

## What Is Medical Physics Without Radiation Safety?

Recent Trends in Radiation Protection and the Responsibility of the Medical Physicist

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## Objectives

- Review of recent changes in accreditation program standards and state x-ray regulations focused on enhancing patient safety
- Understand how mandatory radiation safety training can improve safety
- Review examples of using real time dosimetry information to improve radiation safety programs

## Changes to regulations and accreditation programs

## FDA Updates

- In February, 2010, the FDA published an initiative to reduce unnecessary radiation exposure from medical imaging
  - Collaborative initiative focused on CT, Fluoroscopy, and Nuclear Medicine

More information on the initiative:  
<http://www.fda.gov/downloads/Radiation-EmittingProducts/RadiationSafety/RadiationDoseReduction/UCM200087.pdf>

### 1. Promote Safe Use of Medical Imaging Devices

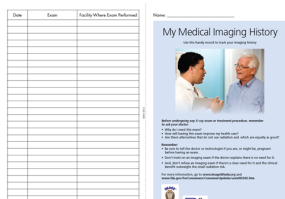
- Establish requirements for manufacturers of CT and fluoroscopic devices to incorporate additional safeguards into equipment design, labeling, and user training
  - Examples include devices displaying, recording, and reporting radiation dose and alerting users when doses exceed established values
- Partner with CMS to incorporate QA practices into accreditation
  - Under MIPPA, this currently applies to stand alone facilities
- Develop diagnostic reference levels including a national dose registry

### 2. Support Informed Clinical Decision Making

- Possibly require manufacturers to incorporate equipment features that will help with decision making such as recording exam dose information
- Electronic decision support (ACR Appropriateness Criteria)

### 3. Increase Patient Awareness

- Encourage patients to track their medical imaging history
  - Image Wisely [www.imagewisely.org](http://www.imagewisely.org)



### Michigan: Part 15 CT Installations

- Proposed rule change in 2010. Finalized June 8, 2011. Requires:
  - Technologist and Medical Physicist to have credentials and continuing education
  - Report and notification of a CT medical event
  - QC program under the direction of a medical physicist

9/13 Guidance: [https://www.michigan.gov/documents/lara/bhs\\_hfs\\_110\\_353828\\_7.pdf](https://www.michigan.gov/documents/lara/bhs_hfs_110_353828_7.pdf)

### The State of California

- Senate Bill 1237, California Health and Safety Code
  - Section 115113 January 2011
    - Requires reporting CT and therapy events that exceed certain criteria to the state
  - Section 115111 July 2012
    - CT doses recorded for every CT study produced
    - Doses verified annually by a medical physicist
  - Section 115112 July 2013
    - CT sites must be accredited by an organization approved by CMS, the Medical Board of California, or the State Department of Public Health

California O&A: [http://www.cdph.ca.gov/centric/advisory/Documents/SBH-SB1237-FAQ\\_PDF](http://www.cdph.ca.gov/centric/advisory/Documents/SBH-SB1237-FAQ_PDF)

### Massachusetts

- Massachusetts Department of Public Health 105 CMR 120 Control of Radiation
  - 120.409: Any facility offering CT services after April 30, 2011 shall have ACR accreditation.

MA Department of Public Health Regulations: [http://www.mass.gov/Eoohhs2/docs/dph/regs/105cmr120\\_400.pdf](http://www.mass.gov/Eoohhs2/docs/dph/regs/105cmr120_400.pdf)

### The Joint Commission

- Sentinel Event Alert 47 (Aug. 24, 2011)
  - Addressing contributing factors to eliminate avoidable radiation dosing
  - Right Test, Right Dose
  - Effective Processes
  - Safe Technology
  - Safety Culture
  - Referenced the ACR's Dose Index Registry

[http://www.jointcommission.org/assets/1/18/sea\\_471.pdf](http://www.jointcommission.org/assets/1/18/sea_471.pdf)

### More from Sentinel Event Alert 47

- Investigate patterns outside the range of appropriate doses.
- Track radiation doses from exams repeated due to insufficient image quality or lack of availability of previous studies to identify the causes.
- Address and resolve these problems through education and other measures.
- Record the dosage or exposure as part of the study's summary report of findings.

## The State of Texas

- New regulations effective 05/01/13: 289.227
  - Radiation Protocol Committees for interventional fluoroscopy and CT
  - Radiation safety training for those using interventional fluoroscopy (other than radiologists or radiation oncologists)
  - Recording output, establishing reference values and actions for when they're exceeded

<http://www.dshs.state.tx.us/radiation/rules.shtml>

## The State of Texas

- Radiation Protocol Committee for CT systems
  - Shall meet in person at least every 14 months
  - Required membership: Radiologist/ Radiation Oncologist, Licensed Medical Physicist, RSO, and others as deemed necessary by the site

## The State of Texas

- Must establish and implement CT system protocols which detail
  - A method to monitor radiation output
  - Recommended reference level for CT procedures performed
  - Actions to be taken for cases when the reference level was exceeded which may include patient follow-up
  - Review of the established protocols at an interval not to exceed 14 months

## The State of Texas

- Required records for radiation output information:
  - Patient ID
  - Type and date of exam
  - Identification of the CT system used
  - If the CT system is capable of displaying CTDIvol and DLP or all parameters needed to calculate these

## The American College of Radiology: Diagnostic Imaging Center of Excellence

- Basic Criteria for Diagnostic Imaging Center of Excellence:
  - ACR accreditation in all provided modalities
  - Dose Index Registry® (DIR) and General Radiology Improvement Database (GRID) participation
  - Image Gently® and Image Wisely® pledges
  - Site survey assessing multiple areas of quality, safety, procedures and personnel by an ACR survey team that includes a radiologist, medical physicist and technologist working with your team members

<http://www.acr.org/Quality-Safety/DICOE>

## TJC Imaging Standards – finalized (2015)

- Several Changes to Environment of Care
  - MRI Safety
  - Annual testing for advanced imaging modalities
- Human Resources
  - Credentials for CT physicists and technologists
- Medication Management
  - Verifying radiopharmaceuticals prior to administration

## TJC Imaging Standards – finalized (2015)

- Provision of Care, Treatment, and Services
  - Document radiation dose index for CT
- Performance Improvement
  - MRI Incidents
  - Review and analysis of CT dose indices exceeding specified ranges

## Effects of Mandatory Safety Training

## A Survey of Urology Residents and Fellows

- Journal of Surgical Education, Volume 70, Issue 2, March-April 2013, P 224-231
  - Confidential, anonymous, internet-based survey on workplace radiation safety practices was completed by 165 respondents
  - Findings show that radiation safety training is insufficient for personnel and patient safety

## States Requiring Radiation Safety Education

- Arkansas 24 hrs every 2 years
- Rhode Island Topics required, but no time limit – plan to correct in 2015
- Alaska 10 hours
- Massachusetts 2 to 4 hours annually – depends on type of operator
- California 10.5 hours
- Oregon 8 hours for non-radiologist operators
- Louisiana State physician license requirement

Information courtesy Lisa Bruedigan / Texas DSHS

## Multicenter Long-Term Validation of a Minicourse in Radiation-Reducing Techniques in the Catheterization Laboratory

- The American Journal of Cardiology, Volume 115, Issue 3, Feb 1, 2015, P 367-373
- First validation of the long-term efficacy of a course in a multicenter field study
  - 54.6% dose reduction in short term, 64.1% dose reduction in long-term following education

## Simulation center training as a means to improve resident performance in percutaneous noncontinuous CT-guided fluoroscopic procedures with dose reduction

- American Journal of Roentgenology, Volume 204, Issue 4, April 2015, P 376-383
  - 40 residents received 1 month of training after baseline data was acquired
    - Median number of pedal steps decreased by 3
    - Median dose decreased by 15.4 mGy
    - Median procedure time decreased by 4 minutes
    - Median number of needle redirects decreased by 1

## Real Time Exposure Monitoring

### A few products that allow real time monitoring

In room monitoring

- Philips Dose Aware / Raysafe i2
- Vertec Bleeper Sv

Occupational Exposure Products – NVLAP accredited labs

- Mirion Instadose / Instadose 2
- Landauer Verifi – “coming soon”

### Benefits of Real-time Monitoring

- Detailed feedback during procedures with different
  - Procedure type/patient dose
  - Geometry
  - Technique factors
- Opportunities for optimization and implementation of ALARA

### Conclusions

- Regulations and accreditation standards are becoming more complex with respect to radiation safety
- Radiation safety training of physicians can be very effective and is becoming mandatory in various locations
- Real time exposure monitoring can be used to visualize personnel exposure and improve radiation safety for staff and patients