

RADIATION SAFETY PROGRAM

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1- Title:

RADIATION SAFETY PROGRAM.

2- Definition:

2.1. Local Regulations

2.1.1. Licenses:

2.1.1.1. The program is coordinated with the organization's safety management program. King Fahd Hospital Nuclear Medicine section operates under a specific license issued by King Abdul-Aziz City for Science and Technology and must comply with the terms of the license using any radioisotopes that are applied in diagnostic and therapeutic nuclear medicine. However, the radiation safety procedures should be followed for any other radiation producing equipment, like x-ray machines.

2.1.2. Regulations:

2.1.1.2. The safety program is part of the organization's safety management program and reports to the organization safety structure at least annually and when any safety events occur, Standards for protection from radiation are published in KACS&T manual. Additional requirements are included in the KFH radiation safety manual governing the possession and use of radioisotopes. Employees are encouraged to refer to these standards and the current license.

3- Application:

Applies to all personnel employed in the Radiology & Imaging Department.

4- Statement of Purpose:

To set guidelines for Radiation Safety Program

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5- Policy:

5.1. Program Operations:

5.1.1. Administration of the Radiation Safety Program:

The Radiation Safety Team (RST) address compliance with applicable standards, laws, and regulations, also has the overall responsibility for developing and administrating the occupational safety and health program at KFH, including the Radiation Safety Program. The Radiation Safety Program is managed by the Radiation Safety Officer (RSO), who is a member of the RST staff. The Radiation Safety Team (RST) provides for oversight of the KFH Radiation Safety Program to ensure safe use of radioactive materials and proper use of X-ray machine in areas under the control of KFH. The RST is responsible for formulating policies with regards to radiation safety at KFH and protection of the environment to ensure the compliance with the KSA regulations, including those of the KACS&T. In an emergency, the Director, RST, or his designee may act for the RSO when necessary to control or prevent an incident involving radioactive materials, including the temporary ordering cessation or the authority to purchase or use isotopes until the RST reviews these infractions. The RSO and the RST shall be provided with sufficient authority, organizational freedom, and management prerogative to accomplish these goals.

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6- Procedures:

- 6.1. Radiation Safety Officer (RSO) — the RSO is a professional health physicist with a license from KACS&T. The RSO provides management of the day-to-day operations of the Radiation Safety Program, and assures compliance with the policies of the KFH, RST, and with the regulations and rules of KACS&T. The duties of the RSO include:
- 6.1.1. Consulting with members of the RST and the users of the radioactive materials on all matters relating to the use of radioactive materials.
 - 6.1.2. Assuring compliance with the regulations and rules, and the requirements of the KACS&T license to procure, use, store, secure, and dispose of radioactive materials through monitoring and periodic formal and unannounced inspections.
 - 6.1.3. Developing and implementing procedures for periodic radiological surveys of the hot lab, monitoring of personnel, handling and disposal of radioactive wastes, ordering, receiving and use of radioactive sources. Developing and implementing training for all personnel involved in any facet of operations involving radioactive materials. Assuring that all nuclear medicine relevant personnel receive periodic review of important procedures, rules and methods.
 - 6.1.4. Developing and implementing training for all personnel involved in any facet of operations involving radioactive materials. Assuring that all nuclear medicine relevant personnel receive periodic review of important procedures, rules and methods.
 - 6.1.5. Reviewing applications of new Authorized Users and protocols from existing Authorized Users before submission to the RST.
 - 6.1.6. Maintaining records of procurement, area monitoring, personnel monitoring, accidents and incidents, inventories, and any other documents required by the Radiation Safety Program and KACS&T regulations.
 - 6.1.7. Approving requests to purchase radioactive materials after assuring that only authorized users place orders and that the orders for radioactive materials do not exceed established limits under KACS&T's license.

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- 6.1.8. Responding to all emergencies involving radioactive materials and providing expert advice and assistance as required by the program.
- 6.1.9. Providing liaison between the RST and the Employee Health Clinic on all matters relating to employee exposure to radiation, monitoring results .
- 6.1.10. Interacting with the KACS&T on issues related to the KFH licenses, license amendments, application renewals, and inspections.
- 6.1.11. Assuring compliance with all “As Low As Reasonably Achievable” (ALARA) regulations.

6.2. NOTE: The Deputy Radiation Safety Officer will back-up the Radiation Safety Officer on all the aforementioned duties.

6.2.1. Radiation Safety Team (RST) - The RST, as required by KACS&T regulations and conditions of KFH license, maintains oversight of all operations involving radioactive materials and radiation-producing equipment. The RST advises the RSO on matters relating to radiological safety and compliance with KACS&T regulations. The RST shall be appointed by the Director of KFH. The RST is responsible for formulating policies with regards to radiation safety at KFH and protection of the environment to ensure compliance with the national regulations, including those of the KACS&T. the RST serves as liaison to all KFH-R&NM workers. The RST shall be provided with sufficient authority, organizational freedom, and management prerogative to accomplish these goals. The duties of the RST and the membership and organization of the RST are provided below:

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- 6.2.1.1. Provides technical oversight, advice, and assistance to the radiation workers on matters concerning radiation safety and security.
- 6.2.1.2. Receives, reviews and acts on all applications for the use of radioactive material or radiation sources in any area used by KFH-R&NM personnel. Determines that all activities involving radioactive materials and sources of radiation are being conducted safely and in accordance with applicable KACS&T and Civil Defense. Receives and reviews periodic reports from the RSO on contamination monitoring, personnel monitoring, inspections, and other related safety matters.
- 6.2.1.3. Reviews and assesses, as necessary, the overall use of radionuclides and radiation sources used at the KFH — R&NM department for possible modification of possession limits.
- 6.2.1.4. Investigates all instances of alleged infractions of safety rules and security regulations and for violations of KACS&T requirements. Determines the course of corrective action(s) to be taken.

6.3. Protective Lead Aprons:

- 6.3.1. Specific processes or devices that reduce safety risks Protective aprons are available in all the department rooms and in the 0.R where ionizing radiation is used .
- 6.3.2. Annual checks are performed on the aprons, followed by a report on their physical status.

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- 6.3.3. The apron tests are conducted by the RSO and consequently a report is compiled about their status.
- 6.3.4. Damaged lead aprons are discarded.
- 6.3.5 Monthly visual check is performed on the aprons, if noticed any issues the physical check will performed and documented.

6.4. Pregnant Radiology Staff:

- 6.4.1. Radiology and diagnostic imaging staff are oriented to safety procedures and practices.
- 6.4.2. Pregnant radiographers should carry an extra radiation dosimeter that should be placed under the lead apron.
- 6.4.3. Occupational radiation exposure for pregnant worker should Not exceed two(2) milliseiverts during pregnancy and should not exceed one (1) milliseivert during the critical stage (8-15 weeks following conception).
- 6.4.4. If a female radiographer exposure might exceed the above stated limits, then she should be relocated to a place where radiation exposure does not exceed the above limits.
 - 6.4.5. when the worker became pregnant, she should inform RSO about that and she will sign the declaration form.

6.5. Survey Meter :

- 6.5.1. RSO should make radiation survey twice a week in the entire radiology department and record the dose rate in the radiation survey monitoring file.
- 6.5.2. RSO should check the radiation survey of the shielding design for all x- ray production room annually.

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6.6. Patients Dose:

6.6.1. RSO should monitoring the dose of the patients and ensure that patients don't exceed the limit and range of typical dose especially in Fluoroscopy and Interventional. The reference dose level (DRLs) for patients' dose is attached.

6.7. Pregnant Patients:

6.7.1. The following procedures are followed:

- 6.7.1.1. The X-Ray Technologist is to check all consultation forms (x-ray requisition form) and note if the physician answered the question on the form regarding pregnancy of the patient.
- 6.7.1.2. X-ray Technologist must ask all Female patients of childbearing age if they are or may possibly be pregnant.
- 6.7.1.3. If patient is pregnant, the technologist must consult the supervising radiologist before proceeding with the x-ray exam. If the exam is performed, proper shielding of the fetus is made
- 6.7.1.4. By request of a physician, the exposure to the fetus is calculated by Radiation Safety and this information is made available to the referring physician.
- 6.7.1.5. Pelvimetry shall only be performed when needed and shall not be carried out on a routine basis. Ultrasound examinations should be used instead.

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6.8. Holding of Patients:

- 4.8.1. No person shall be exposed to radiation unnecessarily when there is an alternative way of restraining a patient, such as the use of restraining devices.
- 4.8.2. A person who works regularly with radiation shall never be subjected to unnecessary radiation exposure by holding patients.
- 4.8.3. No person shall be habitually exposed to radiation by holding patients.
- 4.8.4. Rules for holding patients:
 - 4.8.4.1. Hold only when restraining devices will not work.
 - 4.8.4.2. Technologists may not hold.
 - 4.8.4.3. Fertile women may not hold.
 - 4.8.4.4. Individuals under 18 years of age may not hold.
 - 4.8.4.5. Protect holding individual with apron and gloves.

6.9. Physical Security of Radioactive Materials:

- 6.9.1. The Rule: All Radioactive Materials at King Fahad Hospital-Nm Section Must be Secured or be Under Constant Surveillance at all times;
 - 6.9.1.1. All shipments of radioactive materials received at KFH & NM department must be secured or be under constant surveillance at all times. Shipments of radioactive materials which have not been delivered must be secured at the receiving site by personnel trained until delivery can be made. Delivery personnel are prohibited from delivering a package with radioactive materials unless there is an authorized person (Authorized User, Alternate Authorized User, or Radiation Worker) at the location (KFH-R & NM department) who will accept it, sign for its receipt, and secure the radioactive materials. Shipments of radioactive materials must not be left unsecured in corridors.
 - 6.9.1.2. Any radioactive material in use in the Nuclear Medicine section must be attended at ALL TIMES, or secured by locking that room when not attended. Radioactive materials may not be left unsecured even momentarily. Radioactive materials in storage,

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i.e. not being used, must be secured when the room in which it is stored is unoccupied. It is strongly recommended that all rooms containing radioactive materials be locked during day or night.

- 6.9.1.3. Corridors (hallways, elevator lobbies, and utility chases, etc.) are not secure areas. Therefore, the use and storage of radioactive materials in these areas are prohibited.
- 6.9.1.4. All radioactive wastes are considered as radioactive materials, radioactive wastes, including dry waste, liquid waste, medical pathological waste, and mixed waste, must be secured at all times. Radioactive waste may be placed in lockable containers.
- 6.9.1.5. Unescorted unauthorized personnel may not enter into the Hot Lab. if an authorized person is not present. Any person admitted into the Hot Lab. must be accompanied at all times by an authorized person who works in the area.

6.10. **ALARA PRINCIPLE:**

- 6.10.1. The radiation safety program at KFH fully supports the concept that all radiation doses should be ALARA. This implies that no dose should be acceptable if it can be avoided or is without benefit. Our ALARA program depends on the cooperation of all users of radionuclides and their supervisors at KFH. The program includes the use of proper equipment and procedures to lower radiation exposure.

The RSO will investigate any whole body dose in excess of 1.25mSv or 18.75mSv to the extremities to any individual in any one quarter. If any worker receives a whole-body dose in excess of 3.75mSv or 56.2mSV to the extremities per quarter, direct actions must be taken to minimize any future exposures. These actions may require a change in laboratory procedure or an increased application of the principles of personnel protection.

- 6.10.2. Maintain ALARA exposures by practicing the basic principles of radiation protection.

6.10.2.1. **External Radiation Protection.**

- 6.10.2.2. Maximize the distance from the source. The dose rate for most gamma and x-radiation varies with the inverse square of the distance from a "point" source. Therefore,

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the farther you position yourself for the source of radiation, the smaller the dose you receive.

- 6.10.2.3. Minimize time of exposure, The less time you remain in a radiation field, the smaller the dose you receive.
- 6.10.2.4. Shield the radiation source. Place shielding between yourself and a source of penetrating radiation to decrease your dose. For gamma or x-ray emitters Tc-99m, Ga-67 and I-131) lead is used when exposures rates are significant.

6.11. Internal Exposure Protection.

- 6.11.1. Inhalation: A chemical fume hood which has been certified for radioactive materials work is highly recommended when using potentially volatile compounds such as I-131.
- 6.11.2. Puncture: Dispose of syringes and pipettes promptly and in appropriate containers. Guard against glass and puncture injury during use and disposal. Do not attempt to recap needles before disposal.
- 6.11.3. Ingestion: NEVER introduce any food or drink into a posted restricted area, even for temporary storage. DO NOT eat or drink in any area where radionuclides are used, and never store foods and drinks in a cold room or refrigerator that is designated for radioactive material storage.
- 6.11.4. Absorption: Use measures that prevent the contamination of skin and eyes. If there is possibility that clothes have been contaminated, remove this clothing before leaving the Hot Lab. Eye protection, (e.g. goggles, face shield) is encouraged to prevent contamination of the eyes. This is particularly important for individuals wearing contact lenses since some lenses will absorb and concentrate radiochemicals. Wear protective gloves at all times when working with radioactive materials. Change gloves frequently during the work, dispose of the used gloves as radioactive waste. Wash hands after using radioactive materials and monitor the hands for contamination, especially before eating, and prior to leaving the Hot Lab.

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6.12. Machine Use Authorization:

6.12.1. All authorized machine using personnel must:

- 6.12.2. Post areas where radiation-producing machines are used and stored. Rooms housing x-ray equipment must have warning signs on Entrances specifically for x-ray.
- 6.12.3. Maintain security/control of ionizing radiation-producing equipment. Equipment itself or rooms housing x-ray equipment must be locked when not in use.
- 6.12.4. Keep a log of dates, use parameters, and user's names, as well as any performance checks done on equipment. The RSO will also monitor work areas where x-ray machines are used to detect leakage or scatter radiation.
- 6.12.5. If you modify, transfer, dispose of, or purchase x-ray equipment, notify RST of these changes.
- 6.12.6. N.B.: Wear Dosimeter (TLD) to document radiation Exposures while working with x-ray equipment.

6.11. Radioactive Material:

- 6.11.1. All work involving radioactive material must be conducted under the auspices of an approved authorized user. Each authorized user is ultimately responsible for the safety of those who use radioisotopes under his/her supervision. To become an authorized user, one must be officially approved from the RST according to the laws of KSA.
- 6.11.2. The RST, upon recommendations from the RSO, must approve the appointment of all authorized users. Approval carries many responsibilities. Each authorized user must be familiar with safe nuclear medicine procedures, and all related requirements of the KFH.

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6.14. The Authorized User must:

- 6.14.1. Call the emergency service (code yellow 5555) or fire department (code red 5555) immediately for any fire, explosion, or major accident and tell the dispatcher that the incident involves radioactive materials.
- 6.14.2. Notify RSO immediately of any spill of radioactive materials and any known or suspected overexposure of personnel. Follow the procedures for spill containment.
- 6.14.3. Ensure that all Radiology personnel, including guest investigators complete the KFHR & NM Radiation Safety in the laboratory course or have had sufficient training as certified by the RSO to begin work in the Radiology as Radiation Workers.
- 6.14.4. Properly label all radioactive materials and display proper signs designating radionuclide usage in the Radiology.
- 6.14.5. Ensure that all Radiology personnel comply with KFHR & NM radiation safety regulations, policies, and procedures governing the use of radioactive materials as outlined in this manual and required by the KACS & T.
- 6.14.6. Instruct the laboratory personnel in the proper use of personnel monitoring equipment such as thermo luminescence dosimeters (TLDs) when appropriate, and confirm that these badges are always worn in the laboratory where any procedures involving radioactive materials are performed.
- 6.14.7. Ensure that all orders for radioactive materials are initiated only by the authorized user or his/her representative.
- 6.14.8. Ensure that all orders are received only by the authorized user or his/her alternate or designated radiation worker and that the radioactive materials are immediately stored in a secured laboratory or storage area designated for radioactive material.
- 6.14.9. Keep complete and accurate records of all radioisotopes received, used and disposed of and supply the RST with this information when requested. Each authorized user should have an up-to-date record of the quantity of radioisotopes on hand at any given time.

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- 6.14.10. Assume responsibility for the proper disposal of all radioactive waste.
- 6.14.11. Ensure that all equipment leaving the radiology is surveyed and decontaminated before being sent for repair.
- 6.14.12. Notify the RSO if work with radioisotopes is terminated. The authorized user can permanently discontinue work with radioactive materials, or can be put on inactive status, which would imply that work may continue in the future. Inactive users can be returned to active status within 2 years if a revised authorized user form is completed and submitted to the RST approval.
- 6.14.13. RST should securely freeze all radioactive material, personnel monitoring badges, radiation meters, and any other issued materials or equipment when work with radioisotopes is terminated or the authorized user goes on inactive status.
- 6.14.4. Be responsible for the clearance of laboratories, storage areas, and other facilities under their authorization prior to vacating or renovating such facilities.

6.15. Radiation Workers:

- 6.15.1. Radiology and diagnostic imaging staff are oriented to safety procedures and practices. Also, receive education for new procedures and hazardous materials.
- 6.15.2. The Radiation Worker must:
 - 6.15.2.1. Attend the RST training course in radiation Safety prior to beginning work with radioactive materials.
 - 6.15.2.2. Read the KFH-R & NM Radiation safety Manual and be responsible for its contents as applicable to their duties in the Radiology.

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- 6.15.2.3. Call the emergency medical service or fire department (code red) immediately for any fire, explosion, or major accident and tell the dispatcher that the accident involves radioactive materials. Next, notify RST and their immediate supervisor and/or the Authorized User responsible for their laboratory.
- 6.15.2.4. Notify RSO immediately of any spill of radioactive materials and any known or suspected radiation exposure. Follow the procedures for a spill.
- 6.15.2.5. Adhere to all KFH-R & NM radiation safety regulations, policies, and procedures governing the use of radioactive materials as outlined in this manual and required by the KACS & T.
- 6.15.2.6. Follow the recommendations of the authorized user for those procedures that are specific to their laboratory for the storage, usage, recording, and disposal of radioactive materials.

6.16. Training:

- 6.16.1. All Authorized Users and Radiation workers under their supervision who work with radioisotopes must receive instruction on radiation safety, biological effects of radiation, regulatory requirements, and laboratory techniques. The KFH-R & NM Radiation Safety is designed to achieve strict compliance with applicable KAC & T regulations. receive education for new procedures and hazardous materials .The KFH-RST operates a training program of all individuals working with radioactive materials or radiation. The type of radiation safety training required depends on the nature of their involvement with sources of radiation. Records all training, including documentation of attendance are required to be maintained by RSO for revision.
- 6.16.2. Visiting scientists or contract personnel are not to undertake work involving radioactive material until they have taken the appropriate safety training courses and are under the supervision of an authorized user.

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6.16.3. The training program includes:

- 6.16.3.1. Lectures in radiation protection , implementation about ionizing radiation hazards and handling of spills.
- 6.16.3.2. New technicians receive appropriate training on equipment and radioisotopes handling.
- 6.16.3.3. Hands on training on any newly installed device or equipment.
- 6.16.3.4. Staff are to be oriented about any new development, new equipment or departmental plans.
- 6.16.4. To be authorizes user, laboratories must document that they have completed the basic radiation safety training courses, in addition to all other courses taken at KFH-R & NM department or at other institutions where they may have worked prior to coming KFH-R & NM department.

6.17. Procurement:

- 6.17.1. Ordering Radioisotopes and Other Radioactive Materials:
 - 6.17.1.1. Prior to being ordered or received, approval by RST must be obtained for all radioactive materials, radiation sources, radiation-producing equipment, medical diagnostic devices using radioactive sources or any other equipment or materials containing or capable of producing ionizing radiation.
 - 6.17.1.2. All orders for radioactive materials must be approved by authorized users or their alternates before being forwarded to MOH.

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6.18. Receiving and Opening Radioactive Packages:

- 6.18.1. All packages containing radioactive materials must be surveyed to determine if the exterior is contaminated and/or if the contents have leaked. If the package is not contaminated, the RSO or his designee will approve opening the box and will sign and date it. After being recorded in the radioactive material logbook, packages will be delivered to the authorized user.
- 6.18.2. If an Authorized User or Radiation Worker opens a package and discovers that the contents have been spilled because the container has been broken or cracked, he or she must notify the RSO immediately for guidance and the package should be contained to a restricted area to minimize spread of contamination until it can be safely sealed and removed.
- 6.18.3. Special requirements must be followed for packages containing quantities of radioactive material in excess of the Type A quantity limits, as defined in Radiation Regulations (e.g. more than 20 curies of ^{99}Mo , $^{99\text{m}}\text{Tc}$, uncompressed ^{133}Xe or more than 3 curies (3Ci) of ^{133}Xe , ^{131}I , . the licensee shall make arrangements to receive;
 - 6.18.3.1. The package when the carrier offers it for delivery, or
 - 6.18.3.2. The notification of the arrival of the package at the Transportation Department and to take possession of the package expeditiously.
- 6.18.4. Such packages must be monitored for external radiation levels and surface contamination within three (3) hours after receipt if received during working hours or within eighteen (18) hours if received after working hours. The section must be notified if removable contamination exceeds 0.01 uCi (22,000 dpm)/100cm².

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6.19. Disposal of Radioactive Waste:

- 6.19.1. As our liquid waste is classified as Medium level waste having a short half life (less than a month). The following steps are taken.
- 6.19.2. Collection and disposal.
- 6.19.3. Tc-99m and I-131 liquid is collected in disposable polythene lining bags inside a foot operated waste leaded waste collection bins, Two separate bins are used according to the half life.
- 6.19.4. Each bag must bear a label with the isotopes name, level of activity and monitoring date.
- 6.19.5. Using the Delay and Decay method, these bags are stored in storage spaces with a lead thickness of (10HTV) for a minimum of about 10 half-lives when after decay only 0.1% of initial activity remains, monitored and then disposed off as ordinary waste.
- 6.19.6. 99m/Tc-99m Generators Disposal. These used Generators are stored in the Hot-Lab in Lead shielded cabinets for around 10 half lives, monitored, then transferred to a store in the hospital basement after which they are transported out of the hospital by the supplying company for disposal as mandated by the K.A.C.S.T. regulations and agreement with the supplying company.

7 - Policy Location:

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8- References:

- 8.20.1. Departmental Radiation Safety Manual.
- 8.20.2. ICRP - International Commission on Radiation Protection
- 8.20.3. IAEA - International Atomic Energy Agency, occupational
- 8.20.4. Guidelines from Radiation Technologist Licensure Law, Article 35, Part 89

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PERSONAL RADIATION DOSIMETERS

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1- Title:

PERSONAL RADIATION DOSIMETERS (TLD CARDS) MONITORING

2- Definitions:

- 2.1. Ionizing Radiation:
Radiation that ionizes particles producing oxygen-free radicals which may cause genetic damage.
- 2.2. Individual Monitoring Device (Personal Dosimeter):
Devices designed to be worn by a single individual for the assessment of dose equivalent. Examples of individual monitoring devices are thermo luminescence dosimeters (TLD Badges) which are used at KFH.
- 2.3. Radiation worker:
Any staffs who may receive through his work more than 1 msv (above the background radiation) as annual dose.

3- Application:

All KFH Staff

4- Purpose:

To monitor the amount of radiation dose received by all KFH staff members who are dealing with ionizing radiation sources and ensure their safety within the working environment.

5- Policy:

- 5.1. Every employee dealing with radiation or working in an environment where he could be exposed to radiation more than 1 mSv/Annual will and must be monitored.
- 5.2. The hospital ensures availability of Personal radiation dosimeters (TLD cards), which are tested every 3 months, and actions are taken when test results exceed permissible levels.
- 5.3. Responsibility:
Radiation Safety Officer

6- Procedure:

- 6.1. The monitoring device will be a TLD badges (thermo — luminescent), Provided by the Ministry of Health (Radiation Protection Department - dosimeter service), interventional radiologists or staff potentially receiving a high dose to the hands.

PERSONAL RADIATION DOSIMETERS

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- 6.2. All KFHM staff dealing with ionizing radiation dose will be given a TLD when required after the employee fills the personal dosimeter request form. The dosimeter device must be worn at all times while performing any radiation procedures.
The wear period for the dosimeter device will be three month and at the end Ministry of Health for evaluation.
- 6.3. Badges should be worn close to the mid part of the body. If lead apron is being worn then the badge should be worn under the apron at the same level.
- 6.4. Badges should not be exposed to sun, heat or any other kind of radiation therefore it should be left at the workplace, and when the employee goes on vacation the TLD badge should be handed to the RSO.
- 6.5. Badges will be changed at the end of every three month and a new badge will be issued. New badge will be kept with the Radiation Safety Officer toward the end of three month.
- 6.6. It will be the responsibility of the employee to ensure that they change their old badge on time and replace it immediately with the new badge, so the radiation safety officer will ensure that employees will always have the personal dosimeter device without any gap in the exchanging period. The RSO will ensure that this is complied with. It is expected that employees will co-operate fully and change the dosimeter device on time. Badges that are not handed in on time cannot be sent with the appropriate time and the reading received may not be reliable.
- 6.7. If a dosimeter device is lost or damaged in-charge department must inform so that he/she will inform the Radiation Safety Officer.
- 6.8. If the employee suspects that his/her dosimeter device has been accidentally exposed to ionizing radiation then they must inform in-charge department who will inform the Radiation Safety Officer.
- 6.9. Every three month, the dosimeter device will be collected and returned to the
- 6.10. Radiation dosimeter readings will be shown to all the staff plus a copy will be kept in record with the radiation safety officer.
- 6.11. The Annual Dose Limit for radiation worker is 20 msv averages over 5 years. The Investigation level is 5 msv. Any Reading above 5 mSv/Annual or 0.80 msv will be investigated and the reason for the high value determined in written report and the incident report will be arise. The investigation report will be kept with the radiation safety officer. If the Annual dose reading above the 20 msv, changing the duties to away from radiation sources will be recommending.

PERSONAL RADIATION DOSIMETERS

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- 6.12. The Dose Limit for pregnant radiation worker is 1 msv from declaration of pregnancy day till the deliver day. Any Reading above 0.160 msv in two month will be investigated and the reason for the high value determined in written report and the incident report will be arise. The investigation report will be kept with the radiation safety officer (Medical Physic Unit). If the dose reading above the 0.2 msv in two month, changing the duties to away from radiation sources will be recommending.
- 6.13. Records will be kept of any lost or accidentally destroyed dosimeter device.
- 6.14. Records will be kept of any cancelling of using dosimeter device.
- 6.15. A request for a pervious employees dose records can be provided only if the request is accompanied by a release form, signed by the employee. No information will be given concerning dose records without the permission of the employee.

7- Policy Location:

Hospital Wide Policies, 5th Edition, Moharram 01, 1440-1442,
King Fahd Hospital Madinah

8- References:

- 8.1. Departmental Radiation Safety Manual.
- 8.2. ICRP - International Commission on Radiation Protection.
- 8.3. IAEA - International Atomic Energy Agency, occupational.
- 8.4. Radiation Protection safety guide No. RS-G1.1

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PERSONAL PROTECTIVE EQUIPMENT & SHIELDING

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1- Title:

PERSONAL PROTECTIVE EQUIPMENT & SHIELDING

2- Definitions:

- 2.1 Protective Clothing - Lead aprons, thyroid and gonad shields that are used to provide protection to everyone present inside the X-ray room during the exposure.
- 2.2 Shielding: leaded wall, leaded doors and leaded glass window that are used to provide protection to everyone present inside & outside the X-ray room during the exposure.

3- Application:

King Fahad Hospital Staff

4- Statement of Purpose:

To provide protection against radiation to patients and staff.

5- Policy:

- 5.1. Every staff member working in the radiation area and dealing with the radiological / Nuclear medicine procedures must wear protective clothing as & when required.
- 5.2. Lead aprons and gonad/thyroid shields are available to cover patients and staff needs and are annually tested according to a hospital-wide inventory.
- 5.3. Responsibility:
Radiation Safety Officer.

6- Procedure:

- 6.1. Protective clothing play a key role in the radiation protection of personal in KFH and it should be checked to make sure about its condition.
- 6.2. Conditions for use:
 - 6.2.1. Staff should wear appropriate lead protective shielding whenever they are inside an X-ray room and not protected by stationary lead lined wall or lead glass.
 - 6.2.2. Family members and friends of patients should not to be in the X-ray room during radiation exposure, unless the patient condition requires their presence. If there is a need for their presence, appropriate lead shielding must be worn.

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6.2.3. Whenever possible, patients receiving ionizing radiation shall be properly shielded with lead protective shielding.

6.2.4. If there is a need to assist with holding patients male family members should be asked rather than female members. If a female of childbearing age is required to assist in holding a patient, it must first be determined that she is not pregnant. If there is any indication that she may be pregnant, the female must not be allowed to be present in the main x-ray room.

6.2.5. Protective equipment should provide attenuation equivalent of not less than 0.25 mm lead for X-rays up to 100 kV and not less than 0.35 mm lead for X-rays over 100 kV. For Catheter- Lab. Angiography and fluoroscopy procedure protective equipment.

should provide attenuation equivalent of not less than 0.50 mm.

6.2.6. Personal dosimeters must be worn under the lead apron.

6.2.7. It is a must to wear lead apron and thyroid shield in all Fluoroscopy procedure like ERCP, Catheter-Lab, Angiography, etc.

6.2.8. It is highly recommended to use lead glass shield in all fluoroscopy procedure like ERCP, Catheter-lab, Angiography, etc.

6.2.9. A radiation safety officer must be consulted before the purchase of x-ray protective clothing.

6.2.10. Lead aprons must be stored either flat or on hangers to prevent the development of cracks in the protective material.

6.3. Identification:

6.3.1. Each protective device will be given an Identification Number.

6.3.2. A record must be kept that includes the identification number, usual location, lead equivalence, style, testing dates and test results.

6.3.3. Shielding integrity testing procedures:

6.3.3.1. All new protective clothing must be tested for shielding integrity before use.

6.3.3.2. Protective clothing should be tested when purchased, annually and whenever any staff member notices damage in the protective clothing.

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- 6.3.3.3. Testing will be performed using fluoroscopy at approximately 60 kVp, which gives good radiographic contrast. Faults or non-uniformities in shielding should be easily observed.
- 6.3.4. If faults are found, an image of the region must be taken and must be kept and the apron marked as faulty. The article must be immediately removed from use and returned to the radiation safety officer.
- Lead aprons will be replaced if there is a defect. If the defect is clearly not over a critical organ then continued use of the lead apron may continue, provided the location of the defect is clearly marked on the lead apron and the size, location and M date that the defect was identified logged in the accompanying documentation. Defects not in close proximity of critical organs, which are along the seam, or in overlapped areas, or on the back of the lead protective a conservative rejection criterion. In these cases, it is suggested that lead aprons be replaced if a defect is greater than 670 mm². Thyroid shields with defects greater than 11 mm² should be replaced.
- 6.3.5. Damaged lead aprons are received and stored by the warehouse guard in the hospital and the new lead apron will order instead.
- 6.3.6. The leakage test of shielding of the X-ray room are performed annually, further when any constructions or redesign of the shielded wall.
- 6.3.7. Monthly visual check is performed on the aprons, if noticed any issues the physical check will performed and documented.
- 6.3.8. If there is any leakage in shielding of X-Ray room, the RSO will report to medical director to contact the radiation department in MOH for treating this leakage and then inspect it again.
- 6.3.9. The quality control for radiation machine will be performed annually and report to administration of medical physics and NM in MOH, when there is any failed in this report, the department of medical physics will report to biomedical department to treating and after that the QC will checked again pron, should be subject to a less.

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7-Policy Location:

Radiology Department King Fahd Hospital Madinah

8- References:

- 8.1. Departmental Radiation Safety Manual.
- 8.2. ICRP - International Commission on Radiation Protection
- 8.3. Institute of Physics and Engineering in Medicine (IPEM)(2002)
- 8.4. Lambert K, McKeon T (2001) Inspection of lead aprons:
criteria for rejection Health Phys 80(5):S67—S69.

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