

Dyspnea and Wheezing

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Dyspnea is the subjective sensation of breathing discomfort. It is a normal manifestation of heavy exertion, but also may be caused by underlying conditions (both pulmonary and extrapulmonary). Management focuses on treating the underlying condition. Wheezes are high-pitched, continuous loud sounds that are often louder than breath sounds. They can be heard on inspiration or expiration. They are caused by a narrowing of the airways, resulting in the oscillation of opposing airway walls. The most common causes of wheezing are asthma and COPD exacerbations (often from viral respiratory infections).

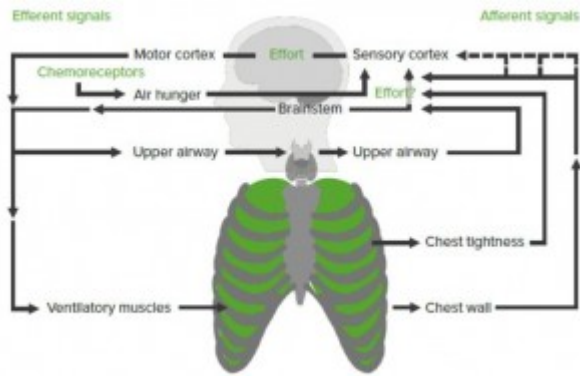
Dyspnea – Introduction and Pathophysiology

Definition

Dyspnea is the **subjective sensation of breathing discomfort** (chest tightness or shortness of breath).

Pathophysiology

Dyspnea occurs due to an **imbalance** between the required gas exchange and the acid-base status of an individual. This sensation is often due to a **combination** of factors including



Layout presenting the pathophysiology of dyspnea. Image by Lecturio.

- Changes in lung physiology:
 - Increased airway resistance
 - Increased dead space
 - Ventilation-perfusion mismatch
- Decrease in lung/chest wall compliance
 - Stimulates chest wall and pulmonary mechanoreceptors
 - Vagus nerve
 - Muscle spindles and tendons of the chest wall
- Acute hypercapnia, hypoxemia, or metabolic acidosis
 - Stimulation of chemoreceptors (by PaO_2 , pH, and PaCO_2)
 - Peripheral: aortic arch and carotid bodies
 - Central: medulla
- Impaired oxygen delivery/utilization
 - May be due to reduced oxygen-carrying capacity of the blood
 - May be due to deconditioning

Dyspnea – Etiology

- Can be broken down into
 - Pulmonary or extrapulmonary causes
- 5 most common causes of chronic dyspnea:
 - Asthma
 - COPD
 - Interstitial lung disease
 - Myocardial dysfunction
 - Obesity/deconditioning
- See chart below for a summary of the conditions in each category.

Pulmonary Causes of Dyspnea		
	Clinical presentation	Associated conditions

Obstructive lung disease	<p>Characterized by air trapping in the lungs</p> <ul style="list-style-type: none"> • ◦ ↑ FRC and TLC ◦ ↓↓ FEV₁ ◦ ↓ FVC ◦ ↓ FEV₁/FVC <p>Findings</p> <ul style="list-style-type: none"> • Wheezing • Dyspnea is not worsened by change in body position. 	<p>COPD</p> <p>Chronic bronchitis</p> <p>Bronchiectasis</p> <p>Emphysema</p> <p>Asthma</p>
Restrictive lung disease	<p>Characterized by decreased lung compliance:</p> <ul style="list-style-type: none"> • ↓ FVC and TLC • FEV₁/FVC ≥ 80% <p>Findings</p> <ul style="list-style-type: none"> • Short, shallow breaths 	<p>Poor breathing mechanics</p> <ul style="list-style-type: none"> • Polio • Scoliosis • Morbid obesity <p>Interstitial lung diseases</p> <ul style="list-style-type: none"> • Pneumoconiosis • Sarcoidosis • Idiopathic pulmonary fibrosis • Drug toxicity <ul style="list-style-type: none"> ◦ Bleomycin ◦ Amiodarone ◦ Methotrexate
Upper airway obstruction	<p>Often caused by infection or foreign body obstruction</p> <p>Findings</p> <ul style="list-style-type: none"> • Usually acute onset dyspnea • Associated with stridor 	<p>Epiglottitis</p> <p>Foreign body obstruction</p> <p>Croup</p>
Others	Characterization and findings vary.	<p>Pulmonary embolism</p> <p>Pneumothorax</p> <p>Pleural effusions</p> <p>Metastatic disease</p> <p>Pulmonary edema</p>

Extrapulmonary Causes of Dyspnea

	Clinical presentation	Associated conditions
Cardiac dyspnea	<p>Often a complication of left-sided heart failure</p> <p>Findings</p> <ul style="list-style-type: none"> • Dyspnea varies with body position • Orthopnea • Paroxysmal nocturnal dyspnea • Bilateral basal rales 	<p>Hypertensive or valvular heart disease</p> <p>Cardiomyopathy</p> <p>Ischemic heart disease:</p> <ul style="list-style-type: none"> • Stable and unstable angina • Acute myocardial infarction • Coronary heart disease <p>Heart failure with reduced or preserved ejection fraction</p> <p>Pericarditis</p> <p>Arrhythmia</p>
Anemia	<p>Impaired tissue oxygenation</p> <p>Findings</p> <ul style="list-style-type: none"> • Dyspnea and dyspnea on exertion 	<p>Hypovolemic shock</p> <p>Acute hemorrhage</p>
Psychogenic dyspnea	<p>Hyperventilation associated with anxiety may lead to acute respiratory alkalosis manifested as</p> <ul style="list-style-type: none"> • Paresthesia at the fingertips and around the mouth • Tetanic cramps in severe cases 	<p>Panic disorder</p> <p>Anxiety</p> <p>Pain</p> <p>Somatization disorder</p>
Endocrine dyspnea	<p>Changes in pH and PaCO₂ stimulate the brain stem</p> <ul style="list-style-type: none"> • Alveolar hyperventilation <ul style="list-style-type: none"> • Deep breathing • Compensates acidosis by washing out the CO₂ 	<p>Metabolic acidosis:</p> <ul style="list-style-type: none"> • Ketoacidosis in diabetes <ul style="list-style-type: none"> • Acidosis in renal insufficiency <p>Medications:</p> <ul style="list-style-type: none"> • Salicylate overdose

Central dyspnea	Variable causes	Neuromuscular disease <ul style="list-style-type: none"> • Myasthenia gravis • Guillain-Barré
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Important elements in clinical history

- Duration, onset, severity, and progression of dyspnea
 - Sudden acute dyspnea is more concerning than chronic dyspnea.
- Triggers relation to
 - Exertion
 - Body position
 - Cold air
 - Animal dander
 - Stress/anxiety
- Associated symptoms:
 - Cough
 - Sputum production
 - Orthopnea
 - Paroxysmal nocturnal dyspnea
 - Chest pain
 - Peripheral edema
 - Joint swelling
 - Palpitations
- Effects of medications (such as albuterol, beta-blockers)
- Tobacco history
- Thrombosis risk factors

Important elements in physical exam

Due to the wide array of differential diagnoses, it is important to take different considerations during physical exam.

Vital signs	<ul style="list-style-type: none"> • Stable vs. unstable • Increasing respiratory rate • Increasing work of breathing 	<p>Red flag vital signs</p> <ul style="list-style-type: none"> • Heart rate > 120 beats/min • Respiratory rate > 30 breaths/min <ul style="list-style-type: none"> • Pulse ox < 90% • Hypotension <p>Red flags exam findings</p> <ul style="list-style-type: none"> • Stridor or airway obstruction <ul style="list-style-type: none"> • Periods of apnea • Use of accessory muscles, chest retractions, or tracheal deviation <ul style="list-style-type: none"> • Cyanosis • Altered mental status
Pulmonary	<ul style="list-style-type: none"> • Stridor • Wheezing • Crackles • Rales 	
Cardiovascular	<ul style="list-style-type: none"> • Jugular venous distention • Distant heart sounds <ul style="list-style-type: none"> • Tachycardia • Arrhythmia • Murmurs • Gallops • Peripheral edema 	
Abdominal	<ul style="list-style-type: none"> • Protruding abdomen 	
Musculoskeletal	<ul style="list-style-type: none"> • Muscle weakness • Clubbing 	

Labs

- CBS and BMP, especially in patients who have fever, sputum production, or anemia
- BNP if heart failure is suspected
- D-dimer if pulmonary embolism is suspected
- Arterial blood gas

Imaging and other tests

- Chest X-ray may detect cardiopulmonary disease (e.g., congestive heart failure, COPD, cor pulmonale, pulmonary hypertension)
- Lateral neck radiography
 - If suspected upper airway obstruction
- ECG
 - May detect ischemia, arrhythmia, or ventricular hypertrophy
- CT - pulmonary angiogram or VQ lung scan
 - If pulmonary embolism is suspected
- Spirometry
 - Used in outpatient setting to differentiate obstructive vs. restrictive lung disease
 - Used with a bronchodilator to differentiate asthma from COPD
- Other tests to consider in specific situations
 - Echocardiography
 - Chest CT
 - Cardiac stress testing

Video Gallery

[Dyspnea](#) by Charles Vega, MD

[Dyspnea: Diagnosis](#) by Charles Vega, MD

Dyspnea – Management

- Oxygen supplementation if O₂ saturation is < 90%.
- Treatment of the underlying cause
 - Asthma and COPD
 - Bronchodilators or inhaled corticosteroids
 - Dyspnea associated with heart failure
 - Diuretics
 - Pneumonia/infectious causes
 - Antibiotics
 - Supplemental oxygen
 - Pulmonary embolism
 - Thrombolytics

Wheezing

Definition

- High-pitched, continuous loud sounds
- Generally louder than normal breath sounds
 - May be inspiratory or expiratory

Pathophysiology

- Caused by a narrowing of the airways, resulting in the oscillation of opposing airway walls

Etiology

- Viral respiratory tract infections

- Most common cause of wheezing in children and adults
- Most common cause of asthma exacerbations in children and adults
- May also be associated with COPD and airway obstruction

Differential Diagnosis

- Symmetric wheezing
 - Asthma
 - COPD
- **Unilateral wheezing:**
 - Foreign body aspiration
 - Airway compression from a tumor or mass

It is important to **differentiate wheezing from stridor**, as acute stridor needs rapid medical intervention.

- Stridor is a specific kind of wheezing that has a constant pitch.
- Most commonly heard in upper respiratory obstruction
 - Inspiratory stridor is usually related to laryngeal obstruction.
 - Expiratory stridor is associated with tracheobronchial obstruction.

Diagnostics

- Dependent on history, exam findings, and extrapulmonary findings
- Pulmonary function testing
 - With pre and post-bronchodilator
 - Evaluation of the flow-volume loop
- Chest X-ray

Video Gallery

[Wheezing](#) by Carlo Raj, MD

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