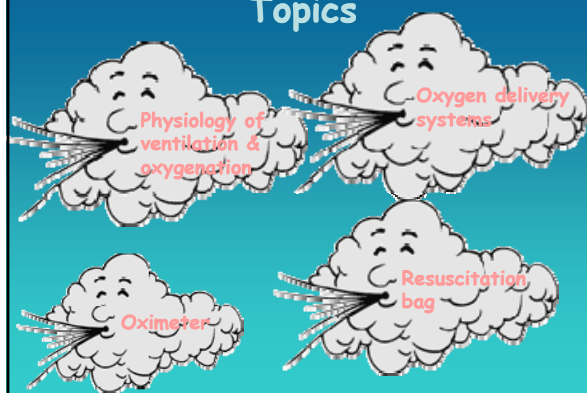


Oxygenation and Manual Ventilation

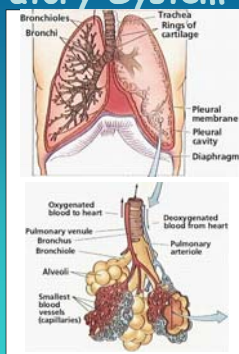
Rebecca Tribby, RN, MSN
Candace Dreier, RRT

Topics



Function of Respiratory System

- Supply the blood with oxygen inhaled into the lungs to deliver to all tissues of the body
- Release the carbon dioxide from the veins and exhaled out of the body



retrieved from: <http://www.emc.maricopa.edu/faculty/farabee/biobk/BioBookRESPSYS.html>

Ventilation

Mechanics

Exhaling

- passive process
- diaphragm moves up
- reduces size of chest cavity
- increases air pressure

Control

- Breathing center in the brain (CNS & Spinal cord)
- stimulates muscles
- Feedback Receptors
- balance blood gasses

Inhaling

- active process
- moves diaphragm down
- enlarges size of chest cavity
- reduces air pressure

Gas Exchange

Gas exchange occurs in the alveoli as gas diffuses between the alveoli and the capillaries

Ventilation (V) = air flow

Perfusion (Q) = blood flow

Retrieved from: http://www.le.ac.uk/pa/teach/va/anatomy/case2/2_2.html

Lower Oxygen Levels

Alveolar Dead Space

Alveoli is ventilated, but there is no blood flow

Clinical Conditions

- Emphysema
- Excessive PEEP
- Pulmonary embolism

Retrieved from: http://projects.mml.mcgill.ca/resp/ventilation_perfusion.htm


Lower Oxygen Levels

Shunt

- Blood is flowing past an alveoli with no air
 - blood has lower levels of oxygen
 - higher levels of carbon dioxide

Clinical Conditions

- Pneumonia
- Atelectasis
- Asthma



Example of **wasted perfusion** because the O₂ cannot enter the alveolus. Thus the blood passing by is not getting oxygenated.
A Shunt

alveolus
capillary

Retrieved from: http://sprojects.mml.mcgill.ca/resp/ventilation_perfusion.htm

Hospital Oxygen


- Via flow meter in the wall
- Always available
- Amount prescribed
 - liter flow
 - frequency



Retrieved from: <http://www.webmm.ahrq.gov/case.aspx?caseID=76>

Supplemental Home Oxygen

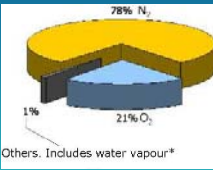
- Oxygen Systems
 - use
 - quantity
- Transport
- Safety
- Amount prescribed
 - liter flow
 - frequency
 - activities of use






Retrieved from: <http://www.upsi.net/philosophy.htm>

Delivery of Oxygen

Room air = 21%
Supplemental Oxygen = > 21%



Retrieved from: <http://www.air-conditioner-selection.com/air-properties-and-air-conditioners.html>



Ventilator

Retrieved from: http://www.aftonmedical.com/trach_masks.htm

Delivery of Oxygen

Heated Humidity System



Ventilator System



Nebulizer treatments



Sleeve for artificial nose



Oxygen Delivery Systems

Concentrator




Liquid



Pressurized Gas



Oxygen Concentrator



Source

- Draws in room air & filters out oxygen

Advantage

- Powered by electricity
- Least expensive

Disadvantage

- Does not store oxygen
- Stationary -not useful for travel

Oxygen Liquid Portable Tanks




Source

- Stored at very low temperature in thermos like device
 - Becomes a gas when warmed to room temperature

Advantage


- More oxygen in same sized container

Liquid Oxygen



Advantage

- Best for daily portability
- Caregiver fills the portable as needed
- Often provided with the concentrator



Base Unit



Top of Base Unit

Filling portable unit

Retrieved from:
<http://www.familyresp.com/html/homeoxygen.html>

Liquid Oxygen

Disadvantage

- Base unit filled from larger unit
- Evaporates if not being used
- Must be kept upright to prevent leakage of oxygen
- Most expensive system



Oxygen Cylinders



Source

- Gas under pressure in metal tanks

Advantage

- Comes in various sized tanks
- Can be portable

Oxygen Cylinder Regulator

Disadvantages

- Can easily tip over
- High pressure system



Retrieved from: <http://www.o2supplies.com.sg/oxygen%20page.html>

Transporting with Oxygen


Retrieved from: <http://www.airmedltd.com/masks.html>

Oxygen can be delivered in a variety of ways



Oxygen Safety

- Do not store in air tight areas
- car trunk
- closet



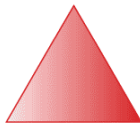
Oxygen Safety



Oxygen Safety


Turn off all oxygen units

Fuel
(flammable gases, liquid or solids)



Oxygen
(present in the air)

Ignition Source
(such as cooking, smoking, electrical equipment)

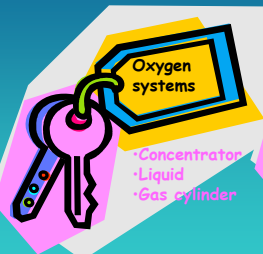


Retrieved from: <http://www.workingatmcmaster.ca/link.php?link=eohss%3Aeohss-fire>

Retrieved from: <http://www.scotland.gov.uk/Publications/2005/11/23133820/38217>

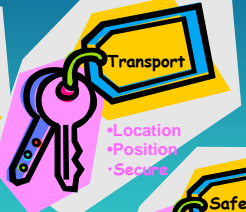
3 components needed for a fire

Key Points: Oxygen




Oxygen systems

- Concentrator
- Liquid
- Gas cylinder



Transport

- Location
- Position
- Secure




Safety

- Storage
- Fire

Pulse Oximetry

Device using a probe to measure oxygen in the blood

- Function of a pulse oximeter
- Using a pulse oximeter to track oxygenation trends




Retrieved from: http://www.gokulamhealthcare.com/Pulse_Oximeter.html


Use of Home Care Oximeters

- Daily readings of oxygenation
- Weaning from ventilator

Tuff Sat



Masimo




Retrieved from: <http://www.masimo.com/awards/index.htm>


Retrieved from: http://used-medical-equipment.medical-supplies-equipment-company.com/product/PPF/param/771_0_1_true/product_search.asp

Oximeter Readings

- Non-invasive probe
 - Finger
 - Toe
 - Earlobe



Retrieved from: <http://www.nihonkohden.com/company/echlead.html>




Retrieved from: <http://som.flinders.edu.au/FUSA/BME/Clin/BasicEquipment/PulseOximeters.htm>

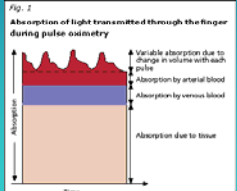
Retrieved from: <http://www.sammonspreston.com/ca/Supply/product-list.asp?subsection=1937>

Oximeter Readings

- Non-invasive probe
 - Lights extremity
 - Reads pressure of blood
 - Calculates % of oxygen
- Incorrect measurement
 - If too tight
 - Incorrect placement



Retrieved from: <http://www.themedweb.co.uk/dictionary/Dictionary.htm>



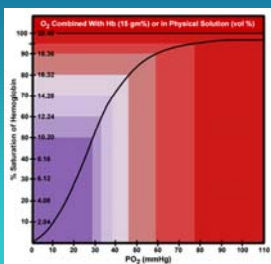
Retrieved from: <http://www.austrianprescriber.com/magazine/06/9/1325/>

Disadvantages of Oximetry

- May give false high or low readings
- Not FDA approved as a continuous monitoring device
- May not alarm for life threatening event

Normal Oxygen Saturations

- Normal saturation range
 - 92-100%
- Supplemental oxygen needed
 - < 89%
- Children with cardiac disease may have lower baseline levels
- Know normal range for each child



Retrieved from: <http://www.cvm.okstate.edu/courses/vmed5412/lect012.htm>

Accuracy of Oximetry Readings

- Check for a quality signal
 - Compare heart rate reading to actual heart rate
 - Check signal bar for good strength



Retrieved from: <http://www.pemed.com/pmonitor/oximeters/oximeters.htm>



Retrieved from: <http://www.healthcareforhealth.com/cellpreto1a.htm>

Key Points: Oximetry

- Probe measures & machine calculates % of oxygen in the blood
- Best used to track trends
- Your assessment is best way to evaluate child

Manual Resuscitation Bag


- Device to push air into the lungs
- Watch chest for adequate expansion



Retrieved from:
http://www.emergencybookstore.com/item_detail.aspx?ItemCode=1581101872

When to Use

- Volume expansion
 - Gives bigger breaths to person
- Give breaths
 - If ventilator not working
- Give at rate on vent or usual for child



Disposable Bags

- Cannot be cleaned or reused
- Used for
 - child who seldom needs bagging
 - family who cannot assemble non-disposable bag



Oxygen reservoir



Non-disposable Bags

- Must be cleaned & is reused
- Used for
 - children needing bagging on regular basis
 - need two bags



Oxygen reservoir

Trach Adaptor



Pediatric Resuscitation Bag

Function Check Step #1

- Squeeze
- Re-inflates



Pediatric Resuscitation Bag Function Check Step #2

- Place finger over the patient port
- Squeeze air out of the bag
- Check for movement of pressure pop off




Pediatric Resuscitation Bag Function Check Step #3

- Place finger over the patient port
- Occlude the pressure pop off
- Squeeze the bag
- No air should escape



Adding Oxygen



Key Points: Manual Resuscitation

- Assists child in taking a breath
- Know how to test & use bag
- Resuscitation Bag & Mask **MUST** be with child at all times



Retrieved from www.trachbag.com

Key Points: Oxygenation & Manual Ventilation

Hypoxia can be caused by a variety of alterations in adequate ventilation

Three types of systems can be used to provide oxygen for home care

Oximeters can measure the amount of oxygen in the blood, but are not reliable as monitors

Resuscitation bags must be in good working order to provide adequate ventilation
