Anatomic & Physiologic Airway Differences in Children

- child's respiratory tract constantly grows & changes until approximately 12 years old.

  - **Upper airway differences**
    - the neck is shorter
    - airway is shorter & narrower
    - there is a greater chance of obstruction
    - an infant's airway is approximately 4 mm in diameter (about the width of a drinking straw)
    - trachea in a child is higher & at a different angle
    - infants, children & adults can breathe through the nose or mouth, but newborns (until 4 weeks of age) are obligate nose breathers.
    - Smaller nasopharynx
    - lymph tissues (tonsils & adenoids) grow rapid in early childhood & atrophies after age 12
    - smaller nares
    - small oral cavity & large tongue
    - long, floppy epiglottis
    - larynx & glottis are higher in neck
    - thyroid, cricoid & tracheal cartilage are immature and can easily collapse when neck is flexed
    - fewer muscles in airway
    - large amounts of soft tissue & loosely anchored mucous membranes lining the airway increase risk of edema

  - **Lower Airway Differences**
    - developing alveoli change size & shape; their numbers increase until respiratory maturity is attained at puberty
    - alveolar growth increases the area available for gas exchange
    - the distal bronchioles to alveoli are narrower and fewer in number at birth

<table>
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<th>Growth &amp; Development (London 1391)</th>
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<td>At birth the lung tissue contains only 25 million alveoli, which are not fully developed. The number of alveoli increases to 300 million by 8 years of age, after which these structures begin increasing in size &amp; complexity until puberty.</td>
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- bronchi & bronchioles are lined with smooth muscle, but the newborn does not have enough smooth muscle bundles to help trap airway invaders. By 5 months a baby has enough muscles to react to irritants. At 1 year old the amount of smooth muscle is comparable to an adult
- children under 6 use the diaphragm to breathe; intercostal muscles are immature.
- By 6 years old, intercostal muscles are more effective
- diameter of an infant's airway is much smaller, see diagram on next page
Respiratory Distress & Respiratory Failure

**Foreign-Body Aspiration** → inhalation of any object (solid, liquid, food or non-food) into the respiratory tract.

Aspiration occurs most often during
- feeding
- reaching activities
- crawling
- during playtime in children 6 months to 4 years of age

Common foods
- nuts
- popcorn
- small pieces of raw vegetables
- hot dog

Common Objects
- small, loose toy parts
- small wheels & bells
- beads
- safety pins
- coins
- buttons
- latex balloon pieces
- colorful liquids (especially from screw top bottles)
Severity of obstruction depends on the size & composition of object or substance
- Right lung is most common site of lower airway aspiration due to the sloped angle of it's bronchus
- Objects can migrate from higher to lower airway locations
- Object can also move back up to trachea, creating extreme respiratory difficulty

**Clinical Manifestations of FBA**
- Children are usually brought to hospital after sudden episode of coughing or gagging
- Dyspnea
- Tachypnea
- Nasal flaring
- Retractions
- Difficulty speaking the letter “p” is a significant sign of diminished expiratory effort
- Concentrated focus on breathing
- Anxiety / anxious expression
- Sitting in a forward position with neck extended
- Increasing hypoxia leads to irritability & decreased responsiveness
- Coughing, choking, gagging, dysphonia, and wheezing may be brief or may persist for several hours if the object drops below the trachea into one of the mainstem bronchi.
- Some children become asymptomatic after coughing for 15-30 minutes
- If foreign body is not removed, the child can develop a chronic cough, persistent or recurrent pneumonia or lung abscess weeks later

**Clinical Therapy**

**History** → determine whether aspiration has indeed occurred.
- Coughing, gagging or choking associated with feeding or crawling on the floor is usually a confirming event for aspiration

**Physical Exam** → often reveals decreased breath sounds, stridor, & respiratory distress

**Forced Expiratory Film** → a special radiograph ordered that shows local hyperinflation (air trapping) and a mediastinal shift away from the affected side

**X-ray** → Radioopaque items can be seen on x-ray film.
- Chest thrusts, black blows or the abdominal thrusts are used to dislodge objects obstructing an airway.
- An object lodged in the trachea is a life-threatening situation
- Fluoroscopy & fiberoptic bronchoscopy may be used to identify, locate & extract AFB.

**Nursing Management**

**Physiologic Assessment**
- Constant monitoring is required
- Perform respiratory assessment following guidelines in Table 47-1
- Track vital signs, audible wheezing on auscultation, retractions & increasing signs of respiratory distress.
- Note changes in breath sounds, from noisy to decreasing to absent, on the affected side. This
can indicate the object is moving & blocking a mainstem bronchus.

- Utilize cardiorespiratory monitors & pulse oximeters to assess child for subtle signs of hypoxia

**Psychosocial Assessment**

- unexpected & acute nature of the event creates anxiety for both parents & child
- child will additionally be stressed and/or fearful due to difficulty breathing
- assess coping & levels of stress
- The signs & symptoms signaling a body response to increased demands for oxygenation
  - increasing restlessness, irritability, unexplained sudden confusion
  - rapid heart rate accompanied by rapid respiratory rate

**Developmental Assessment**

- As child's condition stabilizes, observe how well the child's abilities match the parents' understanding of age-appropriate behaviors
- Common nursing diagnoses for child with AFB
  - Ineffective Airway Clearance r/t foreign body aspiration
  - Impaired Spontaneous Ventilations r/t foreign body aspiration and/or respiratory muscle fatigue
  - Fear (Parent or Child) r/t uncertainty of prognosis, unfamiliar surroundings and procedures
  - Risk for Injury r/t developmental age and small objects in environment

**Planning and Implementation**

- Promptly document & report any subtle changes in child's respiratory status
- a nurse must remain with a child who has significant obstruction
- nurse must have resuscitation equipment at the bedside of a child with significant obstruction
- permit child to remain in a position of comfortable
- avoid stressful procedures and sudden movements that may increase child's anxiety and respiratory efforts; doing so may cause the obstruction to move and completely obstruct the airway
- stabilize child after AFB is removed & observe for a few hours in a short-stay unit

**Discharge Planning and Home Care Teaching**

- focus on anticipatory guidance about childproofing the home
- encourage parents to learn CPR, choking-prevention techniques, back blows, chest thrusts, and/or abdominal thrusts

**Evaluation**

- Expected outcomes → child regains ability to ventilate spontaneously after removal of AFB
- Expected outcome → parents complete a safety check of the home to prevent future aspiration incidents.