

Medical Physicist Involvement in Implementing Patient Protection Standards



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J. Anthony Seibert, PhD
Department of Radiology
University of California Davis Health System
Sacramento, California



Disclosures

- Financial conflicts: NONE

Activities and time commitments

- Implementing the California radiation dose reporting regulations
- Developing procedures for Joint Commission requirements for Diagnostic Imaging Services
- Educating medical physicists, radiologists, technologists, physicians, nurses and hospital personnel on patient safety and imaging
- Going beyond ionizing radiation modalities: MRI safety and patient protection

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January 2008

Radiation Overdoses Point Up Dangers of CT Scans

By David Evans
Radiation
Environmental
Health
California
Hospital
Parents
Sue
California
Hospital
Over
Pediatric
CT
Radiation
Overdose

California hospital fined \$25,000 for pediatric CT radiation overdose

Parents sue California hospital over pediatric CT radiation overdose

150 CT scans to the same location ~5-7 Gray

October 2009

Several hundred patients overexposed over 2 year period

CEDARS-SINAI MEDICAL CENTER

Safety Investigation of CT Brain Perfusion

The California Law...

Requires those responsible for CT system operation:

- To record the CT dose metrics in interpretive report
 - Volume computed tomography dose index (CTDI_{vol})
 - Dose length product (DLP)
- To have on an annual basis, a medical physicist verify that the displayed doses are $\pm 20\%$ of the true measured dose

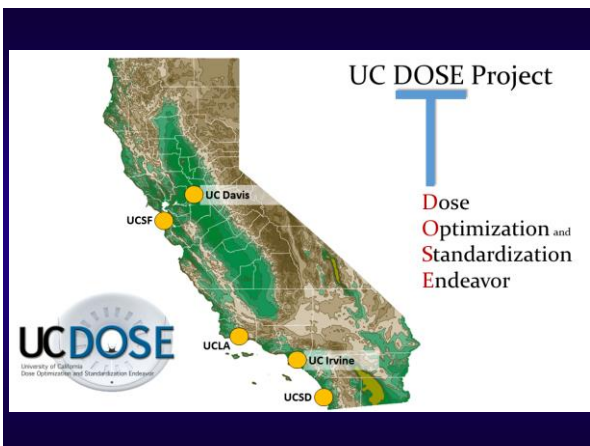
The California Law ...

Requires report to CA Dept of Health Services:

- If an exam results in unintended patient harm (organ damage or erythema), as determined by a physician
- Radiation exposure >50 mSv to a fetus of a known pregnant individual unless approved by a physician
- Irradiating the wrong person or wrong site
- Delivered dose > 20% of the prescribed dose

Medical Physicists Actions

- Worked with state regulators on CA reporting law
- Created consortium of 5 UC Medical Centers (UC DOSE)
- Developed recommendations for reporting
- Provided virtual education opportunities for the medical community
- Generated reference doses for CT exams





10

Recommendations for compliance

- **UCDOSE** consortium of UC Medical Centers

UNIVERSITY OF CALIFORNIA

BERKELEY • DAVIS • IRVINE • LOS ANGELES • MERCED • RIVERSIDE • SAN DIEGO • SAN FRANCISCO • SANTA BARBARA • SANTA CRUZ

UC-DOSE
University of California Health System
Recommendations for Compliance with California Senate Bill 1237 and related pending legislation
May 10, 2012

I. EXECUTIVE SUMMARY

The UC-DOSE project (University of California Dose Optimization and Standardization Endeavor) was funded by the University of California Office of the President (UCOP) to standardize and optimize computed tomography (CT) protocols across the University of California Medical Centers, and to develop a consistent solution for responding to California Senate Bill 1237.¹ This bill takes effect on July 1, 2012, will be enforced by the California Department of Public Health Radiologic Health Branch,² and requires the reporting of CT radiation dose, and the reporting of overdoses in particular settings.

Example reports

- Includes effective dose estimate:

DOSE REPORT:
This study involved (1) CT acquisition(s). The CTDIvol and DLP values are included below as required by state law:

1; Series: 2; Abdomen; 32 cm; CTDIvol=22.7 mGy; DLP 1350.8 mGy-cm

Total estimated effective dose for this examination: 16.7 mSv

For further information on CT radiation dose, see
<http://www.ucdmc.ucdavis.edu/radiology/RadiationDose.html>

CT DOSE:

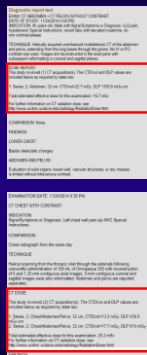
This study involved (2) CT acquisition(s). The CTDIvol and DLP values are included below as required by state law:

1; Series: 2; Chest/Abdomen/Pelvis; 32 cm; CTDIvol=13.2 mGy; DLP 438.9 mGy-cm

2; Series: 2; Chest/Abdomen/Pelvis; 32 cm; CTDIvol=17.7 mGy; DLP 819 mGy-cm

Total estimated effective dose for this examination: 25.2 mSv

For further information on CT radiation dose, see
<http://www.ucdmc.ucdavis.edu/radiology/RadiationDose.html>

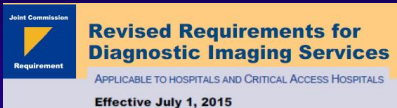


Activities and time commitments

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The Joint Commission: update

- Revised requirements



Elements of Performance for PC.01.02.15

C 5. ^① For [critical access] hospitals in California that provide computed tomography (CT) services: The [critical access] hospital documents in the patient's record the radiation dose index (CTDIvol, DLP, or size-specific dose estimate [SSDE]) on every study produced during a diagnostic computed tomography (CT) examination. The radiation dose index must be exam specific, summarized by series or anatomic area, and documented in a retrievable format. ^② ^③

The complete list of revisions...

The image displays three screenshots of the Joint Commission Requirements for Diagnostic Imaging Services document. The first screenshot shows the "Introduction" section, the second shows the "Elements of Performance" section, and the third shows the "Appendix" section. Each screenshot contains detailed text and tables related to the requirements.

Actions to take:

- Need an organized approach:

JC Requirements for Diagnostic Imaging Services Updated April 2015				
Content of Policies	Initial Review	Policy & Procedure	Policy & Procedure	Compliance
EC 02 04 01 A10	The [critical access] hospital identifies quality control and maintenance activities to maintain the quality of the diagnostic computed tomography (CT), positron emission tomography (PET), magnetic resonance imaging (MRI), and nuclear medicine (NM) images produced. The [critical access] hospital identifies how often these activities should be conducted. (See also EC 02 04 03, EP 15)	On Shared Drive	Training: P&P # 655 Radiation Producing Equipment Inspection and Acceptance Testing, Radiation Use Authorizations (RUA) & A. Seibert - CT & MR & D. Badawi PET	Y
Element of Performance	Standard Text	Action / Response		
EC 02 04 01 A10	The [critical access] hospital identifies quality control and maintenance activities to maintain the quality of the diagnostic computed tomography (CT), positron emission tomography (PET), magnetic resonance imaging (MRI), and nuclear medicine (NM) images produced. The [critical access] hospital identifies how often these activities should be conducted. (See also EC 02 04 03, EP 15)	On Shared Drive		
Policy & Procedure	Person Responsible	Compliant (Y/N)		
Radiology P&P # 655 Radiation Producing Equipment Inspection and Acceptance Testing, Radiation Use Authorizations (RUA) reside in Citrix	Dr. Seibert - CT & MR & Dr. Badawi PET	Y		

Revised requirements highlights

- Identify QC and maintenance activities: CT, PET/CT, MRI, NM
- Conduct structural shielding design and protection survey to verify shielding adequacy
- Consider patient age and previous exams when determining most appropriate exam
- Ensure correct patient, imaging site, positioning, protocol & scanner parameters

Revised requirements highlights

- MR safety program, annual evaluation of MR equipment, patient injuries
- Nuclear Medicine and PET annual performance evaluation and list of tests
- CT annual equipment evaluation, radiation dose metrics, and accuracy
- Acquisition display monitor evaluation, luminance, resolution, uniformity for all above

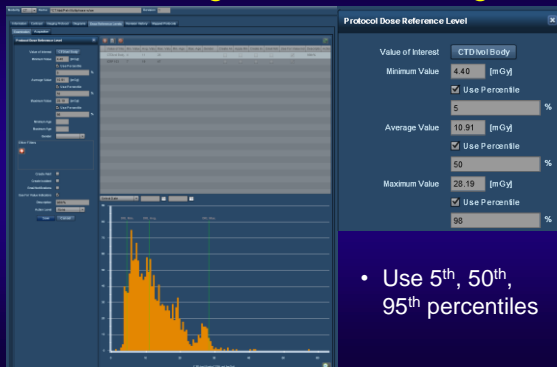
Revised requirements highlights

- CT protocols based on current standards of practice and addressing key patient criteria
- CT protocols reviewed and kept current at a time frame identified by the hospital
- **CT radiation dose index range is identified;** exams exceeding range limits are analyzed
- Requirements for medical physicist education and certification
- Requirements for technologists who perform CT with ongoing education

Reference Dose Levels for CT

- Local values from dose tracking database
- Published values (e.g., UC DOSE results)
- ACR Dose Index Registry values

Determining CTDI_{vol} DRL range



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Medical Physics Education

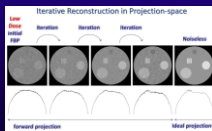
- A broad audience and topics

Iterative Reconstruction: How it Works, How to Apply

The Image Quality
ALARA CT Summit
How to Use New CT Technologies for Children



J. Anthony Seibert, M.D., FAHA, FRCR
Professor and Associate Chair of Informatics
Department of Radiology
University of California Davis Health System
Sacramento, California



Radiation Protection & Safety for Orthopedic Surgeons, OR Staff, and Patients

May 15, 2012

Tony Seibert, Ph.D.
Department of Radiology

Rolando Roberto, M.D.
Department of Orthopedic Surgery



Medical Physics Education

- A true value-add to improve patient safety

Digital Radiography: Image Processing

Technologist In-service
Part II

J.A. Seibert, Ph.D.
Department of Radiology
UC Davis Medical Center
Sacramento, California

UC DAVIS
University of California, Davis

CR: Frequency enhancement

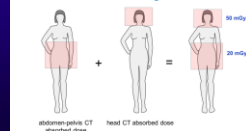


Radiation Dose Metrics and Patient Safety in CT

JA Seibert, PhD
Department of Radiology
University of California Davis Health System

What doses ADD and what doses DON'T ADD?

Absorbed doses to different regions DO NOT add



AAPM Education Resources

- Guides and slides for support of education
- Other resources: IAEA, websites

<http://www.aapm.org/education/ERG/DIARAD/>

EDUCATORS RESOURCE GUIDE

Physics and Technology of Diagnostic Radiology

Content Managed By The Medical Physics Education of Physicians Committee of Education Council

[Curriculum Guides](#) [Study/Reference Books](#) [Journal Articles](#) [Classroom/Conference Visuals](#) [Online Modules](#) [Web Sites](#)

[Feedback](#)

Curriculum Guides

Diagnostic Radiology Residents Physics Curriculum

Released in May 2009 by the AAPM Subcommittee of the Medical Physics Education of Physicians Committee. Prepared with the Support of the AAPM Education Council and the Radiology Academic Council. Updated Curriculum now includes Q&A, November 2013.

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Expanding use of MRI

- MR safety critically important for the patient
- Greater use of "MR-compatible" devices
- The Joint Commission emphasis on MRI
- Involves the Medical Physicist explicitly on several levels
- Hospitals are counting on the MP to provide appropriate guidance and direction

MRI safety emphasis by TJC

- Annual performance evaluation of MRI
- Documentation of ongoing education for safe MRI practices and patient procedures
- Management of MRI safety risk

Ensuring compliance

- Using publications and local resources

ACR Guidance Document on MR Safe Practices: 2013

Expert Panel on MR Safety: Emanuel Kanal, MD,^{1*} A. James Barkovich, MD,² Charlotte Bell, MD,³ James P. Borgstede, MD,⁴ William G. Bradley Jr, MD, PhD,⁵ Jerry W. Froelich, MD,⁶ J. Rod Gimbel, MD,⁷ John W. Gosbee, MD,⁸ Ellisa Kuhn-Kaminski, RT,¹ Paul A. Larson, MD,⁹ James W. Lester Jr, MD,¹⁰ John Nyenhuis, PhD,¹¹ Daniel Joe Schaefer, PhD,¹² Elizabeth A. Sebek, RN, BSN,¹ Jeffrey Weinreb, MD,¹³ Bruce L. Wilkoff, MD,¹⁴ Terry O. Woods, PhD,¹⁵ Leonard Lucey, JD,¹⁶ and Dina Hernandez, BSRT¹⁶

Department of Radiology Magnetic Resonance (MR) Safety ...

... Department of Radiology Magnetic Resonance (MR) Safety ... Commentary:

MR Safety and the American College of Radiology White Paper ...
intranet.ucdmc.ucdavis.edu/_hospital_policies_and_procedures/faculty_management_practice/1727.shtml

Ensuring compliance

- Reviewing and validating policies & procedures

Department of Radiology Magnetic Resonance (MR) Safety

I. PURPOSE

The purpose of this policy is to establish procedures that will prevent ferro metallic, hazardous material, fire or other forms of injury to patients, visitors and staff in the Magnetic Resonance (MR) imaging environment.

II. SETTING

Medical Center
Zone floor plans are attached for each building.

III. DEFINITIONS

A. MR Personnel—MR Technologists and MR Radiology Assistants (RA) who have received a higher level of safety training in addition to the on-line MR Safety Training through Learning Management website. These MR Personnel are Radiology employees.

B. MR Safety Trained Personnel—hospital staff who have completed and passed the on-line MR Safety Training through Learning Management website. They must pass the test with 80% or greater.

UC Davis Medical Center

Hospital Policies and Procedures

Policy ID: 1727

Revised 09/22/2013

Attachments

- MRI Safety Training Details
- EMR Order Questions
- Patient Questionnaire Prior to MRI Examination
- Hazardous Materials and Fire in the MR Suite
- Floor Plan: Main Hospital, First Floor, 3.0T MRI/Radiology
- Floor Plan: Pavilion, First Floor, MRI/Radiology

Conclusions

- Implementing the California radiation dose reporting regulations
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Medical Physicist & Patient Safety

- The Medical Physicist plays an integral role working with radiologists, technologists, staff and administration
 - Ensuring image quality
 - Developing radiation safety procedures
 - Optimizing radiation dose
- Meeting regulatory requirements
 - NRC, FDA, State
 - Accreditation bodies

Medical Physicist & Patient Safety

- Medical physics education is a key role of the Medical Physicist as a full-time-employee or as a consultant
- Involvement goes beyond ionizing radiation
- Achieving optimal patient care and safety is the ultimate deliverable
