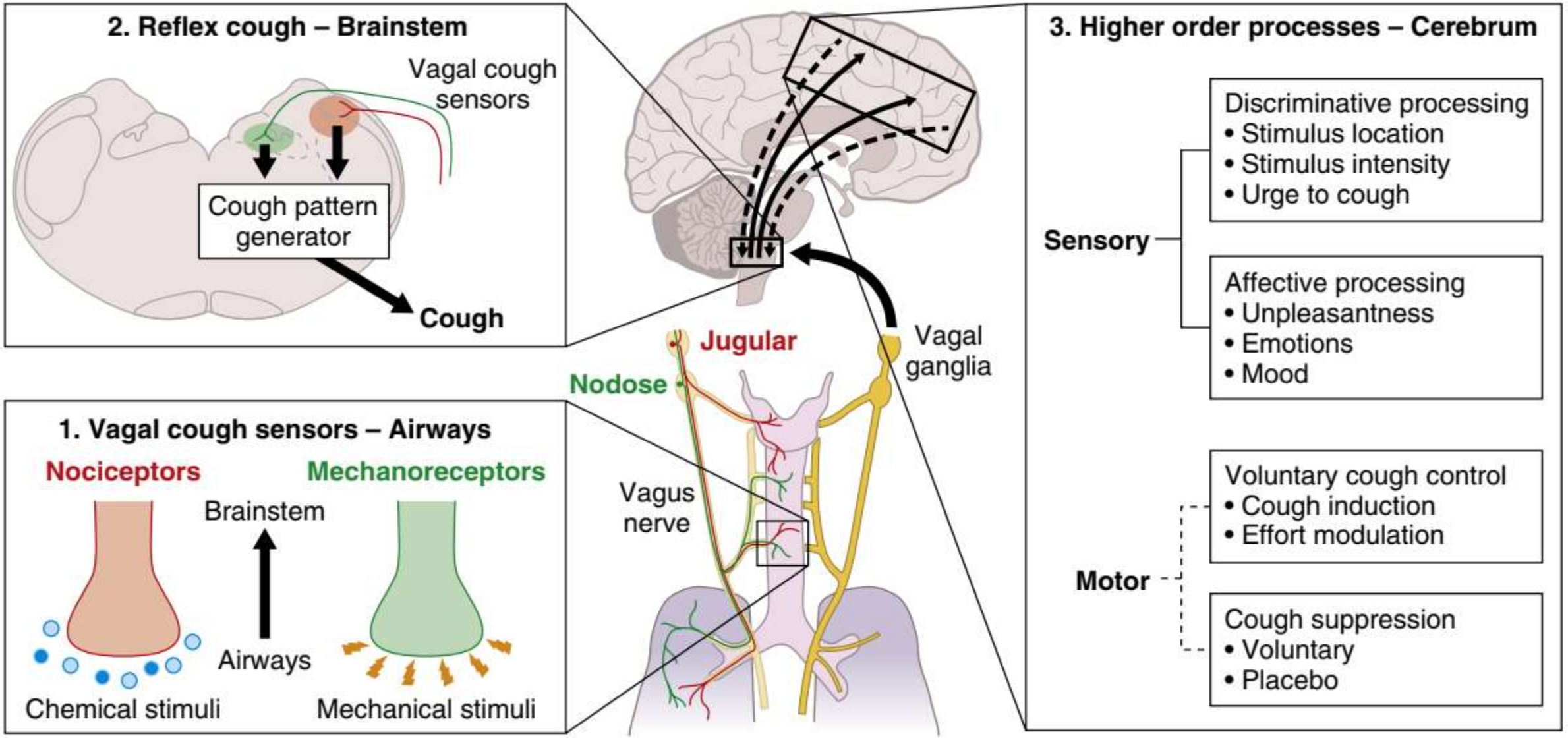
Two types of vagal sensory neurons in the airways and lungs can mediate cough.



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Role of Infection and Inflammation

Infection of the upper airway causes inflammation and the generation of inflammatory mediators such as bradykinin, prostaglandins, and tachykinins. The excitability of the sensor receptors in the airway that normally mediate cough can be increased by the presence of these inflammatory mediators.

The problem with developing a similar mechanism for acute cough associated with URTI is that the site of inflammation in the nose and paranasal sinuses may be physically separate from the sensory receptors that mediate cough in the larynx, trachea, and bronchi.

Not all cases of URTI are associated with cough and the dominant symptoms are of rhinosinusitis.

In those cases of URTI associated with cough there may be some inflammation of the lower airways that predisposes to hyperreactivity of the airway sensory receptors mediating cough

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Three different mechanisms involving inflammatory mediators in the generation of acute cough in URTI:

1) Local effects of mediators:
The inflammatory response to viral infection may extend to the larynx and trachea.
This may or may not involve viral infection of the larynx and trachea.

2) Humoral effects of inflammatory mediators on the lower airways:
The mediators generated in the upper airway enter the blood stream and are transported to the lower airways

3) Post nasal drips (PND)
The inflammatory mediator associated with URTI cause the secretion of mucus and generation of a plasma exudates.

The better term for the disorder is "cough associated with rhinosinusitis" or even "cough-variant rhinitis."

The mechanism of cough production in PNDS:
- is unclear
- direct mechanical stimulation of the larynx with viscous strings mucus that are difficult to clear from the nasopharynx.

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Dry vs. Productive Cough

Cough associated with URTI is often classified as either ‘‘dry’’ or ‘‘productive’’

The mechanisms by which URTI produces dry or chesty cough are not known but it is possible to relate this cough classification to the mechanisms.

Dry cough may be related to:

- mechanism (1) with hyperreactivity of the larynx and trachea being the cause of cough
- possibly to mechanism (3) with PNDS causing mechanical stimulation of the larynx with throat clearing and cough

Productive cough may be related to mechanism (2) with inflammation of the lower airways triggering mucus production and cough.

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Estimating the duration of cough is the first step in diagnosis.

Obviously all types of cough have an onset and hopefully an end, therefore by definition all types of cough must go through an initial acute stage at the time of onset.

Acute lasting less than 3 weeks
Subacute 3–8 weeks
Chronic lasting more than 8 weeks

Key issues in the history include triggers for onset of cough, determinants of increased or decreased cough, and sputum production.

Symptoms of nasopharyngeal disease should be assessed, including postnasal drip, sneezing, and rhinorrhea

Most cases of acute cough will not be seen by specialists as the self-limiting nature due to viral infection of the URTI.
However, cough can be a disturbing symptom and many patients will seek and some form of treatment need to alleviate the symptom.

In endemic areas, tuberculosis should be considered during every cough evaluation.

Other common causes of acute cough :

- acute bacterial sinusitis
- pertussis
- exacerbation of chronic obstructive pulmonary disorder (COPD)
- allergic rhinitis
- exposure to environmental irritants

less common causes of acute cough :

- asthma
- congestive heart failure
- pneumonia
- aspiration syndromes
- pulmonary embolism

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Epidemiology

“there have been no studies of the spectrum and frequency of causes of acute cough.”
Estimate of the incidence of URTI could provide an indication of the incidence of acute cough.

One problem in using this approach is that cough is not always a symptom of URTI.
In a study on patients with naturally acquired URTI and complaint of sore throat pain it was reported that cough as a symptom was present in around 50% of this population.

In one viral challenge study:
The most common symptoms of URTI found in this study were runny nose and sneezing with an incidence of 60–70%.
cough was usually a late symptom and developed 4–5 days after challenge, compared to runny nose, which was a common symptom 1 day after challenge.

according to the virus type such rhinovirus, coronavirus and respiratory syncytial virus (RSV) the incidence of cough in the subjects varied from 9% to 64% .

The common viruses: **Rhinovirus** , coronavirus, respiratory syncytial virus (RSV), influenza virus, parainfluenza virus, adenovirus, enterovirus, and a variety of less common viruses.

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Seasonality

Acute upper respiratory viral infections exhibit seasonality and this causes seasonality in the incidence of acute cough and sales of cough medicines.

In the more northerly and southerly parts of the hemisphere there is a peak of respiratory illness during the winter months.
Winter seasonality has been reported for a wide range of URTI caused by over 200 different viruses belonging to six
families:

- orthomyxoviruses (influenza)
- paramyxoviruses (RSV, parainfluenza)
- coronaviruses
- picornaviruses (common cold)
- herpes viruses
- adenoviruses

Lower respiratory tract diseases such as pneumonia which may be viral or bacterial in etiology also show a similar seasonal pattern with the peak of illness in winter.
The nose is the entrance to the lower airways and URTI predisposes to lower airway infection with viruses and bacteria.

Annual vaccination programs against influenza can help to protect those at risk of lower airway infection, but there is at present no protection from the hundreds of viruses responsible for the common cold syndrome.

For every degree centigrade decrease in mean temperature below 5˚C there is a 10.5% increase in all respiratory consultations.

The seasonal increase in cough associated with URTI is associated with:

- a seasonal increase in acute cough due to other causes such as exacerbation of asthma, and bronchitis and …
- increased crowding
- poor ventilation of working and living spaces
- seasonal cooling of the upper airway as inhalation of cold air causes cooling of the nasal epithelium sufficient to inhibit respiratory defences against infection such as mucociliary clearance and the phagocytic activity of leukocytes.

In winter we protect our core body temperature by wearing thicker winter clothes but our nose and upper airways are still directly exposed to cold air.

facemask and woollen scarf

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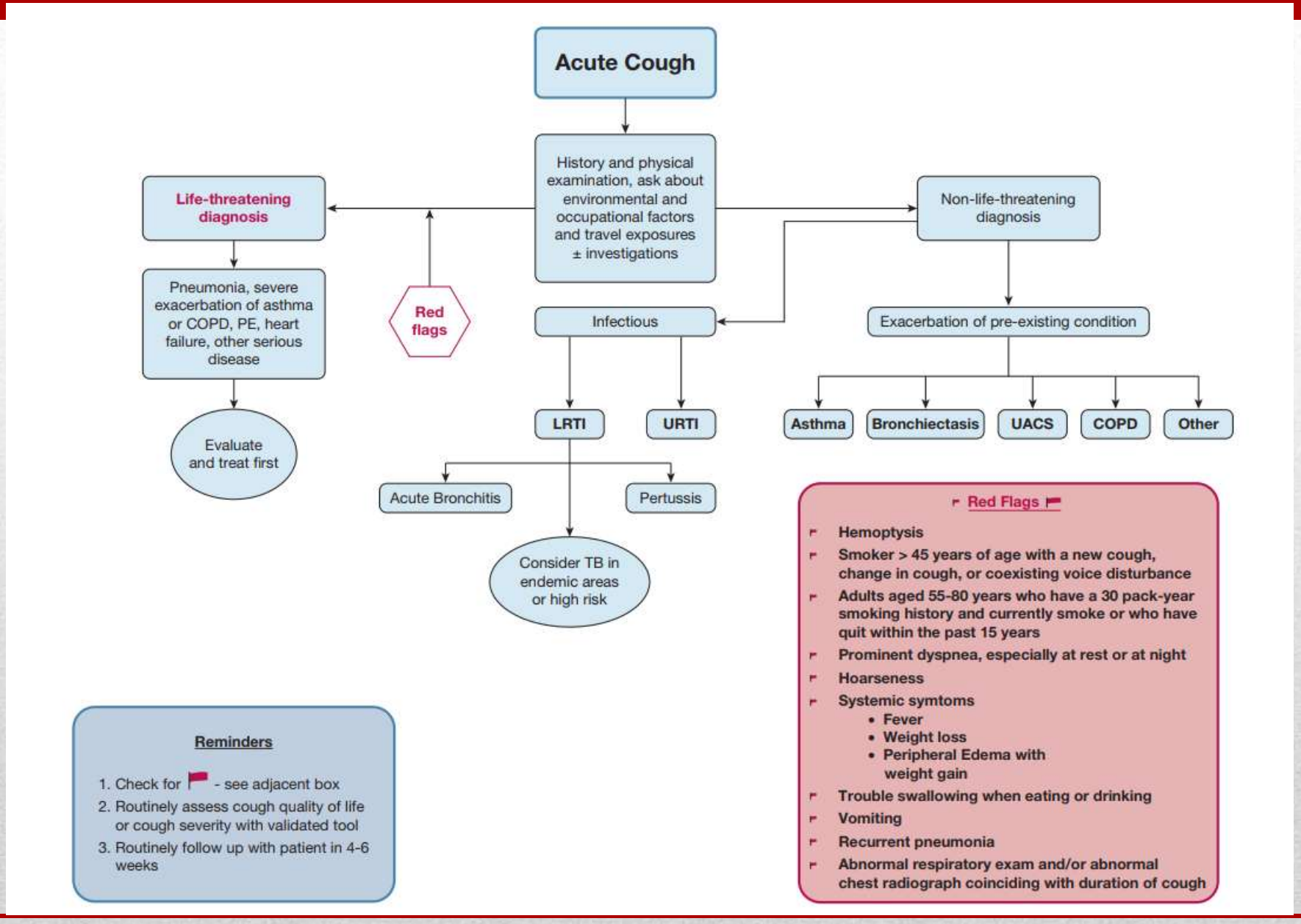


Classification of Cough as a Symptom in Adults and Management Algorithms , CHEST JANUARY 2018

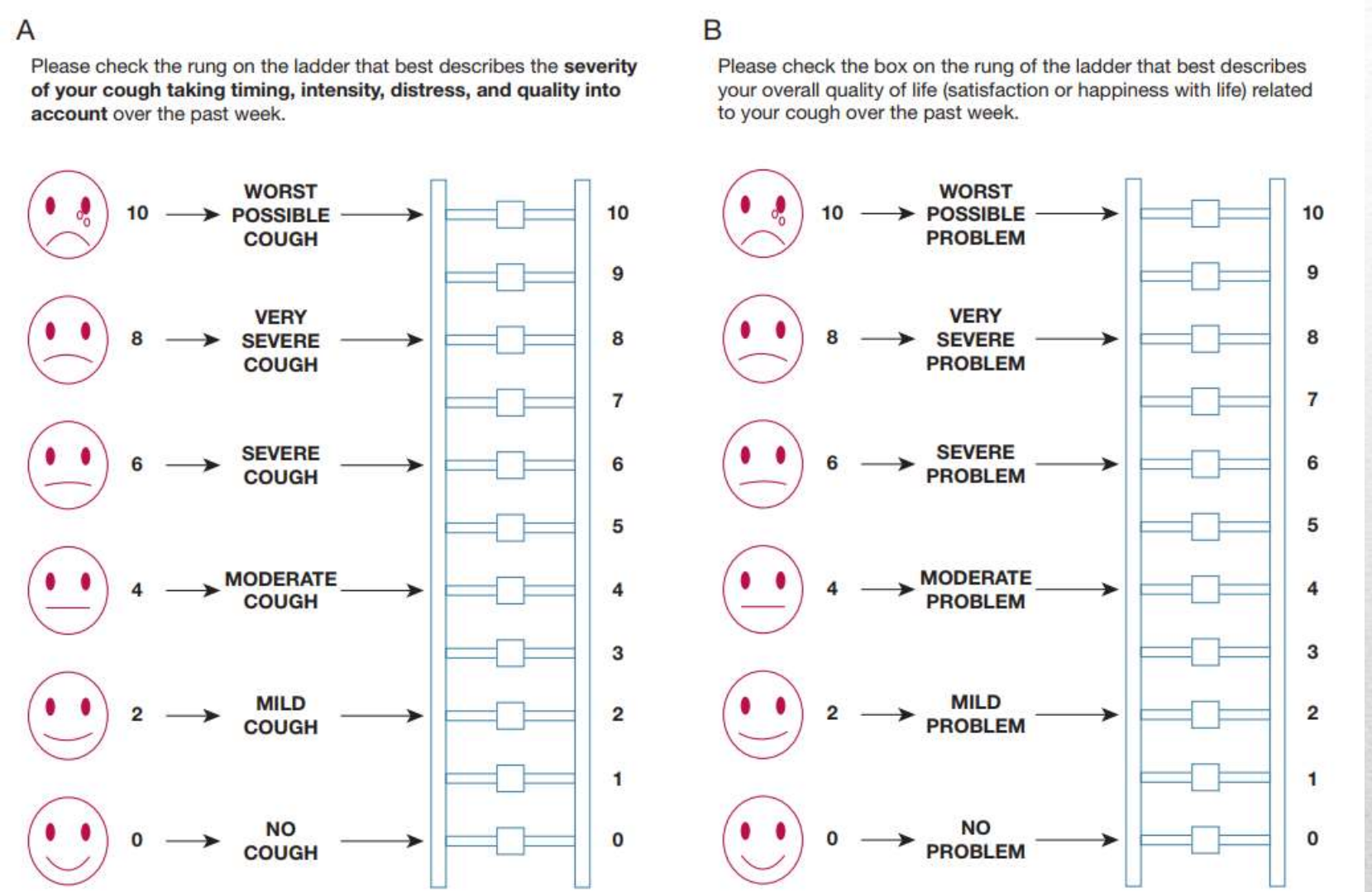


Figure 4 – *Representative Punum ladders to assess (A) cough severity or (B) overall quality of life. Reproduced with permission from Fletcher et al.*[18]

Classification of Cough as a Symptom in Adults and Management Algorithms , CHEST JANUARY 2018

- Antiviral treatments for influenza A and B

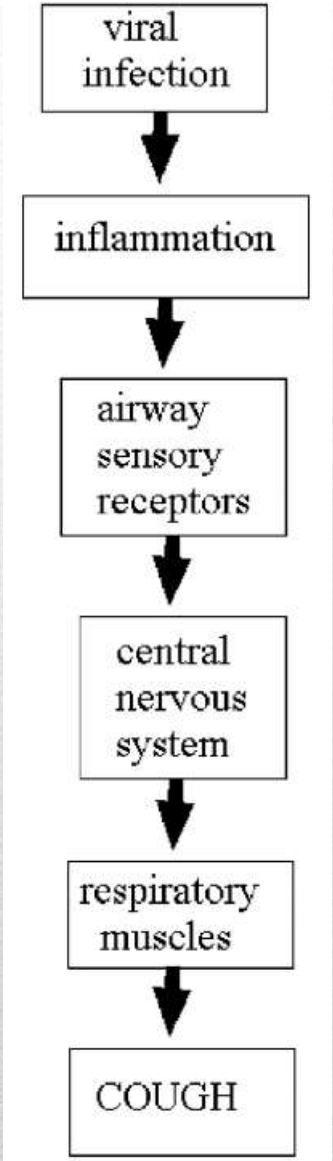
- Anti-inflammatory Treatments :
  - Nonsteroidal Anti-inflammatory Drugs
  - Corticosteroids

- Peripherally Acting Treatments:
  - Local Anesthetics
  - Demulcents
  - Expectorants and Mucolytics
  - Cooling and Warming Agents
  - Vanilloid VR1 Receptor Antagonists

Treatments

Dextromethorphan

Effect



- Centrally Acting

  - Opioids
  -

  - Sedatives
  - Placebo

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Conclusions

The foremost consideration for the clinician at the first visit is to:

(1) determine the severity
(2) assess the possible cause(s) of the cough
(3) plan investigations and treatment

The timing and selection of various investigations may vary according to presentation.

Initial investigations may be limited to a chest radiograph, particularly in a cigarette smoker, where abnormalities can be found in 10–30% of chest radiographs.

Acute cough associated with URTI is the most common form of cough yet there is little knowledge about the mechanisms involved in this type of cough.

Conclusions cont.

PNDS is reported to be the main mechanism involved in the generation of acute cough associated with URTI but there is a scarcity of evidence to support this hypothesis.

Often,

- the cause may not be found,
- the treatment of the putative cause may not suppress or improve the cough,
- the cause may have no effective treatment.

In those cases, therapy that suppresses cough by inhibiting the cough pathway without treating the cause is necessary.

A wide range of medicines is freely available to treat acute cough but most are little more effective than placebo treatment.

Fortunately, placebo treatment is a very effective treatment for acute cough and simple demulcent cough syrups can provide relief.

References:

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thanks for your attention