RADIATION SAFETY
SELF-LEARNING PACKAGE

FOR THE ANNUAL RECERTIFICATION OF HEALTH CARE WORKERS PROVIDING CARE FOR PATIENTS RECEIVING RADIATION THERAPY TREATMENTS

2012 Revision

Table of Contents

RE-CERTIFICATION OF HEALTH CARE RADIATION WORKERS

Any the following meets the annual recertification in radiation safety requirement.

- Complete this self learning package and take the associated exam.
  - To pass the exam you will have to correctly identify several brachytherapy sources and achieve 85% or better on the patient care portion of the exam.
  - Exam may be taken on-line at CPD.uc.edu, as a walk-in at the Radiation Safety Office or during a scheduled exam proxy session. (schedule on RSOf website www.uc.edu/radsafety)
  - If the exam is failed twice one of the other recertification options must be used
- Attend a 1-hour didactic training session presented by the Radiation Safety Office. (schedule on RSOf website www.uc.edu/radsafety)
- Attend the initial 3-hour certification training course presented by the Radiation Safety Office. (schedule on RSOf website www.uc.edu/radsafety)

PRETEST

TRUE/FALSE

(Answer true or false to the following questions)

1.	Brachytherapy is the therapy method in which a radioactive source is placed on or within the tumor.	True False
2.	All radionuclides emit gamma rays.	True False
3.	Beta particles are penetrating rays of energy that have an unlimited range and can penetrate all body surfaces.	True False
4.	The radioactive half-life of a radionuclide refers to the time required for a radionuclide to lose 50% of its activity by decay.	True False
5.	Sealed radioactive sources contain the radioactive material and generally do not present a contamination problem.	True False
6.	Iodine-131 is used as an unsealed source in the treatment of thyroid disease (cancer and benign diseases).	True False
7.	After a temporary, implanted radioactive source is removed by the radiation oncologist, radiation precautions are no longer necessary.	True False
8.	Alpha particles represent the greatest external hazard.	True False
9.	Time, distance, and shielding must be utilized to reduce the external exposure of radiation when caring for a radiation therapy patient.	True False
10.	A radiation dosimeter provides protection from radiation exposure.	True False

1.T 2.F 3.F 4.T 5.T 6.T 7.T 8.F 9.T 10.F

TERMS YOU SHOULD KNOW

(Match the following terms)

_____	ionizing radiation	A. As low as is reasonably achievable.
_____	Rem	B. A unit to express radiation dose.
_____	ALARA	C. As low as reasonably acceptable.
_____	Exposure	D. Radioactive material where it should not be.
_____	Contamination	E. Being exposed to ionizing radiation.
		F. Alpha particles, beta particles, gamma rays, X-rays and other particles capable of producing ions.

ionizing radiation(F) rem(B) ALARA(A) exposure(E) contamination(D)

THE BASICS

THE ATOM AND RADIOACTIVE DECAY

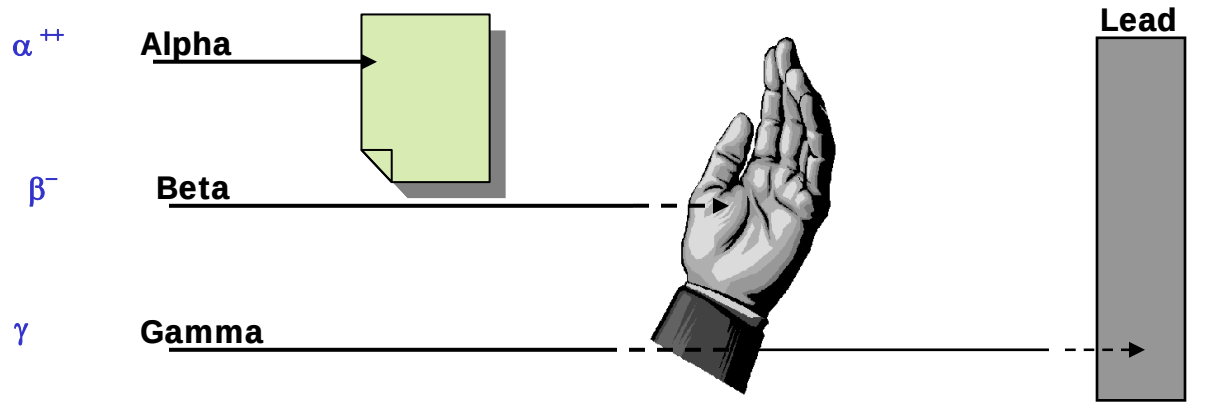
Radiation dose can be delivered through the use of radioactive material. Radioactive material are compounds where one or more atoms is a radionuclide. Radionuclides are unstable forms of atoms. Each radionuclide emits specific types of radiation that differ in their energy and penetrating capabilities. The specific types of radiation include alpha particles, beta particles, and gamma or x-rays. For therapeutic use, gamma or x-rays, and beta particles are the most common.

Alpha particles: Alpha particles are heavy particles that can be blocked by the outer layer of the skin, a thin piece of paper, or a piece of clothing. Alpha particles lose energy quickly and have poor penetrating ability. Radionuclides that emit alpha particles are rarely used in medicine and cannot be used in brachytherapy because the alpha particle will be stopped by the encapsulations.

Beta particles: Beta particles are much lighter than alpha particles. Beta particles can penetrate several layers of skin, but can be shielded by the body's surface. Therefore, beta particles emitted within the body are prevented from traveling outside the body. Beta particles are more penetrating than alphas particles but less penetrating than gamma rays.

Gamma and X-rays: Gamma and x-ray rays are very penetrating rays of energy (photons) that have an unlimited range and can penetrate all body surfaces. Higher energy gamma rays (e.g., from iodine-131) are more penetrating and require thicker shielding than lower energy gamma and x-rays rays (e.g., from iodine-125). Gamma and x-rays present the greatest external hazard. Gammas are emitted from the nucleus of a radionuclide. X-rays are emitted or generated by interaction with electrons.

The Penetrating Power of Radiation



SELF-EVALUATION QUESTIONS

Gamma rays can penetrate body tissue and therefore represent an external hazard.	☐True ☐False
Name three types of radiation emitted from radioactive material.	♦ ♦ ♦
Are alpha emitters routinely used in medicine?	☐Yes ☐No
Name two radiation emissions that can be stopped by the skin.	♦ ♦

RADIATION THERAPY

Radiation therapy kills cancer cells with a radiation source. Radiation therapy is used to improve control of local disease, treat areas at high risk for recurrence of the cancer, preserve vital organ function and minimize normal surrounding tissue damage. The radiation can be delivered by an implant of encapsulated radioactive material near the cancer cells, a procedure called brachytherapy (BRAY-kee-THAIR-uh-pee) or through the use of a radioactive compound called a radiopharmaceutical. The radiation may also be delivered using a technique call teletherapy.

Brachytherapy may be referred to as internal radiation therapy or implant therapy. It is defined as the method of therapy in which the radioactive source is placed on or within the tumor. This placement can be temporary or permanent. Brachytherapy uses sealed sources in the form of a needle, seed, or wire. Sealed sources encapsulate the radioactive material; therefore, brachytherapy body secretions are not radioactive and contamination is not a concern. Sealed sources used in brachytherapy emit gamma rays and may emit beta particles.

Radiopharmaceuticals are unsealed radioactive drugs and at least one element in the drug's molecular structure is radioactive. For example, ^{131}I-MIBG's includes I-131 (a radioactive isotope of iodine) in its molecular structure. A radiopharmaceutical is administered orally or intravenously. Contamination is a concern for radiation therapy involving radiopharmaceuticals.

Teletherapy is "external radiation therapy" and involves radiation dose being delivered remotely. Caregivers are not in the room when the dose is administered.

It is important to know whether a radioactive source is *sealed* or *unsealed*, and if the implant is *temporary* or *permanent*. With this information, the Health Care radiation worker can provide care in the safest environment.

Sealed sources contain the radioactive material and generally do **not** present a contamination problem; are used for brachytherapy and may be used for temporary or permanent implants.

Unsealed sources are uncontained radioactive material and may present a contamination hazard.

Temporary implants sealed sources are placed into a specific area, for a specific amount of time. After the specified time has elapsed, the radiation sources are removed. The radionuclides used in temporary implants may have a long or short half-life.

Permanent implants are sealed source implants which remain in the patient. The patient's body provides shielding such that the patient is not required to be under radiation precautions. Radionuclides use for permanent implants have a shorter half-life.

SELF-EVALUATION QUESTIONS

Is it important for the nurse to know whether a radioactive source is sealed or unsealed?	□Yes	□No
What type of radioactive source presents a potential contamination hazard?	□sealed	□unsealed
Are radionuclides with long half-lives generally used for temporary or permanent implants?	□permanent	□temporary
Radiopharmaceuticals are what type of radiation source?	□sealed	□unsealed
Secretions from a patient who is being treated with a brachytherapy sealed source are radioactive and are a contamination concern?	□Yes	□No
Brachytherapy is performed with what type of source?	□sealed	□unsealed

RADIATION THERAPY APPLICATIONS

Recent Radiation Therapy Applications at CCHMC

Radionuclide	Therapy type	Description	Half-life	Typical therapy for
Iodine 125 (I-125)	♦ brachytherapy ♦ temporary implant	♦ sealed source ♦ gamma emitter ♦ seeds	60 days	♦eye cancers ♦soft tissue cancers
Phosphorous 32 (P-32)	♦ radiopharmaceutical ♦ administered by injection	♦ unsealed source ♦ beta emitter	14 days	♦brain cysts ♦intracavitary cancers ♦polycythemia vera
Iodine 131 (I-131)	♦ radiopharmaceutical ♦ administered by mouth or injection	♦ unsealed source ♦ beta and gamma emitter	8 days	♦thyroid cancer ♦neuroblastoma ♦hyperthyroidism
Yttrium 90 (Y-90)	♦ microsphere ♦ administered IV	♦ unsealed source ♦ beta emitter	2.7 days	♦liver cancers

Other Common Radiation Therapy Applications

Radionuclide	Type of implant	Description	Half-life*	Typical therapy for
Iridium 192 (Ir-192)	♦ temporary	♦ sealed source ♦ beta & gamma emitter ♦ seeds attached on a wire	74 days	♦breast cancer ♦head & neck cancers ♦bronchogenic cancers ♦GYN cancers
Iodine 125 (I-125)	♦ permanent	♦ sealed source ♦ gamma emitter ♦ seeds	60 days	♦prostate cancers ♦brain cysts
Palladium 103 (Pd-103)	♦ permanent	♦ sealed source ♦ gamma emitter ♦ seeds	17 days	♦prostate cancer
Strontium 89 (Sr-89)	♦ radiopharmaceutical ♦ administered by injection	♦ unsealed source ♦ beta emitter	50 days	♦cancers that have metastasized to the bone

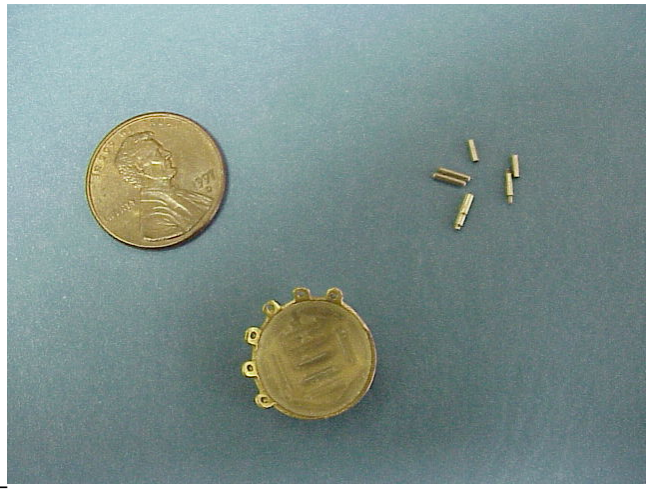
SELF-EVALUATION QUESTIONS

Name the radionuclide used for temporary brachytherapy implants at CCHMC.	
What is the half-life of Iodine-125?	
Name the radionuclide most commonly used for thyroid cancer.	
Which of the following radionuclides would require you to limit the time spent with the patient because it is a gamma-emitting radiation source? (check all that apply)	□I-131 □P-32 □Ir-192 □Y-90 □Pd-103 □I-125

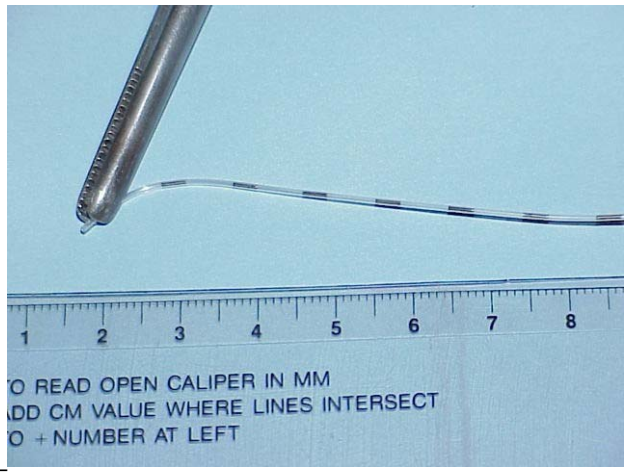
BRACHYTHERAPY SOURCES

Iodine-125 and palladium-103 brachytherapy sources can be described as silver colored tomato-sized “seeds.” Iridium-192 brachytherapy sources look like a string of “seeds” with the appearance of a wire. Using these descriptions identify the brachytherapy sources?

. 1.



1._____



2._____

1. (Iodine-125 or Palladium-103 seeds) 2.(Iridium-192 wire)

RADIATION SAFETY

TERMS AND UNITS

Contamination: Contamination is the deposition of unwanted radioactive material on the surfaces of structures, areas, objects or personnel and includes all radioactive material deposited where it should not be.

Curie: The curie is a unit of radioactivity or amount. A curie equals 3.7×10^{10} disintegrations per second. The most common subdivisions are the millicurie, which is 1/1000 of a curie, and the microcurie, which is 1/1000000 of a curie.

Decontamination: Decontamination is the reduction or removal of radioactive material from a structure, surface, area, object or person. Decontamination may be accomplished by treating (e.g., cleaning) the area, removing the contaminated area and disposing as radioactive waste, or allowing the radioactive material to decay.

Exposure: Radiation is energy and is emitted from all radioactive materials. Exposure means being exposed to ionizing radiation or radioactive material.

Half-life: Radioactive half-life is the time required for a radioactive substance to lose 50 percent of its activity by decay. Each radionuclide has a unique half-life. Biological half-life is the time required for 50 percent of a substance to be eliminated from the body. Effective half-life is the change in radioactivity due the combination of radioactive half-life and biological half-life.

Pig: A pig is a container (usually lead) used to ship or store radioactive material. The container provides protection to a person handling the container from the radioactive material within the container.

Radiation: Energy emitted from a radioactive substance.

Rem: Rem is a unit of radiation dose. The most common subdivision is the millirem, which is 1/1000 of a rem.

SELF-EVALUATION QUESTIONS

Radiation is defined as -	
What is the term that refers to the rate at which a radionuclide decays or loses 50 percent of its radioactivity?	
What is the term that refers to radioactivity decreasing by the combination of radioactive decay and elimination from body?	
Contamination is radioactive material where it should not be.	□True □False
The unit of radiation dose is?	
Shielded containers used to store or ship radioactive sources are called?	

CONTAMINATION VERSUS EXPOSURE

Radiation exposure and **contamination** are two very different concepts that must be understood to safely provide care to radiation therapy patients. Radiation is energy and is emitted from all radionuclides. All radiation therapy patients generate radiation exposure. Consequently, a Health Care radiation worker providing care to a patient receiving a radiopharmaceutical and/or brachytherapy may be exposed to radiation and the Health Care radiation worker should use radiation protection procedures applicable to the radiation exposure. **Contamination** is the deposition of **unwanted** radioactive material on the surfaces of structures, areas, objects, or personnel. Sealed sources generate radiation exposure but do **NOT** present a contamination risk as long as the external casing remains intact. Radiopharmaceuticals and other unsealed sources generate radiation exposure and routinely present a contamination risk. Sources of contamination from radiopharmaceuticals include body fluids or leakage from the injection site.

Radiation Source	**Radiation Exposure Potential When Providing Patient Care**	**Contamination Risk Potential**
Iridium 192 ribbon (Ir-192)	Yes	No
Iodine 125 seed (I-125)	High activity – Yes Low activity – No, body shields	No
Palladium 103 seed (Pd-103)	Low activity – No, body shields	No
Phosphorous as a radiopharmaceutical (P-32)	No – body shields	Yes – if P-32 leaks out or may be present in body fluids
Iodine 131 as a radiopharmaceutical (I-131)	Yes	Yes – I-131 is present in all body fluids
Strontium 89 as a radiopharmaceutical (Sr-89)	No – body shields	Yes – maybe present in body fluids
Yttrium 90 as a microsphere	No – body shields	Yes – free yttrium maybe present in urine

SELF-EVALUATION QUESTIONS

What four radiation sources may result in a contamination risk?	♦ ♦ ♦ ♦	
Radiation is energy emitted from radionuclides.	□True	□False
Radiation exposure is generated from all radiation therapy patients.	□True	□False
Radiation contamination is generated from all radiation therapy patients.	□True	□False

APPLYING TIME, DISTANCE AND SHIELDING

The principles of *time, distance,* and *shielding* shall be used to keep your exposure **as low as is reasonably achievable (ALARA).** These principles are most effective for gamma-emitting radionuclides since the patient's body provides shielding for beta-emitting radionuclides.

Minimize Time: Radiation dose is a function of the time spent near a radiation source. The shorter the time someone is near a radiation source, the smaller the radiation dose. Time spent with a radiation therapy patient shall be limited to the time necessary to provide appropriate care. Visitation time for visitors who are not designated Familiar Adult Caregivers (FAC) or special visitors is limited to the visitor stay time posted on the patient's door.

Maximize Distance: In radiation safety, distance is the amount of space between you and the radiation source. Increasing the distance from the radiation source results in decreased radiation exposure. To maximize distance from the radiation source stand several feet away from the patient while providing indirect care and if applicable, work/provide direct care from the opposite side of the bed of the implant site or location of highest radiopharmaceutical uptake.

Use Shielding: Shielding is defined as the placement of a protective material between the radiation source and yourself. Lead is the most frequently used material for shielding. The thickness of the lead and the energy of the gamma ray determines the degree of protection/decrease in radiation level. A lead shield can be cumbersome when performing procedures and can increase the amount of time spent with the patient. A lead shield in the room should be used as a reminder to limit time and increase distance. **Examples of shielding** include the patient's body, lead area shield **positioned** in room, and lead-lined cap, limb shield or eye shield. Lead area shields are positioned by Radiation Oncology, Nuclear Medicine or Radiation Safety to provide the maximum radiation protection to personnel. Direct patient care shall be provided **behind** the lead shielding and/or as far as reasonably possible from the source. **Positioned** lead area shields are to be moved/repositioned in the patient's room and/or removed from the patient's room only by Radiation Oncology, Nuclear Medicine or Radiation Safety.

SELF-EVALUATION QUESTIONS

What does ALARA stand for?	
To decrease radiation exposure a Health Care radiation worker needs to __ the amount of time in the room with a radiation therapy patient.	□Increase □Decrease
To decrease radiation exposure a Health Care radiation worker needs to __ his/her distance from the radiation source.	□Increase □Decrease
As the distance between a Health Care radiation worker and a radiation source increases, the radiation exposure	□Increases □Decreases
A shield between a gamma-emitting radiation source and a Health Care radiation worker causes the radiation exposure to	□Increase □Decrease
Who may position/reposition shielding?	♦ ♦ ♦

THE RADIATION SAFETY OFFICE

The Radiation Safety Office (RSOf) plays a significant role in radiation safety. The RSOf develops and implements proper radiation safety procedures. The following is a list of some of the duties performed by the RSOf to assist Health Care radiation workers keep their doses ALARA.

- posts and de-posts patient rooms with radiation signage and precautions
- determines dose rates at specific distances from the patient
- determines "stay" time general visitors are allowed with the patient
- determines the length of time the patient must be under radiation precautions
- monitors personnel exposure to radiation
- provides personnel monitors
- monitors the environment to protect staff and public from radiation exposure
- advises staff about radiation safety issues
- performs any necessary patient room preparations
- decontaminates radiopharmaceutical therapy patient rooms
- participates in the ongoing education of staff who work with radiation sources, including Health Care radiation workers who provide care to radiation therapy patients
- provide training to Familiar Adult Caregivers (FAC) and special visitors
- assists in the oversight of incidents involving radiation sources

In addition the RSOf:

- ensures required Ohio Department of Health (ODH) documentation is completed
- ensures that current practices and policies adhere to ODH regulations
- assesses and evaluates any radiation incidents and/or emergencies

A member of the RSOf is available 24/7. The RSOf is available during normal University of Cincinnati business hours (Monday through Friday, 8:00 am to 5:00 pm) by phone at 513-558-4110. The RSOf has a technician on-call via pager 24/7. The digital pager number is 513-249-6812. When you call, ensure to use all 10 digits and after the beeps leave a call back number.

Department	Daytime Number	Pager number
Radiation Safety Office (RSOf)	513-558-4110	513-249-6812 (Digital) On-call RSOf technician (use all 10 digits)

SELF-EVALUATION QUESTIONS

How do I reach the Radiation Safety Office during evening hours?	
The Radiation Safety Office posts and de-posts patient rooms.	□True □False
Who provides training to FACs?	

RADIATION MONITORING DEVICES

Personnel and environmental monitoring are an important part of radiation safety. Monitoring devices do not provide protection from radiation exposure. Monitoring devices provide information about the degree of radiation hazard, the appropriateness and effectiveness of safety precautions and whether the safety practices accomplished the objective.

Personnel monitoring is accomplished through the use of a personal radiation dosimeter and/or the personal dosimeter monitor (PDM). Personal radiation dosimeters are after the fact monitors and require processing by a vendor prior to obtaining the radiation dose. The personal radiation dosimeter used under the University of Cincinnati Radiation Control and Safety Program to monitor the amount of whole-body radiation exposure the wearer received is the Luxel® optically stimulated luminescent (OSL) dosimeter. The Luxel® dosimeter must be worn on the trunk of the body when providing care to a patient who is under radiation precautions. The Luxel® dosimeter is **only** to be worn by the individual for whom it is assigned, is **not** to be worn during non-occupational radiation exposure (e.g., person's medical X-rays) and must be stored in a low-background location. The Radiation Safety Office should be notified immediately if your personal dosimeter badge is lost or damaged. PDMs are electronic devices that can provide a very good estimate of an individual's radiation dose. PDMs may be requested by any Health Care radiation worker when providing care to a patient under radiation precautions and are routinely provided for patients undergoing therapy with I-131. When PDMs are used, they must be worn in conjunction with a Luxel® dosimeter. The PDM is not as accurate as the Luxel® dosimeter but it does provide a quick assessment of the radiation dose received. When using PDMs complete the PDM Log using the posted instructions.

Environmental Monitoring Devices are used to survey an area for the presence of radiation and/or allows for an immediate assessment of the amount of radiation. Environmental monitoring devices include survey instruments. The three types of survey instruments routinely used to monitor the environment are the Geiger-Mueller (GM) survey meter, the ion chamber and the sodium iodide (NaI) survey meter. Each survey instrument has a special function and its use depends upon the type of radionuclide used and the information required.

SELF-EVALUATION QUESTIONS

Name 2 devices used to monitor the radiation exposure a person receives.	♦ ♦	
Name two devices used to survey an area for the presence of radioactivity.	♦ ♦	
Should the same Luxel® dosimeter be passed on from person to person?	□Yes	□No
Do dosimeters protect an individual from radiation?	□Yes	□No
Do survey meters provide an immediate assessment of the amount of radiation?	□Yes	□No
A whole body Luxel dosimeter should be worn in what area of the body.		

REGULATORY REQUIREMENTS

There are some regulatory requirements that must be met and are important points for Health Care radiation workers to review and remember:

The **annual** occupational dose limit for adults who are exposed to ionizing radiation as part of their work is **5 rem (5000 mrem)** per year. For this limit to apply, the individual must be specifically trained in radiation risks and precautions therefore, unauthorized and non-essential personnel are **not** permitted to enter the room of a patient receiving therapeutic doses of radiopharmaceuticals and/or brachytherapy. Individuals considered radiation workers and for whom the occupational dose limit apply include Health Care radiation workers and Familiar Adult Caregivers (FAC).

A **declared pregnant worker** is an individual who has notified the Radiation Safety Office (RSOf) in writing in accordance with regulatory requirements. Health Care radiation workers wishing to declare their pregnancy should notify their supervisor and must notify the RSOf *in writing* using RS Form 33 (available on the website www.uc.edu/radsafety). Once the pregnancy is "declared" in writing to the RSOf, the maximum radiation exposure to the declared pregnant worker's fetus is reduced to **0.5 rem (500 mrem).** Monitoring for fetal dose will occur throughout the declared pregnancy. Throughout the individual's declared pregnancy, work assignments related to the care of patients under radiation precautions are evaluated and monitored by the RSOf. Declaring pregnancy is optional. If pregnancy is not declared in writing, radiation dose limits are not reduced.

Unless specifically approved by the physician and the Radiation Safety Officer (RSO), **visitors of patients under radiation precautions** are limited to non-pregnant individuals 18 years or older. Visitors are **NOT** permitted to enter the patient's room if it is determined that an implant is missing or dislodged. Visitors to a patient who is receiving a radiopharmaceutical and/or brachytherapy implant should inform a Health Care radiation worker of their arrival before entering the patient's room, limit the visit to the "stay time" posted on the door sign and remain at least six (6) feet from the patient or sit/stand only in the designated area unless stay time is posted as ***unlimited.*** FACs are special visitors who receive training and are allowed longer stay times. The radiation dose for a general visitor is 100 millirem.

SELF-EVALUATION QUESTIONS

Visitors (non-FAC) of radiation therapy patients are limited to _____ individuals at least _____ years or older.	
How much time can a visitor be in a radiation therapy patient's room?	
A pregnant Health Care radiation worker must declare her pregnancy.	☐Yes ☐No
What is the dose limit for a declared pregnant Health Care radiation worker?	
Declaring a pregnancy requires what notification?	
A Health Care radiation worker's annual dose limit is?	

VISITORS OF PATIENTS

At the request of the physician, the Radiation Safety Officer (RSO) may allow selected visitor(s) to have extended "stay times" and assist in the patient's care. These visitors have the title of Familiar Adult Caregivers (FAC) or special visitors. If authorized, the Radiation Safety Office (RSOf) shall conduct additional training and provide dosimetry to the visitor(s). Visitor rules and precautions, as summarized below, are posted on the door of a radiation therapy patient's room.

Unless approved by the RSO and the physician, all visitors (including FACs) are limited to:

- Non-pregnant individuals.
- 18 years or older.

General visitors to a patient under radiation precautions may **NOT** handle items in the patient's room, e.g., food, trays, cups, utensils and should:

- Notify a Health Care radiation worker of their arrival before entering the patient's room.
- Limit the visit to the "stay time" posted on the door sign.
- Remain at least six (6) feet from the patient unless posted "stay time" is ***unlimited***.
- Sit/stand only in the designated areas unless posted "stay time" is ***unlimited***.

Because of the contamination concerns additional precautions are necessary if a patient's therapy involves a radiopharmaceutical, such as I-131. All visitors, including FACs:

- May **NOT** bring any items or materials into the patient's room unless cleared by the RSOf.
- Must wear a gown, double gloves, and double shoe coverings into the patient's room and follow the protective clothing removal procedure posted on the door when exiting the room.
- In an emergency situation (e.g., emesis spill, cardiac arrest) do **NOT** leave the room to summon help; push the call button. The Health Care radiation worker directs the visitors to remain in the area just outside the patient's room until the visitor is surveyed and approved to leave by the RSO.

Visitors, including FACs are **NOT** permitted to enter the patient's room if an implant is missing or dislodged.

SELF-EVALUATION QUESTIONS

Visitors entering the room of an I-131 patient must don what type of PPE?	♦ ♦ ♦	
Visitors must be at least 18 years of age	□True	□False
All visitors are allowed to stay in a radiation therapy patient's room longer than the posted "stay time."	□True	□False
FACs are allowed to stay in a radiation therapy patient's room longer than the posted "stay time."	□True	□False
Visitors are not allowed in a patient's room during an emergency situation like a dislodged source.	□True	□False
Visitors should sit/stand in a designated area?	□Yes	□No
Special approval is required for visitors who are pregnant?	□Yes	□No

HANDLING EMERGENCY SITUATIONS

GENERAL RULES:

- Remain calm. Exposures can be maintained at safe levels by responding quickly and calmly.
- Immediately notify the Radiation Safety Office (RSOf) and the applicable physician(s).

DISLODGED BRACHYTHERAPY SOURCE: A sealed lead-lined container (pig) and long-handled tongs remain in the patient's room at all times to assist with this type of situation.

- Do not remove or manipulate a source that appears to be displaced but not totally dislodged.
- Never handle or pick up a source *by hand*. Use the long-handled tongs to pick up the source and place it in the lead-lined container (pig).
- Restrict entry to the room, including family and visitors.

CARDIOPULMONARY ARREST (CPR): Initiate CPR according to procedure and

- Rotate personnel performing CPR to maximize distance and minimize time.
- Post a staff member outside the patient's room door to record the names, and time of all personnel entering the room. If possible, also obtain a contact number.
- Do **NOT** allow unauthorized personnel into the room.
- Perform CPR behind the shields, if possible. Avoid defibrillator to shield contact.
- **Radiopharmaceutical patients:** responders should don a gown, double gloves and double shoe covers. **All** personnel and equipment must remain in the patient's room or just outside the patient's room until released by the RSOf.

BODY FLUID SPILLS (URINE, EMESIS, BLOOD, STOOL): Consider **all** body fluids radioactive for patients receiving any radiopharmaceutical.

- Cover spill with absorbent material.
- Do not allow anyone to enter the room until cleared by the RSOf.
- Do not leave the room use the call button to summon assistance.
- Check for personal contamination.

PERSONAL CONTAMINATION:

- Remove contaminated clothing and isolate in patient's bathroom.
- Don clean protective clothing.
- Stand just outside the patient's room or remain with the patient until cleared by the RSOf.
- Do not leave room or allow others to enter the room until cleared by the RSOf.
- Flush any contaminated skin with tepid water, and wash thoroughly with soap and water for three (3) minutes. Do **NOT** use friction.

SELF-EVALUATION QUESTIONS

What actions should be taken in handling a I-131 body fluid spill?	♦ ♦ ♦ ♦
Who must be notified if there is an incident involving a radiation therapy patient?	♦ ♦
A dislodged radiation source may be handled with your hands.	□True □False

NURSING CARE

NURSING STANDARDS OF CARE – GENERAL RADIATION SAFETY

(refer to Health Care Provider Radiation Safety and Reference Manual)

Nursing Diagnosis	Focus	Outcome	Questions to identify appropriate Nursing Interventions
Potential for Anxiety: Related to social isolation.	Coping	Minimize isolation anxiety	1. List 3 nursing instructions interventions that may reduce patient anxiety related to isolation. • • •
Discharge Planning/Patient Education	Information	Patient will verbalize understanding of visitor precautions.	2. General visitor precautions allow a pregnant woman to visit a patient under radiation precautions True False 3. General visitor precautions require a visitor to be 18 years or older to visit a patient under radiation precautions. True False 4. Modification to general visitor requirements may be approved by the physician and Radiation Safety Officer. True False
Discharge Planning	Information	Nurse will understand special discharge instructions..	5. Room cannot be released for post discharge cleaning without approval by Radiation Safety Office. True False 6. Nursing staff may remove the “Caution Radioactive Material” sign from the door. True False

1.Reassure patient; Encourage call light use; Frequent observation; Encourage deversionary activity. 2.F 3.T 4.T 5.T 6.F

NURSING STANDARDS OF CARE – IODINE 131 RADIOPHARMACEUTICAL

Sodium Iodide Therapy

(refer to Health Care Provider Radiation Safety and Reference Manual)

Nursing Diagnosis	Focus	Outcome	Questions to identify appropriate Nursing Interventions
Knowledge deficit: Related to radiation safety precautions for patients receiving I-131.	Information	Patient verbalizes understanding of radiation safety precautions.	1. Inform patient that he/she will be confined to his/her room for a specific number of days. True False 2. Inform patient that disposable trays and utensils will be used. True False 3. Body fluids are NOT radioactive. True False 4. All items which may have come in contact with the patient must be cleared by the Radiation Safety Office prior to removal from the patient's room. True False
Knowledge deficit: Related to radiation safety precautions for visitors of patients receiving I-131.	Information	Patient/visitor verbalizes understanding of visitor precautions.	5. Visitors must be at least 18 years of age. True False 6. Visitors may be pregnant. True False 7. Visitors must put on two (2) sets of shoe coverings and one set of gloves before entering the room. True False 8. Visitors must wear a gown when visiting the patient. True False
Alteration in Nutrition: less than body requirements related to nausea and vomiting.	Nutrition	Patient has adequate nutrition intake and control of nausea and vomiting.	9. Patient should be NPO before ingesting I-131. True False 10. Antiemitics are not effective to control nausea and vomiting in patients who receive I-131. True False
Discharge Planning/Patient Education	Information	Patient verbalizes understanding of discharge instructions and the need for follow-up care with the physician.	11. From the following list, check (√) the appropriate discharge instructions: □ sleep alone for 2 weeks □ do not shower for 2 weeks □ drink plenty of fluids □ avoid pregnancy and do not breast feed □ wash hands after using toilet □ contact CCHMC if questions

1.T 2.T 3.F 4.T 5.T 6.F 7.F 8.T 9.T 10.T 11.All except not showering correct

NURSING STANDARDS OF CARE – IODINE 125 BRACHYTHERAPY

Brachytherapy Eye - Temporary Implant

(refer to Health Care Provider Radiation Safety and Reference Manual)

Nursing Diagnosis	Focus	Outcome	Questions to identify appropriate Nursing Interventions
Knowledge deficit: Related to radiation safety precautions for patients receiving I-125 temporary eye implants.	Information	Patient verbalizes understanding of radiation safety precautions.	1. Patient will be confined to his/her room during radiation therapy. True False 2. Unless otherwise noted by Radiation Safety, the patient wears a lead eye shield at all times. True False 3. Visitors are not allowed to sit with the patient unless the patient is wearing a lead eye shield. True False
Knowledge deficit: Related to radiation safety precautions for visitors of patients receiving I-125 temporary eye implants.	Information	Patient will verbalize understanding of visitor precautions.	3. List 3 instructions for visitors to limit their exposure: • • •
Discharge Planning/Patient Education	Information	Patient verbalizes understanding of discharge instructions and the need for follow-up care with the physician..	4. Patient will not be radioactive after discharge.. True False 5. Patient will be instructed per physician's orders. True False

1.T 2.T 3.T 4.Limit time; Increase distance; Use eye shield 5.T 6.T

POST TEST

(Answer true or false to the following questions)

1. Brachytherapy can be temporary or permanent. True False

2. Radionuclides emit certain types of radiation that include alpha particles, beta particles, and gamma rays. True False

3. Radiation is defined as energy emitted from a radioactive substance. True False

4. Radionuclides with a short half-life are used for permanent implants. True False

5. Wearing protective clothing is not required when taking care of a patient receiving I-131. True False

6. A dosimeter protects the nurse from radiation exposure. True False

7. Applying time, distance and shielding precautions are only necessary for I-131 patients. True False

8. Gamma rays are penetrating rays of energy that have an unlimited range and can penetrate all body tissues and organs. True False

9. A dislodged source is always picked up with tongs and placed in a lead container. True False

10. An unsealed source such as I-131 does not present a contamination hazard. True False

11. Nurses may share personal radiation dosimeters, like the whole body Luxel dosimeter. True False

12. Lead is the most frequently used material for shielding. True False

13. Brachytherapy patients are radioactive after an implant is removed. True False

14. A radioactive sealed source has a high potential to cause contamination. True False

15. Two pair of gloves are required to provide direct patient care to a patient receiving I-131. True False

1.T 2.T 3.T 4.T 5.F 6.F 7.F 8.T 9.T 10.F 11.F 12.T 13.F 14.F 15.T

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Annual Health Care Radiation Worker Recertification

A Radiation Safety Self-Learning Package (for the annual recertification of Health Care radiation workers providing care for patients receiving radiation therapy treatment) was provided to me.

I have read the *Radiation Safety Self-Learning Package* and completed all activities within the *Radiation Safety Self-Learning Package*.

To complete the recertification process I am aware I must also pass an examination* administered by the Radiation Safety Office. To pass the examination I must achieve a score of 100% on the source portion and 85% or greater on the practical portion. If I fail to achieve a passing score then I must either: (1) complete the *Radiation Safety Self-Learning Package* and associated test again, (2) attend a scheduled Health Care radiation worker recertification course presented by Radiation Safety or (3) attend a scheduled initial Health Care radiation worker certification course presented by Radiation Safety. I am aware the radiation safety Health Care Worker Training schedule is available on the RSOf homepage, www.uc.edu/radsafety.

Name: (Print) _____

Name: (Signature) _____

SSN#: _____-____-_____

Radiation Safety Self-Learning Packet completed _____
(date)

Hospital: []CCHMC []SHC Department/Unit:_____

*Exams are administered during scheduled recertification exam sessions and at the Radiation Safety Office (RSOf). A recertification exam session schedule is available on the RSOf homepage, www.uc.edu/radsafety, under the Health Care Worker Training Schedule. Contact the RSOf (513-558-4110) to schedule attendance at a recertification exam session.

*Exams are administered, without appointment, at the RSOf (RSL 2nd floor) between 8:00 AM and 4:00 PM University of Cincinnati business days. When scheduling an exam session or arriving at the RSOf to take an exam ensure to state the exam is for recertification of Health Care radiation workers.

*Alternately the exam may be taken online at cpd.uc.edu. When signing onto the online exam, verification of completion of this Self-Learning Package is required.