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Fluoroscopy Training and Compliance – Experience of a Large Academic Institution


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Outline

- Regulations regarding fluoroscopy training
- Identifying who requires training
- Training models
- Challenges with compliance
- Delineation of Privileges


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Radiation induced skin injury: Malpractice issues

Cardiac Catheterization Procedure



The down side of angioplasty: Radiation exposure

Fig. 1—radiation and angioplasty. A 60-year-old male patient with a history of coronary artery disease underwent a percutaneous coronary intervention (PCI) for a stenosis in the left anterior descending artery. The procedure was complicated by a severe skin injury to the lower back, which occurred 3 months after the procedure. The patient had no other medical conditions and was on no medications. The skin injury was characterized by a large, dark, circular area of necrosis, which was confirmed by a biopsy. The patient underwent extensive skin grafting and is currently recovering. The image shows the patient's back with the area of skin injury circled in red.

- Initial: 173 min fluoroscopy and number of cine runs
- 5 months later: 74 min fluoroscopy & 2400 cine images (~1.5 min of cine run @ 30 fps)
- Severe skin injury, underwent extensive skin grafting
- Malpractice lawsuit for negligence and not informing about possibility of skin injury
- Jury awarded \$1,000,000 in compensation

Berlin L, AJR: 177, 2001

Skin Injury Caused Due to Malfunction of X-ray Equipment During RFA JOHNS HOPKINS



Rosenthal LS, Mahesh M, et.al. PACE 20: 1834-1839, 1997

Maryland Regulations regarding Fluoroscopic Users JOHNS HOPKINS

- F.5 (n) Qualifications for Users who energize Fluoroscopic systems
 - By December 31, 2005 the registrant shall ensure that only licensed practitioner of healing arts or a radiological technologist be allowed to energize fluoroscopic x-ray systems
 - All persons energizing these systems shall have completed at least four hours of training as specified in F.5 (n)(2) prior to clinical use of a fluoroscopic system, or provide documentation to demonstrate completion of four hours of training as specified in F.5 (n)(2)

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F.5 (n) (2): Topics to be included in the training JOHNS HOPKINS

- Biological effects of x-ray
- Principles of radiation protection
- Factors affecting fluoroscopic outputs
- Dose reduction techniques
- Principles and operation of fluoroscopic systems and outputs of each operational mode

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F.5 (n) (3): Continuing Medical Education JOHNS HOPKINS

- Registrant shall maintain records to demonstrate a minimum of one hour of in-service training for all users who energize fluoroscopic system every 24 months in fluoroscopic radiation safety and patient dose management

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F.5 (n) (4): Documentation Record Keeping JOHNS HOPKINS

- Registrant shall maintain records pertaining to the requirements of sections F.5 (n)(1), F.5 (n)(2) and F.5 (n)(3) for review for three years

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Exempt to Regulatory Requirements JOHNS HOPKINS

- Registrant may exempt from requirements of F.5(n)(1) through F.5(n)(4):
 - Board certified radiologists
 - Fluoroscopy systems ;
 - Licensed practitioners of radiation simulators
 - Physicians operating c-arms (mini) for imaging extremities only

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MARYLAND DEPARTMENT OF THE ENVIRONMENT
1800 Washington Boulevard • Baltimore Maryland 21230
(410) 537-3000 • 1-800-633-6101 • <http://www.mde.state.md.us>

Regulation Number	Requirements for Fluoroscopic Procedures and Equipment	Pass (P), Fail (F) or Not Applicable (NA)
F.5(i)	(1) Facility demonstrated initial in-house privileging of all users who energize fluoroscopic systems? (3) Facility demonstrated refresher in-house privileging?	_____
F.5(m)	(1) Fluoroscopic systems used as a positioning tool for radiographic exams? (2) Facility demonstrated three-month in-house evaluation of fluoroscopic exposure times by procedure and licensed practitioner?	_____

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Fluoroscopy Education Requirements by Department

MSD-Department	MSD-Expertise	When Documentation per Dept (Yes/No)	Notes
Anesthesiology & Critical Care Med	Anesthesiology-Critical Care	No	
Anesthesiology & Critical Care Med	Anesthesiology-General	No	
Anesthesiology & Critical Care Med	Anesthesiology-Pain Management	Yes	* Per Dr. Raju: Pain Clinic uses Fluoro using the C-arm. Primarily provided by fluoro techs from radiology. Dr. Mahesh talks to the faculty and follows yearly.
Anesthesiology & Critical Care Med	Anesthesiology-Pediatric Critical Care	No	
Cardiac Surgery	Cardiac Surgery	Link	*No response continue to f/u
Cardiac Surgery	Cardiothoracic	Link	
Dermatology	Dermatology-General	No	* Per Ms. Legarda
Surgery	Surgery-Vascular	Link	
Urology	Urology	Yes	* Per Dr. Han some people in his dept who perform fluoro but thinks all should have the on insurance.
Ophthalmology	Ophthalmology	No	* Per Dr. Schen
Orthopedic Surgery	Orthopedic-Hand Surgery	Yes	* Per Dr. McFarland none of Ortho run the fluoroscopy but per Dr. Yu Ortho has have left fluoro up to each individual physician. If they desire to run the C-arm, they MUST take the course. Must do not run the C-arm.
Orthopedic Surgery	Orthopedic-General	Yes	* Some Use
Orthopedic Surgery	Orthopedic-Sports (Medical)	Link	
Orthopedic Surgery	Orthopedic-Sports (Surgical)	Link	
Otolaryngology Headneck Surgery	Otolaryngology-Dentistry	Link	* Per Dr. Corry-Skinner, Sandra Liu, and Young Kim use fluoro in the OR rarely. Speech-language pathologists, Kim Webster and Heather Stammer, use it regularly in jawline evaluations. In each case they said that they do not energize the unit. That is done by a radiological technician or radiologist.

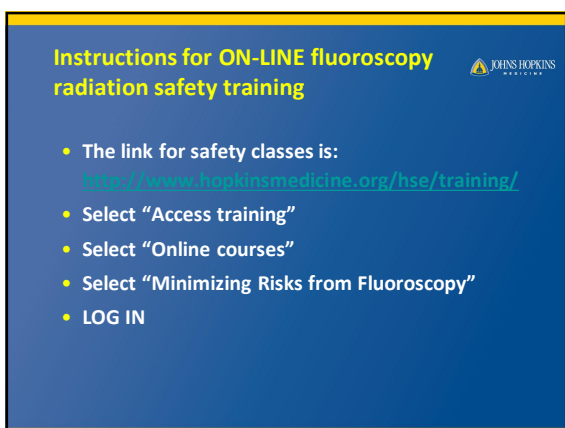
Identifying areas utilizing fluoroscopy

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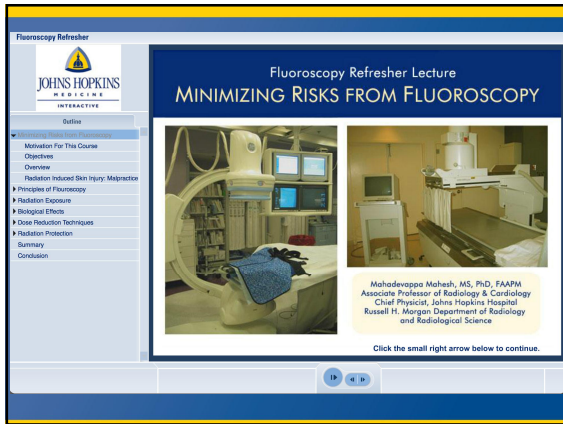
Department/Service	Range of Motion	Factor Indicated	Not for Fluoro	Indicate Fluoroscopy (Yes, No, DGP, DGS)	VSD	Factor Fluoro Monitoring	Robotic	Indicate Motion	Image
Ophthalmology	X			X	X			X	X
Optometrist		X							
Orthopedic Surgery	X			X	X			X	X
Podiatrist (included on previous DGP, not for DGS)				X	X			X	X
Otolaryngology	X			X				X	X
Dentistry and Oral Surgery (Dent)	X			X				X	X
Dental Hygienists		X							
Audiology/Speech Pathologist		X		Add					
Pathology	X								
Affiliate Staff		X							
Podiatrist		X		To be included					
Physician Assistant (not Department specific)	X			Add	Add	Add		X	
PHAR	X			X	X			X	X

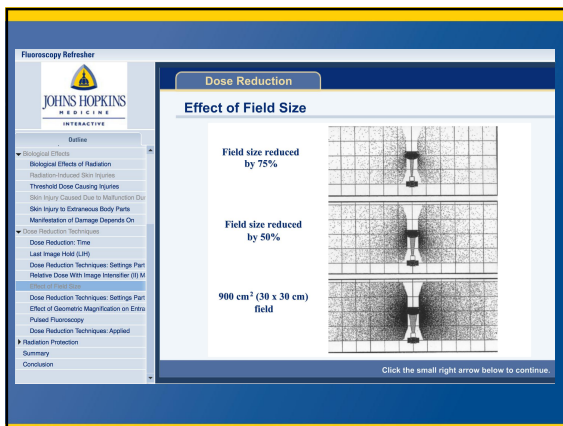
DGP - Current Status - JHH Only As of: 2/13/2011, Revised 1/12/2011 Page 3

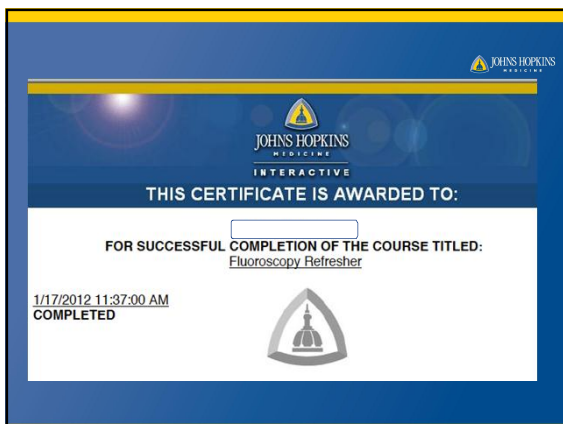












Delineation of Privileges (DOPs) JOHNS HOPKINS MEDICAL

Request by checking

☐ Energizing Fluoroscopic X-ray Units Used Clinically

Overriding Requirements:
Documentation to the Johns Hopkins Radiation Safety Office of completion of four hours of training per State of Maryland regulation. This may be accomplished by completion of "Minimizing Risk: From Fluoroscopy" at http://www.hopkinsmedicine.org/interactive_learning/learning/index.html, under Occupational Safety Council.

The following physicians are exempt from the training requirements: radiologists certified by the American Board of Radiology, physicians exclusively energizing fluoroscopic radiation machines for the purpose of therapy simulation, and physicians whose energizing of fluoroscopic equipment is limited to a C-arm fluoroscope manufactured exclusively for imaging extremities.

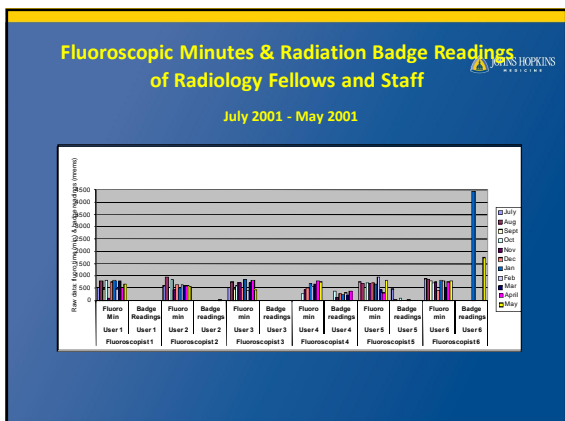
Renewal Requirements:
3 Peer assessments
Review of OPE results during current appointment period
Completion of "Fluoroscopy Refresher" at http://www.hopkinsmedicine.org/interactive_learning/learning/index.html, under Occupational Safety Council.

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NOTE: Confirmation of qualification by the Radiation Safety Office.

Recommended by checking

Radiation Badge Compliance JOHNS HOPKINS MEDICAL



Penalty for unreturned badges

- \$50 will be charged for each dosimeter not returned within 30 days after the monitoring period
- Radiation safety office will bill the department for the unreturned badges
- Enforcement started from January 2011

Joint Commission Sentinel Event Policy Compliance

How to Prepare for the Joint Commission's Sentinel Event Policy Pertaining to Prolonged Fluoroscopy

Mahadevappa Mahesh, MS, PhD

Table 1. Sample guidelines to establish thresholds to track patient radiation exposures during prolonged fluoroscopic procedures

Guidelines	
Level I	Level II
With dose monitors	With dose monitors
Cumulative dose > 3,000 mGy	Cumulative dose > 6,000 mGy
Without dose monitors	Without dose monitors
If all of the following occurs	If all of the following occurs
Fluoroscopy duration ≥ 75 min	Fluoroscopy duration ≥ 150 min
Digital acquisitions ≥ 20	Digital acquisitions ≥ 40
Pregnant subjects	
Subjects ≤ 18 years old	

Note: 10 mGy = 1 rad, 1 Gy = 100 rads.

Mahesh M, JACR 5(4): 601-3 , 2008

[illegible]

Conclusions

- Many challenges exists in a large diverse academic institution
- Variety of training methods should be available
- Strong support from leadership is critical

[illegible]

Early documentation of radiation induced skin injury



FIG. 1.
Case of x ray dermatitis. Photograph showing exfoliation of the epidermis.



Bulletin of The Johns Hopkins Hospital, 1897
