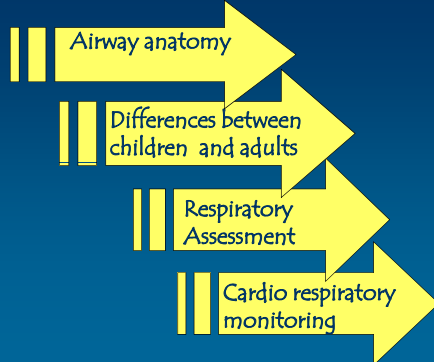


Anatomy and Assessment of the Pediatric Airway

Rebecca Tribby RN MSN
Candace Dreier RRT

Topics



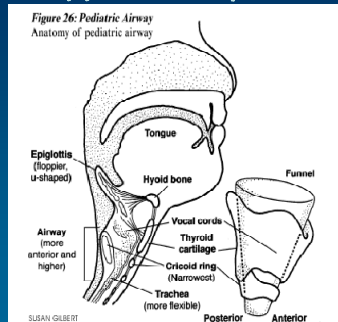
Anatomy and Function of the Respiratory System

- ◊ Respiration is the act of breathing.
 - Inhaling (inspiration) is taking in of air to supply oxygen to body tissues.
 - Exhaling (expiration) is the giving off of the waste product carbon dioxide
- ◊ The respiratory system is divided into the upper and lower airway.

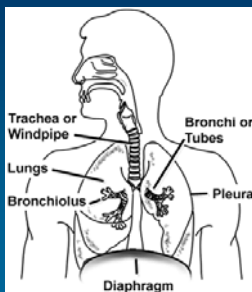
Pediatric Upper Airway

Trachea below
vocal cords

Size of trach tube
dependent on
diameter of airway
and distance to
carina



Pediatric Lower Airway



Bronchi branch
out

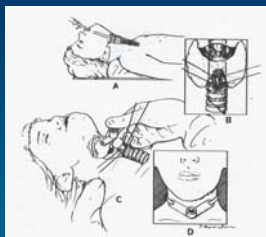
Gas exchange in
alveoli

What is a Tracheostomy?

A surgical opening in the
trachea which bypasses
the nose and mouth

Vertical or horizontal
incision in the trachea

Stay sutures placed near
the end of the incised
tracheal ring



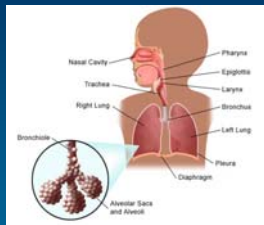
Retrieved from <http://www.tracheostomy.com/surgery/tracheostomy.htm>

Differences Between Children & Adults



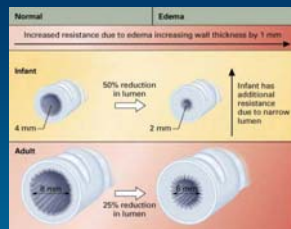
Differences of Airways

- ◇ Airway diameter smaller & airways shorter
- ◇ Larynx higher & more anterior
- ◇ More prone to severe obstruction of airways



Differences of Airways

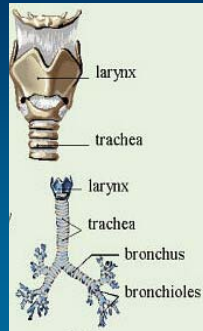
- ◇ Mucus or swelling = increased resistance to airflow
- ◇ One mm of edema increases resistance a factor of 16 versus a factor of 2.4 for and adult



Source: Markenson, D.S. Pediatric Prehospital Care, New Jersey: Prentice Hall, 2002, p. 97.

Differences of Lungs

- ◊ Airway muscles & cartilage not completely developed
- ◊ Easier for airways to collapse
- ◊ Less surface area for gas exchange



Differences of Chest Wall

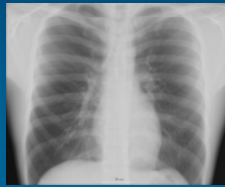
- ◊ Higher ratio of cartilage to bone
- ◊ Chest wall rounder in infant
- ◊ becomes more oval with growth

Infant



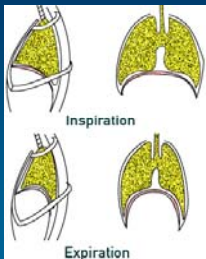
Retrieved from: <http://www.hawaii.edu/medicine/pediatrics/pemxray/v4c03.html>

Adult



Retrieved from: <http://www.answers.com/topic/anatomy>

Differences of Respiratory Muscles



- ◊ Diaphragm higher & less curved in a child
- ◊ Intercostal muscles not as effective

Retrieved from <http://www.buteyko.co.nz/asthmafacts/mechanics.cfm>

Assessment Look Color

- ◇ Best seen inside mouth, lips, eyes, face, or fingers
- ◇ Sufficient
 - pink = adequate oxygen
- ◇ Insufficient
 - Pale, white, gray, blue, purple (cyanosis)

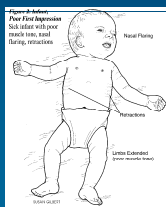


Assessment Look Respiratory Effort

Sufficient
Alert, content, playful



Insufficient
Lethargic or too sleepy, anxious, restless, agitated, irritable



Retrieved from: <http://www.cpm.org/html/gif/inf.html>

Assessment Look Respiratory Rate

- ◇ Count rate for one minute when child is quiet
- ◇ Insufficient
 - Significantly increased respiratory rate = respiratory distress
 - Significantly decreased respiratory rate = fatigue or hypothermia

Assessment Look Respiratory Rate

Pediatric Respiratory Rates		Pediatric Heart Rates	
Age	Breath Rate (breaths per minute)	Age	Heart Rate (beats per minute)
Infant (birth-1year)	30-60	Infant (birth-1year)	100-160
Toddler (1-3 years)	24-40	Toddler (1-3 years)	90-150
Preschooler (3-6 years)	22-34	Preschooler (3-6 years)	80-140
School-age (6-12 years)	18-30	School-age (6-12 years)	70-120
Adolescent (12-18 years)	12-16	Adolescent (12-18 years)	60-100

Assessment Look Mucus

- ◇ Note amount, color, consistency, child's ability to clear secretions
- ◇ Sufficient
 - None or minimal amount, thin, clear or white from nose, mouth, or trach
- ◇ Insufficient
 - Increased amount
 - Yellow or green
 - ◇ Indicates infection
 - Signs of food
 - ◇ may indicate reflux or aspiration
 - bloody



Assessment Look Feeding Behavior

- ◇ Feeding
 - Appetite
 - Feeding tolerance
 - Fatigue
 - Coughing (aspiration)



Retrieved from http://www.acclaimimages.com/_gallery/_print_pages/0001-0407-1909-4716.html

Assessment Listen Audible Sounds

- ◇ Sufficient
 - Occasional cough to clear throat or trach
 - Quiet breaths
- ◇ Insufficient
 - Cough- frequency,
 - character of cough – dry or loose – clearing trach
 - Wheeze- musical sounding usually on expiration. Sign of airway obstruction

Assessment Listen Auscultation Sounds



- ◇ Sufficient
 - Clear
 - Symmetry
 - May hear transmitted sounds from top to bottom or side to side

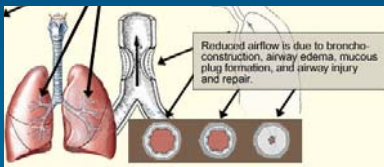
Retrieved from: <http://www.med.emory.edu/GENETICS/patients/>

Assessment Listen Auscultation Sounds

Insufficient

- Wheeze- where heard?
- Caused by airway obstruction

1. something obstructing the airway	3. edema or inflammation of airway
2. bronchoconstriction	4. malacia of the airway



Retrieved from: http://learn.gosmc.edu/hscidist/LearningObjects/PediatricAsthma/what_is_asthma.htm

Assessment Listen Auscultation Sounds

Insufficient

Crackles – fine or coarse

Sign of fluid in lungs

Coarse or rhonchi –

sign of mucus in larger airways



Decreased– less loud in one area
= less air movement

Retrieved from <http://www.scale.ca/>

Retrieved from <http://biology.clc.ac.edu/courses/bio105/respirat.htm>

Websites for Breath Sounds

- ◇ <http://www.emory.edu/WHSC/Grady/inetgrp/hplung.html>
- ◇ <http://mceus.com/resp/respabn.html>
- ◇ http://faculty.etsu.edu/arnall/www/public_html/heartlung/breathsounds/contents.html
- ◇ <http://www.umshp.org/rt/sounds/sounds.html>

Assessment Feel Chest Expansion

◇ Sufficient

– Movement in & out equal on both sides



◇ Insufficient

– Shallow rapid movement of chest

– Unequal movement of chest

Assessment Feel Mucus in Lungs

- ◇ Sufficient
 - No evidence of mucus
- ◇ Insufficient
 - Feel mucus moving in the lungs



Retrieved from:
<http://ihealth.yahoo.com/topic/asthma/overview/article/mayoclinic/E05029A1-9E99-427B-BE47BA91B7BD70B5>

Tools for assessment You



- ◇ You are the best tool
- ◇ Knowledge of child's baseline if child has chronic illness

Tools for Assessment Stethoscope



Use correct size
stethoscope

Tools for Assessment Cardio/Respiratory Monitors

Purpose:
Detect and Inform of
potential life threatening event

Topics:

- ◊ Attaching the cardio/respiratory monitor to the child
- ◊ Safely using the monitor
- ◊ Responding to cardio/respiratory alarms

Tools for Assessment Monitors

- ◊ Best monitor is vigilant, trained caregiver
- ◊ No commercial monitor is ideal
- ◊ Consider monitoring for children at high risk
- ◊ Know how to use the equipment




When To Use Monitor

- ◊ During sleep
- ◊ Traveling
- ◊ When not closely observed



Parts of Monitor

- ◇ Two electrodes
- ◇ Lead wires
- ◇ Patient cable
- ◇ Monitor

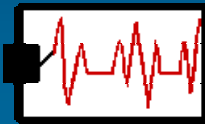


- ◇ Measures
 - ◇ heart rate
 - ◇ breathing rate

Two electrodes

Monitor Alarm Limits

- ◇ Alarms and limits appropriate for age
- ◇ Apnea delay 20 seconds
- ◇ High heart rate (tachycardia)
 - greater than the upper range for the child
 - (200–225)
- ◇ Low heart rate (bradycardia)
 - dependent on age and individual child
 - (50–80)



Parts of Monitor



Monitor & Patient Cable

Electrodes

Lead Wires

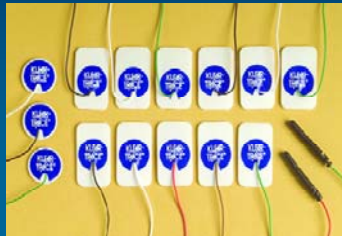
Retrieved from http://www.casmed.com/pdf/apnea_acces.pdf

<http://websites.labx.com/rankin/listings.cfm?show=1&catid=1354&p=2>

Monitor Parts Electrodes

◇ Disposable – stick directly on skin

- paper
- cloth
- foam



Monitor Parts Electrodes

◇ Reusable – black carbon secured with belt

- less irritating
- move out of position more easily



Electrodes

◇ Use 2 electrodes

- White electrode on child's right side
- Black one on child's left



Retrieved from: <http://www.casmed.com/Z1020117-R04.pdf>

◇ Place directly under armpit

- At greatest amount of chest wall movement



Retrieved from <http://xpedia02.childrenshc.org/stellent/groups/public/@xcp/@web/@clinicsanddepts/documents/policyreferenceprocedureweb037975.asp>

Safety Considerations

- ◇ Never put in water
- ◇ Disconnect monitor from child before bathing
- ◇ Don't use water with electrodes



Safety Considerations

- ◇ Siblings should not play with monitor
- ◇ Need to be within 10 seconds of reaching child
- ◇ Place on high, hard, flat surface
- ◇ Have light source available



Safety Considerations

- ◇ Avoid electrical interference caused by
 - placement too close to electrical appliances
 - woolen blankets or sweaters
 - intercom too close to monitor
- ◇ Have phone available for call for help
- ◇ Keep lead wires out of reach of all children
- ◇ Misuse of monitor can cause a shock or electrical burn for caregiver or child



Monitor Power Source

- Electrical
 - plugged into AC source
 - internal battery lasts 8 hours
 - recharge every night





Monitor Alarms

- Equipment –steady tone
 - loss of power
 - lead alarm
- Human–beep once per second
 - High Heart Rate
 - Low Heart Rate
 - Apnea
- Response
 - count beeps
 - look at and assess the child
 - push reset button to clear the alarm light




Monitor Alarms

False alarms caused by something other than child's status

Apnea alarm when child is breathing can happen with shallow breathing (deep sleep)

If all else fails call the equipment provider

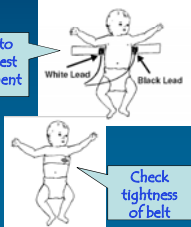
Change leads, electrodes, patient cable

Move leads to area of greatest chest movement

Check for tight connections

White Lead Black Lead

Check tightness of belt





[illegible][illegible]

Key Points: Anatomy & Assessment

Children respond differently than adults to changes in their respiratory status

Correct use of a cardio-respiratory monitor may save a child's life

Assessment and documentation of the assessment are key components of caring for a child with a tracheostomy
