Arbeitsgemeinschaft der Deutschen Röntgengesellschaft

Physik und Technik
in der bildgebenden Diagnostik

Dosismonitoring in der Praxis

MHH Medizinische Hochschule Hannover

Dr. Georg Stamm
Institut für Radiologie

AJR 2013; 200:142–145

Extraction of CT Dose Information From DICOM Metadata: Automated Matlab-Based Approach

Jaydev K. Dave[1]
Eric L. Gingold

OBJECTIVE. The purpose of this study was to extract exposure parameters and dose-relevant indexes of CT examinations from information embedded in DICOM metadata.

Informationstechnologie und Management

Radiologe 2013
DOI 10.1007/s00117-013-2492-7
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Erfassung und Monitoring der radiologischen Strahlenexposition

Journal of Digital Imaging

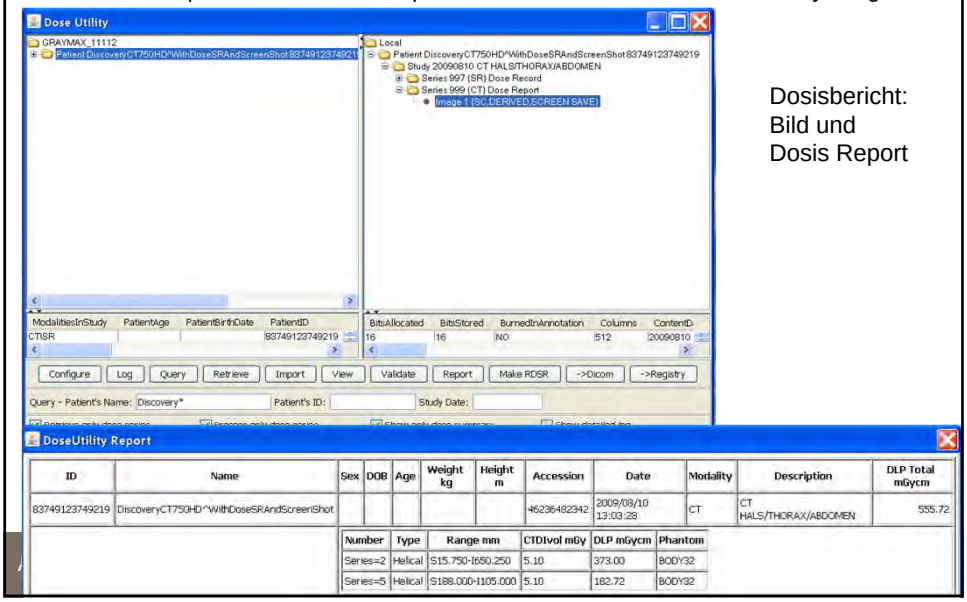
Journal of Digital Imaging, Vol 24, No 2 (April), 2011: pp 223–233

An Automated DICOM Database Capable of Arbitrary Data Mining (Including Radiation Dose Indicators) for Quality Monitoring

Shanshan Wang,[1] William Pavlicek,[2] Catherine C. Roberts,[2] Steve G. Langer,[3] Muhong Zhang,[1] Mengqi Hu,[1] Richard L. Morin,[4] Beth A. Schueler,[3] Clinton V. Wellnitz,[2] and Teresa Wu[1]

DoseUtility

http://www.dclunie.com/pixelmed/software/webstart/DoseUtilityUsage.html



Dosisbericht:
Bild und
Dosis Report

radiance

Opensource – nur CT!
http://radiancedose.com/

Recipient of the 2011 Imaging Informatics Open Source Leadership Award at SIIM2011!

RADIANCE is a free, open-source software pipeline designed to automatically extract and archive CT dose-related parameters from the dose sheets produced by CT scanners. It was designed at the Hospital of the University of Pennsylvania in Philadelphia, PA by a team of radiologists interested in dose monitoring and quality assurance. The power of RADIANCE is its ability to extract information from dose sheets produced by legacy CT scanners that cannot generate DICOM RDSRs (radiation dose structured reports).

RADIANCE v2.0 is here! Click here to download it. If you are upgrading from v1.0, an update script will

radimetrics

Kommerziell

eXposure™

Cumulative Dose Tracking

The ability to track patient exposure to radiation from imaging procedures is rapidly becoming a "must have" for healthcare providers due to numerous factors

Welcome Features Reviews Training Contact

Kommerziell

Jenny Dose Tracking System ©2012

A Complete X-Ray Radiation Dose Trackin

DOSEMONITOR®

Kommerziell

Please Contact Us at: info@dosemonitor.com Call Us at: 877-299-6587

DoseMonitor™ is a full featured ionizing radiation dose monitoring solution.

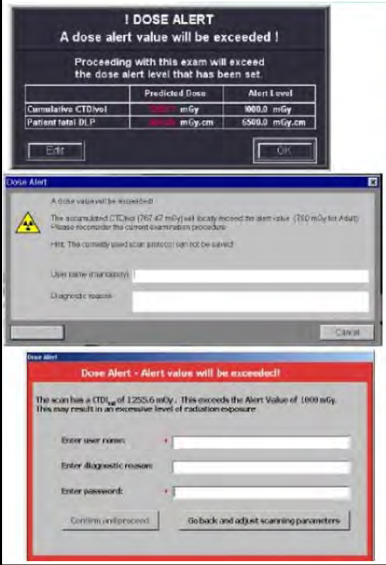
- Cumulative patient dose profile
- Customizable alerts and notification
- Robust reporting capabilities
- Modality dose monitoring
- Rapid deployment

Auswertemöglichkeiten

Möglichkeiten des Dosismonitoring

- Dosis-Warnschwellen am Gerät
- Händisch pro Patient
- „Dosisbericht“/Untersuchung
  - Screenshot/Bild
  - Strukturierter Bericht/IHE Profil
- Auswertung der RIS-Datenbank
- Automatische Auswertung

Dosiswarnungen am Gerät



Gerät wird nur nach Eingabe eines Grundes und/oder Passwort freigegeben!

Dosisbericht als Screenshot

GE

Exam Description: CT Thorax+ Abdomen

DOB:
Sex:

Dosisbericht

Series	Type	Scan Range (mm)	CTDIvol (mGy)	DLP (mGy-cm)	Phantom cm
1	Scout	-	-	-	-
200	Axial	I786.510-I786.510	34.01	17.01	Body 32
2	Helical	S643.000-S29.000	21.04	1388.86	Body 32

Total Exam DLP: 1405.87

1/1

Siemens

18-May-2010 02:22

Ward:
Physician:
Operator: Cattelaens

Total mAs 12316 Total DLP 1821 mGy*cm

	Scan	kV	mAs / ref.	CTDIvol mGy	DLP mGy*cm	TI s	cSL mm
Patient Position H-SP							
Topogram	1	120	36 mA			8	0.6
Abd nativ	2	120	183 / 140	12.10	569	0.5	1.2
PreMonitoring	3	120	20	1.10	1	0.5	10.0
I.V. Bolus							
Monitoring	4	120	20	1.10	1	0.5	10.0
OBB art	5	120	164 / 200	11.85	314	0.5	0.6
Thx/Abd ven	6	120	211 / 200	15.28	936	0.5	0.6

Toshiba

Study ID 0803558992 Study Date 2011.08.13 (P. 2)
Accession Number 0803558992

<< Detail information >>

1 Neu Trauma CCT-Koerper-Extrem

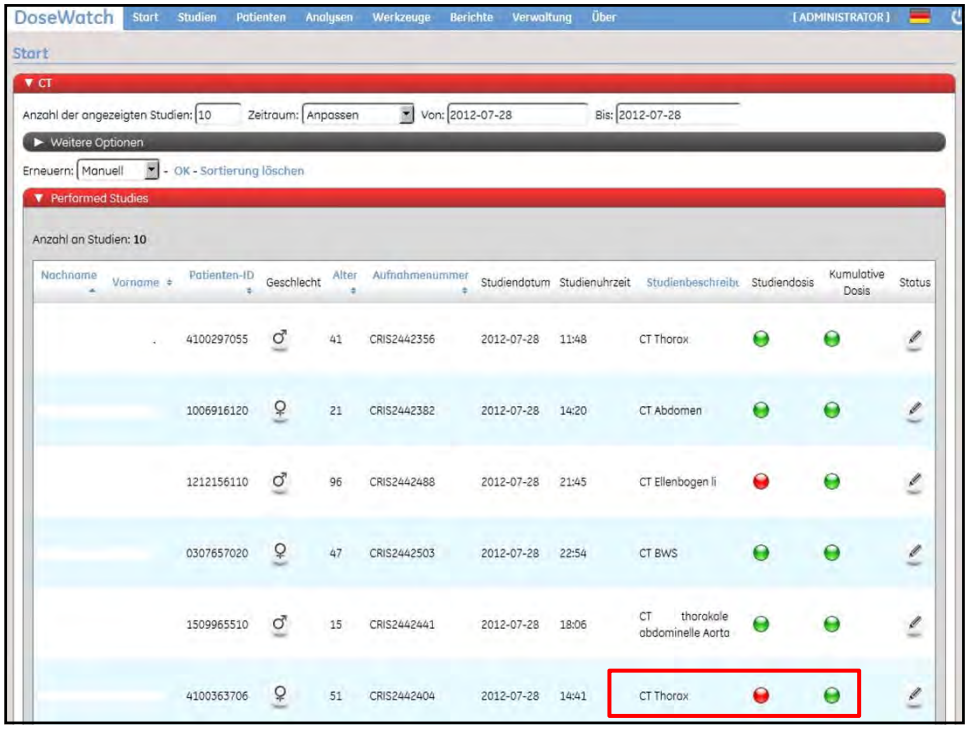
	Total DLP	Image Number	Exposure Time	Total mAs		CTDIvol
		Start Pos.		End Pos		
SCANOSCOPE[2]		35.00		2625.00		
HELICAL_CT	1028		16.48		6590.00	
	1441.90(Body)	-1277.00		-931.0		41.70(Body)
HELICAL_CT	1366		15.45		6021.00	
	2022.00(Body)	-1193.50		-359.0		32.80(Body)
HELICAL_CT	1368		17.02		2997.00	
	1086.30(Body)	-436.50		+482.5		28.30(Body)

Philips

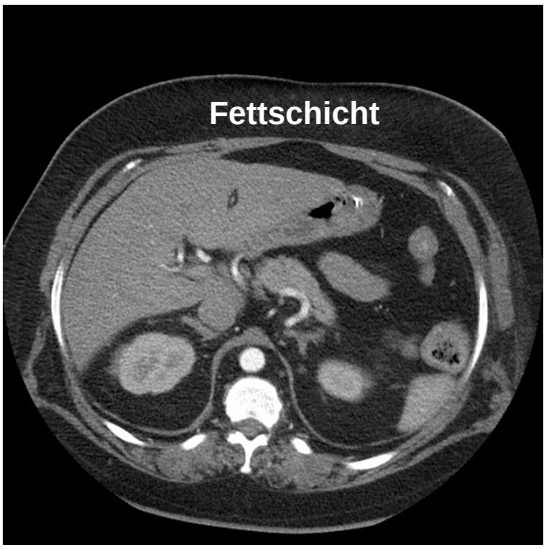
Exam Information
Study ID: 12875
Time: Oct 31, 2011, 18:52
Total DLP: 1124.8 mGy*cm
Estimated Dose Savings: 39%

Dose

#	Description	Scan Mode	mAs	kV	CTDIvol [mGy]	DLP mGy*cm	Phantom Type[cm]
1		Survey	1	120	0.09	4.3	32 CM
2	BA+LDM	Helical	55	120	3.64	172.8	32 CM
3	BA+ADM	Helical	122	120	7.99	378.9	32 CM
4	LDM	Helical	57	120	3.77	179.0	32 CM
5	ADM	Helical	126	120	8.22	390.0	32 CM

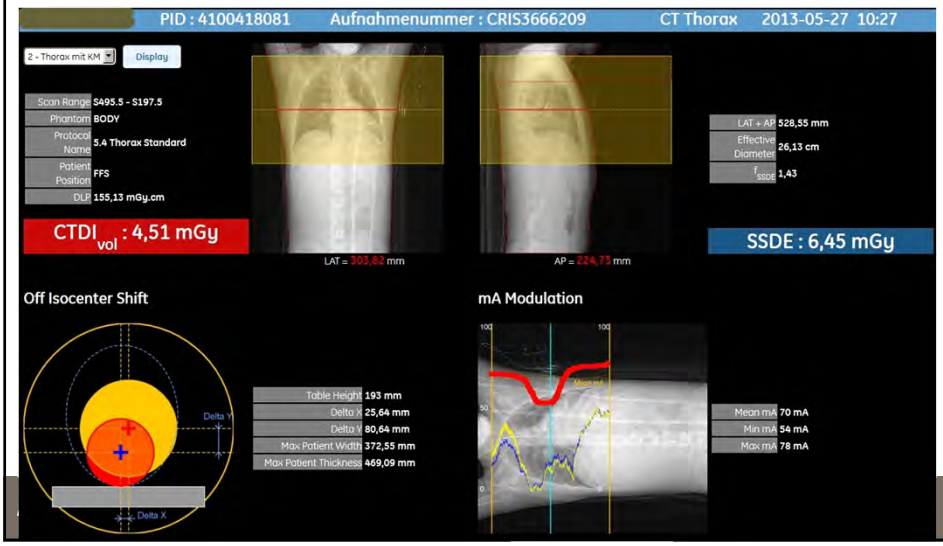


1. Dosis „im Blick“

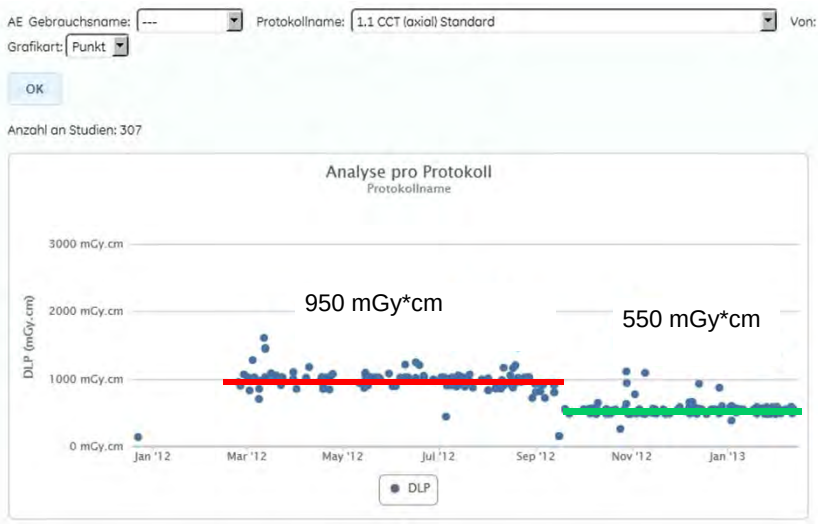


2. Auswertung – SSDE

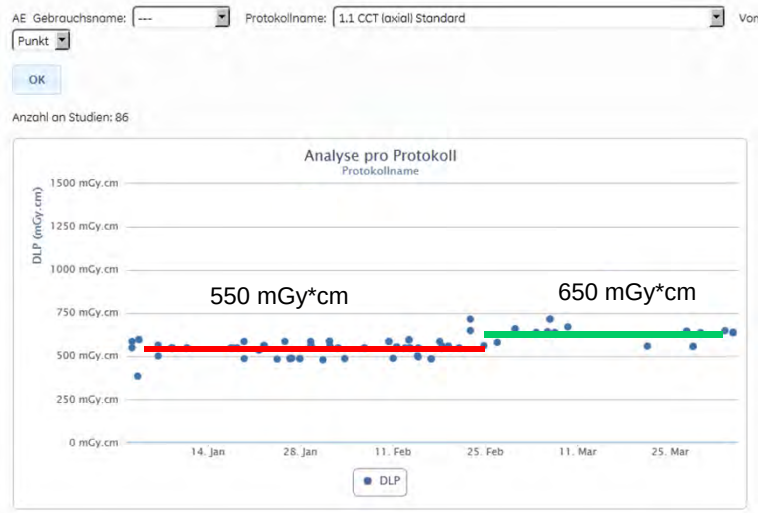
Größenspezifische Dosisabschätzung (**S**ize **S**pezific **D**ose **E**stimates)



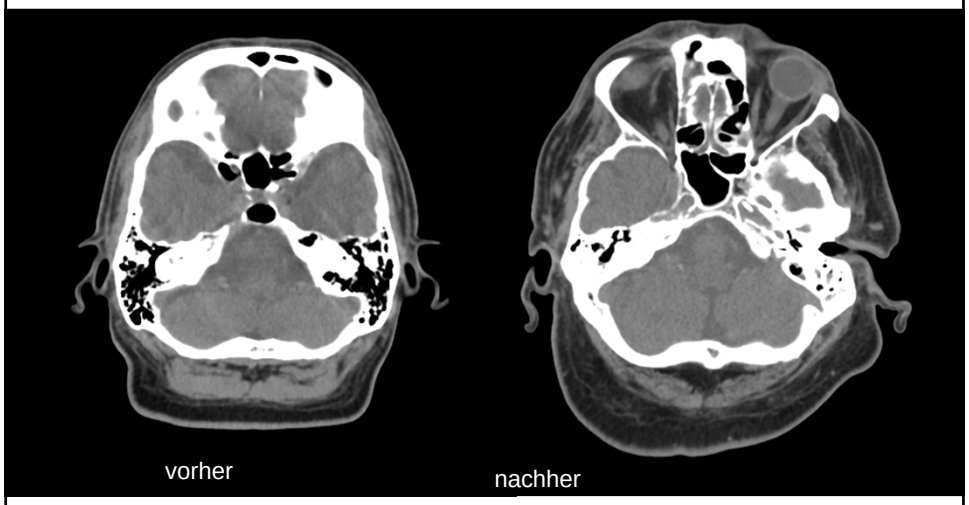
ASIR Einführung: CCT



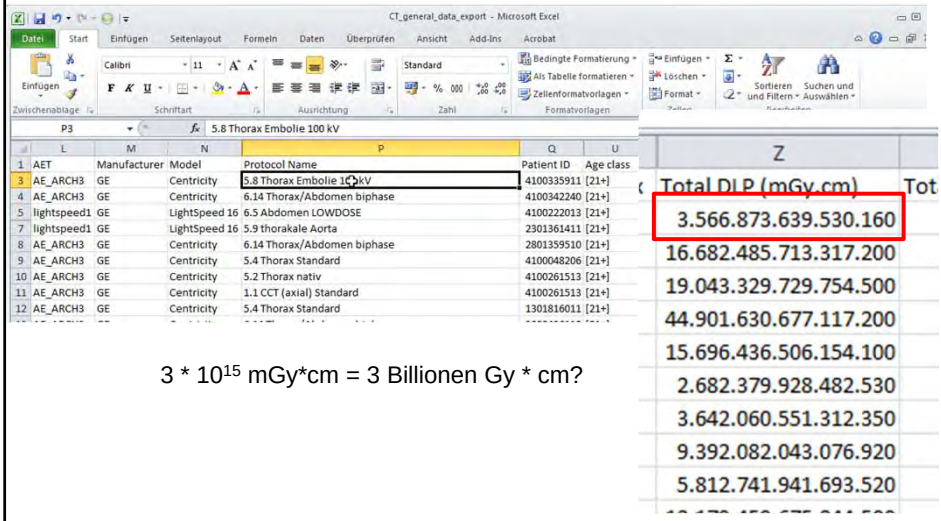
ASIR Einführung: CCT 2



ASIR: CCT Erhöhung min mA



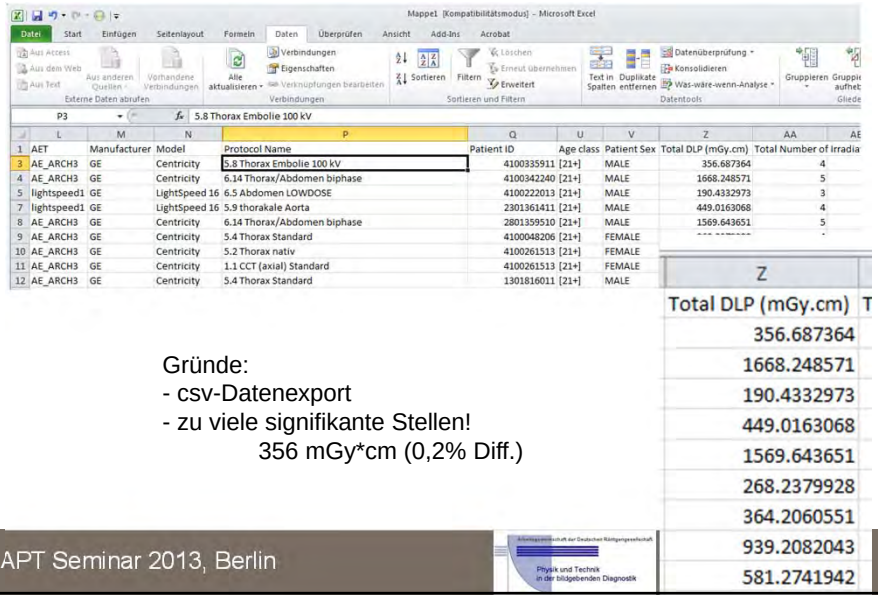
Dosiswerte in der Praxis



AET	Manufacturer	Model	Protocol Name	Patient ID	Age class	Total DLP (mGy.cm)
AE_ARCH3	GE	Centricity	5.8 Thorax Embolie 100 kV	4100335911	[21+]	3.566.873.639.530.160
AE_ARCH3	GE	Centricity	6.14 Thorax/Abdomen biphase	4100342240	[21+]	16.682.485.713.317.200
lightspeed1	GE	LightSpeed 16	6.5 Abdomen LOWDOSE	4100222013	[21+]	19.043.329.729.754.500
lightspeed1	GE	LightSpeed 16	5.9 thorakale Aorta	2301361411	[21+]	44.901.630.677.117.200
AE_ARCH3	GE	Centricity	6.14 Thorax/Abdomen biphase	2801359510	[21+]	15.696.436.506.154.100
AE_ARCH3	GE	Centricity	5.4 Thorax Standard	4100048206	[21+]	2.682.379.928.482.530
AE_ARCH3	GE	Centricity	5.2 Thorax nativ	4100261513	[21+]	3.642.060.551.312.350
AE_ARCH3	GE	Centricity	1.1 CCT (axial) Standard	4100261513	[21+]	9.392.082.043.076.920
AE_ARCH3	GE	Centricity	5.4 Thorax Standard	1301816011	[21+]	5.812.741.941.693.520

$3 * 10^{15}$ mGy*cm = 3 Billionen Gy * cm?

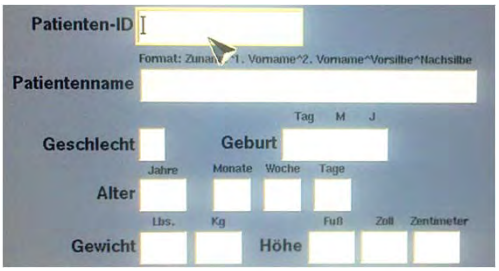
Dosiswerte in der Praxis

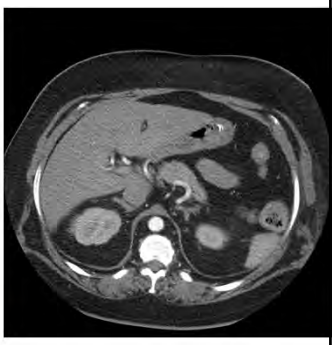


AET	Manufacturer	Model	Protocol Name	Patient ID	Age class	Patient Sex	Total DLP (mGy.cm)	Total Number of irradia
AE_ARCH3	GE	Centricity	5.8 Thorax Embolie 100 kV	4100335911	[21+]	MALE	356.687364	4
AE_ARCH3	GE	Centricity	6.14 Thorax/Abdomen biphase	4100342240	[21+]	MALE	1668.248571	5
lightspeed1	GE	LightSpeed 16	6.5 Abdomen LOWDOSE	4100222013	[21+]	MALE	190.4332973	3
lightspeed1	GE	LightSpeed 16	5.9 thorakale Aorta	2301361411	[21+]	MALE	449.0163068	4
AE_ARCH3	GE	Centricity	6.14 Thorax/Abdomen biphase	2801359510	[21+]	MALE	1569.643651	5
AE_ARCH3	GE	Centricity	5.4 Thorax Standard	4100048206	[21+]	FEMALE		
AE_ARCH3	GE	Centricity	5.2 Thorax nativ	4100261513	[21+]	FEMALE		
AE_ARCH3	GE	Centricity	1.1 CCT (axial) Standard	4100261513	[21+]	FEMALE		
AE_ARCH3	GE	Centricity	5.4 Thorax Standard	1301816011	[21+]	MALE		

Gründe:
- csv-Datenexport
- zu viele signifikante Stellen!
  356 mGy*cm (0,2% Diff.)

BMI am Gerät dokumentieren





Z	AA	AB	AC	AD	AE
Age class	Patient Sex	Patient Weight (kg)	Patient Size (cm)	BMI	Total DLP (mGy.cm)
[21+]	FEMALE	53	179	16,5	808,1
[21+]	FEMALE	53	158	21,2	454,8
[21+]	FEMALE	40	162	15,2	608,1
[21+]	FEMALE	87	168	30,8	655,8

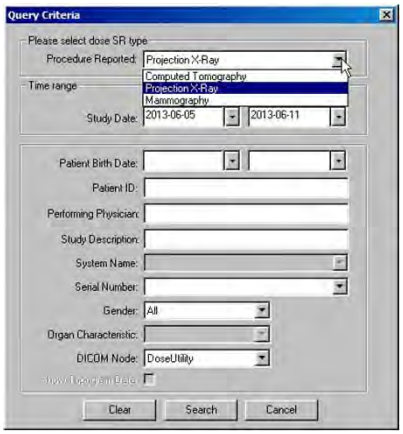
AF	AG	AH	AI
Max tube current (mA)	tube current (mA)	Mean CTDI vol (mGy)	DLP (mGy.cm)
248	184	7,6	217,2
278	203	8,4	590,9
170	112	7,2	454,8
100	100	6,4	192,0
102	100	6,5	416,1
327	289	18,6	655,8

APT Seminar 2013, Be

CareAnalytics

- Query dose reports
- Query dose reports from local media
- Update report
- Merge results
- Export file to Excel
- Save file as XML
- Close current dose report
- Delete entry from list
- Column configuration
- DICOM parameter configuration
- Help

Bisher nur Query auf ein Gerät!



Medizinische Hochschule Hannover

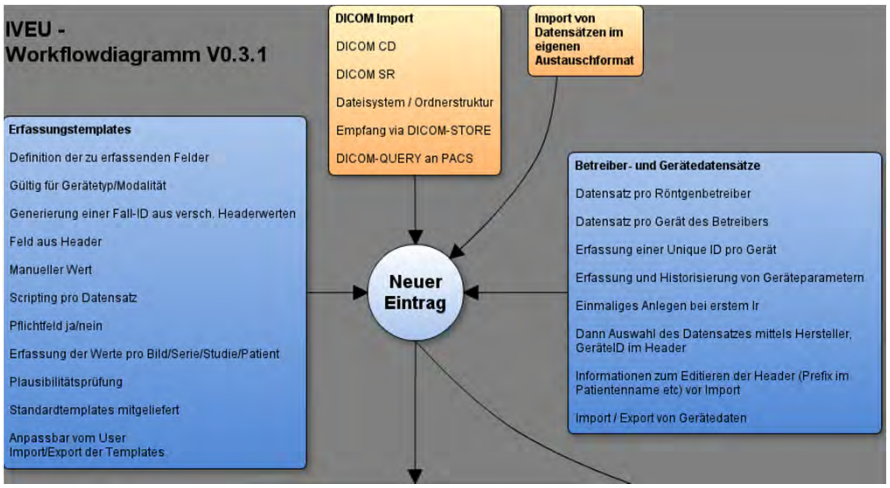
CareAnalytics

Fluoro Mode	Pulse Rate	Number of Pulses	KVP	X-Ray Tube Current	Exposure Time	Pulse Width	Exposure	Focal Spot Size	Distance Source
Pulsed	15	6	70 kV	28.7 mA	13.2 ms	2.2 ms	378 uAs	0.6 mm	1040 mm
Pulsed	15	35	65 kV	74.2 mA	112 ms	3.2 ms	8310 uAs	0.6 mm	1040 mm
Pulsed	15	35	65 kV	55.8 mA	108.5 ms	3.1 ms	6054 uAs	0.6 mm	1040 mm
Pulsed	15	7	65 kV	92.3 mA	29.4 ms	4.2 ms	2713 uAs	0.6 mm	1096 mm
	2	12	65 kV	182.2 mA	1116 ms	93 ms	203335 uAs	0.3 mm	1096 mm
	2	14	65 kV	182 mA	1345.4 ms	96.1 ms	244862 uAs	0.3 mm	1096 mm
Pulsed	15	10	70 kV	97.5 mA	122 ms	12.2 ms	11895 uAs	0.6 mm	1138 mm
Pulsed	15	76	68 kV	98.2 mA	570 ms	7.5 ms	55974 uAs	0.6 mm	1138 mm

IT gestütztes Verfahren zur Erfassung von Untersuchungsdaten (IVEU)

- DICOM Importer
  - DICOM-CD, DICOM-SR
  - Filesystem, DICOM-Store, DICOM-Query
- DICOM Export
  - Speichern von Header-/Bilddaten in lokale Struktur (DICOMDIR)
  - Weiterleiten in ein PACS
  - Editieren DICOM-Header

IVEU-Workflow



Physik und Technik in der bildgebenden Diagnostik

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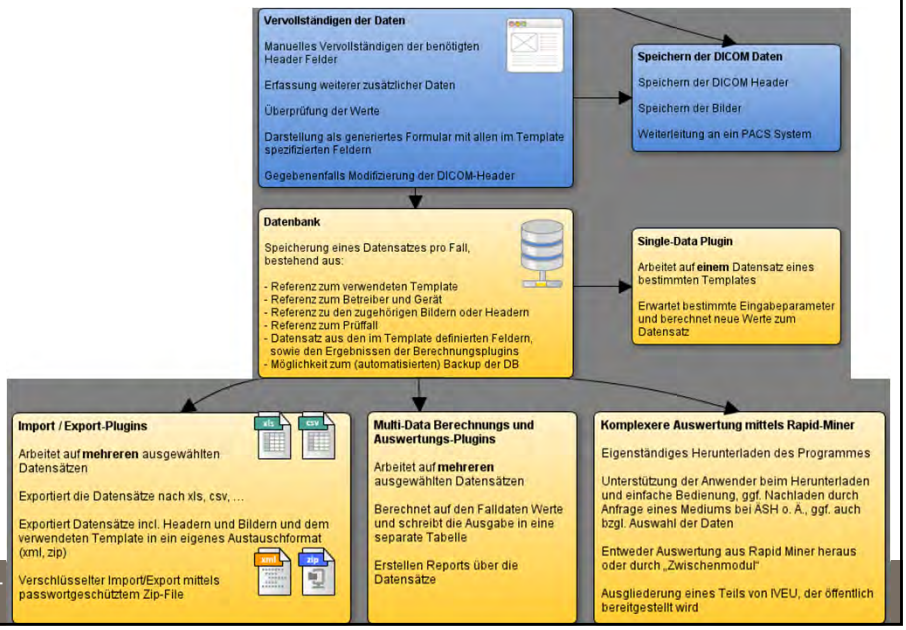
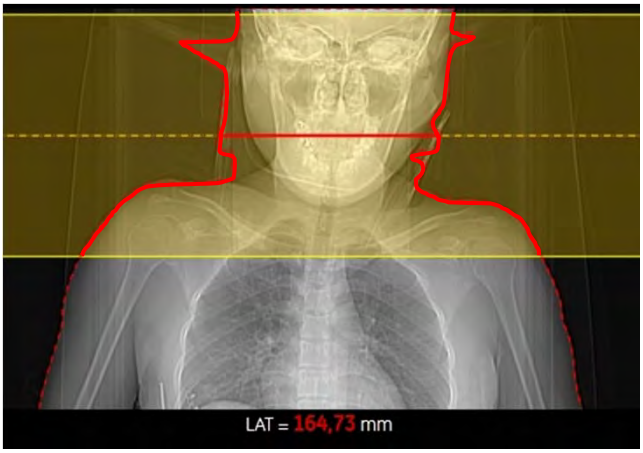
IVEU-Workflow



Vielen Dank für Ihre Aufmerksamkeit!