Radiation Safety Practices for X-Ray Technologists

Video Lesson Presented by RADSAF™

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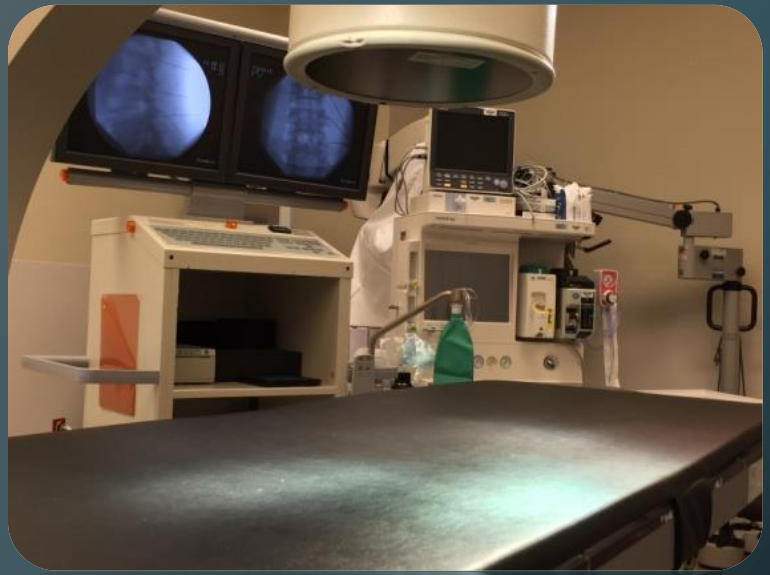
INTRODUCTION

- There are many facets and divisions where ionizing radiation safety is categorized and monitored
- State regulatory agencies monitor radiation safety protocols differently

INTRODUCTION (Continued)

- Where you work:
  - The regulations pertaining to ionizing radiation fall into the

Medical Category



INTRODUCTION (Continued)

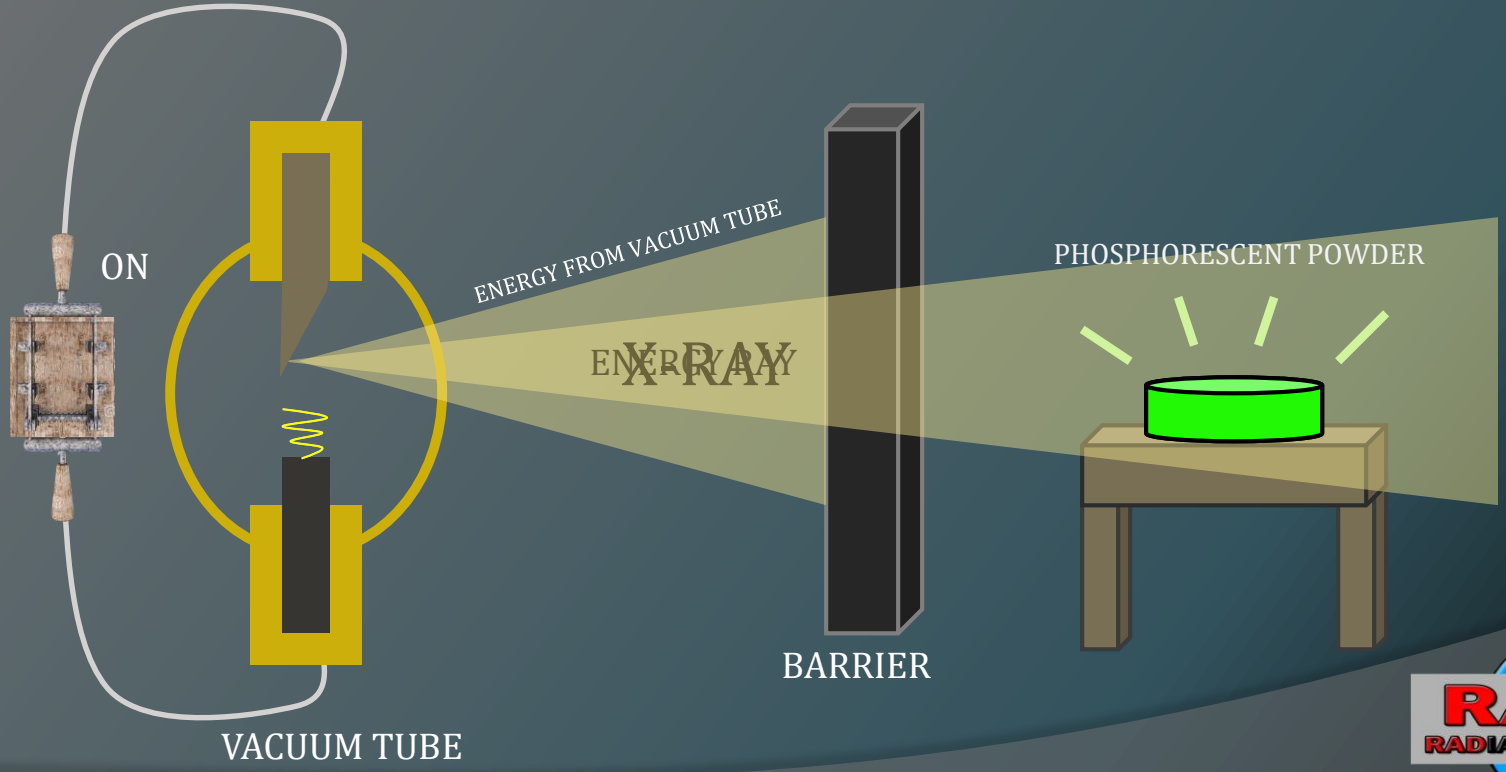
- Participation is a mandatory review
- Designed to educate operators on the harmful effects of radiation
  - Provides quality control guidelines to ensure best safety practices for you and those working around you

HISTORY OF X-RAYS

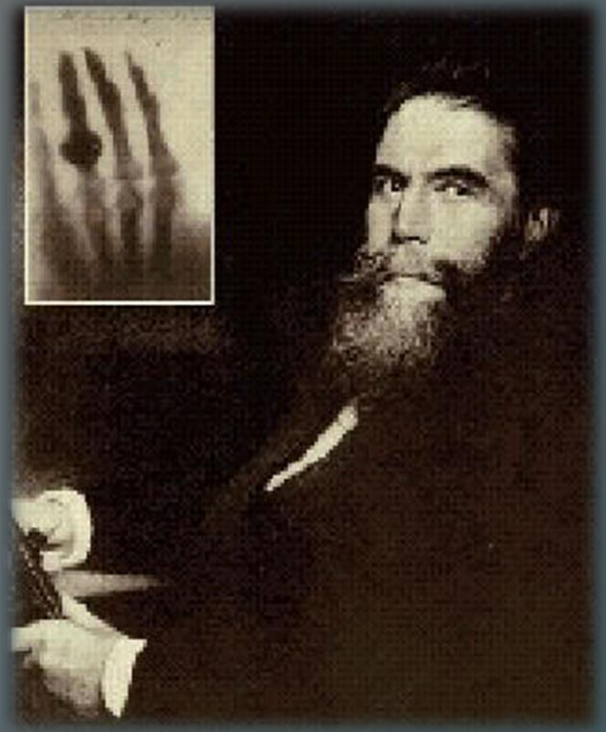
- Discovered on November 8th 1895 by Wilhelm Roentgen
- German-Dutch mechanical engineer and physicist

- Understanding how x-rays are created is not required in this presentation, but a short history about the discovery of x-rays and the reason we require caution when using x-rays is a good fundamental start to this presentation

HISTORY OF X-RAYS (Continued)



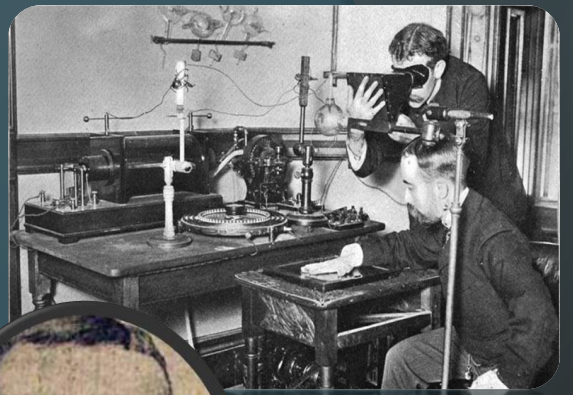
HISTORY OF X-RAYS (Continued)



- Presented his wife's hand x-ray to medical board

HISTORY OF X-RAYS (Continued)

- Thomas Edison and Clarence Madison Dally set out to make x-ray invention more useful to the medical community
- Dally became the first casualty of x-ray radiation overdose
- X-rays were then deemed useful but harmful. Measurements and control needed to be established



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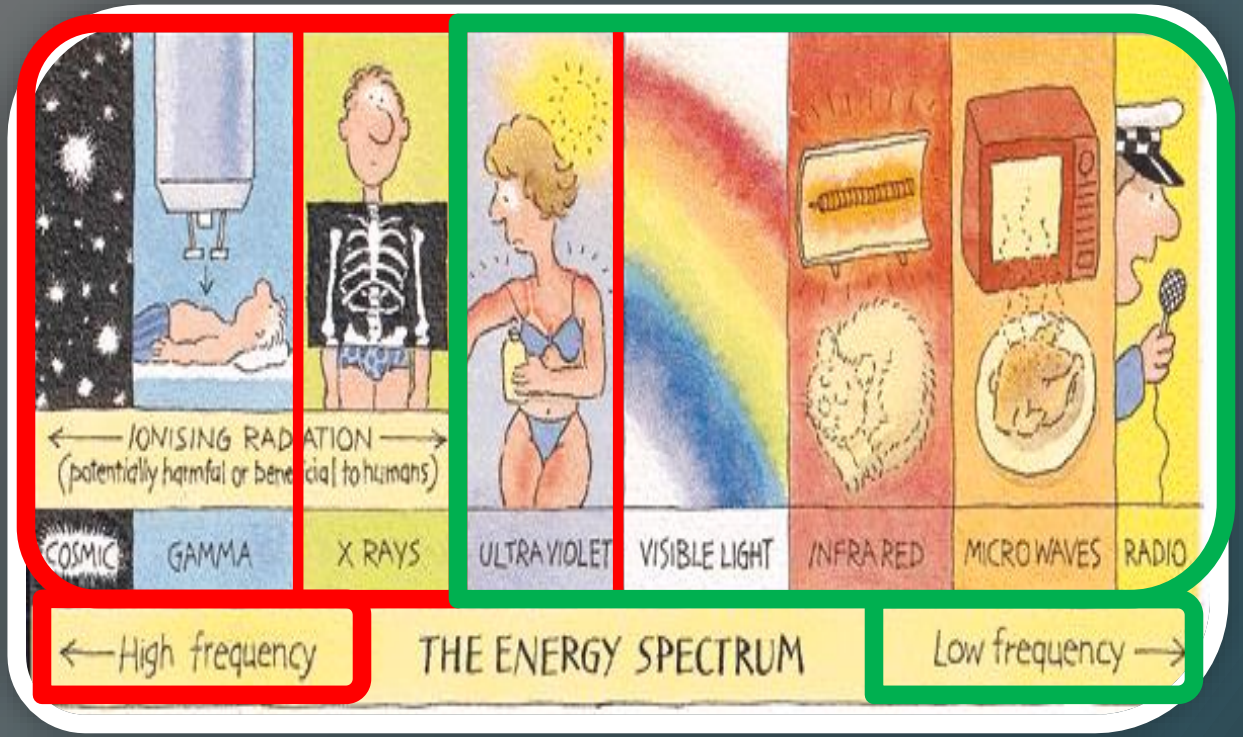
THE ENERGY SPECTRUM: TWO TYPES OF RADIATION



- Ionizing Radiation
  - High Frequency Wavelengths
  - Cosmic, Gamma and X-Rays
- Non-Ionizing Radiation
  - Low Frequency Wavelengths
  - Radio, Microwaves, Infrared, Visible Light and Ultraviolet waves

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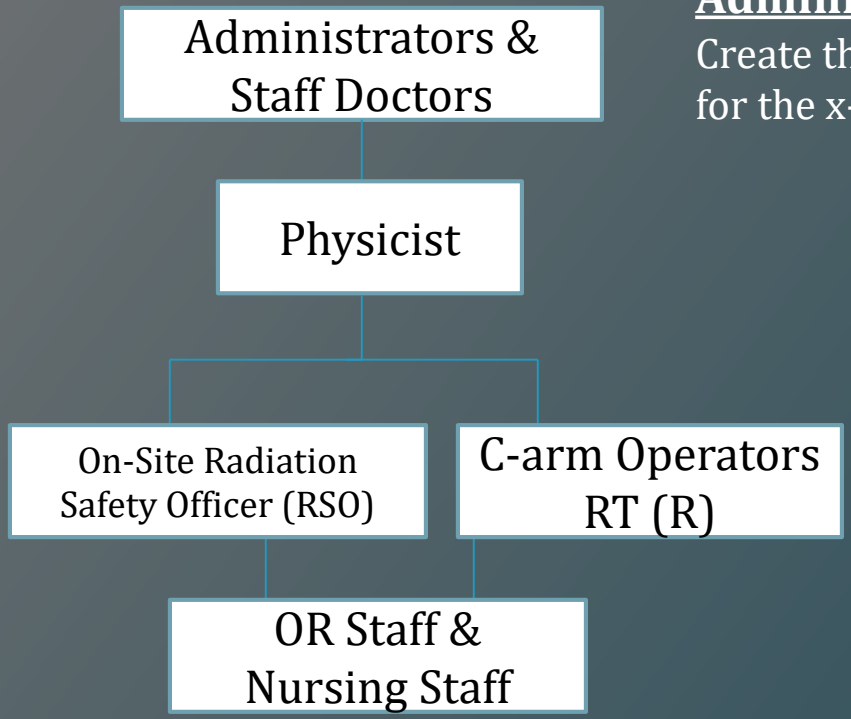
ALARA DEFINED:

- ALARA is a common acronym which stands for:

"AS LOW AS REASONABLY ACHIEVABLE"

- It is the professional practice of maintaining a high standard of radiation safety for the patient as well as for the staff

X-RAY DEPARTMENT HIERARCHY



Administrators & Staff Doctors

Create the quality assurance policies & guidelines for the x-ray department

Medical Physicist

Performs yearly quality control testing on all x-ray units. This yearly test survey assures that the x-ray unit is operating properly and to manufacturers specifications

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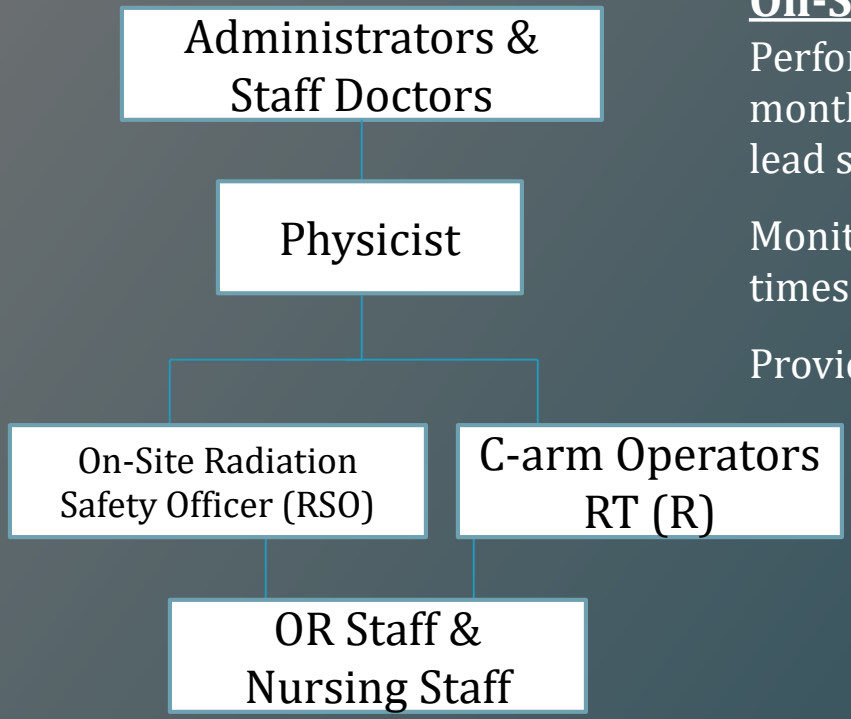
X-RAY DEPARTMENT HIERARCHY



On-Site Radiation Safety Officer (RSO)

Performs periodic testing, daily visuals, monthly phantoms, quarterly tests & yearly lead scans (Quality Control)

Monitors dosimetry badge levels & fluoro times

Provides daily radiation safety motivation

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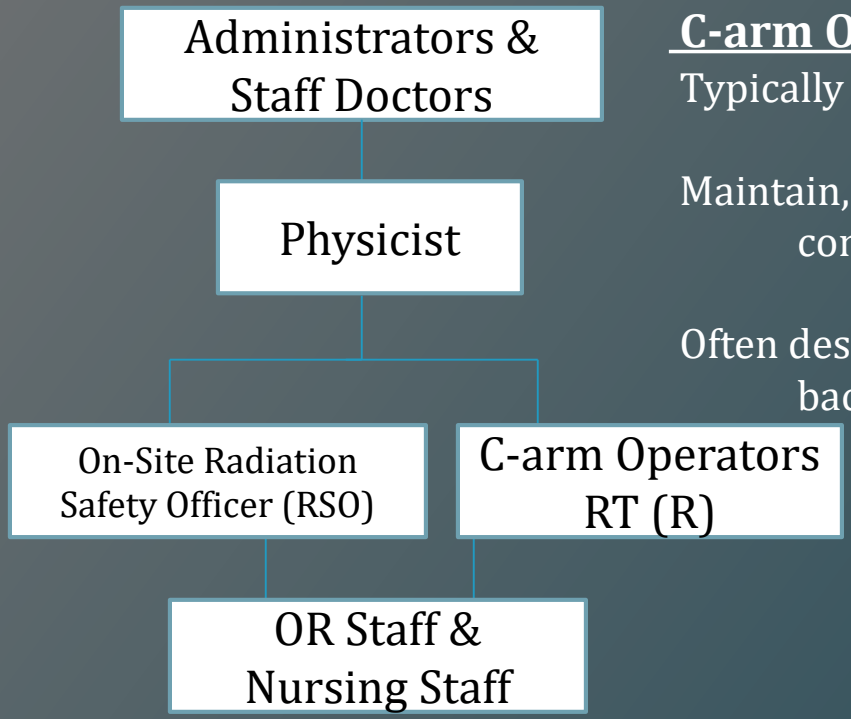
X-RAY DEPARTMENT HIERARCHY



C-arm Operators RT (R)

Typically licensed or registered within the state.

Maintain, monitor & report all radiation safety issues or concerns to managers

Often designated as RSO because of their educational background in x-ray

Practice ALARA, shield patients and maintain daily radiation safety motivation

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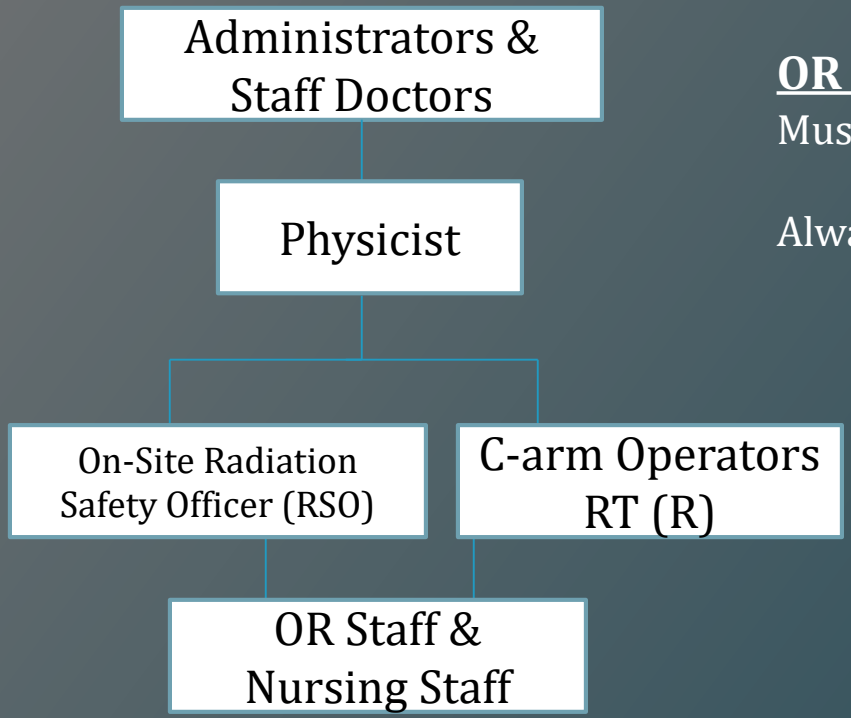
X-RAY DEPARTMENT HIERARCHY



OR Staff & Nursing Staff

Must be aware of radiation safety policies

Always Practice ALARA

COMPONENTS OF A RADIOLOGY DEPARTMENT

- Develop Departmental Hierarchy
- Enforce Radiation Safety Policies
- Provide Qualified Staff/Operators
- Designated Radiation Officer (RSO)
  - Daily Equipment Protocols
  - Periodic Equipment Testing (Month/Qtr)
  - Review Staff Exposure Records
- Ensure Warning Signs Are Displayed
- Communicate and Record Fluoro Times
- Maintain X-Ray Records For 10 Years
- Yearly Physicist Equipment Survey
- Yearly In-Services to Staff

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QUALITY ASSURANCE VS QUALITY CONTROL

Quality Assurance

- A manual based on a description of the policies and protocols required to run a radiology department properly

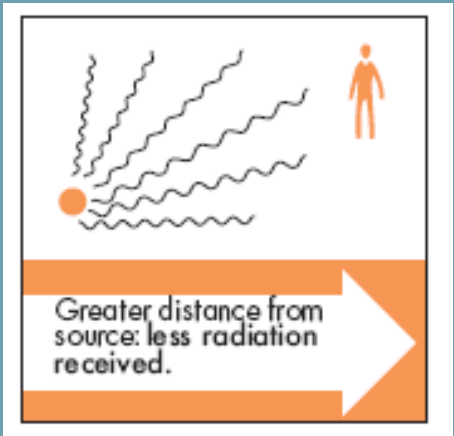
Quality Control

- The actual process of testing and recording by way of continued inspections and corrective actions as required by the quality assurance manual

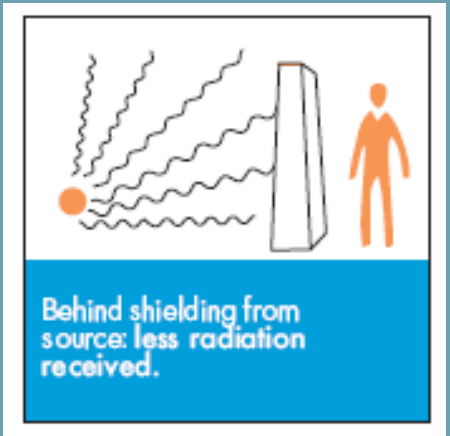
BASIC RULES OF RADIATION PROTECTION

DECREASE TIME

INCREASE DISTANCE



INCREASE SHIELDING



ALWAYS REMEMBER ALARA!

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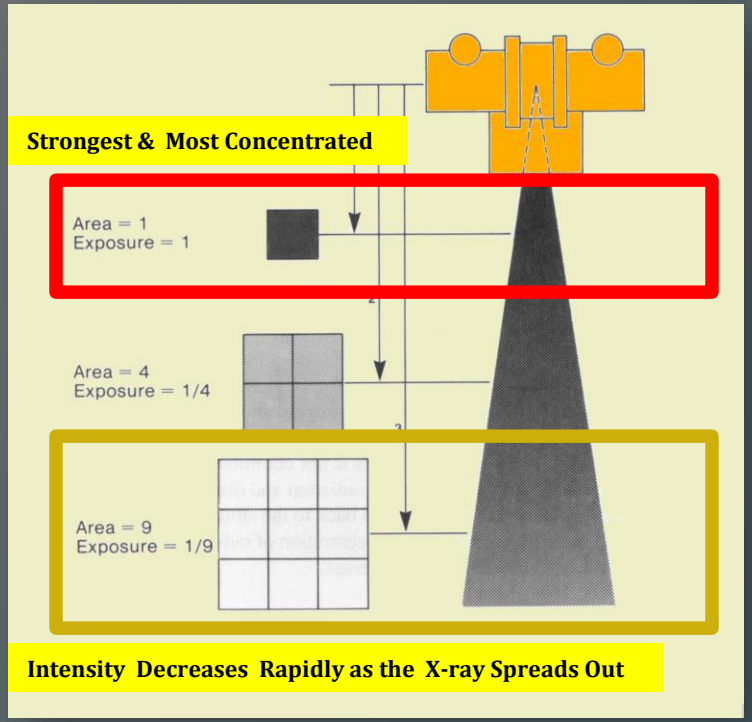
X-RAY CHARACTERISTICS



The Inverse Square Law

- An x-ray's intensity is made up of two main factors:
  - Strength or Energy
  - Number of x-rays produced
- An x-ray's intensity is proportional to the inverse square of the distance that they travel

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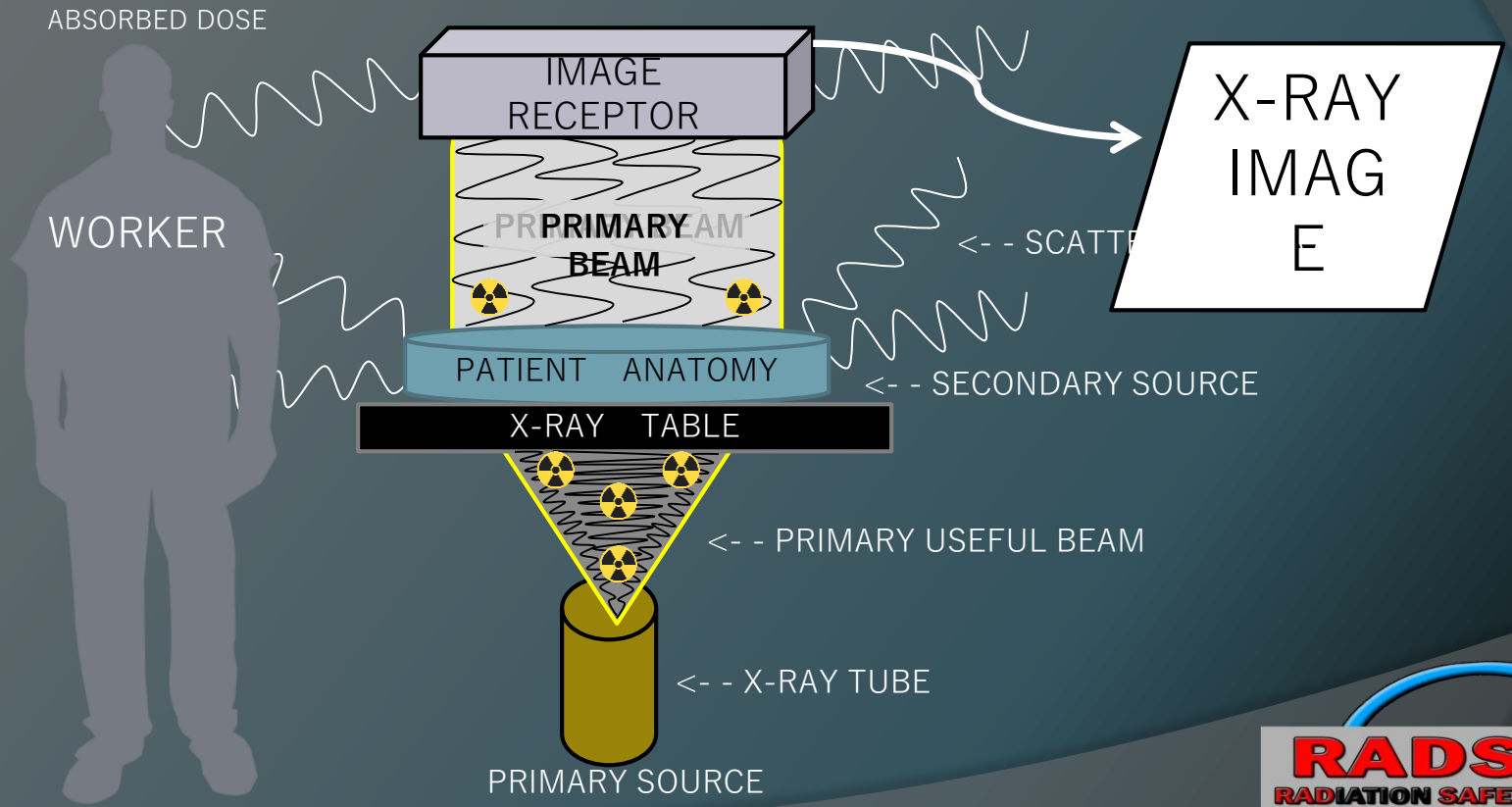
CHRONOLOGICAL COURSE OF X-RAYS



DOSING & HOW IT EFFECTS THE BODY

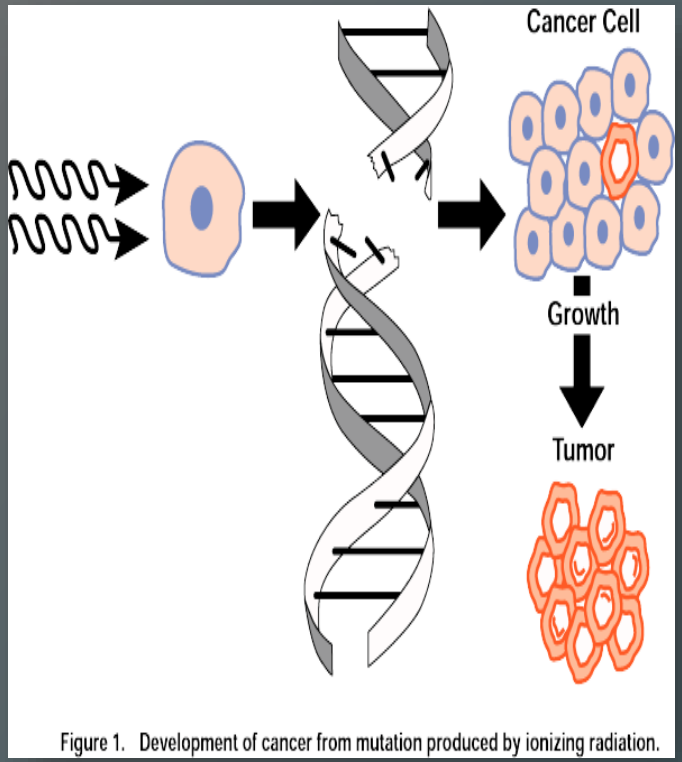


Figure 1. Development of cancer from mutation produced by ionizing radiation.

- Some doses may be completely harmless, stronger doses or an accumulation of dose may be harmful to the human body
- 1 in 40 people are potentially more susceptible to the damaging effects of ionizing radiation then others

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UNITS OF MEASURE

- On radiation dose reports you will see a unit of measure called rem
  - A representation of the relative risk of a radiation exposure to a person
  - A person's radiation absorbed dose
- Dose reports are recorded in *millirem (mrem)*
  - *mrem is 1/1000th of a rem*

UNITS OF MEASURE (Continued)

HISTORY DETAIL REPORT

Report Period: 12/16/2009 12:00 AM - 12/16/2010 12:00 AM

instadose™ BY QUANTUM PRODUCTS

	Serial Number	Body Region	Read Date/Time	Dose Reported in Units of mrem		
				Deep (Whole Body)	Shallow (Skin)	Eye
	10484	Torso	12/2/2010 10:31:00 PM	9	9	9
	10484	Torso	10/18/2010 12:30:00 PM	0	0	0
	10484	Torso	8/12/2010 5:37:00 PM	0	0	0
	10484	Torso	8/6/2010 12:19:00 PM	3	3	2
	10484	Torso	7/18/2010 12:30:00 PM	30	30	25
	10484	Torso	5/5/2010 12:41:00 PM	3	3	
	10484	Torso	4/19/2010 10:39:00 AM	44	44	
	10484	Torso	2/17/2010 5:52:00 PM	25	27	
	10484	Torso	1/9/2010 3:27:00 PM	6	7	
			Total:	120	123	36
	3	4	5	6	7	8

Accredited by the National Institute of Standards and Technology through NVLAP for the specific scope of accreditation under lab code 100555

- The most commonly accepted set standard, for yearly exposure limits for healthcare workers is **5 rem per year**
- State and federal regulatory agencies request monitoring to assure that exposed workers are within these limits
- The maximum dose per year for a declared pregnant woman is 500 mrem or .5 rem per year

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RADIATION BADGE

- If you were issued a radiation badge, then it should be worn at all times when around areas where you may come in contact with ionizing radiation
- All those wearing a radiation badge should be tracking and aware of their dose reports

RADIATION BADGE (Continued)

- Dose reports provide radiation safety officers the ability to control your exposure and keep you safe
- Worn outside the lead apron at collar level or breast pocket level, this badge picks up the scatter radiation that we are working in

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RADIATION BADGE (Continued)

X-Ray Film Badge

- Common badges are made up of attenuating filters and include a piece of x-ray film that is developed, and used to calculate your mrem exposure
- These badges are mailed in quarterly, developed and a report is generated and sent to your radiation safety officer

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RADIATION BADGE (Continued)

- New technology such as Bluetooth and USB devices allow a person to see their dose as readily as they prefer, not just quarterly.

To purchase radiation badges, please visit:
www.RADSAF.com

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RADIATION BADGE (Continued)

- Tips about radiation badges:
  - Proper placement is on the outside of the lead apron
  - They should never be removed from the facility
  - They should be stored in a location away from live radiation work areas
  - Film badges can become contaminated if left in extreme temperature areas, such as automobiles

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RADIATION BADGE (Continued)

- Tips about radiation badges:
  - Badge readings can be false or inaccurate or contaminated
    - If this is the case, your Radiation Safety Officer (RSO) should investigate thoroughly
  - Radiation badges give your RSO a dose report which can be monitored and used as a quality control instrument to assure staff radiation safety

RADIATION DOSE REPORTS

- Your facility's RSO will be submitting and processing staff badges **consistently** throughout the year!

JANUARY	FEBRUARY	MARCH
APRIL	MAY	JUNE
JULY	AUGUST	SEPTEMBER
OCTOBER	NOVEMBER	DECEMBER

Example: Badges processed quarterly

- You have a limited time window to turn in or process your badge
- In most cases your RSO will request that it is done in a chosen month

RADIATION DOSE REPORTS (Continued)

HISTORY DETAIL REPORT

Report Period: 12/16/2009 12:00 AM - 12/16/2010 12:00 AM

instadose™ BY QUANTUM PRODUCTS

	Serial Number	Body Region	Read Date/Time	Dose Reported in Units of mrem: Deep (Whole Body)	Shallow (Skin)	Eye
	10484	Torso	12/2/2010 10:31:00 PM	9	9	9
	10484	Torso	10/18/2010 12:30:00 PM	1317	1317	1282
	10484	Torso	8/12/2010 5:37:00 PM	820	820	800
	10484	Torso	8/6/2010 12:19:00 PM	3	3	2
	10484	Torso	7/18/2010 12:30:00 PM	30	30	25
	10484	Torso	5/5/2010 12:41:00 PM	3	3	
	10484	Torso	4/19/2010 10:39:00 AM	44	44	
	10484	Torso	2/17/2010 5:52:00 PM	25	27	
	10484	Torso	1/9/2010 3:27:00 PM	6	7	
			Total:	2257	2260	2118
	3	4	5	6	7	8

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Dose report readings are recorded in millirem, that's 1/1000th of a rem

If you acquire a cumulative deep dose reading of 5 rem or 5000 mrem, then you have reached the standard dose limit, and you cannot work in live radiation work areas

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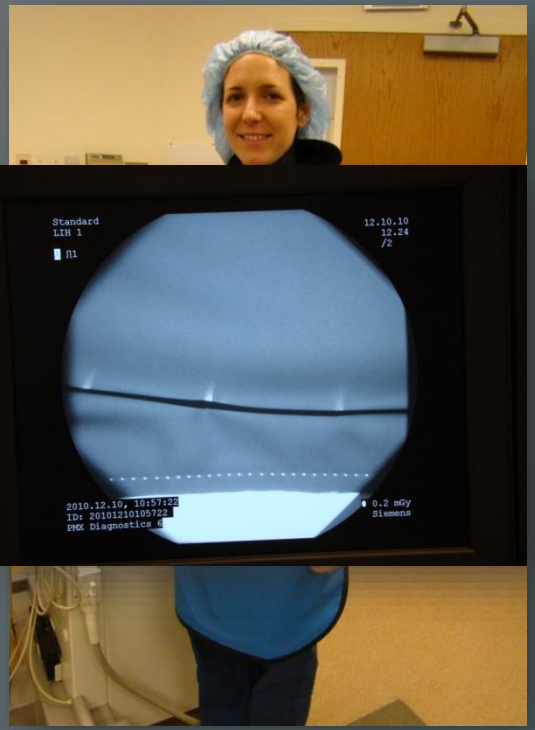
CARE & MAINTENANCE OF PERSONAL PROTECTIVE GEAR



- Aprons are made of attenuating elements contained within a rubber like material
- If not taken care of properly aprons crack and expose us to ionizing radiation

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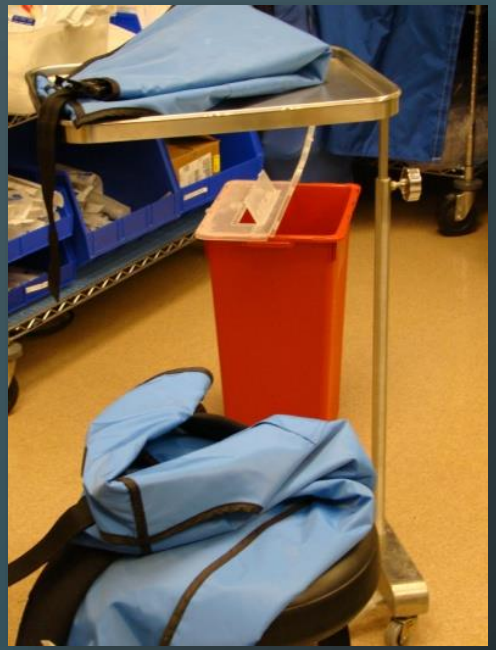
CARE & MAINTENANCE OF PERSONAL PROTECTIVE GEAR

- Folding lead aprons will increase the cracking potential of the lead barrier which reduces the lifespan of the apron



CARE & MAINTENANCE OF PERSONAL PROTECTIVE GEAR

- Always remember to hang up lead aprons for storage
- When not in use, hang or drape them to reduce folds

CARE & MAINTENANCE OF PERSONAL PROTECTIVE GEAR

- PLEASE NOTE:
  - Lead aprons are expensive to replace
  - If you notice wear or any need for an apron repair, point it out to your RSO

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WEARING YOUR LEAD APRON

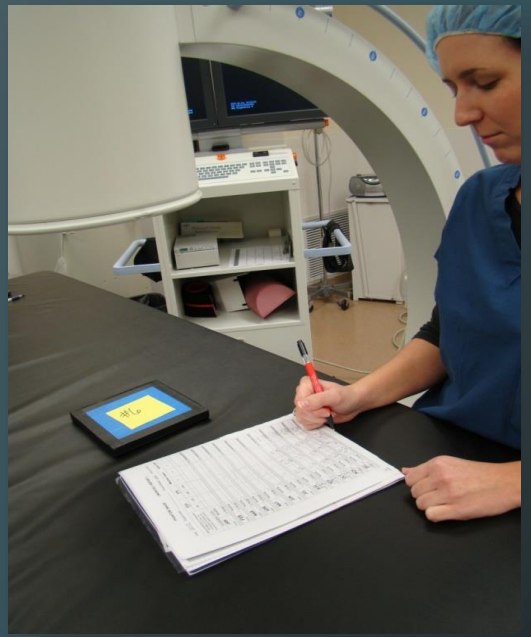
- Properly worn personal protective gear is mandatory in an x-ray environment
- Buckles and straps should be fastened properly
- Thyroid shields should be available for use

WEARING YOUR LEAD APRON

- Your radiation badge should be worn outside your lead apron at collar level
- If you are wearing one sided lead aprons, never turn your back to the active x-ray tube

REPORTING & DOCUMENTATION OF C-ARM ISSUES

- At the start of each day:
  - Turn on c-arm
  - Wipe down (BoH procedure)
  - Complete visual inspection
  - Sign-Off
- Report any issues to your supervisor
- Document all issues in the RADSAF Technologist's Workbook
- Follow up report to ensure repair service was conducted
- Reports should also be kept in the RADSAF Retention Binder



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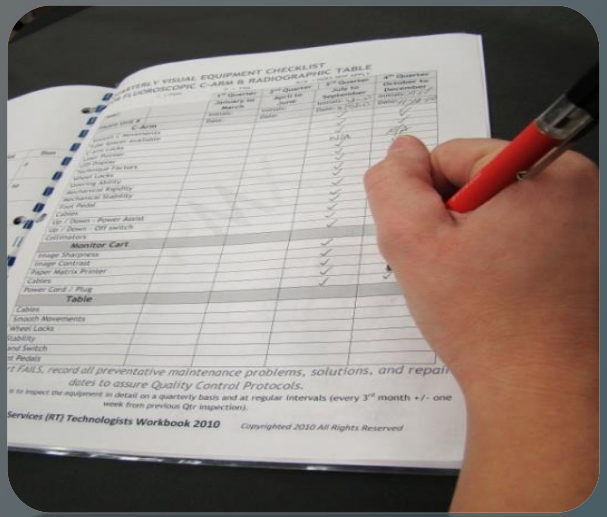
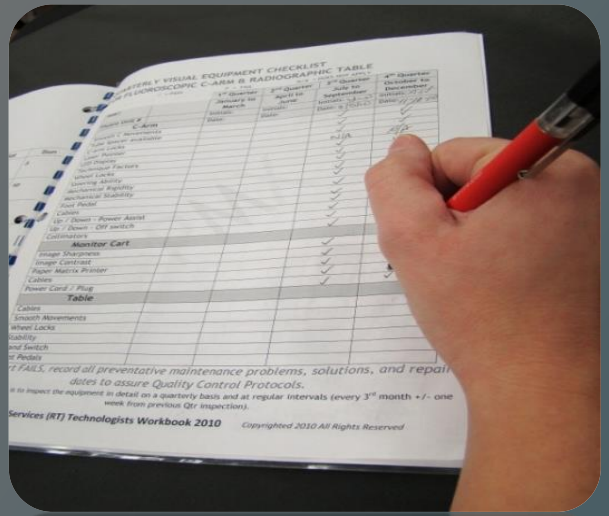
C-ARM “IN USE” RECORD KEEPING



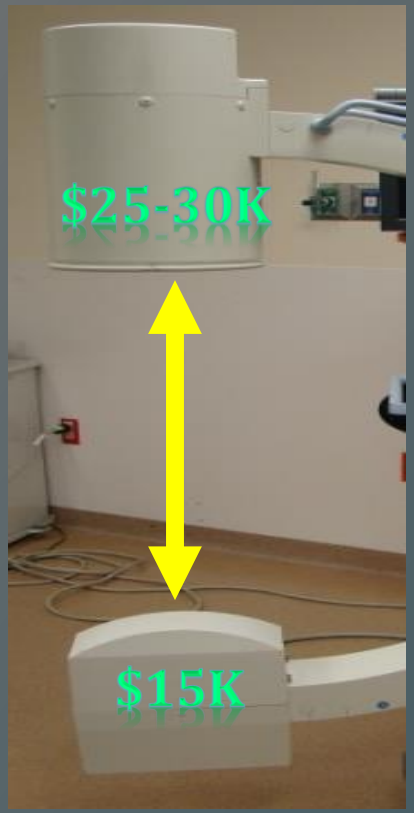
- The RADSAF Technologist’s Workbook is designed to track the daily use of each machine
- It tracks the quality control testing and safety protocols required by the state and designed by your facility
- All workbooks are located and stationed with each x-ray machine at all times

C-ARM "IN USE" RECORD KEEPING (Continued)



- It is important for c-arm operators to become familiar with the tech workbook, know its location and be able to perform and document the quality control testing
- Wiping down and visual inspection procedures are expected to be documented
- Mini c-arms must also be tracked daily
- Fluoro log books record PT exposure times and dose:
  - Stored and secured at the end of each day
  - HIPPA violation to leave patient information unsecured
  - Depending on facility policies, fluoro times are either recorded in a patient's folder, or stored in the fluoro logbook

C-ARM FACTS & UPKEEP



Average Repair Costs

- A c-arm is a complicated piece of equipment
- It contains many fragile parts that are calibrated for safe use
- These two main parts of the c-arm need to be taken care of to maintain proper usage and patient safety when in use
- Banging or striking these parts will result in costly repairs and recalibrations

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C-ARM FACTS & UPKEEP (Continued)

- **Document All Service and Testing**
- **Conduct Quality Control Tests Regularly**
- **Report Issues to Your Supervisor**
- **Keep Your Machine Clean**

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TROUBLESHOOTING C-ARM ISSUES

over expose a patient or create a
ndition in an o

at your c-a e telling yo
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warnings, or out of the o
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place? If necessary, re e the
from the patient, and ask yourself,
exposure clear an er or fix
ll rebooting be your on?

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ELECTRICAL HAZARDS

- Look out for wires that are loosely attached, exposed or frayed
- Be vigilant to ensure that all plugs and outlets are working properly

ELECTRICAL HAZARDS (Continued)

- Keep an eye out for water and other electrical conducting elements that may endanger your patient, or interfere with patient monitoring
- Report all potential hazards immediately to your supervisor
- In the event of any major electrical malfunction on your c-arm, always use the emergency shutoff switch

STANDARD RADIATION SAFETY POLICIES

- Every radiology department has a radiation safety policy in place
- We will be reviewing the general radiation safety policies that are the ***"standard of practice"*** in most facilities
- In this next section we will present to you a quick and fast review of these policies
- Any questions or concerns, please ask your RSO, managers or administrators after this presentation is over

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STANDARD RADIATION SAFETY POLICIES

GENERAL POLICIES:

- Must wear proper protection and radiation safety badges when working with x-ray
- Never expose anyone, including staff, purposely or to self diagnose
- All staff should practice ALARA
- Appropriate x-ray signs should be displayed in designated areas
- Employees that test x-ray equipment must have appropriate education

STANDARD RADIATION SAFETY POLICIES

HOLDING PATIENTS DURING FLUOROSCOPY:

- Only in life threatening situations
- Persons holding must be over 19 years old
- No body parts of person holding patient should be in x-ray field
- Proper lead protection must be worn
- Only staff personnel can hold a patient, no family members or outside representatives

STANDARD RADIATION SAFETY POLICIES

INDIVIDUALS PRESENT IN THE ROOM DURING FLUOROSCOPY PROCEDURES:

- Only those necessary to perform patient care
- Only those training or equipment maintenance
- The Center shall provide sufficient exposure protection for all those in the room
- Wearing protection is NOT a request or option, it is a requirement

STANDARD RADIATION SAFETY POLICIES

POLICY FOR PREGNANT STAFF & PATIENTS:

- Reminder signs are posted throughout the Center
- Efforts made to keep pregnant staff out of fluoro rooms
- Extra shielding and two dosimetry badges
- Patients of child bearing age are to be questioned about the possibility of pregnancy
- Continuance to procedures may require:
  - Verbal / written or signed denial of pregnancy
  - Urine Pregnancy Test
  - Results of pregnancy test via patients primary physician.

STANDARD RADIATION SAFETY POLICIES

GONADAL PROTECTION & PATIENTS UNDER 18:

- Patients under 18 must be protected by shielding whenever possible
- Gonadal shielding is .5mm lead equivalent
- If documentation of patient sterility is present, then shielding may be omitted
- Patient shielding should be utilized when ever possible especially when it does not interfere with the anatomy being worked on

STANDARD RADIATION SAFETY POLICIES

PERSONAL RADIATION MONITORING:

- The center provides each individual their own radiation dosimetry badge
- Quarterly readings are available to staff upon request
- Badges never leave the center
- Badge readings are stored up to 10 years
- Questions or concerns are to be addressed to management

STANDARD RADIATION SAFETY POLICIES

QUALITY CONTROL POLICY:

- Center is committed to quality control testing and preventative maintenance
- Maintaining equipment and keeping service records
- Repairing equipment to manufacturer's specifications
- Performing yearly testing and physicist surveys
- Maintaining documentation retention of testing results and fluoro time logs

RADIATION SAFETY PROTECTION TIPS

- Pointers and tips you can use to protect yourself and others while working with ionizing radiation:
  - Never place your hands, fingers or arms into the primary beam or within the field of view shown on the monitor screen
  - If you find yourself working really close to an operative site, wear a thyroid collar and if available wear protective eye glasses
  - Since we never exposure ourselves to the primary beam, our worst enemy is scatter radiation

RADIATION SAFETY PROTECTION TIPS

- 12 Useful tips to reduce your scatter radiation exposure:
  - It is best to utilize a properly trained c-arm operator
  - Distance is your friend; take a short step away from your patient each time you take an x-ray
  - Use low dose fluoroscopy applications
  - Use the pulsed fluoroscopy mode if you must use “live” x-ray
  - Perform multiple c-arm movements, then take one exposure
  - Limit “live” fluoroscopy whenever possible; single exposures are best
  - Use collimation whenever possible
  - Save images for references to limit repeat exposures
  - Use the hand exposure switch rather than the foot pedal. Exposure lag times increase when using the foot pedal

RADIATION SAFETY PROTECTION TIPS

- 12 Useful tips to reduce your scatter radiation exposure:
  - Take notice to the distance of the image intensifier to the exposed anatomy. The closer your intensifier is to the anatomy, the less scatter is produced. This technique also improves the detail in your final image
  - In the torso section of the anatomy, shooting a lateral projection requires more dose, so stand back or step away if possible
  - Do not leave radiopaque objects, such as instruments or retractors in the field of view; they increase the dose technique as the image receptor compensates for the added attenuating materials

THANKS FOR WATCHING!

- Thank you for taking the time to watch, learn, and listen to the important radiation safety policies and measures that your facility has put into place for your overall safety
- Your RSO may ask you to take a brief competency test or sign off on this required radiation safety educational tutorial
- If you have any questions or concerns please address them to your RSO

For information pertaining to purchasing new lead aprons and other radiation protection gear, please visit our website, call, or email us at :

www.RADSAF.com

877-774-XRAY (9729)
Or RADSAF@RADSAF.com

BE SAFE… BE RADSAF!

Video Lesson Produced by RADSAF™

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