Fluoroscopy Dose Management

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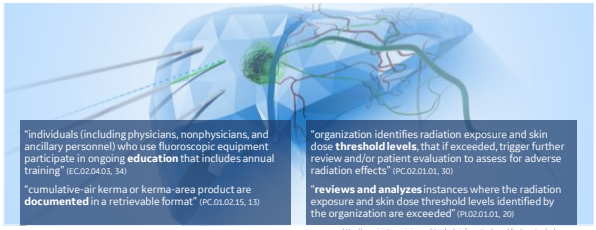
DISCLAIMER

Various organizations have announced changes intended to encourage providers to better manage patient fluoroscopy dose

Joint Commission Fluoroscopy Pre-publication Requirements

Effective Jan 1, 2019: Hospital, Critical Access Hospital, Ambulatory Health Care, Office-based Surgery



"individuals (including physicians, nonphysicians, and ancillary personnel) who use fluoroscopic equipment participate in ongoing **education** that includes annual training" (EC.02.04.03, 34)

"cumulative-air kerma or kerma-area product are **documented** in a retrievable format" (PC.01.02.15, 13)

"organization identifies radiation exposure and skin dose **threshold levels**, that if exceeded, trigger further review and/or patient evaluation to assess for adverse radiation effects" (PC.02.01.01, 30)

"**reviews and analyzes** instances where the radiation exposure and skin dose threshold levels identified by the organization are exceeded" (PI.02.01.01, 20)

https://www.jointcommission.org/standards_information/prepublication_standards.aspx

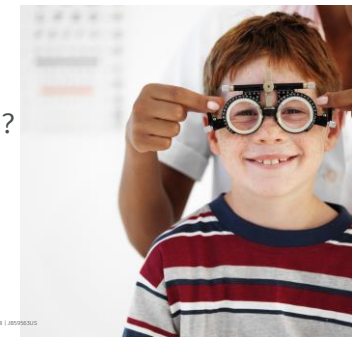
Key components for success

Project and Change Management

Right Technology

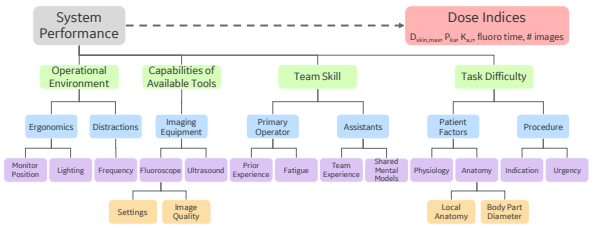
What is your vision?

Vision and strategy are important, but vision comes first

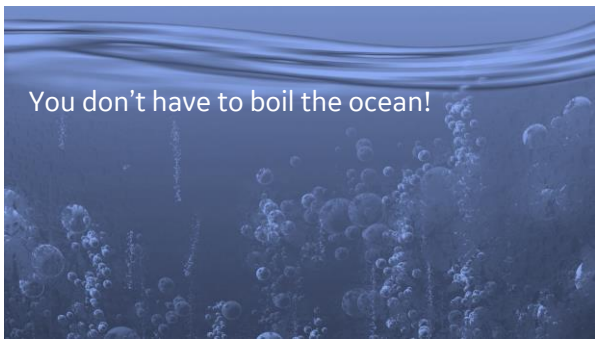


Where to Start?

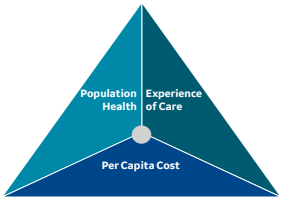
Sources of Variability, Fluoroscopically Guided Interventional Procedures[1]



[1]National Council on Radiation Protection & Measurements, Report 172: Reference Levels and Achievable Doses in Medical and Dental Imaging: Recommendations for the Unites States, 2012 [8]



Consider framing your goals in terms of health outcomes



A common framework for health outcomes is "The Triple Aim"[1]

Outcomes
- Better care for individuals
- Better health for populations
- Lower per capita cost

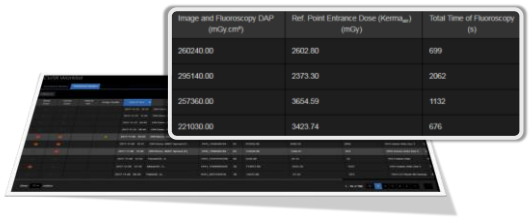
[1] *Institute for Healthcare Improvement*

Example outcomes associated with "Experience of Care"

	General Aim or Desired Outcome[1,2]	Potential Dose Management Impact
Effective	Care is appropriate and scientific	Identify high risk patients more accurately & earlier; location of skin damage
Efficient	Care is provided efficiently	Decreased effort to manage patient dose
Timely	Care is available as needed	Faster identification of high risk patients and estimation of peak skin dose
Safe	Minimized risk, reduced mistakes	Drive dose optimization and safe practices
Equitable	Care is equitable across race, gender, income, age, location	Access to medical physics expertise regardless of facility size or location
Patient Centric	Patient culture, preferences, values, specific needs are respected	Tracking of radiosensitive patients, cumulative dose history to identify potential FGI dose issues

[1] *Centers for Medicare and Medicaid Services, Quality Improvement Roadmap*
[2] *Agency for Healthcare Research & Quality, US Dept of Health & Human Services*

Tracking
Collection of dose indices in a retrievable format



Tracking
Collection of detailed information for further investigation

Run specific data: frame rate, mode, angulation, table position, etc.

Tube Voltage (kV)	Tube Current (mA)	Exposure (mAs)	Distance Source to Patient (cm)	Distance Source to Detector (cm)	Table Vertical Position (cm)
77.00	221.30	184.121	75.00	108.60	24.37
77.00	187.70	42.758	75.00	104.40	24.37
77.00	241.70	46.406	75.00	104.40	24.37
78.00	242.40	77.568	75.00	104.40	24.37

Data collection considerations

Equipment Age and Licensing

- Can my imaging system send dose information? Is there a fee?
- Can it only send to one location?

Data Type

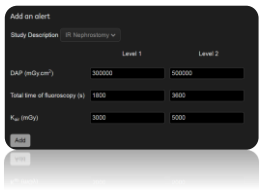
- How complete is it?
  MPPS < Proprietary ≤ RDSR

Does it need to go anywhere else?

- Registry: Do I need to map study description?
- RIS / EMR

Management of Outliers
Setting of Thresholds

Study Dose



DRLs and Additional Granularity

Create / Import / Export DRLs
Site – Specific Thresholds
Device
Patient Age
Patient Weight

Management of Outliers
Setting of Thresholds – Cumulative Dose

Management of Outliers
Notifications

E-mail

- Customizable distribution list
- Site specific
- Customizable Content
  - Metric
  - Thresholds
  - Performing Physician

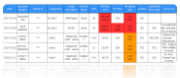
User Interface

Listing of exams and alert status

Reporting

Listing of reviewed and unreviewed alerts

Patient Watchlist (based on cumulative air kerma)



Management of Outliers
Review and Documentation

Codes and Comments

Audit Trail

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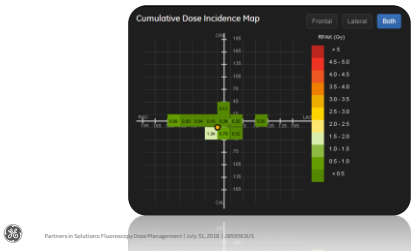
Management of Outliers
Detailed Assessment – Incidence Map (Angulation)



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Management of Outliers
Detailed Assessment – 4D Skin Dose Map

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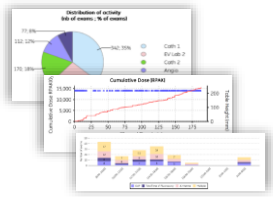
Continuous Improvement

Analytics & Reporting



Purpose

Operational Visibility

- Devices
- Personnel
- Technique
- Review of Outliers

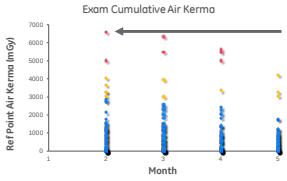
Visibility to high risk cases

Benchmarking

Practical Case

Event Information

Identify Significant Radiation Dose Level Incidents



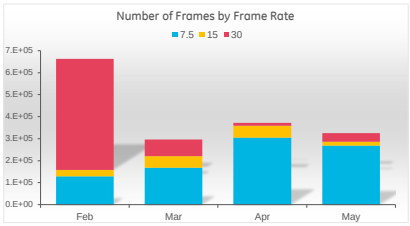
Mode	AK mGy	# Events
Fluoro	2357	128
Record	4232	36
Total	6589	164

164 Exposure Events
31167 frames all at 30 fps

Other Available Data
DAP, FT, Table Height, Table lateral position, SID, kV, mA, patient weight, etc.

Evolution of Imaging Technique

Frame Rate



Physician Performance (*Real names removed)

Performing Physician*	Exams	3-5 Gy	>5 Gy	% 3-5 Gy	% > 5 Gy
Ludie Lindley	1	0	1	0.0%	100.0%
Carl Tower	14	1	2	7.1%	14.3%
Corrin Gayer	11	1	1	9.1%	9.1%
Jeramy Kell	12	1	1	8.3%	8.3%
Ladonna Douse	46	3	2	6.5%	4.4%
Freeman Liverman	4	1	0	25.0%	0.0%
Hue Carbonaro	17	2	0	11.8%	0.0%
Brigette Orloff	7	2	0	28.6%	0.0%
See Wilkins	8				
Paris Euell	2				
Michaele Baillargeon	6				
Deangelo Purves	27				
Sparkle Lenhardt	35				
Grand total	293	11	7	3.75%	2.39%

Key Learnings

Many sites have challenges creating change in the organization: politics, goals, motivation, education, communication challenges.

Technology can enable and provide insights, but it doesn't make the change.

Set the vision, realistic goals, and ownership.

Medical physicist insight is critical to success.

It takes a team – physicist, technologist, physician, and hospital leadership.