



Roles and Responsibilities of Medical Physicists and Health Physicists in Diagnostic Radiology



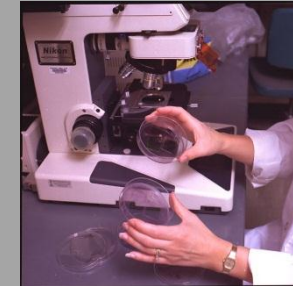
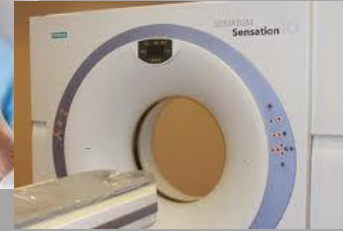
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Penn State Hershey Medical Center
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Penn State Hershey Medical Center



Penn State Hershey Medical Center

- 138 pieces of x-ray equipment
 - Includes 10 CT scanners
- 2 Nuclear Medicine clinics
 - Pet/CT, Spect/CT
- New Cancer Treatment building
 - 3 linear accelerators, 1 HDR, Planning CT
 - Gamma knife
- New Children's Hospital (new OR!)
- >200 Biomedical Research Laboratories
- Rented (radiological)research space in adjacent research park
- Animal research facility
- 7 outpatient facilities
- The Medical Center and College of Medicine have a combined budget of nearly \$1.5 billion, representing roughly one-third of Penn State's total budget.



Diagnostic X-ray program

- > 165,000 X-ray exams
- > 12,000 Fluoroscopy exams
 - > 67,000 CT exams
- adult and pediatric Level 1 trauma center

Roles of the RSO and Imaging Physicist

	<u>RSO</u>	<u>Imaging Physicist</u>
• Registration and licensing	X	
• Dosimetry program	X	
• Room Shielding	X	X
• Acceptance testing		X
• Periodic machine surveys		X
• Patient radiation safety	X	
• Patient dose tracking	X	X
• Patient dose calculations	X	X
• Personnel dose calculations	X	X
• Machine imaging issues		X
• Joint Commission concerns	X	X
• Apron tracking/testing	X	
• Equipment QC oversight		X
• Personnel Radiation Safety	X	
• Radiation/Equipment Safety Training	X	X

Roles of the RSO and Imaging Physicist

The CHP shall practice only in areas of his/her expertise

The same goes for the ABR certified Imaging physicist!

Dental/Panoramic

X-ray Film / digital CR vs. DR

X-ray cabinet systems

R/F systems

C-arm Fluoroscopic systems

Mini c-arms

Bone density scanning (DXA)equipment

Bilateral fluoroscopic systems,

IR & Cardiology Fluoroscopic systems

Flat panel detectors, image intensifiers

Rad therapy fluoroscopic systems

CT scanners (Include Nuclear Medicine and Radiation Therapy)

Dual energy CT scanners

Pet CT systems? Spect CT

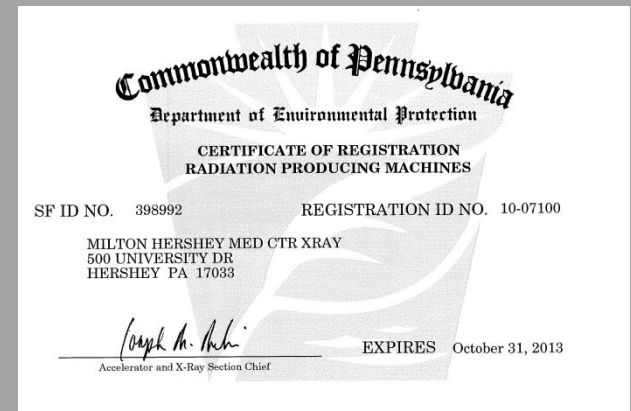
PACS medical imaging storage

Mammography systems

Laser safety, MRI safety.....

Roles of the RSO and Imaging Physicist

- Registration and licensing
- Varies by institution, must be certain that equipment is registered and fees paid annually.
- Inventory of equipment that is acquired and disposed.
- Make certain that equipment registration is displayed when mandatory.



Roles of the RSO and Imaging Physicist

Room Shielding

Whoever is competent in these calculations can perform them. There should be records of all room shielding calculations plus the assumptions that were made. If the room use changes, the calculations may need to be revisited. Can use other professionals to double-check calculations.

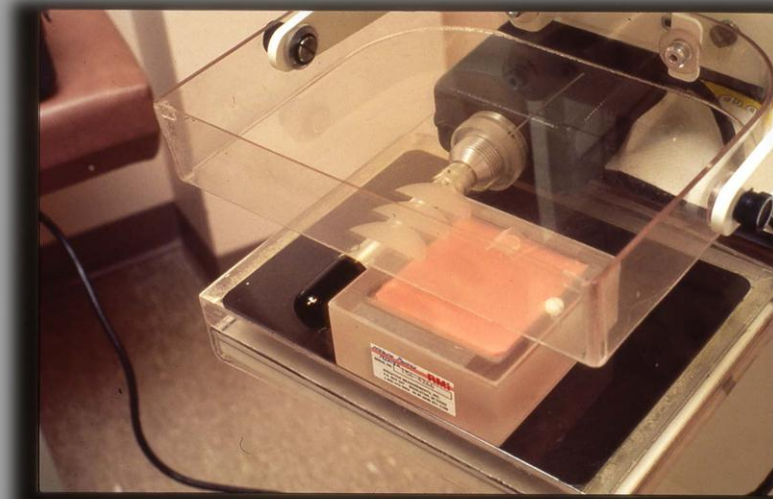
Do you have insurance??



Roles of the RSO and Imaging Physicist

Acceptance testing

Only trained imaging professionals should do acceptance training. The testing done at acceptance is different than used for annual surveys and makes certain that the institution is receiving what they paid for and that all aspects of the equipment are operating perfectly. This step is necessary for radiation protection, electrical protection and monetary protection.



Roles of the RSO and Imaging Physicist

Periodic x-ray equipment surveys

Depending on the equipment being surveyed,

- competent trained personnel may do annual surveys that can then be checked and verified by trained imaging professionals.
- For some testing, such as mammography machines, Federal law limits who can check the equipment.
- For other surveys with accredited equipment, they must be checked by imaging professionals on certain survey intervals.
- ACR accredited equipment must be tested by an ABR/ABMP certified imaging professional.
- ABR certification today means an MS or PhD along with a 2 year residency period and passing the certification process.

Roles of the RSO and Imaging Physicist

Patient radiation safety

The RSO is responsible for patient radiation safety and can get information about the dose each machine would deliver to the patient. The RSO institutes programs, procedures or policies to record/report patient doses, audits x-ray survey records (to make sure they are being done and timely) and engineer reports and sits on committees that discuss radiation risk to patients.

The imaging physicist can actively measure and direct the radiologic engineer to change machine parameters to change the radiation dose to the patient to optimize the risk vs. benefit equation in consultation with physicians responsible for interpreting the image. Should work in concert with the RSO.

Roles of the RSO and Imaging Physicist

Patient Dose tracking:

Can be performed by either person.

Extremely laborious without dose tracking software in most hospitals. Examines patterns, identifies patients at risk and forces physicians to prove medical necessity.

Roles of the RSO and Imaging Physicist

Patient dose calculations:

- Can be performed by either person. Should be automatically placed in patient records for x-ray (factors) and CT (SSDE) and entered or automatically placed (Diagnostic reference levels) in the medical records for fluoroscopy (NCRP 168, 172).
- Joint commission has a requirement to calculate and notify them directly if a fluoroscopic exams results in a skin dose > 15 Gray (Sentinel event). Check your State regulations as well.
- This can be controversial, set policies by the radiation safety committee and management before giving a patient their dose information. Train (or give the script to) physicians so that they can talk intelligently to their patients about risk from radiation. (NCRP 171)

Roles of the RSO and Imaging Physicist

Personnel dose calculations :

Can be performed by either person. Need dosimetry information and knowledge of room specific patterns (i.e. where do they stand during a procedure). Can indicate incorrect training or poor behaviors resulting in retraining being indicated.



Roles of the RSO and Imaging Physicist

Machine imaging issues :

The medical imaging physicist handles all machine imaging issues and works with the equipment engineers and repair personnel to resolve them.

Roles of the RSO and Imaging Physicist

Joint commission issues :

Traditionally dealing with the joint commission meant showing them your protective apron database.

- Now, there are future considerations that were outlined in the Joint Commission sentinel alert Issue 47, August 24, 2011 “ **Radiation risks of diagnostic imaging**” which has 21 points of discussion.

The Joint Commission
**Sentinel Event
Alert**

Radiation risks of diagnostic imaging

Correction: Diagnostic radiation is an effective tool that can save lives. The higher the dose of radiation delivered at any one time, however, the greater.....

Roles of the RSO and Imaging Physicist

Joint commission issues:

Now you should:

- Use appropriateness criteria such as what the ACR has developed to assure you are ordering the correct test to correctly diagnose the problem. **MP**
- Provide physicians and technologists with reference doses based on anatomy, purpose of the study, and patient size. Establish appropriate dose ranges for high-volume and high-dose diagnostic imaging studies. **MP RSO**
- Adhere to ALARA guidelines for patient dose (I have a problem using ALARA here) **MP RSO**

Roles of the RSO and Imaging Physicist

Joint commission issues:

Now you should:

- Institute a process for the review of all dosing protocols either annually or every two years to ensure that protocols adhere to the latest evidence **MP**
- Record the dosage or exposure as part of the study's summary report of findings
- Expand the radiation safety officer's role to explicitly include patient safety and involve the officer in the organization's patient safety committee **RSO**
- Ensure all physicians and technologists who prescribe diagnostic radiation or use diagnostic radiation equipment receive dosing education and are trained on the specific model of equipment being used (Institute a process for annual education, review and competency testing.) **RSO MP**

Roles of the RSO and Imaging Physicist

Joint commission issues:

Now you should:

- Perform an organization-wide audit/survey of diagnostic imaging equipment that have the potential of emitting high amounts of cumulative radiation **MP**
- Have a qualified medical physicist test all diagnostic imaging equipment initially and at least annually or every two years thereafter to assure proper installation and calibration, and review scanning protocols and doses **MP**
- Invest in technologies that optimize or reduce dose
- Use the following Joint Commission standards to support the use of safe and effective diagnostic radiation. The concepts in these standards promote a safety culture, which is necessary for the safe use of diagnostic radiation **RSO**

Roles of the RSO and Imaging Physicist

Apron tracking/testing



Roles of the RSO and Imaging Physicist

Equipment QC oversight

Necessary and formalized for ACR mammography, CT, MRI and Nuclear medicine.

Should be done for x-ray as well.

Roles of the RSO and Imaging Physicist

Personnel Radiation Safety

classic radiation safety training

dosimeter placement, explanation of use

Time, distance, shielding

radiation risk, dose limits

etc.

Roles of the RSO and Imaging Physicist

Equipment Radiation Safety Training

Check State regulations for all requirements, should include hands-on training as well as didactic or computer based training.

Really important for residents to establish safety patterns “imprinted” in their training.

Roles of the RSO and Imaging Physicist

QUESTIONS?