

Math Strand 3: Geometric and Spatial Relationships

CLE: 3.1 Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.

Health Profession: Respiratory Therapist

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References:

Peak Expiratory flow rate: Normal values. Retrieved on January 27, 2008, from www.peakflow.com

Black, J. M., Hawks, J. H. (2005). *Medical-Surgical nursing*. St. Louis: Elsevier Saunders.

Occupational Outlook Handbook: Respiratory Therapy. Retrieved on February 25, 2008, from <http://www.bls.gov/oco/ocos084.htm>

ConCorde Respiratory Therapy Program Details. Retrieved on February 25, 2008, from <http://www.concorde.edu/kansas/programs/advanced-respiratory-therapy.asp>

Commission on Accreditation: Respiratory Therapy programs. Retrieved on February 25, 2008, from http://www.caahep.org/Find_An_Accredited_Program.aspx

Objectives:

At the completion of this presentation the high school student will be able to:

- 1. State the normal peak flow range for their age and height.**
- 2. Demonstrate the use of a peak flow meter.**
- 3. Identify the importance of this information as it relates to respiratory therapists.**

Background Summary of Information as Related to Respiratory Therapists and CLE:

The human body needs an ample supply of oxygen to support all bodily functions. When the body doesn't have this supply it can affect a person in many aspects. People with normal lung (pulmonary) function have a total lung capacity between 4400-5900 ml. Normal quiet breathing consumes about 500ml as shown on the chart provided titled as Tidal Volume (Vt). Inspiratory reserve volume (IRV) is the volume of air actively inhaled (sucking in all the air a person possibly can at one time). Expiratory reserve volume (ERV) is the volume of air actively exhaled (pushing out all the air a person possibly can at one time) and Reserve volume (RV) is the volume of air that remains in the lung that can't escape to prevent collapse. Vital Capacity (VC) is the measurement of IRV+Vt+ERV together.

Respiratory therapists (RT) use these volumes and other mechanisms to compare and determine if a person is adequately ventilating ie. Pulmonary function tests.

Peak flow meters, a form of pulmonary function testing, are used by RT's to measure expiratory flow volume. Asthmatic patients use these frequently to measure and

compare the number values to determine if they are ventilating at their usual breathing level, and also to determine if their medication regimen is adequate. This meter evaluates for constriction or obstruction of the pulmonary airway. RT's use age, ht, and sex to determine the appropriate value per person, as seen on the chart provided.

Education Requirements for Respiratory Therapy:

An associate degree is the minimum education requirement, but a bachelor's or master's degree may be important for advancement.

Here is a list of nearby accredited schools:

- ConCorde Career College- Kansas City, MO
- Kansas City Kansas Community College- Kansas City, KS
- Johnson County Community College- Overland Park, KS
- University of Kansas Medical Center- Kansas City, KS
- Missouri Southern State College- Joplin, MO
- University of Missouri- Columbia, MO

For Example- ConCorde Career College is a 60 week program for an associate's degree and a 64 week program for an advanced Respiratory Therapy degree.

Scenario:

Johnny a RT, is working with Sara a 20 year old newly diagnosed asthmatic patient in the hospital. In order to determine if this pt is ventilating adequately, he compares and calculates information on vital capacity from the chart to see if she falls in the normal range. Johnny knows her IRV is 2100, Vt is 500 and her vital capacity is 3300. What is her ERV? Does it fall within the normal range? Use the chart to compare with normals.

Formula: $2100+500+x=3300$

$$2600+x=3300$$

$$x=700$$

The ERV is 700 ml

The Vital Capacity range is 3400-4700. This pt does not fall within the normal range. It may indicate need for further evaluation and a medication regimen should be discussed with Sara's doctor to determine her exact needs.

-Other formulas utilized by Respiratory Therapists-

$PAO_2 = FIO_2(Pb-47)-1.2(PaCO_2)$ - Alveolar Gas Equation-assess if the lungs are properly transferring oxygen into the blood.

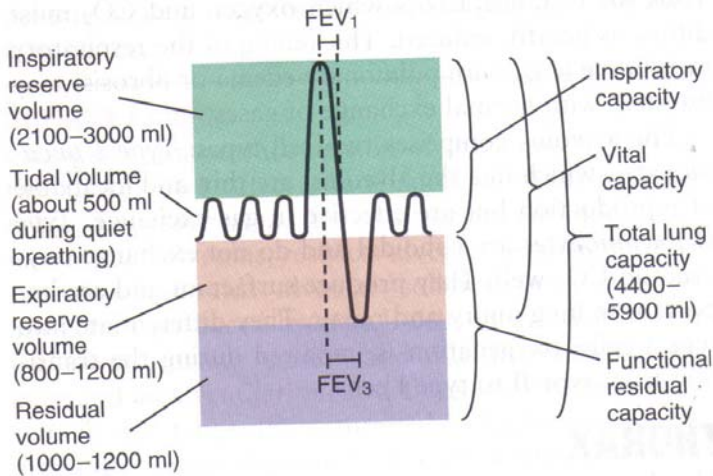
Activities:

Supplies needed:

- Approximately 6 peak flow meters
- Approximately 30 alcohol swabs
- 35 copies of peak flow chart
- watch with second hand

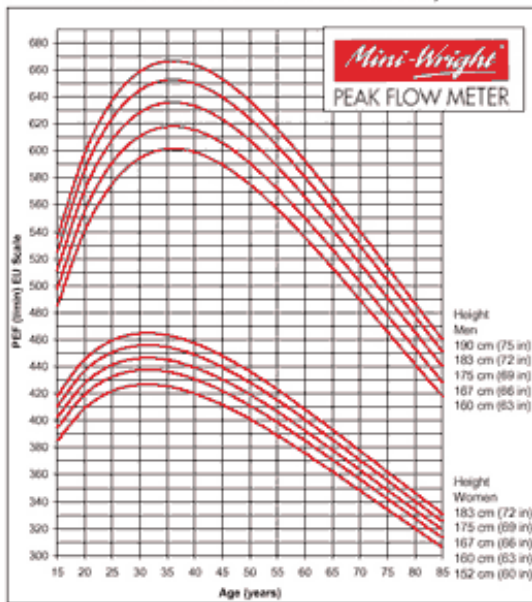
Divide the class into 6 small groups of 4 or 5. Give each group 1 peak flow meter. Have each student take in a deep breath and blow as hard as they can into the meter

with lips tightly wrapped around it. Each student should do this a total of 3 times, with 30 second resting times between, using the highest number they achieve and compare it to the chart given to see if they fall into the normal range for their age, ht and sex. Disinfect the meter each time between students with alcohol swabs around the mouth piece.



PEAK EXPIRATORY FLOW RATE - NORMAL VALUES

For use with EUVEN13826 scale PEF meters only



Adapted by Clement Clarke for use with EN13826 / EU scale peak flow meters from Nunn AJ Gregg J, Br Med J 1989;298:1068-70