

Requirements for Reporting Radiation Dose – The ACR Perspective

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Outline

- Overview of registries
- Description of ACR Dose Index Registry
- Sample reports
- Plans

Why quality registries?

To **empower** facilities and physicians to **monitor and improve quality**, and to do so **easily** and **correctly**.

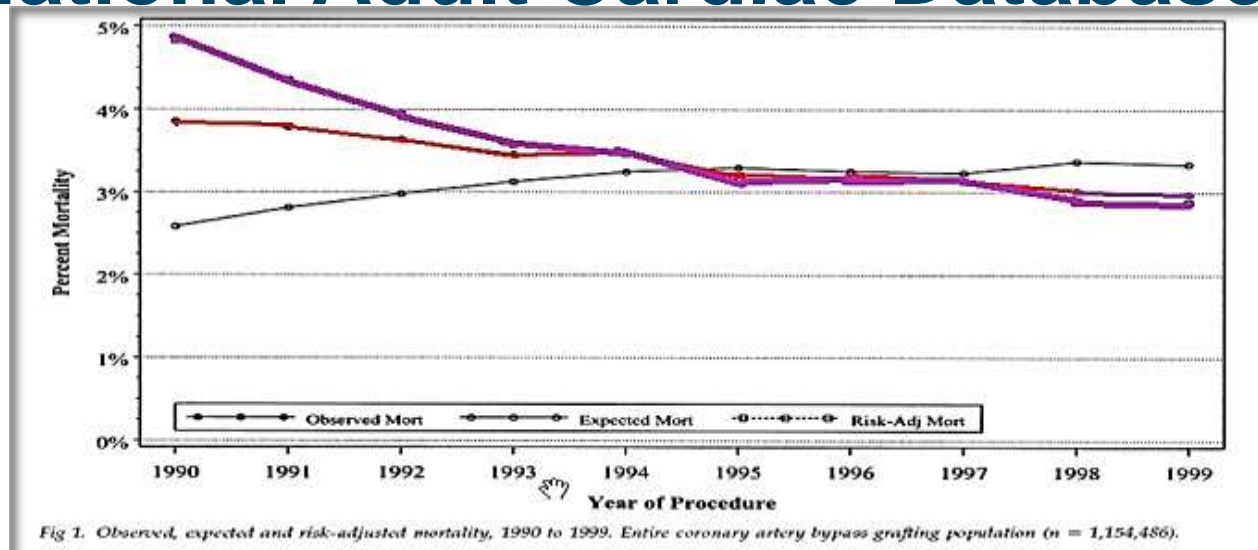
Guiding principle behind registries



Do registries work?

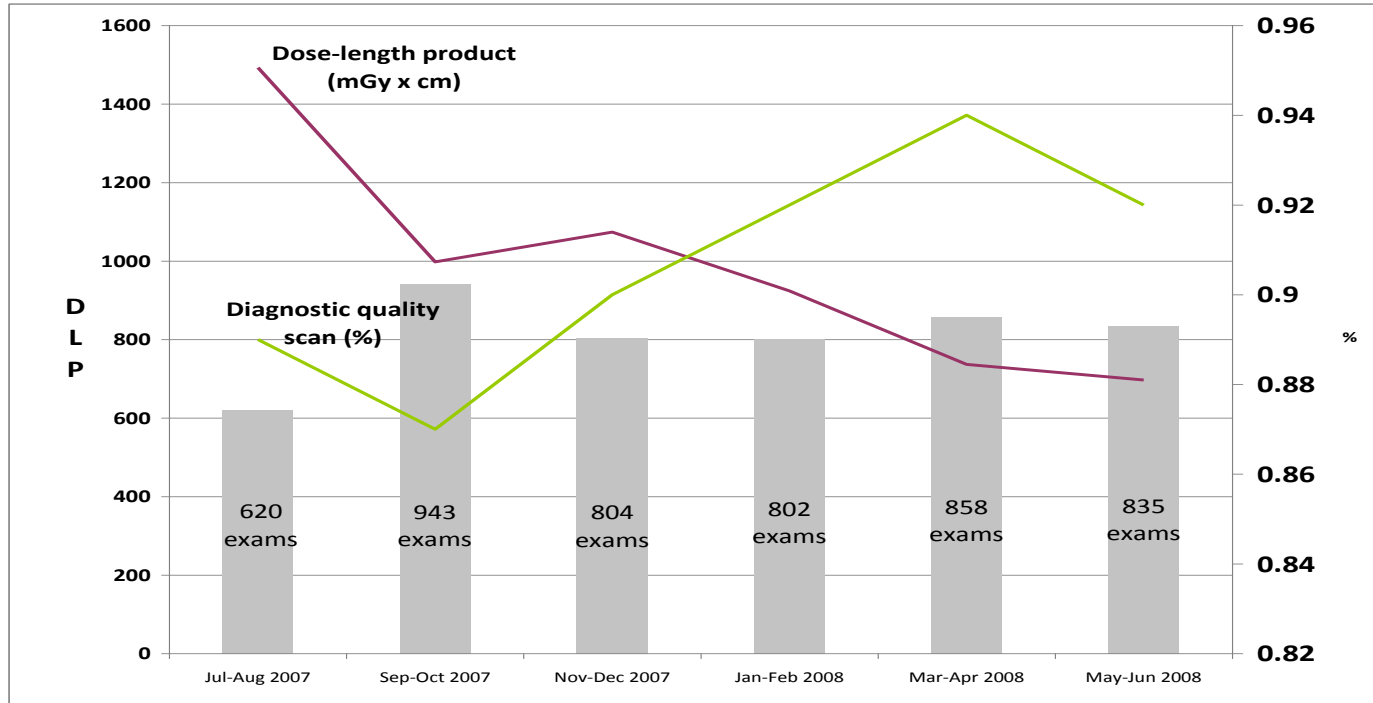
- There is evidence of data-driven improvement in performance from:
 - Medicine in general, outside radiology
 - Recent ACR registries

Evidence on CABG mortality from the Society of Thoracic Surgeons National Adult Cardiac Database



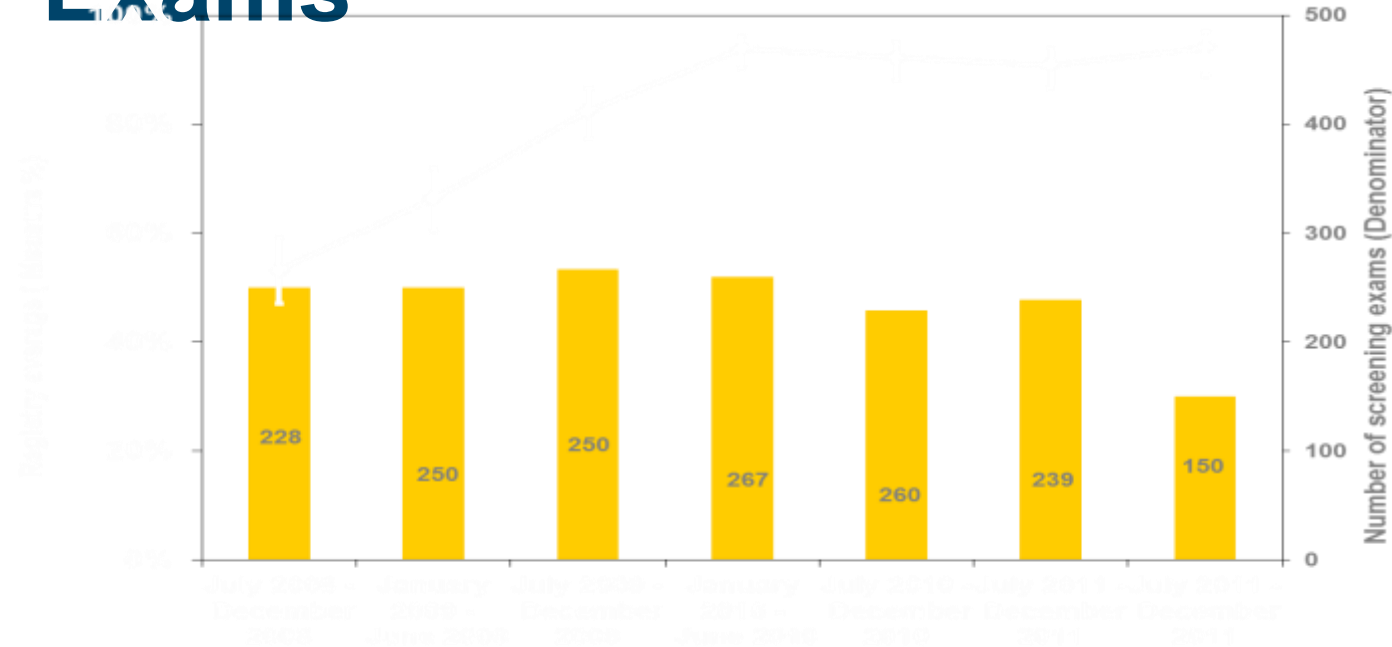
Ferguson TB Jr, Hammill BG, Peterson ED, DeLong ER, Grover FL; STS National Database Committee. A decade of change--risk profiles and outcomes for isolated coronary artery bypass grafting procedures, 1990-1999: a report from the STS National Database Committee and the Duke Clinical Research Institute. Society of Thoracic Surgeons. *Annals of Thoracic Surgery* 2002 February;73(2):480-9.

Evidence on CCTA From Michigan Registry



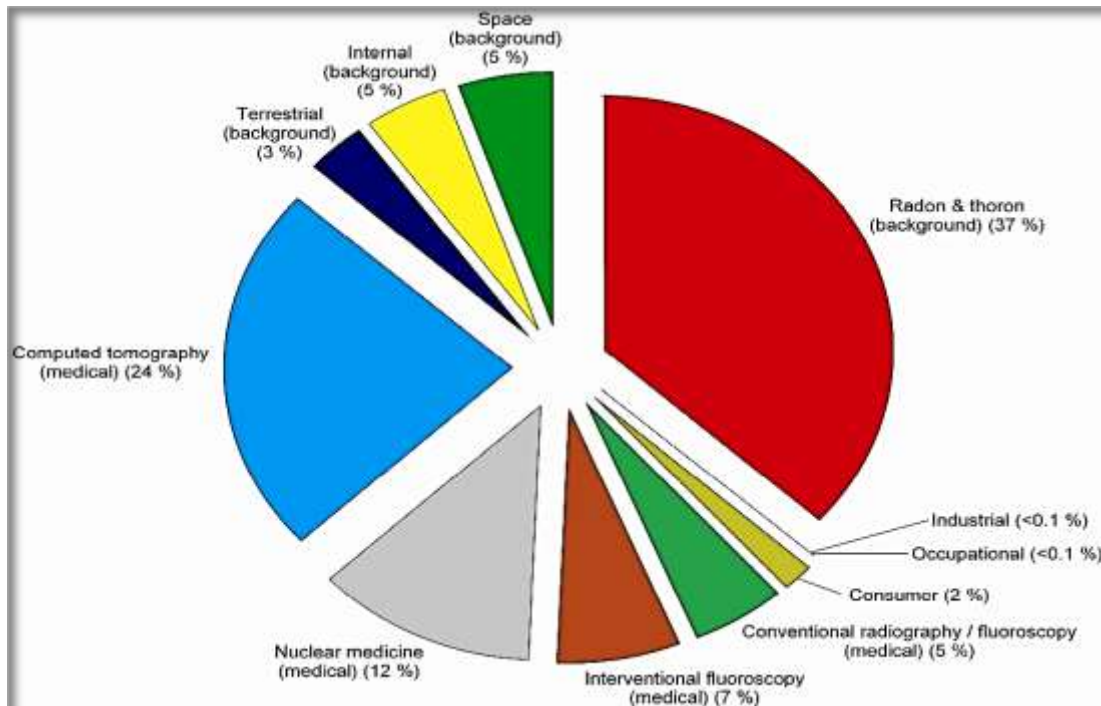
Raff GL, Chinnaiyan KM, Share DA, et al., "Radiation Dose From Cardiac Computed Tomography Before and After Implementation of Radiation Dose-Reduction Techniques," *Journal of the American Medical Association*, June 2009, Vol. 301, No. 22, pp. 2340-2348.

Evidence from ACR registries: Adequacy of Screening CTC Exams



Why a Dose Index Registry?

CT scans contribute 25% of radiation dose in the US.



The New York Times

Money & Policy

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F.D.A. Urges Two Steps for Safer CT Scans

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CT Scan Radiation May Cause Cancer Decades Later, Study Finds

By Nicole Ostrow Dec. 14 (Bloomberg)

USA TODAY

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Radiation from CT scans linked to cancers, deaths

Updated 12/14/2009 9:41 PM | Comments 186 | Recommend 63 | E-mail | Save | Print | Reprints & Permissions

The New York Times Money & Policy

F.D.A. to Increase Oversight of Medical Radiation

By WALT BOGDANICH and REBECCA R. RUIZ
Published: February 9, 2010

Bloomberg Businessweek

EXECUTIVE HEALTH May 23, 2010, 14:00 EST

Radiation Risks Nearly Double for Younger CT Scan Patients

Doctors should consider age when evaluating risks, study suggests

May 25, 2010

npr FIND A STATION

Radiation From CT Scans May Raise Cancer Risk

By RICHARD KNOX

FDA Working to Prevent CT Radiation Overdoses

By Joyce Frieden, News Editor, MedPage Today
Published: November 09, 2010

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THE INFORMED PATIENT | MARCH 2, 2010

Radiation Risks Prompt Push to Curb CT Scans

VOA News.com Voice of America A Trusted Source of News & Information since 1942

News USA Africa Asia

CT Scan Radiation Draws Concern

30 January 2010

msnbc

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15,000 will die from CT scans done in 1 year

Scans have higher levels of radiation than thought, researchers say

REUTERS updated 5:14 p.m. ET, Mon., Dec. 14, 2009

Video

abc NEWS / Health

CT Scan Radiation May Lead to 29,000 Cancers, Researchers Warn

ardian.co.uk

News Society Health

Radiation fears lead to curb on CT scans

Ministers stop short of banning whole body scans for the worried well

Search Results, Health Editor
guardian.co.uk, Tuesday 6 April 2010 17:47 BST

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Medical Radiation: An Overview of the Issues

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Table of Contents

**What is the national average level
of radiation administered by
imaging facilities for a CT of the
head?**

WE DON'T KNOW

What is the Dose Index Registry?

A **tool** to **enable** facilities to **optimize protocols,** **implement standards** and contribute to the development of **reference levels.**

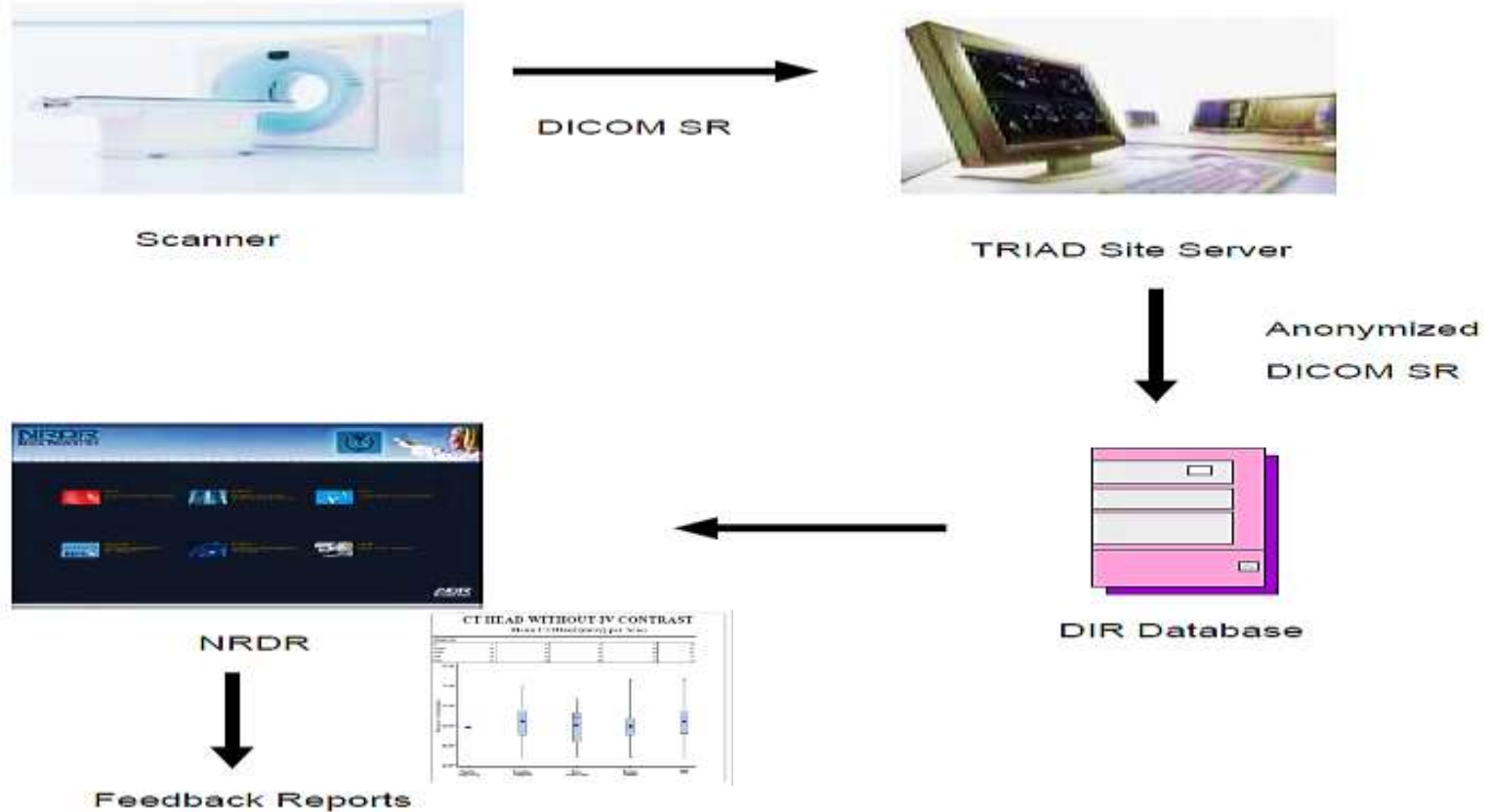
ACR Dose Index Registry

- Component of the National Radiology Data Registry
- Launched in May 2011
- Collects and compares dose index information across facilities
- Fully automated; Uses standard methods of data collection and processing (DICOM SR, IHE REM Profile, RadLex)
- Establishes national benchmarks and practice patterns in dose indices

DIR supports all aspects of the quality monitoring process

- **Standardization:** Use of
 - industry standards
 - clearly specified data dictionaries
- **Automation:** Data collection from a variety of platforms
 - with minimal effort for facilities
 - high accuracy
- **Feedback and benchmarks:**
 - Easy to understand customizable reports

How does the Dose Index Registry work?



Challenges and Solutions

- Comparability
 - Procedure name standardization
 - Patient size adjustment
- Ability to capture data from new and old scanners
 - DICOM structured report for new scanners
 - OCR on dose screen for old scanners

Mapping Exam Names

Procedure Name Standardization

- Exam names mapped to Radlex Playbook
 - <http://playbook.radlex.org>
- ACR used external vendor, RadMapps, to map all exam names currently in the registry
 - ~ 21,000 unique exam names
- New facilities may choose to use third party tool or may use mapping tool on website. Suggested tags are provided if an exam name is already in the database.



DIR Exam Name Mapping

[Home](#) [Logout](#)

At a Glance: Not Tagged : [1](#) / Tagging in Process : [0](#) / Tagging Suggested : [0](#) / Tagging Completed : [2](#) / RPID Requested : [2](#) / Invalid Tag : [0](#) / Guidance : [0](#)

Search Exam

Exam:

Status:

☒ Show Everything

RPID:

A B C D E F G H I J K L M N O P Q R S T U V W X Y

<input type="checkbox"/> Select All	Exams	RPID or Predicate values	Status	Change Status
<input type="checkbox"/>	Cardiac^FLASH_COR_CTA_100KV (Adult)	ANATOMIC_FOCUS:CORONARY ARTERIES BODY_REGION:CHEST	RPID Requested	Mark as Not Tagged
<input type="checkbox"/>	CT ANGIO CHEST	RPID360 RAD ORDER CT CHST ANGIO W IVCON	Tagging Completed	Mark as Not Tagged
<input type="checkbox"/>	CT CHEST WITH CONTRAST	BODY_REGION:CHEST CONTRAST_ENHANCEMENT:WITH IV CONTRAST POPULATION:PREGNANT	RPID Requested	Mark as Not Tagged
<input type="checkbox"/>	DAILY QA	RPID88 RAD ORDER CT	Tagging Completed	Mark as Not Tagged
<input type="checkbox"/>	TC TX		Not Tagged	

Note:You can tag the selected exams by :

1)assigning an RPID using the 'Search RPID' button or 2)building your own mapping using the 'Build your own mapping' button

[Search RPID](#)

[Build your own mapping multiple](#)

Size-Specific Dose Estimate (SSDE)

- DIR allows sites to submit localizer images along with Dose Report
- Algorithm developed by Duke physicists will measure patient thickness from localizer



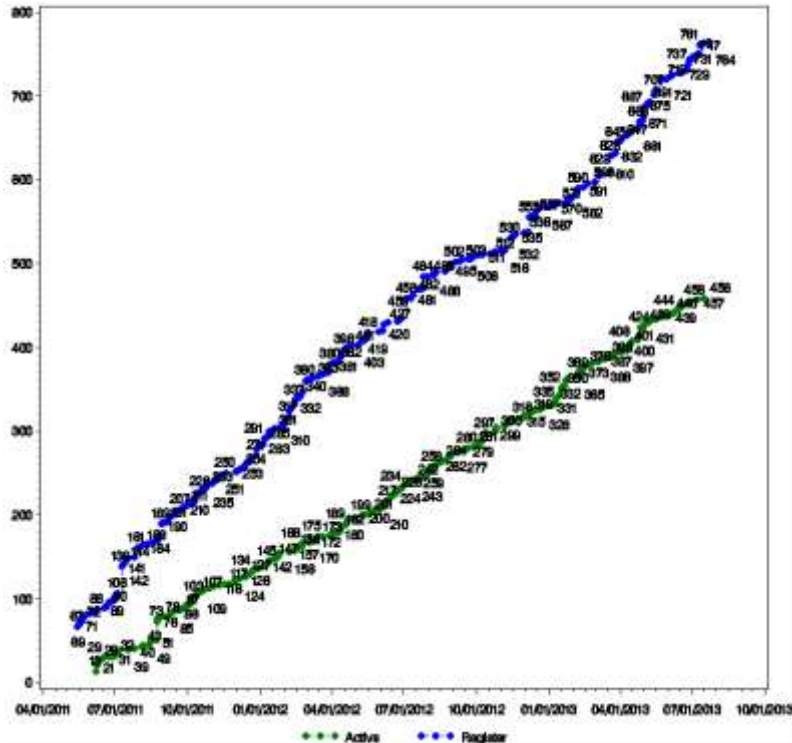
Size Specific Dose Estimate (SSDE)

Patient Size Adjustment

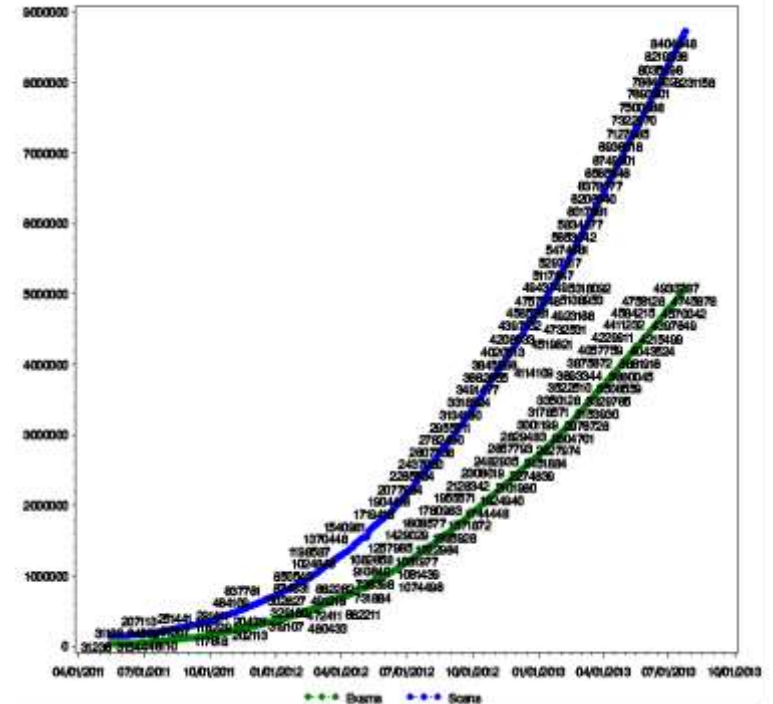
- Measure patient thickness (from AP or lateral image or average of the two)
- Calculate effective diameter
- Determine normalized dose conversion factor using effective diameter and phantom size (AAPM TG204)
- Apply conversion factor to CTDIvol to get SSDE

July 2013: Over 750 facilities 458 of which are fully active; 4.8 million exams and 8.5 million scans

Facilities — Registered and active

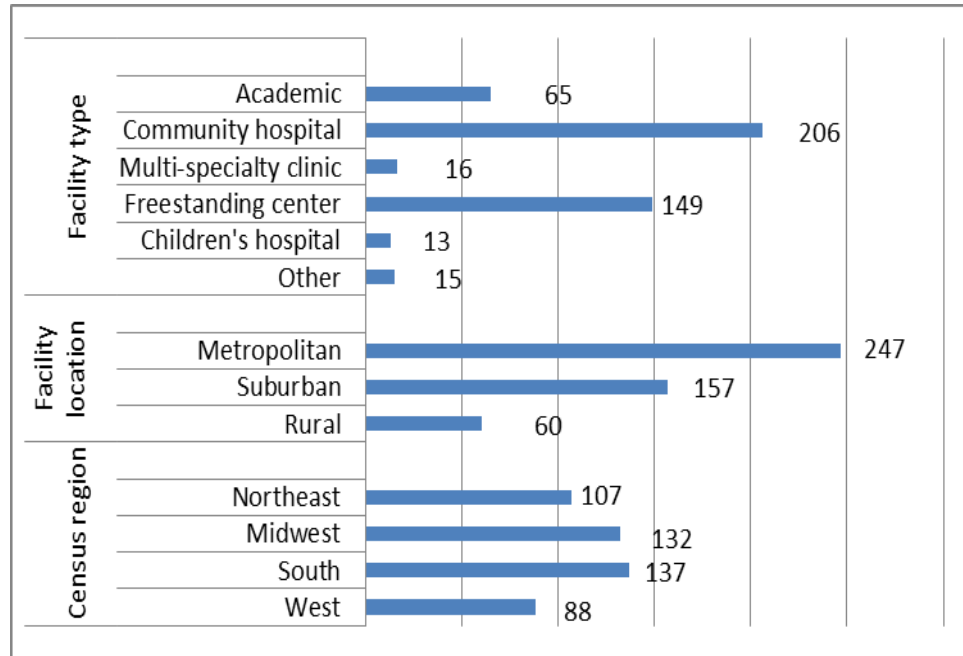
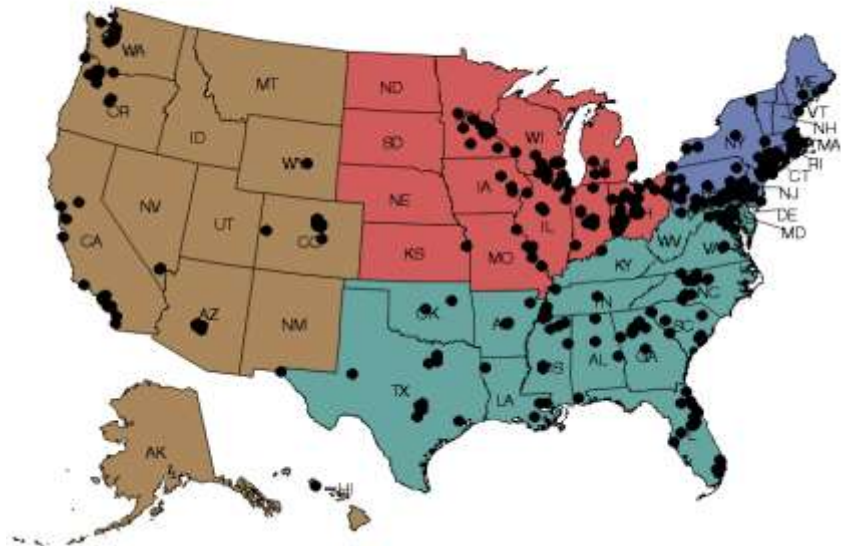


Exams and Scans



Representation by a variety of facilities nationwide

DIR Facilities
January - June 2013



Sample feedback report

- Uploaded to registry website every six months
- Available to all facility users

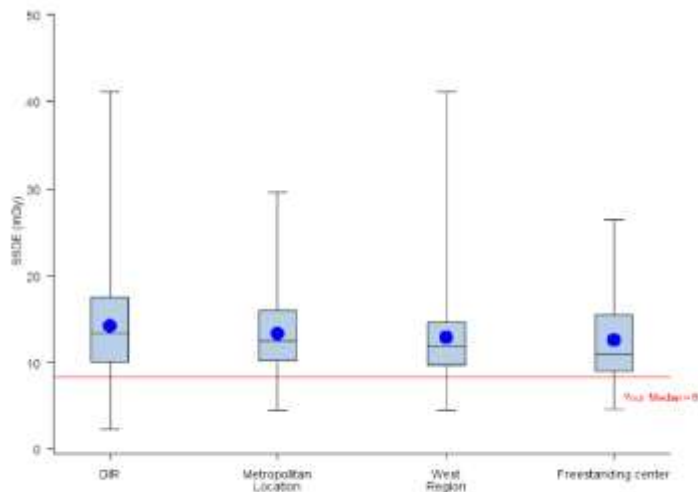
Executive Summary: Facility 999999
CTDivol Per Scan (mGy)

	1: Site 999999	2: All DIR sites	3: Sites in location Metropolitan	4: Sites in the South	5: Sites of type Community hospital
RPID Shortname	(25th-Med-75th)	(25th-Med-75th)	(25th-Med-75th)	(25th-Med-75th)	(25th-Med-75th)
CT ABD	(14/18/21)	(13/17/24)	(12/16/21)	(12/17/22)	(13/17/22)
CT ABD PELVIS KIDNEY CALC	(10/14/18)	(9/13/19)	(10/14/18)	(11/15/19)	(10/14/20)
CT ABD PELVIS W IVCON	(10/15/21)	(11/16/22)	(11/16/22)	(11/16/22)	(11/16/22)
CT ABD PELVIS WO & W IVCO	(11/17/28)	(13/19/25)	(14/19/26)	(14/20/27)	(13/20/26)
CT ABD PELVIS WO IVCON	(10/15/23)	(10/16/22)	(10/15/21)	(11/17/23)	(11/16/23)
CT C SPINE WO IVCON	(26/40/69)	(20/30/49)	(21/31/49)	(22/34/52)	(20/31/56)
CT CHST	(13/16/24)	(8/12/16)	(8/11/15)	(9/12/16)	(9/12/17)
CT CHST ABD PELVIS W IVCO	(12/17/24)	(12/16/22)	(12/15/22)	(13/17/24)	(11/16/22)
CT CHST ANGIO W IVCON	(13/14/18)	(13/18/27)	(13/17/23)	(13/16/24)	(13/17/26)
CT CHST PULM ARTS EMBO W	(17/25/36)	(13/21/33)	(14/22/33)	(14/23/36)	(13/22/35)
CT CHST W IVCON	(9/14/17)	(9/13/20)	(8/13/19)	(9/13/18)	(10/14/20)
CT CHST WO IVCON	(7/11/15)	(7/11/16)	(7/11/16)	(8/12/18)	(7/11/17)
CT HEAD BRN WO IVCON	(43/53/71)	(47/56/66)	(45/55/62)	(46/54/65)	(48/58/68)
CT HEAD SINUSES WO IVCON	(13/26/47)	(13/20/36)	(14/20/33)	(19/33/44)	(14/19/28)
CT L SPINE WO IVCON	(17/29/47)	(20/31/45)	(18/27/43)	(22/34/51)	(20/29/43)
CT NECK W IVCON	(14/19/48)	(14/20/36)	(14/21/41)	(13/22/48)	(14/19/33)

For each exam, facility data are compared to that of similar facilities.

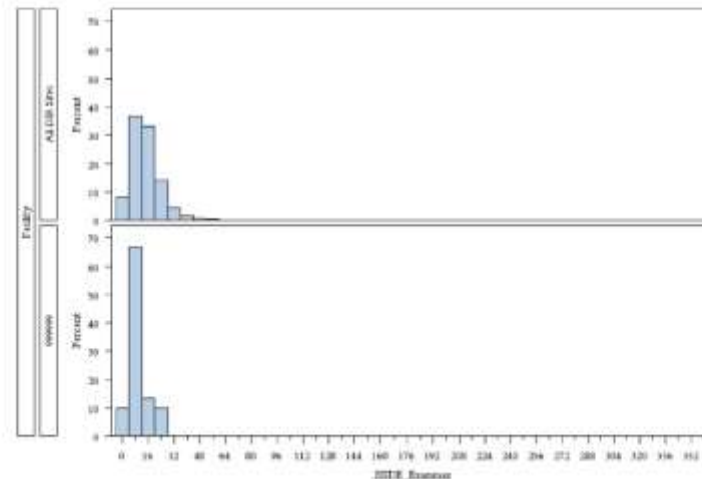
Median CT CHST WO IVCON SSDE Per Scan

Category	Number of Facilities	Mean	Std Dev	Min	25th %ile	50th %ile	75th %ile	Max
DIR	103	14	6	3	10	13	17	42
Metropolitan	94	13	5	4	10	12	16	39
West	36	13	6	4	10	12	15	42
Freestanding center	65	13	5	3	9	11	15	28



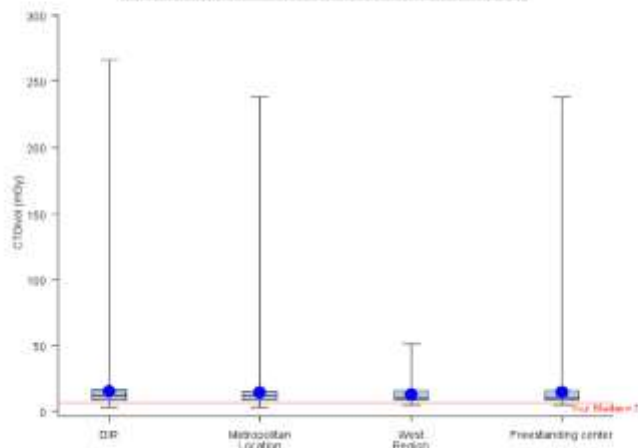
CT CHST WO IVCON SSDE Per Scan

Facility	N	Mean	StdDev	Min	Median	Max
All DIR Sites	3493	13	11	0	13	361
999999	30	14	6	2	8	26



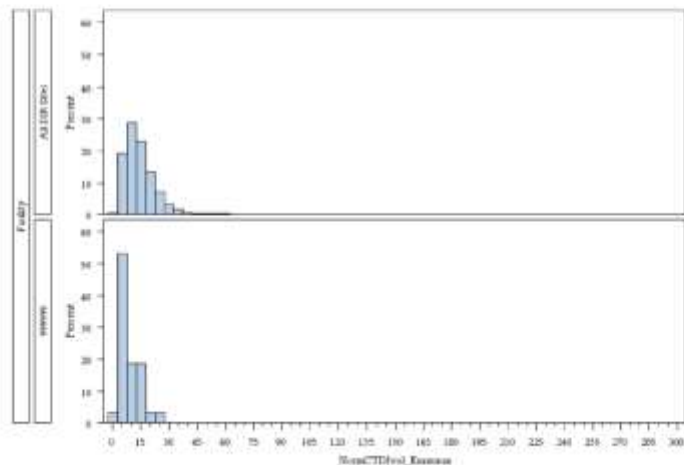
Median CT CHST W IVCON CTDIvol Per Scan

Category	Number of Facilities	Mean	Std Dev	Min	25th %ile	50th %ile	75th %ile	Max
DIR	302	16	23	5	9	12	16	307
Metropolitan	146	25	23	5	9	12	17	238
West	70	15	7	5	9	11	18	51
Freestanding center	303	25	23	5	9	11	16	238



CT CHST W IVCON CTDIvol Per Scan

Facility	N	Mean	StdDev	Min	Median	Max
All DIR Sites	14064	16	20	4	13	300
999999	32	9	5	2	7	27



Facility's own data available at all times

- Web-based reports
- Displays exam details and comparisons of scanners

Results of Dose Information by Exam

Dose Information By Exam Report for facility #100001 - Windows Internet Explorer

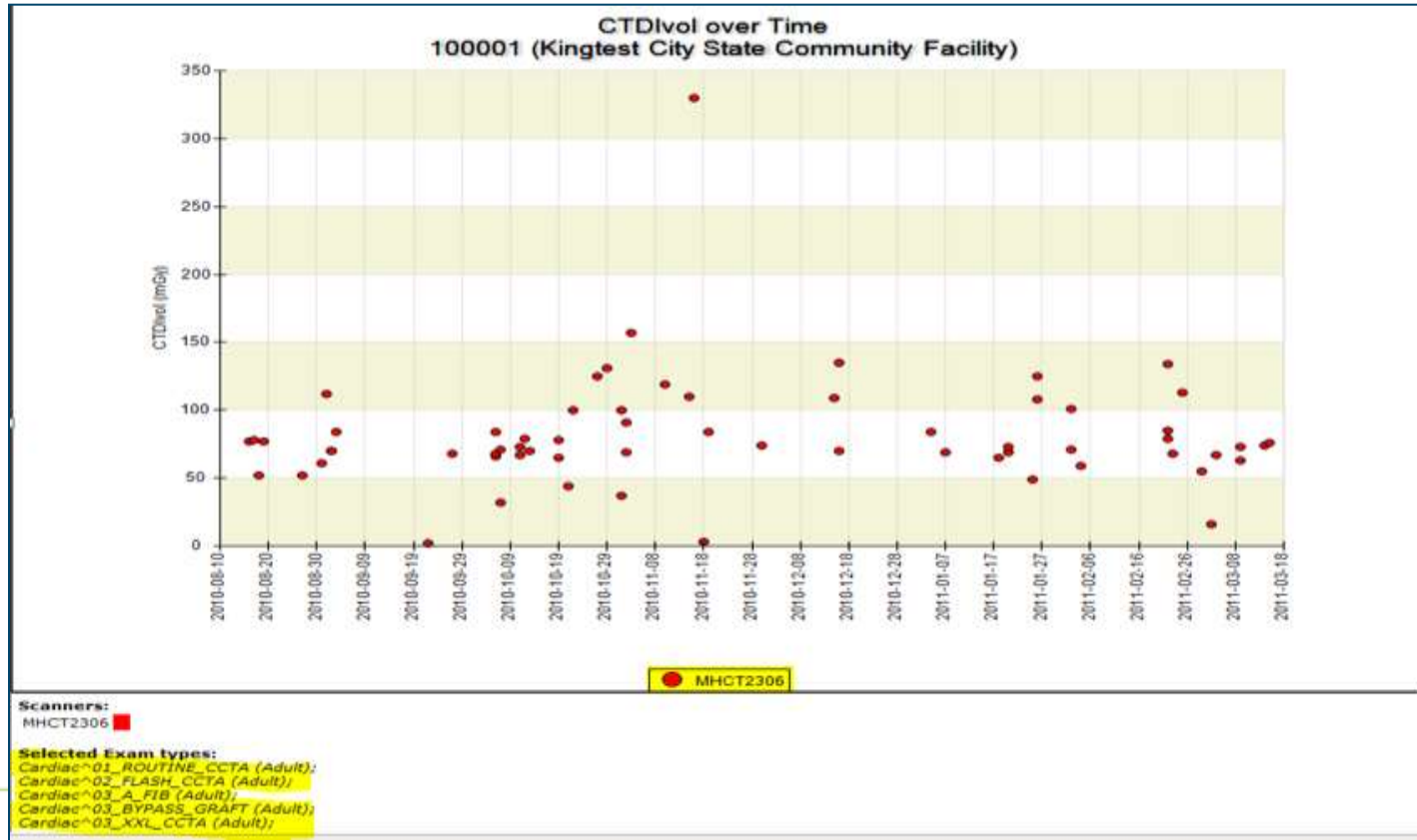
http://192.168.1.118/Portal/Parts/DIR/Reports/ShowReport.aspx?Report=DoseInformationByExamReport&FacilityId=100001&DateFrom=6/1/2010&DateTo=

1 / 1 100% **Export to Excel 97-2000**

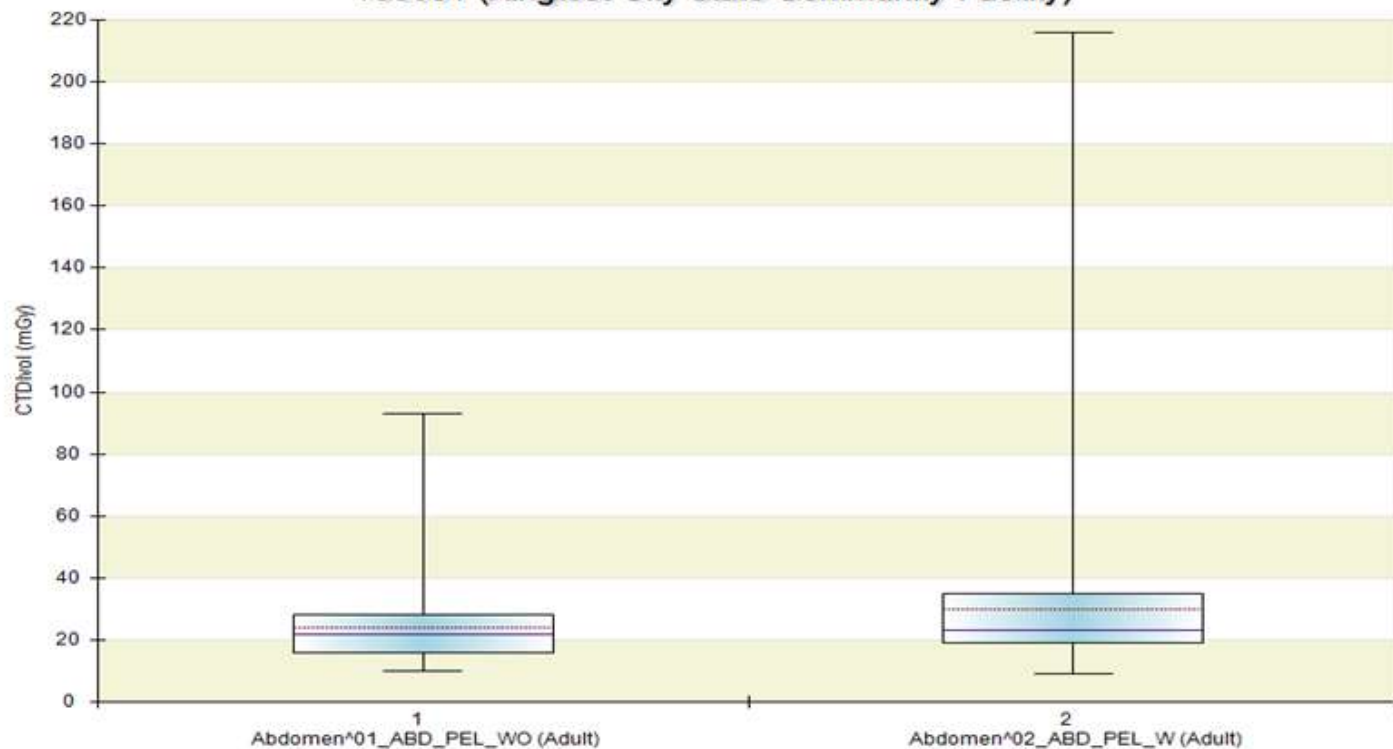
Dose Information by Exam
06/01/2010 - 07/31/2010

Facility ID	Study	Institution	Total CTDIvol (mGy)	Total DLP (mGycm)	Study Date
100001	Abdomen^01_ABD_PEL_WO (Adult)	MJH	25	1966	20100618
100001	Abdomen^01_ABD_PEL_WO (Adult)	MH CT P	14	248	20100617

Results of scanner & Exam search



Boxplots for Facility
100001 (Kingtest City State Community Facility)



Additional Benefits of DIR to facilities

In addition to size-adjusted standardized comparisons to enable meaningful protocol review, participation in DIR supports quality initiatives.

- Certified as PQI project for ABR MOC
- Supports PQRS measure for 2014 on participation in national dose index registry
- Endorsed by the National Quality Forum

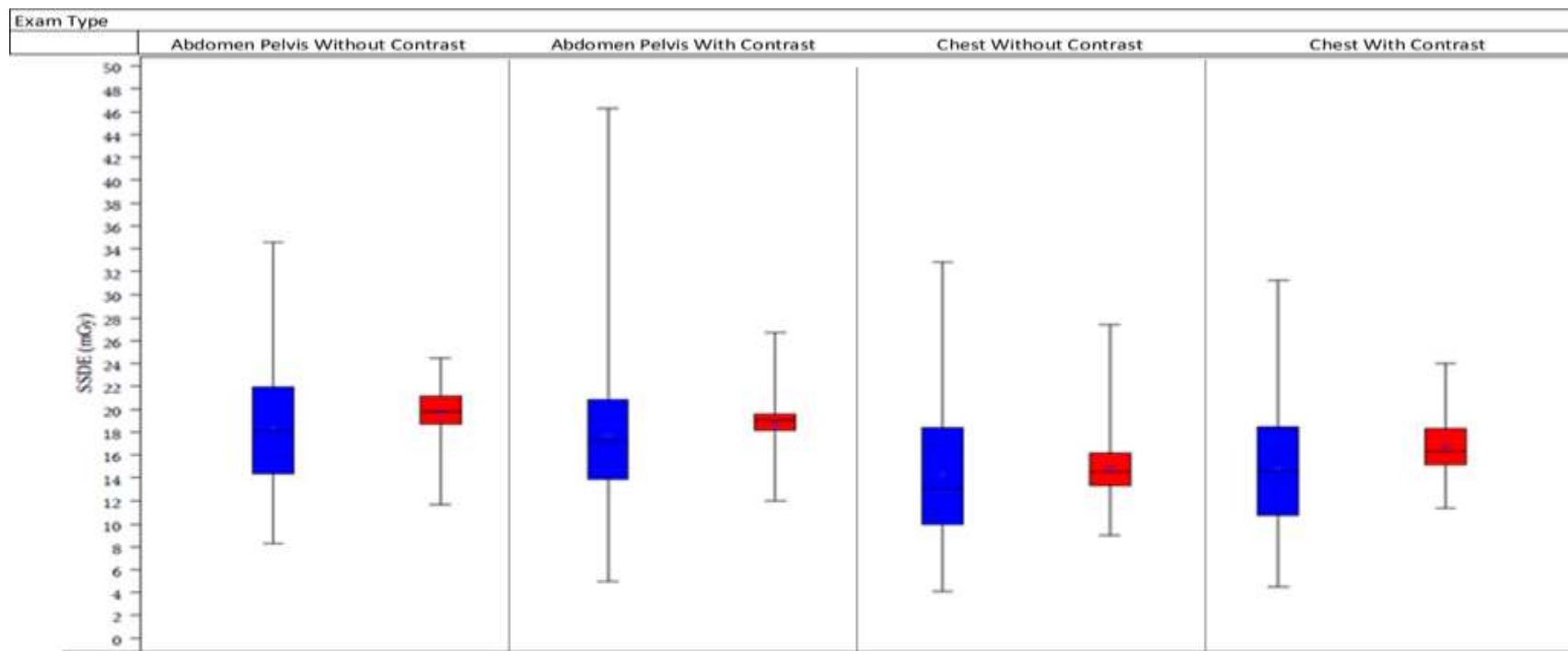
Summary of Data: January-June 2013

To be released mid-August

- 424 facilities to receive feedback reports on adult exams, and 398 on pediatric
- Reports on over 2 million adult CT exams and 1 million pediatric CT exams with standardized names,
- Results reported on exams where SSDE and CTDIvol were available

Exam	N	Mean SSDE	Std Dev	1 st %ile	25 th %ile	Median SSDE	75 th %ile	99 th %ile	Range
CT Abdomen/Pelvis Without IV Contrast	41,065	20	11	6	13	19	24	58	202
CT Abdomen/Pelvis With IV Contrast	95,076	19	10	5	13	17	23	55	225
CT Chest Without IV Contrast	30,980	14	10	1	8	12	18	48	184
CT Chest With IV Contrast	30,136	17	10	3	10	15	21	52	239





Summary Statistics								
N	131	131	167	167	160	160	150	150
Mean	18	20	18	19	14	15	15	17
Median	18	20	17	19	13	15	15	16
Minimum	8	12	5	12	4	9	4	11
Maximum	35	24	46	27	33	27	31	24
	Abdomen Pelvis Without Contrast Unadjusted	Abdomen Pelvis Without Contrast Adjusted	Abdomen Pelvis With Contrast Unadjusted	Abdomen Pelvis With Contrast Adjusted	Chest Without Contrast Unadjusted	Chest Without Contrast Adjusted	Chest With Contrast Unadjusted	Chest With Contrast Adjusted

Coming soon to DIR

- CR/DR later this year
 - RDSRs
 - Pilot in summer, anticipated launch in Fall
- New report format for online reports
- Identifiable data available to facilities, with transmission of anonymized data to registry

Contact ACR DIR

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X3535

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