Hazardous Materials in the Operating Room
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Hazardous Materials in the OR

**Purpose**

The purpose of this self-learning packet is to provide current information to the perioperative staff member regarding hazardous materials in the operating room.

**Learning Objectives**

*Upon completion of this self-learning packet, the reader will be able to:*

1. Identify hazardous materials present in operating rooms
2. List actions that can be taken to minimize exposure to hazardous materials
3. Explain the purpose of a MSDS
4. Describe the process for cleaning up a spill
5. Identify when and how to use the emergency eyewash station

**Instructions**

*In order to receive credit, you must:*

1. Complete the post test in this packet and sign the attestation at the bottom of the post-test.
2. Submit the post test and evaluation to your manager or Nurse Educator
Hazardous Materials in the OR

Introduction

Safety issues in the OR need to be discussed not only for patient safety, but also for personnel, as hazards may occur for all persons within the OR. The main hazards of the perioperative environment are usually due to the direct involvement in the surgical procedure.

Perioperative staff may be exposed to anesthetic gases, drugs, and radiation. The use of cleaning, disinfecting, and sterilizing agents may damage the skin, mucous membranes, and respiratory system.

Hazards in the OR

Some of the hazards in the operating room include fire, electrical, radiation, hazardous materials, laser, latex allergy, compressed gases, smoke, and plume.

OR nurses are the team leaders of the OR and therefore must be familiar with the toxic effects of commonly used chemicals and medications. Nurses can take appropriate and quick action to reduce morbidity and prevent mortality when patients and staff are exposed to toxic common substances. They also can verify that the proper steps are being taken to minimize contamination of breathing air with anesthetics.

Additional chemicals are antiseptics which are antimicrobial agents intended for application to living tissue to kill or inhibit the growth of microorganisms. Antiseptics commonly are used in hand washing preparations and as surgical skin preparations.

Reminder:

All chemical containers must have proper labeling indicating contents, safe use and associated hazards. This also applies to secondary containers.

Hazardous materials are biological, chemical or radioactive substances that have negative health and environmental implications.

AORN RP: Safe Environment of Care

Recommendation XIII

Potential hazards associated with the use of chemicals, in the practice setting should be identified, and safe practices should be established.

Improper handling of chemicals can result in injury to health care workers and patients. Injuries may result from exposure to any portion of the body, including the integumentary or respiratory systems.
Hazardous Materials in the OR

**Types of Hazardous Materials**

**Anesthetic Gases**

Gases such as nitrous oxide, halothane, enflurane and isoflurane are administered to patients undergoing anesthesia. They are found in operating rooms and labor and delivery rooms. Perioperative staff that may be exposed include anesthesiologists, physicians, nurses, surgical technicians and other ancillary personnel.

The hazards of anesthetic gases include the potential for gases to be released into the environment by leaks in equipment, via patient masks, when patients exhale, or misuse/malfunction of scavenging systems.

Perioperative staff can prevent exposure to anesthetic gases by:

- routinely checking, maintaining, and monitoring equipment
- turning off gas when breathing system is disconnected from patient
- ensuring patients have properly fitted masks
- using and maintaining scavenging systems
- periodically monitoring ambient air to assess gas concentration and exposure

The release of anesthetic gases into an OR with short term exposure may cause drowsiness or nausea while long term exposure can result in reproductive risks, and cancer. Other symptoms of exposure include irritability, problems with judgment, headache, depression, fatigue, and lack of coordination.

The level of occupational risk associated with exposure to trace anesthetic gases is unclear. Therefore, it is important to limit the amount of waste anesthetic gases in the perioperative environment.

**Formaldehyde**

Formaldehyde is a colorless, strong-smelling toxic chemical, which occurs in gaseous and liquid forms. Formalin 10% buffered, used for preserving pathology specimens, is a concentrated solution of formaldehyde gas.

Very low concentrations of formaldehyde, probably less than one part per million, are detectable as an irritating odor to most individuals. As formaldehyde concentrations in the air increase, the eyes and respiratory tract become more irritated. The potential hazards of Formalin include skin and mucous membrane irritation, respiratory discomfort, and long term exposure has been linked to cancer.

Probably the greatest concern for perioperative staff involves splashing of formalin solution into the eyes, which can result in severe eye injury and corneal damage, even at fairly low concentrations.

If formalin is splashed in the eyes, both eyes should be irrigated copiously immediately. After irrigation, an eye examination should be performed by an appropriate physician. Initial treatment of formaldehyde inhalation is to remove the patient from the contaminated area and provide fresh air to breathe.
Hazardous Materials in the OR

How to protect yourself:

- Avoid skin contact
- Wear personal protective equipment (PPE)
- Keep containers tightly sealed
- Use appropriate spill kits to clean up spills
- Routinely monitor ambient air and personnel

Gluteraldehyde is an active ingredient in some disinfectants (e.g., Cidex). It has a broad-spectrum antimicrobial activity that destroys all vegetative forms of bacteria as well as 100% of resistant *Mycobacterium tuberculosis* in 45 minutes at 25°C.

Cidex provides rapid, cost-effective high level disinfection for a wide range of endoscopes and other medical instruments. It is a colorless liquid that turns green when activated. It is practically odorless, soluble in water and volatile in steam.

The solution is poured from the container to the disinfection/sterilization basin by a method that will prevent employee contact with the chemical solution and reduce exposure to Cidex liquid.

Soaking containers must always be covered and clearly labeled. The lid must be kept on the soaking container at all times except when items are placed into or taken out of the solution.

The hazards of gluteraldehyde include the potential of it entering the body by inhalation, ingestion, and skin contact. The chief workplace hazard presented by gluteraldehyde solution is contact dermatitis.

Perioperative staff can protect themselves by keeping containers and basins tightly covered, use in well ventilated areas, wear PPE, and in cases of skin or eye contact, flush with water for 15 minutes.
Peracetic Acid

Peracetic acid is produced by continuously feeding acetic acid and hydrogen peroxide into an aqueous reaction medium.

\[
\text{acetic acid} + \text{hydrogen peroxide} \rightarrow \text{peroxyacetic acid} + \text{water}
\]

Peracetic acid is an ideal antimicrobial agent due to its high oxidizing potential. It is broadly effective against microorganisms and is not deactivated by catalase and peroxidase, the enzymes which break down hydrogen peroxide.

It also breaks down food to safe and environmentally friendly residues (acetic acid and hydrogen peroxide), and therefore can be used in non-rinse applications. It can be used over a wide temperature range (0-40 °C), wide pH range (3.0-7.5), and is not affected by protein residues.

Peracetic acid kills microorganisms by oxidation and subsequent disruption of their cell membrane, via the hydroxyl radical (OH·). As diffusion is slower than the half-life of the radical, it will react with any oxidizable compound in its vicinity. It can damage virtually all types of macromolecules associated with a microorganism: carbohydrates, nucleic acids, lipids and amino acids. This ultimately leads to cell lysis and true microbial death.

Isolyzer

Effective containment and management of fluids in the surgical environment is fundamental to risk reduction from point of origin through transport and disposal.

Isolyzer has been used effectively in surgery settings to solidify blood in suction canisters. This material can be mixed with a serum, plasma, tissue and organ homogenates, blood and other water containing infectious liquids and allowed to react.

Place the infectious liquid in a plastic jar with screw cap closure. Pour the Isolyzer in and allow to react. After solidification, tape the cap securely, and place the jar into a red bag lined infectious waste box.

Isolyzer offers industry leading safety measures for bio-hazardous fluid encapsulation and conversion from liquid waste to solid.

Chemotherapy

Chemotherapeutic agents or cytotoxic drugs kill or inhibit the growth of cancer cells. Antineoplastic drugs have the potential to cause serious health risks to health care workers exposed to them.

Exposure can occur by inhalation, ingestion or absorption through the skin which can cause irritation/damage to skin, eyes, or mucous membranes. Some drugs have been linked to birth defects, liver damage, and cancer.

The Occupational Safety and Health Administration (OSHA) has not determined safe levels of exposure to the drugs and no reliable system is available to monitor exposure levels.
Hazardous Materials in the OR

Betadine

Elemental iodine kills bacteria, viruses, fungi, protozoa, and yeasts. Iodophors, such as povidine-iodine solution, are a combination of iodine and a carrier molecule that increases the solubility of iodine and provides a reservoir of the active form of iodine.

Toxicity from iodine is infrequent in adults except with chronic systemic absorption. The iodine in povidine-iodine solution is absorbed poorly through intact skin; as a result, reports of metabolic complications from iodine absorption are rare except when applied to vaginal mucosa or large surface area burns.

Cases of patients exhibiting hypersensitivity to injected iodine solutions are well known. Povidine-iodine causes local irritation occasionally but hypersensitivity reactions are uncommon. Nevertheless, its use in individuals with a history of iodine sensitization is not recommended. Chlorhexadine gluconate is used as an alternate prep for patients allergic to betadine.

Alcohol

Isopropyl alcohol, like hydrogen peroxide, is a common hospital cleaner. Alcohol is highly flammable in the operating room environment.

Unlike hydrogen peroxide, however, its external toxicity is minimal except in rare individuals who experience hypersensitivity. Isopropyl alcohol ingestion causes CNS, respiratory, cardiovascular, and renal toxicity.

Benzoin

Benzoin provides skin protection from irritation and acts as an antiseptic prior to the application of adhesives or skin barriers. It is fluid impermeable.

It works by forming a barrier over the affected area. It is often applied to skin before applying tape or other adhesive bandages. To some degree, it protects the skin from allergy to the adhesive in the tape or bandage, but mostly it makes the tape or bandages adhere much longer.
Hazardous Materials in the OR

**Location of MSDS/Content Information**

In the OR, information about the physical characteristics, storage, cleanup, disposal, and toxicity of chemical substances, as well as first aid for chemical exposure, can be found in material safety data sheets (MSDS). This information is developed and provided by the suppliers of potentially hazardous chemicals.

The MSDS is a detailed information bulletin prepared by the manufacturer of a chemical that describes the physical and chemical properties, physical and health hazards, routes of exposure, precautions for safe handling and use, emergency and first-aid procedures, and control measures.

Information on a MSDS assists in the selection of safe products and helps prepare health care systems and employees to respond effectively to daily exposure situations as well as to emergency situations.

Hospitals must maintain a complete and accurate MSDS for each hazardous chemical that is used in its facility.

**Spill Kits**

Spills in the healthcare setting can include blood, chemotherapy, and mercury. Spill kits are available in the operating room. In case of a spill, e.g., formalin, the employee must contain the spill, alert individuals in the area of the spill, control traffic, and use the proper spill kit along with personal protective equipment (PPE) to clean up the spill.

Refer to the MSDS, bring waste and completed spill log form to the main laboratory. Large volume spills require a call to the operator for code yellow.

The UNI-SAFE spill kit absorbs all biological and chemical spills, including oxidizers and reactives. The amount required varies depending on the chemicals spilled. Chemotherapy spill kits are available from the pharmacy or oncology service to contain accidental spills. Chemotherapy waste must be placed in a leak-proof, puncture resistant container that is sealed and labeled and accompanied by a completed spill log and brought to pharmacy for disposal.

**Eye Wash Station**

Per American National Standards Institute (ANSI) regulations, there are standards that establish minimum performance requirements for eyewash equipment for the emergency treatment of a person’s eyes that have been exposed to hazardous materials.
Hazardous Materials in the OR

If an exposure to any hazardous materials occurs, including body fluid splash to the eyes, the staff member will:
- verbalize the need to seek assistance from other staff
- approach the sink, turn on the faucet, and regulate the water to tepid temperature
- lean over the eyewash station and activate eyewash device
- hold eyelids open, direct flow of water into the eyes and flush eyes for 15 minutes with tepid water while rolling eyeballs
- verbalize the need for medical follow up as necessary

Eyewash stations are inspected and monitored once per week. The eyewash station is flushed by allowing water to flow through it for at least 3 minutes. The results are recorded and initialed in a designated log book.

Conclusion

Per AORN perioperative standards and recommended practices, perioperative patient care quality is based on nursing practice that includes “providing perioperative care within an environment that is conducive to its effective, safe, and efficient administration”. Perioperative staff members must ensure the adherence of safety standards including continuous monitoring of the surgical environment to maintain safe conditions.

References


United States Department of Labor-Occupational Safety and Health Administration. 25 Sept. 2008

Read each question carefully and answer. (10 points each)

1. List four common hazardous materials found in the operating room.

2. What does the acronym MSDS mean?

3. The level of risk associated with exposure to anesthetic gases is unclear.
   a) True
   b) False

4. The potential hazard of formalin exposure can include:
   a) skin irritation
   b) mucous membrane irritation
   c) respiratory discomfort
   d) cancer
   e) all of the above

5. Perioperative staff can protect themselves from gluteraldehyde exposure by:
   a) keeping containers/basins tightly covered
   b) use in well ventilated areas
   c) wearing PPE
   d) all of the above

6) Peracetic acid kills microorganisms by oxidation and disruption of the cell membrane.
   a) True
   b) False
Hazardous Materials in the OR

7) Betadine kills:
   a) bacteria
   b) viruses
   c) fungi
   d) yeasts
   e) all of the above

8) List 4 types of product information that are found in the MSDS.

9) The UNI-SAFE spill kit absorbs biological and chemical spills including oxidizers and reactives.
   a) True
   b) False

10) Proper use of the eyewash station include:
    a) turn on faucet & regulate temperature
    b) lean over eyewash station & activate eyewash device
    c) hold lids open & flush eyes for 15 minutes while rolling eyeballs
    d) all of the above

ATTESTATION STATEMENT

Course #

ATTESTATION

1) I have received the Self-Learning Packet (SLP) on hazardous materials in the operating room.
2) I have read the entire packet and have had the opportunity to ask questions related to its content.
3) Return the posttest & Attestation Statement to your nurse educator.
4) Keep the SLP for your own reference.

Employee Signature: ________________________________ Date: ________________
Hazardous Materials in the Operating Room

Self-Learning Packet Evaluation

Name of Packet: Hazardous materials in the operating room # Date: ________________

Your position?

**Please take a few moments to answer the following questions by marking the appropriate boxes**

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**Please answer the following questions:**

How long did this packet take you to complete? ____________________

What have you learned that you will apply in your work? ____________________

What was the best part of the packet? ____________________

What would you suggest be done differently? ____________________

**Additional Comments:**
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________

Thank you for your input. Comments will be evaluated for further revisions. Please return this evaluation to Nursing Education & Staff Development, with your posttest and signed attestation.