Pediatric Pulmonary Issues in School

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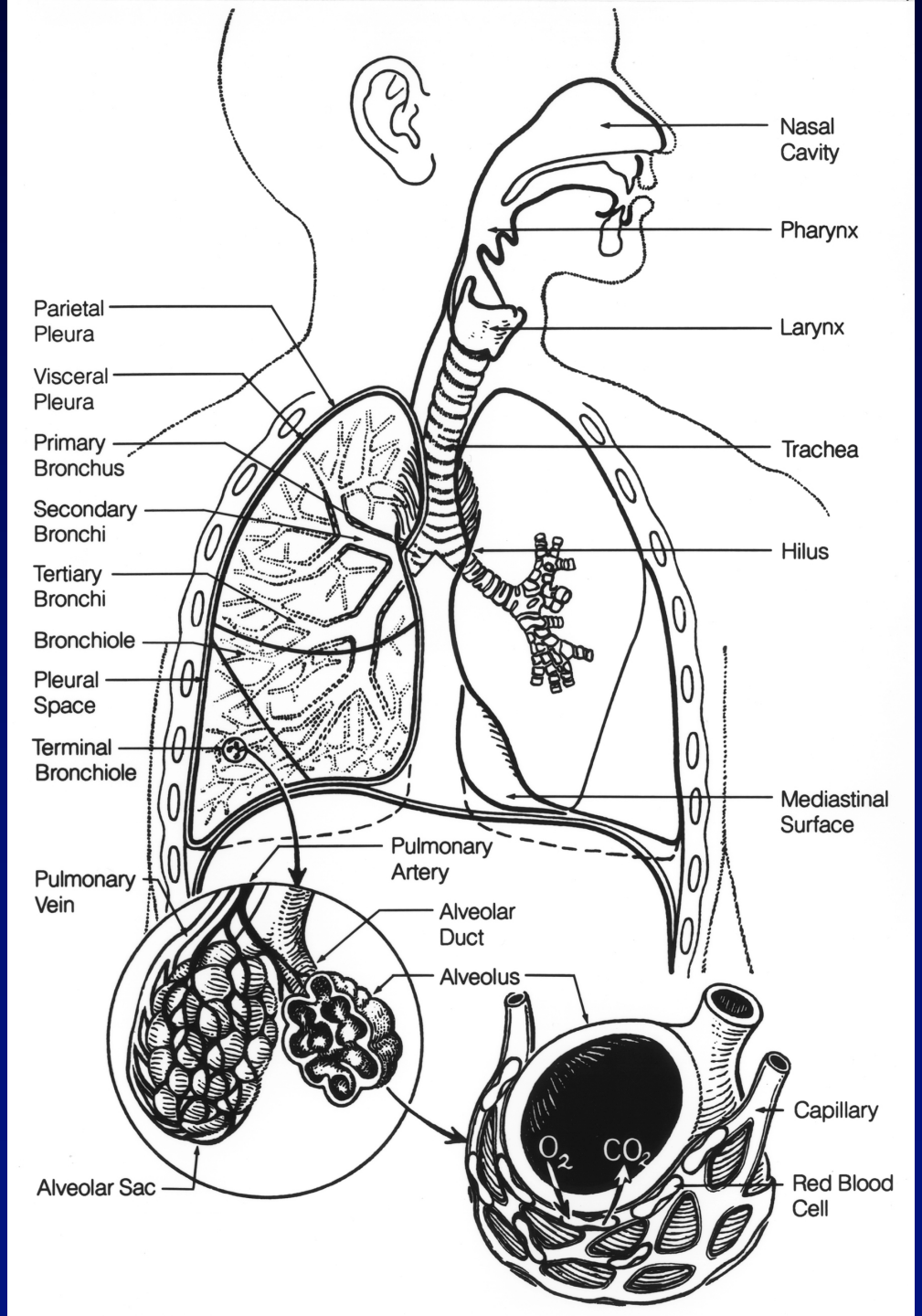
Outline

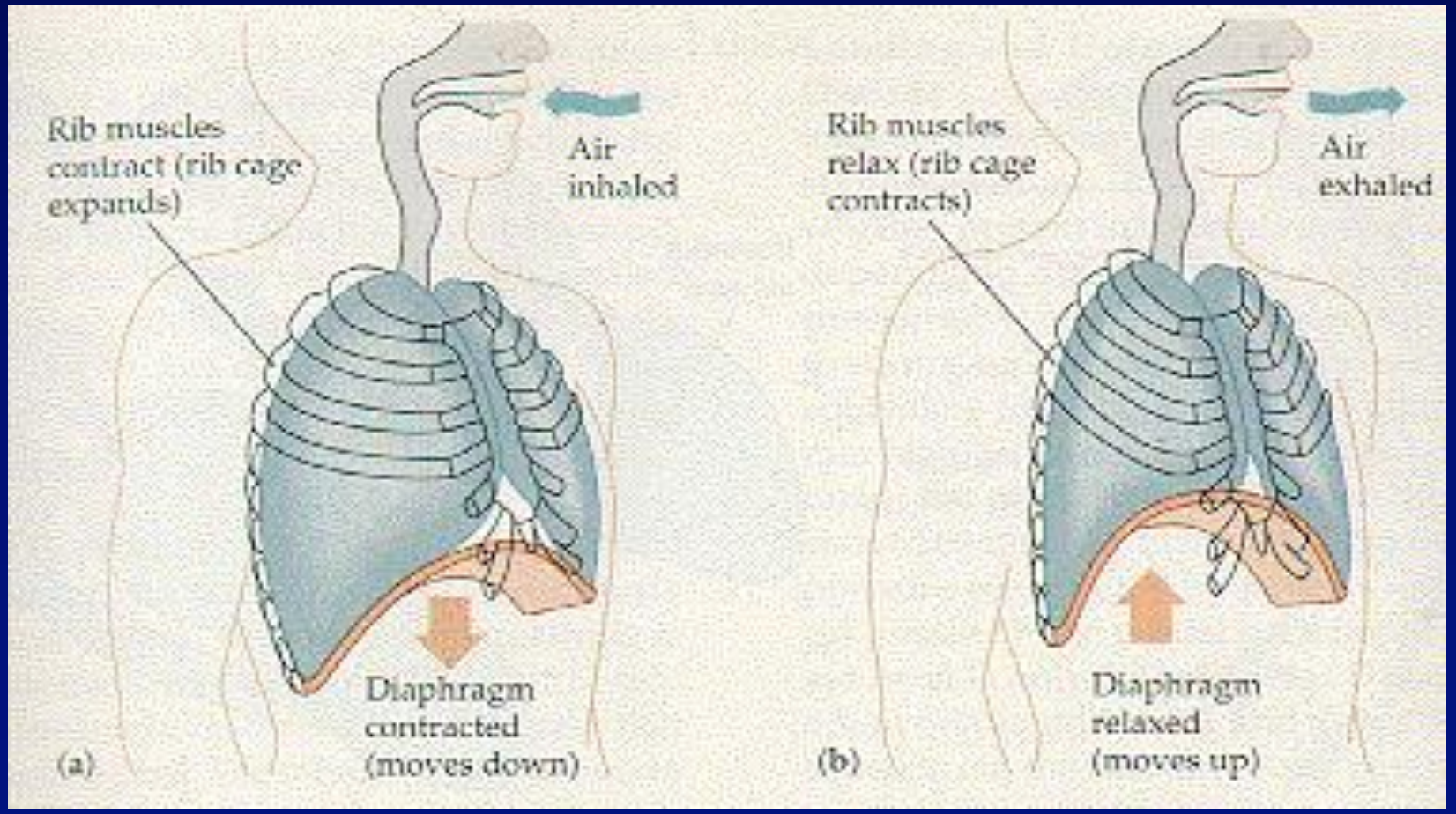
- Types of respiratory issues encountered
- Lung diseases, management
- Airway issues and management
- Muscle issues and management

Respiratory issues

- Acute
  - Illness with cough/wheeze/dyspnea
  - Flare of chronic illness, i.e. asthma attack
- Chronic
  - Airway diseases, lung diseases, muscle diseases
  - Examples: Cystic fibrosis, asthma, muscular dystrophy, cerebral palsy, tracheostomy, other technology


Nasal Cavity
Pharynx
Larynx
Trachea
Hilus
Mediastinal Surface
Parietal Pleura
Visceral Pleura
Primary Bronchus
Secondary Bronchi
Tertiary Bronchi
Bronchiole
Pleural Space
Terminal Bronchiole
Pulmonary Artery
Pulmonary Vein
Alveolar Duct
Alveolus
Alveolar Sac
Capillary
O_2
CO_2
Red Blood Cell

Basic Physiology



http://www.biology.eku.edu/RITCHISO/301notes6.htm

Airway problems

- Airway collapse or obstruction (make the child noisy or need mechanical help like a tracheostomy)
  - Laryngomalacia
  - Subglottic stenosis
  - Tracheobronchomalacia
  - Vascular compression
  - Foreign body

Lung Problems

- Asthma
- Cystic Fibrosis
- Bronchopulmonary Dysplasia
- Pneumonia or other infectious lung disease

Muscle Problems

- Muscular dystrophies
  - Duchenne muscular dystrophy
  - Spinal muscular dystrophy
- Neurologic problems
  - Cerebral palsy
  - Spinal cord injury

Presentation

- Cough
- Wheeze
- Stridor
- Shortness of breath/difficulty breathing
- Retractions
- Tachypnea
- Cyanosis
- Fever

Case

- 5 y.o. with no known past medical history or medications at school comes to your room with trouble breathing. She has a dry ”tight-sounding” cough, has a respiratory rate of 40 with mild subcostal retractions. You listen to her and see she has expiratory wheeze throughout all lung fields. She is mildly febrile at 38 (100.4) degrees.

Asthma or Bronchiolitis

- Both often present acutely
- Both often triggered by illness/viruses
- Most recurrent wheeze is asthma, regardless of age, atopy, frequency
- Common viruses: RSV, rhinovirus, parainfluenza virus, human metapneumovirus, adenovirus

What to do

- Assess level of distress
- Consider administration of albuterol
- Call family vs emergency personnel

Case

- Eight year old presents to the Emergency Room with shortness of breath and wheezing in the evening
- Problems started after running around outside at school
- Child also coughs at night with waking, has seasonal allergies and a mother with asthma


Pathology of Asthma
Top 10
Normal bronchiole
Asthmatic bronchiole

Asthma

- Chronic inflammatory disorder of the airway which results in recurrent episodes of airflow obstruction that is often reversible
  - Symptoms—cough, wheeze, dyspnea
  - Airway obstruction
  - Inflammation
  - Hyperresponsiveness

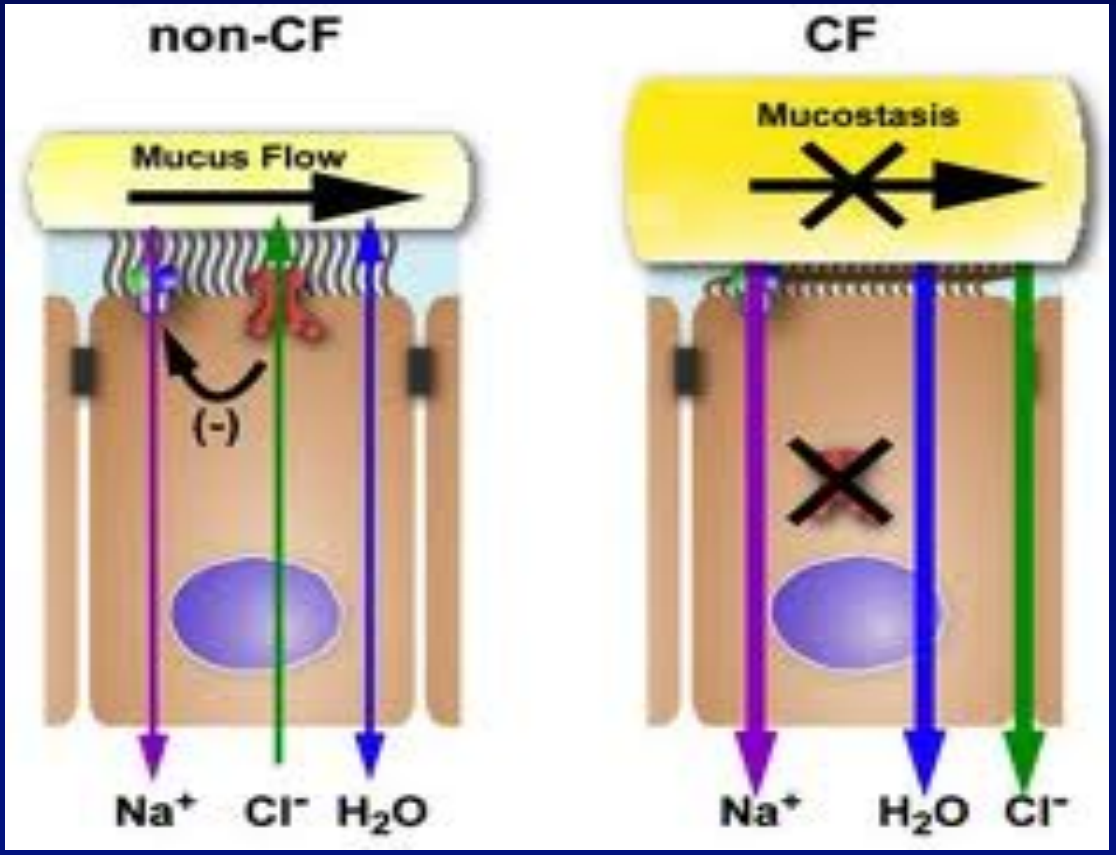

Pulmicort Respules

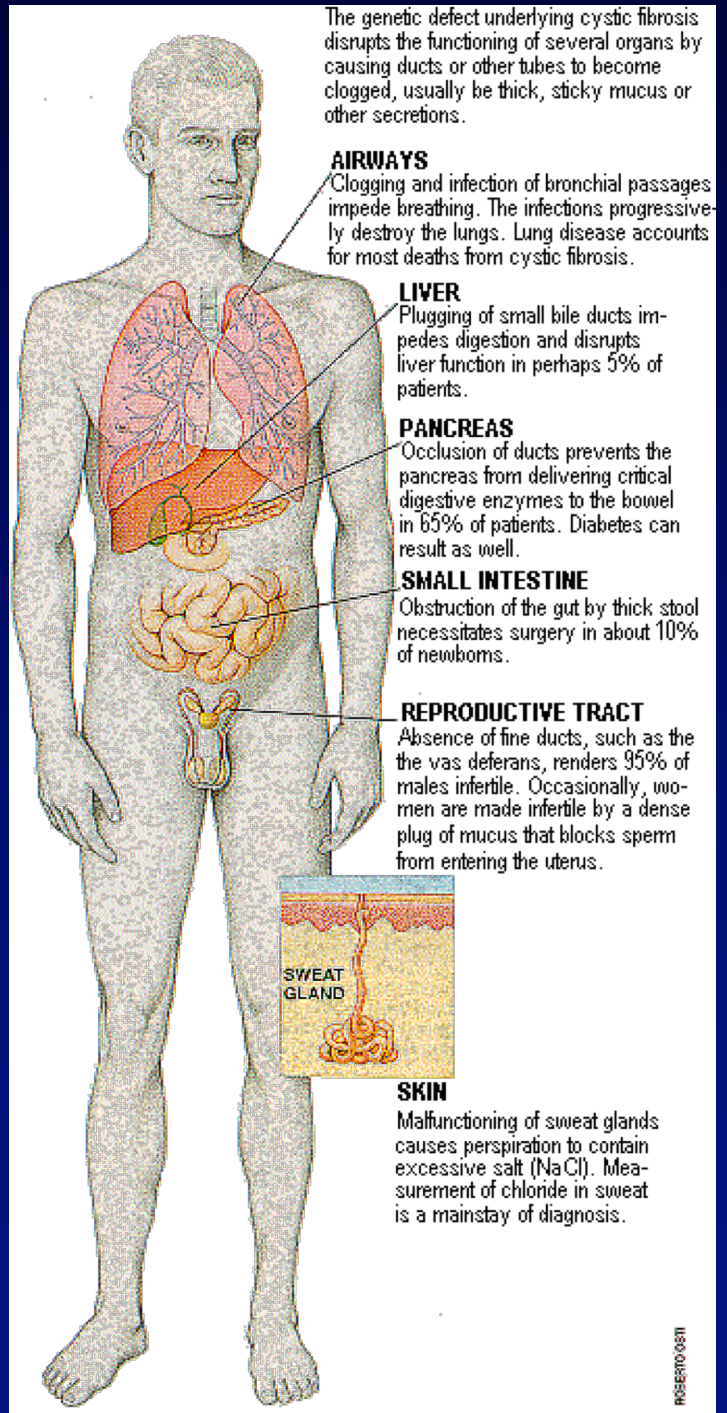

Xolair
omalizumab

Case

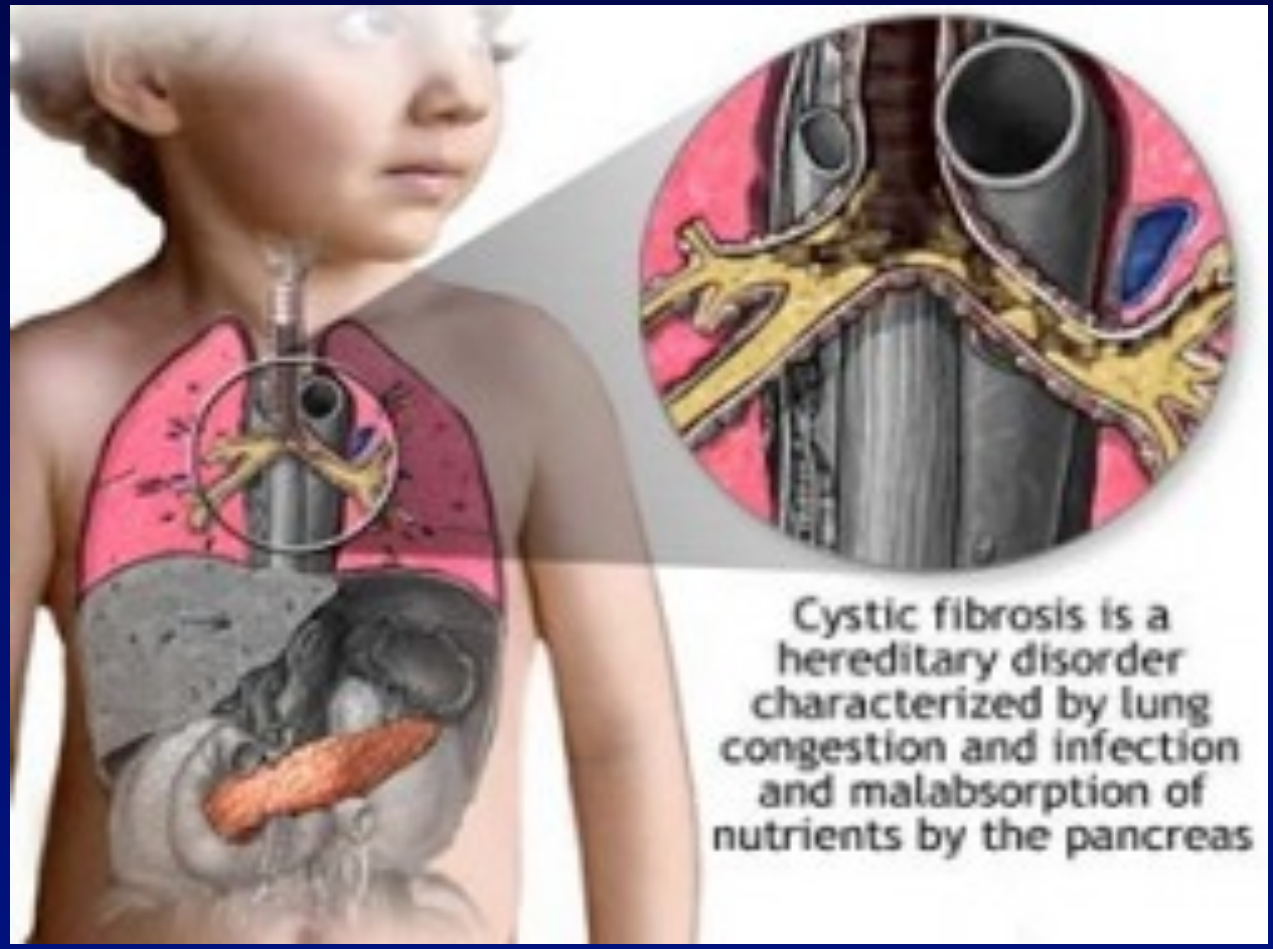
- 16 year old child admitted with pneumonia and asthma
- Third hospitalization for pneumonia this year
- Misses a lot of school
- Chronic cough and wheeze
- Poor growth with height and weight both below the 5th percentile

Basic Defect



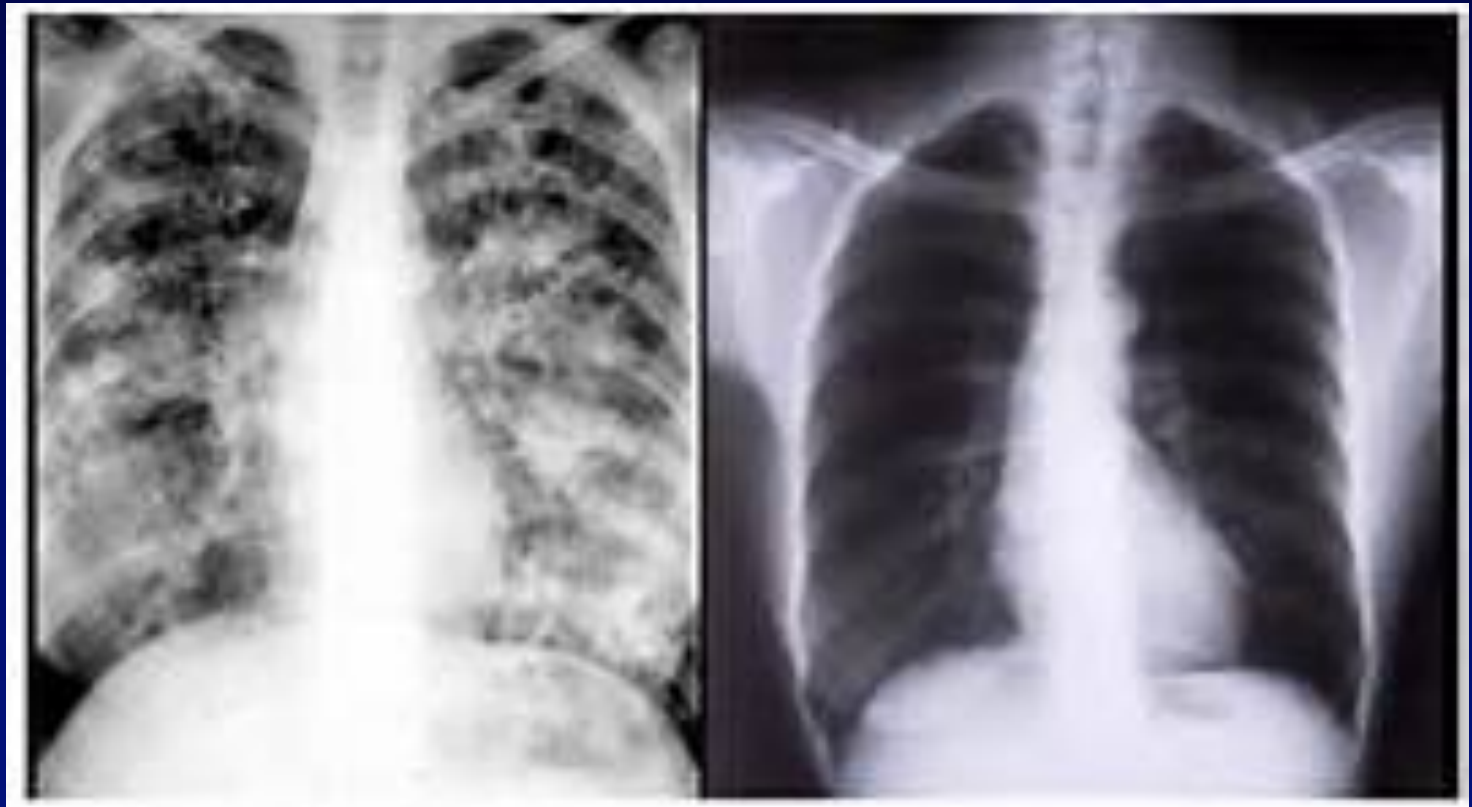


Welsh, MJ and Smith, AE. Cystic Fibrosis. *Scientific American*. 273 (6): 52, 1995.


Cystic fibrosis is a hereditary disorder characterized by lung congestion and infection and malabsorption of nutrients by the pancreas

Pulmonary Manifestations

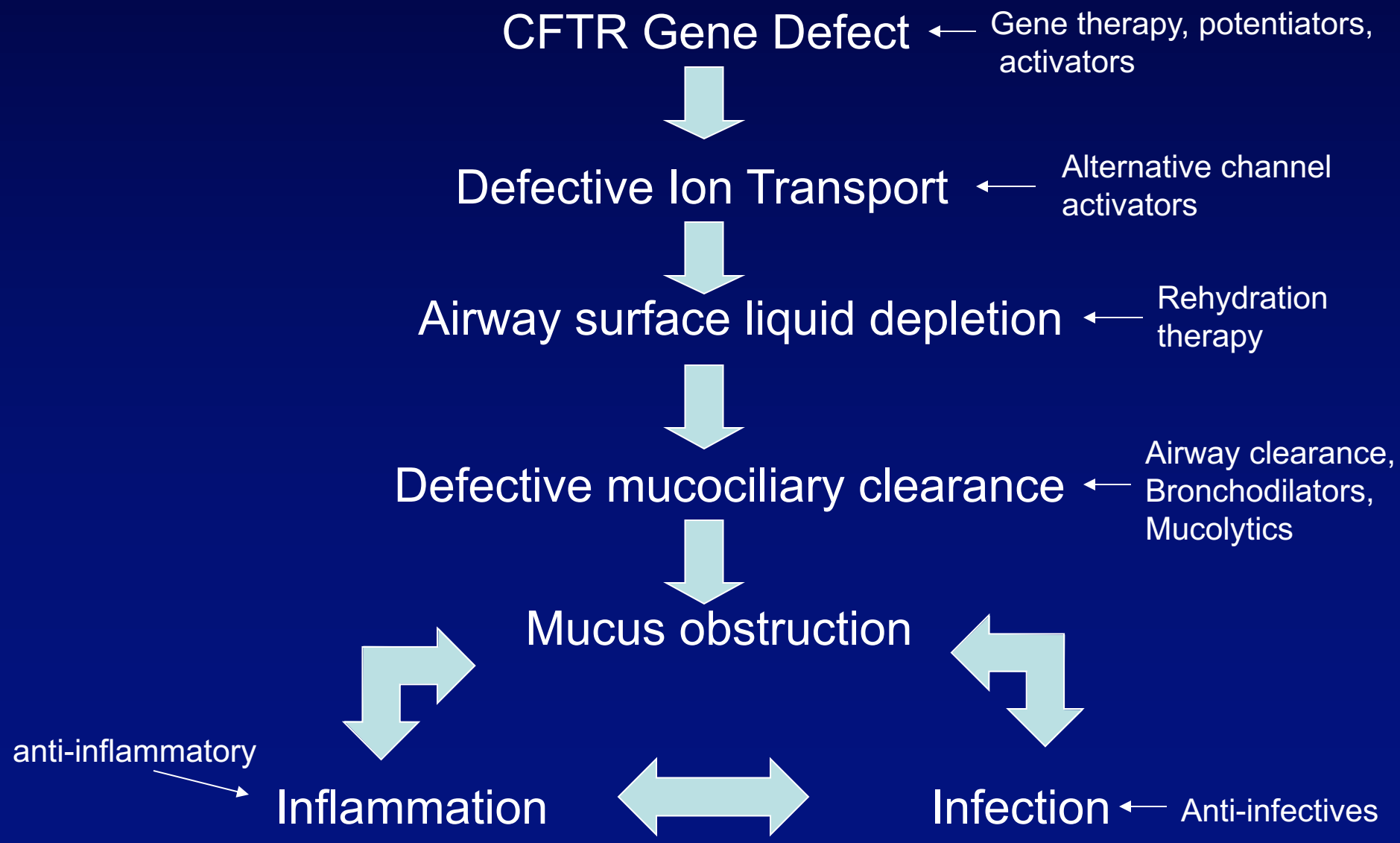
- Chronic symptoms
  - Productive cough, wheeze, recurrent exacerbations
- Obstructive lung disease
- Bronchiectasis
- Infection



Cystic Fibrosis Lung

Healthy Lung

Treatment-Lungs



School Impact

- Coughing
- Medication Administration
- Restroom privileges
- Gym class and sports
- Absences
- Self-esteem
- Academic performance
- Career goals
- Disclosure of child’s condition

Psychosocial Issues

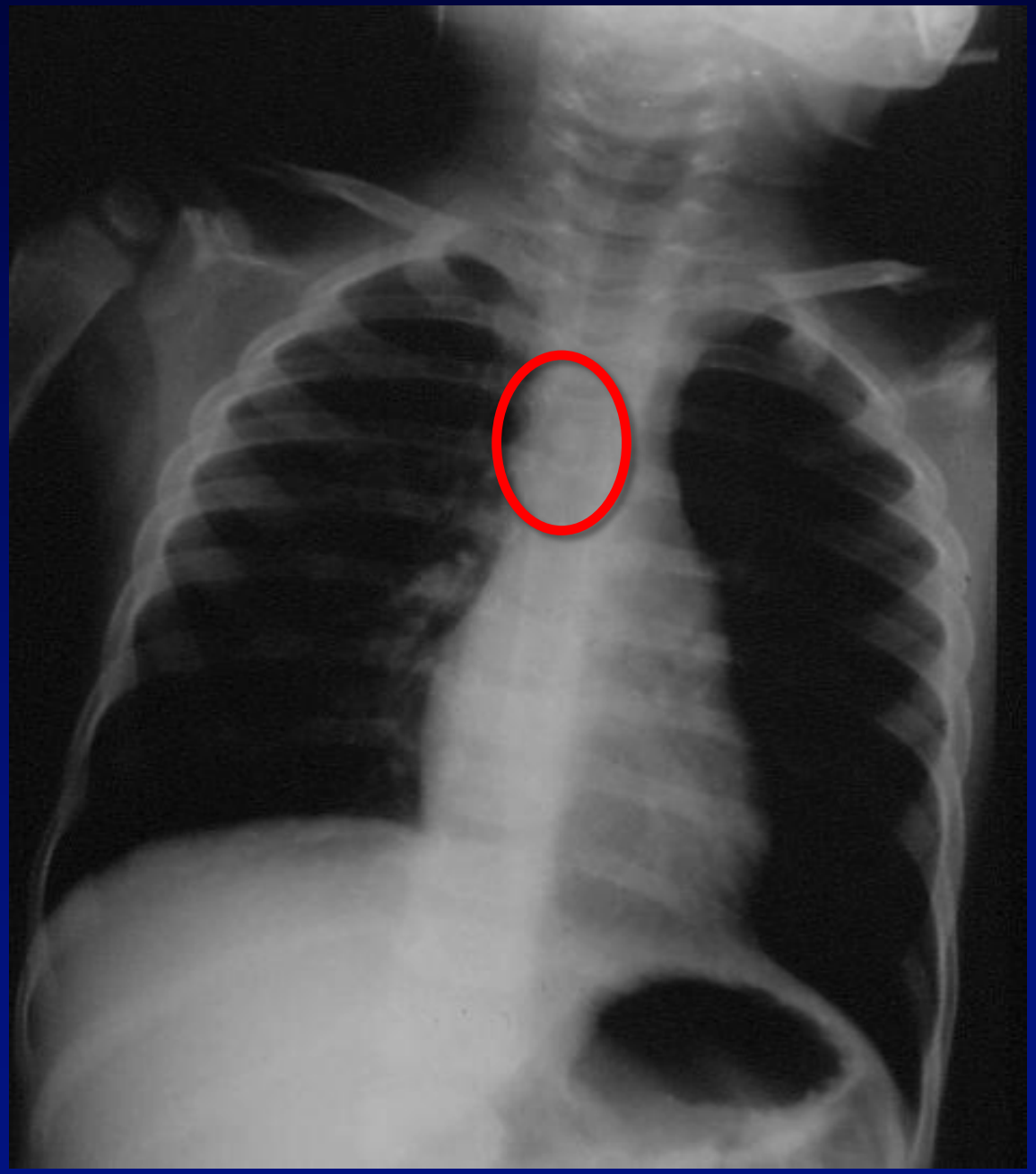
- Quality of Life
  - Hospitalizations, daily therapy burden, morbidity, limitations
- Normal growth and development
- Transitions
- Adherence
- Financial issues, insurance
- End of life issues

Teamwork

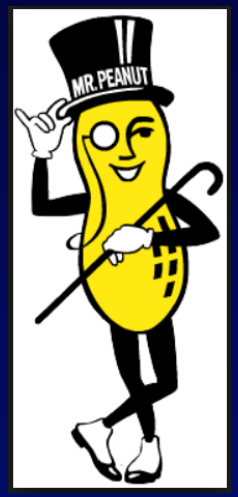
- Physicians
  - Pulmonary, Primary MD, Gastroenterology, ENT, Surgery, Endocrine, Infectious Disease, plus
- Nurses
- Respiratory Therapist
- Nutrition
- Social work
- The school nurse may need to interact with one or many of these people in addition to the family

Case

- 8 y.o. presents to your office after “choking” at lunch
- Was eating trail mix when a friend hit him on the back
- Has been coughing and having trouble breathing since
- You hear audible wheezing as he comes in the room
- Lungs sound coarse and diminished in the bases



Foreign Body



- Age > 6-10 months and male
- ‘Helpful toddler sibling’ in home
- Sunflower seeds, peanuts, etc.
- Coarse wheeze with monophonic component
- Heterophony (Differential air entry)
- Tracheal FB may lack differential air entry and may be associated with severe paroxysmal cough
- Local hyperinflation or collapse
- 30% FB aspirations are late diagnoses

What to Do

- Child needs medical attention now
- Call the family
- Keep child calm
- Can try albuterol—won’t hurt but not likely to help much either

Case

- 6 month old admitted to the Pediatric ICU with a viral infection that requires a ventilator
- Child is globally weak, has never sat up, has head lag, chokes when he feeds and doesn’t breathe over the ventilator

(I know this is not a school case, but you will deal with these children as they get older.)

Spinal Muscular Atrophy

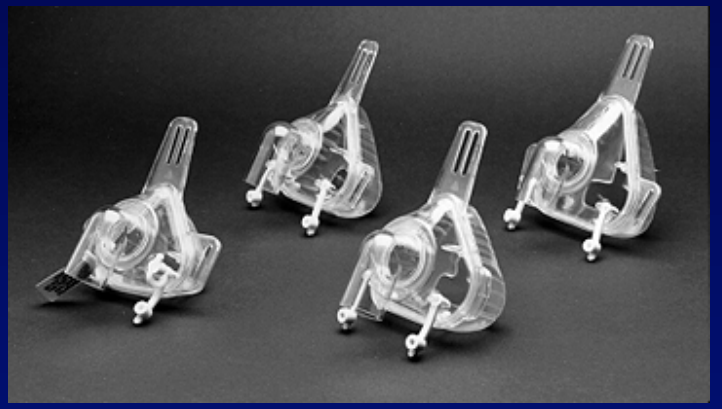
- Progressive muscle weakness with destruction of spinal neurons
- Multiple types all eventually lead to respiratory failure
- Weak suck and swallow with big aspiration risk

Interfaces

- Noninvasive vs. Invasive
  - Age
  - Cognitive ability
  - Body habitus
  - Ventilatory needs
  - Anticipated length of ventilation
  - Family/patient preference

Noninvasive interfaces

- Nasal masks
- Full facemasks
- Nasal pillows
- Sipper mouthpiece
- Lipseal/mouthpiece device

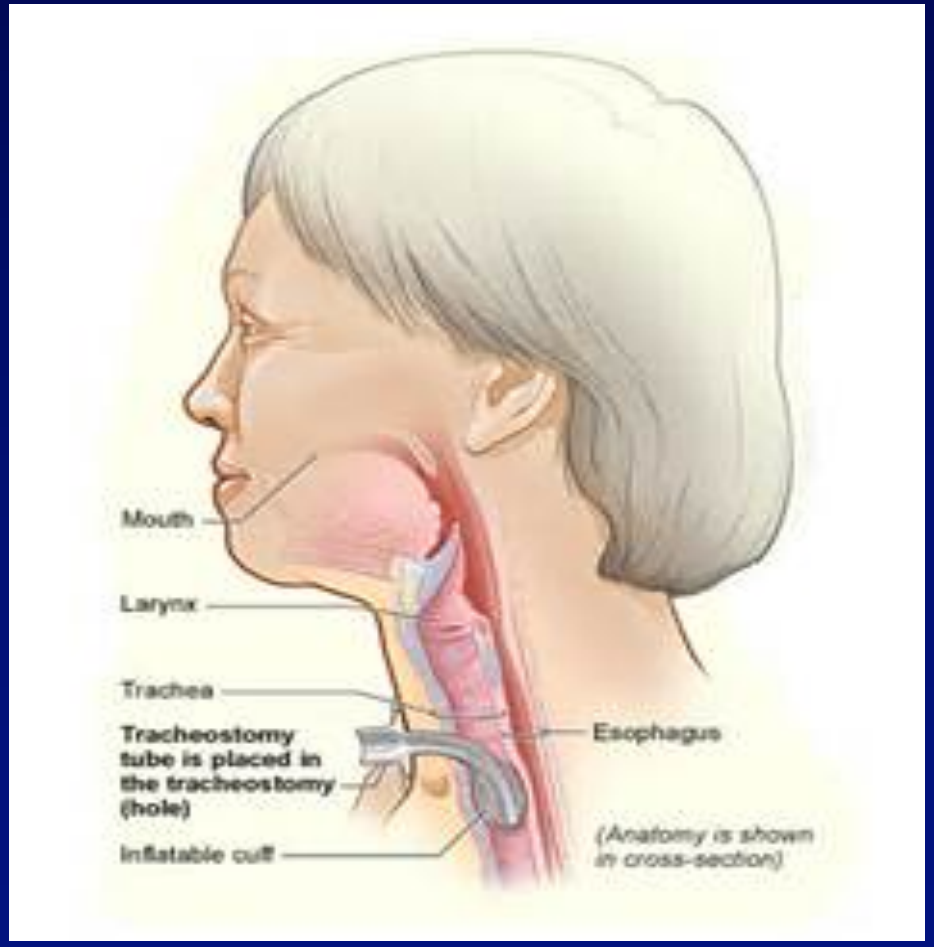


Tracheostomies

- Shiley, Bivona, Portex and others
- Pediatric sizes mimic ETT ID’s
- Neonatal, pediatric, adult and customized lengths
- Cuffed and uncuffed
- Disposable inner cannula models

Tracheostomies

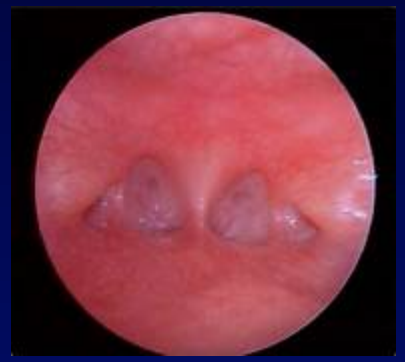
Tracheostomy Tubes

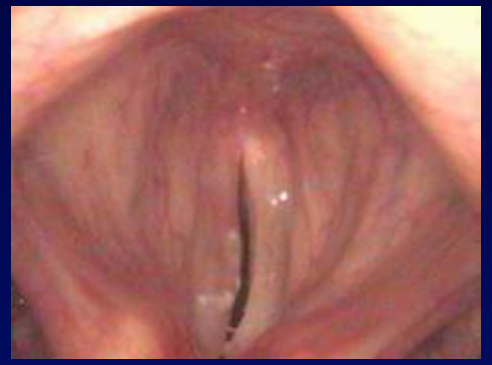


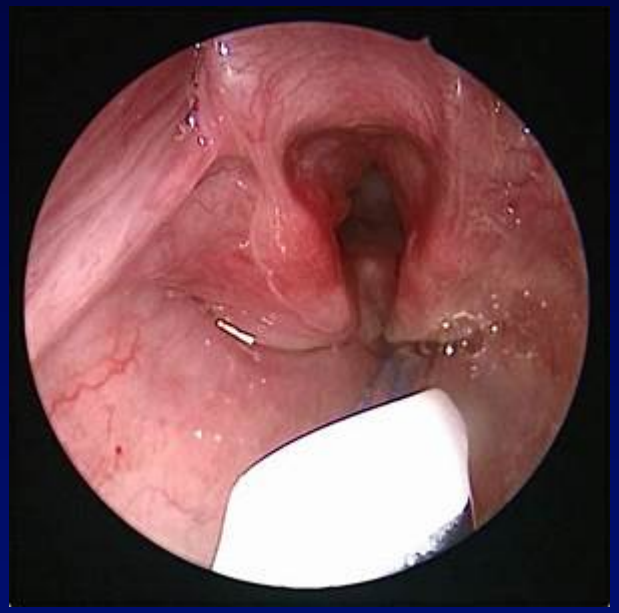
Tracheostomy

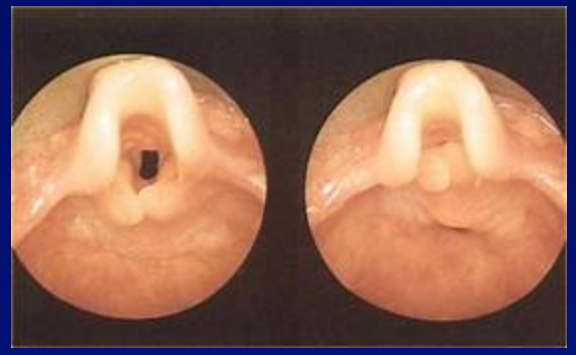
Airway

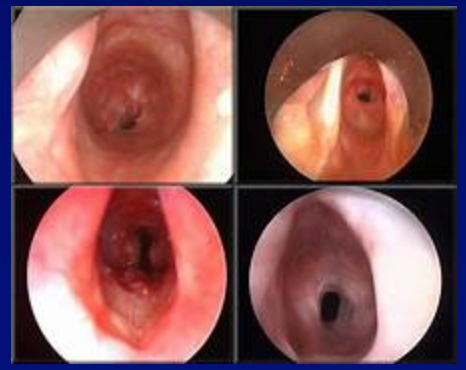
- Choanal atresia
- Laryngomalacia
- Glossoptosis
- Vocal cord paralysis
- Laryngotracheoesophageal cleft
- Stenosis—glottic, subglottic, tracheal
- Tracheobronchomalacia
- Tracheoesophageal fistula
- Tracheostomy-dependent

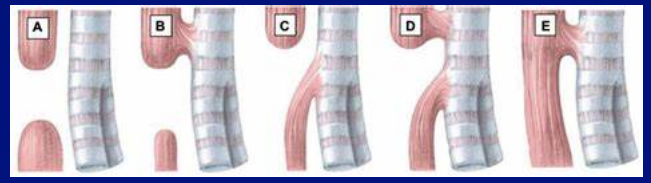


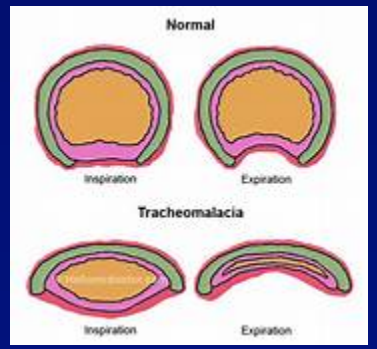









A
B
C
D
E


Normal
Inspiration
Expiration
Tracheomalacia
Inspiration
Expiration

Ventilators

Supporting Equipment

- External support—PEEP
- Alarms/Monitoring
  - Pulse oximetry, Apnea monitor, Capnography
- Humidification
  - Internal, External w/ heater, HME
- Airway clearance
  - Suctioning, Vest, cough assist
- Talking devices

Indications

- Disorders of the respiratory pump
  - Neuromuscular diseases, chest wall diseases, spinal cord injury
- Obstructive diseases of the airway
  - Craniofacial abnormalities, hypotonia, obesity
- Parenchymal lung disease
  - BPD, cystic fibrosis
- Disorders of control of respiration
  - Congenital central hypoventilation syndrome

Indications

- Inability to wean from mechanical ventilation
  - After and acute illness
  - After prolonged ventilation for a chronic disease
- Progressive chronic respiratory failure
- Sleep disturbance
  - Central or obstructive, apnea or hypopnea

School Considerations

- Educational needs/placement
  - General vs special education classroom
  - Handicapped status
- Ventilatory need
  - Continuous, only nocturnal, periodically during day
- Nursing interventions
  - Suctioning, medications, feeds, intervention for complications
- Medical needs
  - Appointments, illnesses, hospitalization

PROCEDURE	RN	LPN	UAP	Other
RESPIRATORY ASSISTANCE				
• Postural Drainage*	Q	S	S	X
• Percussion*	Q	S	S	X
• Suctioning*				
○ Oral*	Q	S	S	EM
○ Tracheostomy *	Q	S	S	EM
• Trach Change*	Q	S/EM	EM	X
Mechanical Ventilator Care*	Q	S	X	X
SCREENINGS				
• Growth / BMI	Q	S	S	X
• Vital Signs	Q	S	S	X
• Hearing	Q	S	S	X
• Vision	Q	S	S	X
• Scoliosis	Q	S	S	X

Definition of symbols:

* Medical provider order required
Q Qualified to perform task with demonstrated competency
S Qualified to perform task with training and demonstrated competency
EM In emergencies with training and demonstrated competency
X Should not perform task

RN: Registered Nurse
LPN: Licensed Practical Nurse
UAP: (Unlicensed Assistive Personnel): Individuals working in a school health office, teachers, instructional assistants, school secretaries or other school personnel who have daily responsibilities for care of the student.
Others: Bus drivers, bus monitors, cafeteria workers or custodians who have routine interaction with the student.

Underlying Diagnoses

Dlagnosis	Percentage
Congenital abnormalities	42
Injuries	21
Diseases of the Nervous System	19
Bronchopulmonary Dysplasia	8
Other	8
Unknown	3

Educational Placements for Children Who are Ventilator Assisted, Jones, DE 1995

Classroom Settings

Educational Program	General Classroom	Special Classroom
General Education	43%	1%
Severe multi handicap	--	7%
Orthopedic handicap	12%	6%
Other health impairment	4%	3%
Learning disabilities	3%	3%
Mental retardation	--	3%
Speech impairment	1%	1%
Unknown	3%	4%
Total	67%	29%

*Hours in classroom varied from 7.5 to 40 hours per week

Educational Placements for Children Who are Ventilator Assisted, Jones, DE 1995

Parental Satisfaction

Area of Need	Yes	No	Unsure
Academic	83%	10%	7%
Health Care	80%	16%	4%
Socialization	78%	17%	5%
Psych/Emotional	70%	16%	14%
Therapy	61%	36%	4%

Educational Placements for Children Who are Ventilator Assisted, Jones, DE 1995

Sleep

- Obstructive apnea
  - Airway
- Central apnea
  - Neurologic
- Hypoventilation

Case

- Five year old child with hyperactivity, trouble paying attention
- Falls asleep in the car and at school, naps daily
- Restless sleeper, wakes easily at night, snores loudly and sometimes obstructs during sleep

Conclusions

- Pulmonary issues can arise at school
- Pulmonary issues can impact school performance and attendance
- School nurses will be asked to provide pulmonary interventions and medications at school
- Communication with physicians and families will clearly improve care