The ACR Fluoroscopy Dose Index Registry

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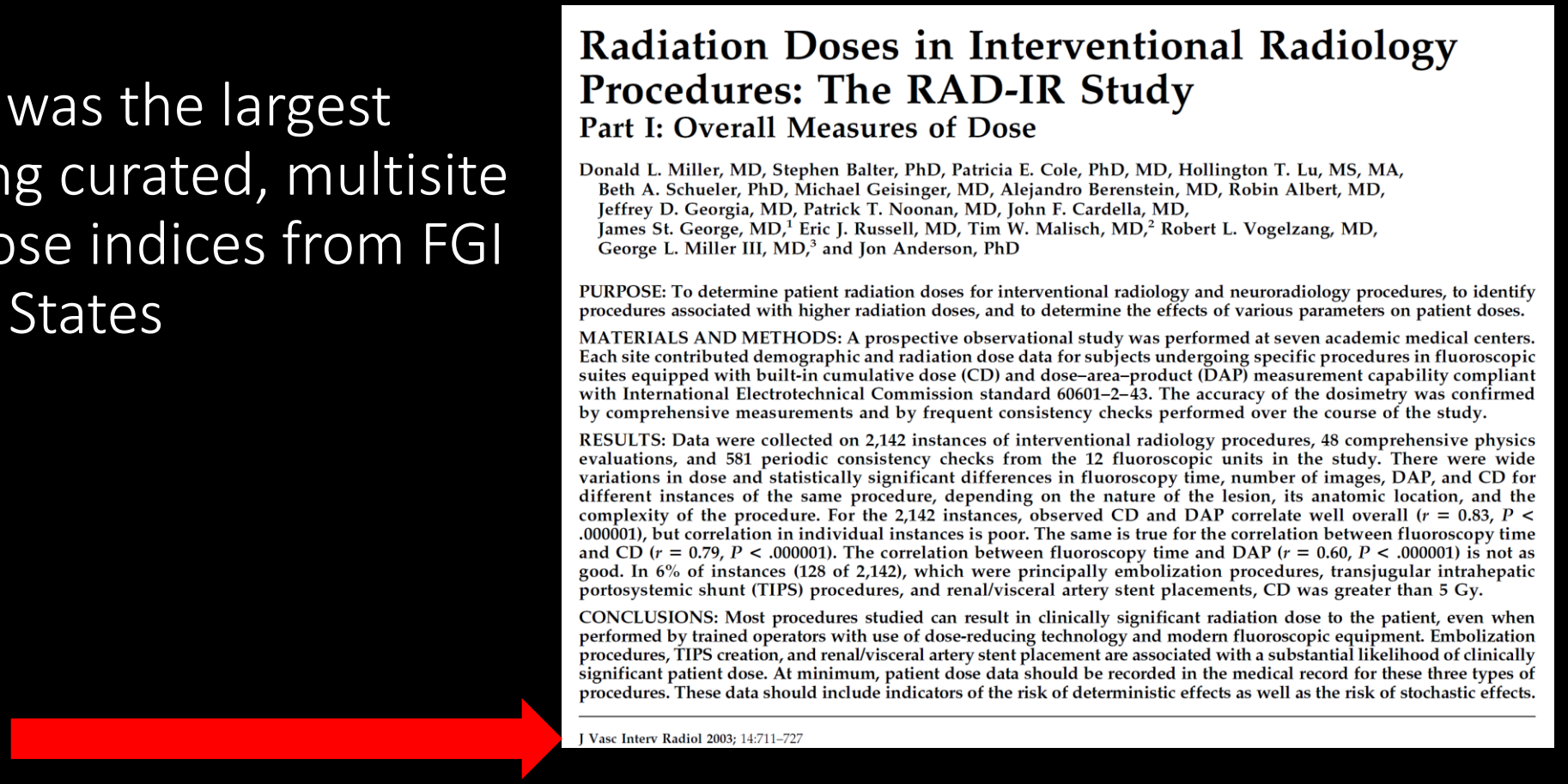
and the American College of Radiology DIR-Fluoro pilot team

Disclosures

- I am the president of FluoroSafety, a company that produces CME on quality and safety in medical imaging.
- Neither FluoroSafety nor its offerings will be discussed in this talk
- This talk represents my views and not necessarily those of the American College of Radiology

A (very) brief history

- RAD-IR study was the largest (only?) existing curated, multisite dataset for dose indices from FGI in the United States



Radiation Doses in Interventional Radiology Procedures: The RAD-IR Study

Part I: Overall Measures of Dose

Donald L. Miller, MD, Stephen Balter, PhD, Patricia E. Cole, PhD, MD, Hollington T. Lu, MS, MA, Beth A. Schueler, PhD, Michael Geisinger, MD, Alejandro Berenstein, MD, Robin Albert, MD, Jeffrey D. Georgia, MD, Patrick T. Noonan, MD, John F. Cardella, MD, James St. George, MD,[1] Eric J. Russell, MD, Tim W. Malisch, MD,[2] Robert L. Vogelzang, MD, George L. Miller III, MD,[3] and Jon Anderson, PhD

PURPOSE: To determine patient radiation doses for interventional radiology and neuroradiology procedures, to identify procedures associated with higher radiation doses, and to determine the effects of various parameters on patient doses.

MATERIALS AND METHODS: A prospective observational study was performed at seven academic medical centers. Each site contributed demographic and radiation dose data for subjects undergoing specific procedures in fluoroscopic suites equipped with built-in cumulative dose (CD) and dose–area–product (DAP) measurement capability compliant with International Electrotechnical Commission standard 60601–2–43. The accuracy of the dosimetry was confirmed by comprehensive measurements and by frequent consistency checks performed over the course of the study.

RESULTS: Data were collected on 2,142 instances of interventional radiology procedures, 48 comprehensive physics evaluations, and 581 periodic consistency checks from the 12 fluoroscopic units in the study. There were wide variations in dose and statistically significant differences in fluoroscopy time, number of images, DAP, and CD for different instances of the same procedure, depending on the nature of the lesion, its anatomic location, and the complexity of the procedure. For the 2,142 instances, observed CD and DAP correlate well overall ($r = 0.83$, $P < .000001$), but correlation in individual instances is poor. The same is true for the correlation between fluoroscopy time and CD ($r = 0.79$, $P < .000001$). The correlation between fluoroscopy time and DAP ($r = 0.60$, $P < .000001$) is not as good. In 6% of instances (128 of 2,142), which were principally embolization procedures, transjugular intrahepatic portosystemic shunt (TIPS) procedures, and renal/visceral artery stent placements, CD was greater than 5 Gy.

CONCLUSIONS: Most procedures studied can result in clinically significant radiation dose to the patient, even when performed by trained operators with use of dose-reducing technology and modern fluoroscopic equipment. Embolization procedures, TIPS creation, and renal/visceral artery stent placement are associated with a substantial likelihood of clinically significant patient dose. At minimum, patient dose data should be recorded in the medical record for these three types of procedures. These data should include indicators of the risk of deterministic effects as well as the risk of stochastic effects.

J Vasc Interv Radiol 2003; 14:711–727

RAD-IR

- The RAD-IR study reported mean and 95% CI for the three primary fluoroscopy dose indices for 2,142 fluoroscopy procedures
  - 35 procedure types
- Each clinical procedure was reviewed by Dr. Don Miller to ensure it was categorized correctly

Procedure Description	Total Cases
TIPS creation	135
Biliary drainage	123
Nephrostomy	
Obstruction	79
Stone access	64
Pulmonary angiography	
No IVC filter	106
IVC filter	17
IVC filter placement only	279
Renal/visceral angioplasty	
No stent	53
Stent	103
Iliac angioplasty	
No stent	24
Stent	93
Central venous reconstruction	
SVC	12
IVC	3
Aortic fenestration	2
Bronchial artery embolization	27
Hepatic chemoembolization	126
Pelvic arterial embolization	
Trauma	18
Tumor	19
Fibroids	90
AVM	12
Aneurysm	4
Pelvic vein embolization	
Ovarian vein	6
Varicocele	14
Other tumor embolization	91
Peripheral AVM embolization	17
GI hemorrhage: diagnosis/therapy	94
Neuroembolization/head	
AVM	177
Aneurysm	149
Tumor	56
Neuroembolization/spine	
AVM	10
Aneurysm	1
Tumor	13
Stroke therapy	9
Carotid stent placement	18
Vertebroplasty	98

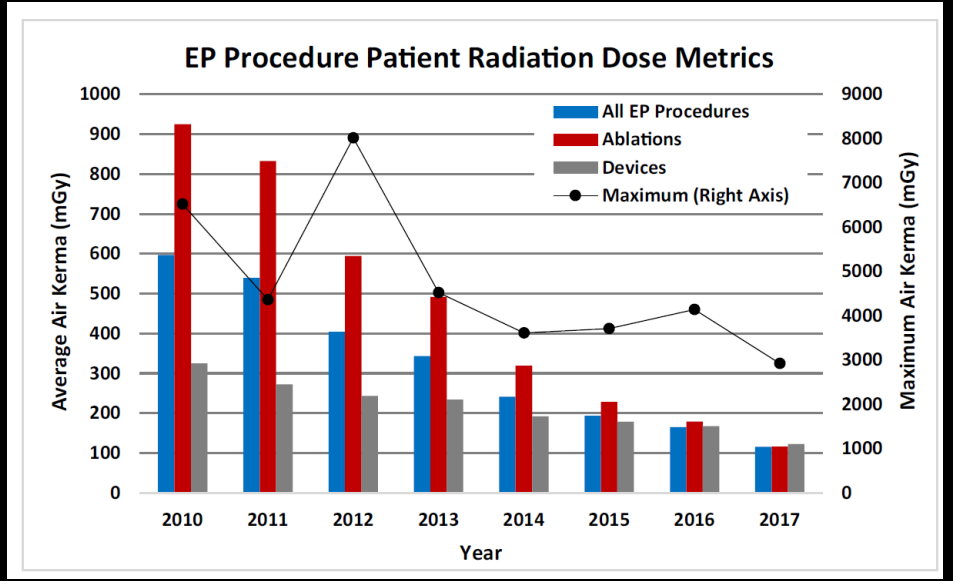
Journal of Interventional Cardiac Electrophysiology
https://doi.org/10.1007/s10840-018-0462-8

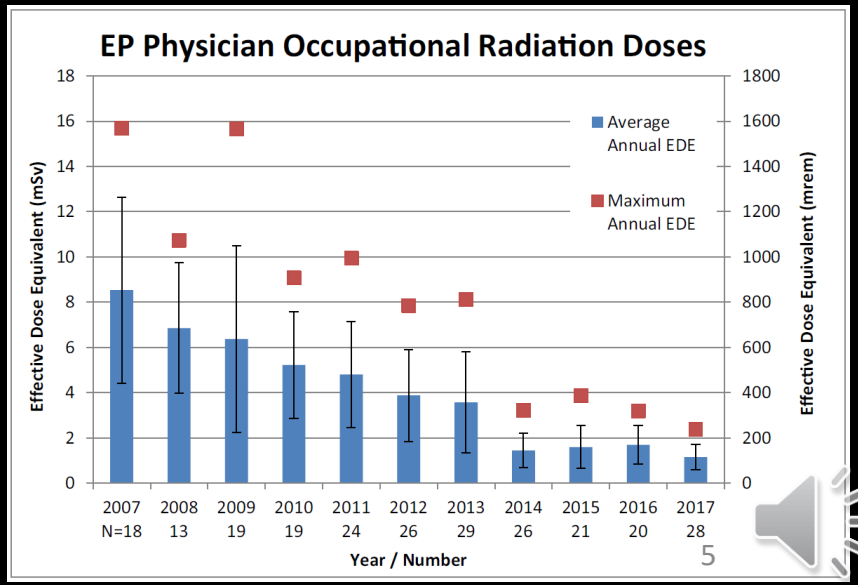
Occupational and patient radiation doses in a modern cardiac electrophysiology laboratory

Kevin A. Wunderle[1] · Mina K. Chung[2] · Sripriya Rayadurgam[3] · Mark A. Miller[3] · Nancy A. Obuchowski[4] · Bruce D. Lindsay[2]

We know things have changed

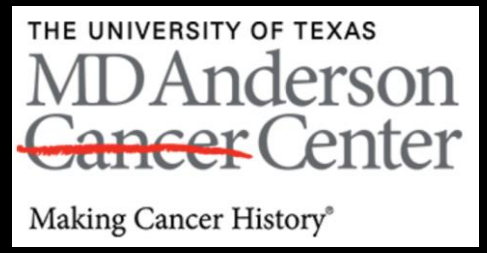
- There have been several reports on decreases in patient dose indices and occupational dose indices
- In the last decade there have been a number of technological advances
  - And systems are delivered with lower default dose rates

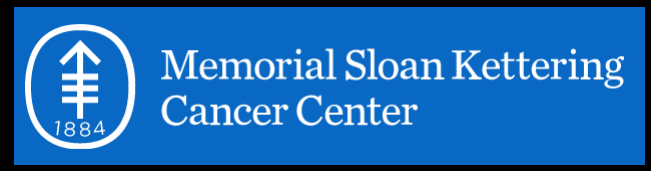




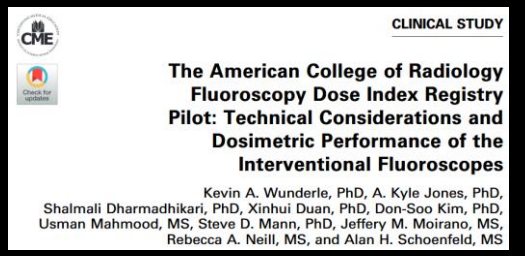
Pilot phase of DIR-Fluoro

- Nine pilot sites
  - Included academic medical centers, community hospitals, and a children's hospital
- Data collection from March 1, 2018 through December 31, 2019





J Vasc Interv Radiol 2020; 31:1545–1550
https://doi.org/10.1016/j.jvir.2020.04.023


CLINICAL STUDY

The American College of Radiology Fluoroscopy Dose Index Registry Pilot: Technical Considerations and Dosimetric Performance of the Interventional Fluoroscopes

Kevin A. Wunderle, PhD, A. Kyle Jones, PhD, Shalmali Dharmadhikari, PhD, Xinhui Duan, PhD, Don-Soo Kim, PhD, Usman Mahmood, MS, Steve D. Mann, PhD, Jeffery M. Moirano, MS, Rebecca A. Neill, MS, and Alan H. Schoenfeld, MS

Pilot study: machine data

- Surveyed pilot sites regarding fluoroscopic equipment, availability of radiation protective equipment, and its use
- Quarterly measurement of dose measuring device calibration factor for all fluoroscopes submitting data

Table 1. Fluoroscope Information from Participating Institutions

Manufacturer	Single-Plane Systems	Biplane Systems	Installation Date Range	Average Year of Installation
General Electric	6	0	2005–2019	2015
Philips	7	7	2002–2017	2011
Siemens	15	1	2004–2016	2012
Toshiba (Canon)	0	2	2008–2014	2011
Total	28	10	2002–2019	2012

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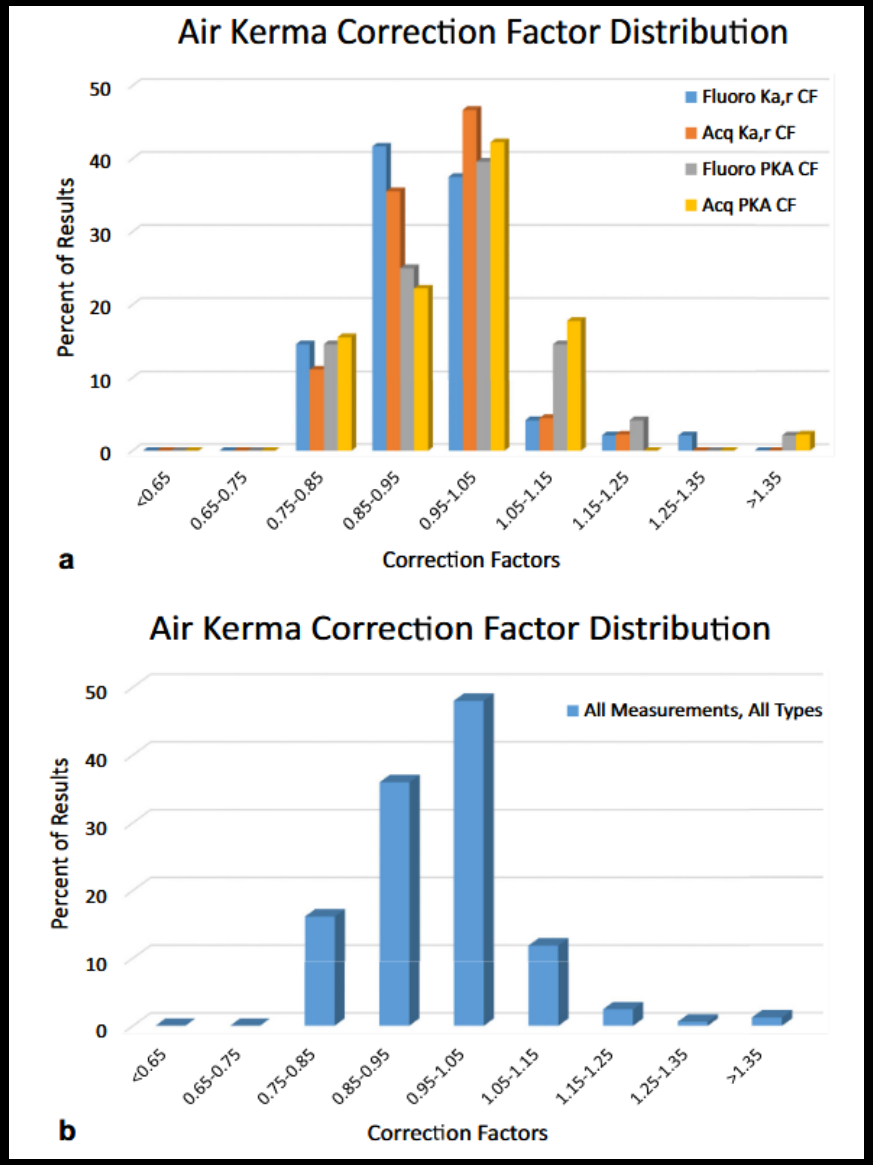
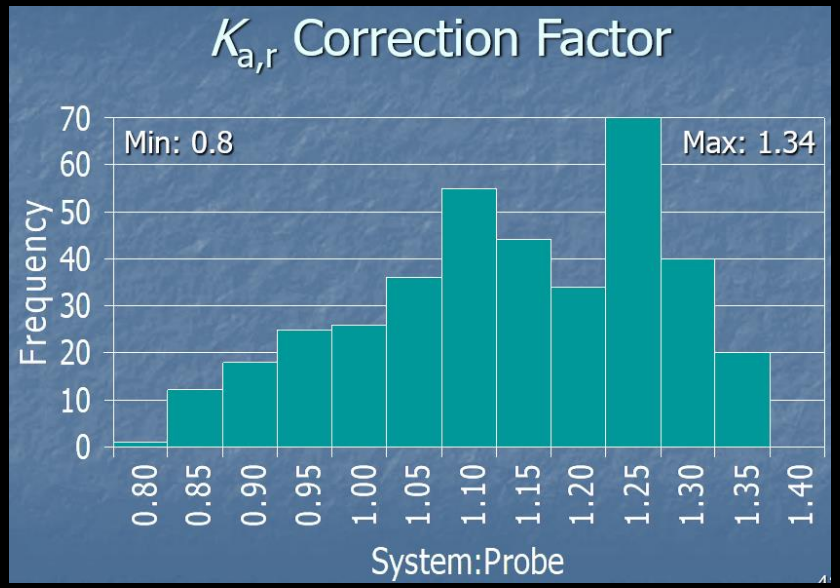
Table 2. Summary of Answers to Survey Questions

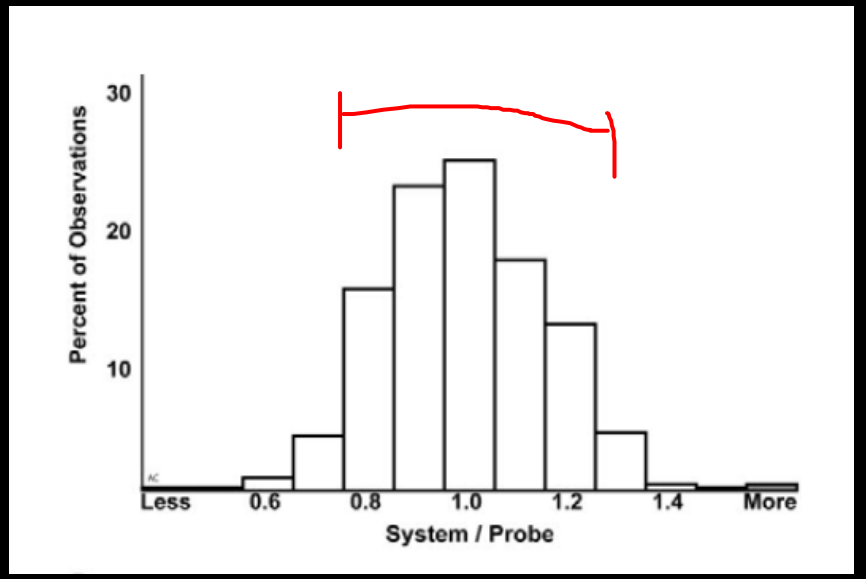
Question	Yes	No	Total
1. Does your facility/department have trainees (residents or fellows) performing procedures on this fluoroscope?	32	6	38
2. Does this fluoroscope have a large flat-panel primary display monitor (eg, ~60-inch monitor)?	26	12	38
3. Does this imaging suite have table skirts available (drapes hanging down from the table sides)?	38	0	38
3a. Are the table skirts routinely used (> 50% of the time)?	36	2	38
4. Does this imaging suite have table side shields available in the suite (shields affixed to the table side rails extending above the table)?	17	21	38
4a. Are the table side shields routinely used (> 50% of the time)?	9	8	17
5. Does this imaging suite have a pull-down (suspended or face) shield(s)?	38	0	38
5a. Is the pull-down shield(s) routinely used (> 50% of the time)?	24	14	38
6. Who primarily operates this fluoroscope during clinical procedures (MDs or radiologic technologists)?	30 (MD), 8 (tech)		38

Dose measuring device CF

- CF = Measured/Reported
- Report of AAPM TG 190 provides the method for measuring
- Space available to store single point calibration factor in RDSR
  - NEMA XR-27 provides the framework for actually storing this on the angio system







Radiation Doses in Interventional Radiology Procedures: The RAD-IR Study

Part III: Dosimetric Performance of the Interventional Fluoroscopy Units

Stephen Balter, PhD, Beth A. Schueler, PhD, Donald L. Miller, MD, Patricia L. Cole, PhD, MD, Hollington T. Lu, MS, MA, Alejandro Berenstein, MD, Robin Albert, MD, Jeffrey D. Georgia, MD, Patrick T. Noonan, MD,[1] Eric J. Russell, MD, Tim W. Malisch, MD,[2] Robert L. Vogelzang, MD, Michael Geisinger, MD, John F. Cardella, MD,[3] James St. George, MD,[4] George L. Miller III, MD,[5] and Jon Anderson, PhD

J Vasc Interv Radiol 2004; 15:919–926

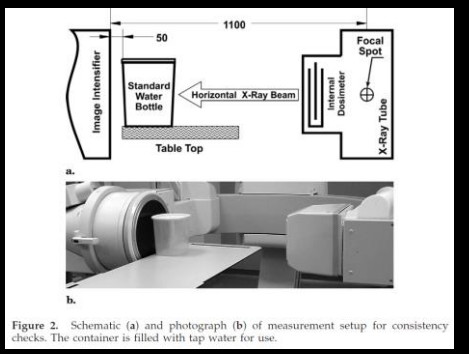
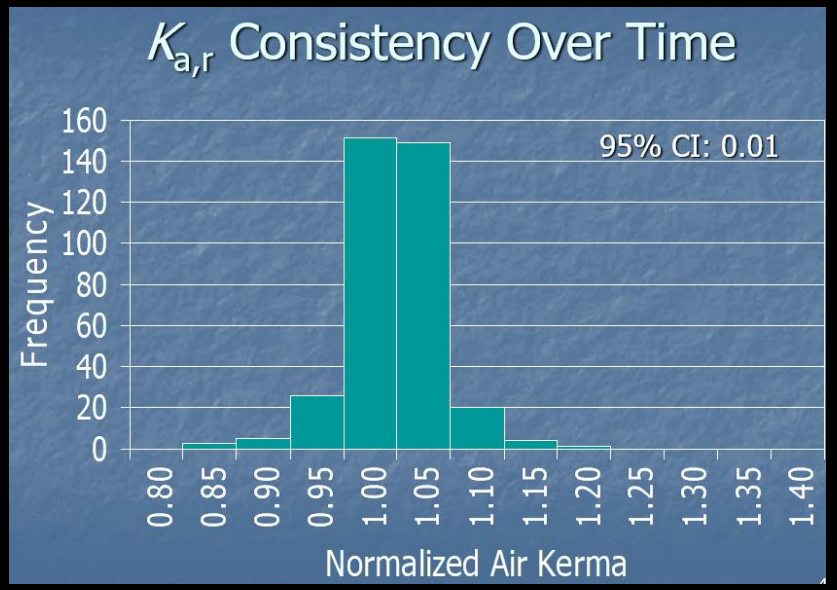
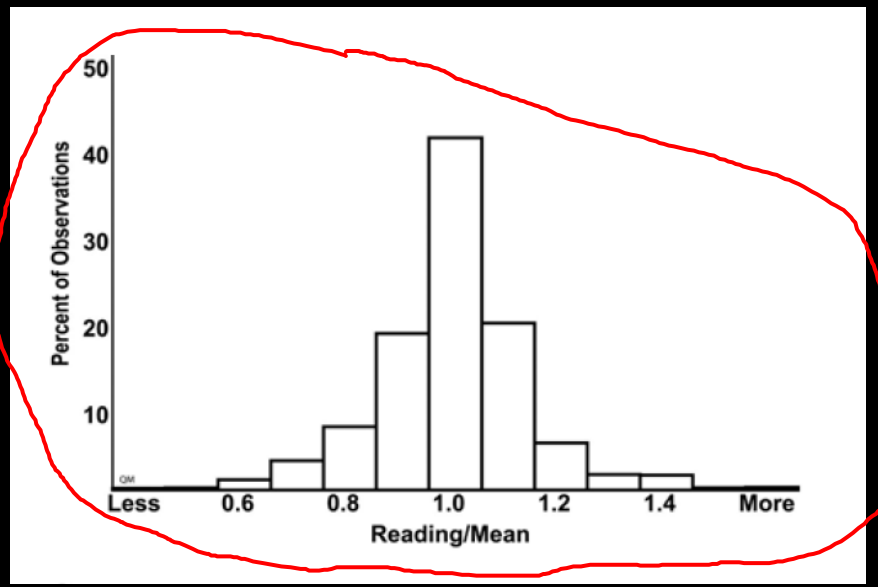


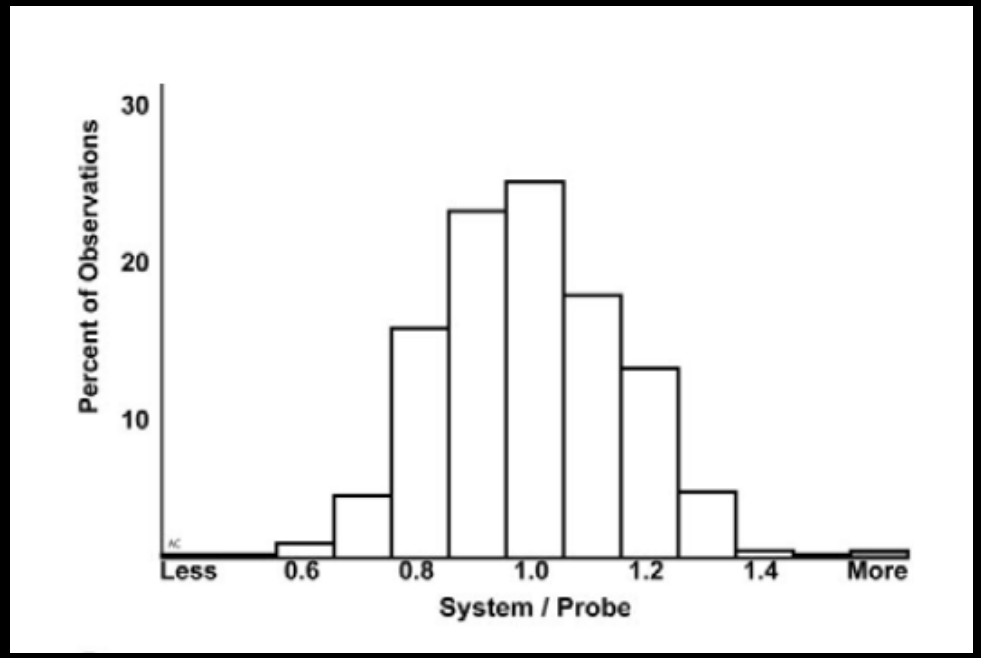
Figure 2. Schematic (a) and photograph (b) of measurement setup for consistency checks. The container is filled with tap water for use.



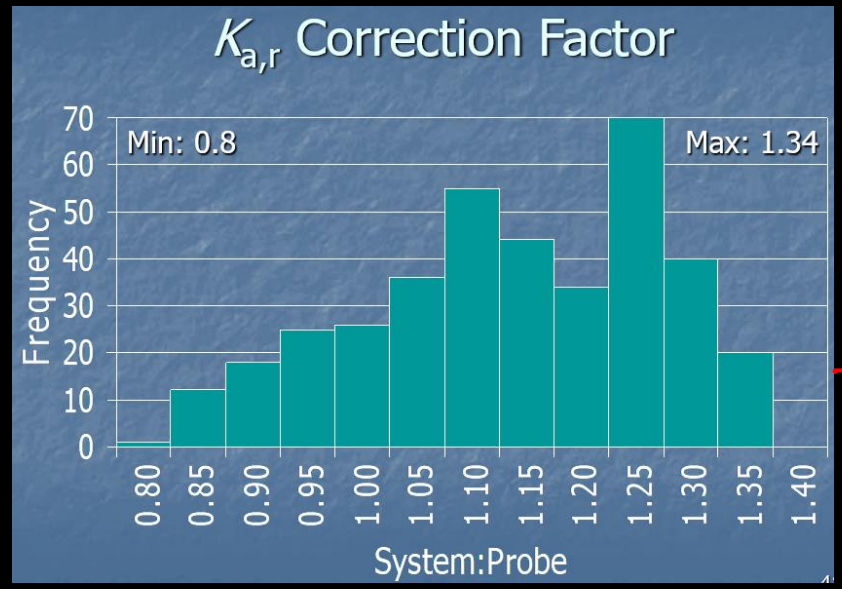


Beth Schueler, AAPM 2010

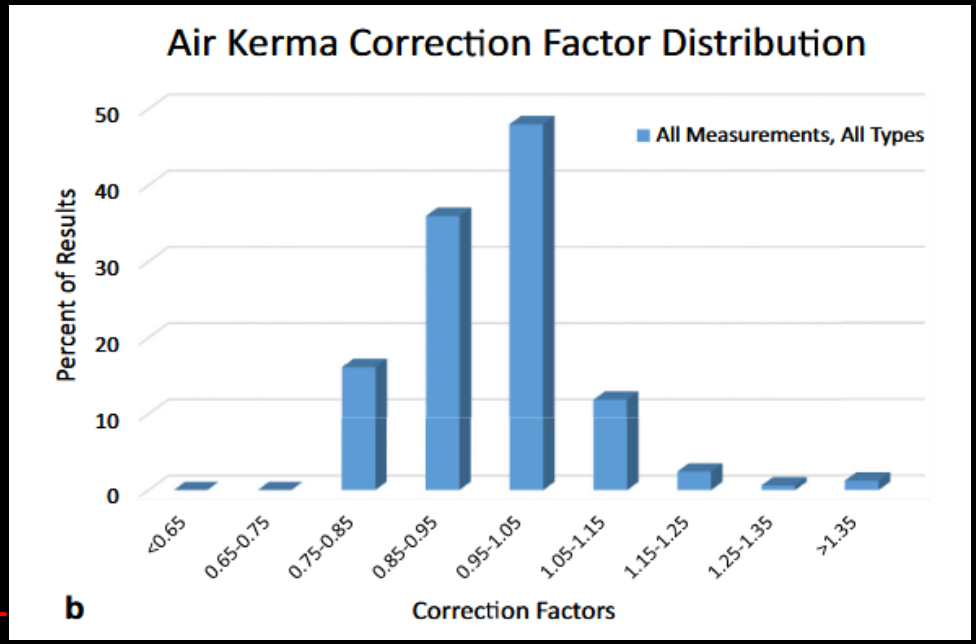
Balter, RAD-IR



Balter, RAD-IR, ca. 2000



Beth Schueler, AAPM 2010



Wunderle, DIR-Fluoro, 2018-2019

Table 3. Results of $K_{a,r}$ and P_{KA} Accuracy Tests in Fluoroscopic and Acquisition Modes

Dose Index	Mean (95% CI)	Range	SD	n
Fluoroscopic $K_{a,r}$	0.94 (0.92–0.96)	0.80–1.26	0.10	120
Acquisition $K_{a,r}$	0.95 (0.93–0.96)	0.77–1.19	0.08	114
Fluoroscopic P_{KA}	0.96 (0.93–0.98)	0.77–1.49	0.14	120
Acquisition P_{KA}	0.98 (0.95–1.00)	0.76–1.44	0.14	114
Absolute difference (fluoroscopic$_i$ – acquisition$_i$)	0.03 (0.03–0.03)	0–0.14	0.03	228

CI = confidence interval; $K_{a,r}$ = reference-point air kerma; P_{KA} = air kerma–area product; SD = standard deviation.

Table 1
Summary Statistics: Comprehensive Dosimetry Measurements

	Ratio of System to Probe Measurements*					
	Sample Size	Mean	95% CI	Median	Standard Deviation	Non-normalized Mean†
						Acquisition mGy/Frame
All 30 cm PMMA	144	0.93	0.91–0.95	0.90	0.13	11.8
All 20 cm PMMA	144	0.99	0.97–1.01	0.97	0.14	5.3
All 10 cm PMMA	143	1.06	1.02–1.11	1.06	0.27	0.5
						20 cm PMMA mGy/min
All Continuous Fluoroscopy	144	1.03	0.99–1.07	1.02	0.24	28.3
All Pulsed Fluoroscopy	143	1.02	1.00–1.05	1.01	0.16	14.0
All Fluoroscopy	287	1.03	1.00–1.05	1.02	0.20	‡
						mGy/Frame
All Acquisition	144	0.93	0.90–0.96	0.90	0.17	5.3
All Data	431	0.99	0.98–1.01	0.98	0.20	—‡

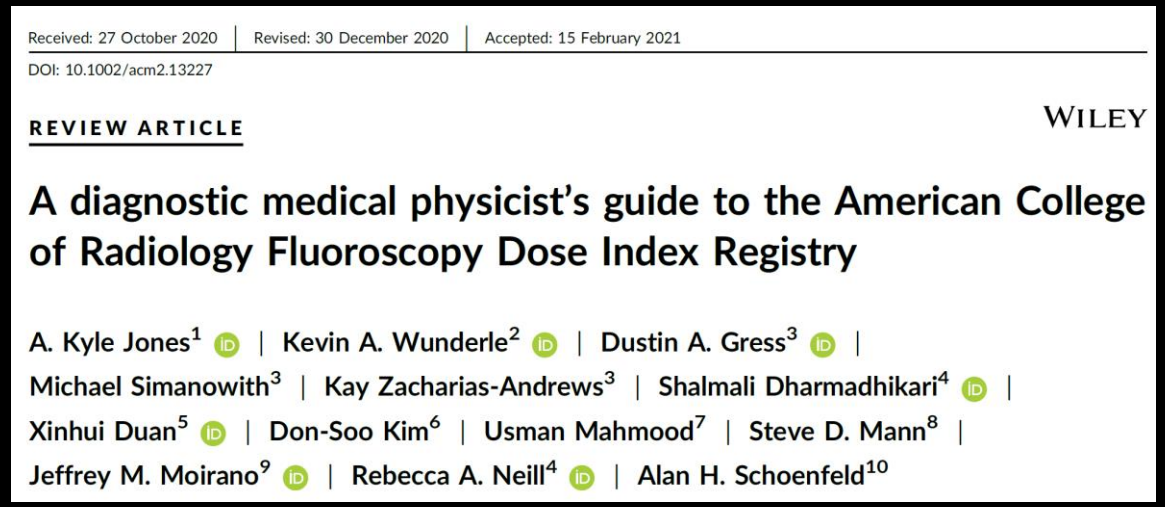
* Expected value = 0.93.
† Pooled over all biplane (neuro) and monoplane (body) systems.
‡ Further pooling is not appropriate.

	Phantom	Ka rate (mGy/min)	Ka rate @ IRP (mGy/min)	Ka rate @ FDA (mGy/min)	Audible alarm?	Ka,r rate (mGy/min)
FL Angio 7.5 pps	8" PMMA	9.00	4.7	2.4		5.0
	12" PMMA	94.53	49.6	24.7		50.0
	Pb	288.10	151.2	75.3		149.0

Pilot participation guide

- The diagnostic medical physicist representatives from the pilot sites collaborated with the ACR to publish a participation guide

- Step-by-step guide to participating in the ACR DIR-Fluoro



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REVIEW ARTICLE

WILEY

A diagnostic medical physicist's guide to the American College of Radiology Fluoroscopy Dose Index Registry

A. Kyle Jones[1] | Kevin A. Wunderle[2] | Dustin A. Gress[3] | Michael Simanowith[3] | Kay Zacharias-Andrews[3] | Shalmali Dharmadhikari[4] | Xinhui Duan[5] | Don-Soo Kim[6] | Usman Mahmood[7] | Steve D. Mann[8] | Jeffrey M. Moirano[9] | Rebecca A. Neill[4] | Alan H. Schoenfeld[10]

Connecting to the TRIAD server

- Three basic options to send **RDSR** to TRIAD

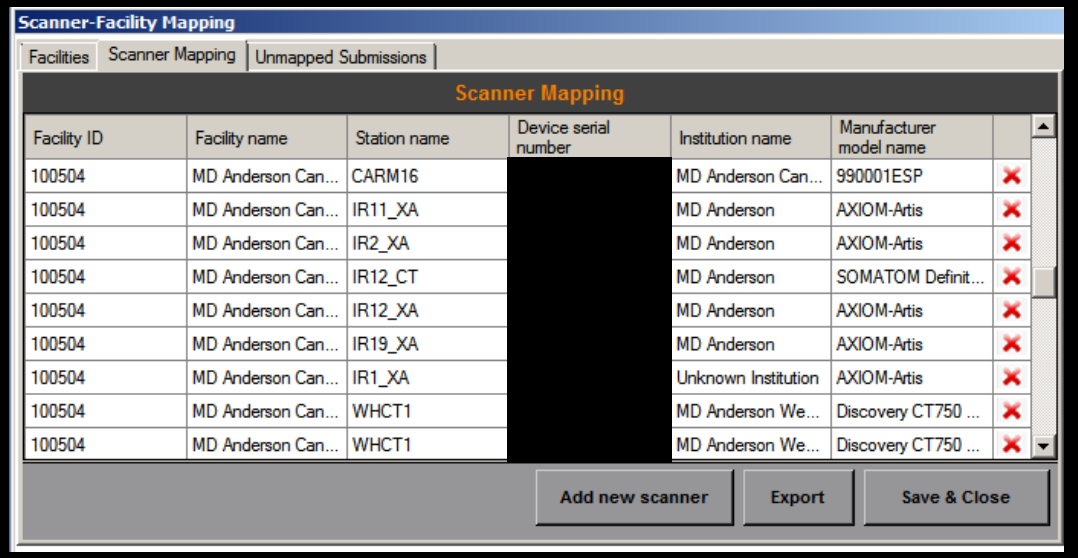
1. Direct connection to TRIAD server using IP, AET, and port

2. Routing to TRIAD through a Radiation Dose Index Monitoring (RDIM) system
   - Must ensure that RDSR is passed through without modification

3. Routing to TRIAD from PACS

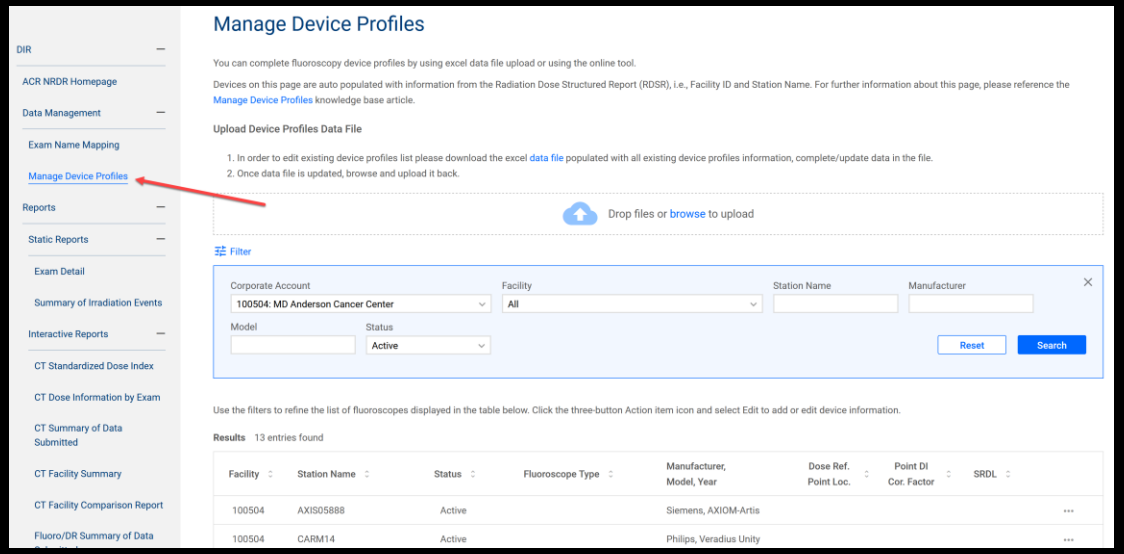
Configuring fluoroscopes on the TRIAD server

- Any fluoroscope that intends to send RDSR to the registry must be configured on the TRIAD server
  - Otherwise RDSR will be quarantined
- At a minimum, the Station Name must be configured
  - Anything that is configured must be an exact match



Device profile

- Allows basic information about a fluoroscope to be entered
- Facilitates data analysis



Edit Device Profile

Facility	Station Name	Manufacturer	Model
100504	IR10_XA	Siemens	AXIOM-Artis

Status	Year of Manufacture	Fluoroscope Type
Active	2015	Single plane

Location of dose reference point: 64 (cm)

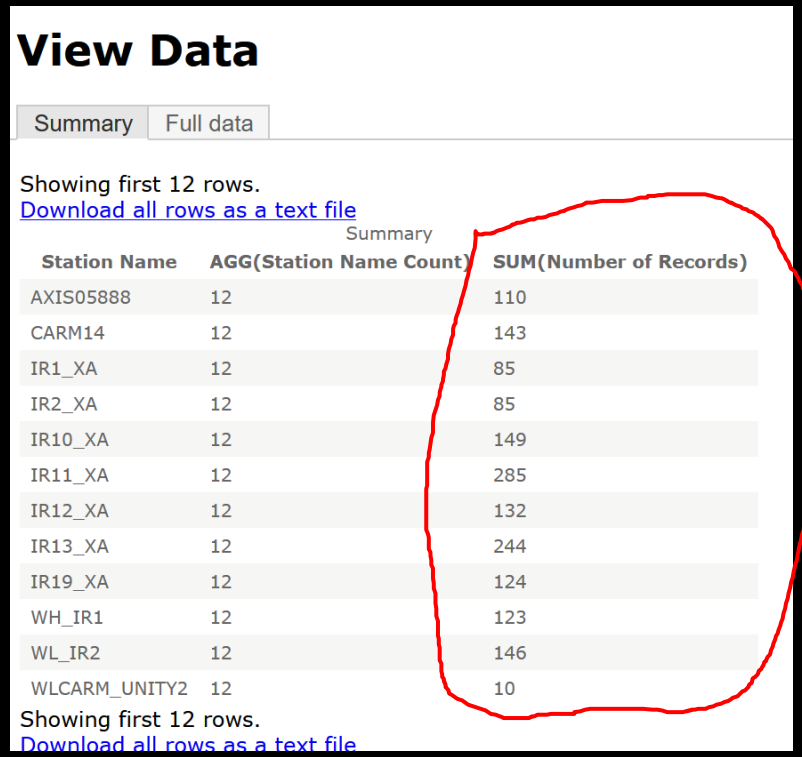
Single point dose index correction factor: 1.0

Substantial radiation dose level: 7,500 (mGy)

Cancel Save

Data validation – initial

- Data being received from all fluoroscopes that a site intends to connect to TRIAD
- Full RDSR being received from each fluoroscope
  - Including correct Station Name
- Use the “Fluoro Summary of Data Submitted” tab



View Data

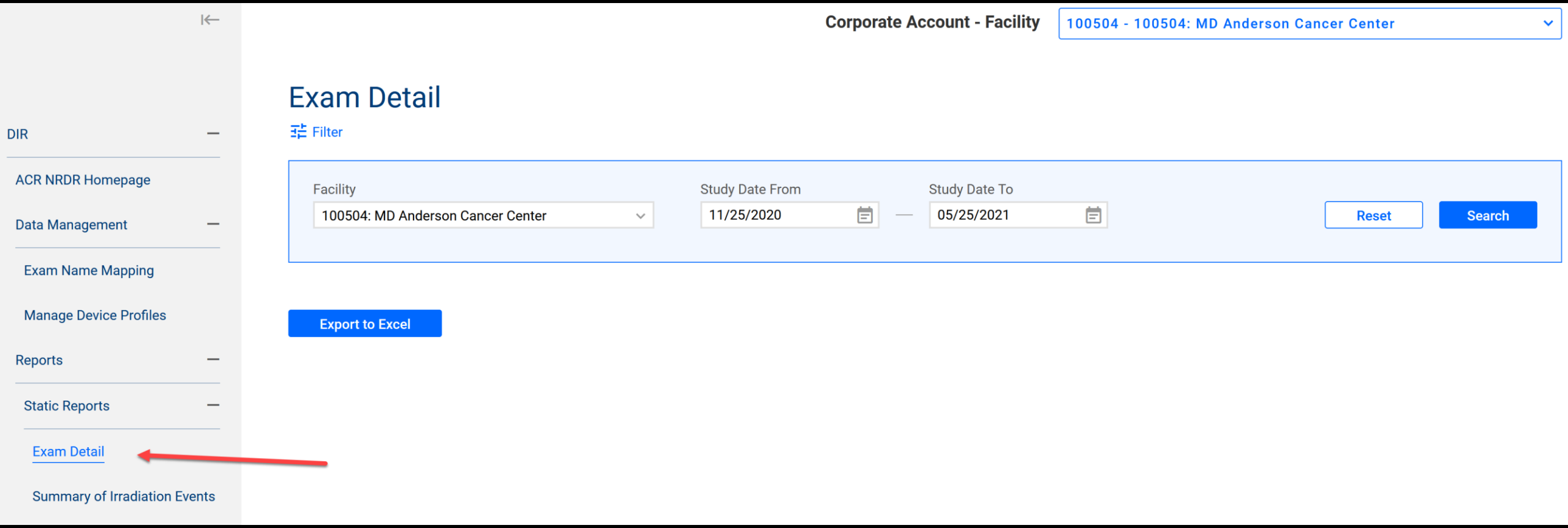
Summary | Full data

Showing first 12 rows.
Download all rows as a text file

Summary

Station Name	AGG(Station Name Count)	SUM(Number of Records)
AXIS05888	12	110
CARM14	12	143
IR1_XA	12	85
IR2_XA	12	85
IR10_XA	12	149
IR11_XA	12	285
IR12_XA	12	132
IR13_XA	12	244
IR19_XA	12	124
WH_IR1	12	123
WL_IR2	12	146
WLCARM_UNITY2	12	10

Showing first 12 rows.
Download all rows as a text file


Corporate Account - Facility
100504 - 100504: MD Anderson Cancer Center
Exam Detail
Filter
DIR
ACR NRDR Homepage
Data Management
Exam Name Mapping
Manage Device Profiles
Reports
Static Reports
Exam Detail
Summary of Irradiation Events
Facility
100504: MD Anderson Cancer Center
Study Date From
11/25/2020
Study Date To
05/25/2021
Reset
Search
Export to Excel

Exam search

Exam Search

Facility 100504: MD Anderson Cancer Center
ACR Common: All

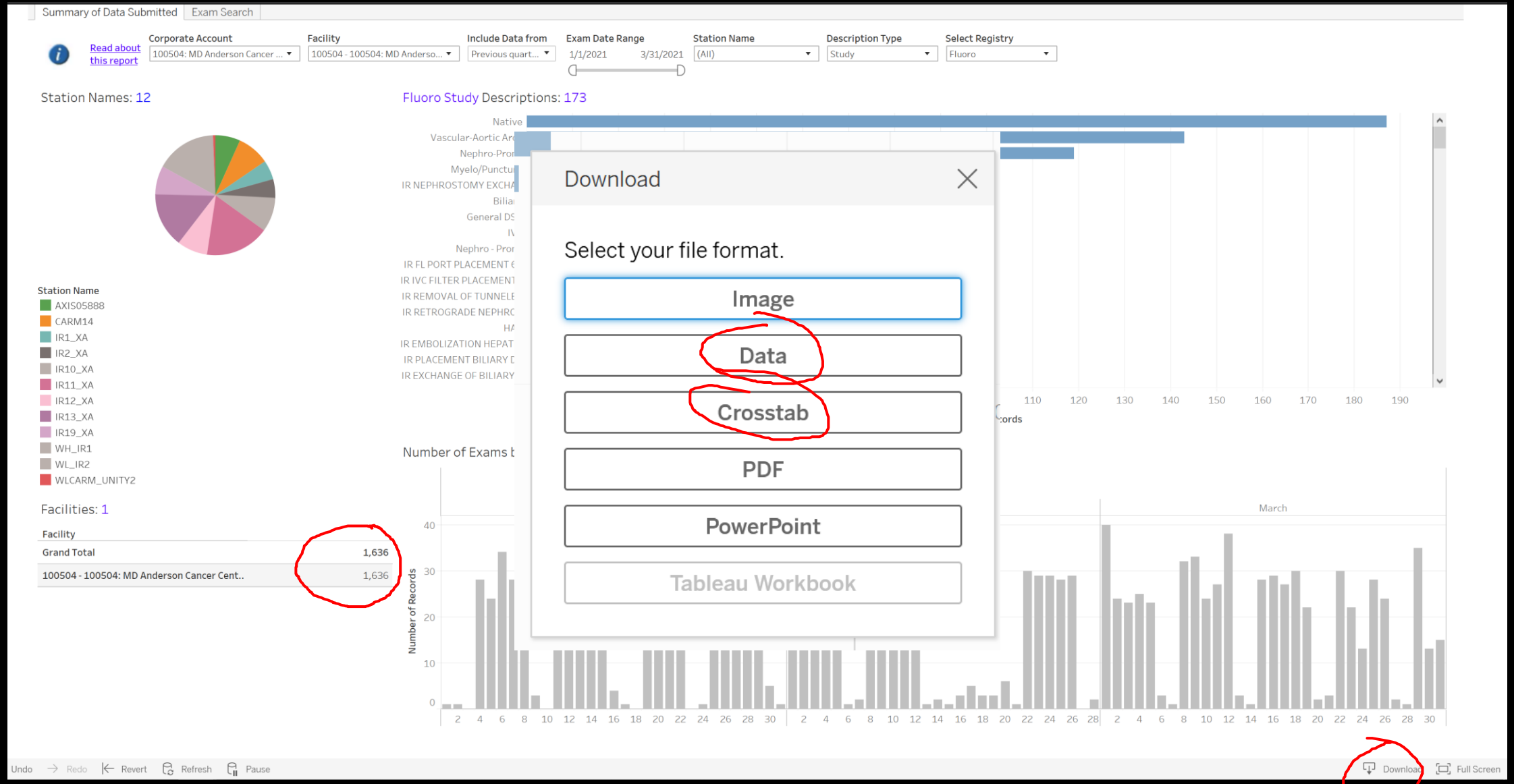
Total Exams: 145

ACR/Req./Study	[redacted]	(A) Total Fluoro Time (min.)	(B) Reference Air Kerma (mGy)	(C) Air Kerma Area Product (Gy*cm^2)	(B / A) Reference Air Kerma Rate (mGy/min.)	(C / B) Average Field Size (cm^2)	Pct Event With Filter
4002249: XRAY, spine, area of interest		0.5	4.9	0.7	9.5	139.2	100.0
		0.3	5.5	0.8	19.3	149.7	94.4
		0.2	11.7	2.3	77.7	195.8	94.1
		1.1	17.7	3.6	15.7	205.0	96.4
		0.2	5.4	0.9	23.1	175.8	96.2
		0.4	17.2	2.0	49.2	116.5	93.2
		0.2	17.2	2.0	103.3	117.8	88.9
		0.4	3.4	0.6	8.5	167.8	95.0
4011275: INV-FLUOR, artery embolization, abdomen-pelvis, viscera		12.1	373.6	31.1	30.8	83.1	100.0
		39.4	1,286.0	70.5	32.7	54.8	100.0
		9.2	1,031.1	124.4	112.3	120.6	100.0
4011285: INV-FLUOR, biliary catheter exchange, abdomen, liver		4.0	28.7	5.2	7.2	181.3	100.0
		1.2	10.8	3.6	9.4	337.3	0.0
		1.9	9.7	3.2	5.0	326.6	100.0
		4.3	25.9	5.7	6.1	222.0	100.0
		3.9	29.5	5.0	7.5	170.5	100.0
		2.3	22.5	5.8	9.8	257.0	100.0
		2.3	27.1	6.8	11.7	250.6	100.0
		5.8	232.3	25.3	39.8	109.0	100.0
4011292: INV-FLUOR, percutane..		2.0	16.1	5.8	7.9	361.6	100.0
4011300: INV-FLUOR, gastrostomy catheter exchange, abdomen, stomach		5.3	16.1	3.3	3.0	207.7	100.0
		4.1	73.1	15.3	17.9	209.5	100.0
		2.2	32.4	7.9	14.8	244.6	100.0
		1.3	4.9	1.1	3.8	232.8	100.0
		2.2	30.5	5.9	13.9	194.1	100.0
		0.6	1.9	0.5	3.0	260.5	100.0
4011302: INV-FLUOR, gastroje..		1.6	24.0	8.3	15.2	345.4	100.0
4011309: INV-FLUOR, gastrostomy catheter placement, abdomen, stomach		2.3	14.0	2.0	6.1	146.0	100.0
		5.2	123.5	19.3	23.6	156.4	0.0
		1.8	11.1	2.6	6.1	233.3	100.0

Data validation – periodic

- Compare internal procedure volumes to DIR-Fluoro data
  - IF(overall volumes match closely)
    END

- If there is a mismatch, then further analysis at the level of Station Name or Study Description | Requested Procedure Description may be required


Summary of Data Submitted
Exam Search
Read about this report
Corporate Account
100504: MD Anderson Cancer ...
Facility
100504 - 100504: MD Anderso...
Include Data from
Previous quart...
Exam Date Range
1/1/2021
3/31/2021
Station Name
(All)
Description Type
Study
Select Registry
Fluoro
Station Names: 12
Fluoro Study Descriptions: 173
Native
Vascular-Aortic Ar
Nephro-Pror
Myelo/Punctu
IR NEPHROSTOMY EXCHA
Bilia
General DS
IV
Nephro - Pror
IR FL PORT PLACEMENT E
IR IVC FILTER PLACEMENT
IR REMOVAL OF TUNNELE
IR RETROGRADE NEPHRC
HA
IR EMBOLIZATION HEPAT
IR PLACEMENT BILIARY D
IR EXCHANGE OF BILIARY
110 120 130 140 150 160 170 180 190
cords
Download
Select your file format.
Image
Data
Crosstab
PDF
PowerPoint
Tableau Workbook
Station Name
AXIS05888
CARM14
IR1_XA
IR2_XA
IR10_XA
IR11_XA
IR12_XA
IR13_XA
IR19_XA
WH_IR1
WL_IR2
WLCARM_UNITY2
Facilities: 1
Facility
Grand Total 1,636
100504 - 100504: MD Anderson Cancer Cent.. 1,636
Number of Exams b
March
Number of Records
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2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
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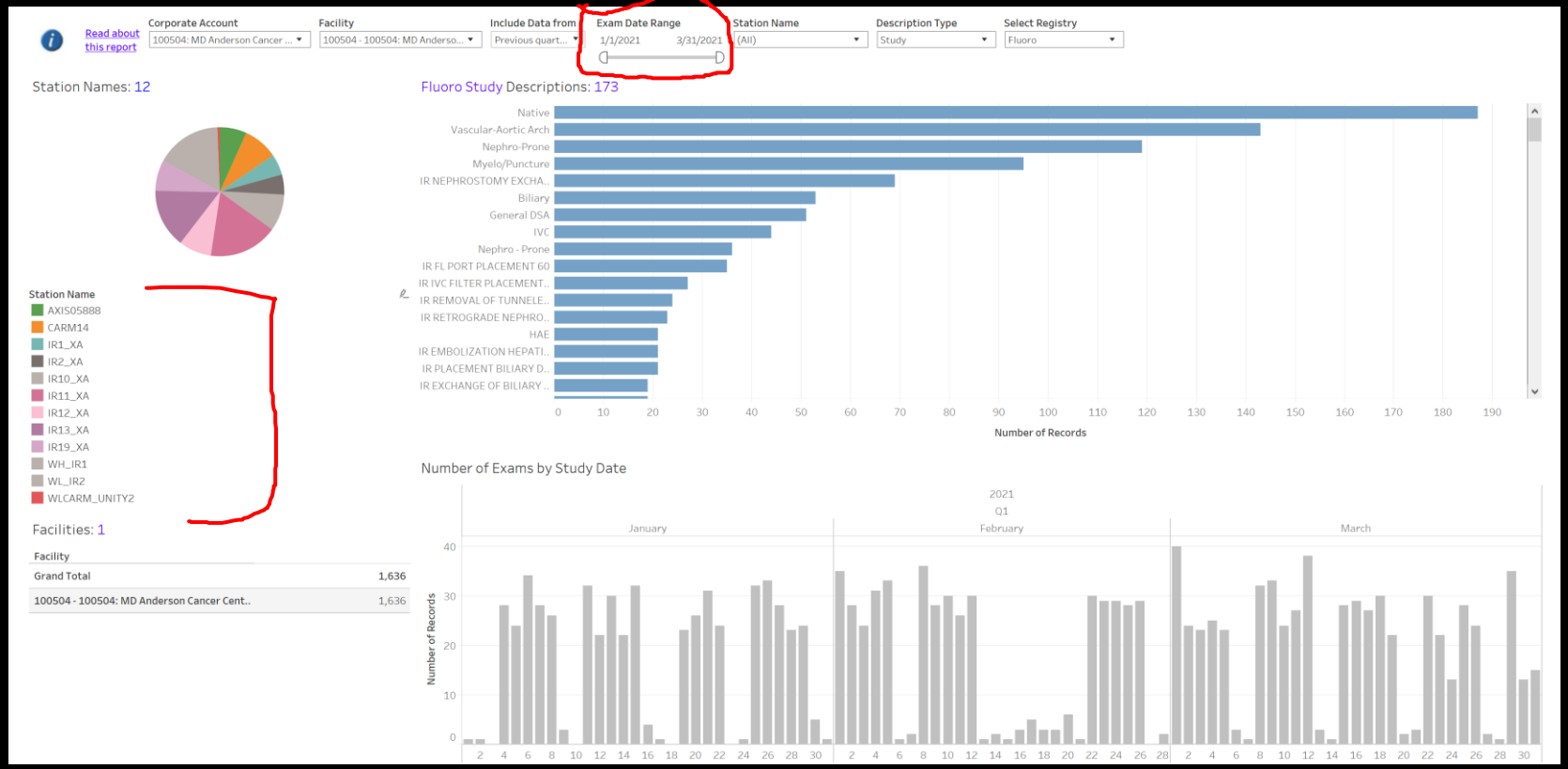
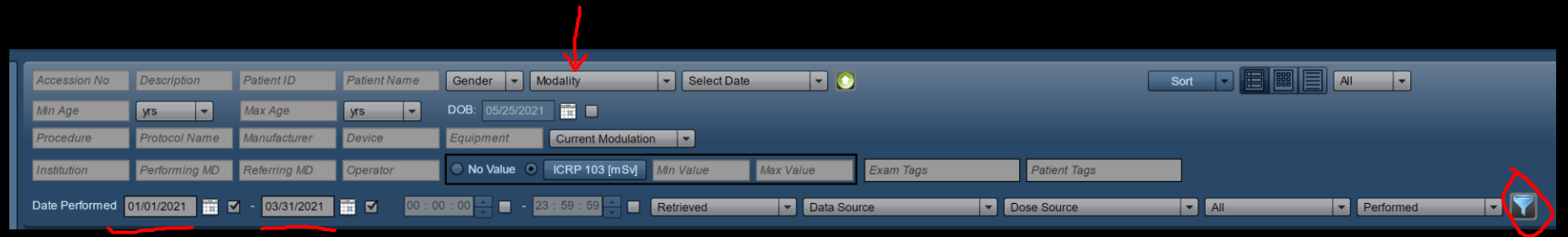
Redo
Revert
Refresh
Pause
Download
Full Screen



Facilities: 1

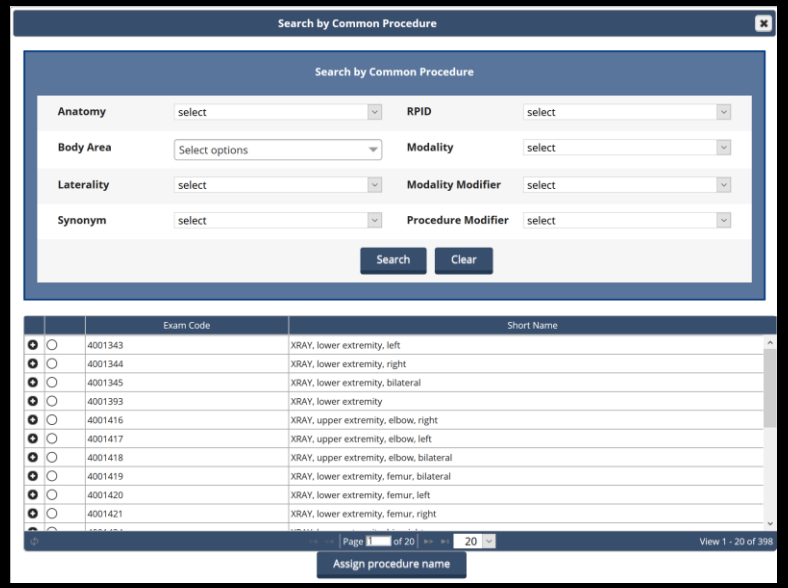
Facility	
Grand Total	1,636
100504 - 100504: MD Anderson Cancer Cent..	1,636



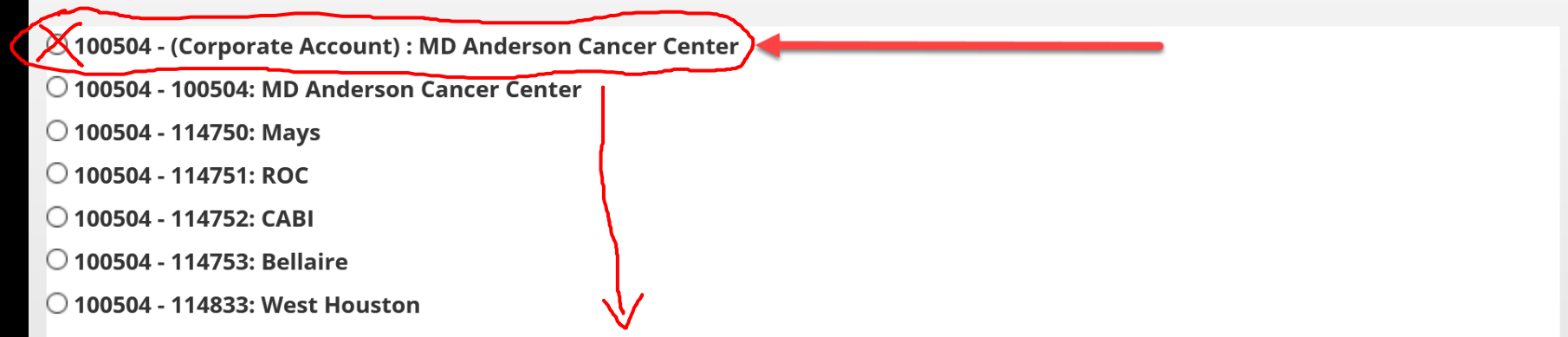
Procedure mapping

- The secret sauce of DIR-Fluoro
- Accurate mapping is critical for sites to receive the highest quality actionable feedback
- It is possible – overall mapping discrepancy rate at the end of the pilot was < 1%
  - Three rounds of mapping validation

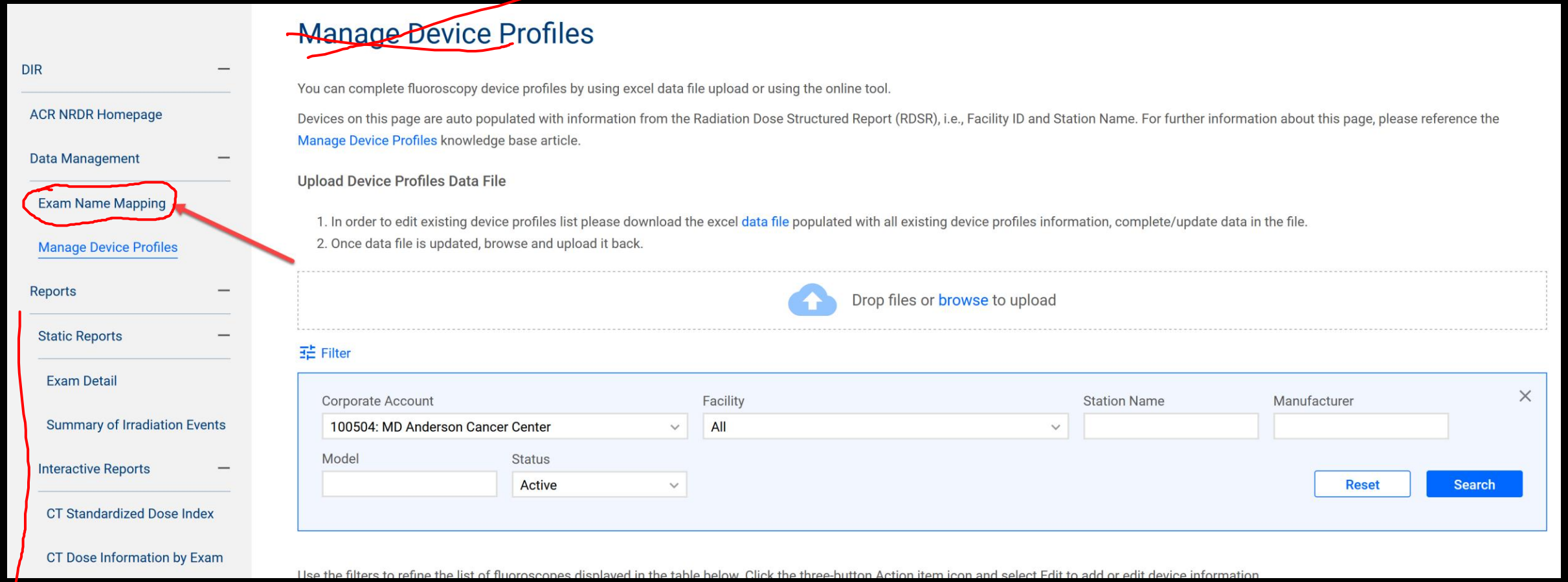
RecordId	StudyDescription | Requested Procedure Description	AcrCommonId	Status
47880	+++HAE+++ | Null	9999998 INV-FLUOR.Unwanted	Tagging Completed
6817	+++HAE+++ | IR RADIOEMBOLIZATION THERASPHERES - TREATMENT	4012735 Inv-Fluoro, Hepatic Radioembolization Admin, Abdomen, Liver	Tagging Completed
6816	+++HAE+++ | IR RADIOEMBOLIZATION SIR SPHERES - TREATMENT	4012735 Inv-Fluoro, Hepatic Radioembolization Admin, Abdomen, Liver	Tagging Completed
47881	+++Native+++ | Null	9999998 INV-FLUOR.Unwanted	Tagging Completed
6820	+++Native+++ | IR CHEST TUBE PLACEMENT (FOR PNEUMOTHORAX)	4011699 INV-FLUOR, chest tube placement, chest, lungs	Tagging Completed
6821	+++Native+++ | IR FL ASPIRATION AND INJECTION BONE CYST	4011690 INV-FLUOR, drainage aspiration, unspecified	Tagging Completed
6819	+++Native+++ | IR CHEST TUBE EXCHANGE/REPOSITION	9999998 INV-FLUOR.Unwanted	Tagging Completed
6822	+++Native+++ | IR GASTROSTOMY CATHETER EXCHANGE/RE-INSERTION	4011300 INV-FLUOR, gastrostomy catheter exchange, abdomen, stomach	Tagging Completed
47882	++HAE++ | Null	9999998 INV-FLUOR.Unwanted	Tagging Completed
6828	++HAE++ | IR RADIOEMBOLIZATION SIR SPHERES - TREATMENT	4012735 Inv-Fluoro, Hepatic Radioembolization Admin, Abdomen, Liver	Tagging Completed
6826	++HAE++ | IR HEPATIC CHEMO EMBOLIZATION DEB W DOXORUBICIN	4011364 INV-FLUOR, tumor arterial embolization, abdomen, liver	Tagging Completed
6824	++HAE++ | IR ANGIOGRAPHY VISCERAL SELECTIVE (INITIAL)	4011595 INV-FLUOR, angiography, abdomen-pelvis, visceral arteries	Tagging Completed
86219	++HAE++ | IR SIR SPHERES-TREATMENT	4012735 Inv-Fluoro, Hepatic Radioembolization Admin, Abdomen, Liver	Tagging Completed
86220	++HAE++ | IR THERASPHERE-TREATMENT	4012735 Inv-Fluoro, Hepatic Radioembolization Admin, Abdomen, Liver	Tagging Completed
6827	++HAE++ | IR RADIOEMBOLIZATION SIR SPHERES - DIAGNOSTIC	4012734 Inv-Fluoro, Hepatic Radioembolization Prep, Abdomen, Liver	Tagging Completed
6825	++HAE++ | IR EMBOLIZATION SPLENIC ARTERY	4011387 INV-FLUOR, artery embolization, abdomen, spleen	Tagging Completed
6839	++Native++ | IR GASTROJEJUNOSTOMY TUBE PLACE	4011308 INV-FLUOR, gastrojejunostomy tube placement, abdomen-pelvis, stomach-jejunum	Tagging Completed
6832	++Native++ | IR CENTRAL VENOUS LINE REPOSITION	9999998 INV-FLUOR.Unwanted	Tagging Completed
6843	++Native++ | IR PERC FEEDING GASTROSTOMY PLACEMENT	4011309 INV-FLUOR, gastrostomy catheter placement, abdomen, stomach	Tagging Completed
6842	++Native++ | IR NEPHRO-URETERAL CATHETER EXCHANGE	4011348 INV-FLUOR, percutaneous nephroureteral stent exchange, abdomen-pelvis, kidney-urethra	Tagging Completed
86221	++Native++ | IR FL SUPRAPUBIC CATHETER PLACEMENT	4011681 INV-FLUOR, genitourinary catheter placement, suprapubic, pelvis, urethra-bladder	Tagging Completed
47883	++Native++ | Null	9999998 INV-FLUOR.Unwanted	Tagging Completed
86222	++Native++ | IR PERC GASTROSTOMY DRAIN PLACEMENT	4011309 INV-FLUOR, gastrostomy catheter placement, abdomen, stomach	Tagging Completed
6847	++Native++ | IR TUNNELED PLEURAL CATHETER PLACEMENT	4011371 INV-FLUOR, pleural catheter placement, tunneled, chest	Tagging Completed
6830	++Native++ | IR ABSCESS CATHETER EVALUATION	4011696 INV-FLUOR, drainage catheter check and removal, unspecified	Tagging Completed
6846	++Native++ | IR TUNNELED CENTRAL VENOUS CATHETER PLACEMENT	4011269 INV-FLUOR, central venous catheter placement, tunneled, chest	Tagging Completed
87247	++Native++ | IR CONVERSION OF GASTROSTOMY TO GASTROJEJUNOSTOMY CATHETER	4011523 INV-FLUOR, gastrostomy to gastrojejunostomy catheter conversion, abdomen-pelvis, stomach-jejunum	Tagging Completed
6840	++Native++ | IR GASTROSTOMY TUBE EVALUATION	9999998 INV-FLUOR.Unwanted	Tagging Completed
6835	++Native++ | IR CHOLANGIOGRAPHY THRU EXISTING CATHETER	9999998	Not Tagged
86539	++Native++ | IR FL PORT PLACEMENT	4011658 INV-FLUOR, central venous access port placement, unspecified	Tagging Completed
6844	++Native++ | IR PERCUTANEOUS CHOLECYSTOSTOMY DRAIN PLACEMENT	4011292 INV-FLUOR, percutaneous cholecystotomy drain placement, abdomen, gallbladder	Tagging Completed
87082	++Native++ | IR CENTRAL VENOUS LINE EXCHANGE	4011541 INV-FLUOR, central venous line exchange, unspecified	Tagging Completed
6837	++Native++ | IR DOBHOFF TUBE PLACEMENT		Not Tagged
43826	++Native++ | IR INTRAPERITONEAL PLACEMENT (NON-TUNNELED)	4012741 Inv-Fluoro, Peritoneal Catheter Placement, Non-Tunneled, Abdomen, Peritoneum	Tagging Completed
6834	++Native++ | IR CHEST TUBE PLACEMENT (FOR PNEUMOTHORAX)	4011699 INV-FLUOR, chest tube placement, chest, lungs	Tagging Completed
6841	++Native++ | IR GJ TUBE EXCHANGE/RE-INSERTION	4011302 INV-FLUOR, gastrojejunostomy catheter exchange, abdomen-pelvis, stomach-jejunum	Tagging Completed



Facility List:



Service User is NOT one of the Administrative Roles defined in the NRDR


DIR
ACR NRDR Homepage
Data Management
Exam Name Mapping
Manage Device Profiles
Reports
Static Reports
Exam Detail
Summary of Irradiation Events
Interactive Reports
CT Standardized Dose Index
CT Dose Information by Exam
Manage Device Profiles
You can complete fluoroscopy device profiles by using excel data file upload or using the online tool.
Devices on this page are auto populated with information from the Radiation Dose Structured Report (RDSR), i.e., Facility ID and Station Name. For further information about this page, please reference the Manage Device Profiles knowledge base article.
Upload Device Profiles Data File
1. In order to edit existing device profiles list please download the excel data file populated with all existing device profiles information, complete/update data in the file.
2. Once data file is updated, browse and upload it back.
Drop files or browse to upload
Filter
Corporate Account
100504: MD Anderson Cancer Center
Facility
All
Station Name
Manufacturer
Model
Status
Active
Reset
Search
Use the filters to refine the list of fluoroscopes displayed in the table below. Click the three-button Action item icon and select Edit to add or edit device information

Lexicon

- **ACR Common** is the lexicon that drives DIR-Fluoro
- There are presently 206 specific interventional fluoroscopy procedures in Common
- Reviewed and updated on a regular basis

4011531	INV-FLUOR, transjugular intrahepatic portosystemic shunt, abdomen, liver
4011533	INV-FLUOR, transjugular intrahepatic portosystemic shunt revision, abdomen, liver
4011535	INV-FLUOR, angiography, unspecified, spine
4011536	INV-FLUOR, venous angioplasty, unspecified, veins
4011538	INV-FLUOR, abdominal aortic aneurysm endovascular repair, abdomen, aorta
4011540	INV-FLUOR, vein sampling, abdomen, adrenal
4011541	INV-FLUOR, central venous line exchange, unspecified
4011543	INV-FLUOR, diagnostic sinogram, unspecified
4011545	INV-FLUOR, percutaneous balloon dilation biliary duct, abdomen, liver
4011548	INV-FLUOR, tumor arterial embolization, head-neck
4011549	INV-FLUOR, tumor arterial embolization, spine
4011550	INV-FLUOR, tumor arterial embolization, unspecified
4011553	INV-FLUOR, radioembolization cir-spheres, unspecified
4011555	INV-FLUOR, radioembolization theraspheres, unspecified
4011556	INV-FLUOR, tumor arterial embolization, rib-chest
4011558	INV-FLUOR, artery embolization, abdomen-pelvis, uterus
4011561	INV-FLUOR, vein embolization, sclerotherapy, unspecified, single vein
4011566	INV-FLUOR, lymphangiogram, abdomen-pelvis, bilateral
4011567	INV-FLUOR, lymphangiogram, abdomen-pelvis, unilateral
4011568	INV-FLUOR, aortography, abdomen
4011570	INV-FLUOR, angiography, head-neck, carotid artery, bilateral
4011571	INV-FLUOR, angiography, head-neck, carotid artery, unilateral
4011572	INV-FLUOR, aortography, chest-abdomen-pelvis, aorta

Process health monitoring and maintenance

- RELEIF! You have finished after the initial configuration, data validation, and mapping

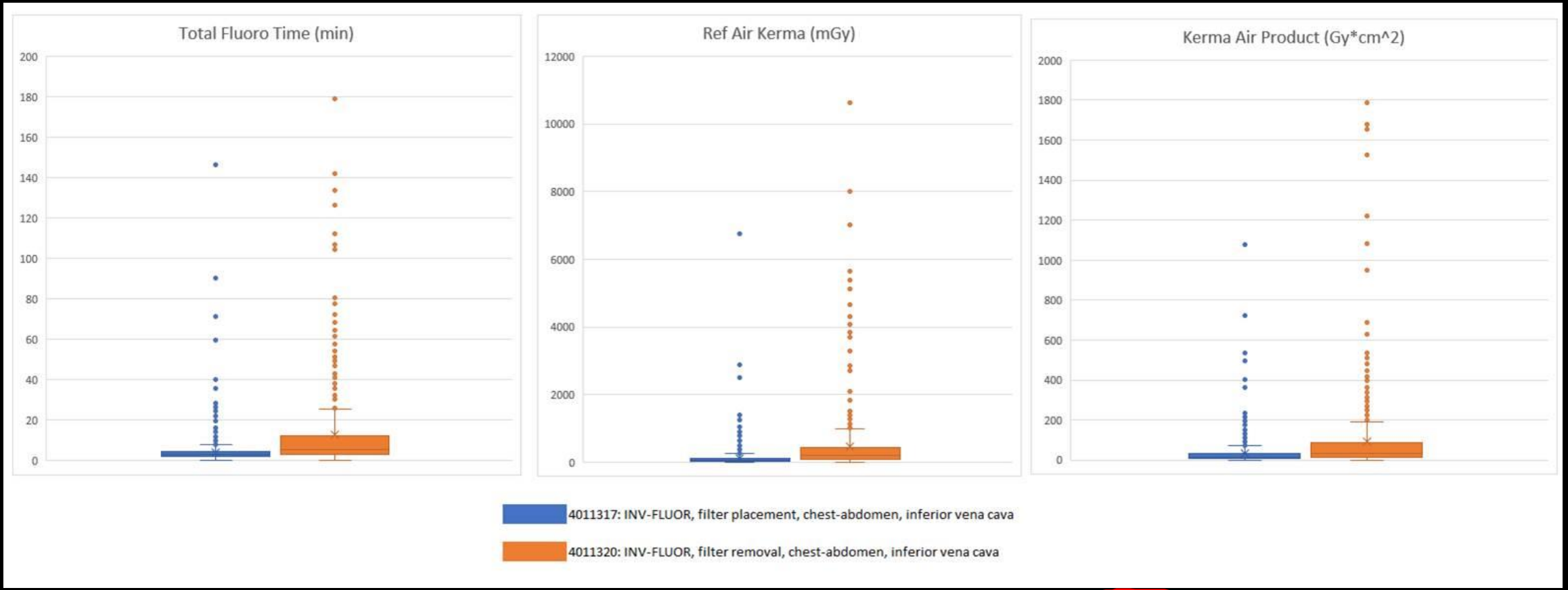
- Not so fast – a major key to ongoing success is maintenance
  - Mapping
  - Adding new fluoroscopes
  - Periodic data validation

- Initial mapping establishes a framework for maintenance and mapping of new procedures

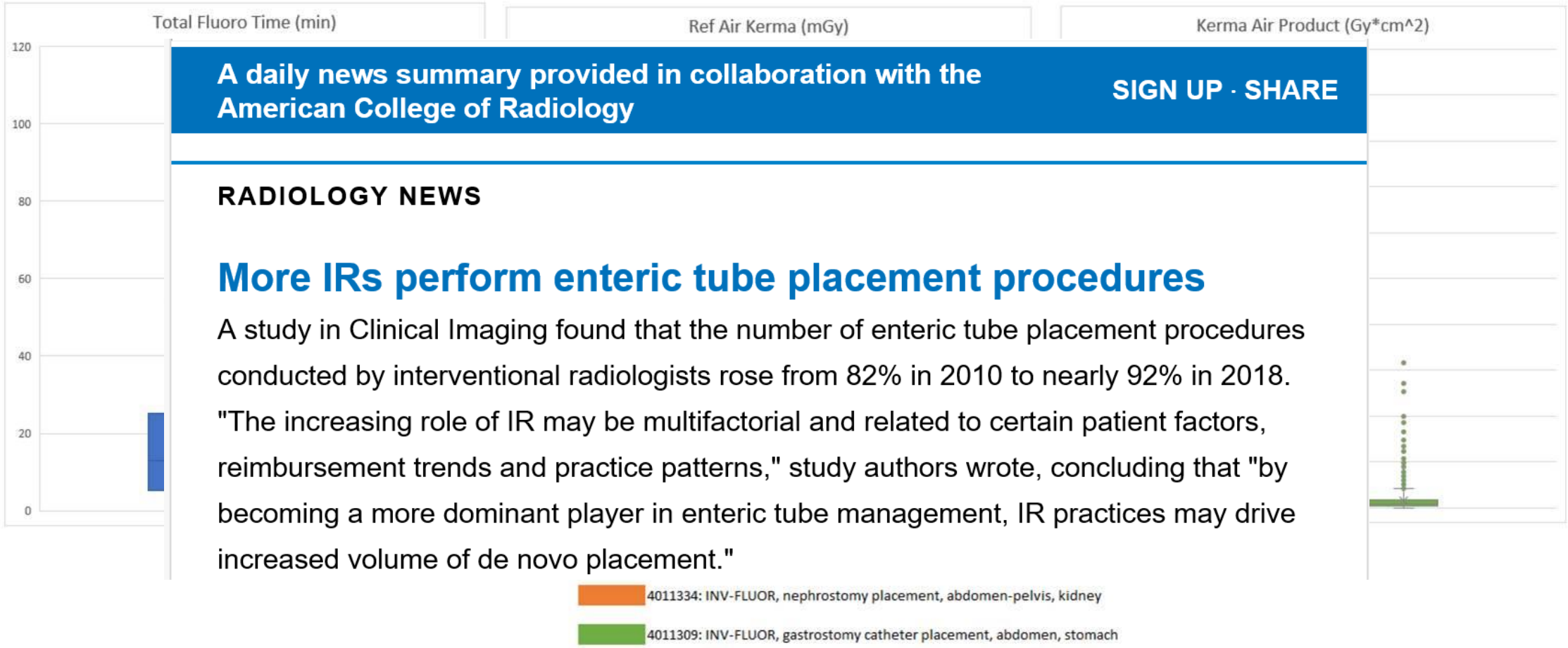
Analysis of clinical data from the pilot

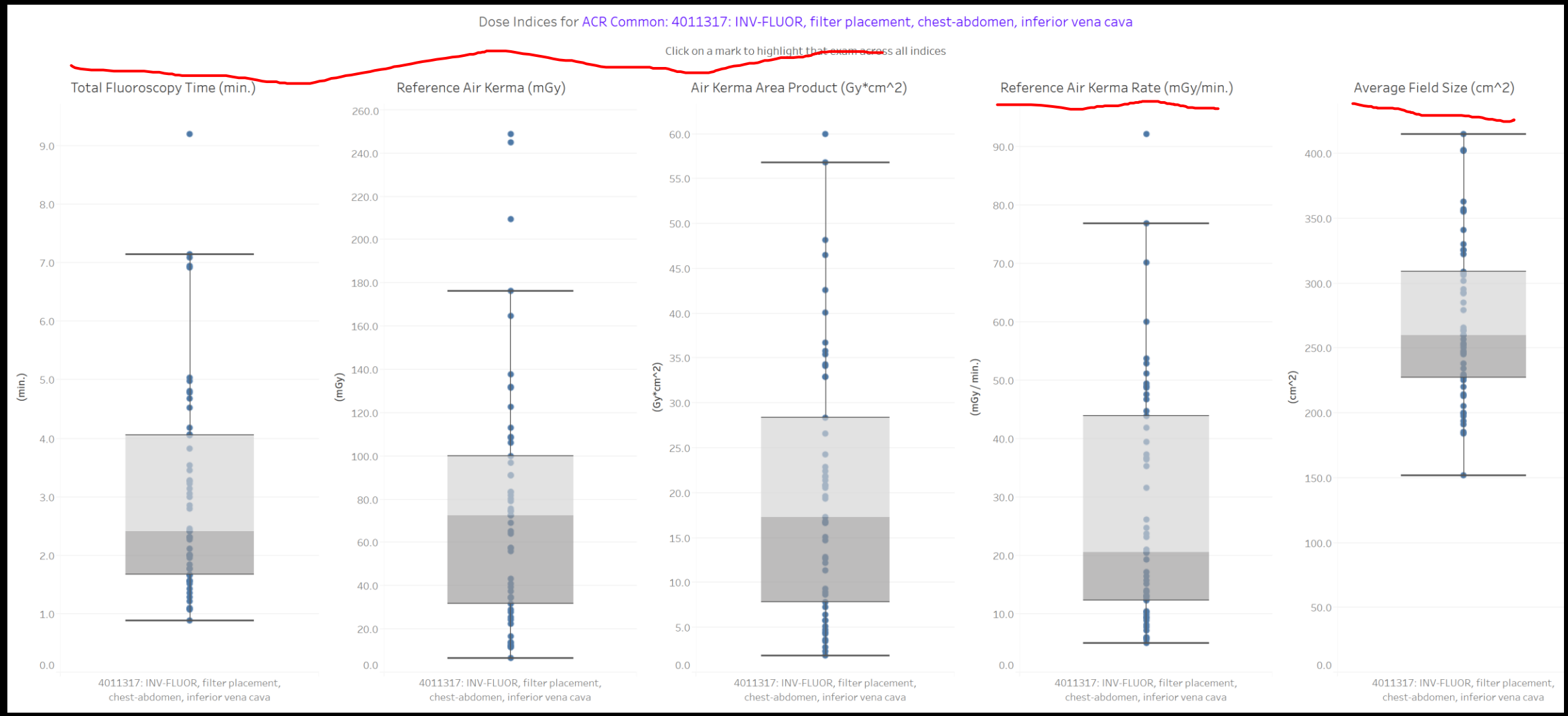
- Dose indices collected for more than 53,000 (mapped) procedures
- Final round of data validation indicates that mapping by pilot sites was excellent
  - Discrepancy rate < 1%
- Roll-up concept to be implemented, will result in inclusion of more procedures

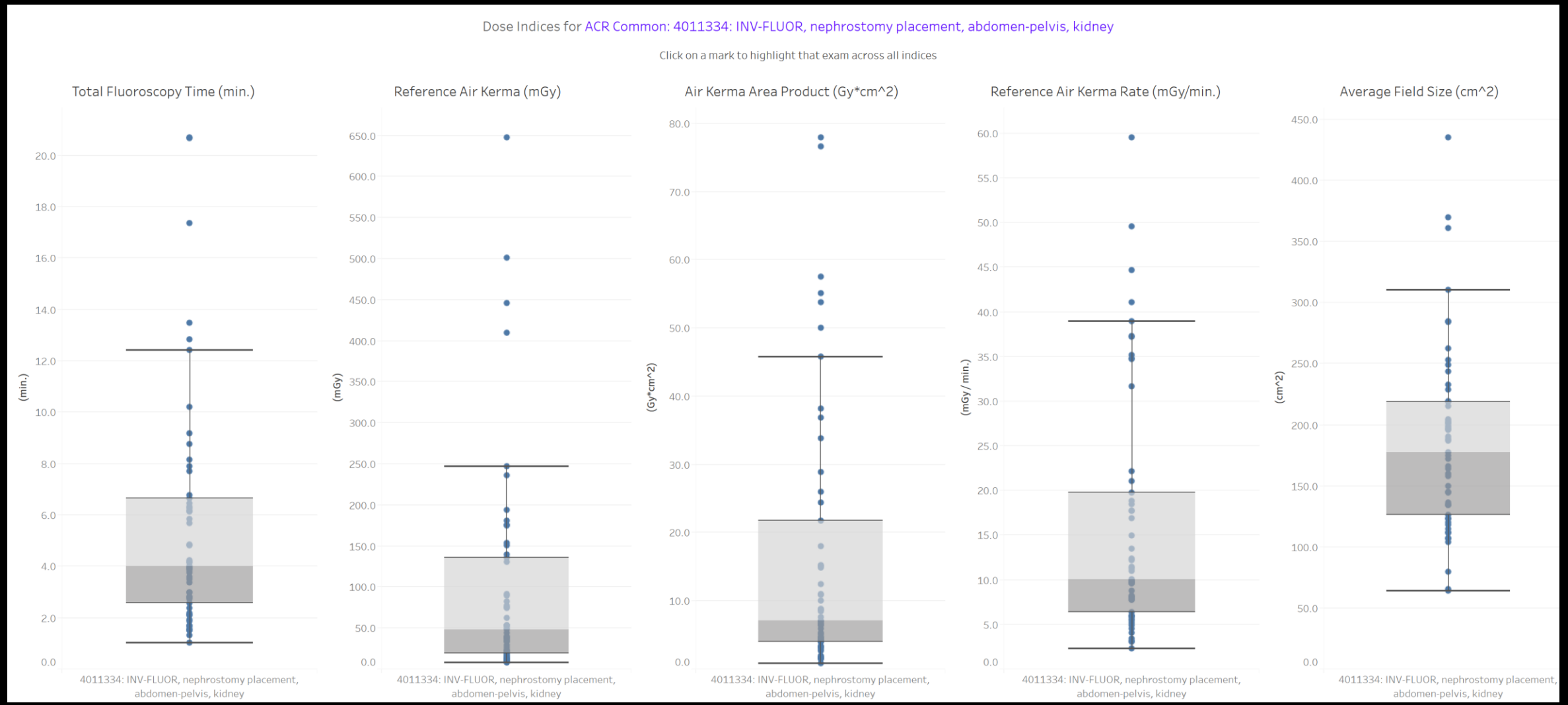
Common ID	Common Term	Roll-up 1 (most specific)	Roll-up 2	Roll-up 3	Roll-up 4 (most general)
4011269	INV-FLUOR, central venous catheter placement, tunneled, chest		CVC placement	venous access	vascular catheter placement
4011272	INV-FLUOR, artery embolization, pelvis, pelvic artery			Artery embolization	Embolization
4011275	INV-FLUOR, artery embolization, abdomen-pelvis, viscera		Visceral embolization (non-t	Artery embolization	Embolization
4011276	INV-FLUOR, artery stent placement, neck-chest, common carotid artery			artery stent placement	stent placement
4011278	INV-FLUOR, artery stent placement, lower extremity, femoral-popliteal artery			lower extremity revascu	lower extremity revascularization
4011285	INV-FLUOR, biliary catheter exchange, abdomen, liver			tube exchange (liver)	tube exchange

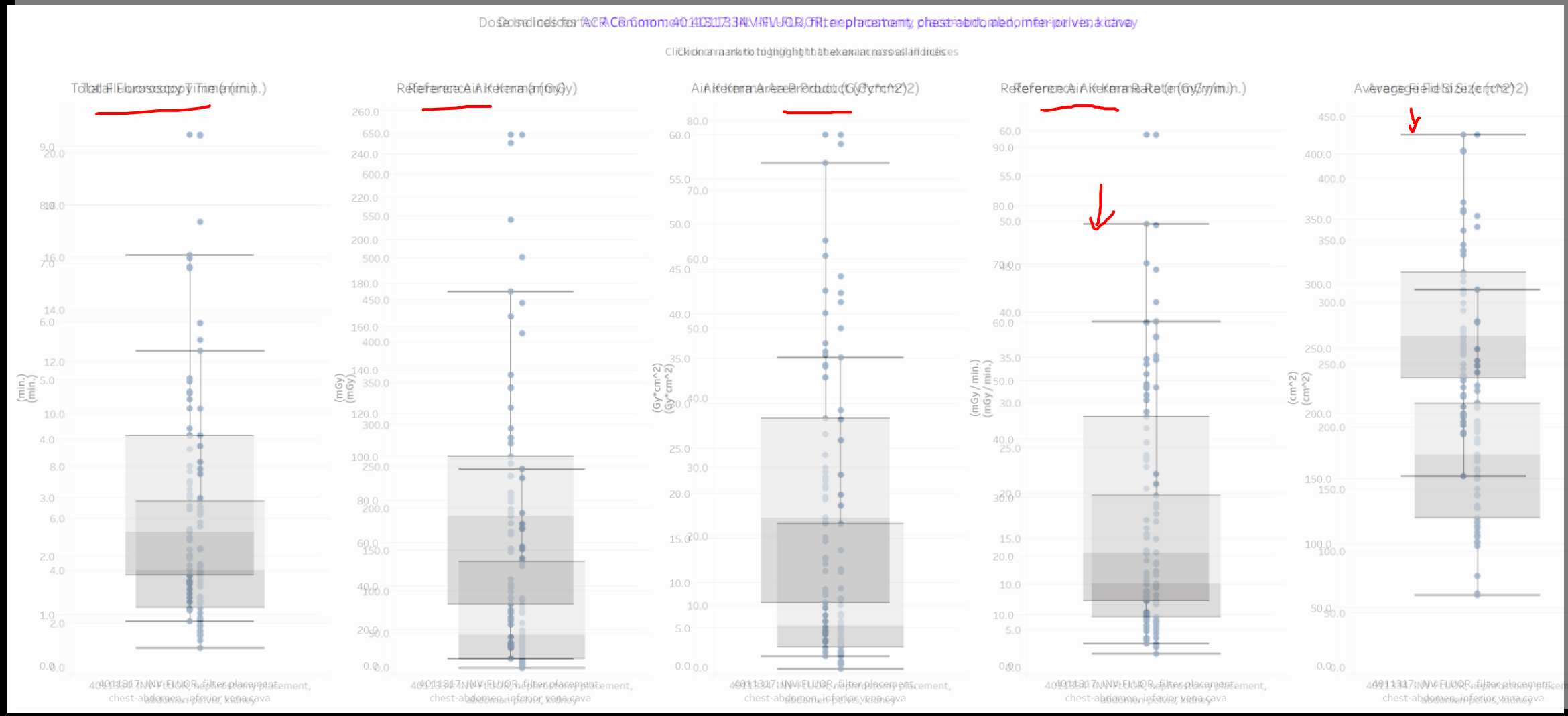


IVC filter insertion	DIR-Fluoro pilot (median)	RAD-IR (mean)
Fluoroscopy time	2.9 min	2.8 min
$K_{a,r}$	57.2 mGy	166 mGy
P_{KA}	14.6 Gy-cm^2	44.51 Gy-cm^2


Total Fluoro Time (min)
Ref Air Kerma (mGy)
Kerma Air Product (Gy*cm^2)
120
100
80
60
40
20
0
A daily news summary provided in collaboration with the American College of Radiology
SIGN UP · SHARE
RADIOLOGY NEWS
More IRs perform enteric tube placement procedures
A study in Clinical Imaging found that the number of enteric tube placement procedures conducted by interventional radiologists rose from 82% in 2010 to nearly 92% in 2018. "The increasing role of IR may be multifactorial and related to certain patient factors, reimbursement trends and practice patterns," study authors wrote, concluding that "by becoming a more dominant player in enteric tube management, IR practices may drive increased volume of de novo placement."
4011334: INV-FLUOR, nephrostomy placement, abdomen-pelvis, kidney
4011309: INV-FLUOR, gastrostomy catheter placement, abdomen, stomach


Dose Indices for ACR Common: 4011317: INV-FLUOR, filter placement, chest-abdomen, inferior vena cava
Click on a mark to highlight that exam across all indices
Total Fluoroscopy Time (min.)
Reference Air Kerma (mGy)
Air Kerma Area Product (Gy*cm^2)
Reference Air Kerma Rate (mGy/min.)
Average Field Size (cm^2)
(min.)
(mGy)
(Gy*cm^2)
(mGy / min.)
(cm^2)
4011317: INV-FLUOR, filter placement, chest-abdomen, inferior vena cava


Dose Indices for ACR Common: 4011334: INV-FLUOR, nephrostomy placement, abdomen-pelvis, kidney
Click on a mark to highlight that exam across all indices
Total Fluoroscopy Time (min.)
(min.)
Reference Air Kerma (mGy)
(mGy)
Air Kerma Area Product (Gy*cm^2)
(Gy*cm^2)
Reference Air Kerma Rate (mGy/min.)
(mGy / min.)
Average Field Size (cm^2)
(cm^2)
4011334: INV-FLUOR, nephrostomy placement, abdomen-pelvis, kidney


Total Fluoroscopy Time (min.)
Reference Air Kerma (mGy)
Air Kerma Area Product (Gy*cm^2)
Reference Air Kerma Rate (mGy/min.)
Average Field Size (cm^2)
(min.)
(mGy)
(Gy*cm^2)
(mGy / min.)
(cm^2)
401131 7, NV FLUOR, filter placement, chest-abdomen, inferior vena cava

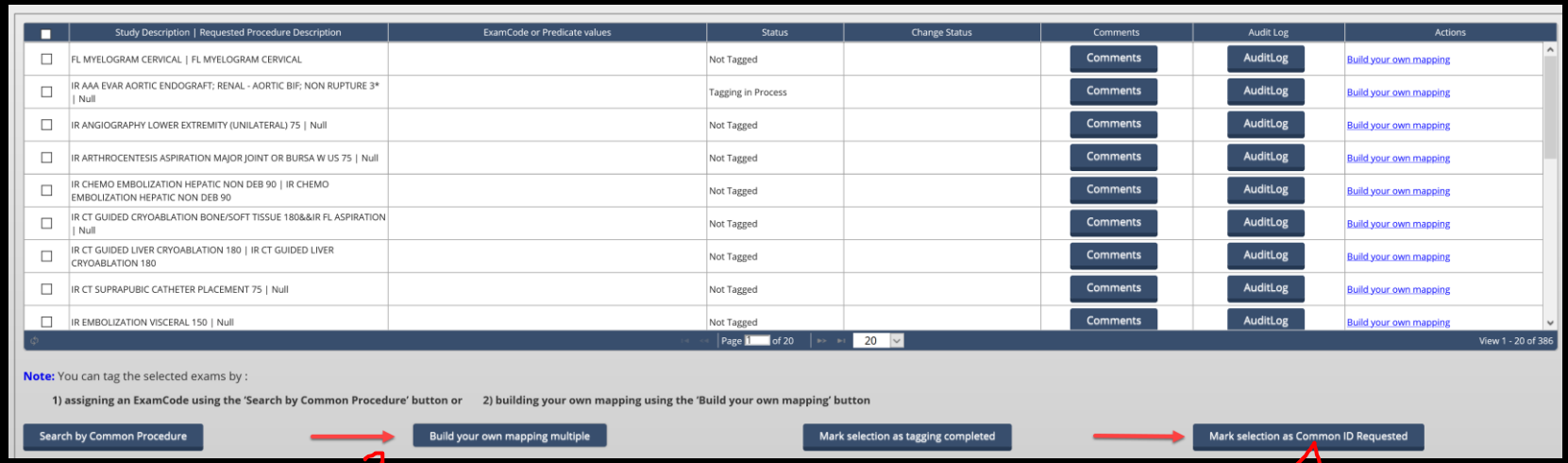
The future of the DIR-Fluoro registry

- The registry is open to all sites wishing to participate
- Presently collecting data to help us better understand FGI
  - Average reference air kerma “rate”
  - Percent of irradiation events with added filtration inserted in beam
- A number of potential enhancements have been proposed
  - Follow up when SRDL exceeded
  - PSD
- We hope to evaluate the impact of bringing other clinical data sources in to supplement procedure description

The future of the DIR-Fluoro registry

- Mapping enhancement
  - QA
  - Automated assistance

- YOUR input and diligence will play a large role in ensuring the long-term success of DIR-Fluoro



Acknowledgements

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