

# Medical Radiation Safety

## Lesson 1: Objectives

In this course you will learn about the:

- ❖ Different sources of radiation used in medical facilities;
- ❖ The health effects of ionizing radiation;
- ❖ And steps you can take to minimize your exposure.

### *Introduction*

Ionizing radiation used in medicine is the largest source of man-made radiation to which people in the United States are exposed. Most medical facilities use radioactive materials for diagnostic and therapeutic procedures. The effects of ionizing radiation on personnel depend on how much radiation an individual is exposed to and the length of the exposure.

## Lesson 2: Radiation Basics

**Radiation** is the process of producing invisible energy in the form of waves and particles. Radiation occurs naturally or is man-made. Naturally-occurring radiation comes from radioactive materials that exist in nature, such as from outer space, rocks and soil, and the human body, and accounts for about half of a person's annual exposure. The other half comes from man-made radiation sources, primarily medical procedures.

**Ionizing radiation** carries enough energy to change living cells. This can be used in good ways for sterilizing medical equipment and treating cancer. X-Rays and CT scans are examples of procedures in which a person may be exposed to man-made ionizing radiation.

**Radioactive materials** are materials that are unstable. They emit ionizing radiation in an attempt to become stable, non-radioactive materials. Precautions need to be taken to minimize or prevent exposure to the radiation emitted and to prevent the spread of radioactive contamination on a person or throughout a facility.

Since ionizing radiation can change living cells, it creates some health risk. That is why your organization addresses the issue of safety and maintains a radiation-friendly environment.

Quiz Question:

Since ionizing radiation can change living cells, it creates some health risk.

**\*True** or False

### **Lesson 3: Sources of Radiation at Medical Facilities**

Sources of radiation include diagnostic radiology, nuclear medicine and radiation therapy.

Diagnostic radiology refers to the use of ionizing radiation to create images of the human body for clinical purposes. At your organization, personnel may work near radiation sources such as:

- X-Rays
- Fluoroscopy
- Computed Tomography (CT)
- Mammography
- Catheter angiography

The only time that radiation is generated by these sources is when they are actually “taking the image”. Compare it to a light switch. When “on”, the radiation travels in a straight line at the speed of light and cannot be seen, tasted, smelled or felt. It can also be produced at different levels of energy. A small amount of radiation scatters in other directions. If you are near one of these sources at the time of exposure, you may be asked to wear a lead apron or stand behind some equipment for shielding.

When used within a Radiology Department or another fixed location, these sources are typically enclosed within lead walls and access is restricted to keep out non-radiation personnel, except when medically necessary. Some of the sources are portable (or mobile) however and may be used outside of the Radiology Department, such as in the Emergency Department, Operating Room or patient room. When using portable sources, precautions should be taken to prevent unnecessary exposure by keeping people out of the radiation beam. Precautions should also be taken to keep people out of areas where there are high levels of unshielded, scattered radiation.

Quiz Question:

A small amount of radiation can scatter from the straight line and put others in the area at risk.

**\*True** or False

### **Lesson 4: Sources of Radiation – Diagnostic Nuclear Medicine**

[\(NOTE: This lesson may be removed from the course for your organization\)](#)

Nuclear medicine imaging uses small amounts of radioactive materials called radiotracers that are typically injected into the bloodstream, inhaled or swallowed. The radiotracer travels through the area being examined and gives off energy in the form of gamma rays which are detected by a special camera and a computer to create images

of the inside of the body. Individuals may resume normal activities after the nuclear medicine scan because of the natural process of radioactive decay. These individuals do not require special precautions for staff safety because the amount of radioactive material administered is low and therefore the radiation dose to others is minimal.

Your organization may perform diagnostic nuclear medicine procedures such as:

- Myocardial Perfusion Scanning
- Positron Emission Tomography (PET)
- Thyroid Scan and Uptake

Quiz Question:

Individuals may resume normal activities after a nuclear medicine scan.

**\*True** or False

### **Lesson 5: Sources of Radiation – Therapeutic Nuclear Medicine**

(NOTE: This lesson may be removed from the course for your organization)

In therapeutic nuclear medicine procedures, radioactive substances are administered to individual intravenously or orally to treat disease. In doing so, these “radiopharmaceuticals” mix with the individual’s body fluid, making the blood, urine, saliva and perspiration radioactive. Some facilities choose to treat the individuals in-house until the level of radioactive material in their body is low enough to send them home. Because of the higher amount of radioactive material used in therapeutic procedures, it is important to handle the individual and any body fluids with care, including the use of gloves when handling dressings, sheets, and eating utensils, and the disposal of body fluids in specially labeled containers.

Your organization may perform therapeutic nuclear medicine procedures such as Iodine-131 therapy.

Quiz Question:

During therapeutic nuclear medicine procedures the individual’s body fluids are radioactive.

**\*True** or False

### **Lesson 6: Sources of Radiation – Radiation Therapy**

(NOTE: This lesson may be removed from the course for your organization)

Radiation therapy uses ionizing radiation to kill cancer cells and shrink tumors. Internal radiation therapy, in which a sealed radiation source is placed in a person, allows a higher total dose of radiation to be used to treat a smaller tissue area in a shorter time

than is possible with external radiation treatment. The radioactive material is enclosed and implanted within or next to the tumor. While the implant is in place, there is a large amount of radioactive material in the individual. When the implant is removed, all radioactive material is gone. For these procedures, the individual remains in the facility until the radioactive source is removed. Your organization may perform internal radiation therapy such as brachytherapy.

External radiation therapy is a procedure in which a source of radiation outside the body is used to treat cancer cells or a tumor. A beam of radiation leaves the source and irradiates the tumor. The individual does not become radioactive with this type of procedure and therefore no special precautions are needed when attending to them either before or after the treatment. Your organization may perform external radiation therapy such as teletherapy.

Quiz Question:

An individual with an internal radiation implant has a large amount of radioactive material in their body.

**\*True** or False

### **Lesson 7: Steps to Minimize Your Exposure to Ionizing Radiation While at Work**

While radiation is used to help diagnose and treat disease, exposure to high levels can be harmful. The effects of exposure to ionizing radiation depend on how much radiation you are exposed to and how long you are exposed. Too much radiation can increase your risk of developing cancer. Exposure to high levels while a woman is pregnant may lead to complications in pregnancy. It is important to keep your exposure to radiation as low as possible by adhering to the following precautions.

### **Lesson 8: Standard Precautions**

Standard precautions refer to the practice of avoiding contact with an individual's bodily fluids by means of wearing personal protective equipment such as gloves, lab coats or other disposable garments. Standard precautions should be followed with all individuals, not just those receiving radiation.

Quiz Question:

Standard precautions should only be used with individuals receiving radiation.

True or **\*False**

### **Lesson 9: Internal Exposure Precautions**

(NOTE: This lesson may be removed from the course for your organization)

Radioactive substances or radiopharmaceuticals used for diagnostic and therapeutic nuclear medicine procedures may be accidentally internally deposited in your body through inhalation, ingestion and absorption. These exposures can occur when radioactive substances are inhaled and absorbed by the lungs; are present in contaminated food or drink; or are spilled onto the skin or enters through cuts or scratches. Internal deposition may also result from contaminated hands with subsequent eating or rubbing of the eyes. Precautions should be taken to avoid each of these means of internal exposure to radioactive substances. Wearing protective equipment such as gloves and lab coats and washing your hands frequently are ways to avoid getting radioactive materials in your body.

Quiz Question:

Ingestion of radioactive substances can occur after eating with contaminated hands.

**\*True** or False

### **Lesson 10: External Exposure Precautions**

There are three major ways to minimize your external exposure to radiation:

1. Distance – Increase the distance between the radioactive source and yourself. As radiation travels from the source, it spreads out becoming less intense.
2. Time – Spend less time around radiation sources to limit your exposure.
3. Shielding – Use proper barriers to minimize your external exposure.

Quiz Question:

The three major ways to reduce your exposure to radiation are to increase the distance between the radioactive source and yourself, decrease your time around radiation sources, and properly shield yourself.

**\*True** or False

### **Lesson 11: ALARA**

ALARA is an acronym for **A**s **L**ow **A**s **R**easonably **A**chievable. All organizations and personnel are responsible for taking steps to keep radiation doses to all people ALARA. Your organization follows this radiation safety principle by establishing procedures personnel are to follow and utilizing reasonable methods that minimize radiation doses and releases of radioactive materials to work and public areas. ALARA is not only a reliable safety principle but is a regulatory requirement for all radiation safety programs.

## **Lesson 12: Monitoring for Radiation Exposure**

Individual monitoring equipment is used to detect and measure radiation to which you may have been exposed. It is the most important monitor to determine your risk from radiation on the job. There are different types of monitoring devices available. Personnel who are likely to be exposed to radiation may wear monitoring equipment. The millirem (mrem) is a unit of radiation dose. The annual allowable limit is 5,000 millirems whole body radiation dose for occupationally exposed radiation workers.

The following personnel may wear monitoring equipment in your organization:

- Radiologic Technologists
- Nuclear Medicine Technologists
- Radiologists
- Cardiologists
- Cath Lab and Special Procedures staff
- Surgery staff
- Clinical Equipment engineers
- Staff caring for the Iodine-131 therapy patient

*Quiz Question:*

Which of the following measures the amount of radiation you have been exposed to on the job?

- a. ALARA
- b. \*Individual monitoring equipment**
- c. Standard precautions
- d. Radiation signs

## **Lesson 13: Radiation Signs**

A radiation “caution” sign will tell you when radiation precautions are in effect. Do not enter rooms containing radiation generating equipment or radioactive substances without authorization. If you must be in an area where radiation is being generated follow the directions of the appropriate personnel for personal protection procedures.

## **Lesson 14: Radiation Safety Concerns and Pregnant Workers**

Exposure to radiation while pregnant can involve exposure to the embryo or fetus. The maximum permissible exposure to the embryo or fetus of a declared pregnant worker during the gestation period is 500 mrem. Declaring the pregnancy to your employer is voluntary. The pregnant worker must notify appropriate personnel in writing in order for the prenatal exposure limits to take effect. Pregnant personnel working within areas in which radiation or radioactive materials are used may be assigned additional monitoring equipment.

## **Lesson 15: Radioactive Contamination Concerns**

(NOTE: You may wish to add-on your organization's policy regarding radioactive spills, including proper notification of appropriate personnel)

(NOTE: This lesson may be removed from the course for your organization)

Contamination occurs when material that contains radioactive atoms is deposited on materials, skin, clothing, or any place where it is not desired. A person contaminated with radioactive material will receive radiation exposure until the source of radiation is removed. A person is externally contaminated if radioactive material is on the skin or clothing. A person is internally contaminated if radioactive material is breathed in, swallowed, or absorbed through wounds. The environment is contaminated if radioactive material is spread about or is unconfined. Follow your organization's guidelines for addressing radioactive contamination, including proper notification of appropriate personnel.

Quiz Question:

A person contaminated with radioactive material will receive radiation exposure until the source of radiation is removed.

**\*True** or False

## **Lesson 16: Magnetic Resonance Imaging**

(NOTE: This lesson may be removed from the course for your organization)

Although Magnetic Resonance Imaging (MRI) does not involve the use of ionizing radiation and is therefore not associated with the same health hazards, it does involve the use of magnetic and radiofrequency fields to acquire its images which carry its own hazards. Because of these fields it is important to address some MRI specific safety issues for healthcare personnel.

- **Projectiles**: As a result of the very high strength of the magnetic field needed to produce scans there are several safety issues. Missile-effects accidents, where magnetic objects are attracted to the center of the magnet, have resulted in injury and death. It is for this reason that magnetic objects and devices are prohibited in proximity to the MRI scanner, with non magnetic versions of many of these objects typically retained by the scanning facility. Only use equipment that has been approved for use during MRI scans. The magnetic field remains a permanent hazard – the superconductive MRI magnet retains its magnetic field at all times. Never attempt to run a cardio-pulmonary arrest code or resuscitation within the MR magnet room itself.
- **Cryogenics**: An emergency shut-down of a superconducting electromagnet is an operation known as “quenched”. During this process helium may be released into the scanner room where it may cause displacement of the

oxygen and, therefore, risk of asphyxiation. Spontaneous quenches are uncommon, but can occur at any time.

Quiz Question:

The magnets in the MRI scanner are always “on”.

**\*True** or False

### **Lesson 17: The Joint Commission Requirements**

(NOTE: This lesson may be removed from the course for your organization)

For diagnostic CT services and/or fluoroscopic services, a diagnostic medical physicist conducts a performance evaluation of all CT and/or fluoroscopic imaging equipment on an annual basis. The evaluation results, along with recommendations for correcting any problems identified, are documented. If your organization provides fluoroscopic services, the cumulative-air kerma or kerma-area product are documented in a retrievable format. For equipment that cannot display or provide cumulative-air kerma or kerma-area product, fluoroscopy time and number of images acquired are documented in a retrievable format. Your organization has also identified radiation exposure and skin dose threshold levels, that if exceeded, trigger further review, analysis and evaluation to assess for adverse radiation effects on the individual. If your organization provides diagnostic CT imaging, the organization has established and adopted protocols based on current standards of practice.

Individuals who perform diagnostic CT examinations and/or use fluoroscopic equipment must participate in ongoing education that includes annual training on radiation dose optimization techniques and tools for children and adults addressed in the Image Gently® campaign for both CT and fluoroscopy and Image Wisely® campaign for CT services. Your organization also provides training on safe procedures for operation of the types of CT and/or fluoroscopy equipment you will use.

Your organization has designated an individual to serve as the radiation safety officer. This individual is responsible for ensuring radiologic services are provided in accordance with law, regulation, and organizational policy.

### **Lesson 18: Conclusion**

(NOTE: You may wish to display contact information for the appropriate personnel to contact within your organization.)

Your organization is committed to maintaining a radiation-friendly environment. And it takes your help. All employees are responsible for ensuring a safe work environment and notifying your employer if there are safety problems such as contamination, unusual or unnecessary radiation doses, or people are not following established safety procedures. If you have questions about any practice involving radiation or radioactive



materials, contact the appropriate personnel within your organization for guidance and assistance.

Reducing the risk of adverse health effects from radiation exposure greatly depends on you. Together, everyone can keep the workplace safe.

## Test Questions (10 questions Pre-test or 5 questions Post-test)

### Pool 1 (6 or 3 questions)

#### MULTIPLE CHOICE

1. Radiation:
  - a. Occurs naturally.
  - b. Is man-made.
  - c. Occurs naturally and is man-made.
  
2. Which of the following is a source of man-made radiation?
  - a. Medical procedures
  - b. Outer space
  - c. Rocks and soil
  - d. The human body
  
3. Which statement is correct?
  - a. Radiation produced by an X-Ray machine travels in a straight line and at the speed of light.
  - b. Radiation produced by an X-Ray machine cannot be seen, tasted, smelled, or felt.
  - c. Radiation produced by an X-Ray machine can be produced at different levels of energy.
  - d. All of the above statements are correct.
  
4. The following personnel may wear radiation monitoring equipment in an organization:
  - a. Radiologic Technologists
  - b. Nuclear Medicine Technologists
  - c. Surgery staff
  - d. All of the personnel above
  
5. Which of the following measures the amount of radiation you have been exposed to on the job?
  - a. ALARA
  - b. Personnel monitoring equipment
  - c. Standard Precautions
  - d. Radiation signs
  
6. Diagnostic radiology sources include:
  - a. X-Rays
  - b. Computed Tomography (CT)
  - c. Mammography
  - d. All of the above

7. Which statement is correct:
- ALARA is an acronym for A Little Amount of Radiation Activity.
  - ALARA is not a regulatory requirement.
  - ALARA is an acronym for As Low As Reasonably Achievable.
  - ALARA is not a reliable safety principle.
8. You are required to wear \_\_\_\_\_ when exposure to radiation is likely to occur.
- A lead apron
  - Goggles
  - Shoe covers
  - A gown

**Pool 2 (4 or 2 questions)**

**TRUE OR FALSE**

9. Since ionizing radiation can change living cells, it creates some health risk.
10. The only time that radiation is generated by an X-Ray machine is when it actually “takes the image”.
11. A linen curtain will protect you from radiation exposure.
12. It is important to keep your exposure to radiation as low as possible.
13. You will reduce your exposure to radiation by increasing the distance between the radioactive source and yourself.
14. Radiation signage on a door does not require authorization before entering.
15. Standard precautions should only be used with individuals receiving radiation.
16. The three major ways to reduce your exposure to radiation are to increase the distance between the radioactive source and yourself, decrease your time around radiation sources, and properly shield yourself.
17. A radiation “caution” sign indicates radiation precautions are in effect.
18. All employees are responsible for reporting radiation safety concerns to their employer.
19. Radiation produced by an X-Ray machine can be seen, tasted, smelled and felt.

## **Medication Administration**

### **Lesson 1: Objectives**

After completion of this course, you will be able to:

- ❖ Describe the importance of using standard precautions with medication administration;
- ❖ List the “rights” of medication administration;
- ❖ Describe the types of oral, injectable, and intravenous medications and safe practices for the administration of each;
- ❖ Explain documentation requirements;
- ❖ List elements of medication education; and
- ❖ Define an adverse drug reaction and a medication error and explain the appropriate response to each.

### *Introduction*

Medication management is an important component in the treatment of many diseases and conditions. However, medications are also capable of causing significant harm if the incorrect dose or medication is administered to a patient/resident or if the medication administered is at the incorrect time or via the incorrect route. Your organization has developed an effective and safe medication management program to eliminate any potential harm that could be caused by medications. The medication management program addresses:

- the safe storage, preparation, dispensing, and administration of medications,
- the management of emergency, high-alert, and hazardous medications,
- measures to control medications brought in by patients/residents, their families, or licensed independent practitioners (LIPs),
- methods for reporting medication-related errors and adverse drug reactions (ADRs),
- the safe use of look-alike/sound-alike medications, and
- the maintenance of a formulary.

Information such as the patient’s/resident’s age, sex, diagnoses, allergies, sensitivities, and current medications must be accessible to anyone who participates in the management of the individual’s medications. In addition, information about height and weight, pregnancy, lactation, and laboratory results must be accessible when necessary.

### **Lesson 2: Standard Precautions**

Standard Precautions, including hand hygiene and the use of personal protective equipment (PPE), must be used as appropriate based upon the specific patient/resident and route of medication administration. Hand hygiene must be performed:

- before and after direct contact with the patient/resident,
- before applying and after removing gloves, and
- between the administration of medications if more than one route is used in a single encounter.

Gloves must be worn for the:

- instillation of eye, ear, or nose drops,
- administration of oral medications if the medication must be placed in the person's mouth,
- administration of elixirs or suspensions in small children if a syringe is used or a child's mouth must be helped,
- administration of medications into a feeding tube, bladder irrigation, or any other tube,
- insertion of vaginal or rectal medications, and
- application of topical medications.

Mouth, nose, and eye protection must be used:

- any time splashing may occur,
- for the irrigation of a wound with medication,
- any time medication administration may cause the individual to cough or sneeze, and
- with the administration of medication to combative or confused individuals who may spit out the medication.

Gowns must be worn:

- any time soiling may occur,
- during the application of large, medicated dressings, and
- during the instillation of rectal medications.

Quiz Question:

Match the standard precaution image to the situation in which the precaution must be used.

Hand hygiene - **\*before or after direct contact with the patient/resident**  
 Gloves - **\*instillation of eye, ear, or nose drops**  
 Mouth, nose, and eye protection - **\*any time splashing may occur**  
 Gowns - **\*any time soiling may occur**

### **Lesson 3: The Safe Practice of Medication Administration**

Your organization has determined the required elements of a medication order, the type of medication order that is deemed acceptable for use, and the actions to take when a medication order is incomplete, illegible, or unclear.

The Rights of Medication Administration addressed in this course include: The Right Patient/Resident, The Right Drug, The Right Dose, The Right Time, and The Right Route. Your organization may require additional verifications.

To verify that you are preparing to administer the medication to the Right Patient/Resident you must:

- cross-check the name on the order with the individual's identification,
- use two identifiers,
- ask the patient/resident to identify himself/herself,
- use technology when available, and
- confirm the appropriateness of the medication based on the patient's/resident's diagnosis and plan of care.

To verify that you are preparing to administer the Right Drug you must:

- verify verbal and telephone orders and ensure the order is repeated back to the licensed independent practitioner (LIP) to confirm accuracy of the medication,
- confirm that the medication was correctly transcribed and noted from the LIP's orders,
- verify that the medication is appropriate for the patient's/resident's diagnosis and plan of care, and
- confirm that the individual does not have a stated allergy to the medication being administered.

To verify that you are preparing to administer the Right Dose you must:

- verify verbal and telephone orders and ensure the order is repeated back to the LIP to confirm accuracy of the dose,
- confirm that the dose was correctly transcribed and noted from the LIP's orders,
- verify that the dose is appropriate for the patient's/resident's diagnosis, plan of care, and body weight,
- confirm appropriateness of the dose using a current drug reference, and
- calculate the dose and ask a second person to calculate the dose as well if necessary.

To verify that you are preparing to administer the medication at the Right Time you must:

- verify verbal and telephone orders and ensure the order is repeated back to the LIP to confirm accuracy of the frequency or time of administration,

- confirm that the frequency or time of administration was correctly transcribed and noted from the LIP's orders,
- confirm that the frequency or time of administration is appropriate for the medication and the dose being administered,
- confirm when the last dose was given,
- ensure the medication is administered within 30 minutes of the scheduled time or provide documentation of the deviation, including the reason, and
- ensure the medication is administered before or after meals, as ordered.

To verify that you are preparing to administer the medication via the Right Route you must:

- verify verbal and telephone orders and ensure the order is repeated back to the LIP to confirm accuracy of the route,
- confirm that the route was correctly transcribed and noted from the LIP's orders,
- ensure that the route is appropriate for the patient's/resident's diagnosis and body size,
- confirm that the concentration of the medication is correct for the route being administered,
- verify that the administration rate is consistent with the route being administered, and
- confirm that the patient/resident can take or receive the medication by the ordered route, and if not obtain a new order for an alternative route.

Before administration, the individual administering the medication must verify that the medication product label matches the medication order; inspect the medication for particulates, discoloration, or other loss of integrity; verify that the medication has not expired; verify that no contraindications exist; and discuss any unresolved concerns about the medication with the patient's/resident's LIP. Education must be provided before administering a new medication.

Self-administered medications must be administered safely and accurately. This includes medications administered by a family member. Both the patient/resident and family member must be deemed competent at medication administration before allowing him/her to administer.

Quiz Question:

Which of the "five rights" is being used when observing that a particular medication ordered as an oral medication comes only in an injectable form?

- Right Patient
- Right Dose
- Right Route**
- Right Time

## **Lesson 4: Oral Medications**

Types of oral medications include tablets, caplets, capsules, enteric-coated tablets, sublingual and buccal medications, syrups, elixirs, suspensions, and sustained and extended-release medications.

Medications should not be removed from individually labeled packages until you are with the patient/resident and ready to administer. Medications removed from a multidose container should be placed in a clearly labeled container before taking it to the patient/resident. Do not warm refrigerated medications unless specifically instructed to do so.

Allow the patient/resident to take oral medications independently when able. Encourage patients/residents to swallow tablets, caplets, and capsules whole. Enteric coated, sustained and extended-release medications must not be crushed. Shake all suspensions and syrups thoroughly. Determine if an elixir can be mixed with water or juice to alter or improve the taste. With children, consider the use of medication cups and sipping syringes. Allow a parent or caregiver to administer the medication with your supervision or assistance. Insert liquids into the side of the mouth to reduce the amount of medication the child may spit out. Any medications administered through a feeding tube should be in liquid form whenever possible. Crushable medications for feeding tubes must be powder consistency to prevent clogging the tube. Flush feeding tubes well after all tubal medications, even liquids.

Quiz Question:

Select the correct statements regarding the safe administration of oral medications.  
(Select all that apply)

Oral medications...

**\*should not be removed from individually labeled packages until you are with the patient/resident and ready to administer**

should be warmed if refrigerated prior to administration

**\*should be taken independently by the patient/resident when able**

such as enteric coated, sustained and extended-release medications must be crushed

**\*administered through a feeding tube should be in liquid form whenever possible**

## **Lesson 5: Injectable Medications**

Types of injectable medications include intramuscular, subcutaneous, and intradermal.



Injectable medications should be left in pre-filled labeled syringes whenever possible. When syringes are prepared, they must be labeled with patient/resident identification and medication information.

Prior to administering an injectable medication, determine the appropriate size of syringe and needle based on the age and size of the patient/resident, the muscle that will be used for injection, the type and amount of medication being administered, and the viscosity of the medication. If the medication is being stored in a refrigerator gently warm it by rolling it between your hands. Use a filtered needle as appropriate when drawing up the medication. Changing needles between draw up and administration can reduce the amount of discomfort for the individual.

Determine the appropriate injection site based on the age and size of the patient/resident, his/her preference, and the type and amount of medication being administered.

Determine the appropriate method for preparing the site for the injection.

Following administration apply a dressing or band-aid only if there is bleeding at the site. Wiping the site with alcohol is not required after an injection and can cause local skin irritation and burning.

### *Vaccines*

Vaccines are regulated by the local health department and require special techniques and considerations. There may be additional documentation requirements as well.

Quiz Question:

There are special techniques and considerations when vaccines are administered.

**True** or False

## **Lesson 6: Intravenous Medications**

Types of intravenous (IV) medications include intravenous solutions, premixed intravenous piggy-backs (IVPB) and IV push medications.

Only dilute IV push medications when recommended by the manufacturer, supported by evidence in peer-reviewed biomedical literature, or in accordance with approved institutional guidelines. Dilution of medications prior to IV push administration should occur in the pharmacy before dispensing the medication. If dilution of a medication is necessary outside of the pharmacy, your organization will take steps to provide ready access to the proper diluent and instructions for dilution to support safe practice. A saline flush may need to be prepared. IV push medication is kept in its original package unless it is mixed with a diluent in a larger syringe. Most IVPB medication is kept in a refrigerator until about 30 minutes prior to use. All medications must be labeled according to your organization's policy.

Prior to administering an IV medication, evaluate the location of the IV site and the size of the blood vessel. For IV solutions, determine the infusion rate. If a IVPB or IV push medication is to be administered using the same IV site as a continuous infusion, check the compatibility of the medication with the solution.

During administration, assess the IV site for the presence of localized irritation and observe the patient/resident for evidence of an adverse drug reaction for the first 15 to 30 minutes, particularly if it is the first time the medication has been administered to the individual. Ensure that the saline lock is flushed after administration.

### *Complications*

Phlebitis is the inflammation of a vein and can be evidenced by localized redness, heat and swelling, which can track further along the length of the vein, eventually leading to induration (or hardness) and a “palpable venous cord”. Phlebitis is precipitated by mechanical, chemical, or infective causes. If a patient/resident with a peripheral venous catheter develops signs of phlebitis, remove the catheter, elevate the extremity, and apply a warm compress as directed.

The unintentional leakage of vesicant (or blistering) fluids or medications from a vein into the surrounding tissues, called extravasation, can be evidenced by swelling and pain at the site and slow infusion rates. When extravasation is suspected, stop the infusion immediately, elevate the extremity, and leave the catheter in place to attempt to aspirate fluid and facilitate the administration of an antidote to the local area, if appropriate. If an antidote will not be injected, the peripheral catheter can be removed after attempted aspiration of the subcutaneous tissues.

If IV fluids no longer infuse via gravity and the catheter cannot be flushed easily, a clot may have formed within the catheter. Do not flush the catheter forcefully because this can dislodge a clot into circulation.

If the catheter is a central line, notify the LIP as soon as possible and avoid using the catheter.

Quiz Question:

All of the following are treatments for phlebitis except:

- a. Removal of catheter
- b. Application of a warm compress
- c. Elevation of extremity
- d. Application of a pressure dressing**

## **Lesson 7: Documentation**

Follow your organization's policy regarding documentation requirements for medication administration. For example, you may be required to document the date and time the medication was administered, the selected site for an injectable medication, or the assessment of the IV site accessed for the administration of an IV medication. You may be required to document the effectiveness of the medication, any difficulty the individual had in taking the medication, if the individual refused the medication, and any education that was provided. The policy also includes the requirements for PRN, STAT, and One Time medications.

### **Lesson 8: Education**

The patient/resident should be educated on the purpose of the medication, intended effects and possible or expected side effects, how to respond to side effects, the medication name and its qualities, instructions such as whether the medication should be taken with food or on an empty stomach, warnings such as known interactions with food and other medications, the importance of asking questions, the value of transparency regarding his/her health history, and what to report to an LIP immediately.

### **Lesson 9: Adverse Drug Reactions**

An adverse drug reaction (ADR) is an unwanted or harmful reaction experienced following the administration of a medication or combination of medications under normal conditions of use and is suspected to be related to the medication. An ADR will usually require the medication to be discontinued or the dose reduced.

ADRs place patients/residents at considerable risk. Follow your organization's policy on how to respond to and monitor a patient/resident in the event of an ADR, LIP and/or prescriber notification, documentation, and reporting requirements.

Quiz Question:

An adverse drug reaction is an unwanted or harmful reaction experienced following the administration of a medication or combination of medications under normal conditions of use and is suspected to be related to the medication.

**True** or False

### **Lesson 10: Medication Errors**

A medication error is any preventable event that may cause or lead to inappropriate medication use or harm while the medication is in the control of the health care professional or patient/resident. Common causes of medication errors include the patient/resident wearing an incorrect or incomplete identification band or no band, the

patient/resident wearing an incorrect allergy band or no band, failure to clarify a written order that is incomplete, illegible, or unclear, failure to verify a verbal or telephone order, lack of knowledge about the medication being administered, medications that look alike or sound alike, medical abbreviations, and failure to use drug information resources. Medication errors are also caused by a failure to read medication labels completely at the time it is removed from storage, when it is compared with the medication record, and when it is administered to the individual.

Follow your organization's policy on how to respond to and monitor a patient/resident in the event of a medication error, LIP notification, documentation, and reporting requirements.

Quiz Question:

Which of the following are common causes of medication errors? (Select all that apply)

- a. Failure to clarify a written order that is incomplete, illegible, or unclear**
- b. Using drug information resources
- c. Failure to verify a verbal or telephone order**
- d. The patient/resident wearing a correct and complete identification band
- e. Medications that look alike or sound alike**
- f. Medical abbreviations**

### **Lesson 11: Conclusion**

(NOTE: You may wish to display contact information for the appropriate personnel to contact within your organization.)

Your organization is committed to eliminating any potential harm that could be caused by medications. And it takes your help! If you have any questions regarding the medication management program at your organization, contact the appropriate personnel for guidance and assistance.

## Test Questions (10 questions Pre-test or 5 questions Post-test)

### Pool 1 (6 or 3 questions)

#### MULTIPLE CHOICE

1. Which statement regarding the appropriate use of gloves with medication administration is incorrect?
  - a. Gloves must be worn for the insertion of vaginal or rectal medications.
  - b. Gloves must be worn when removing a medication from its package.
  - c. Gloves must be worn for the application of topical medications.
  - d. Gloves must be worn for the instillation of eye, ear, or nose drops.
  
2. Which statement regarding the appropriate use of mouth, nose, and eye protection with medication administration is incorrect?
  - a. Mouth, nose, and eye protection must be used any time splashing may occur.
  - b. Mouth, nose, and eye protection must be used any time medication administration may cause the individual to cough or sneeze.
  - c. Mouth, nose, and eye protection must be used for the application of topical medications.
  - d. Mouth, nose, and eye protection must be used with the administration of medication to combative or confused individuals who may spit out the medication.
  
3. Which statement regarding the appropriate use of gowns with medication administration is incorrect?
  - a. Gowns must be worn if the medication must be placed in the person's mouth.
  - b. Gowns must be worn any time soiling may occur.
  - c. Gowns must be worn during the application of large, medicated dressings.
  - d. Gowns must be worn during the installation of rectal medications.
  
4. Which of the "five rights" is being used when observing that a particular medication ordered as an oral medication comes only in an injectable form?
  - a. Right Patient/Resident
  - b. Right Dose
  - c. Right Route
  - d. Right Time
  
5. Which of the "five rights" is a being using when questioning why a patient/resident is receiving a particular medication that does not seem to be appropriate for the diagnosis or any related condition?
  - a. Right Drug
  - b. Right Dose

- c. Right Route
  - d. Right Time
6. Which of the "five rights" is a being using when a medication has been ordered every 4 hours and the usual dosing is every 8-12 hours?
- a. Right Patient/Resident
  - b. Right Dose
  - c. Right Route
  - d. Right Time
7. Which of the following are considerations in determining the appropriate size of syringe and needle for an injectable medication?
- a. Age and size of patient/resident
  - b. Muscle that will be used for injection
  - c. Type and amount of medication being administered
  - d. Viscosity of the medication
  - e. All of the above
8. Which of the following are considerations in determining the appropriate site for an injection?
- a. Patient/resident preference
  - b. Age and size of patient/resident
  - c. Type and amount of the medication
  - d. All of the above

**Pool 2 (4 or 2 questions)**

**TRUE/FALSE**

9. Standard Precautions must be used as appropriate based upon the specific patient/resident and route of medication administration.
10. Oral medications must never be taken independently by the patient/resident.
11. Enteric coated, sustained and extended-release medications must be crushed.
12. Medications administered through a feeding tube should be in liquid form whenever possible.
13. Oral medications should not be removed from individually labeled packages until you are with the patient/resident and ready to administer.

14. Injectable medications should be administered at the refrigerated temperature because the coolness makes the medication hurt less.
15. Medications removed from a multidose container should be placed in a clearly labeled container before taking it to the patient/resident.
16. All oral medications should be warmed if refrigerated prior to administration.
17. An adverse drug reaction is an unwanted or harmful reaction experienced following the administration of a medication or combination of medications under normal conditions of use and is suspected to be related to the medication.
18. A medication error is any preventable event that may cause or lead to inappropriate medication use or harm while the medication is in the control of the health care professional or patient/resident.