Session 83X
Dose Management: Patient and Staff
Radiation Safety in Radiology

Presented by:
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Dose Management: Patient and Staff Radiation Safety in Radiology

Setting up a comprehensive dose management program

Faculty

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Disclosure of Relevant Financial Relationships

The following faculty of this continuing education activity has no relevant financial relationships with commercial interests to disclose:

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Christoph Wald, MD, PhD
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Learning Objectives

- Understand the risk of unnecessary radiation exposure that can adversely impact your staff and your patients.
- Understand Joint Commission radiology process flow and quality performance standards that may require new ways of working for healthcare providers.
- Learn how to set up a comprehensive dose management plan.
Agenda

- Radiation Safety 101: Understanding risk and benefits associated with radiology imaging
- New standards/regulations for dose management
- Manufacturer and care provider roles
- Establishing a culture of radiation dose management in healthcare
- Innovation in lowering radiation exposure to patients and staff
- The future of diagnostic imaging

Radiation Safety 101

- Appropriateness: benefit > risk if the exam is medically necessary
- Justification: which radiology exam is most suited for patient
- Optimization: lowest dose for that patient and exam pairing
Radiation Safety 101

“Exposure” is the output of the X-ray machine.

“Dose” is the radiation X-ray energy the patient’s body actually absorbs.

CTDvol is a measure of dose output from a CT scanner, NOT what the patient really gets.

CT phantoms are plastic standardized size objects used to calibrate machines.

What is the Risk of Radiation Exposure?

There are 2 main models of risk: Stochastic and Deterministic.

There are two models of risk when talking about human exposure to radiation in general. Stochastic means that exposure to any amounts of radiation could be harmful (a matter of probability). Deterministic means that we do understand limits of exposure before health effects happen (like skin reddening). This is why we must justify and optimize exposure to patients.

Ref: NCRP 160

Radon 37%
Interventional radiology physicians receive more radiation dose than nuclear power plant workers per year on average.¹
What is the risk?

Radiosensitivity is the relative susceptibility of cells, tissues, organs or organisms to the harmful effect of ionizing radiation. Some organs are more radiosensitive than others, such as the eye lens, reproductive organs and the lungs.

What is the risk?

24% OF PUBLIC EXPOSURE DUE TO CT EXAMS

- Computed Tomography: 24%
- Radon: 37%
- Nuclear Medicine: 12%
- Interventional fluoroscopy: 7%
- Medical X-ray: 5%
- Consumer: 2%
- Terrestrial background: 3%
- Internal Background: 5%
- Space background: 5%

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Interventions to Reduce Dose

- Joint Commission Requirements
- CMS’ MACRA payment program
- American College of Radiology Appropriateness Criteria
- California SB AB510 – CT Dose Reporting
- Texas Administrative Code 25 TAC 289.227 CT Protocol Committee
- Image Wisely/Gently Awareness Program
- Medical Imaging & Technology Alliance (MITA) XR 29 Standard
- Optimizing scanning protocols at Lahey Clinic
  - Value of delayed-phase images
  - Renal stone patients example
How Are Manufacturers Helping to Reduce Dose?

• Manufacturers realize that non-X-ray procedures are safer than those with X-ray, for example using MR or ultrasound

• We must be careful, however, that we are not sacrificing clinical excellence by trading radiation exposure to the patient for inferior clinical results

• Innovation is key—manufacturers are now experimenting with adding tools like ultrasound to surgical catheters gaining even better results and eliminating radiation exposure

• Critical that manufacturers partner with healthcare providers to drive meaningful innovation

Joint Commission Requirements

• Imaging equipment testing and maintenance

• Annual education for staff supporting CT and MRI services

• Minimum qualifications for medical physicists Managing MRI safety risks

• Data collection on MRI incidents and CT radiation dose data CT protocol management

• Documentation of CT radiation dose
Challenging the “Gold Standard”

The time is now for manufacturers, regulators and healthcare providers to work together to develop and implement cost-effective, realistic and meaningful programs to monitor radiation dose.

Establishing a Radiation Safety Program
Radiologist Role

- Make decisions about appropriateness
- When applicable, engage clinician about possible alternatives
- Determine how the exam will be done
- Continuously work to find the balance between radiation dose risk and image quality

Technologist Role

- Understand the equipment
- Translate the ordered exam, unless done by a radiologist
- Either receive or pick the imaging protocol, and how the scan is to be done
- Dial in exposure parameters either according to standard protocol or for each patient
Manufacturer Role

• Support programs that help hospitals comply with new standards
• Develop software for dose monitoring and tracking
• Establish partnerships that can offer overarching support
• Work with other manufacturers to create harmonized standards
• Train users on new technology

Patient Role

• Question the medical appropriateness of exams
• Where possible, ask for an alternative modality
• Help providers by being transparent and informative about care received
• Educate themselves on basic terminology

“Yes, I had a CT scan last week. Could you request those images from the other hospital?”
Empowering Clinicians to Make Data-driven Decisions

- It is important for radiology practitioners to view retrospective patient exposure data to look for trends (both favorable and unfavorable).
- Part of the radiology quality system should be regular analysis of data to ensure expected outcomes are met, and strike a balance between clinical image quality and radiation exposure.

Empowering Clinicians to Make Data-driven Decisions

Interaction with EMR, PACS

Upgrading Equipment

Increasing Connectivity and Interoperability within the Hospital IT Network

Vendor-Agnostic Software

Analyze Radiation Exposure History
Empowering Clinicians to Make Data-driven Decisions

- Interaction with hospital Electronic Medical Record systems is vital to patient records being updated with radiation exposure records.
- Interoperability with PACS systems allows clinicians to identify patient radiation exposure by exam.

Empowering Clinicians to Make Data-driven Decisions

Older X-ray equipment, even ten years old, may not be suitable to display or send out patient radiation dose information to the hospital IT systems. Older systems also may expose patients to higher levels of radiation.
Empowering Clinicians to Make Data-driven Decisions

One of the latest advances in dose tracking has been vendor-agnostic software that can track radiation dose within the entire hospital enterprise regardless of modality.

Empowering Clinicians to Make Data-driven Decisions

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The Future of Diagnostic Imaging

- Health systems can be empowered in analyzing and acting upon data trends in their radiology departments
- **The future of using X-ray and radiation may go away!**
  - Sub-milliSievert imaging is real and will push cancer risk into negligible ranges
  - The LNT model (Linear No Threshold) may stay as the model for risk, but it will be greatly reduced with new technology
  - May be left with just a few exams that have “high dose”
  - The technology may eliminate cancer risk in patients

Faculty Biography & Contact Info

Dr. Wald serves as the Executive Chair of the Department of Radiology at the Lahey Clinic, responsible for Operations of this multispecialty independent academic medical center imaging department with 38 staff, 20 residents, 350 employees performing approximately 360,000 exams per year at three sites. He has also been the Vice Chair for the Department of Medical Education and Chair of the Graduate Medical Education Committee at the Lahey Clinic, responsible for the oversight of the over 20 training programs and is an elected member of the Lahey Clinic Board of Governors/Medical Executive Committee.

Dr. Wald specializes in advanced image post processing, has been integrally involved in the development of computer assisted live donor liver transplant planning methods which have become state of the art worldwide.

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Faculty Biography & Contact Info

Bert van Meurs is Senior Vice President and CEO for the Business Group Image Guided Therapy (IGT) at Philips. Leading a group of 3000+ employees, he is responsible for developing a strategy for Philips to become a therapy and device company.

Bert has 30 years of proven leadership in Healthcare, where he developed a customer-focused organization that is results oriented. He has a strong professional attitude towards the business, where living the values, being passionate about developing clinical solutions with a strong customer focus and taking care of talented people are his most important leadership competencies.

He began his career at Philips in 1985 and worked in various leadership positions in R&D, Clinical Science, Marketing and Sales. He has a record of accomplishment in e.g. X-Ray, Medical Imaging, Radiology, Digital Imaging and Innovation Management.

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Bibliography/References