**Respiratory System of Children**

**Learning objectives**

* To know the anatomy and physiology of the respiratory system
* To Describe the etiology, pathophysiology, clinical manifestations, diagnosis, and treatment of common respiratory alterations
* To Discuss the nursing management and interventions appropriate for children with respiratory disorders

**Introduction and Overview of Respiratory** **System**

Pediatric respiratory disorders are responsible for a number of acute and chronic health conditions and are a leading cause of pediatric emergency room visits and hospitalizations. Basic knowledge of the development and functions of respiratory system are essential to understand many of these respiratory tract diseases.

**Common Respiratory Terminology**

**Otitis Media :** Middle ear infection

**Tonsillitis** :is a viral or bacterial infection in the throat that causes inflammation of the tonsils. Tonsils are small glands (lymphoid tissue) in the pharyngeal cavity.

**Laryngotracheo-bronchitis (Croup):** Infection and inflammation of the larynx/trachea/bronchi

**Sinusitis:** Inflammation and infection of the sinuses can be acute or chronic.

**Bronchiolitis :** Infection/inflammation of bronchiole

**Asthma**: Allergic hypersensitivity to foreign substances

**Pneumonia** : is an inflammation with consolidation of the lung tissue

**Acute Bronchitis:** is an inflammation of the lining of the bronchial tubes, the airways that connect the trachea to the lungs

**emphysema:** Purulent pleurisy is an accumulation of pus in the pleural spaces.

**Pediatric Respiratory Differences**

* Surfactant is lacking in premature infants. Infants born before 34 weeks of gestation have a higher risk for respiratory distress syndrome (RDS)
* Smaller lower airways and undeveloped supporting cartilage predispose the child to an increased risk for obstruction by mucus, edema, and foreign bodies. The neonate’s airway is 50% smaller than that of adults
* Brief periods of apnea (10 to 15 seconds) are common in the neonate. The respiratory pattern may be irregular
* Children’s normal respiratory rate is higher than that of adults.
  + - Tracheal size approximately triples by adulthood.
    - Tonsillar tissue is normally enlarged in early school-age children.
    - Infants and children use abdominal muscles to inhale until about age 5 to 6 years.
    - Smaller nares and nasopharynx, which can be occluded with edema • Obligatory nose breathers until 4 weeks of age and are unable to use mouth to breathe
    - Small and fl oppy epiglottis, which can be occluded with edema
    - Large tongue, which increases risk for occlusion of airway
    - Larynx and glottis are located higher in neck, which increases risk for aspiration
    - Trachea is shorter and narrow with fl exible cartilage, which can be occluded with edema and neck and head flexion

• Enlarged tonsillar tissue, which increases risk for obstruction

• Underdeveloped respiratory muscles result in poor chest expansion and decreased expiratory lung volume

• Diaphragm and abdominal muscles used for breathing in children under 6 years of age

• Higher metabolic rate, which increases oxygen demands

• Eustachian tubes are horizontal until age 7, which increases the risk of ear infections

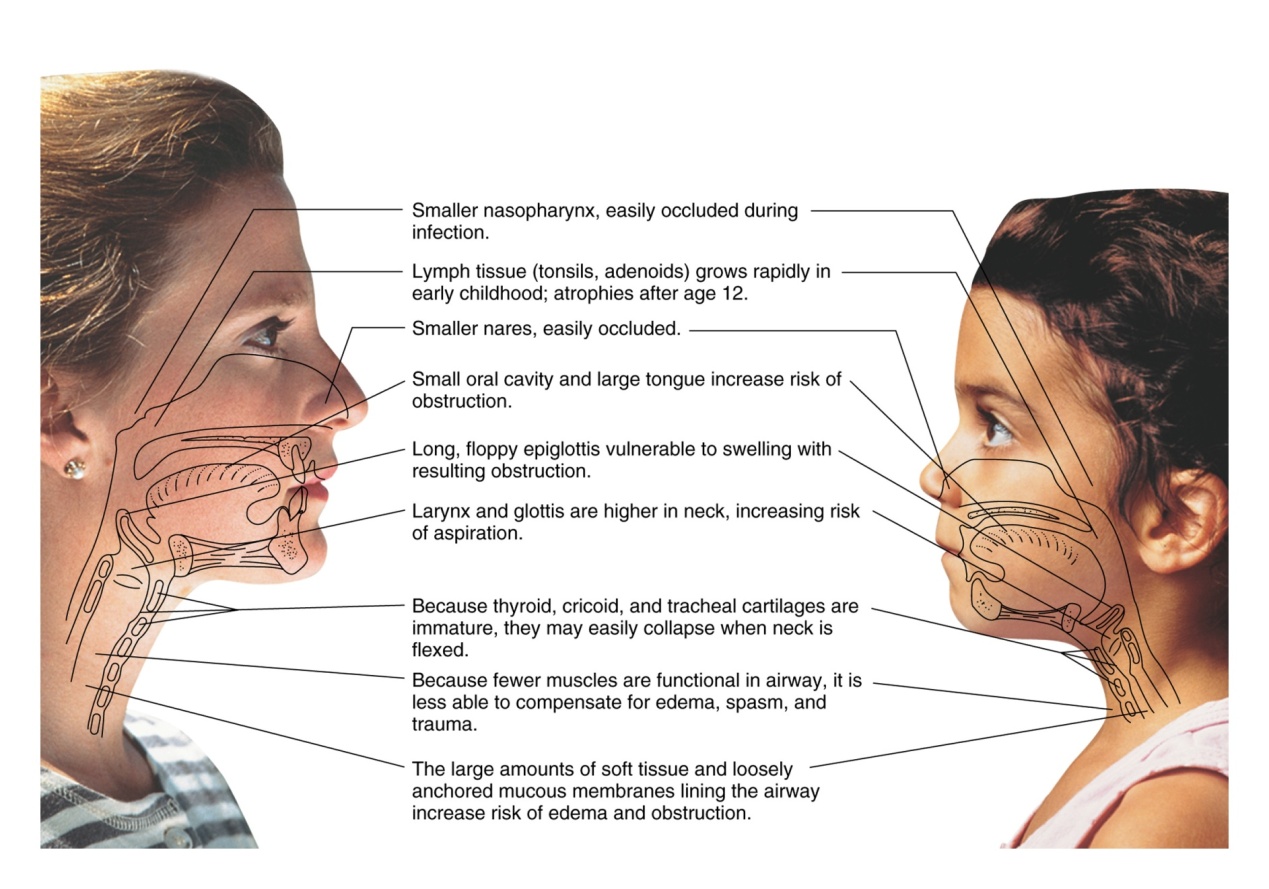
• Higher respiratory rate with irregular breathing patterns in infants

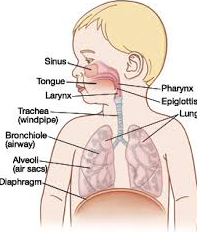
• Small and floppy epiglottis, which can be occluded with edema

• Large tongue, which increases risk for occlusion of airway

• Alveoli are underdeveloped and continue to develop

until 12 years of age





**The respiratory system has two parts: upper and lower:**

1-the upper respiratory system includes the nose, mouth, sinuses and throat. If your child has an upper respiratory infection he or she may feel uncomfortable and sound congested, with runny nose, cough and poor appetite.

Upper Respiratory diseases

* [Common Cold](http://www.aanma.org/faqs/welcome-to-precious-breathers/respiratory-diseases/#Common cold)
* [Influenza (flu)](http://www.aanma.org/faqs/welcome-to-precious-breathers/respiratory-diseases/#Influenza (flu))
* [Croup](http://www.aanma.org/faqs/welcome-to-precious-breathers/respiratory-diseases/#Croup)
* [Sinusitis](http://www.aanma.org/faqs/welcome-to-precious-breathers/respiratory-diseases/#Sinusitis)

2-The lower respiratory system refers to the bronchial tubes and lungs. Among children under five, symptoms of a lower respiratory infection are usually more severe than those of upper respiratory illnesses and may include shortness of breath, wheezing and rapid breathing.  As a result, the child is more likely to require a visit to a healthcare provider.

Lower Respiratory Diseases:

* [Bronchiolitis](http://www.aanma.org/faqs/welcome-to-precious-breathers/respiratory-diseases/#Bronchiolitis)
* [Pneumonia](http://www.aanma.org/faqs/welcome-to-precious-breathers/respiratory-diseases/#Pneumonia)
* [Asthma](http://www.aanma.org/faqs/welcome-to-precious-breathers/respiratory-diseases/#Asthma)

**Respiratory Assessment**

**Observation for**

* Nasal Flaring
* Circumoral cyanosis
* Expiratory grunting
* Retractions
  + Substernal, lower intercostal,
* Tachypnea :Repirations greater than 60

**Appearance** (respiratory assessment cont.)

* + Restless, inactive,   irritable, apprehensive
  + Respiratory Status
  + Nutrition/Hydration –   anorexia, vomiting
  + Chest Examination
  + Respiratory rate
  + Breath sounds
  + Inspiratory/Expiratory phases

**Influenza (flu)**  
Like a cold, influenza affects the upper respiratory system. Unlike a cold, though, it often causes more severe illness and complications.

**Symptoms:**

* Fever with chills
* Body aches
* Headache
* Cough
* Sore throat
* Nasal congestion/runny nose
* Extreme exhaustion and weakness
* Possible stomachache or vomiting in children

**Croup**The common early childhood ailment known as croup (tracheolaryngobronchitis) involves inflammation of the trachea (windpipe), the larynx (voice box) and the bronchioles (tiny airways leading to the lungs). It is recognized by a distinctive “barking cough” that usually starts suddenly and at night. Children ages 3 months to 3 years are most susceptible to croup.

**Signs and symptoms:**

* Dry, barking (brassy) cough
* Stridor – noisy, labored breathing; high-pitched noise when inhaling
* Hoarseness
* A tight throat

**Sinusitis**  
Viral infections and allergies affect sinuses the same way they affect the nasal passages, causing swelling and producing extra mucus.

**Signs and symptoms:**

* Upper respiratory tract infection symptoms lasting more than 10 days without improvement
* Nasal congestion or discharge, any color
* Cough, day and night
* Facial pain or headache
* Fatigue and irritability
* Low-grade fever

**Tonsillitis**

is an inflammation of the tonsils,  They help in the immune system to protect the body from infections that may enter the body through the mouth. When the tonsils become infected they become enlarged and red, and have a yellow or white coating. Symptoms of tonsillitis may include:

* Difficult or painful swallowing
* Swollen and tender glands (lymph nodes) on the sides of the neck
* Fever and chills
* Tiredness and headache
* Stomach upset or pain
* Enlarged and reddened tonsils with spots of white/yellow pus
* Mouth breathing, noisy breathing, and/or snoring (due to enlarged tonsils blocking the airways).

**Nursing Care for Tonsillectomy**

**Pre-operatively**

* Clotting Time
  + - Assess for bleeding (frequent swallowing)
    - Prevent bleeding –no hard   objects or gargles
* Monitor hydration
  + - Diet – cool :liquids   to soft foods
* Position on side

**Post-operatively**

* Ice collar
* Analgesics
* Mouth care
* Emotional support

**Nursing intervention for Otitis Media**

* Put ice bag over the affected ear may also be beneficial to reduce edema (between pain attacks).
* For drained ear; the external canal may be frequently cleaned using sterile cotton swabs (dry or soaked in hydrogen peroxide).
* Excoriation of the outer ear should be prevented by frequent cleansing & application of zinc oxide to the area of oxidate.
* Give special attention to the tympanostomy tube i.e., avoid water entering the middle ear and introducing bacteria.
* Educate family about care of child, & keep them aware with the potential complications of acute otitis media e.g., conductive hearing loss.
* Provide emotional support to the child & his family.

**Nursing intervention for Bronchiolitis**

* Oxygen if necessary
* Small, frequent feedings
* Provide adequate rest
* Bronchodilators and steroids
* Provide high humidity environment

**Asthma**

A chronic inflammatory disorder of the airway (trachea, bronchi, & bronchioles) characterized by attacks of wheezy breathlessness, sometimes on exertion, sometimes at rest, sometimes mild, sometimes severe.

children with asthma have sensitive, easily irritated airways in their lungs. When exposed to certain triggers – like viruses, allergens, secondhand smoke, chemical irritants, cold air or pollution – the airways become more inflamed, producing increased mucus, mucosal swelling and muscle contraction. This results in airway obstruction, chest tightness, coughing, shortness of breath and wheezing.

**Etiology:**

* Allergens e.g: pollens ,air pollution, dust.
* Irritants e.g: Tobacco smoke, sprays.
* Exercise.
* Temperature or weather changes.
* Exposure to infection.
* Animals: e.g: cats, dogs, rodents, horses.
* Strong emotions e.g: fear
* Food: e.g: Nuts, chocolate, milk
* Medication: e.g: Aspirin

**Symptoms:**

* Coughing on expiration (breathing out), especially at night
* Wheezing on expiration
* Difficulty breathing
* Shortness of breath when exercising or playing
* Rapid heart rate

**Nursing intervention for Asthma**

* Assess for   cyanosis/respiratory distress
* Administer oxygen, monitor   SaO2
* Maintain IV access
* Ensure fluid intake & med   administration
* High-Fowler’s position
* Cluster nursing care to conserve child’s energy
* Medications
* Bronchodilators (acute and   daily use)
* Parental, inhaled and oral   routes
* Corticosteroids
* Reduces inflammatory response during or to prevent an attack

**Bronchitis:**

Bronchitis is a mild self limiting disease that requires only symptomatic treatment including:

* Analgesics.
* Antipyretics.
* Humidified oxygen.
* Cough suppressants.

Antibiotics are not used to treat viral illness or reduce the incidence of complications

**Nursing intervention for Bronchitis:**

* Provide well balanced diet.
* Encourage adequate fluid intake, provide small frequent amount to prevent nausea & vomiting.
* Ensure warm atmosphere, encourage the child to inhale steam to liquefy secretions.
* Change position (postural drainage) to facilitate the drainage of mucous
* Administer oxygen according to doctor order (flow rate).
* Reassure the child & his parents especially during oxygen administration & postural drainage.

**Bronchiolitis**   
Bronchiolitis is caused by an infection that affects the tiny airways—called the bronchioles— that lead to the lungs. As these airways become inflamed, they swell and fill with mucus, making breathing difficult. This disease affects mostly infants and young children ,with peak occurrence at 3 to 6 months.Bronchiolitis is usually caused by  colds, [influenza (flu)](http://kidshealth.org/parent/infections/lung/flu.html) and human metapneumovirus (hMPV, which may also cause pneumonia).

**Signs and symptoms:**

* Cough
* Fever
* Rapid heartbeat
* Rapid, shallow breathing
* Retractions—drawing in of muscles and skin around neck and chest with each breath
* Flaring of the nostrils

**Nursing intervention for Bronchiolitis:**

* Follow strict precautions to prevent spread of infection.
* Administer high humidified oxygen.
* Clear nasal congestion, try a bulb syringe and saline (saltwater) nose drops.
* Provide adequate Ng. Care for vomiting, fever, & diarrhea.
* Small frequent diet, & increase fluid intake.

**Pneumonia**

Pneumonia is a bacterial or viral infection of the lung that causes the lungs’ air pockets (alveoli) to become inflamed.

**Symptoms:**

* Fever
* Cough
* Rapid breathing
* Decreased activity and poor eating
* A grunting sound when your child exhales
* Retractions— drawing in of muscles and skin around neck and chest with each breath

**Classification of pneumonia**

A-According to pathological changes

* lobar pneumonia :one or more lobes are involved. lobar pneumonia is often present in old children.
* lobular pneumonia (brochopneumonia): lobular pneumonia is the most common pattern in infants and younger children. So it is the focal point in our study.
* Interstitial pneumonia :

B-According to etiologic agents

* Virus pneumonia: Caused by viruses such as respiratory syncytial virus (RSV), adenovirus (ADV),cytomegalovirus (CMV
* Bacterial pneumonia: Such as pneumococcal pneumonia, staphylococcal aureus pneumonia,colibacillus pneumonia .
* Mycoplasma pneumonia .
* Others: Fungous pneumonia,

C- According to clinical manifestation

* Mild pneumonia
* Severe pneumonia →heart failure, respiratory failure, toxic encephalopathy

**Principles of treatment of pneumonia**

* Control the inflammation;
* Improve ventilation;
* Prevent complications

**Complication Severe pneumonia Severe pneumonia**

* Congestive heart failure
* Toxic encephalopathy
* Toxic intestinal paralysis
* Disseminated intravascular coagulation

**Nursing Assessment:**

* Mild Pneumonia: Fever, malaise, cough, chills, rapid & shallow respiration
* Severe Pneumonia: The previous signs + chest indrawing

Very severe Pneumonia: The previous signs + Grunting, inability to drink, sleep difficulties, severe dehydration & malnutrition

**Tuberculosis**

in children Tuberculosis in children Tuberculosis (TB) is a chronic infectious disease caused by tubercle bacillus. The tubercle bacilli belong to the mycobacterium

**Prevention of TB:**

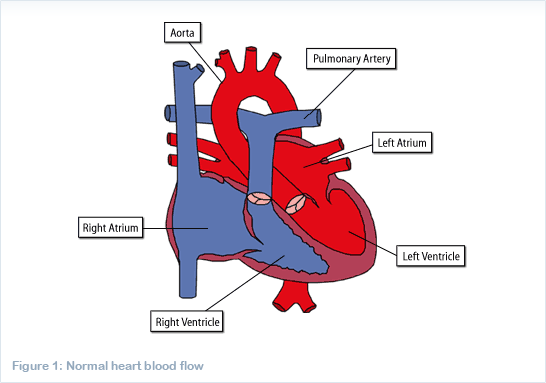
3 methods for effective prevention:

* Isolation of infected cases.
* Immunization with B.C.G.
* Prophylactic treatment using N.IH. For infants & children who must live a household with an infectious adult.

**Learning objectives**

* To know the anatomy and physiology of the cardiac system in children
* To Describe the etiology, types, clinical manifestations, and diagnosis of cardiac disorders in children
* To Discuss the nursing goals and nursing care of children with cardiac disorders

**Introduction and Overview of Respiratory** **System**



**The heart** is composed of four chambers. The top two chambers are called atriums. The bottom two chambers are called ventricles, and these are the pumping chambers of the heart.

**A baby's heart** begins to develop at conception, but is completely formed by eight weeks into the pregnancy. Congenital heart defects happen during this crucial first eight weeks of the baby's development. Congenital heart defects are the most common birth defects

**Pediatric heart** disease is a term used to describe several different heart conditions in children. The most common type of pediatric heart disease is congenital, meaning that children are born with it. Congenital heart disease (CHD) can exist in adults, but is still considered CHD if the adult was born with the disease.

**Types of heart disorders in children**

**A-acquired heart disorder:**

**Kawasaki disease –** an illness that occurs mainly in young children and may leave the heart muscle or coronary arteries damaged.

**Myocarditis –** the heart muscle becomes inflamed and may be damaged after a viral infection.

**Cardiomyopathy –** a disease of the heart muscle, caused by a genetic disorder or after an infection. It leads to poor heart function.

**Rheumatic heart disease –** caused by rheumatic fever, this disease leads to heart muscle and valve damage.

## B-Congenital Heart Disease

is a type of heart disease that children are born with, usually caused by heart defects that are present at birth. In fact, the most common heart conditions found in children are structural heart defects. These usually involve a problem with the heart muscle or the heart valves and include:

* Heart valve disorders, e.g. narrowing of the aortic valve, or [mitral valve prolapsed](http://www.healthline.com/health/mitral-valve-prolapse).
* Defects in the septum e.g. VSD ,ASD or PDA
* A combination of defects. for example, Tetralogy of Fallot

**Classification of congenital heart defects?**

1. problems that cause too much blood to pass through the lungs such as (PDA,VSD ,ASD
2. problems that cause too little blood to pass through the lungs such as (tricuspid atresia , pulmonary atresia (PA) , tetralogy of Fallot )
3. problems that cause too little blood to travel to the body such as (coarctation of the aorta , aortic stenosis)

**Other classification :**

* A cyanotic (PDA,VSD ,ASD,PS )
* cyanotic (TOF,transposition of the great arteries

**A cyanotic diseases**

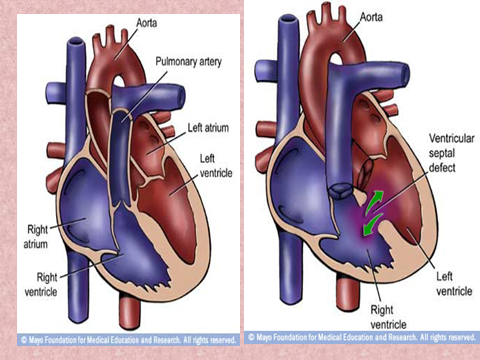
* **Patent Ductus Arteriosus (PDA)** -the normal pulmonary vascular system and allows blood to mix between the pulmonary artery and the aorta. Prior to birth, there is an open passageway between the two blood vessels, which closes soon after birth. When it does not close, some blood returns to the lungs. Patent ductus arteriosus is often seen in premature infants.



* **Atrial Septal Defect (ASD)** **-** in this condition, there is an abnormal opening between the two upper chambers of the heart - the right and left atria - causing an abnormal blood flow through the heart. Some children may have no symptoms and appear healthy.



* **Ventricular Septal Defect (VSD)** - abnormal opening between the two lower chambers of the heart - the right and left ventricles) occurs. This causes an extra volume of blood to be pumped into the lungs by the right ventricle, which can create congestion in the lungs.



* **Coarctation of the Aorta** - in this condition, the aorta is narrowed or constricted, obstructing blood flow to the lower part of the body and increasing blood pressure above the constriction. Usually there are no symptoms at birth, but they can develop as early as the first week after birth. If severe symptoms of high blood pressure and congestive heart failure develop, and surgery may be considered.



**B-Cyanotic diseases**

* **Transposition of the Great Arteries:**with this congenital heart defect, the positions of the pulmonary artery and the aorta are reversed  
  the aorta originates from the right ventricle, so most of the blood returning to the heart from the body is pumped back out without first going to the lungs.the pulmonary artery originates from the left ventricle, so that most of the blood returning from the lungs goes back to the lungs again

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**Tetralogy of Fallot -** this condition is characterized by the following four defects:

* An abnormal opening, or ventricular septal defect, that allows blood to pass from the right ventricle to the left ventricle without going through the lungs
* A narrowing (stenosis) at or just beneath the pulmonary valve that partially blocks the flow of blood from the right side of the heart to the lungs
* The right ventricle is more muscular than normal
* the aorta lies directly over the ventricular septal defect



**Causes of Congenital Heart Disease**

* The majority of congenital heart defects have no known cause.
* Genetic factors
* mother had a disease was taking medications, such as anti-seizure
* Infection disease (rubella )in early pregnancy
* Smoking and alcoholism
* Chronic disease such as (H.T ,D.M )
* mother age over 40 years
* Chromosomal abbreviation

**Diagnosis of CHD**

* Electrocardiogram ECG
* Chest –x-ray
* Echocardiography
* Cardiac catheterization

**General signs and symptoms of CHD**

* Dyspnea
* Tachycardia
* Apnea
* Difficult in feeding
* Heart murmur
* Cyanosis
* Failure to gain
* Clubbing finger
* Fatigue
* Recurrent respiratory infection

**Nursing Goals of Treatment of CHD**

* Reduce the work of the heart
* Improve respiration
* Prevent infection
* Reduce anxiety of family

**General Nursing Management of CHD**

* Keep child in comfortable position (knee-position or head elevated to facilitate breathing
* Small frequent feeding
* O2 on needed
* Check vital signs frequently
* daily weight
* Record input and output
* Give drug in right time and dose and explain the using for family
* Suitable diet such as ↓sodium, adequate fluid
* Prepare resuscitation for cardiac arrest
* Reduce stress and provide emotional support for child and family
* Give drug according to the Dr. order such as digoxin ,diuretic
* Restricted activity
* Prepare family for surgery