Science Strand 1: Properties and Principles of Matter and Energy

CLE: 1.2 Energy has a source, can be transferred, and can be transformed into various forms but is conserved between and within systems.

Health Profession: Surgery Technologist

Name: Mary Nelson; MWSU Senior Nursing Student

Contributor: Christy Cobb LPN, NST.

Reference(s)

Murray, S., McKinney E. (2006) *Foundations of Maternal-Newborn Nursing* (4th ed.). St. Louis, MO: Elsevier Saunders (p. 455)

Objectives:

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

1. **Understand that energy takes different forms, differentiate between types of energy, state ways that energy is transferred, know that thermal energy that is transfers from one object to another is due to temperature**
2. **Demonstrate how heat energy is transferred.**
3. **Identify the importance of this information to surgery tech.**

Background Summary of Information as Related Surgery Technologists and CLE

The surgery technologist is a health care tem member whose duties are to get the operating/ procedure room ready with necessary supplies and equipment for a particular procedure or surgery. This includes setting up and maintaining the integrity of the sterile field. The technologist assist the physician during the procedure by: passing instruments, holding retractors, monitoring equipment, being aware of any hazards to the patient. The technologist encounters the following are sources of energy in surgery: electric instruments (cautery), battery powered (drills and saws). Battery or electrical powered equipment cause energy and heat to be released though friction. This heat can damage unintended or adjoining tissues; the technologist must understand this and be prepared with proper supplies to dissipate the heat. Additionally, hot equipment and paper drapes can cause a fire hazard. Another concern for the technologist is the patient may lose heat by conduction (metal instruments, cold irrigations), evaporation (drapes become wet), convection (many surgical suits are equipped with air changing systems, the air is changes several time an hour, basically always causing a constant draft.), and radiation (cool room). The surgery technologist must be aware that energy from one source can be transformed or transferred in many ways, and that caution is required to avoid undue harm.

Scenario:

A surgery technologist has set up for a total knee surgery, he/she assure the saws and drills are out and working. He/she also has a container of sterile water and bulb syringe on the set–up. This will be used for visual irrigation of the wound as well as what?

Answer: To reduce the heat energy (heat) produced by the drill or saw as it cuts through the bone.

Education: Certification from technical college or two year associates program.
Work places: Hospital or surgery center.

Activities:

1. **Measure time it takes for heat to be lost from different types of objects using each of the different methods of heat loss. Example: place warm meat or heat pad on mental, wood, and plastic surface.**
2. **Measure the heat that different types of friction produce. Example metal to metal, metal to bone as with a saw or drill. A thermometer can be placed in drill holes or within an inch of area being sawed Example, drill or saw through meat bones to demonstrate the heat produced by rotation of tool in contact with bone.**
3. **Observe the effects of thermal energy on tissue caused by cautery. Demonstrate that cautery of veins can seal the vein preventing bleeding in the live patient.**
4. **Discuss how injuries can occur to the patient if the heat energy is not dissipated.**

Materials:

1. **Three chicken breast or pork chops, surface of wood, metal, and plastic, timer and thermometers.**
2. **Drill or saw, meat bones, metal plate, plastic gloves, safety goggles, board to drill on and thermometer. A digital or mercury stick thermometers (depending on drill bit size) for drill holes, a strip or stick-on thermometer for saw demonstrations.**
3. **Cautery device or in its stead soldering iron, and pieces of raw meat preferable with some veins exposed.**
4. **No supplies need.**