Math Strand 1: Numbers & Operations

CLE: 1.1 Understanding numbers, ways of representing numbers, relationships among numbers and number systems.
Example: Read, write, and compare numbers. Compare and order rational and irrational numbers, including finding their approximate locations on a number line.
Health: Explain the relationship between nutrition and quality of life and disease.

Health Profession: Physician

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References:

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Medical Encyclopedia: Hypokalemia. Retrieved on February 21, 2008, from http://www.nlm.nih.gov/medlineplus/enc/article/000479.htm

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Objectives:

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

1. **Explain why potassium chloride is necessary for body function and how it is replaced within the human body.**
2. **Demonstrate the concept of body mass index by setting up and applying the equation**
3. **Identify the importance of this information to physicians and high school students.**

Background Summary of Information as Related to physician and CLE:

The importance of this project is to spark an interest in the students in the medical field and to tie in their learning experiences with a chosen profession. The profession topic chosen for this CLE is physician. The education of physicians in the United States is lengthy and involves undergraduate education, medical school and graduate medical education.

Potassium is an electrolyte that is important to the human nervous system, muscle function, fluid balance and heart, kidney and adrenal functions. A deficiency in potassium is called hypokalemia and can manifest as heart dysrhythmias, breakdown of muscle fibers, constipation, fatigue, muscle weakness or spasms, or paralysis (which can include the lungs). Mild hypokalemia can be treated by taking potassium supplements by mouth but more severe cases require intravenous potassium. The prognosis of hypokalemia is that it can be taken care of with treatment, but without treatment, potassium levels can drop low enough to cause death.

BMI (body mass index) is a tool often used by physicians to screen for potential weight problems. For children and teens, once the BMI is calculated, it is charted on a graph (attached) showing the percentile they would fit into. The percentile determines the potential problems. The following is the recommended ranges:

Weight Status Category	Percentile Range
Underweight	Less than the 5th percentile
Healthy weight	5th percentile to less than the 85th percentile
At risk of overweight	85th to less than the 95th percentile
Overweight	Equal to or greater than the 95th percentile

Scenario:

Helen is a 15 year old female who is suffering from anorexia nervosa. She is 68 inches tall and weighs 105 pounds. She is rushed to the hospital for fainting in math class. Upon admission, the doctors run multiple blood tests. Her electrolytes come back showing low potassium, magnesium, and sodium.

- **Calculate Helen's weight in pounds to kilograms using the following equation: pounds / 2.2 = weight in kg Answer: 47.73**
- **Calculate Helen's height in inches to meters using the following equation: inches x 0.0254 = height in meters Answer: 1.73**
- **Calculate Helen's BMI by using the following equation: BMI = weight in kilograms / (height in meters x height in meters) Answer: 15.96**
- **If Helen's potassium level is a 3.0 and the desired level is 3.8 and 10 mEq will raise the potassium level 0.1, how many mEq of potassium will Helen need to get her potassium to a normal level? Answer: 80 mEq (0.1/10 = 0.8/X, 0.1X=8, X=80**
- **The physician would like to replace Helen's potassium with 50% oral and 50% IV potassium. Utilizing the previous answer, given that the maximum rate of potassium chloride through a peripheral IV is 10 mEq per hour, how many hours would it take for the potassium chloride to infuse? Answer: 4 hours (80mEq – 50% oral would be 40mEq, 50% IV would be 40mEq – infused at 10 mEq per hour would take 4 hours)**

Activities:
Each student will calculate their own BMI and use the chart in the Background Summary section and determine the percentile their BMI falls under. Each student will then know where their BMI is at in the weight status category.
Supplies needed: Paper, pencils, copies of growth charts - Optional: tape measure to measure students height and weight scales to measure students weight

Summary

As shown in the scenario, a physician utilizes his/her math and algebra skills in evaluating and providing care to their patients.

Medical School Preparation:

Four years at a college or university to earn a BS or BA degree, usually with a strong emphasis on basic sciences, such as biology, chemistry, and physics (some students may enter medical school with other areas of emphasis).

Medical School: Four years of education at one of the U.S. medical schools, consisting of preclinical and clinical parts. After completing medical school, students earn their doctor of medicine degrees (MDs), although they must complete additional training before practicing on their own as a physician. (Note: Some physicians can go to a college of osteopathic medicine and receive a doctor of osteopathic medicine degree (DO).)

A unique medical program is offered at the University of Missouri – Kansas City which is a six year medical program. Students enter the program directly from high school and work on their BS and MD simultaneously, attending year-round school, graduating in six years instead of the typical eight years.

Residency program: Through a specially designed match program, newly graduated MDs enter into residencies that are three to seven years or more of professional training under the supervision of senior physician educators. The length of residency training varies depending on the chosen specialty: family practice, internal medicine, and pediatrics, for example, require 3 years of training; general surgery requires 5 years.

Table 1. Characteristics of the Selected Specialties

Specialty	Lifestyle	Average Income, $ in Thousands	Average Work Hours per Week	Years of Graduate Medical Education Required
Anesthesiology	Controllable	225	61.0	4
Dermatology	Controllable	221	45.5	4
Emergency medicine	Controllable	183	46.0	4
Family practice	Uncontrollable	132	52.5	3
Internal medicine	Uncontrollable	158	57.0	3
Neurology	Controllable	172	55.5	4
Obstetrics and gynecology	Uncontrollable	224	61.0	4
Ophthalmology	Controllable	225	47.0	4
Orthopedic surgery	Uncontrollable	323	58.0	5
Otolaryngology	Controllable	242	53.5	5
Pathology	Controllable	202	45.5	4
Pediatrics	Uncontrollable	138	54.0	3
Psychiatry	Controllable	134	48.0	4
Radiology (diagnostic)	Controllable	263	58.0	4
Surgery (general)	Uncontrollable	238	60.0	5
Urology	Uncontrollable	245	60.5	5
Average for the above specialties	Not applicable	208	53.9	4