

Analyzing Consistency in Physician Performance in  
Cardiac Fluoroscopic Procedures within Six Facilities  
Using Outlier Analyses

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# Introduction

- NCRP Statement 11 recommends
  - “quality assurance program that incorporates quality improvement and provides ongoing feedback..”
- NCRP 168 and TJC suggest/require review of procedures with dose values above thresholds
  - Reviews emphasize identifying radiation tissue injuries due to individual procedures
- Sources of variability in fluoroscopic procedure doses
  - Procedure difficulty
  - Equipment
  - Patient size
  - **Performing Physician**

## Purpose

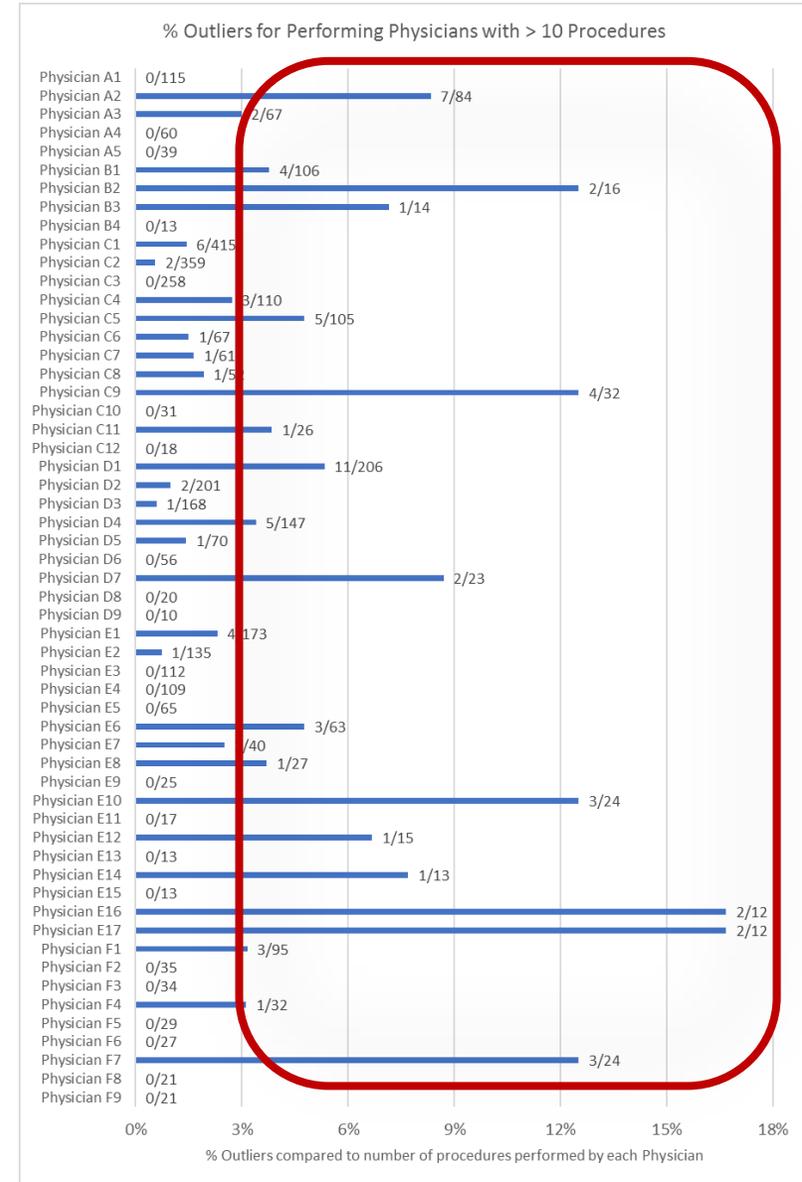
- Provide greater context for procedure review within facilities
- Identify causes for higher radiation dose studies
- Create action items to remediate

# Methods

- Six Different Radiology Facilities
- Collected twelve months of fluoroscopic procedure data for each facility
  - Data collected using two dose monitoring software products
    - Landauer OPTIMIZE (Fluke Health Solution, Glenwood, IL)
    - Radimetrics (Bayer HealthCare, Leverkusen, Germany)
  - Facility, scanner model, performing physician, study description, and reference point dose (RPD)
- Identified the most frequently performed cardiac procedure and scanner model per facility
  - Calculated RPD means ( $\mu$ ) and standard deviations ( $\sigma$ ) for each facility
  - Defined facility outlier: Procedures with  $RPD > \mu + 3\sigma$
- Calculated the percent of total procedures that were outliers
  - For each facility
  - For each facility's physicians
- Calculated cumulative percentage values for total exams and outliers
  - Sorted by Performing Physicians' outlier percentage

# Results

- Facility outlier percentage ranged from 1.5-2.7%
  - Determined an individual physician achievable target for percent of outliers > 3%
- Considered Physicians with > 10 procedures
  - Individual physician outlier percentage values ranged from 0% to 16.7%
  - Physicians with outlier percentage exceeding the achievable target identified for Quality Review (QR)



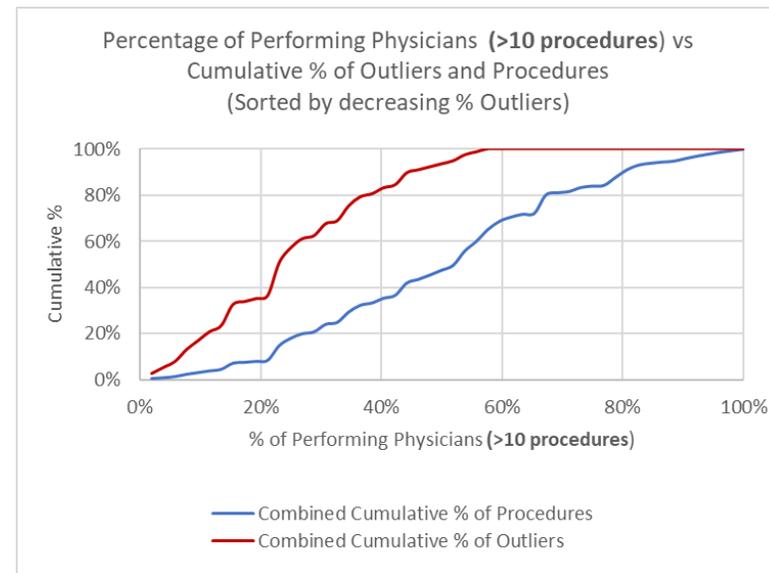
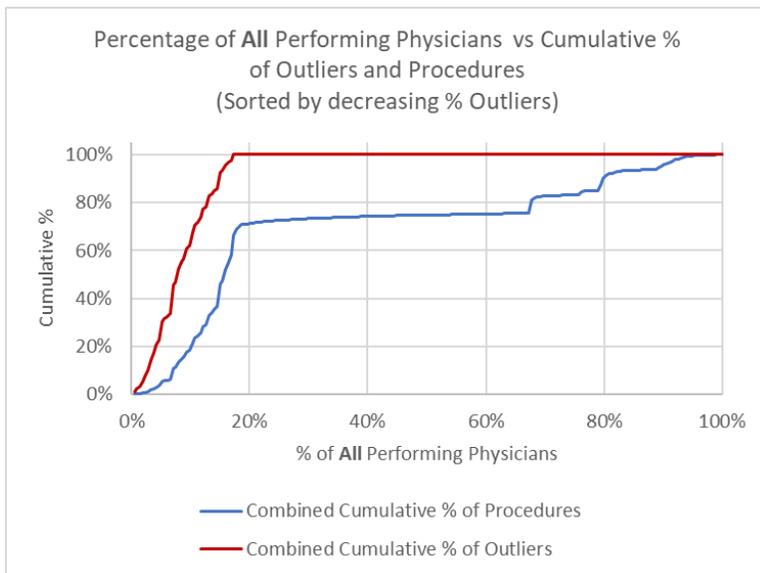
# Results (continued)

- The number of studies and outliers performed by physicians marked for quality review were compared to facility totals
- In five of six facilities, physicians marked for QR accounted for
  - > 65% of facility outliers
  - < 42% of the total facility procedures

Facility	A	B	C	D	E	F	Combined
Study Description	Left Heart Cath	CARD	Cardiac Cath	Diagnostic Cath	CL CATH LAB	LHC/POSS	N/A
Number of Studies	377	346	1572	905	913	456	4569
Number of Outliers	10	8	24	22	20	8	92
Facility Outlier %	2.7%	2.3%	1.5%	2.4%	2.2%	1.8%	2.0%
Physicians marked for Quality Review (QR) (Physician's Individual Outlier % > 3%)	2	3	3	3	7	4	22
% of Studies performed by Physicians marked for QR	40%	39%	10%	42%	18%	37%	29%
% of Outliers performed by Physicians marked for QR	90%	88%	42%	82%	65%	100%	72%

# Results (continued)

- Sorted physicians from highest to lowest percentage of outliers (per facility)
- Calculated cumulative percentages of exams and outliers
  - Among ALL performing physicians
    - 17% of physicians were responsible for 100% of outliers
    - These physicians performed up to 67% of procedures
  - Among performing physicians with > 10 procedures
    - 58% of physicians were responsible for 100% of outliers
    - These physicians performed up to 65% of procedures



# Discussion

- High dose outliers are performed by a disproportionately smaller group of physicians
- The data analyzed are sufficient to give valuable (targeted) physician feedback to improve fluoroscopy patient doses
- Use of these data in a quality improvement context can lower clinical radiation doses resulting in fewer adverse radiation effects (e.g. soft tissue damage)
- This approach identifies physicians who may benefit from shared education from those physicians identified as less prone to having high dose procedures

# Limitations

- This study presumed physicians using the same study description and system are performing similar procedures
- Experienced physicians may perform more difficult procedures
- Differences in clinical outcomes associated with differences in patient dose were not considered
- Dose Distributions may be non-normal
  - Alternate definitions for outliers may be superior (e.g. quartile-based)



**Thank You!**