HEALTH TECH ACADEMY

# Environmental Hazards

Diagnostics, Infection Control and Sterilization

# Lesson Objectives

1. Identify the risks that are present in the operating room
2. Describe how to respond appropriately to a patient fire
3. Identify precautions to prevent exposure to ionizing radiation
4. Describe methods to avoid chemical injury
5. Describe toxic substances in smoke plumes
6. Describe Standard Precautions
7. Discuss techniques to prevent sharps injuries
8. Identify the practice for transmission-based precautions
9. Identify methods of properly handling and disposing of hazardous waste in the operating room
10. Identify necessary precautions to prevent latex reaction in allergic patients
11. Describe correct body mechanics for lifting, pulling, and pushing heavy equipment

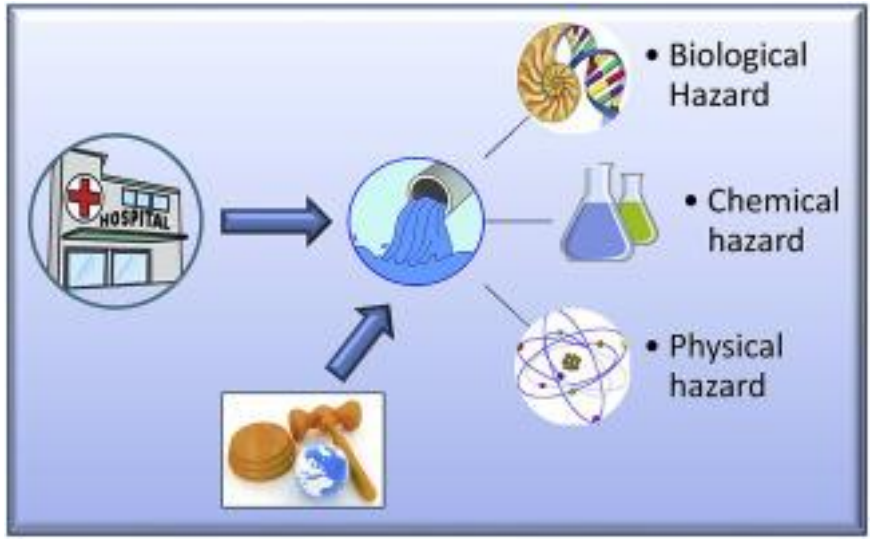
# Risk

- Statistical probability of harmful events.
- Based on past occurrences and conditions.

- **Risk Perception**:
  - Often underestimated due to personal beliefs.
  - Ignoring risk factors doesn't eliminate them.
- **Risk in Healthcare**:
  - Personal risks can impact patient and staff safety.
- **Human Factors Contributing to Risk**:
  - Fatigue, task-focused culture, rushing tasks, lack of knowledge, emotional strain.
- **Creating a Culture of Safety**:
  - Awareness, responsibility, and prevention measures are essential.

# Types of Risk

- **Types of Risks**:
  - Technical risk factors: related to medical devices and energy sources.
  - Chemical risk factors: related to chemicals in the perioperative environment.
  - Biological risk factors: related to infectious disease transmission.



# Safety Standards and Recommendations by Organizations

- ECRI Institute: http://www.ecri.org
- Association for Professionals in Infection Control and Epidemiology (APIC): http://www.apic.org
- Centers for Disease Control and Prevention (CDC): http://www.cdc.gov
- U.S. Environmental Protection Agency: http://www.epa.gov
- U.S. Food and Drug Administration (FDA): http://www.fda.gov
- The Joint Commission: http://www.jointcommission.org
- Occupational Safety and Health Administration (OSHA): http://www.osha.gov

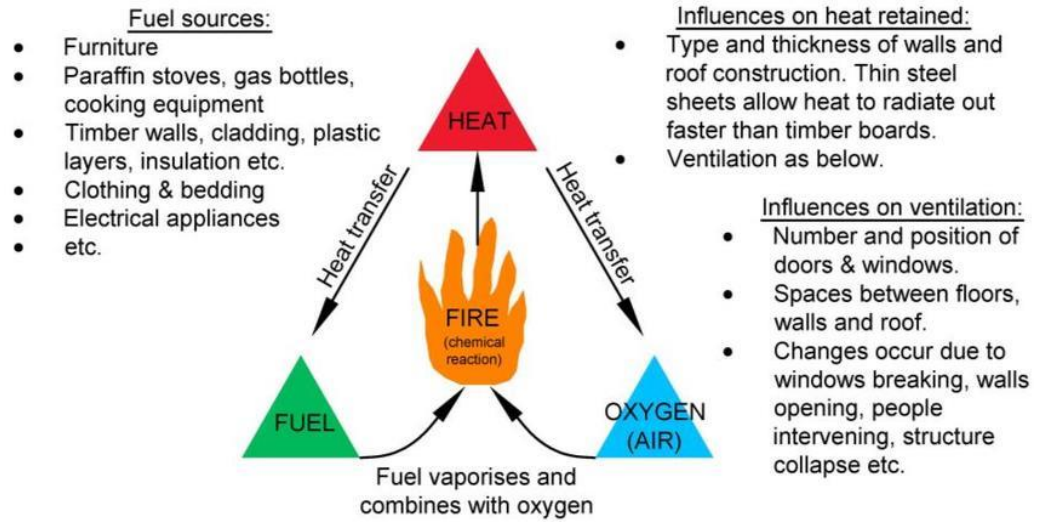
# Environmental Hazards

- Fire
- Compressed Gas Cylinder
- Electrical Hazards
- Ionizing Radiation
- Magnetic Resonance Imaging
- Toxic Chemicals
- Smole Plume
- Later Allergy
- Muscoloskeletal Risks

# Technical Risk - Fire

## The Fire Triangle

- All 3 must be present to start a fire
- The OR is full of items that can create a fire:
  - Oxygen
    - Oxygen delivered to patient
  - Fuel
    - Surgical Drapes
    - Surgical Prep
    - Body Tissues/Gases
  - Source of ignition (Heat)
    - Electrocautery
    - Lasers
    - Focused Light Sources
    - Power Instruments



# Classes of Fires

**Class A Fires:** Fires involving ordinary combustible materials, such as wood, cloth, paper, rubber, and many plastics.

**Class B Fires:** Fires involving flammable liquids, combustible liquids, petroleum greases, tars, oils, oil-based paints, solvents, lacquers, alcohols, and flammable gases.

**Class C Fires:** Fires that involve energized electrical equipment.

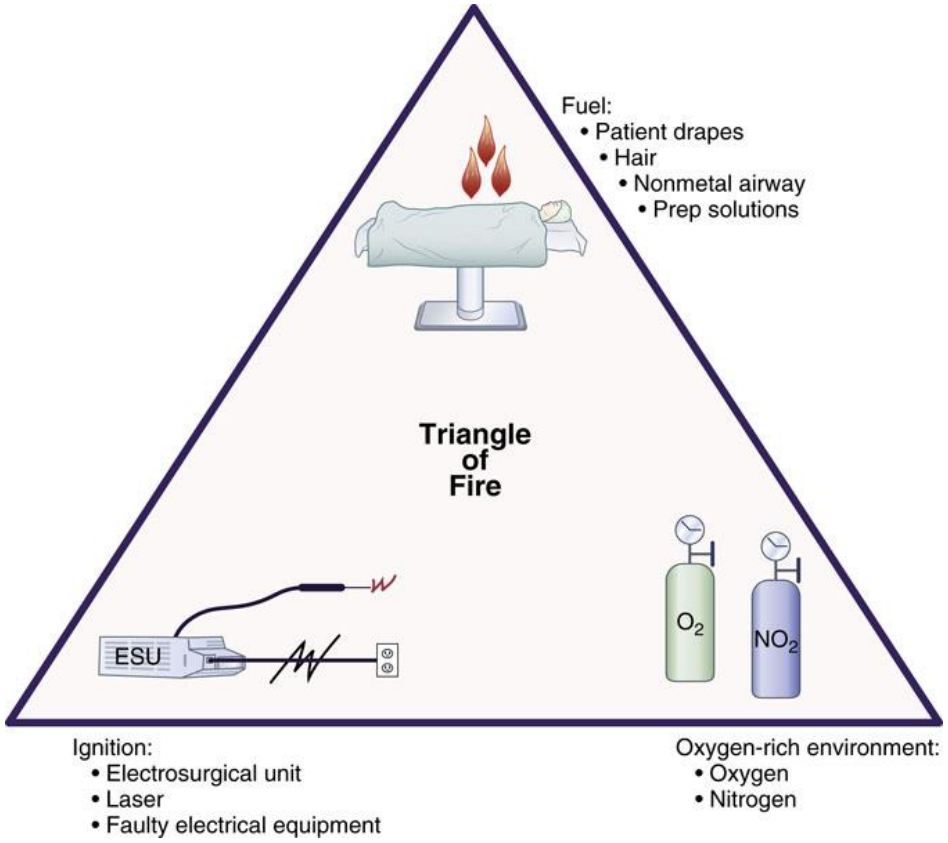

**Class D Fires:** Metal fires involving magnesium, sodium, potassium and sodium-potassium alloys.

**Class K Fires:** Cooking media fires involving oils and greases.

# Fire in the OR

- **Patient fire**
  - Keep water/saline on field to douse fire
  - Shut off gas flow
  - Remove any burning objects
  - Assess patient injuries

- **RACE Fire Plan**
  - Rescue: The patient in immediate danger
  - Alarm: Activate the fire alarm
  - Contain: Close fire doors and corridors
  - Evacuate: Move patient and staff if necessary
    - Follow your hospitals evacuation plan



# Fire Drills and Extinguishers

- **PASS – Using Fire Extinguisher**
  - Pull:  Pull the pin
  - Aim:  Aim at the base of the fire
  - Squeeze:  Squeeze the handle
  - Sweep: Sweep across the fire

# Fire Prevention

- **Strategies for risk management**
  - Participation in fire drills
  - Demonstration of the use of firefighting equipment
  - Developing methods for rescue operation
  - Gas shutoff procedures
  - Location of ventilation and electrical systems
  - Review of code "RED" (fire alert) policies
  - Review of fire department procedures
  - Developing a safety culture

**Watch the Surgical Fires Video from Good Morning America, for an overview of OR fires and how easily they can happen!**

# Surgical Fires Video

# Surgical Fires Video

**Summary of Video:**

- Surgical Fires can happen if preventative measures are not taken
- Know the fire triangle, and keep items from coming in contact:
  - Wait for Prep to dry
  - Keep ignition sources away from fuel/oxygen

# Technical Risk - Compressed Gas Cylinders

- **Construction and Components**:
  - Made of heavy steel.
  - Withstand high pressure.
  - Equipped with regulators and gauges.
- **Identification and Hazards**:
  - Contents identified by stamp, stencil, or cylinder tag.
  - Hazards include physical (high pressure) and chemical (flammability, toxicity).
- **Agents inside Compressed Gas Cylinders**
  - Oxygen
  - Nitrogen
  - Argon
  - Nitrous oxide
  - Carbon dioxide

# Preventing Cylinder Accidents

- Has two valves
- Only use tools that are provided with the cylinder
- Right-hand gauge displays cylinder pressure; left-hand gauge displays pressure in the power hose
- Do not use a tank with less than 500 psi
- After use, turn off tank
- Do not return a tank to storage with less than 500 psi
- Regulators are gas-specific
- Separate Full Tanks from Empty Tanks


- ✓ Seal is intact
- ✓ No gas leaks from valve
- ✓ Heat tag is intact
- ✓ Gas type on the product label
- ✓ Check the batch label. Do not use if missing
- ✓ Look for cylinder dents or damage

# Technical Hazard – Electricity

- **Electrical Hazards Overview**:
  - Leading cause of hospital fires.
  - Compliance with building codes crucial.
  - Maintenance of electrical equipment essential.

- **Characteristics of Electricity**:
  - Current: Direct (DC) vs. Alternating (AC).
  - Voltage: Driving force behind electron flow.
  - Impedance (Resistance): Ability to stop electron flow.
  - Grounding: Discharge of current to ground for safety.

# Preventing Electrical Hazard

- **Prevention of Electrical Accidents**:
  - Avoid use of frayed cords or exposed wires.
  - Do not splice cords or thread through obstacles.
  - Protect switches from moisture.
  - Use equipment intended for fluid environments.
  - Ensure proper grounding of all equipment.
  - Switch off equipment before removing power plug.
  - Inspect and use only UL-approved equipment.
- **ESU (Electrosurgical Unit)**:
  - Common source of electrical injury.

# Watch the "Basics of Electricity" video for an overview of these concepts

# Basics of Electricity Video (Start at 1:18)

# Basics of Electricity Video

## Summary of Video

- Conductors: Carry Electric Current
- Insulators: Do not carry Current
- Current: Flow of Electricity
- Voltage: Like "Pressure"
- Impedance (resistance)

# Ionizing Radiation

- **Risk**
  - Causes tissue damage
- **Injury prevention**
  - Wear lead shield, control distance and exposure time
- **Safety precautions**
  - Guide from:
  - https://www.cdc.gov/nceh/radiation/safety.html

## Time

- Time refers to the amount of time you spend near a radiation source.
- Minimize your time near a radiation source to only as long as it takes to accomplish a task.
- First responders can use alarming dosimeters to help them minimize the amount of time they are in an area with elevated radiation levels.

Learn More

## Distance

- Distance refers to how close you are to a radiation source.
- Maximize your distance from a radioactive source as much as possible.
- If you increase your distance from a radiation source, you will decrease your dose.

Learn More

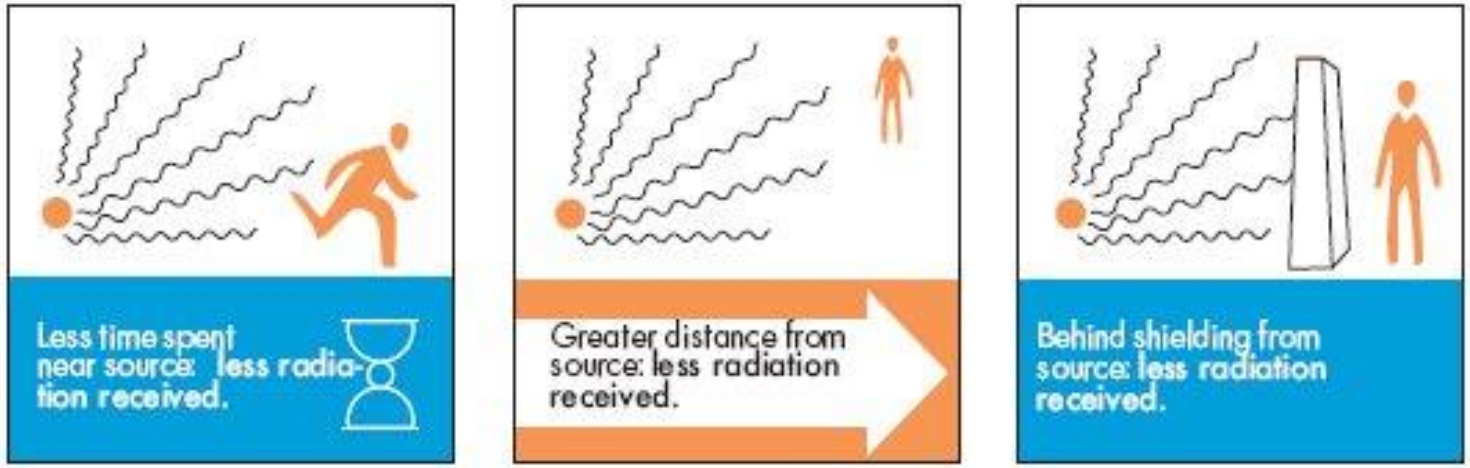
## Shielding

In a radiation emergency you may be asked to get inside a building and take shelter for a period of time.

- To shield yourself from a radiation source, put something between you and the source.
- In a radiation emergency, officials may instruct you to get inside and put as many walls between you and the outside as possible. This is another way to use shielding.
- Protective clothing can shield first responders from alpha and beta particles, but will not protect them from gamma rays. Standing behind a wall or a fire truck can also serve as a shield.

# Protection from Ionizing Radiation for ST

- Three important factors:
    1. Time (Longer Exposure means more health concern – Turn of X-ray/C-Arm)
    2. Shielding (Use lead, shield, gown, gloves, thyroid shield)
    3. Distance (6 feet away from X-ray Machine)



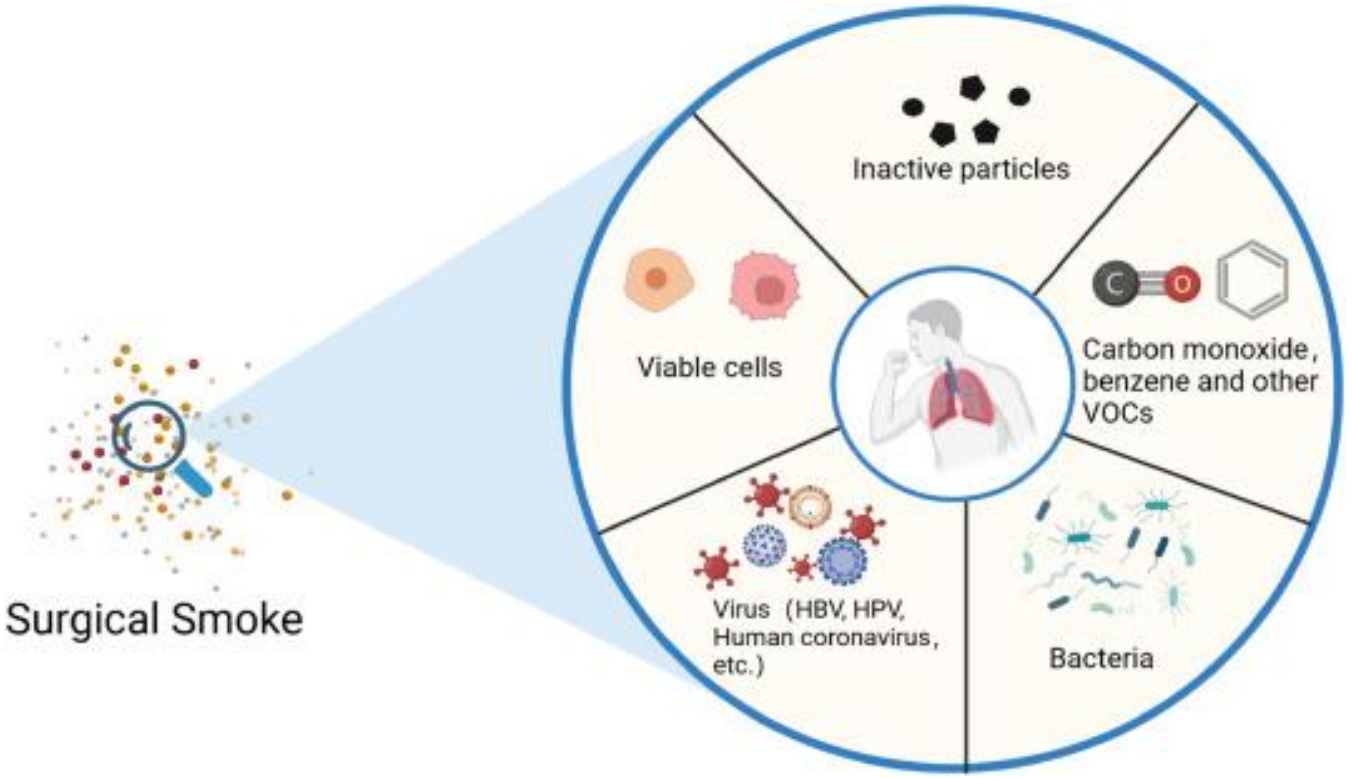
# Environmental Hazards
(Slide 1 of 2)

- **Magnetic imaging (MRI)**
  - Primary risk: presence of metal in the environment.
  - MRI's strong magnetic field can pull metal objects, including implants and personal items.
  - Only plastic and titanium objects are safe to use during MRI procedures.

- **Toxic chemicals**
  - Respiratory problems.
  - Skin issues.
  - Genetic changes.
  - Fetal injury.

# Environmental Hazards
(Slide 2 of 2)

- **Surgical Smoke plume**
  - Surgical smoke carries carcinogens
  - Use smoke evacuation when possible



# Standard Precautions

- **Hand hygiene**
- **Protective barriers**
- **Double-glove during invasive procedures**
  - Top glove can be replaced when torn. Bottom glove different color
- **Precautions should be taken with sharps**
  - Needles, scalpels, etc.

- **Isolation Precautions:**
  - Contact precautions
    - Used when caring for patients infected with microorganisms transmitted by contact
  - Droplet precautions
    - Used when caring for patients with diseases of the upper respiratory tract
  - Airborne precautions
    - Used when caring for patients with diseases like tuberculosis and COVID (aerosolizing)

# Latex Allergy

- An abnormal immune response
- Local or systemic reaction
- Swelling or redness
- Latex hypersensitivity
  - A delayed reaction
  - Causes dermatitis
  - Cell-mediated response

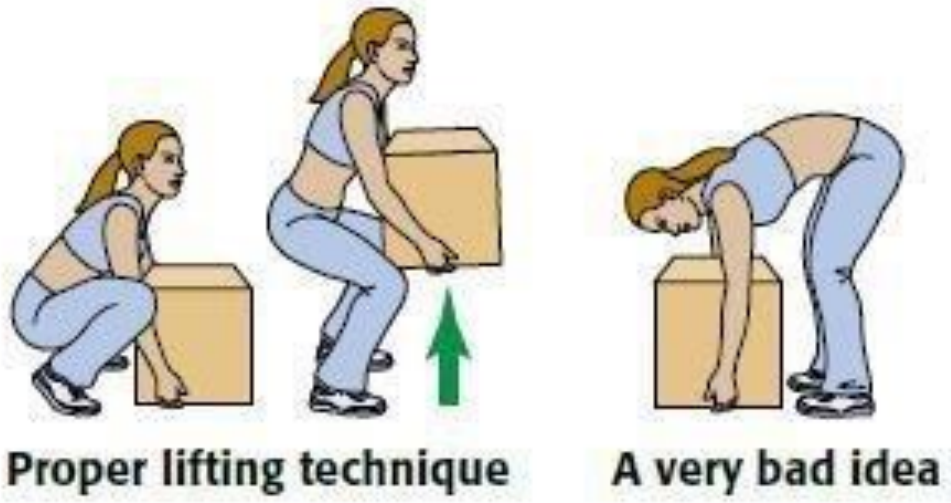
- Latex in the OR
  - Gloves containing latex should be avoided
  - Prevention
    - Identification of allergic individuals
    - Removal of latex items from OR

# Musculoskeletal Risk

- **Musculoskeletal Risks**:
- Vulnerable areas: lumbosacral, wrist, shoulder, neck.
- Causes: exertion, posture, repetitive motion, contact stress.
- **Risk Prevention**:
- Common causes in the operating room.
- Safe work environment and body mechanics.
- Strategies to reduce fatigue and stress.
- **Prevention Techniques**:
- Safe lifting, positioning, and transferring of patients.
- Proper storage of heavy equipment and instrument trays.
- Use of supportive shoes, stockings, and ergonomic equipment.

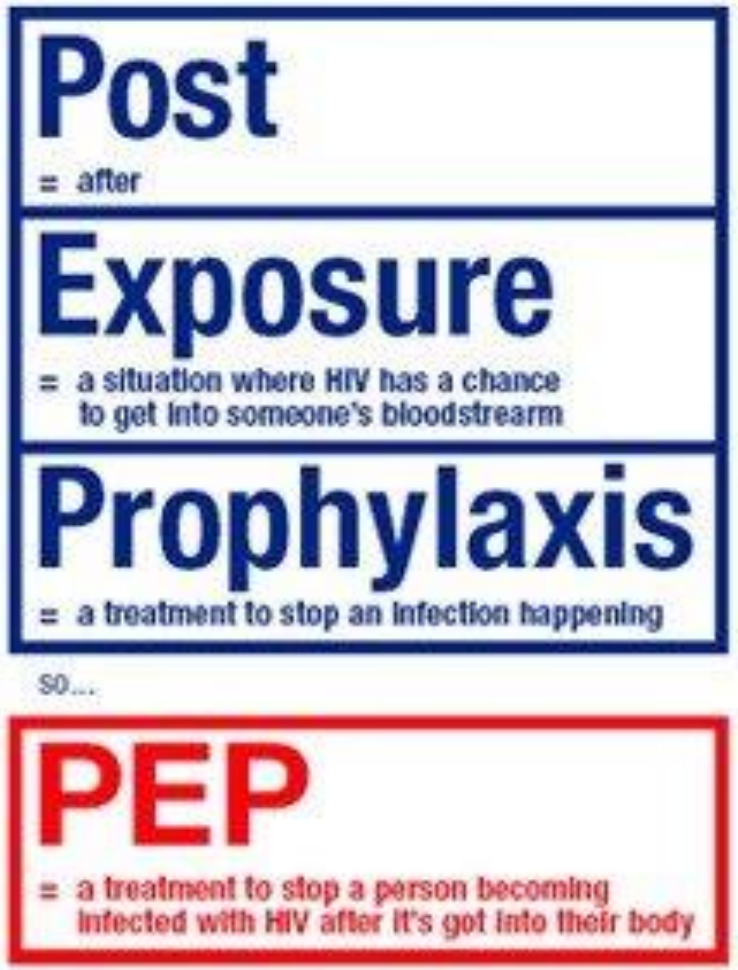
# Proper Posture and Body Mechanics

- **Back injury risks**
  - Lift w/ back
  - Bending and reaching
  - Jerk/twisting at hips
  - Obesity
  - Poor core strength
  - Poor nutrition



# Risk Assessment

- After exposure
- Rapid hiv test
- Risk factors
  - Exposure type
  - Route
  - Patient viral load?
- Start pep?
- Further testing at 6, 12 weeks and 6 months



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HEALTH TECH ACADEMY

# Read Chapter 7 from the E-Book

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**Click Here to access Chapter 7!**

# Thank you!

Get ready for your quiz and rest of the activities now. Best of luck!

# Congratulations!

Lesson 7 is complete.