Necesidad y estado actual del registro y gestión de la dosis en procedimientos radiológicos

Registro y Gestión de dosis a pacientes en procedimientos radiológicos

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Introducción

1. **Registro y Gestión de la Dosis**
   - Dosis e Historial Dosimétrico
   - Orígenes de indicadores de dosis
   - Dilema – Necesidades
   - Magnitudes derivadas: SSDE/PSD
   - IHE-REM
   - Documentos AAPM
     - Medical Physics Practical Guidelines 1a/6a
     - AAPM TG246 & EFOMP
   - Magnitudes derivadas: Dosis efectiva

2. **OpenREM**

3. **Grupo de Trabajo SEFM**

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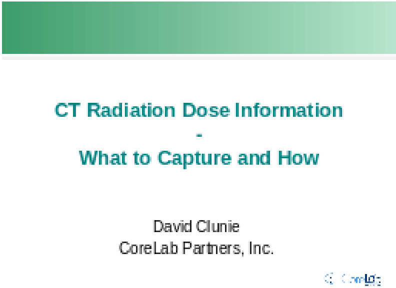
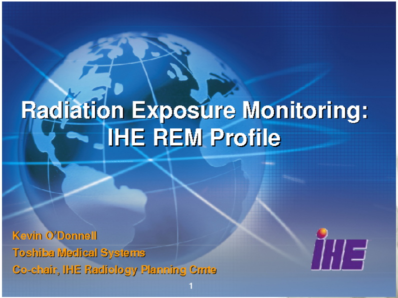
Thanks !

1. Kevin O'Donnell

   &

2. David Clunie





Declaración: diversos contenidos de la presentación son originales de estas

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Dosis e Historial Dosimétrico

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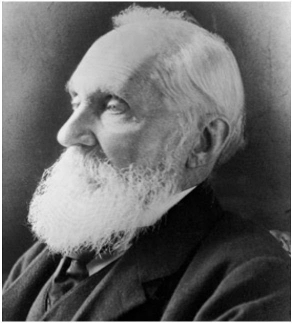
Lord Kelvin (William Thomson 1824-1907)

"If you can not measure it, you can not improve it."
1st President of IEC (International Electrotechnical Commission)



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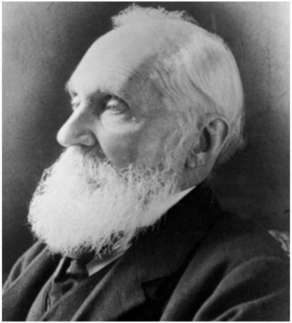

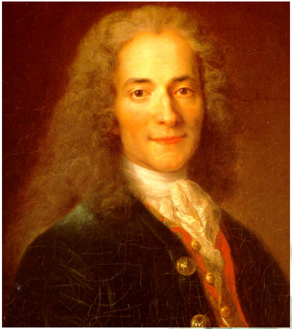

Voltaire (1764)

"The perfect is the enemy of the good."
"Le mieux est l'ennemi du bien."

Jacoby Roth Incident

Registro y Gestión de la Dosis

Cedars-Sinai Incident

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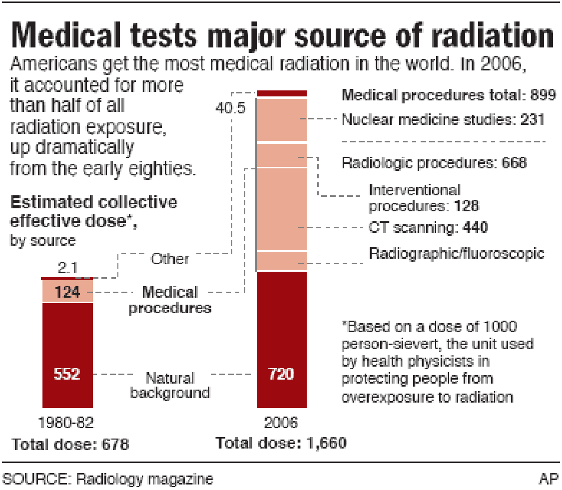

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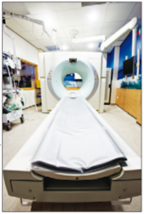
Tracking radiation exposure of patients



Science Photo Library

As recently as only 6 years ago, it was not possible to come across a radiation-induced skin injury (erythema such as a burn, or hair loss) to a patient resulting from CT. However, in 2009–10, overexposure of about 400 patients undergoing brain-perfusion CT protocols, resulting in hair loss or skin redness in some patients, was brought to the attention of the US Food and Drug Administration[1] and in media reports. 20 years ago, it was not possible to come across a patient who had undergone scores of CT scans in a few years, especially the patient without cancer. Did we see this coming? The answer is largely "no" for visible radiation effects and "probably yes" for usage. In view of these recent events, what might be the scenario in a few years? There are no indications that the increase in CT use will decrease. On the contrary, CT might replace some traditional fluoroscopy-based angiographic procedures.[2] The medical profession has a responsibility to account for radiation exposure from medical imaging.

What are the risks and are the risks real? Essentially there are two types of radiation effects. Ones that are visible, documented, and confirmed (deterministic effects:

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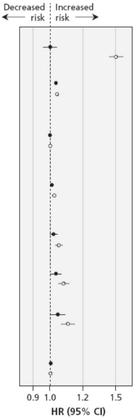
Cancer risk related to low-dose ionizing radiation from cardiac imaging in patients after acute myocardial infarction

Mark J. Eisenberg MD MPH, Jonathan Afilalo MD MSc, Patrick R. Lawler MD et al

Variable	HR (95% CI)
Sex, male	
Unadjusted	1.002 (0.963–1.042)
Adjusted	1.504 (1.443–1.568)
Age (per year)	
Unadjusted	1.039 (1.037–1.040)
Adjusted	1.045 (1.043–1.047)
Radiation from cardiac procedures (per milliSievert)*	
Unadjusted	1.001 (1.000–1.002)
Adjusted	1.003 (1.002–1.004)
Radiation from cardiac procedures*	
Per 10-mSv increase	1.013 (1.002–1.023)
Unadjusted	1.028 (1.018–1.039)
Adjusted	
Per 20-mSv increase	
Unadjusted	1.025 (1.004–1.047)
Adjusted	1.058 (1.036–1.080)
Per 30-mSv increase	
Unadjusted	1.038 (1.006–1.072)
Adjusted	1.088 (1.054–1.122)
Per 40-mSv increase	
Unadjusted	1.051 (1.008–1.097)
Adjusted	1.119 (1.073–1.166)
Radiation from noncardiac procedures (per milliSievert)	
Unadjusted	1.009 (1.007–1.011)
Adjusted	1.008 (1.006–1.010)



For every 10 mSv of low-dose ionizing radiation, there was a 3 % increase in the risk of age- and sex-adjusted cancer over a mean follow-up period of five years

ARCH INTERN MED/ VOL 169 (NO. 22), DEC 14/28, 2009 WWW.ARCHINTERNMED.COM

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ORIGINAL INVESTIGATION

Projected Cancer Risks From Computed Tomographic Scans Performed in the United States in 2007

Amy Berrington de González, DPhil; Mahadevappa Mahesh, MS, PhD; Kwang-Pyo Kim, PhD; Mythreyi Bhargavan, PhD; Rebecca Lewis, MPH; Fred Mettler, MD; Charles Land, PhD

Table 2. Projected Number of Future Cancers That Could Be Related to CT Scans Performed in the United States in 2007, According to CT Scan Type[a]

		No. of Cancers					
		Females		Males		Total	
Type of CT Scan	No. of Scans,[b] Millions (%)	Mean (95% UL)	%	Mean (95% UL)	%	Mean (95% UL)	%
Head	18.7 (33)	1900 (500-4400)	11	2100 (600-4300)	19	4000 (1100-8700)	14
Chest	7.1 (12)	3100 (1400-6100)	17	1000 (500-2000)	9	4100 (1900-8100)	14
Cervical spine	1.8 (3)	700 (200-1700)	4	300 (100-600)	3	1000 (300-2300)	3
Thoracic spine	0.3 (<1)	200 (80-300)	1	50 (20-100)	<1	250 (10-400)	1
Lumbar spine	2.2 (4)	700 (300-1600)	4	500 (200-1100)	5	1200 (400-2700)	4
Abdomen/pelvis	18.3 (32)	8500 (4200-15 000)	47	5500 (2600-9600)	50	14 000 (6900-25 000)	48
CTA chest	2.3 (4)	2200 (1100-4200)	12	500 (200-900)	5	2700 (1300-5000)	9
CTA other[c]	1.6 (3)	400 (200-900)	2	500 (200-1100)	5	900 (300-1900)	3
Whole body	0.3 (<1)	300 (100-500)	2	100 (50-200)	1	400 (200-600)	1
Colonography	0.2 (<1)	70 (30-120)	<1	50 (20-100)	<1	120 (60-200)	<1
Calcium scoring	0.6 (1)	150 (70-300)	1	30 (10-60)	<1	180 (80-400)	<1
Other[d]	3.5 (6)	10 (3-20)	<1	20 (1-80)	<1	30 (4-100)	<1
Total[e]	56.9 (100)	18 000 (9000-28 000)	100	11 000 (6000-16 000)	100	29 000 (15 000-45 000)	100

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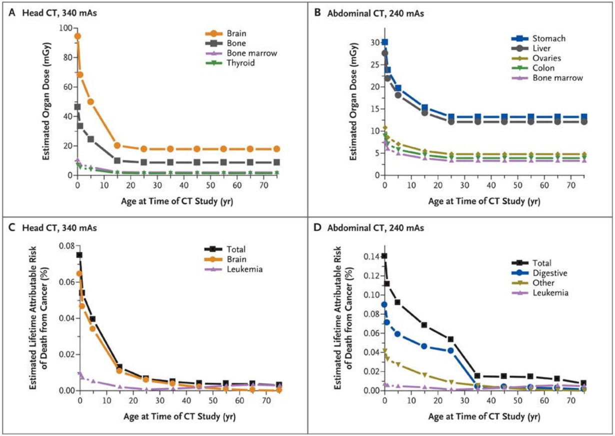
Estimated Organ Doses and Lifetime Cancer Risks from Typical Single CT Scans of the Head and the Abdomen

Brenner DJ, Hall EJ. N Engl J Med 2007;357:2277-2284.



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Objectives of patient dosimetry

- Monitoring the procedure
  - Important in high dose procedures and high risk patients (paediatrics)
- Risk estimation
  - Individual and population exposure
    - Personal history
    - Regional & national archives
- Quality assurance
  - Procedure optimisaton
  - Comparisons with Reference Levels
  - Comparison with other techniques

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- DLP, DTDIvol, kVp, mA, s
- Effective Dose (Optional)

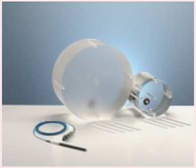
- KAP, Dose@RP, kVp, mA, s
- Imaging geometry, Fluoro Dose, Fluoro Time, . . .

- AGD, Incident Kerma@RP, kVp, mA, s
- Compression, Half Value Layer

Procedure Dose Data (CT)

- What would be absorbed by a phantom
  - CTDIvol (mGy)
  - DLP (mGy.cm)
- Effect of what was absorbed
  - Effective Dose (mSv)
- What is the additional risk
  - Lifetime Attributable Risk of cancer
- All are estimates, not measured

Measuring



Output versus Actual (CT)

- What the machine output
  - CTDIvol and DLP describe the output of the scanner as if absorbed by a phantom, not measured in the actual patient
- Extrapolation to real patients
  - requires patient size information
  - impact on organs (tissue weighting factors)
  - assumes knowledge of impact on risk

Capture what we can (CT)

- Easy to capture
  - per acquisition CTDIvol and DLP
  - total procedure DLP
- Can be captured
  - standard code/term for procedure type
  - standard code/term for anatomy
  - proxies for patient size – height, weight, sex
- Harder to capture
  - actual measures of patient size (localizer?)
  - actual organs exposed and extent (segment images?)

Registro y Gestión de la Dosis

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Patient Name: Exam no:

Accession Number:

Patient ID: Discovery CT750 HD

Exam Description: CT HALS/THORAX/ABDOMEN

Dose Report

Series	Type	Scan Range (mm)	CTDIvol (mGy)	DLP (mGy-cm)	Phantom cm
1	Scout	-	-	-	-
2	Helical	S15.750-I650.250	5.10	373.00	Body 32
5	Helical	S188.000-I105.000	5.10	182.72	Body 32
		Total Exam DLP:		555.72	

1/1

Registro y Gestión de la Dosis

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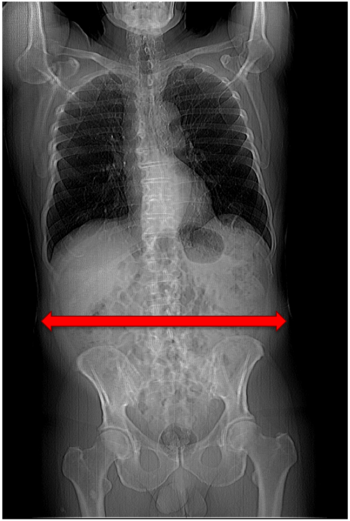
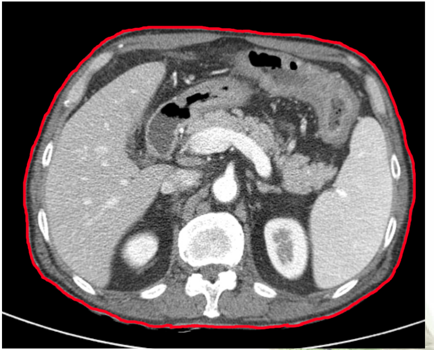
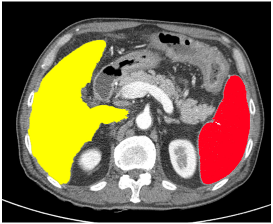




Registro y Gestión de la Dosis

- Fully automated organ segmentation from axial slices is non-trivial but tractable
- Might be useful for more refined tissue factor weighting based estimates of organ dose or total dose rather than depending on nominal procedure type
- Certainly useful for patient-specific Monte Carlo simulations of dose
- Cannot segment beyond reconstructed images (e.g., over-ranging for helical scans, scatter beyond scan extent), but could be used to scale to fit anthropomorphic phantoms



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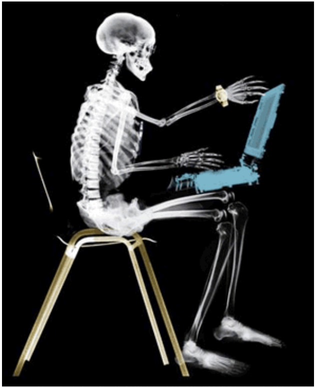
Orígenes de indicadores de dosis



Dose DICOM sources

- Multiple possible DOSE sources
  - DICOM
    - Image "header"
    - Modality Performed Procedure Step
    - Dose Screen OCR or "header"
    - Radiation Dose Structured Report
  - Other
    - Text Documents (.doc, .pdf, .txt, . . .) send by . . .
    - Monitoring :)

Dose from Modality - Images

- Images are **insufficient**
  - Technique only
    - kVP,mAs, not usually CTDIvol
    - not DLP, which spans entire acquisition
    - not Fluoro time, ...
  - No image ⇒ No dose
  - Multiple reconstructions per exposure.
    More images ⇒ apparently more dose
    - soft tissue and bone reconstructions, MPRs
    - might count more than once
  - Timing of encoding
    - images encoded/sent before acquisition ends

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Dose from Modality - MPPS

- Modality Performed Procedure Step (MPPS) is **insufficient**
  - limited ability to encode complex data
  - transient message to notify the status of the study from the modality to RIS and/or PACS, nor a persistent object
  - cannot be "stored" long term or queried
  - intended to manage scheduling system
  - also not very widely implemented
  - perceived as offering little benefit in addition to work list
  - RIS/PACS can read the information of MMPS and store them in the database, but no rule and no standard that indicate which information should be stored in the database

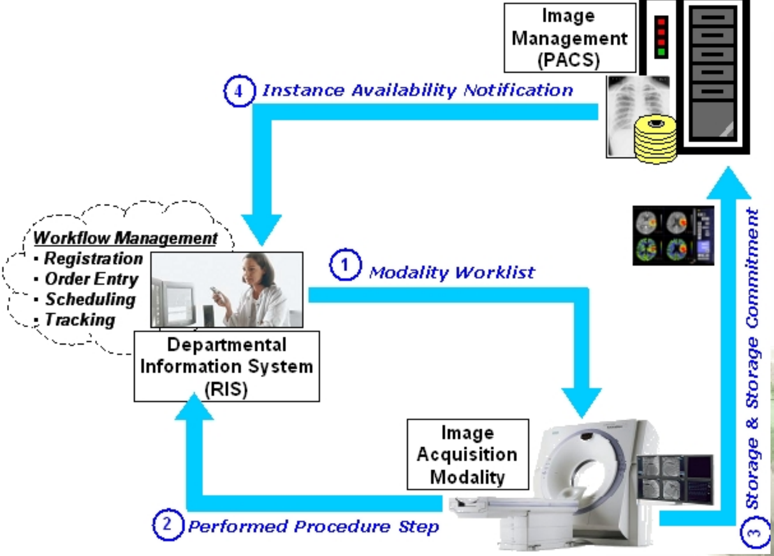
Image Management (PACS)
4 Instance Availability Notification
Workflow Management
▪ Registration
▪ Order Entry
▪ Scheduling
▪ Tracking
Departmental Information System (RIS)
1 Modality Worklist
3 Storage & Storage Commitment
Image Acquisition Modality
2 Performed Procedure Step

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MPPS

```
Operation Received = N-CREATE
(some tags are removed for simplicity)

(0008,0060) : 1 : Modality                     : XA
(0010,0010) : 1 : Patient's Name               : XXXXXXXX
(0010,0020) : 1 : Patient ID                   : YYYYYYYY
(0020,0010) : 1 : Study ID                     : ART. MESENT. SUP
(0040,0244) : 1 : Performed Procedure Step Start: 30/05/2006
(0040,0245) : 1 : Performed Procedure Step Start: 11:30:18
(0040,0250) : 1 : Performed Procedure Step End D: 30/05/2006
(0040,0251) : 1 : Performed Procedure Step End T: 13:03:08
(0020,000D) : 1 : Study Instance UID           :
1.3.46.670589.28.3711508483448.20060530093017670.13850

Operation Received = N-SET
(0018,115E) : 1 : Image Area Dose Product      : 2391.62
(0040,0250) : 1 : Performed Procedure Step End D: 30/05/2006
(0040,0251) : 1 : Performed Procedure Step End T: 13:03:08
(0040,0252) : 1 : Performed Procedure Step Statu: COMPLETED
(0040,0300) : 1 : Total Time of Fluoroscopy    : 1330
(0040,0301) : 1 : Total Number of Exposures    : 70
(0040,0302) : 1 : Entrance Dose                : 19
```

“Dose Screens” - Old Scanners

- Usually no explicit dose information
  - just technique (kVP, mA, etc.)
  - scanner-specific dosimetry efforts (ImPACT)
- Human-readable “dose screens”
  - CTDIvol and DLP per series & total DLP
  - not (generally) machine-readable
  - can use Optical Character Recognition (OCR)

Registro y Gestión de la Dosis

Dose Screen - GE

Patient Name: Exam no:

Accession Number:

Patient ID: Discovery CT750 HD

Exam Description: CT HALS/THORAX/ABDOMEN

Dose Report

Series	Type	Scan Range (mm)	CTDIvol (mGy)	DLP (mGy-cm)	Phantom cm
1	Scout	–	–	–	–
2	Helical	S15.750-I650.250	5.10	373.00	Body 32
5	Helical	S188.000-I105.000	5.10	182.72	Body 32
			Total Exam DLP:	555.72	

1/1

Registro y Gestión de la Dosis

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Key Fields to Extract

Patient Name: Exam no:

Accession Number:

Patient ID: Discovery CT750 HD

Exam Description: CT HALS/THORAX/ABDOMEN

Dose Report

Series	Type	Scan Range (mm)	CTDIvol (mGy)	DLP (mGy-cm)	Phantom cm
1	Scout	-	-	-	-
2	Helical	S15.750-I650.250	5.10	373.00	Body 32
5	Helical	S188.000-I105.000	5.10	182.72	Body 32

Total Exam DLP: 555.72

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Additional Fields to Extract

Patient Name: Exam no:

Accession Number:

Patient ID: Discovery CT750 HD

Exam Description: CT HALS/THORAX/ABDOMEN

Dose Report

Series	Type	Scan Range (mm)	CTDIvol (mGy)	DLP (mGy-cm)	Phantom cm
1	Scout	-	-	-	-
2	Helical	S15.750-I650.250	5.10	373.00	Body 32
5	Helical	S188.000-I105.000	5.10	182.72	Body 32
			Total Exam DLP:	555.72	

1/1

Registro y Gestión de la Dosis

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Available from "Header"

Patient Name: Exam no:

Accession Number:

Patient ID: Discovery CT750 HD

Exam Description: CT HALS/THORAX/ABDOMEN

Dose Report

Series	Type	Scan Range (mm)	CTDIvol (mGy)	DLP (mGy-cm)	Phantom cm
1	Scout	–	–	–	–
2	Helical	S15.750-I650.250	5.10	373.00	Body 32
5	Helical	S188.000-I105.000	5.10	182.72	Body 32
			Total Exam DLP:	555.72	

1/1

"Dose Screens" - Challenges

- Query and retrieval of dose screens
- Extracting sufficient information
- No coded anatomy information present
- Attempt to parse plain text

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"Dose Screens" - Challenges

- Query and retrieval of dose screens
- Extracting sufficient information
  - matching against actual series
  - information from reconstructed images
  - extracting anatomy and procedure
  - extracting phantom information
  - extracting scanning range
  - establishing scope of accumulation
  - absence of an Irradiation Event UID
- No coded anatomy information present
- Attempt to parse plain text

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“Dose Screens” - Challenges

- Query and retrieval of dose screens
- Extracting sufficient information
- No coded anatomy information present
  - legacy scanner consoles
    - no place to select anatomy from standard list
    - not available from Modality Work List (MWL)
    - not copied from protocols
  - so Body Part Examined and Anatomic Region Sequence usually empty or absent
- Attempt to parse plain text

"Dose Screens" - Challenges

- Query and retrieval of dose screens
- Extracting sufficient information
- No coded anatomy information present
- Attempt to parse plain text
  - challenging across multiple languages
  - abbreviations and punctuation are problematic
    - C/A/P versus CAP versus Chest/Abdomen/Pelvis

Radiation Dose Structured Report

- Radiation Dose Structured Report
  - persistent document-like object
  - store to PACS, RIS, XDS, CD media
  - extensible coded structured content
  - similar to other DICOM "evidence document" structured content like measurements
  - allows transfer and addition of more content
  - contains aggregate and per event exposure
  - contains detailed technique description

Registro y Gestión de la Dosis

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CT RADIATION DOSE SR IOD TEMPLATES

The templates that comprise the CT Radiation Dose SR are interconnected as in Figure A-12

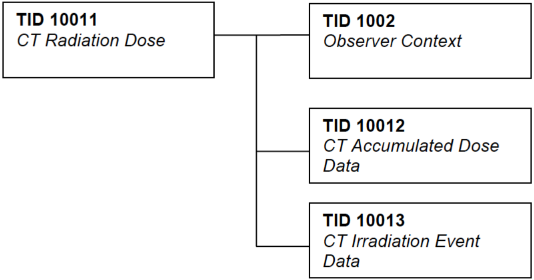

Figure A-12: CT Radiation Dose SR IOD Template Structure

Registro y Gestión de la Dosis

- : CONTAINER: X-Ray Radiation Dose Report [SEPARATE] (DCMR,10011)
  - HAS CONCEPT MOD: CODE: Procedure reported = Computed Tomography X-ray
    - HAS CONCEPT MOD: CODE: Has Intent = Diagnostic Intent
  - HAS OBS CONTEXT: CODE: Observer Type = Device
  - HAS OBS CONTEXT: TEXT: Device Observer Name = ilqhfaatc1ws444
  - HAS OBS CONTEXT: TEXT: Device Observer Manufacturer = Philips
  - HAS OBS CONTEXT: TEXT: Device Observer Model Name = Brilliance 64
  - HAS OBS CONTEXT: TEXT: Device Observer Physical Location During Observation = PMSTL
  - HAS OBS CONTEXT: DATETIME: Start of X-ray Irradiation = 20100422162839.030
  - HAS OBS CONTEXT: CODE: Scope of Accumulation = Study
    - HAS PROPERTIES: UIDREF: Study Instance UID = 1.2.840.113704.1.111.6084.1271942101.12
  - CONTAINS: CONTAINER: CT Accumulated Dose Data [SEPARATE]
    - CONTAINS: NUM: Total Number of Irradiation Events = 2 events
    - CONTAINS: NUM: CT Dose Length Product Total = 19.67375 mGycm
  - CONTAINS: CONTAINER: CT Acquisitions [SEPARATE]
  - CONTAINS: CONTAINER: CT Acquisitions [SEPARATE]
    - CONTAINS: CODE: Acquisition Type = Sequenced Acquisition
    - CONTAINS: CODE: Procedure Context = CT without contrast
    - CONTAINS: UIDREF: Irradiation Event UID = 1.2.840.113704.1.111.6084.1271942101.12.2
    - CONTAINS: CONTAINER: CT Acquisition Parameters [SEPARATE]
      - CONTAINS: NUM: Exposure Time = 4254 s
      - CONTAINS: NUM: Scanning Length = 10 mm
      - CONTAINS: NUM: Nominal Single Collimator Width = 0.625 mm
      - CONTAINS: NUM: Nominal Total Collimator Width = 1.25 mm
      - CONTAINS: NUM: Number of X-ray Sources = 1 X-ray sources
      - CONTAINS: CONTAINER: CT X-ray Source Parameters [SEPARATE]
    - CONTAINS: CONTAINER: CT Dose [SEPARATE]
      - CONTAINS: NUM: Mean CTDIvol = 1.3978125 mGy
      - CONTAINS: CODE: CTDIw Phantom Type = IEC Body Dosimetry Phantom
      - CONTAINS: NUM: DLP = 16.77375 mGycm
    - CONTAINS: CODE: Device Role in Procedure = Irradiating Device
      - HAS PROPERTIES: TEXT: Device Manufacturer = Philips
      - HAS PROPERTIES: TEXT: Device Model Name = Brilliance 64
  - CONTAINS: CODE: Source of Dose Information = Automated Data Collection

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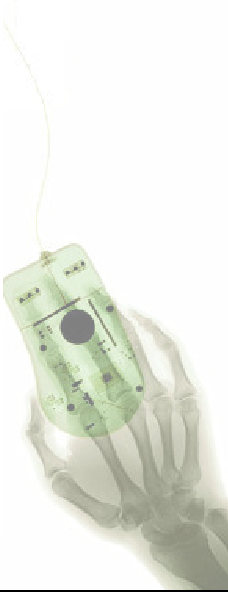

Registro y Gestión de la Dosis

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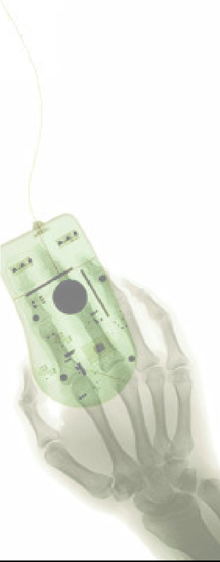
- : CONTAINER: X-Ray Radiation Dose Report [SEPARATE] (DCMR,10011)
  - HAS CONCEPT MOD: CODE: Procedure reported = Computed Tomography X-ray
    - HAS CONCEPT MOD: CODE: Has Intent = Diagnostic Intent
  - HAS OBS CONTEXT: CODE: Observer Type = Device
  - HAS OBS CONTEXT: TEXT: Device Observer Name = ilqhfaatc1ws444
  - HAS OBS CONTEXT: TEXT: Device Observer Manufacturer = Philips
  - HAS OBS CONTEXT: TEXT: Device Observer Model Name = Brilliance 64
  - HAS OBS CONTEXT: TEXT: Device Observer Physical Location During Observation = PMSTL
  - HAS OBS CONTEXT: DATETIME: Start of X-ray Irradiation = 20100422162839.030
  - HAS OBS CONTEXT: CODE: Scope of Accumulation = Study
    - HAS PROPERTIES: UIDREF: Study Instance UID = 1.2.840.113704.1.111.6084.1271942101.12
  - CONTAINS: CONTAINER: CT Accumulated Dose Data [SEPARATE]
    - CONTAINS: NUM: Total Number of Irradiation Events = 2 events
    - CONTAINS: NUM: CT Dose Length Product Total = 19.67375 mGycm
  - CONTAINS: CONTAINER: CT Acquisitions [SEPARATE]
  - CONTAINS: CONTAINER: CT Acquisitions [SEPARATE]
    - CONTAINS: CODE: Acquisition Type = Sequenced Acquisition
    - CONTAINS: CODE: Procedure Context = CT without contrast
    - CONTAINS: UIDREF: Irradiation Event UID = 1.2.840.113704.1.111.6084.1271942101.12.2
    - CONTAINS: CONTAINER: CT Acquisition Parameters [SEPARATE]
      - CONTAINS: NUM: Exposure Time = 4254 s
      - CONTAINS: NUM: Scanning Length = 10 mm
      - CONTAINS: NUM: Nominal Single Collimator Width = 0.625 mm
      - CONTAINS: NUM: Nominal Total Collimator Width = 1.25 mm
      - CONTAINS: NUM: Number of X-ray Sources = 1 X-ray sources
      - CONTAINS: CONTAINER: CT X-ray Source Parameters [SEPARATE]
    - CONTAINS: CONTAINER: CT Dose [SEPARATE]
      - CONTAINS: NUM: Mean CTDIvol = 1.3978125 mGy
      - CONTAINS: CODE: CTDIw Phantom Type = IEC Body Dosimetry Phantom
      - CONTAINS: NUM: DLP = 16.77375 mGycm
    - CONTAINS: CODE: Device Role in Procedure = Irradiating Device
      - HAS PROPERTIES: TEXT: Device Manufacturer = Philips
      - HAS PROPERTIES: TEXT: Device Model Name = Brilliance 64
  - CONTAINS: CODE: Source of Dose Information = Automated Data Collection



```
CT Accumulated Dose Data:
--------------------------------------------------------------------------
Total Number of Irradiation Events: 4.0 events
CT Dose Length Product Total: 93.51 mGycm

CT Irradiation Event Data:
--------------------------------------------------------------------------
   Acquisition Protocol: Topogram
   Target Region: Heart
   CT Acquisition Type: Constant Angle Acquisition
   Procedure Context: CT without contrast
   Irradiation Event UID: 1.3.12.2.1107.5.1.4.61999.300000090227084527312(
   Comment: Internal technical scan parameters: Organ Characteristic = Ca
Modulation Type = OFF
   Device Role in Procedure: Irradiating Device

   CT Acquisition Parameters:
   -----------------------------------------------------------------------
      Exposure Time: 5.28 s
      Scanning Length: 541.0 mm
      Nominal Single Collimation Width: 0.6 mm
      Nominal Total Collimation Width: 3.6 mm
      Pitch Factor: null
      Number of X-ray Sources: 1.0 X-ray sources

      CT X-ray Source Parameters:
      --------------------------------------------------------------------
         Identification of the X-ray Source: A
         KVP: 120.0 kV
         Maximum X-ray Tube Current: 36.0 mA
         X-Ray Tube Current: 36.0 mA
         Exposure Time per Rotation:

CT Irradiation Event Data:
--------------------------------------------------------------------------
   Acquisition Protocol: PreMonitoring
   Target Region: Heart
   CT Acquisition Type: Sequenced Acquisition
   Procedure Context: CT without contrast
   Irradiation Event UID: 1.3.12.2.1107.5.1.4.61999.300000090227084527312(
```

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Ruota in senso orario | Trova

Casa di Cura Madre Fortunata Toniolo - Bologna
Servizio di Radiologia e Diagnostica per Immagini
Direttore Carlo Monti

X-Ray Radiation Dose Report

ID paziente:	ANON-939-732-218	**Nome:**	368 Anonymous
Data di nascita:	1933-08-28	**Età:**	76 (77)
Sesso:	Maschile	**Gruppo etnico:**	
Data esame:	2009-12-28, 08:41:12	**Esame n.:**	50
Numero richiesta:	1	**Data contenuto:**	2009-12-28, 08:41:12
Peso:		**Area della superficie corporea:**	
Statura:		**Indice di massa corporea:**	
Flag di completamento:	COMPLETE	**Flag di verifica:**	UNVERIFIED

Procedure reported Computed Tomography X-Ray
Observer Type Device
Device Observer UID 1.2.840.113619.6.267
Device Observer Name ct01
Device Observer Manufacturer GE Medical Systems
Device Observer Model Name Discovery CT750 HD
Start of X-ray Irradiation 2009-12-28, 08:41:12
End of X-ray Irradiation 2009-12-28, 08:44:47
Scope of Accumulation Study
Study Instance UID 1.2.840.113619.2.267.3.3363899913.904.1261981794.186

CT Accumulated Dose Data

Total Number of Irradiation Events 3.0 {events}
CT Dose Length Product Total 321.6 mGycm

CT Acquisition

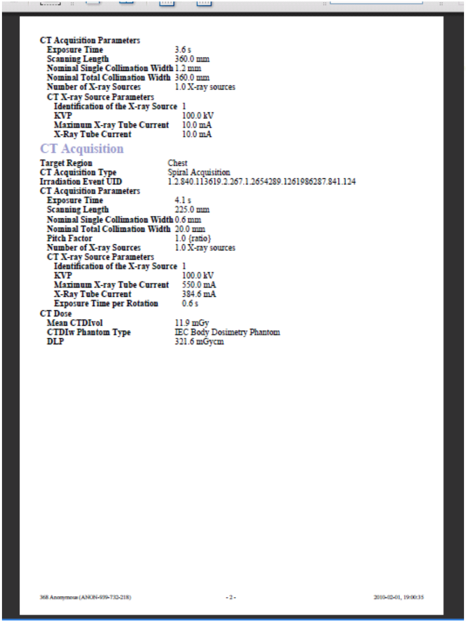
Target Region Chest
CT Acquisition Type Constant Angle Acquisition
Irradiation Event UID 1.2.840.113619.2.267.1.2654289.1261986287.816.124
CT Acquisition Parameters
- **Exposure Time** 3.6 s
- **Scanning Length** 360.0 mm
- **Nominal Single Collimation Width** 1.2 mm
- **Nominal Total Collimation Width** 360.0 mm
- **Number of X-ray Sources** 1.0 X-ray sources
- **CT X-ray Source Parameters**
  - **Identification of the X-ray Source** 1
  - **KVP** 100.0 kV
  - **Maximum X-ray Tube Current** 10.0 mA
  - **X-Ray Tube Current** 10.0 mA

CT Acquisition

Target Region Chest
CT Acquisition Type Constant Angle Acquisition
Irradiation Event UID 1.2.840.113619.2.267.1.2654289.1261986287.829.124

368 Anonymous (ANON-939-732-218) - 1 - 2010-02-01, 19:00:35

Registro y Gestión de la Dosis



CT Acquisition Parameters	
Exposure Time	3.6 s
Scanning Length	360.0 mm
Nominal Single Collimation Width	1.2 mm
Nominal Total Collimation Width	360.0 mm
Number of X-ray Sources	1.0 X-ray sources
CT X-ray Source Parameters	
Identification of the X-ray Source	1
KVP	100.0 kV
Maximum X-ray Tube Current	10.0 mA
X-Ray Tube Current	10.0 mA

CT Acquisition

Target Region	Chest
CT Acquisition Type	Spiral Acquisition
Irradiation Event UID	1.2.840.113619.2.267.1.2654289.1261986287.841.124
CT Acquisition Parameters	
Exposure Time	4.1 s
Scanning Length	225.0 mm
Nominal Single Collimation Width	0.6 mm
Nominal Total Collimation Width	20.0 mm
Pitch Factor	1.0 {ratio}
Number of X-ray Sources	1.0 X-ray sources
CT X-ray Source Parameters	
Identification of the X-ray Source	1
KVP	100.0 kV
Maximum X-ray Tube Current	550.0 mA
X-Ray Tube Current	384.6 mA
Exposure Time per Rotation	0.6 s
CT Dose	
Mean CTDIvol	11.9 mGy
CTDIw Phantom Type	IEC Body Dosimetry Phantom
DLP	321.6 mGycm

368 Anonymous (ANON-939-732-218) - 2 - 2010-02-01, 19:00:35

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```
Irradiation Event X-Ray Data:
---------------------------------------------------------------------------
   Acquisition Protocol: FL Card
   Irradiation Event UID: 1.3.12.2.1107.5.4.5.161998.300000090119083857500
   Distance Source to Detector: 989.0 mm
   Distance Source to Isocenter: 785.0 mm
   Table Longitudinal Position: 1.0 mm
   Table Lateral Position: -620.0 mm
   Table Height Position: -999.0 mm
   Acquisition Plane: Single Plane
   Irradiation Event Type: Fluoroscopy
   Dose Area Product: 6.8E-6 Gym2
   Dose (RP): 0.00156 Gy
   Positioner Primary Angle: -1.0 °
   Positioner Secondary Angle: -1.1 °
   Positioner Primary End Angle: 0.0 °
   Positioner Secondary End Angle: 0.0 °
   Fluoro Mode: Pulsed
   Pulse Rate: 15.0 pulse/s
   Number of Pulses: 28.0 no units
   KVP: 74.0 kV
   X-Ray Tube Current: 162.8 mA
   Exposure Time: 235.2 ms
   Pulse Width: 8.4 ms
   Exposure: 38290.0 uAs
   Focal Spot Size: 0.4 mm
   Acquired Image: 1

   X-Ray Filters:
   ------------------------------------------------------------------------
      X-Ray Filter Type: Strip Filter
      X-Ray Filter Material: Copper or Copper compound
      X-Ray Filter Thickness Minimum: 0.2 mm
      X-Ray Filter Thickness Maximum: 0.2 mm


Irradiation Event X-Ray Data:
---------------------------------------------------------------------------
   Acquisition Protocol: FL Card
   Irradiation Event UID: 1.3.12.2.1107.5.4.5.161998.300000090119083857500
   Distance Source to Detector: 989.0 mm
   Distance Source to Isocenter: 785.0 mm
```

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X-Ray Radiation Dose Report

Procedure reported :	113704 Projection X-Ray
Has Intent :	R-002E9 Combined Diagnostic and Therapeutic Procedure
Observer Type :	121007 Device
:	1.2.840.113619.2.245.5324865481432626087 8.1228670545.1506.3
Device Observer Name :	TERRA
Device Observer Manufacturer :	GE MEDICAL SYSTEMS
Device Observer Model Name :	DL
Device Observer Serial Number :	Unknown
Scope of Accumulation :	113016 Performed Procedure Step
:	1.2.840.113619.2.245.5324865481432626087 8.1228670545.1506.4
Comment :	Dose report of Innova
Source of Dose Information :	113856 Automated Data Collection

Accumulated X-Ray Dose Data

Acquisition Plane :	113622 Single Plane
Dose Area Product Total :	3.7695 Gym2
Dose (RP) Total :	0.00563482 Gy
Fluoro Dose Area Product Total :	0.0 Gym2
Fluoro Dose (RP) Total :	0.0 Gy
Total Fluoro Time :	0 S
Acquisition Dose Area Product Total :	3.72126 Gym2
Acquisition Dose (RP) Total :	0.00563482 Gy
Total Acquisition Time :	28 s
Total Number of Radiographic Frames :	100 No units
Reference Point Definition :	113860 15cm from Isocenter toward Source

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Radiation Dose Structured Report

- Radiation Dose Structured Report
  - general structure common to all modalities
  - specific content for different modalities
  - CT versus projection X-Ray
  - fluoroscopy versus individual exposures
  - allows for shared infrastructure to manage all ionizing radiation producing diagnostic modalities
  - future extension to nuclear medicine & PET
  - irradiation event: uniquely identified
  - scope: event, series, PPS, study
  - accumulated & per-event data
  - phantom dose required (CTDIvol, DLP)
  - effective dose (mSv) optional (ICRP 60, 103)
  - per-event acquisition parameters (kV,. . .)
  - standard coded region (anatomy)
  - standard coded CT type (sequenced,spiral,. . .)

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Dilema – Preguntas – Necesidades

Registro y Gestión de la Dosis

- What to do about older scanners / older modalities
  - that are not yet updated, and may never be
  - vast majority of global installed base
  - what existing capabilities can be leveraged ?
- What about new objects in old PACS ?
  - new modalities may produce RDSR, but ...
  - site has no system to view, aggregate, report
- Even for old images in the archive ...
  - vast collection of reference dose information
  - manual recording is tedious (== expensive)
  - prior data for patients with new studies

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Para preguntarnos

- ¿Sabemos lo que queremos?
  - Registro de dosis, Historial dosimétrico
  - Para optimizar procedimientos, para que el paciente tenga esa información, para que el médico peticionario "pida menos"
  - A nivel IntraHospitalario, InterHospitalario, Regional (incluyendo Atención Primaria), Nacional
- ¿Hemos valorado las implicaciones?
- ¿Sabemos como obtener los datos para alimentar "congruentemente" este Historial Dosimétrico?

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Para preguntarnos

- ¿Sabemos lo que queremos?
- ¿Hemos valorado las implicaciones?
  - De que el paciente se lleve una información que "habitualmente no entenderá".
  - De que al médico peticionario se le presente una información **fragmentada** que "habitualmente no entenderá".
  - De implantar un Historial Dosimétrico sobre "Pilares de Barro".
- ¿Sabemos como obtener los datos para alimentar "congruentemente" este Historial Dosimétrico?

Para preguntarnos

- ¿Sabemos lo que queremos?
- ¿Hemos valorado las implicaciones?
- ¿Sabemos como obtener los datos para alimentar "congruentemente" este Historial Dosimétrico?
  - ¿Tenemos los consensos necesarios?
  - ¿Qué hacemos con las exposiciones no almacenadas?
  - ¿Qué utilizamos? Imágenes, MPPS, SC, RDSR
  - ¿La tecnología soporta lo que queremos?

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Sin embargo . . . es necesaria una actuación

- Independientemente del riesgo real, el riesgo percibido requiere nuestra actuación.
- Monitorización e Informado de las Dosis en procedimientos de RX es alcanzable.
- Las empresas están colaborando para que sus equipos provean información estándar a través de los DICOM RDSR
- Dispositivos antiguos (CT) pueden incorporarse mediante OCR
- Los Registros de Dosis Nacionales (**necesarios/imprescindibles**) pueden utilizar esta información para generar informes agregados
- Incorporación de la información de Dosis en un Historial “Global” sigue siendo un gran desafío.
- Incorporar sistemáticamente **IHE-REM** en los **requisitos de compra** de los equipos.

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Objetivo: Asegurar una Mejor Dosis

- Reducir errores "técnicos"
- Reducir uso inapropiado (CT, RX conv., . . .)
- Mejorar protocolos (CT, intervencionismo, . . .)
- Mejorar tecnologías de baja-dosis (así como su utilización)

- Avanzar en la monitorización
- Mayor regulación y capacidades de informar de las dosis.
- Mejor conocimiento de los fundamentos

Registro y Gestión de la Dosis

Concepto: ¿Estamos hablando de . . . ?

Riesgo vs Variabilidad

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Concepto: ¿Estamos hablando de . . . ?

Riesgo vs Variabilidad

En estos pacientes la estimación de AK y $CTDI_{vol}$ fue correcta

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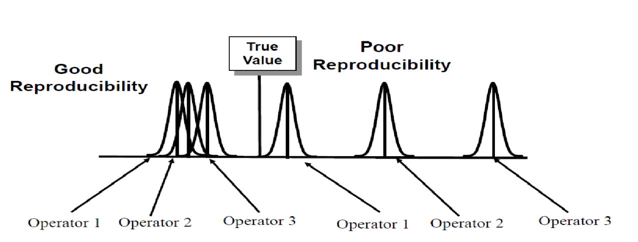
Concepto: ¿Estamos hablando de . . . ?

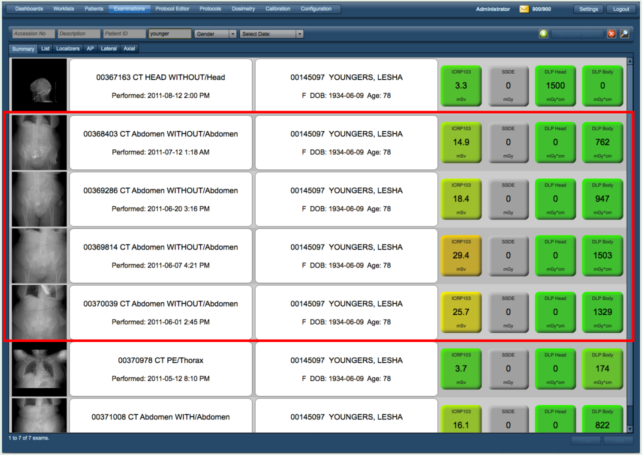
Riesgo vs **Variabilidad**



Registro y Gestión de la Dosis

Concepto: ¿Estamos hablando de . . . ?

Riesgo vs **Variabilidad**



Exam	Patient	ICRP103 (mSv)	SSDE (mGy)	DLP Head (mGy*cm)	DLP Body (mGy*cm)
00367163 CT HEAD WITHOUT/Head Performed: 2011-08-12 2:00 PM	00145097 YOUNGERS, LESHA F DOB: 1934-06-09 Age: 78	3.3	0	1500	0
00368403 CT Abdomen WITHOUT/Abdomen Performed: 2011-07-12 1:18 AM	00145097 YOUNGERS, LESHA F DOB: 1934-06-09 Age: 78	14.9	0	0	762
00369286 CT Abdomen WITHOUT/Abdomen Performed: 2011-06-20 3:16 PM	00145097 YOUNGERS, LESHA F DOB: 1934-06-09 Age: 78	18.4	0	0	947
00369814 CT Abdomen WITHOUT/Abdomen Performed: 2011-06-07 4:21 PM	00145097 YOUNGERS, LESHA F DOB: 1934-06-09 Age: 78	29.4	0	0	1503
00370039 CT Abdomen WITHOUT/Abdomen Performed: 2011-06-01 2:45 PM	00145097 YOUNGERS, LESHA F DOB: 1934-06-09 Age: 78	25.7	0	0	1329
00370978 CT PE/Thorax Performed: 2011-05-12 8:10 PM	00145097 YOUNGERS, LESHA F DOB: 1934-06-09 Age: 78	3.7	0	0	174
00371008 CT Abdomen WITH/Abdomen	00145097 YOUNGERS, LESHA	16.1	0	0	822

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Consideraciones sobre la Variabilidad

1. Los pacientes tiene el "**derecho**" de sentirse seguros al realizarse procedimientos o exploraciones con rayos X.
2. Es el propio proceso el que crea la variabilidad - la incertidumbre de "**ser seguro**".
3. Las personas mas cercanas al producto/proceso son las que mas pueden afectar a la calidad.
4. Es necesario identificar las herramientas que den "**poder**" al operador.

Registro y Gestión de la Dosis

Magnitudes derivadas: SSDE/PSD

Registro y Gestión de la Dosis

SSDE

AAPM Report No. 204

Size-Specific Dose Estimates (SSDE) in Pediatric and Adult Body CT Examinations

Report of AAPM Task Group 204, developed in collaboration with the International Commission on Radiation Units and Measurements (ICRU) and the Image Gently campaign of the Alliance for Radiation Safety in Pediatric Imaging

AAPM REPORT NO. 220

Use of Water Equivalent Diameter for Calculating Patient Size and Size-Specific Dose Estimates (SSDE) in CT

The Report of AAPM Task Group 220

September 2014

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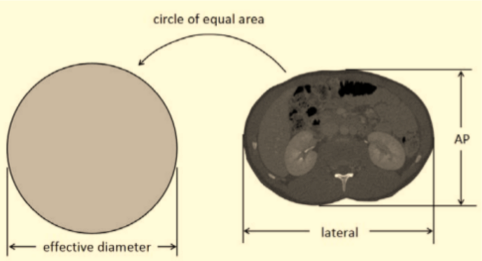
Registro y Gestión de la Dosis

SSDE

Definitions: Size related parameters

Figure 2. The anterior posterior (AP) and lateral dimension, along with effective diameter are illustrated in this figure. The lateral dimension can be determined from a PA or AP CT radiograph, and the AP dimension can be determined by a lateral CT radiograph. The effective diameter corresponds to a circle having an area equal to that of the patient's cross section on a CT image. Some investigators have also used patient perimeter (circumference) as a metric of patient size.



The specific formula to estimate patient dose for a specific patient size is given by:

$$\textit{size specific dose estimate} = SSDE = f^{32X}_{size} \times CTDI^{32}_{vol}\,, \qquad \text{Equation 8a}$$

for the 32 cm diameter $CTDI_{vol}$ reference phantom, and

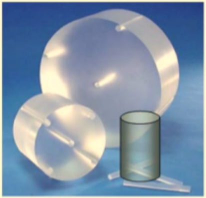
$$\textit{size specific dose estimate} = SSDE = f^{16X}_{size} \times CTDI^{16}_{vol} \qquad \text{Equation 8b}$$

for the 16 cm diameter $CTDI_{vol}$ reference phantom.

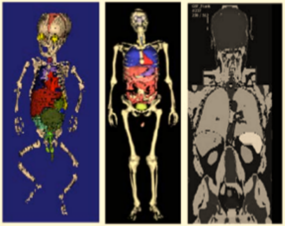
SSDE

The various tools used by the four independent research groups are illustrated Figure 3.

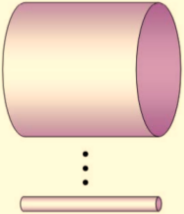
A. Physical Anthropomorphic Phantoms
(McCollough and collaborators, Mc)



B. Cylindrical PMMA phantoms
(Toth and Strauss, TS)



C. Monte Carlo Voxelized Phantoms
(McNitt-Gray and collaborators, MG)



D. Monte Carlo Mathematical Cylinders
(Boone and collaborators, ZB)

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SSDE

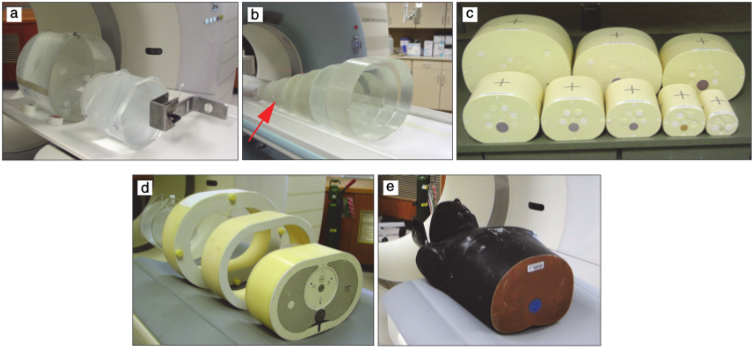

Figure 1. Phantoms used for estimating D_w from CT localizer radiographs and CT images: (a) water cylinders, (b) torso-shaped phantoms with a PMMA shell filled with water, (c) water equivalent torso phantoms, (d) semi-anthropomorphic thorax phantom with extension rings for mimicking larger patient sizes, and (e) anthropomorphic thorax phantom.

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SSDE

Table 2: Thorax Phantom. AP and lateral dimensions, effective diameters calculated using phantom dimensions, and water equivalent diameters D_w calculated using CT images and CT localizer radiographs. Effective and water equivalent diameter values were normalized to D_w calculated from the CT images. The absolute value of D_w calculated using the CT image is shown in parentheses. (Adapted with permission from Wang et al. [8].)

Phantom	Phantom Size	Phantom Dimension (cm)		Effective Diameter (%)		Water Equivalent Diameter (%)	
		AP	LAT	(AP + LAT)/2	$\sqrt{AP \times LAT}$	From CT Image**	From CT Localizer Radiograph
Tissue Equivalent Thorax Phantom	30 cm*	20	30	119.6	121.5	100 (20.9)	100.0
	35 cm*	25	35	109.9	112.5	100 (27.3)	100.7
	40 cm*	30	40	105.4	107.5	100 (33.2)	101.5
Anthro-pomorphic Phantom		21.6	31.8	104.3	112.1	100 (25.6)	100.0
Mean ± Standard Deviation				109.8 ±7.0%	113.4 ±5.9%	-	100.6 ±0.7%

AP = anteroposterior, LAT = lateral, * Lateral width of the phantom, ** Absolute value in parenthesis (cm).

Registro y Gestión de la Dosis

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SSDE

Considering the rapid rate of adoption of SSDE in the clinical and research communities, and given the continued interest in assessing patient-specific dose models, it is imperative that scanner manufacturers and other dose metric tracking software providers automatically calculate D_w at z-axis intervals of no larger than 5 mm and store these data in clearly labeled DICOM data fields, in both the image and the Radiation Dose Structured Report, as soon as possible. Additionally, scanner manufacturers are urged to provide the angular and longitudinal modulation tube current values in a separate DICOM data array to allow $CTDI_{vol}$ and SSDE to be calculated for z-axis ranges that are clinically relevant, e.g., over the entire thorax or over just the heart. While the mean tube current value per image, or over a 5 mm z-axis interval, provide important and useful information, the individual tube current values for different view angles (x-ray source angles) should be provided at reasonable intervals (such as every 1 degree or every 5 degrees).

The strongly expressed goal of the CT stakeholder community is that this work be completed and begin shipping on software versions released in 2016. This will provide users sophisticated metrics for assessing size-specific patient doses in an automated and reproducible manner for use in many quality and safety initiatives.

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PSD: Dosis en procedimientos intervencionistas

Skin dose mapping for fluoroscopically guided interventions

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(Received 3 May 2011; revised 24 June 2011; accepted for publication 15 August 2011; published 19 September 2011)

Purpose: To introduce a new skin dose mapping software system for interventional fluoroscopy dose assessment and to analyze the benefits and limitations of patient-phantom matching.
Methods: In this study, a new software system was developed for visualizing patient skin dose during interventional fluoroscopy procedures. The system works by translating the reference point air kerma to the location of the patient's skin, which is represented by a computational model. In order to orient the model with the x-ray source, geometric parameters found within the radiation dose structured report (RDSR) are used along with a limited number of in-clinic measurements. The out-

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PSD: Dosis en procedimientos intervencionistas

TABLE I. Geometric and dose parameters extracted from the RDSR. These parameters are used by the skin dose mapping program to orient the tube with respect to the anthropomorphic model and to determine PSD.

RDSR Parameters
Table lateral position
Table longitudinal position
Table vertical position
Primary angle
Secondary angle
Source-to-detector distance
Source-to-isocenter distance
Peak tube voltage
Field of view
Air kerma at reference point
Air kerma-area product

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PSD: Dosis en procedimientos intervencionistas

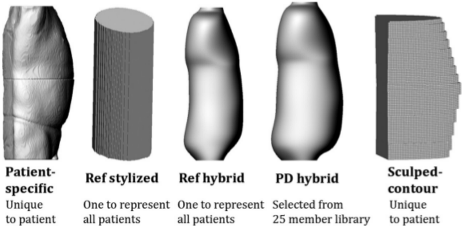

FIG. 3. For each patient-specific model, peak skin dose was also calculated for a reference stylized, reference hybrid, patient-dependent hybrid, and patient-sculpted contour phantom. Accuracy was quantified using the PSD calculated using the patient-specific model as the standard.

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PSD: Dosis en procedimientos intervencionistas

FIG. 5. Skin dose comparison between a real patient and anthropometrically matched hybrid patient dependent phantom (view is posterior). [Reprinted with permission from the Radiological Society of North America (RSNA). Balter, Hopewell, Miller, Wagner, and Zelefsky, "Fluoroscopically guided interventional procedures: A review of radiation effects on patients' skin and hair," Radiology **254**, 326-341 (2010)].

Medical Physics, Vol. 38, No. 10, October 2011

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PSD: Dosis en procedimientos intervencionistas

Table III. Mean absolute percent difference in PSD between patient-specific models and four different phantom types. Results are grouped according to patient size, tube projection, and orientation.

		Cardiac					Abdominal			
		Reference stylized	Reference hybrid	Patient-dependent	Patient-sculpted		Reference stylized	Reference hybrid	Patient-dependent	Patient-sculpted
Male						PA				
	Heavy	0.9	1.1	4.6	0.9		1.0	2.1	4.9	1.0
	Light	2.7	1.5	2.1	2.7		1.9	1.7	2.1	1.9
	All	2.0	1.4	3.0	2.0		1.6	1.8	3.1	1.6
						Lt Lat				
	Heavy	5.5	5.8	2.5	1.6		3.1	10.7	6.7	1.9
	Light	10.9	9.1	8.0	2.5		16.0	5.2	3.4	3.3
	All	9.0	7.9	6.0	2.2		11.4	7.1	4.5	2.8
						AP				
	Heavy	34.4	18.4	5.8	7.3		40.5	21.1	9.8	2.3
	Light	20.9	8.6	8.3	7.1		25.2	6.9	7.7	3.2
	All	25.7	12.0	7.4	7.2		30.6	12.0	8.4	2.9
Female						PA				
	Heavy	3.6	8.0	10.7	3.6		2.4	10.3	10.0	2.4
	Light	4.6	7.1	7.4	4.6		4.3	8.6	9.1	4.3
	All	4.2	7.5	8.7	4.2		3.5	9.3	9.5	3.5
						LT Lat				
	Heavy	9.2	13.3	12.1	5.5		12.4	19.1	14.5	5.5
	Light	11.6	5.5	3.0	3.9		19.7	4.5	6.3	3.8
	All	10.6	8.8	6.8	4.5		16.7	10.6	9.7	4.5
						AP				
	Heavy	39.1	8.6	9.8	5.2		46.7	22.4	9.1	9.0
	Light	16.8	29.1	17.1	9.8		16.2	20.3	11.3	6.3
	All	26.1	20.6	14.1	7.9		28.9	21.2	10.4	7.4

PSD: Dosis en procedimientos intervencionistas

Radiation Protection Dosimetry (2014), pp. 1–13 doi:10.1093/rpd/ncu181

PATIENT DOSE MAP INDICATIONS ON INTERVENTIONAL X-RAY SYSTEMS AND VALIDATION WITH GAFCHROMIC XR-RV3 FILM

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Received 20 December 2013; revised 14 April 2014; accepted 9 May 2014

To help avoiding secondary effects of interventional procedures like skin damage, a dose map method has been developed to provide an indication of the local dose on a surface representative of individual patient shapes. To minimise user interactions, patient envelope shapes are automatically determined depending on simple patient data information. Local doses are calculated in 1-cm^2 areas depending on the estimated air kerma, table and gantry positions and system settings, taking into account the table and mattress attenuations and estimated backscatter from the patient. These local doses are cumulated for each location of the patient envelope during the clinical procedure. To assess the accuracy of the method, Gafchromic XR-RV3 films have been used in several operating configurations. Good visual agreements on cumulated dose localisation were obtained within the 1-cm^2 precision of the map and the dose values agreed within 24.9 % accuracy. The resulting dose map method has been integrated into GE Healthcare X-Ray angiographic systems and should help in the management of the dose by the users during the procedure.

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Gestión de dosis – IHE-REM

IHE™

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Integrating the Healthcare Enterprise

IHE

IHE Radiology

Technical Framework Supplement

Radiation Exposure Monitoring (REM)

Trial Implementation

Date: November 16, 2010
Editor: Kevin O'Donnell
Email: radiology@ihe.net

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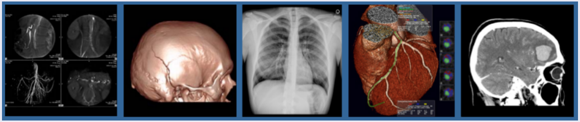
Motivación

1. X-Ray based imaging can provide tremendously useful information
2. Patient Dose is an important consideration
3. Potential benefit >> potential risk

   . . . but the risk should still be managed



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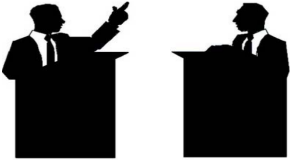
"I think patient dose is improving."



"I think it's getting worse."

> Managing in the presence of data is far better and easier than managing in its absence. – **Robert Glass**

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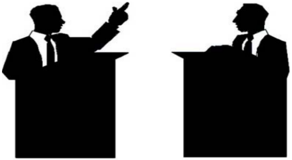
"I think patient dose is improving."



"I think it's getting worse."

Managing in the presence of data is far better and easier than managing in its absence. – **Robert Glass**

Should be easy / automatic / routine

IHE Radiation Exposure Monitoring Profile

- Integration of systems reporting dose and systems which receive, store, or process those reports
- Modalities, PACS, RIS, Workstations, Registries
- Facilitate compliance with Euratom 97/43, ACR Guidelines, etc.
- DICOM Dose Reports
- Creation, Collection, Distribution, Processing

IHE Radiation Exposure Monitoring Profile

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- Modalities, PACS, RIS, Workstations, Registries
- Facilitate compliance with Euratom 97/43, ACR Guidelines, etc.
- DICOM Dose Reports
- Creation, Collection, Distribution, Processing

- "SR Objects" – DICOM Structured Reports
  - Easily ingested (and regurgitated) by PACS
- Granularity : "Irradiation Event"
  - + Accumulated Dose over Study, Series
- Templates:
  - CT, Projection X-Ray (Mammo, Fluoro)
- Not addressed yet: NM(*), RT

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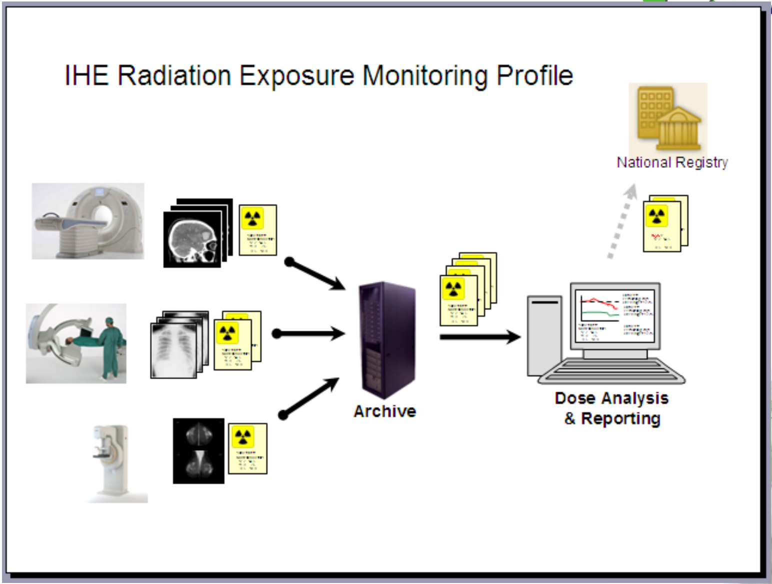

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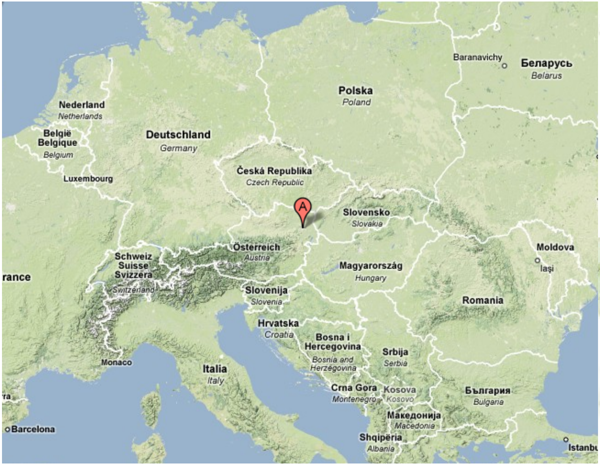
CAT 200 – Verificaciones REM

Viena, 20-24 Abril 2009



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Registro y Gestión de la Dosis

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```
CT Accumulated Dose Data:
---------------------------------------------------------------------------
Total Number of Irradiation Events: 4.0 events
CT Dose Length Product Total: 93.51 mGycm

CT Irradiation Event Data:
---------------------------------------------------------------------------
   Acquisition Protocol: Topogram
   Target Region: Heart
   CT Acquisition Type: Constant Angle Acquisition
   Procedure Context: CT without contrast
   Irradiation Event UID: 1.3.12.2.1107.5.1.4.61999.3000000902270845273120
   Comment: Internal technical scan parameters: Organ Characteristic = Ca
Modulation Type = OFF
   Device Role in Procedure: Irradiating Device

   CT Acquisition Parameters:
   ------------------------------------------------------------------------
      Exposure Time: 5.28 s
      Scanning Length: 541.0 mm
      Nominal Single Collimation Width: 0.6 mm
      Nominal Total Collimation Width: 3.6 mm
      Pitch Factor: null
      Number of X-ray Sources: 1.0 X-ray sources

      CT X-ray Source Parameters:
      ---------------------------------------------------------------------
         Identification of the X-ray Source: A
         KVP: 120.0 kV
         Maximum X-ray Tube Current: 36.0 mA
         X-Ray Tube Current: 36.0 mA
         Exposure Time per Rotation:

CT Irradiation Event Data:
---------------------------------------------------------------------------
   Acquisition Protocol: PreMonitoring
   Target Region: Heart
   CT Acquisition Type: Sequenced Acquisition
   Procedure Context: CT without contrast
   Irradiation Event UID: 1.3.12.2.1107.5.1.4.61999.3000000902270845273120
```

CAT 200 – Verificaciones REM

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Viena, 20-24 Abril 2009

```
Irradiation Event X-Ray Data:
---------------------------------------------------------------------------
   Acquisition Protocol: FL Card
   Irradiation Event UID: 1.3.12.2.1107.5.4.5.161998.300000090119083857500
   Distance Source to Detector: 989.0 mm
   Distance Source to Isocenter: 785.0 mm
   Table Longitudinal Position: 1.0 mm
   Table Lateral Position: -620.0 mm
   Table Height Position: -999.0 mm
   Acquisition Plane: Single Plane
   Irradiation Event Type: Fluoroscopy
   Dose Area Product: 6.8E-6 Gym2
   Dose (RP): 0.00156 Gy
   Positioner Primary Angle: -1.0 °
   Positioner Secondary Angle: -1.1 °
   Positioner Primary End Angle: 0.0 °
   Positioner Secondary End Angle: 0.0 °
   Fluoro Mode: Pulsed
   Pulse Rate: 15.0 pulse/s
   Number of Pulses: 28.0 no units
   KVP: 74.0 kV
   X-Ray Tube Current: 162.8 mA
   Exposure Time: 235.2 ms
   Pulse Width: 8.4 ms
   Exposure: 38290.0 uAs
   Focal Spot Size: 0.4 mm
   Acquired Image: 1

   X-Ray Filters:
   ------------------------------------------------------------------------
      X-Ray Filter Type: Strip Filter
      X-Ray Filter Material: Copper or Copper compound
      X-Ray Filter Thickness Minimum: 0.2 mm
      X-Ray Filter Thickness Maximum: 0.2 mm


Irradiation Event X-Ray Data:
---------------------------------------------------------------------------
   Acquisition Protocol: FL Card
   Irradiation Event UID: 1.3.12.2.1107.5.4.5.161998.300000090119083857500
   Distance Source to Detector: 989.0 mm
   Distance Source to Isocenter: 785.0 mm
```

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Documentos AAPM

AMERICAN ASSOCIATION of PHYSICISTS IN MEDICINE

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Medical Physics Practical Guidelines 1a/6a

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PUBLICATIONS

Medical Physics Practice Guidelines

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Published Guidelines

- AAPM Medical Physics Practice Guideline 1.a.: CT Protocol Management and Review Practice Guideline published in the **Journal of Applied Clinical Medical Physics** (JACMP). Volume 14, Number 5 (2013). [ISBN: 978-1-936366-27-9]
- AAPM Medical Physics Practice Guideline 2.a: Commissioning and quality assurance of X-ray–based image-guided radiotherapy systems published in the **Journal of Applied Clinical Medical Physics** (JACMP). Volume 15, Number 1 (2014). [ISBN: 978-1-936366-31-6]
- AAPM Medical Physics Practice Guideline 3.a: Levels of supervision for medical physicists in clinical training published in the **Journal of Applied Clinical Medical Physics** (JACMP). Volume 16, Number 3 (2015). [ISBN: 978-1-936366-45-3]
- Medical Physics Practice Guideline 4.a: Development, implementation, use and maintenance of safety checklists published in the **Journal of Applied Clinical Medical Physics** (JACMP). Volume 16, Number 3 (2015). [ISBN: 978-1-936366-46-0]

JOURNAL OF APPLIED CLINICAL MEDICAL PHYSICS, VOLUME 14, NUMBER 5, 2013

AAPM Medical Physics Practice Guideline 1.a: CT Protocol Management and Review Practice Guideline

The American Association of Physicists in Medicine (AAPM) is a nonprofit professional society whose primary purposes are to advance the science, education, and professional practice of medical physics. The AAPM has more than 8,000 members

1. Introduction

The review and management of computed tomography (CT) protocols is a facility's ongoing mechanism of ensuring that exams being performed achieve the desired diagnostic image quality at the lowest radiation dose possible while properly exploiting the capabilities of the equipment being used. Therefore, protocol management and review are essential activities in ensuring patient safety and acceptable image quality. These activities have been explicitly identified as essential by several states[1-2] regulatory and accreditation groups such as the American College of Radiology (ACR) CT Accreditation program,[3] as well as the Joint Commission in its Sentinel Event Alert,[4] among others. The AAPM considers these activities to be essential to any quality assurance (QA) program for CT, and as an ongoing investment in improved quality of patient care.

CT exam protocols are used to obtain the diagnostic image quality required for the exam

Registro y Gestión de la Dosis

1. Introducción
2. Definiciones
3. Responsabilidades y cualificación del personal
4. El proceso de gestión y revisión de protocolos
    - Especial importancia debe darse a la revisión y vigilancia de protocolos existentes junto a la implementación de nuevas e innovadoras tecnologías
    - Debe prestarse atención a las particularidades técnicas de cada CT para asegurar el máximo rendimiento de cada equipo. Además se deberá considerar la consolidación de protocolos existentes y eliminación de los protocolos desfasados o fuera de uso.
    - El proceso de revisión deberá incluir la revisión y puesta al día de la literatura existente
5. Conclusión

Registro y Gestión de la Dosis

1. Introducción
2. Definiciones
3. Responsabilidades y cualificación del personal
4. El proceso de gestión y revisión de protocolos
   - Recomendaciones nacionales o estatales
   - Frecuencia de revisiones ($<$ 24 meses)
   - Prot. clínicamente significativos que requieren revisión anual.
   - Denominación de los protocolos
   - Permisos
   - Parámetros de adquisición: kV, mA, t, colimación, etc $\Longrightarrow$ calidad de imagen apropiada. $CTDI_{vol}$
   - Parámetros de recostrucción
   - Uso de técnicas avanzadas de reducción de dosis
   - Herramientas de gestion de la dosis de radiación (prev. y post.)
   - Instalación de Protocolos entre CTs
   - Documentación
   - Sesiones periódicas (especificas de producto/CT)
   - Verificación
5. Conclusión

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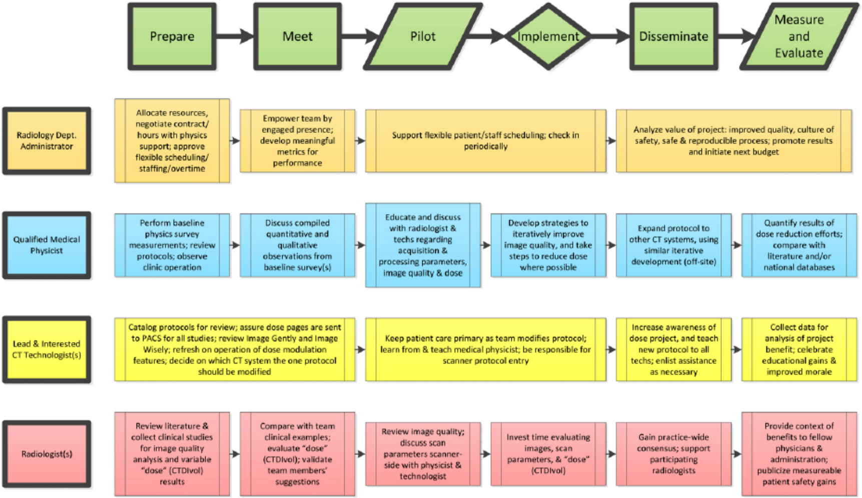

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Received: 30 November 2016 | Revised: 30 November 2016 | Accepted: 20 January 2017
DOI: 10.1002/acm2.12089

AAPM REPORTS & DOCUMENTS

WILEY

AAPM medical physics practice guideline 6.a.: Performance characteristics of radiation dose index monitoring systems

Dustin A. Gress[1] | Renee L. Dickinson[2] | William D. Erwin[1] | David W. Jordan[3] | Robert J. Kobistek[4] | Donna M. Stevens[5] | Mark P. Supanich[6] | Jia Wang[7] | Lynne A. Fairobent[8]

[1]Department of Imaging Physics, University of Texas MD Anderson Cancer Center,

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Registro y Gestión de la Dosis

1. Introducción
   - "Overview"
   - "Goals and Rationale"
   - "Potential limitations and precautions"
   - "Cumulative patient dose history"
   - "RDIs are not patient dose"
   - "Patient dose estimates"

Registro y Gestión de la Dosis

1. Introducción

Specific questions include:

- How can/will the monitored data be used?
- Which indices are needed for these uses?
- What do these indices mean?
  - Are they relevant to the overall goal?
  - How accurate are they?
  - How accurate do they need to be?
  - Is one index sufficient?
- Are the desired indices available for tracking?
- Where will they be tracked (stored and analyzed)?
- Are the facility's relevant imaging systems compatible with the RDIM to send and receive data? If so, then how will the data transfer take place?
- Under what conditions, if any, should either estimated or derived dose quantities or RDI be summed?
- Who should have access? How much access should they have?

2. Definiciones y acrónimos
3. Equipo de trabajo asociado al RDIM

Registro y Gestión de la Dosis

1. Introducción
2. Definiciones y acrónimos
3. Equipo de trabajo asociado al RDIM
4. Requisitos/recomendaciones informáticas

To ensure adequate interconnectivity, data security, and data integrity, the following informatics recommendations and requirements apply to all RDIM systems:

1. RDIM systems must communicate using appropriate DICOM and HL7 standards and conform with appropriate IHE integration profiles (e.g., REM).
2. RDIM systems must provide data portability, meaning that the RDI information database remains the property of and accessible to the healthcare institution (end user) after the termination of any RDIM software subscription or support agreement.

   a. All RDI information, patient demographics, and other data transmitted to the RDIM system by the end user's systems must be made available to the end user in a format and medium that may be retained and accessed by the end user without proprietary tools associated with the RDIM system. Data need not be stored in such a format in the RDIM working database; if the RDIM solution uses a proprietary database, export tools or functions must be provided.

   b. Data or values that are calculated, simulated, or generated by the RDIM system may be stored or exported in proprietary or nonproprietary formats. Methods by which these values are created must be clearly referenced.

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7. A variety of means exist for collecting RDI data. Therefore, the end user of the RDIM system should carefully assess the type(s) of data that can be sent by each imaging device to be monitored and ensure that the RDIM system supports one or more data collection methods for all imaging devices. Examples of methods for RDI data collection are:

- **a.** DICOM Radiation Dose Structured Report (RDSR) objects
- **b.** DICOM Modality Performed Procedure Step (MPPS) messages
- **c.** As described by IHE Radiation Exposure Monitoring (REM) profile
- **d.** Screen capture images of "dose reports" or "protocol information" with extraction via Optical Character Recognition (OCR)
- **e.** Manual entry
- **f.** Protocol and/or dose information stored in DICOM image file headers

Registro y Gestión de la Dosis

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1. Introducción
2. Definiciones y acrónimos
3. Equipo de trabajo asociado al RDIM
4. Requisitos/recomendaciones informáticas
5. Elementos comunes recomendados a todos los sistemas de gestión de dois independientemente de la modalidades

Table 1 Elements common to all modalities.

Elements	Description
Essential RDI	Essential RDI of the imaging modality must be recorded. If not automated, essential acquisition parameters must be able to be recorded with manual input capability.
Notifications for RDI outside a defined range	User-defined thresholds of RDI that trigger automatic notifications to a set of end users must be configurable in the RDIM software.
Review/follow-up documentation	User inputs for status tag and notes must be provided so that the user who reviews the alert can document acknowledgement of each alert and the status and outcome of any follow-up in the RDIM software.
User management	Access to the RDIM software must be limited to a group of authorized users as determined by the facility.
Audit trails	User identity, date and time stamp, and details of activity must be logged for all manual data inputs, edits, and deletions performed by RDIM software users.
RDI analysis tools	RDI analysis tools should be provided to assist users in utilizing the collected information.
User interface elements	A user interface should provide key functionalities of reviewing the recorded RDI and imaging acquisition parameters.

Registro y Gestión de la Dosis

1. Introducción
2. Definiciones y acrónimos
3. Equipo de trabajo asociado al RDIM
4. Requisitos/recomendaciones informáticas
5. Elementos comunes recomendados a todos los sistemas de gestión de dois independientemente de la modalidades
6. Elementos recomendados específicos para CT

Table 2 Elements specific to CT.

Elements	Description
Essential RDI	CTDIvol, CTDI phantom, and DLP for each CT series must be recorded.
Notification of RDI outside of defined range	User-defined thresholds of RDI that trigger automatic notifications to a set of end users must be configurable.
Transmission of anonymized data to data repositories/ registries	The software must possess the capability to transmit CT RDI to data repositories/registries.
Size-Specific Dose Estimate (SSDE) calculation	Calculation of the SSDE for applicable acquisitions should be available.

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1. Introducción
2. Definiciones y acrónimos
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4. Requisitos/recomendaciones informáticas
5. Elementos comunes recomendados a todos los sistemas de gestión de dois independientemente de la modalidades
6. Elementos recomendados específicos para CT
7. Elementos recomendados específicos para Fluoroscopía

Table 3 Elements specific to fluoroscopy.

Elements	Description
Essential RDI	Fluoroscopy time, $K_{a,r}$ and P_{KA} must be recorded; for bi-plane imaging systems, RDI must be recorded separately for each X-ray tube (e.g., A/B or PA/lateral). Number of irradiation events and acquisition details (i.e., kV, filtration, mA, number of frames, gantry angle, etc.) should be recorded.
Manual entry of RDI data and fluoroscopy time	Manual entry of fluoroscopy time and RDI data should be available for systems with no RDI information displays or those which have no ability to transfer such data electronically.
Exposure incidence map	A graphical indicator of cumulative $K_{a,r}$ distribution across a two-dimensional plane that intersects the patient entrance reference point (PERP), potentially highlighting areas of peak air kerma, which can be used to estimate peak skin dose (PSD)[7] should be available for systems connected using RDSR.
Notification of RDI outside of defined range	User-defined thresholds of RDI that trigger automatic notifications to a set of end users must be configurable.

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AAPM TG246 & EFOMP

AAPM COMMITTEE TREE

Task Group No. 246 Task Group on Patient Dose from Diagnostic Radiation

AAPM Members, Affiliates and Non-Member Affiliates - Login for access to additional information

Charge To summarize the current state of the art and outline a roadmap for standardized estimation of organ doses from medical imaging. Experts would be recruited from the appropriate subcommittees, including but not limited to, Informatics, CT, RFSC, and Mammography, with work between the subgroups being coordinated by the task group co-chairs. The roadmap would include information about how radiation was applied, the location of the patient with respect to the source of radiation, and the patient model and methods used to estimate organ doses. Standard reporting methods, quantities, and units will also be recommended.

Bylaws: Not Referenced. **Rules:** Not Referenced.

Approved Date(s) Start: 3/25/2013
End: 1/1/1900

Committee Keywords: TG246

- Board of Directors [Status]
  - Science Council [Status]
    - Imaging Physics [Status]
      - TG246 Task Group on Patient Dose from Diagnostic Radiation [Status]
        - Unit No. 20 CT [Status]
        - Unit No. 21 Fluoro [Status]

» Active Task Group listing

Chairs

William Pavlicek
Task Group Chair

Jonas Andersson
Task Group Co-Chair

AAPM TG246 & EFOMP – Introducción

1. Grupo de trabajo formado en primavera del 2013
   - Esfuerzo combinado AAPM/EFOMP
2. Objetivo: Resumir el estado del arte y elaborar un plan de trabajo para la estimación de dosis en órganos para imágenes médicas
3. Este plan de trabajo incluye: Información de la exposición a la radiación, de la localización del paciente, del modelado del paciente y de los modelos de estimación de dosis en órganos
4. Modalidades: CT y XA

Dosis Paciente: ¿qué necesitamos?

1. Parámetros de adquisición que afectan al paciente
   - ¿Qué es lo que hace “realmente” la modulación de dosis?
2. Información sobre el scan
   - ¿Que me aporta el RDSR?
3. Exactitud de la información del escaner (verificaciones físicas)
   - ¿Qué barra de error ponemos a los datos? ¿30 %-40 %?
4. Modelos Maniquí/Paciente
   - ¿Qué significa para la dosis el/los modelos utilizados?

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Patient Organ Dose with Computed Tomography

A Review of Present Methodology and DICOM Information

The Joint Report of AAPM Task Group 246 and EFOMP

TG246 – en Elaboración

Registro y Gestión de la Dosis

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Accuracy and calibration of integrated radiation output indicators in diagnostic radiology: A report of the AAPM Imaging Physics Committee Task Group 190

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(Received 29 April 2015; revised 4 September 2015; accepted for publication 19 October 2015; published 6 November 2015)

Due to the proliferation of disciplines employing fluoroscopy as their primary imaging tool and the prolonged extensive use of fluoroscopy in interventional and cardiovascular angiography procedures, "dose-area-product" (DAP) meters were installed to monitor and record the radiation dose delivered

Registro y Gestión de la Dosis

Magnitudes derivadas: Dosis efectiva

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ICRP 103

(j) Effective dose is intended for use as a protection quantity. The main uses of effective dose are the prospective dose assessment for planning and optimisation in radiological protection, and demonstration of compliance with dose limits for regulatory purposes. Effective dose is not recommended for epidemiological evaluations, nor should it be used for detailed specific retrospective investigations of individual exposure and risk.

(k) The collective effective dose quantity is an instrument for optimisation, for comparing radiological technologies and protection procedures, predominantly in the context of occupational exposure. Collective effective dose is not intended as a tool for epidemiological risk assessment, and it is inappropriate to use it in risk projections. The aggregation of very low individual doses over extended time periods is inappropriate, and in particular, the calculation of the number of cancer deaths based on collective effective doses from trivial individual doses should be avoided.

ICRP Publication 103

4.4.5. Medical exposure of patients

(151) The relevant quantity for planning the exposure of patients and risk-benefit assessments is the equivalent dose or the absorbed dose to irradiated tissues. The use of effective dose for assessing the exposure of patients has severe limitations that must be considered when quantifying medical exposure. Effective dose can be of value for comparing doses from different diagnostic procedures and for comparing the use of similar technologies and procedures in different hospitals and countries as well as the use of different technologies for the same medical examination. However, for planning the exposure of patients and risk-benefit assessments, the equivalent dose or the absorbed dose to irradiated tissues is the relevant quantity.

(152) The assessment and interpretation of effective dose from medical exposure of patients is very problematic when organs and tissues receive only partial exposure or a very heterogeneous exposure which is the case especially with x-ray diagnostics.

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AAPM MMPG 6a

applications and limitations of the recorded dose indices.[1] At this time, none of the RDI represent location-specific absorbed dose in an individual patient. Most are related to X-ray beam output or X-ray absorption at the image receptor. Software indications of organ absorbed doses and effective dose are based on standardized

models of the human which incorporate organ- and tissue-weighting factors adopted by ICRP[2] and do not accurately represent the absorption or risk characteristics of any single individual. Standardized human models do not account for the variation observed in size and location of organs within normal individuals, do not account for disease processes, and might not match the age or gender of the patient. Consequently, there are significant limitations to the utility of absorbed and effective dose estimates, detailed discussion of which is beyond the scope of this document. The most significant limitations can be coarsely and briefly summarized as follows: Effective dose does not apply to individuals, and the current state of organ dose calculations in commercial RDIM software is not patient-specific.

It is therefore the recommendation of this Medical Physics Practice Guideline (MPPG) that estimated organ and effective dose values must only be used with the direction and involvement of a Qualified Medical Physicist, and with careful consideration and understanding of limitations of the quantities. Furthermore, these estimated organ and effective dose values should not be included in physician-dictated reports.

Registro y Gestión de la Dosis

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ICRP ref 4811-7254-2307

24 April 2018

Annals of the ICRP

ICRP PUBLICATION 1XX

The Use of Effective Dose as a Radiological Protection Quantity

Registro y Gestión de la Dosis

Cálculo de la D_{eff}

their format type and their morphometric category. Format types are presently either stylized, voxel, or hybrid and generally referred as the first, second, and third generation of phantom technology (see Figure 7.1).

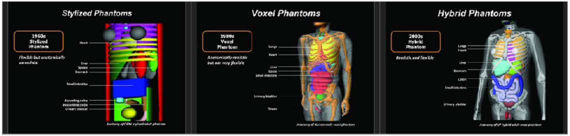

Figure 7.1. Graphical examples of stylized, voxel, and hybrid phantoms of the adult reference male.

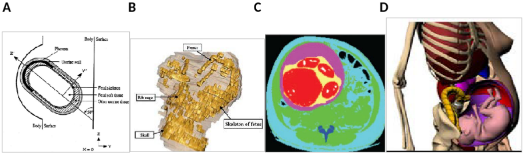

Figure 7.2. Examples of pregnant female computational phantoms including (A) stylized 9-month model of Stabin *et al.* (1995) [83], (B) voxel model of a 36-week fetus by Shi and Xu (2004) [189], (C) voxel model of a 35-week fetus by Angel *et al.* (2008) [49], and (D) a hybrid model of a 24-week fetus by Xu *et al.* (2004) [159].

Registro y Gestión de la Dosis

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Cálculo de la D_{eff}

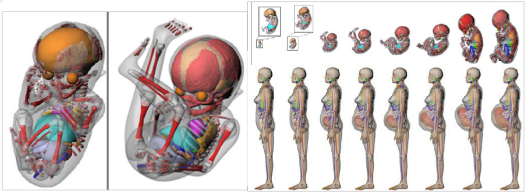

Figure 7.3. (left) Specimen-specific hybrid models of the 11.5 and 21 week fetus [180]. (right) UF series of hybrid reference phantoms of the adult pregnant female. Gestational ages are weeks post-conception [186].

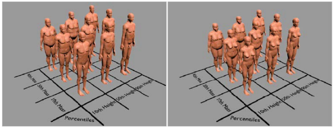

Figure 7.11. FUP library of adult male (left) and adult female (right) hybrid phantoms at three different height and three different weight percentiles [176].

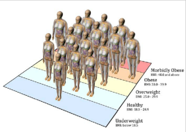

Figure 7.16. Selection of adult female phantoms at a fixed height of 170 cm at varying weights [185].

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Cálculo de la D_{eff}

8. Uncertainties in Patient Organ Dose with CT

Characterizing patient-specific radiation dose in CT has emerged as a necessary requirement to practice medical imaging. Amongst various dose metrics, organ dose is generally regarded as one of the best metrics to quantify individual radiation burden. There arises a necessity to better understand the uncertainties associated with different organ dose estimation methods, given that all methods are inherently associated with significant uncertainty. In fact, quite large variations in organ dose estimates can be found even when comparing the highly refined methods discussed in this report. The quantification of uncertainty provides a better understanding of the limitations of current organ dose estimation methods and indicates areas for which further research is needed.

AAPM Task Group 246 and EFOMP recommend the inclusion of a 95% confidence interval for computed estimates of organ dose, as well as any underlying assumptions included in the methodology that may yield additional uncertainty.

TG246 - en Elaboración

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Cálculo de la D_{eff}

Table 8.2. Summary of the sources and level of uncertainties with Computational Phantoms and Monte Carlo organ dose estimations.

Source	Description	Magnitude of Error
Computational phantoms	Depend on how accurately different types of computational phantoms resemble the anatomical structure of the actual patient	3 - 66%
Patient matching	Induced by geometry difference between a clinical patient to a matched computational phantom	10 - 15%
Organ start/end location	Induced by the heterogeneous dose pattern created across patient body by the helical trajectory of the CT source	<10% for most organs 10 - 33% for the small surface organs
TCM simplification	Induced by using simplified tube current profiles (z-dimensional) to approximate organ dose under TCM	0 - 20% depending on the method used to model the dose field under TCM
Monte Carlo simulation	Mainly caused by the underlying differences in the physical models used by different codes	5 - 10%
Contrast medium	Induced by the photoelectric interaction products of the contrast medium	26 - 380% depending on organ, injection protocols
Assuming that the patient is at isocenter	Bow-tie filter spatially distorts the X-ray beam to which the patient is exposed	0-50% depending upon the actual patient centering
Organs partially irradiated	Thyroid, bone marrow and skin	Depends on the extent of full organ irradiation

TG246 — en Elaboración

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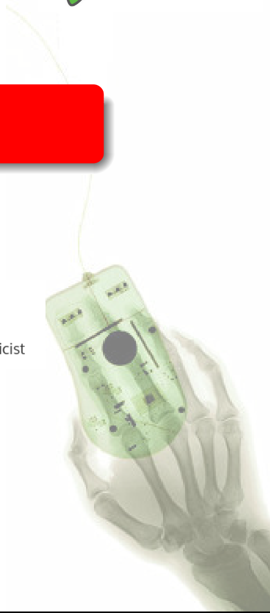

OpenREM

Free and Open Source Radiation Exposure Monitoring for the physicist

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En Andalucia . . .

1. Sevilla – Daniel Fernández Molina
    - 3-4 años. Problemas iniciales con codificación
    - CT con RDSR y MG digitales
    - Análisis tras exportar los datos a Excel
    - PACS => Ortahnc => OpenREM (SQLite) => Excel
    - Problemas rendimiento (instalado en PC personal “obsoleto”)
2. Córdoba – Rafael Martínez Luna
3. Granada – Julio Almansa López

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En Andalucia . . .

1. Sevilla – Daniel Fernández Molina
2. Córdoba – Rafael Martínez Luna
    - Iniciando el trabajo
    - Intervencionismo
    - Problemas con la visualización de datos en GUI (RP, DAP totales, . . .). Exportación a Excel correcta.
    - Instalado por TIC hospital. Conectado al PACS
3. Granada – Julio Almansa López

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En Andalucia . . .

1. Sevilla – Daniel Fernández Molina
2. Córdoba – Rafael Martínez Luna
3. Granada – Julio Almansa López
    - Iniciando el trabajo
    - CT-Intervencionismo-MG-DX
    - Importados RDSR 2017 y 2018. En breve se importarán imágenes MG
    - Instalado en máquina virtual (limitada) alojada en CPD de los Hospitales de Granada
    - Última versión disponible (0.8.1)
    - Completamente operativa. Importación manual

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OpenREM   User ▾   Docs ▾

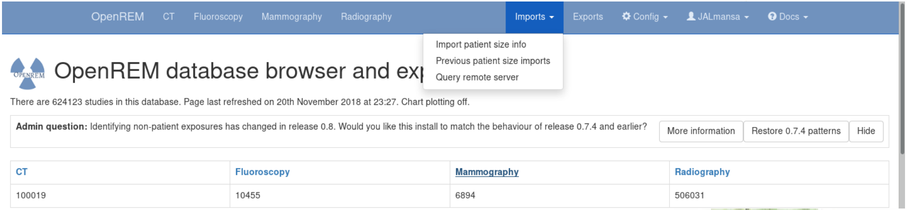
OpenREM database browser and export

There are 624123 studies in this database. Page last refreshed on 20th November 2018 at 23:25.

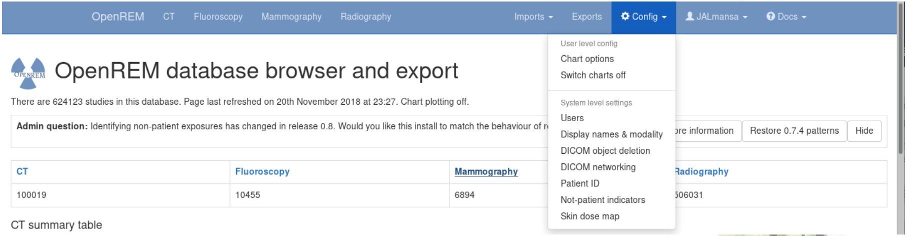
CT	Fluoroscopy	Mammography	Radiography
100019	10455	6894	506031

CT summary table

System name	Total number of studies	Latest study
CAMPUS DE LA SALUD PHILIPS-705	24707	3 days ago
Virgen de las Nieves (H.M.Q.) CT1020303	15340	3 days ago
HOSPITAL DE TRAUMATOLOGIA HOST-336215	6240	3 days ago
Hsp.Virgen de las Nieves H.R.T CT1020403	2951	3 days, 1 hour ago
Hospital Virgen de las Nieves CT48609	12796	3 days, 5 hours ago
[illegible]	[illegible]	[illegible]


OpenREM
CT
Fluoroscopy
Mammography
Radiography
Imports
Exports
Config
JALmansa
Docs
Import patient size info
Previous patient size imports
Query remote server
OpenREM database browser and exp
There are 624123 studies in this database. Page last refreshed on 20th November 2018 at 23:27. Chart plotting off.
Admin question: Identifying non-patient exposures has changed in release 0.8. Would you like this install to match the behaviour of release 0.7.4 and earlier?
More information
Restore 0.7.4 patterns
Hide
CT
Fluoroscopy
Mammography
Radiography
100019
10455
6894
506031

OpenREM


OpenREM
CT
Fluoroscopy
Mammography
Radiography
Imports
Exports
Config
JALmansa
Docs
OpenREM database browser and export
There are 624123 studies in this database. Page last refreshed on 20th November 2018 at 23:27. Chart plotting off.
Admin question: Identifying non-patient exposures has changed in release 0.8. Would you like this install to match the behaviour of r
re information
Restore 0.7.4 patterns
Hide
User level config
Chart options
Switch charts off
System level settings
Users
Display names & modality
DICOM object deletion
DICOM networking
Patient ID
Not-patient indicators
Skin dose map
CT
Fluoroscopy
Mammography
Radiography
100019
10455
6894
506031
CT summary table

OpenREM

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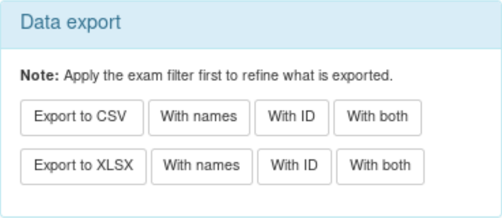
There are 100019 studies in this list.

‹‹ previous 1 2 3 4 ... 3998 3999 4000 4001 next ››

Institution	Make Model Display name	Date	Study description Procedure Requested Procedure Accession number	Number of events	Total DLP (mGy.cm)	Delete?
CAMPUS DE LA SALUD	Philips Brilliance 64 CAMPUS DE LA SALUD PHILIPS-705	2018-11-17 23:23	TC sin Contraste I.V. de Tórax None TC sin Contraste I.V. de Tórax 90340732	2	469.83	Delete
Virgen de las Nieves (H.M.Q.)	GE Medical Systems LightSpeed VCT Virgen de las Nieves (H.M.Q.) CT1020303	2018-11-17 23:14	TC sin Contraste I.V. de Tórax None None 90340514	5	1469.33	Delete
HOSPITAL DE TRAUMATOLOGIA	Philips Ingenuity CT HOSPITAL DE TRAUMATOLOGIA HOST-336215	2018-11-17 22:56	TC sin Contraste I.V. de Cadera, Bilateral None TC sin Contraste I.V. de Cadera, Bilateral 90340035	3	312.70	Delete
CAMPUS DE LA SALUD	Philips Brilliance 64 CAMPUS DE LA SALUD PHILIPS-705	2018-11-17 22:39	TC sin Contraste I.V. de Abdomen None TC sin Contraste I.V. de Abdomen 90339885	2	1430.21	Delete
Hsp.Virgen de las Nieves H.R.T	GE Medical Systems LightSpeed VCT Hsp.Virgen de las Nieves H.R.T CT1020403	2018-11-17 21:50	TC sin Contraste I.V. de Cráneo None None	2	651.07	Delete

OpenREM


Data export
Note: Apply the exam filter first to refine what is exported.
Export to CSV
With names
With ID
With both
Export to XLSX
With names
With ID
With both

OpenREM

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Exam filter

Date format yyyy-mm-dd

Date from:

Date until:

Study description:

Procedure:

Requested procedure:

Acquisition protocol:

Min age (yrs):

Max age (yrs):

Hospital:

Make:

Model:

Station name:

Accession number:

Min study DLP:

Max study DLP:

Display name:

Include possible test data: Yes (default)

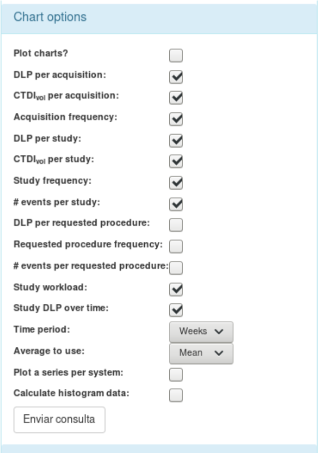
Chart options
Plot charts?
DLP per acquisition:
CTDIvol per acquisition:
Acquisition frequency:
DLP per study:
CTDIvol per study:
Study frequency:
events per study:
DLP per requested procedure:
Requested procedure frequency:
events per requested procedure:
Study workload:
Study DLP over time:
Time period:
Weeks
Average to use:
Mean
Plot a series per system:
Calculate histogram data:
Enviar consulta

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Detail list of events

- Accession number: 90336738
- Study date: Nov. 17, 2018
- Study time: 17:24
- Study description: TC sin Contraste I.V. de Cráneo
- Procedure: None
- Requested procedure: TC sin Contraste I.V. de Cráneo
- Patient age: 88.3 years
- Patient height and weight: m, kg
- Hospital: HOSPITAL DE TRAUMATOLOGIA
- Scanner: Philips | Ingenuity CT | HOST-336215
- Display name: HOSPITAL DE TRAUMATOLOGIA HOST-336215
- Study UID: 1.3.46.670589.33.1.63678072287692701000001.4916797100810220906
- Comment: None
- Performing physician(s): None
- Operator(s): None
- Test patient indicators? None

Total number of events	2
Total DLP	908.80 mGy·cm

Acquisition protocol	Type	$CTDI_{vol}$ (mGy)	DLP (mGy·cm)	Scanning length (mm)	kVp	mA	Max mA	Exposure time per rotation (s)	Pitch	Exposure time (s)	Slice thickness (mm)	Collimation (mm)	X-ray modulation type
CR SECUENCIAL+CF CEREBRO /Cabeza	Constant Angle Acquisition	0.05 (32 cm)	1.30	253	100	30	30			1000.000	0.625	2.50	None
Comment Loc													
CR SECUENCIAL+CF CEREBRO /Cabeza	Sequenced Acquisition	60.50 (16 cm)	907.50	135	120	383	383	1.000	1.000	1170.000	0.625	25.00	None
Comment Craneo **Dose Check Alerts** CTDIvol alert is configured at 1000.00 mGy with no accumulated forward estimate recorded.													

OpenREM version 0.8.1 is © 2013-2018 The Royal Marsden NHS Foundation Trust

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There are 10431 studies in this list.

‹‹ previous 1 2 3 4 ... 415 416 417 418 next ››

Institution	Make Model Display name	Date	Study description Procedure Requested Procedure Accession number	Number of events	Total DAP (cGy.cm^2)	Total dose at RP (Gy)	Physician	Delete?
None	None None 722013-632	2018-11-17 20:42	Tto. Químico de Vasoespasmo en Carótida Extracraneal Derecha None None 90339405	27	Plane B: 1310.7 Plane A: 3262.3	Plane B: 0.0632 Plane A: 0.160	None	Delete
None	None None 722013-632	2018-11-17 16:22	Angioplastia de Arteria Carótida Extracraneal Izquierda None None 90336157	168	Plane B: 5818.9 Plane A: 17319.3	Plane B: 0.607 Plane A: 0.908	None	Delete
None	None None 722013-632	2018-11-17 12:34	Trombectomía en Arteria Carótida Intracraneal Derecha None None 90333125	33	Plane B: 1735.5 Plane A: 3694.8	Plane B: 0.106 Plane A: 0.262	None	Delete
None	Philips Medical Systems None Blank	2018-11-16 17:23	Cardíaca None None 70758	111	16061.2	2.13	None	Delete
Hospital PTS	GE MEDICAL SYSTEMS DL Hospital PTS XA1033616	2018-11-16 14:34	CORONARIOGRAFIA None None 181159	17	1703.0	0.338	None	Delete
None	None None 722012-2706	2018-11-16 13:20	Catéter Venoso Central con Tracto Subcutáneo None None 90239632	6	202.2	0.00465	None	Delete
Hospital PTS	GE MEDICAL SYSTEMS DL Hospital PTS XA1033616	2018-11-16 13:20	CORONARIOGRAFIA None None 181158	26	1242.0	0.196	None	Delete

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There are 6894 studies in this list.

Scatter plot chart showing AGD vs. compressed breast thickness.

Scatter plot chart showing kVp vs. compressed breast thickness.

Scatter plot chart showing exposure vs. compressed breast thickness.

‹‹ previous 1 2 3 4 ... 273 274 275 276 next ››

Institution	Make Model Display name	Date	Study description Procedure Requested Procedure Accession number	Number of events	Accumulated AGD (mGy)	Delete?
HOSPITAL CIUDAD DE BAZA	HOLOGIC, Inc. Selenia Dimensions HOSPITAL CIUDAD DE BAZA DIMENSIONS	2018-11-16 18:29	Mamografía de Screening, Bilateral Mamografía de Screening, Bilateral None 89931358	4	Right: 2.380 Left: 2.370	Delete
HOSPITAL CIUDAD DE BAZA	HOLOGIC, Inc. Selenia Dimensions HOSPITAL CIUDAD DE BAZA DIMENSIONS	2018-11-16 17:53	Mamografía de Screening, Bilateral Mamografía de Screening, Bilateral None 89930357	4	Right: 2.550 Left: 2.540	Delete
HOSPITAL CIUDAD DE BAZA	HOLOGIC, Inc. Selenia Dimensions HOSPITAL CIUDAD DE BAZA DIMENSIONS	2018-11-16 17:03	Mamografía de Screening, Bilateral Mamografía de Screening, Bilateral None 89930077	4	Right: 2.260 Left: 2.510	Delete
HOSPITAL CIUDAD DE BAZA	HOLOGIC, Inc. Selenia Dimensions HOSPITAL CIUDAD DE BAZA DIMENSIONS	2018-11-16 16:58	Mamografía de Screening, Bilateral Mamografía de Screening, Bilateral None 89929611	4	Right: 2.740 Left: 2.590	Delete
HOSPITAL CIUDAD DE BAZA	HOLOGIC, Inc. Selenia Dimensions HOSPITAL CIUDAD DE BAZA DIMENSIONS	2018-11-16 16:54	Mamografía de Screening, Bilateral Mamografía de Screening, Bilateral None 89929469	4	Right: 2.030 Left: 2.110	Delete
HOSPITAL CIUDAD DE BAZA	HOLOGIC, Inc. Selenia Dimensions HOSPITAL CIUDAD DE BAZA DIMENSIONS	2018-11-16 16:39	Mamografía de Screening, Bilateral Mamografía de Screening, Bilateral None 89927959	4	Right: 2.690 Left: 2.660	Delete

Data export

Note: Apply the exam filter fi

Export to CSV | With na

Export to xlsx | With nan

Export to CSV using the NI

Exam filter

Date format yyyy-mm-dd

Date from:

Date until:

Study description:

Procedure:

Requested procedure:

Acquisition protocol:

Min age (yrs):

Max age (yrs):

Hospital:

Manufacturer:

Model:

OpenREM CT Fluoroscopy Mammography Radiography Imports Exports Config JALma

There are 506031 studies in this list.

‹‹ previous 1 2 3 4 ... 20239 20240 20241 20242 next ››

Institution	Make Model Display name	Date	Study description Procedure Requested Procedure Accession number	Number of events	Total DAP (cGy.cm²)	Delete?
Hospital de Traumatologia	CARESTREAM DRX-Evolution Hospital de Traumatologia DX1020404	2018-11-17 23:53	Radiografía Lateral de Tobillo Izquierdo Radiografía Lateral de Tobillo Izquierdo None 90340863	1	1.1	Delete
Hospital de Traumatologia	CARESTREAM DRX-Evolution Hospital de Traumatologia DX1020404	2018-11-17 23:53	Radiografía A.P. de Tobillo Izquierdo Radiografía A.P. de Tobillo Izquierdo None 90340862	1	1.1	Delete
HOSPITAL CAMPUS DE LA SALUD	Philips Medical Systems DigitalDiagnost HOSPITAL CAMPUS DE LA SALUD DiDiDR	2018-11-17 23:50	Radiografía Lateral de Tórax Radiografía Lateral de Tórax Radiografía Lateral de Tórax 90340828	1	20.0	Delete
HOSPITAL CAMPUS DE LA SALUD	Philips Medical Systems DigitalDiagnost HOSPITAL CAMPUS DE LA SALUD DiDiDR	2018-11-17 23:49	Radiografía P.A. de Tórax Radiografía P.A. de Tórax Radiografía P.A. de Tórax 90340829	1	5.9	Delete
HOSPITAL CAMPUS DE LA SALUD	Philips Medical Systems DigitalDiagnost HOSPITAL CAMPUS DE LA SALUD DiDiDR	2018-11-17 23:46	Radiografía Lateral de Columna Cervical Radiografía Lateral de Columna Cervical Radiografía Lateral de Columna Cervical 90340831	1	3.6	Delete
HOSPITAL CAMPUS DE LA SALUD	Philips Medical Systems DigitalDiagnost HOSPITAL CAMPUS DE LA SALUD DiDiDR	2018-11-17 23:45	Radiografía A.P. de Columna Cervical Radiografía A.P. de Columna Cervical Radiografía A.P. de Columna Cervical 90340832	1	16.2	Delete
HOSPITAL CAMPUS DE LA SALUD	Philips Medical Systems DigitalDiagnost HOSPITAL CAMPUS DE LA SALUD DiDiDR	2018-11-17 23:39	Radiografía A.P. en Supino de Abdomen Radiografía A.P. en Supino de Abdomen Radiografía A.P. en Supino de Abdomen 90340795	1	125.1	Delete
HOSPITAL CAMPUS DE LA SALUD	Philips Medical Systems DigitalDiagnost HOSPITAL CAMPUS DE LA SALUD DiDiDR	2018-11-17 23:37	Radiografía A.P. de Dedos de la Mano Izquierda Radiografía A.P. de Dedos de la Mano Izquierda Radiografía A.P. de Dedos de la Mano Izquierda 90340757	1	0.9	Delete
HOSPITAL CAMPUS DE LA SALUD	Philips Medical Systems DigitalDiagnost HOSPITAL CAMPUS DE LA SALUD DiDiDR	2018-11-17 23:37	Radiografía Lateral de Dedos de la Mano Izquierda Radiografía Lateral de Dedos de la Mano Izquierda Radiografía Lateral de Dedos de la Mano Izquierda 90340758	1	1.6	Delete
		7 23:17	Radiografía L Radiografía L Radiografía L			

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OpenREM | CT | Fluoroscopy | Mammography | Radiography | Imports | Exports | Config | JALmansa | Docs

Detail list of events

- Accession number: 90340829
- Study date: Nov. 17, 2018
- Study time: 23:49
- Study description: Radiografía P.A. de Tórax
- Procedure: Radiografía P.A. de Tórax
- Requested procedure: Radiografía P.A. de Tórax
- Patient age: 23.8 years
- Patient height and weight: 0.00 m, 0.0 kg
- Hospital: HOSPITAL CAMPUS DE LA SALUD
- X-ray system: Philips Medical Systems | DigitalDiagnost | DiDiDR
- Display name: HOSPITAL CAMPUS DE LA SALUD DiDiDR
- Study UID: 1.2.840.113564.99.1.71094327433004.1.20181117234811247.50395.2
- Operator(s): None
- Test patient indicators? None

Total number of events	1
Total DAP	5.9 cGy·cm^2

Time	Acquisition protocol	Anatomy, laterality Targe region View	kVp	mAs	mA	Time (ms)	Filters (mm)	SID (mm)	Grid FD (mm)	Exposure Index IEC	Exposure Index vendor	DAP (cGy.cm^2)	Control mode	Comment
23:49.36	PA	Chest Chest	125	1.4	190.5		Cu: 0.10 - 0.10 Al: 1.00 - 1.00	1788		EI: 399.0 EI_T: DI:	None	5.9	None	None

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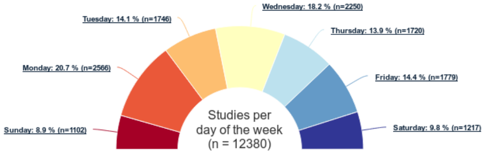
Pie chart showing a breakdown of number of studies per weekday.



Highcharts.com

Click on a segment to be taken to a pie chart showing the breakdown per hour for that weekday.

Toggle fullscreen | Toggle data table

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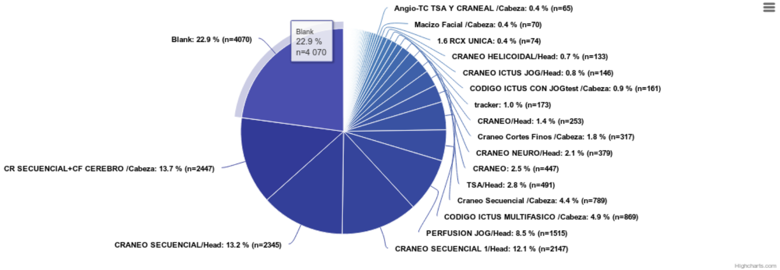
Pie chart showing a breakdown of acquisition protocol frequency.



Toggle fullscreen | Toggle data table

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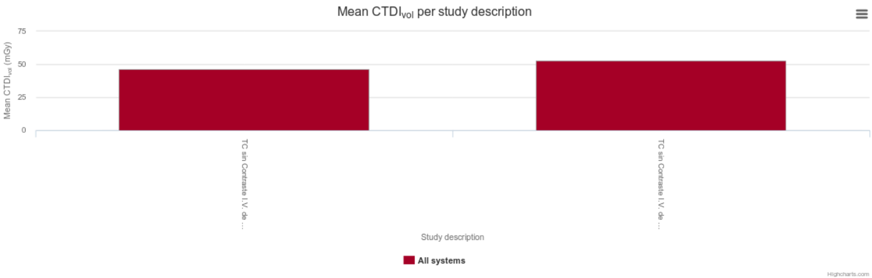
Plot of mean $CTDI_{vol}$ for each study description (may include multiple acquisition protocols per study).



Study description	All systems (y)	All systems (freq)
TC sin Contraste I.V. de Cráneo	46.32	16725
TC sin Contraste I.V. de Cráneo y Charnela Cervical	52.86	1077

Sorting options

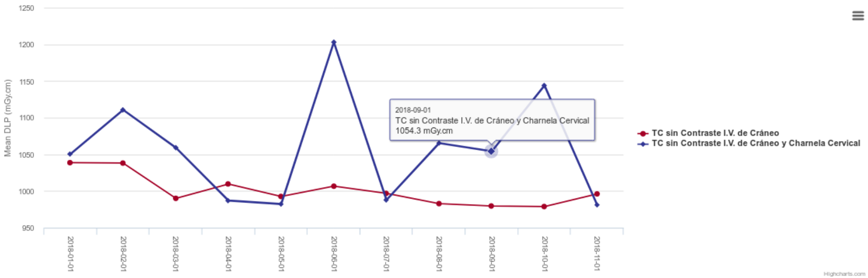
↑CTDI ↑frequency A to Z

↓CTDI ↓frequency Z to A

Toggle fullscreen | Toggle data table | Reset zoom

OpenREM

Line plot showing mean DLP of each study type over time (months).

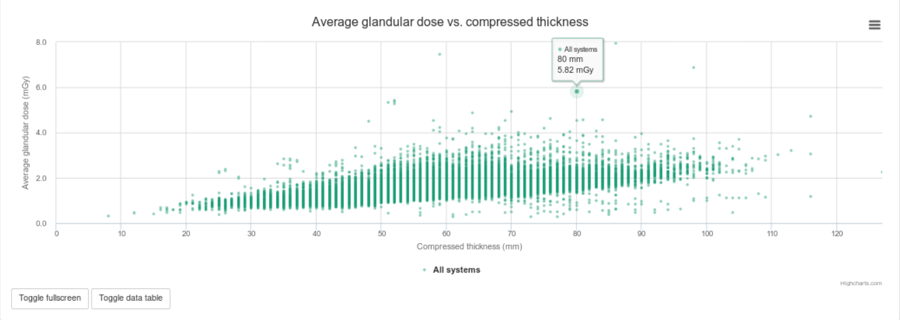


Category	TC sin Contraste I.V. de Cráneo (y)	TC sin Contraste I.V. de Cráneo y Charnela Cervical (y)
2018-01-01	1038.76	1050.49
2018-02-01	1038.15	1110.72
2018-03-01	990.09	1059.18
2018-04-01	1009.69	987.03
2018-05-01	992.67	982.24
2018-06-01	1006.64	1203.15
2018-07-01	996.86	987.80
2018-08-01	982.89	1065.41
2018-09-01	979.67	1054.31
2018-10-01	978.90	1143.98
2018-11-01	996.15	981.15

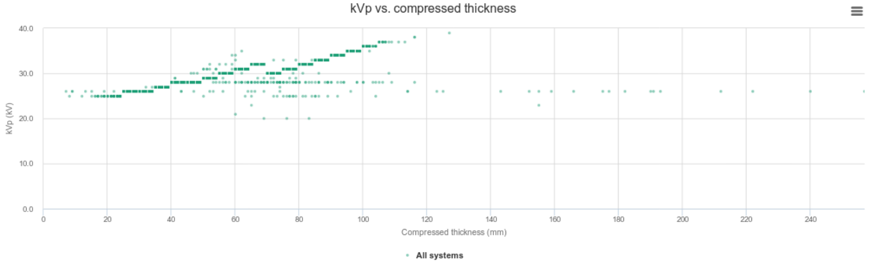
Click on the legend entries to show or hide the corresponding series. Click and drag the mouse over a date range to zoom in.

Toggle fullscreen | Toggle data table | Hide all series | Toggle all series

Scatter plot chart showing AGD vs. compressed breast thickness.



Scatter plot chart showing kVp vs. compressed breast thickness.



Toggle fullscreen | Toggle data table

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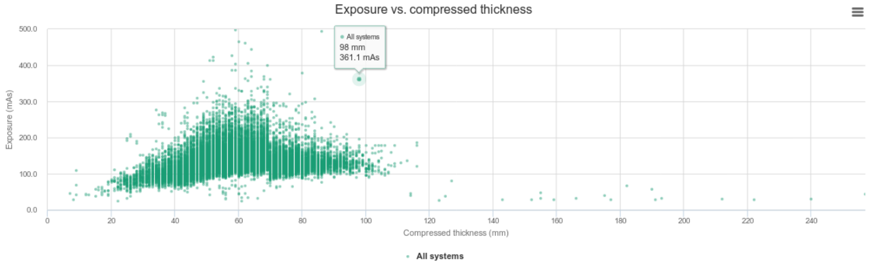
Scatter plot chart showing exposure vs. compressed breast thickness.



Toggle fullscreen Toggle data table

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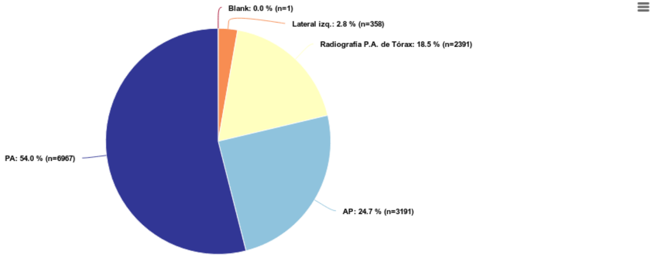
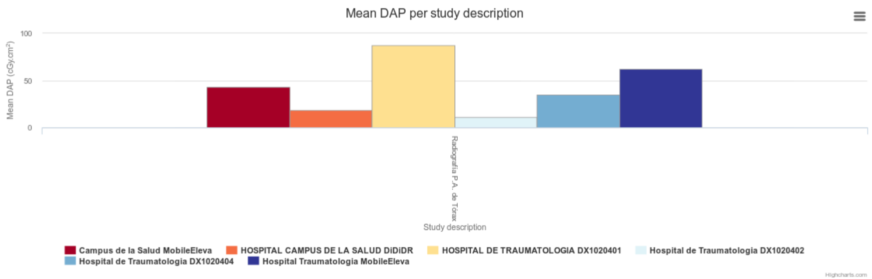
Pie chart showing a breakdown of acquisition protocol frequency



Toggle fullscreen | Toggle data table

Plot of mean DAP for each study description.



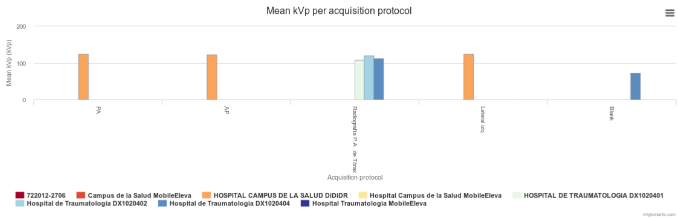
Study description	Campus de la Salud MobileEleva (y)	Campus de la Salud MobileEleva (freq)	HOSPITAL CAMPUS DE LA SALUD DiDiDR (y)	HOSPITAL CAMPUS DE LA SALUD DiDiDR (freq)	HOSPITAL DE TRAUMATOLOGIA DX1020401 (y)	HOSPITAL DE TRAUMATOLOGIA DX1020401 (freq)	Hospital de Traumatologia DX1020402 (y)	Hospital de Traumatologia DX1020402 (freq)	Hospital de Traumatologia DX1020404 (y)	Hospital de Traumatologia DX1020404 (freq)	Hospital Traumatologia MobileEleva (y)	Hospital Traumatologia MobileEleva (freq)
Radiografía P.A. de Tórax	42.80	2	18.44	9564	87.69	88	10.92	3	34.71	2022	62.30	6

Sorting options

↑DAP ↑frequency A to Z
↓DAP ↓frequency Z to A

Toggle fullscreen | Toggle data table | Reset zoom | Hide all series | Toggle all series

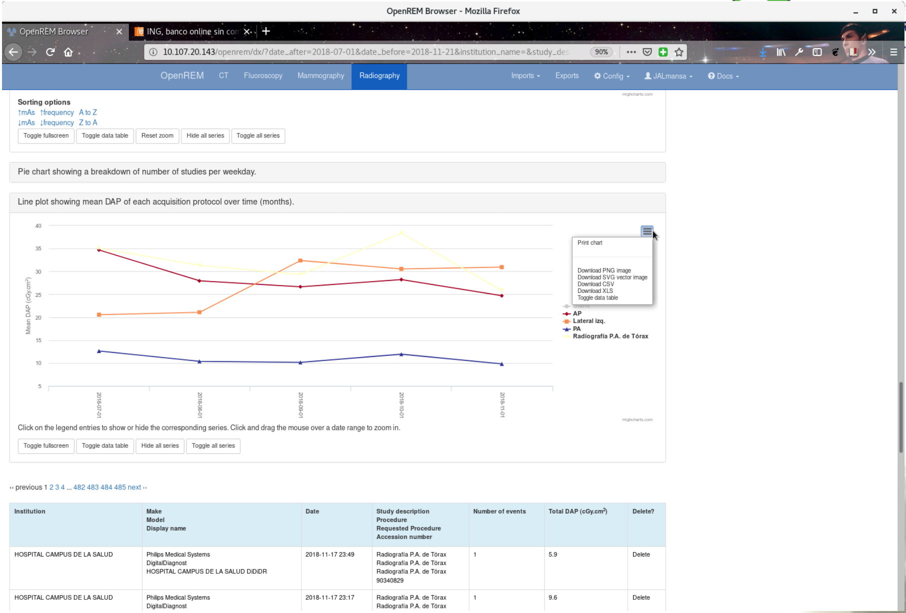
Plot of mean kVp for each acquisition protocol.



Acquisition protocol	722012-2706 (y)	722012-2706 (freq)	Campus de la Salud MobileEleva (y)	Campus de la Salud MobileEleva (freq)	HOSPITAL CAMPUS DE LA SALUD DiDiDR (y)	HOSPITAL CAMPUS DE LA SALUD DiDiDR (freq)	Hospital Campus de la Salud MobileEleva (y)	Hospital Campus de la Salud MobileEleva (freq)	HOSPITAL DE TRAUMATOLOGIA DX1020401 (y)	HOSPITAL DE TRAUMATOLOGIA DX1020401 (freq)	Hospital de Traumatologia DX1020402 (y)	Hospital de Traumatologia DX1020402 (freq)	Hospital de Traumatologia DX1020404 (y)	Hospital de Traumatologia DX1020404 (freq)	Hospital Traumatologia MobileEleva (y)	Hospital Traumatologia MobileEleva (freq)
PA	0.00	0	0.00	0	124.87	6967	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
AP	0.00	0	0.00	0	123.53	3183	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
Radiografía P.A. de Tórax	0.00	0	0.00	0	0.00	0	0.00	0	108.43	115	120.00	3	112.16	2273	0.00	0
Lateral izq.	0.00	0	0.00	0	124.54	356	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
Blank	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	73.00	1	0.00	0

Sorting options

↑kVp ↑frequency A to Z


OpenREM Browser - Mozilla Firefox
OpenREM Browser
ING, banco online sin con
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90%
OpenREM
CT
Fluoroscopy
Mammography
Radiography
Imports
Exports
Config
JALmansa
Docs
Sorting options
↑mAs ↑frequency A to Z
↓mAs ↓frequency Z to A
Toggle fullscreen
Toggle data table
Reset zoom
Hide all series
Toggle all series
Pie chart showing a breakdown of number of studies per weekday.
Line plot showing mean DAP of each acquisition protocol over time (months).
Mean DAP (cGy.cm²)
2018-07-01
2018-08-01
2018-09-01
2018-10-01
2018-11-01
Print chart
Download PNG image
Download SVG vector image
Download CSV
Download XLS
Toggle data table
AP
Lateral izq.
PA
Radiografía P.A. de Tórax
Click on the legend entries to show or hide the corresponding series. Click and drag the mouse over a date range to zoom in.
Toggle fullscreen
Toggle data table
Hide all series
Toggle all series
‹‹ previous 1 2 3 4 ... 482 483 484 485 next ››
Institution
Make
Model
Display name
Date
Study description
Procedure
Requested Procedure
Accession number
Number of events
Total DAP (cGy.cm²)
Delete?
HOSPITAL CAMPUS DE LA SALUD
Philips Medical Systems
DigitalDiagnost
HOSPITAL CAMPUS DE LA SALUD DiDiDR
2018-11-17 23:49
Radiografía P.A. de Tórax
Radiografía P.A. de Tórax
Radiografía P.A. de Tórax
90340829
1
5.9
Delete
HOSPITAL CAMPUS DE LA SALUD
Philips Medical Systems
DigitalDiagnost
2018-11-17 23:17
Radiografía P.A. de Tórax
Radiografía P.A. de Tórax
1
9.6
Delete

OpenREM | CT | Fluoroscopy | Mammography | Radiography | Imports | Exports | Config | JALmansa | Docs

Detail list of events

- Accession number: 90280676
- Study date: Nov. 16, 2018
- Study time: 12:05
- Study description: Arteriografía de Renal Izquierda
- Procedure: None
- Requested procedure: None
- Patient age: 43.2 years
- Patient height and weight: m, 0.0 kg
- Total DAP, Single Plane: 32382.6 cGy.cm^2
- Total dose at RP, Single Plane: 0.902 Gy
- Hospital: None
- Equipment: None | None | 722012-2706
- Display name: 722012-2706
- Study UID: 1.2.840.113564.99.1.71094327433004.1382.20181116957440.49788.2
- Performing physician(s): None
- Operator(s): None
- Test patient indicators? None

Irradiation type	Total DAP (cGy.cm^2)	Total dose at RP (Gy)	Total duration (s)
Fluoroscopy	2818.80	0.0723	206.00
Acquisition	29563.80	0.829	62.66
- Stationary Acquisition	*29563.80*	*0.829*	*62.66*
Total	**32382.60**	**0.902**	**268.66**

OpenSkin radiation exposure incidence map

Sorry, the skin dose map could not be calculated for this study. Possible reasons for this are shown below:

- The openSkin code currently only works for Siemens equipment.
- The maximum calculated dose was zero: it may be that every exposure has missed the phantom. This may be due to the way in which this x-ray system has defined the table and x-ray beam geometry.

Please consider feeding this back to the openSkin BitBucket project or OpenREM discussion group so that the issue can be addressed.

Create openSkin export. (Not available if you don't have export permissions.)

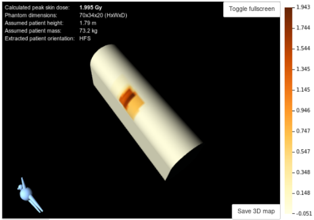
Time	Acquisition protocol	Event type	Pulse rate (s^{-1})	Plane	DAP (cGy.cm^2)	Dose at reference point (mGy)	Duration (ms) Exposure time (ms)	kVp	mA	Filters (mm)	Primary angle (°)	Secondary angle (°)	Detector size (mm)	SDD (mm)	Orientation
12:19.21	None	Fluoroscopy	15.00	Single Plane	154	3.79	11199.0 940.80	83	160.0	Al: 1.00 - 1.00 Cu: 0.40 - 0.40	0.6	-0.2	None		Headfirst, Recumbent, Supine
12:19.02	None	Stationary Acquisition		Single Plane	5.10e+3	139	11333.0 2184.00	80	508.1	: -	0.6	-0.2	None	1002	Headfirst, Recumbent, Supine
12:18.36	None	Fluoroscopy	15.00	Single Plane	243	5.94	16599.0 1444.20	80	160.0	Al: 1.00 - 1.00 Cu: 0.40 - 0.40	0.6	-0.2	None		Headfirst, Recumbent, Supine
12:18.13	None	Stationary Acquisition		Single Plane	4.50e+3	123	5833.0 1926.40	80	508.1	: -	0.6	-0.2	None	1002	Headfirst, Recumbent, Supine
12:17.59	None	Fluoroscopy	15.00	Single Plane	81.2	1.99	5933.0 507.30	81	160.0	Al: 1.00 - 1.00 Cu: 0.40 - 0.40	0.6	-0.2	None		Headfirst, Recumbent, Supine
12:17.22	None	Fluoroscopy	15.00	Single Plane	423	10.4	31666.0 2660.00	82	160.0	Al: 1.00 - 1.00 Cu: 0.40 -	0.6	-0.2	None		Headfirst, Recumbent, Supine

Detail list of events

- Accession number: None
- Study date: Oct. 25, 2018
- Study time: 13:33
- Study description: Vertebroplastia Única, Guiada por TC&&Inyección Terapéutica Intr
- Procedure: Vertebroplastia Única, Guiada por TC
- Requested procedure: Vertebroplastia Única, Guiada por TC&&Inyección Terapéutica Intr
- Patient age: 60.6 years
- Patient height and weight: m, kg
- Total DAP, Plane A: 3038.3 $cGy.cm^2$
- Total dose at RP, Plane A: 0.659 Gy
- Total DAP, Plane B: 8238.4 $cGy.cm^2$
- Total dose at RP, Plane B: 1.58 Gy
- Hospital: None
- Equipment: Siemens | AXIOM-Artis | AXIS05236
- Display name: AXIS05236
- Study UID: 1.3.12.2.1107.5.4.5.153321.30000018102506030707800000024
- Performing physician(s): DR PARDO | DR. RUIZ VILLAVERDE
- Operator(s): JOSE MIGUEL SALMERON | JOSE MIGUEL SALMERON
- Test patient indicators? None

Irradiation type	Total DAP ($cGy.cm^2$)	Total dose at RP (Gy)	Total duration (s)
Fluoroscopy	9938.33	1.91	1435.00
Acquisition	1338.36	0.327	15.00
- Stationary Acquisition	*1338.33*	*0.327*	
Total	**11276.69**	**2.24**	**1450.00**

Radiation exposure incidence map



Reset controls | Use max/min | Colour scales | Toggle 2D/3D view

0.946 Gy window level

1.994 Gy window width

Skin dose maps are calculated using openSkin, and are for indication only: openSkin calculations have not been validated. Contributions are welcome, see openSkin website for details. Create openSkin export. (Not available if you don't have export permissions.)

Time	Acquisition protocol	Event type	Pulse rate (s^{-1})	Plane	DAP ($cGy.cm^2$)	Dose at reference point (mGy)	Duration (ms) Exposure time (ms)	kVp	mA	Filters (mm)	Primary angle (°)	Secondary angle (°)	Detector size (mm)	SDD (mm)	Orientation
14:37.04	Body 1	Stationary Acquisition	1.00	Plane B	149	42.7	*n/a* 275.70	97	701.2	: -	-83.3	0.2	320	1177	Headfirst, Recumbent, Supine
14:37.04	Body 1	Stationary Acquisition	1.00	Plane A	70.6	22.3	*n/a* 161.40	83	792.7	: -	6.7	0.1	320	1011	Headfirst, Recumbent, Supine
14:36.37	Body 1	Stationary Acquisition	1.00	Plane B	184	52.7	*n/a* 338.40	102	651.3	: -	-83.3	0.2	320	1177	Headfirst, Recumbent, Supine
14:36.37	Body 1	Stationary Acquisition	1.00	Plane A	68.5	21.6	*n/a* 161.40	81	792.7	: -	6.7	0.1	320	1011	Headfirst, Recumbent, Supine
14:36.27	Body 1	Stationary Acquisition	1.00	Plane B	299	85.9	*n/a* 563.50	99	668.7	: -	-83.3	0.2	320	1177	Headfirst, Recumbent, Supine
14:36.27	Body 1	Stationary Acquisition	1.00	Plane A	139	43.9	*n/a* 322.80	82	792.6	: -	6.7	0.1	320	1011	Headfirst, Recumbent, Supine
14:35.24	FL Angio	Fluoroscopy	10.00	Plane B	110	31.5	*n/a*	80	167.1	Cu: 0.20 - 0.20	-83.3	0.2	320	1177	Headfirst, Recumbent, Supine

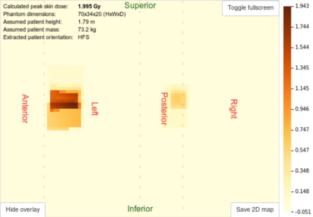
OpenREM CT Fluoroscopy Mammography Radiography Imports Exports Config JALmansa Docs

Detail list of events

- Accession number: None
- Study date: Oct. 25, 2018
- Study time: 13:33
- Study description: Vertebroplastia Única, Guiada por TC&&Inyección Terapéutica Intr
- Procedure: Vertebroplastia Única, Guiada por TC
- Requested procedure: Vertebroplastia Única, Guiada por TC&&Inyección Terapéutica Intr
- Patient age: 60.6 years
- Patient height and weight: m, kg
- Total DAP, Plane A: 3038.3 cGy.cm^2
- Total dose at RP, Plane A: 0.659 Gy
- Total DAP, Plane B: 8238.4 cGy.cm^2
- Total dose at RP, Plane B: 1.58 Gy
- Hospital: None
- Equipment: Siemens | AXIOM-Artis | AXIS05236
- Display name: AXIS05236
- Study UID: 1.3.12.2.1107.5.4.5.153321.30000018102506030707800000024
- Performing physician(s): DR PARDO | DR. RUIZ VILLAVERDE
- Operator(s): JOSE MIGUEL SALMERON | JOSE MIGUEL SALMERON
- Test patient indicators? None

Irradiation type	Total DAP (cGy.cm^2)	Total dose at RP (Gy)	Total duration (s)
Fluoroscopy	9938.33	1.91	1435.00
Acquisition	1338.36	0.327	15.00
- Stationary Acquisition	*1338.33*	*0.327*	
Total	**11276.69**	**2.24**	**1450.00**

Radiation exposure incidence map



Reset controls | Use max/min | 0.946 Gy window level

Colour scales | Toggle 2D/3D view | 1.994 Gy window width

Skin dose maps are calculated using openSkin, and are for indication only: openSkin calculations have not been validated. Contributions are welcome, see openSkin website for details. Create openSkin export. (Not available if you don't have export permissions.)

Time	Acquisition protocol	Event type	Pulse rate (s^{-1})	Plane	DAP (cGy.cm^2)	Dose at reference point (mGy)	Duration (ms) Exposure time (ms)	kVp	mA	Filters (mm)	Primary angle (°)	Secondary angle (°)	Detector size (mm)	SDD (mm)	Orientation
14:37.04	Body 1	Stationary Acquisition	1.00	Plane B	149	42.7	*n/a* 275.70	97	701.2	: -	-83.3	0.2	320	1177	Headfirst, Recumbent, Supine
14:37.04	Body 1	Stationary Acquisition	1.00	Plane A	70.6	22.3	*n/a* 161.40	83	792.7	: -	6.7	0.1	320	1011	Headfirst, Recumbent, Supine
14:36.37	Body 1	Stationary Acquisition	1.00	Plane B	184	52.7	*n/a* 338.40	102	651.3	: -	-83.3	0.2	320	1177	Headfirst, Recumbent, Supine
14:36.37	Body 1	Stationary Acquisition	1.00	Plane A	68.5	21.6	*n/a* 161.40	81	792.7	: -	6.7	0.1	320	1011	Headfirst, Recumbent, Supine
14:36.27	Body 1	Stationary Acquisition	1.00	Plane B	299	85.9	*n/a* 563.50	99	668.7	: -	-83.3	0.2	320	1177	Headfirst, Recumbent, Supine
14:36.27	Body 1	Stationary Acquisition	1.00	Plane A	139	43.9	*n/a* 322.80	82	792.6	: -	6.7	0.1	320	1011	Headfirst, Recumbent, Supine
14:35.24	FL Angio	Fluoroscopy	10.00	Plane B	110	31.5	*n/a*	80	167.1	Cu: 0.20 - 0.20	-83.3	0.2	320	1177	Headfirst, Recumbent, Supine

Date	Study description Procedure Requested Procedure Accession number	Number of events	Total DAP (cGy.cm^2)	Total dose at RP (Gy)	Physician	Delete?
2018-10-09 12:27	Embolización Arterial de Encéfalo por Aneurisma Complejo None None 88782258	152	Plane B: 7469.2 Plane A: 34827.5	Plane B: 1.80 Plane A: 7.28	None	Delete
2018-10-08 08:24	Cardíaca None None 70441	166	41825.9	6.02	None	Delete
2018-10-15 10:11	Cardíaca None None 70498	215	36843.3	5.46	None	Delete
2018-10-18 11:51	Cardíaca None None 70541	121	40096.3	5.44	None	Delete
2018-10-15 11:28	Embolización Arterial de Riñón Izquierdo por Tumor None None 88880698	102	119908.5	5.18	None	Delete
2018-10-24 15:59	Cardíaca None None 70584	169		4.82	None	Delete
2018-10-31 10:43	Cardíaca None None 70625	164	28238.1	4.44	None	Delete
2018-10-18 11:49	None None None None	167	24255.0	4.39	None	Delete
2018-11-05 11:27	Cardíaca None None 70654	123	25465.0	4.20	None	Delete
2018-10-02 13:05	CORONARIOGRAFIA None None	105	23547.0	4.17	None	Delete

Note: Apply the exam filter first to refine what is exported.

Export to CSV | With names | With ID | With both

Export to XLSX | With names | With ID | With both

Exam filter

Date format yyyy-mm-dd

Date from: 2018-10-01

Date until: 2018-11-21

Study description:

Procedure:

Requested procedure:

Acquisition protocol:

Min age (yrs):

Max age (yrs):

Hospital:

Manufacturer:

Model:

Station name:

Physician:

Accession number:

Nuestra utilización

1. Utilización herramientas internas para filtrado / visualización / alertas
2. Exportación a csv y procesado con "R" (o exportación a excel según preferencias)

Proyecciones

1. Mejora por parte del Hospital de la máquina virtual (CPU y memoria) para mejorar el rendimiento.
2. OpenREM: cambio y mejora de las librerias gráficas
3. OpenREM: introducción de valores de referencia y visualización en gráficas.
4. OpenREM: mejora de mapas de dosis piel
5. OpenREM: . . .

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. . . en resumen . . .

Una herramienta a considerar

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Grupo de Trabajo SEFM

Sociedad Española de Física Médica

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	JOSÉ MANUEL ORDIALES SOLIS Hospital de Mérida
	POR PARTE DE LA SERAM
	GLORIA GOMEZ MARDONES Hospital Niño Jesús de Madrid
	ÁNGEL MORALES SANTOS Complejo Donostia
Tareas encomendadas:	Definir las características exigibles a los sistemas de registro de indicadores dosimétricos, y el papel que los profesionales (radiofísicos sobretodo y radiologos y otros profesionales que emplean radiaciones ionizantes) juegan en el empleo de estos sistemas como herramienta de optimización.
Fecha de inicio:	Noviembre de 2017
Fecha prevista de fin:	Junio de 2019

Grupo de Trabajo SEFM

Documento

1. Introducción
2. Resumen de la ICRP 135.
3. Magnitudes DRL y sus unidades por modalidad.
4. Requisitos de los sistemas de registro de dosis.
5. Verificación (control de calidad) del sistema de registro de dosis.
6. Registro de dosis y dosis efectiva
7. El rol del radiofísico hospitalario en los sistemas de gestión de dosis.

Ap Software de cálculo de dosis absorbida en órganos / tejidos y dosis efectiva.

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Estado del trabajo

Prevista la finalización en febrero de 2019