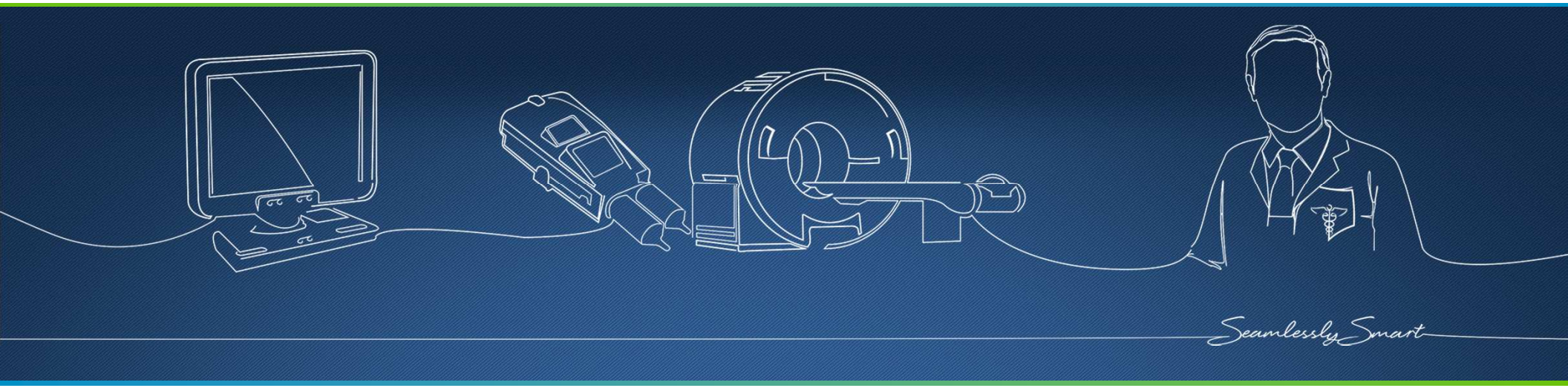
Science For A Better Life



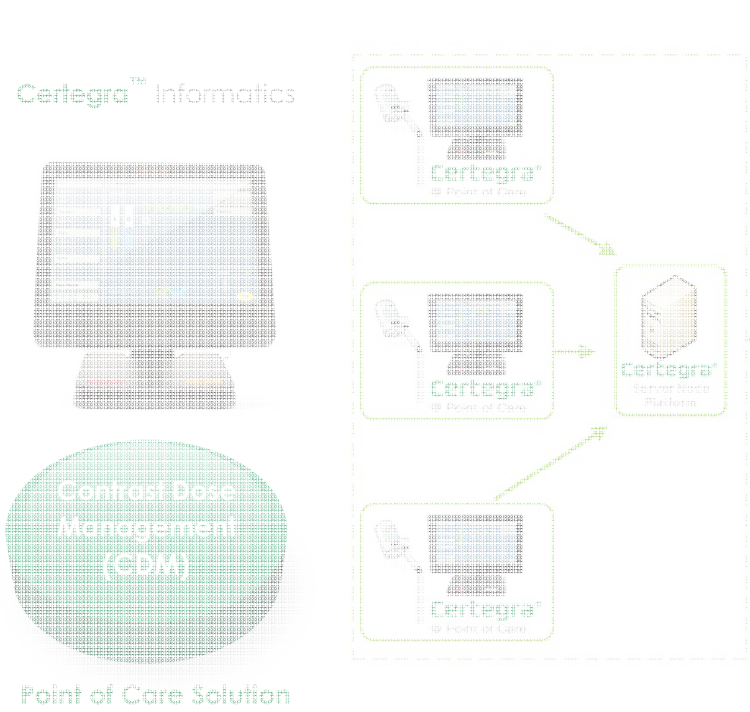
Radimetrics

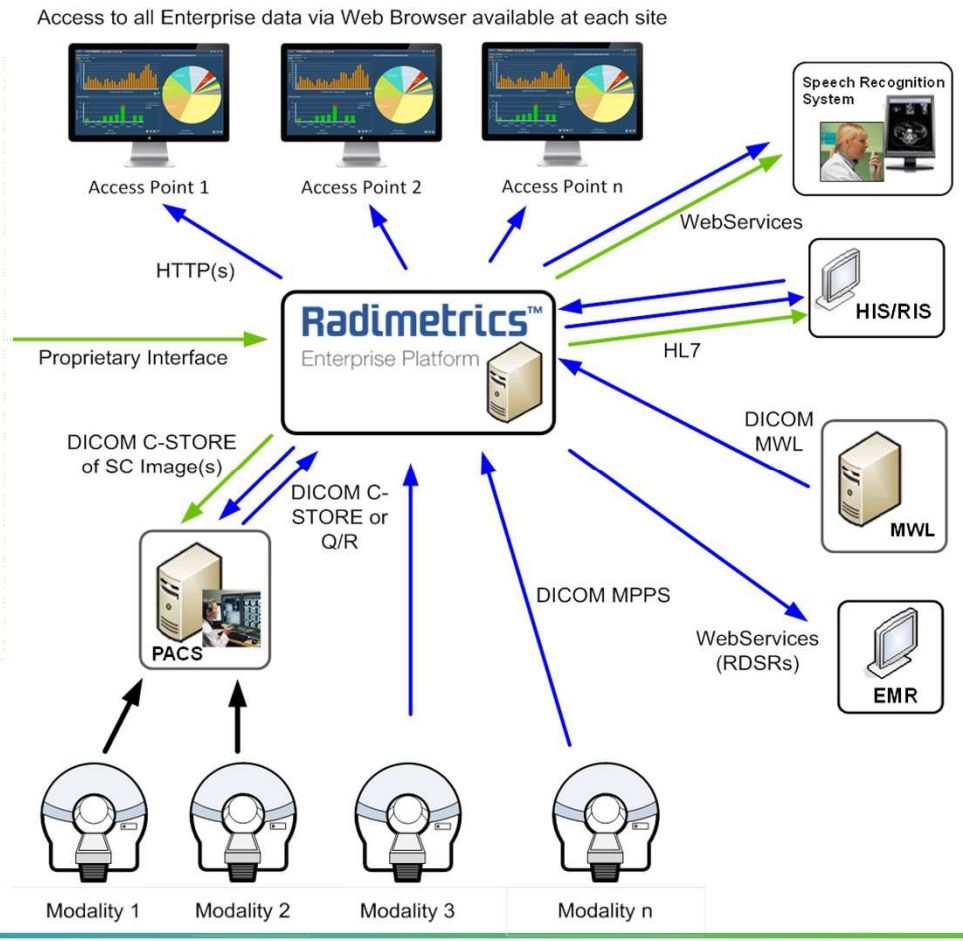
Dosis- und Qualitätsmanagement in der Radiologie

Christian Lienerth, PhD
Leitung MR-/CT-/Informatics-Application Service
Bayer Vital GmbH
Strategische Geschäftseinheit Radiologie

Installationsmöglichkeiten / Datenimport

Physikalischer oder virtuell Server (VM) – keine Cloud (basierend auf Linux & SQL DB)





Radimetrics™ Platform

Enterprise Solution

Radimetrics

Enterprise Platform

Hersteller unabhängig

GE · HITACHI · PHILIPS · Neusoft · SAMSUNG · SIEMENS · TOSHIBA · iCRco · Medtronic

Multiple-Browser kompatibel

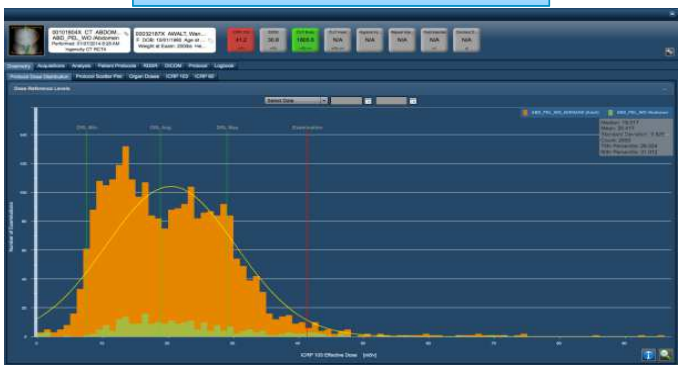
Unterstützung von LDAP Authentifikation

Mandanten-fähig

Welche Geräte lassen sich anschließen

Alle bildgebenden Modalitäten und KM-Injektoren der Firma Bayer

Computertomographie (CT)



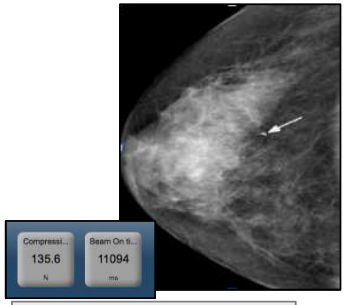
Interventionelle Radiologie (RF/XA)

Höchste Hautdosisabschätzung (Peak Skin Dose Estimate)

Computerradiographie/ digitale Radiographie (CR/DX)

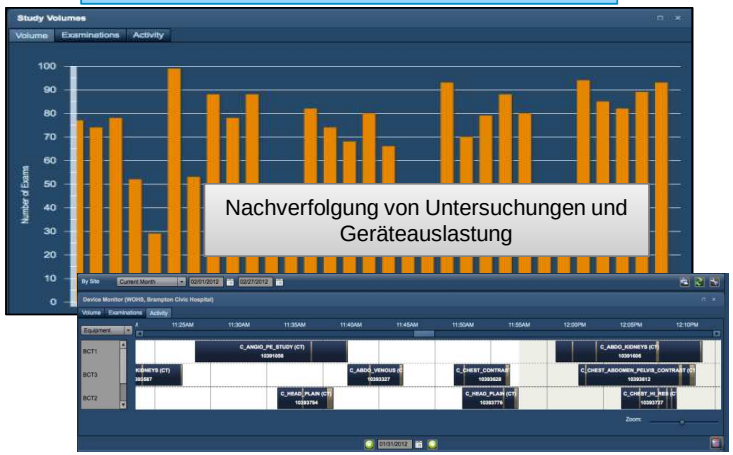
Standard-set an CR/DX-Master-protokollen

Mammographie (MG)



Erfasst durchschnittliche Glanduläre Dosis

Magnetresonanztomographie (MRT)



Nachverfolgung von Untersuchungen und Geräteauslastung

Ultraschall (US)

Vereinfachte Erfassung und Übertragung von strukturierten Ultraschall-berichtsdaten an HL7 kompatible Informations-systeme

Nuklearmedizin (NM)

Effektiv- und Organdosis nach ICRP106

Auswertung der relevanten Informationen
Verwendung von verschiedenen Quellen

Does it provide	RDSR	Dose Capture Image	MPPS	DICOM Header	DAP Meter
DAP	Yes	Yes	Maybe*	Maybe*	Yes
Flouro Time	Yes	Yes	Maybe*	Maybe*	Yes
Air Kerma (Reference Point Dose)	Yes	Yes	Maybe*	Maybe*	Maybe*
Peak Skin Dose	Yes	Maybe*	Maybe*	Maybe*	No
Study Description	Yes	Yes	Yes	Yes	Yes
Performing Physician	Yes	Yes	Yes	Yes	No

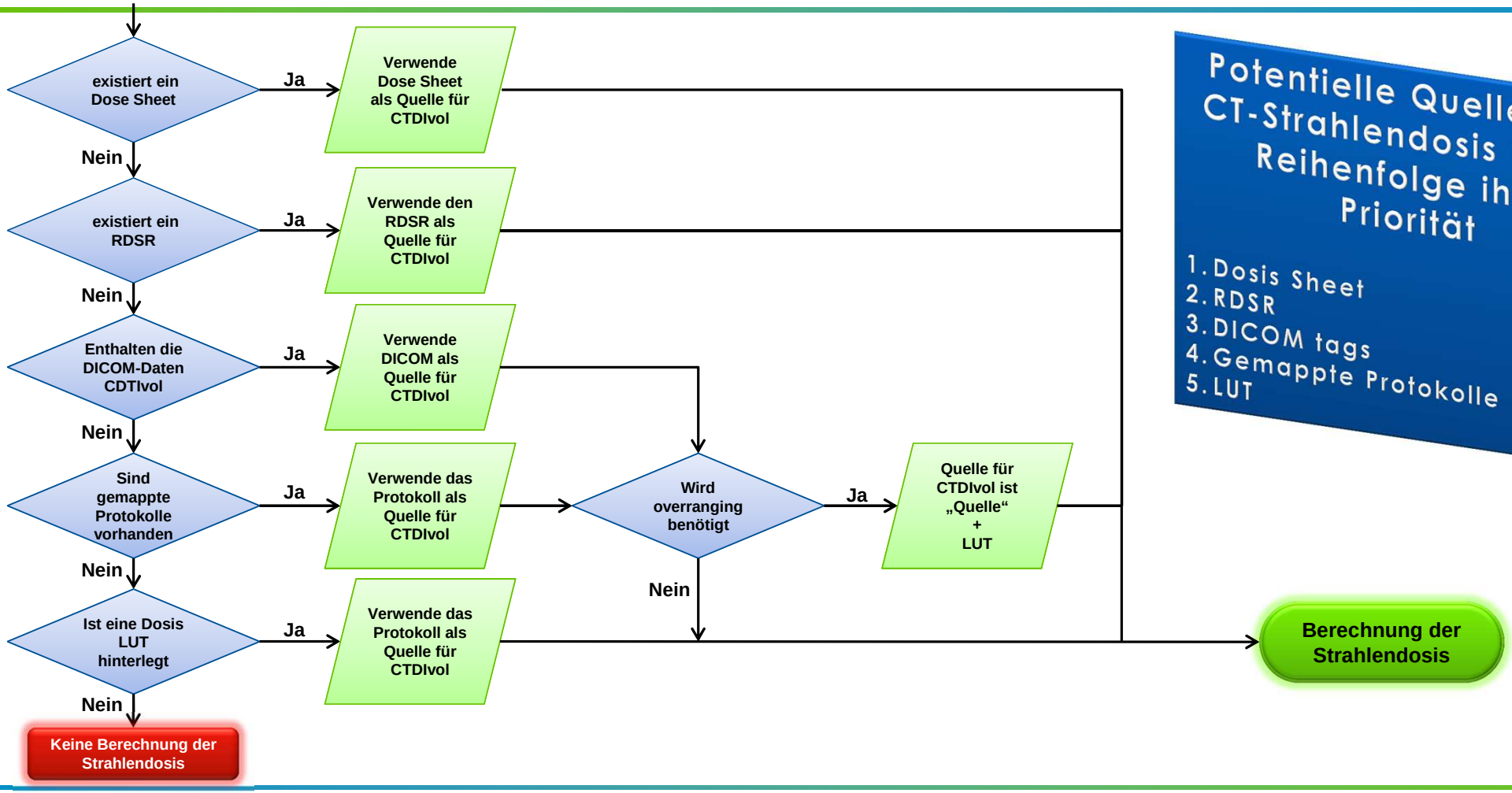
Does it provide	RDSR	Dose Capture Image	MPPS	DICOM Header	DAP Meter
DAP	Yes	Maybe*	Maybe*	Maybe*	Maybe*
Exposure Indices	Yes	Maybe*	Maybe*	Maybe*	Maybe*
Deviation Index	Yes	Maybe*	Maybe*	Maybe*	Maybe*
Number of Exposures	Yes	Maybe*	Maybe*	Maybe*	Maybe*

Does it provide	RDSR	Dose Capture Image	DICOM Header
$CTDI_{vol}$	Yes	Yes	Maybe*
DLP	Yes	Yes	Maybe*
Organ Dose	Yes	Yes	Maybe*
Effective Dose	Yes	Yes	Maybe*

Does it provide	RDSR	Dose Capture Image	MPPS	DICOM Header	DAP Meter
Number of Views	Yes	Maybe*	Maybe*	Maybe*	Maybe*
Beam on Time	Yes	Maybe*	Maybe*	Maybe*	Maybe*
Compression Force	Yes	Maybe*	Maybe*	Maybe*	Maybe*
Mean Grandular Dose	Yes	Maybe*	Maybe*	Maybe*	Maybe*

Auswertung der relevanten Informationen

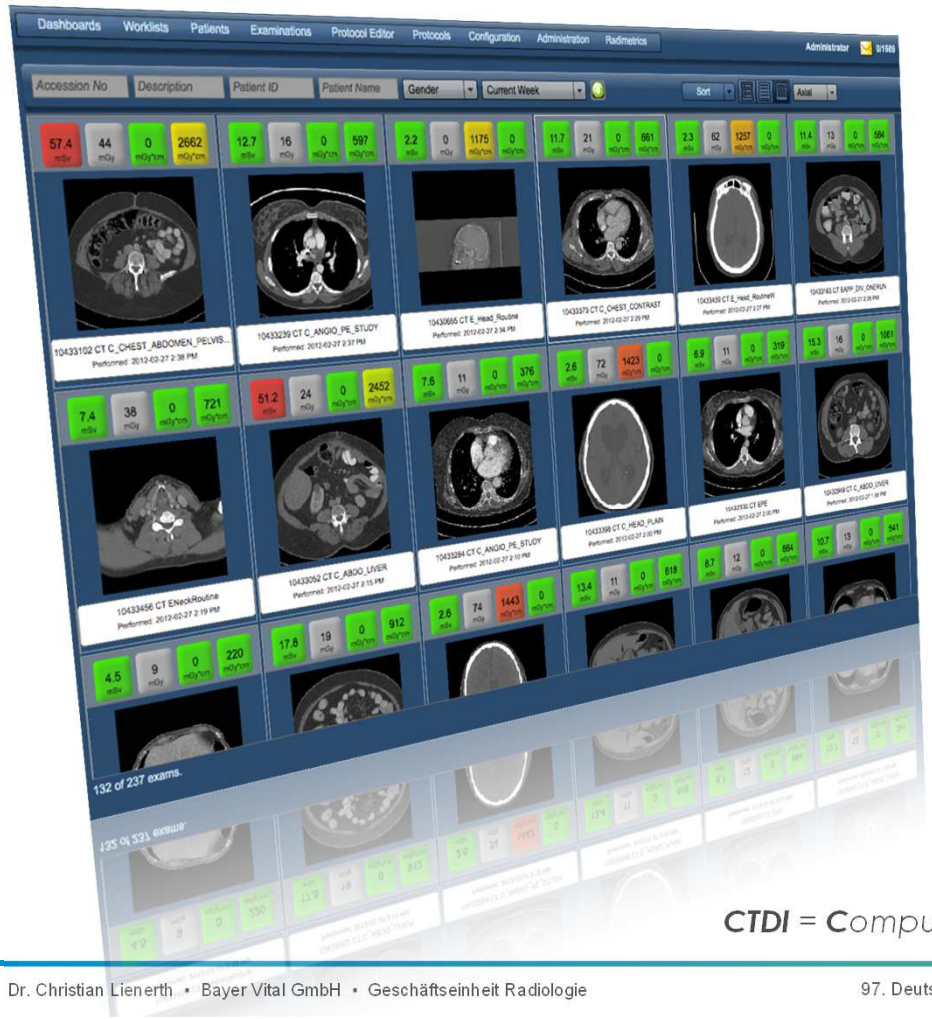
Beispiel: CT-Aufnahmen



Potentielle Quellen für CT-Strahlendosis in der Reihenfolge ihrer Priorität

1. Dosis Sheet
2. RDSR
3. DICOM tags
4. Gemappte Protokolle
5. LUT

Dosisangaben
Beispiel: CT



$CTDI_{VOL}$ Head
99.8
mGy

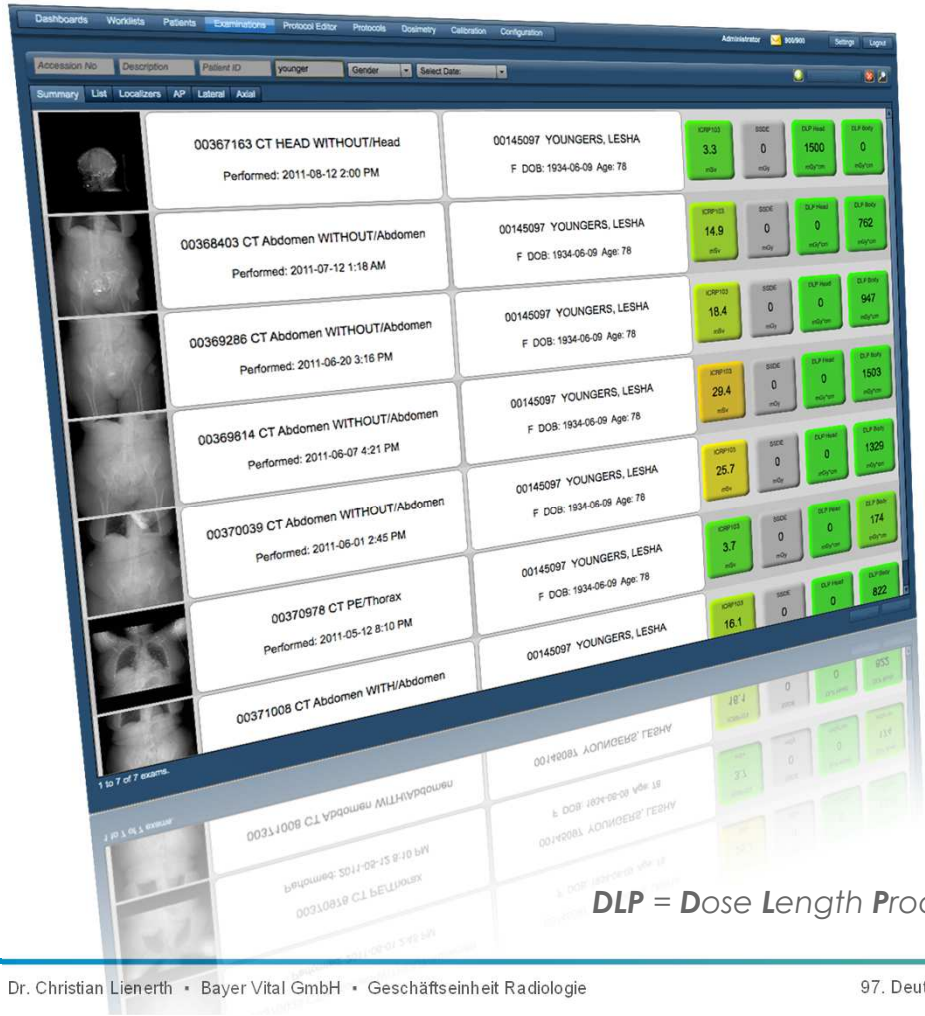
$CTDI_{VOL}$ HEAD (16 cm)

$CTDI_{VOL}$ Body
22.1
mGy

$CTDI_{VOL}$ BODY (32 cm)

CTDI = Computed Tomography Dose Index

Dosisangaben
Beispiel: CT



DLP Head

3024

mGy · cm

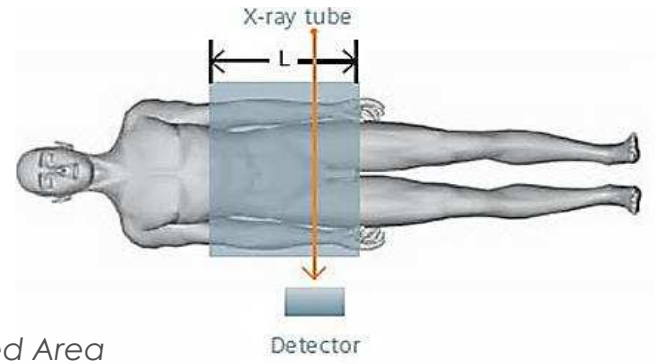
DLP HEAD (16 cm)

DLP Body

765

mGy · cm

DLP BODY (32 cm)



DLP = Dose Length Product = CTDI × Length of Scanned Area

Dosisangaben
Beispiel: CT

SSDE

3.9

mGy

Size Specific Dose Estimate

(AAPM TG204)

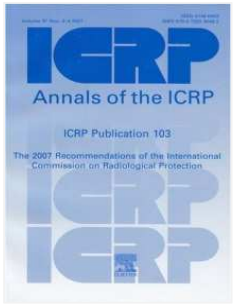
ICRP 103

17.4

mSv

Effective Dose

ICRP-103 & ICRP-60



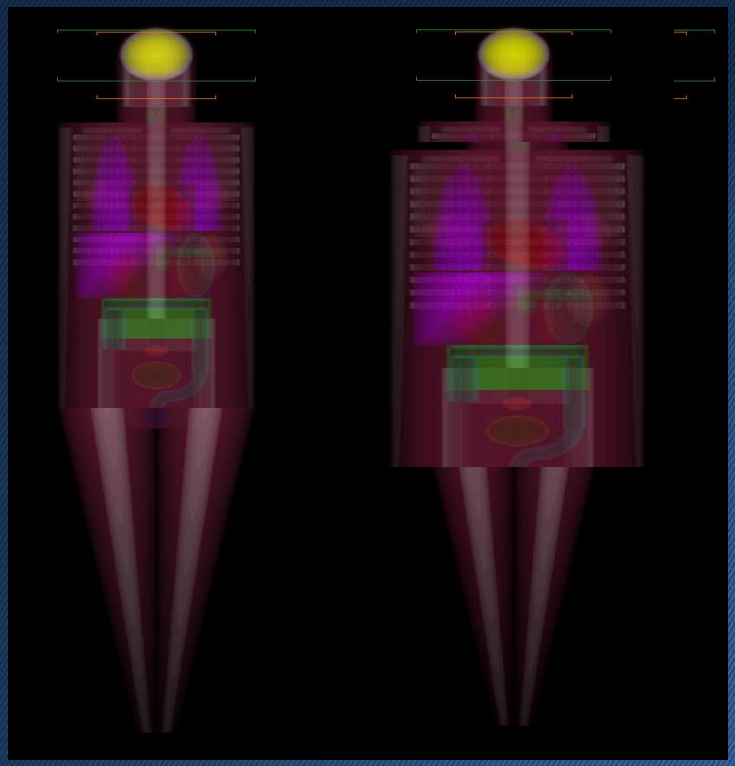
AAPM TG204 *= **T**ask **G**roup nr. 204 – 2011 (**A**merican **A**ssociation of **P**hysicists in **M**edicine)*

ICRP-60 *= **I**nternational **C**ommission for **R**adiological **P**rotection **1990***

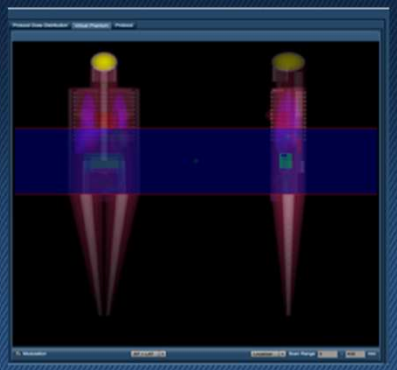
ICRP-103 *= **I**nternational **C**ommission for **R**adiological **P**rotection **2007***

Phantome
Grundlage für Berechnungen in der CT

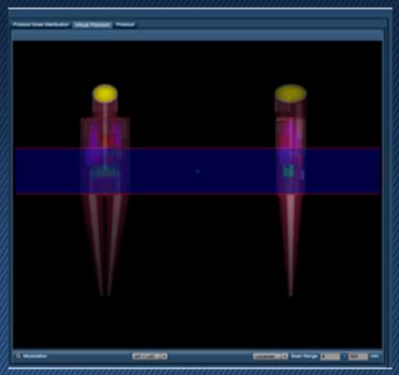
26 Anthropomorphic Virtual Models Family (Cristy/Eckerman)



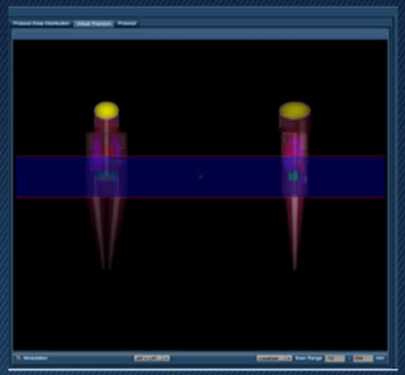
Bariatrische Patienten



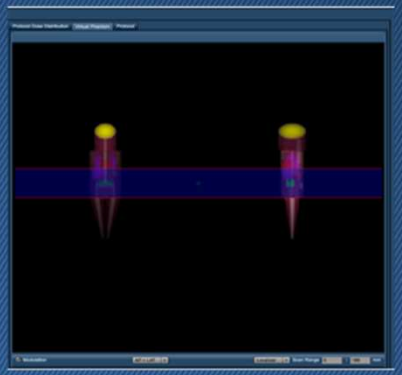
Erwachsene



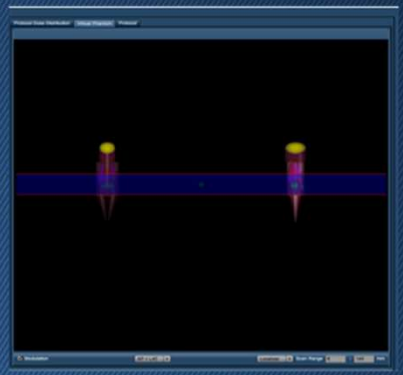
Jugendliche



Kinder



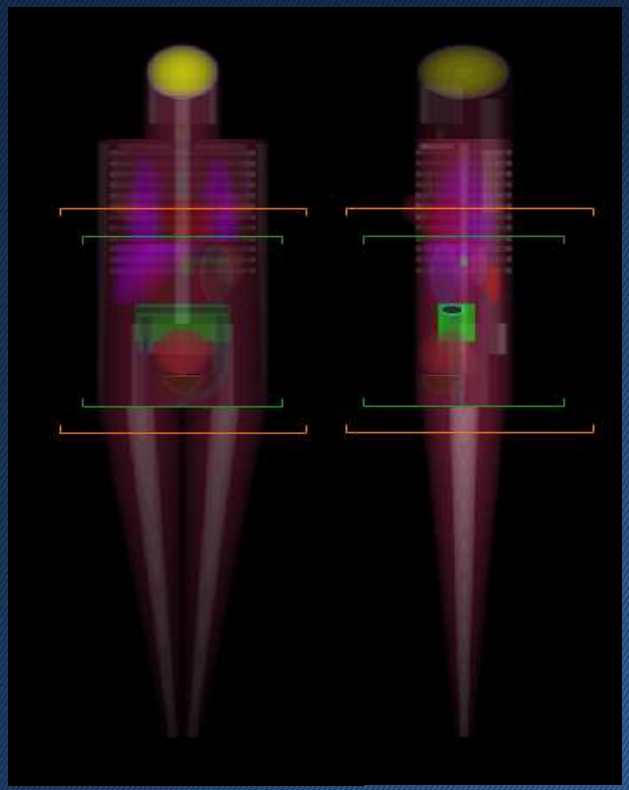
Kleinkinder



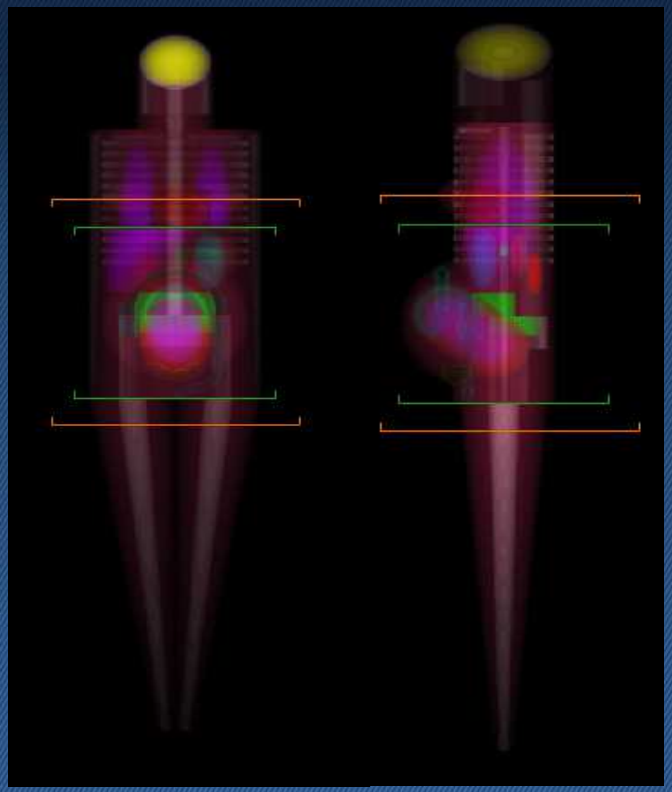
Neugeborene

Phantome
Grundlage für Berechnungen in der CT

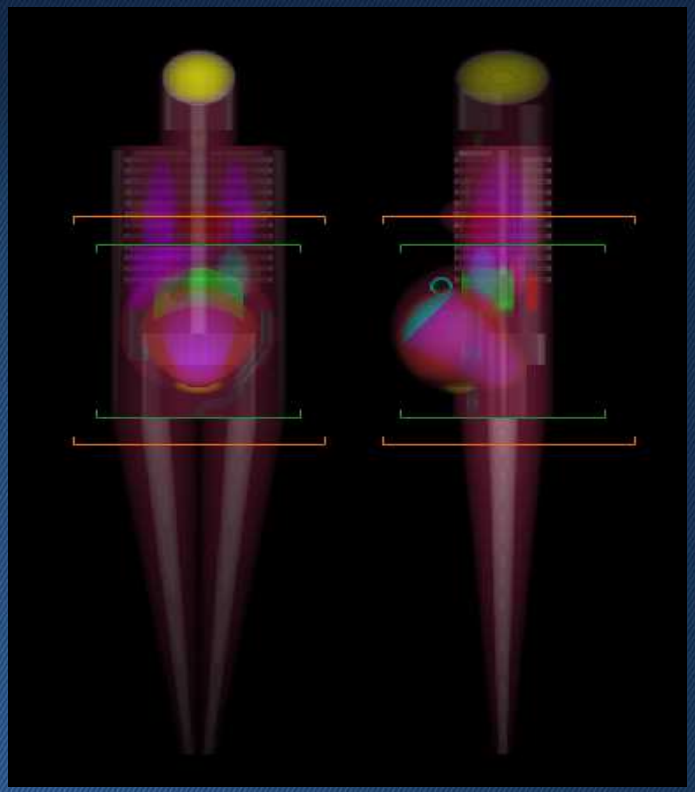
Pregnant Anthropomorphic Models



I TRIMESTER



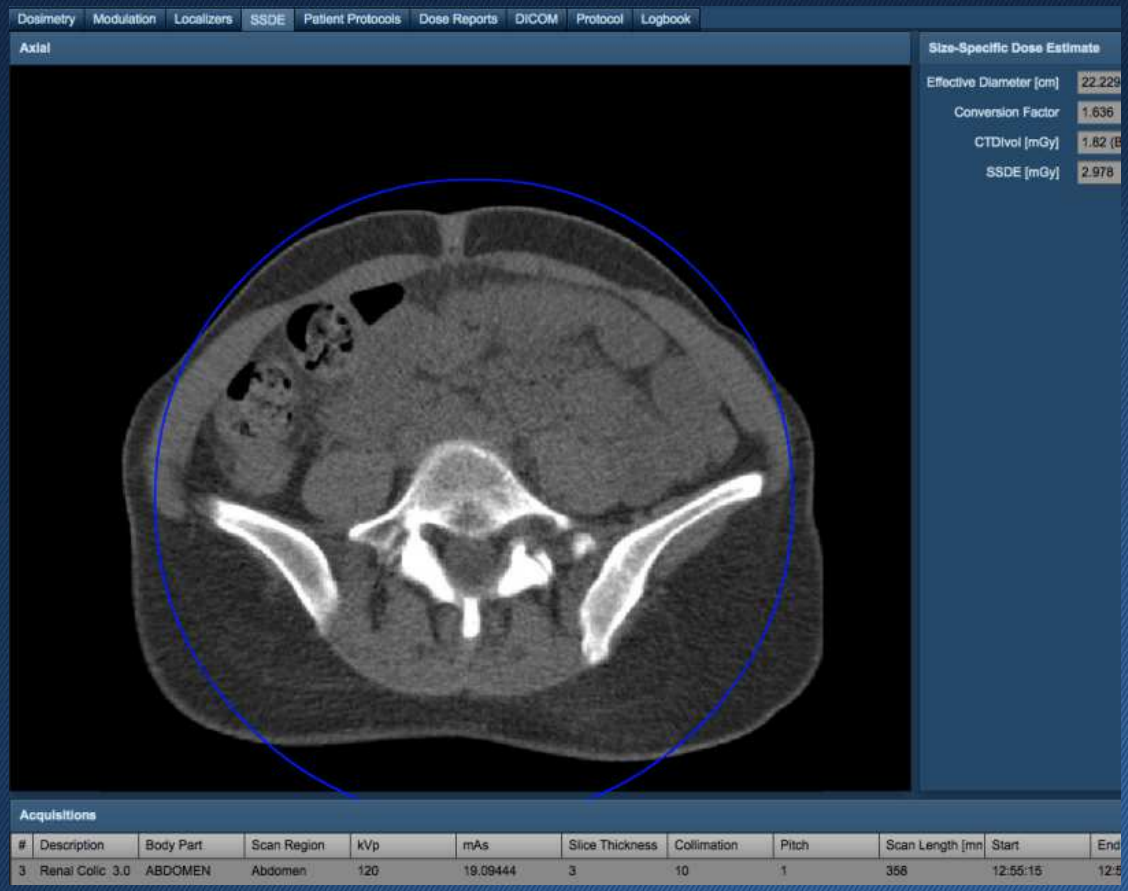
II TRIMESTER



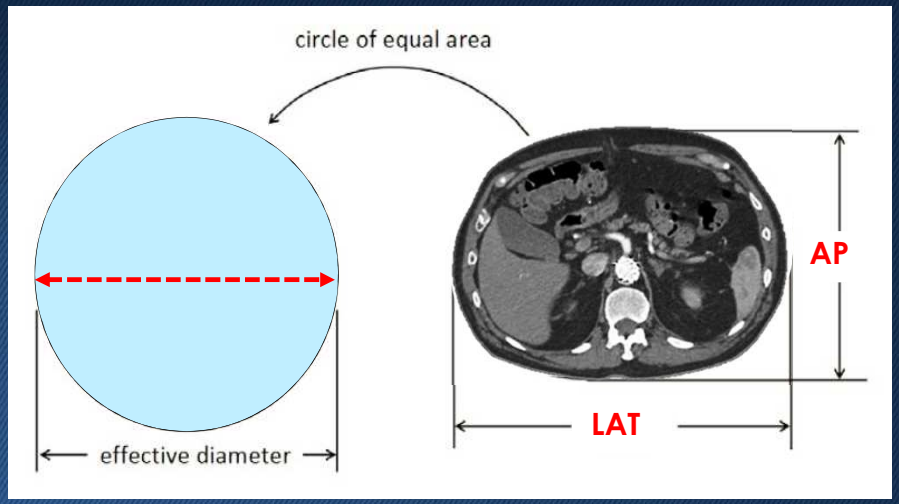
III TRIMESTER

Dosisangaben

Dosisangaben unter Einbeziehung individueller Patientengrößen



SSDE basierend auf AAPM TG204

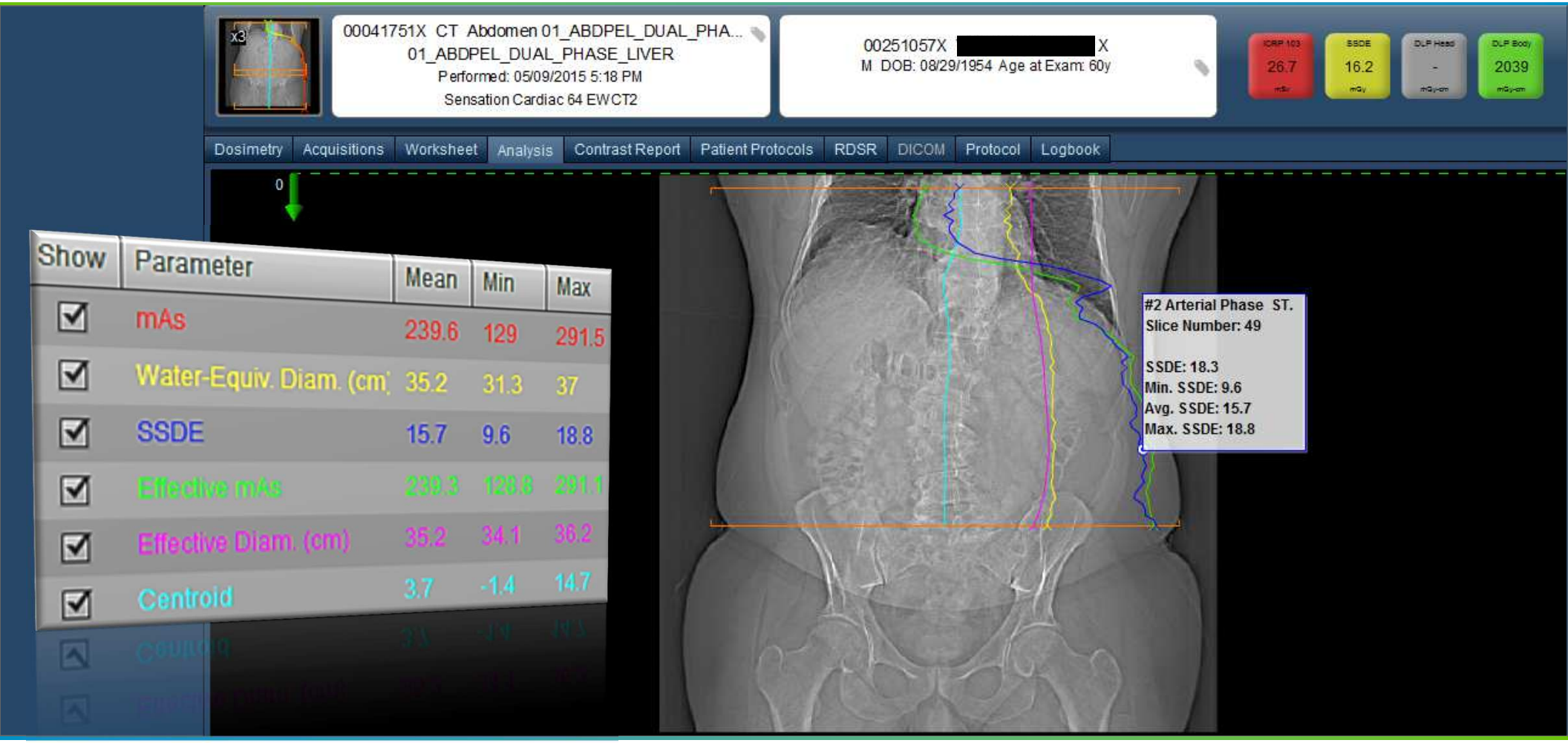


$$\text{EFFECTIVE DIAMETER} = \sqrt{AP \times LAT}$$

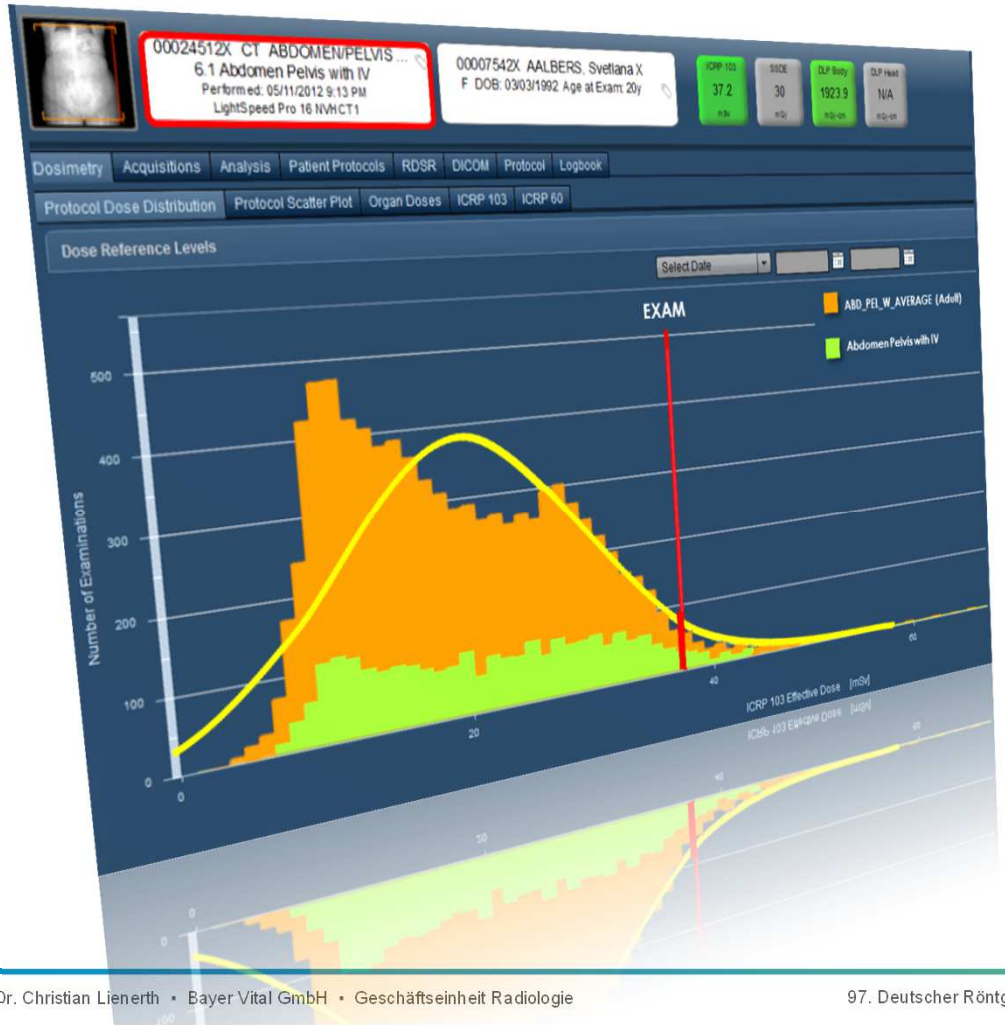
AAPM Report No. 204

Dosisangaben

Dosisangaben unter Einbeziehung individueller Patientengrößen



Dosisangaben
Beispiel: Mammographie



Compress...
138.5
N

Compression Force

Right Breast…
2.5
mGy

Left Breast…
2.5
mGy

R&L MGD

If provided by mammography

Entrance Dose
2.5
mGy

Entrance Dose

Dosisangaben
Beispiel: CR / DR

Exposure Index
9.8
mGy

Exposure Index

AAMP 116

Dev. Index
0.5

Deviation Index

AAMP 116

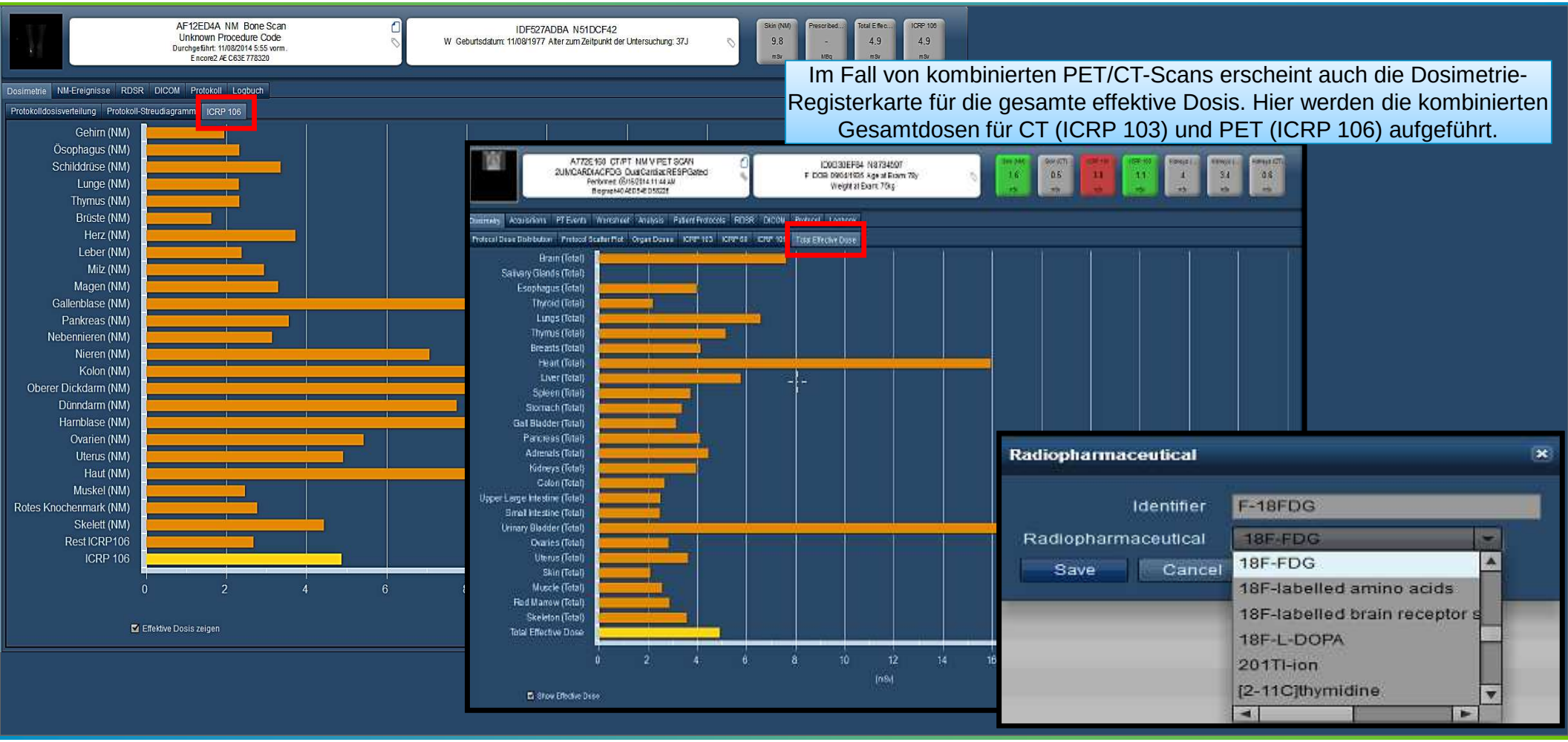
DAP
12.7
Gy cm2

Dose Area Product

AAPM TG116 = *Task Group nr. 116 – 2009 (American Association of Physicists in Medicine)*

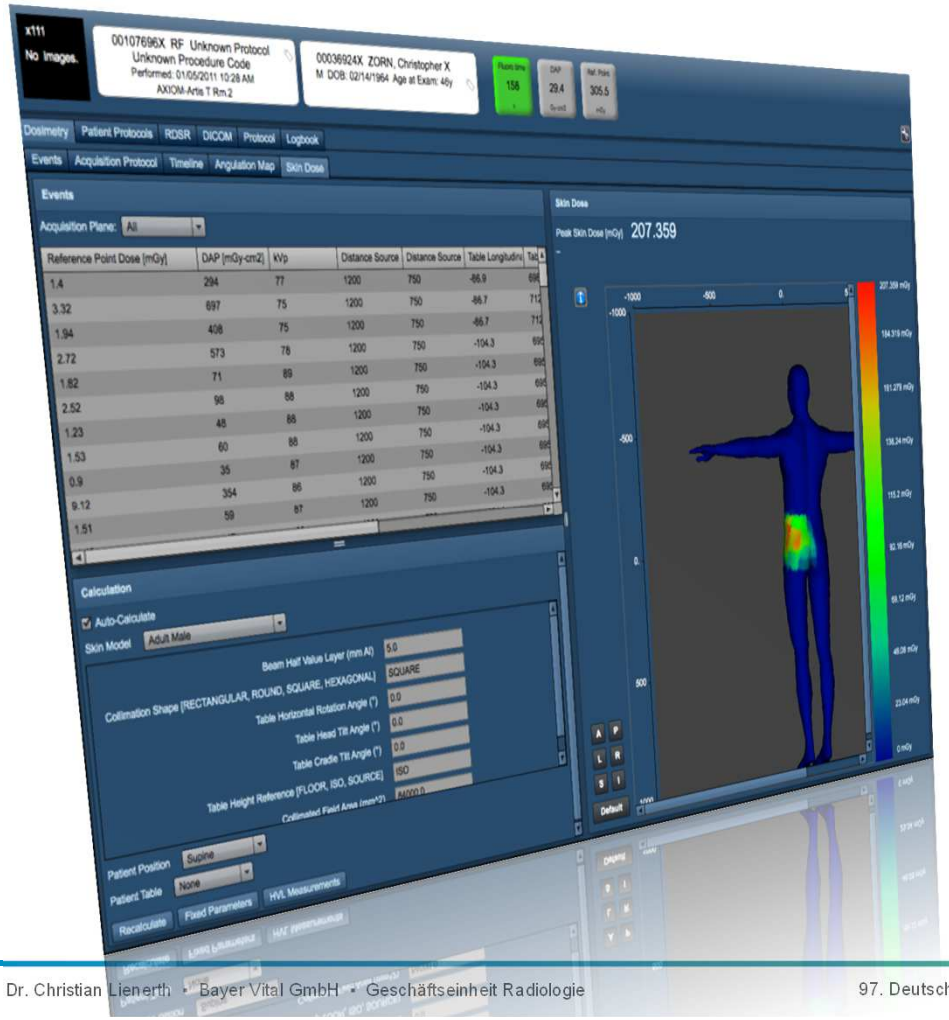
Dosisangaben

Beispiel: PET (ICRP 106) und PET/CT total (ICRP 103+106)



Im Fall von kombinierten PET/CT-Scans erscheint auch die Dosimetrie-Registerkarte für die gesamte effektive Dosis. Hier werden die kombinierten Gesamtdosen für CT (ICRP 103) und PET (ICRP 106) aufgeführt.

Dosisangaben
Beispiel: IR / XA / RF



DAP
2.7
Gy cm2

Dose Area Product

FLUORO time
35.6
s

Exposure Time

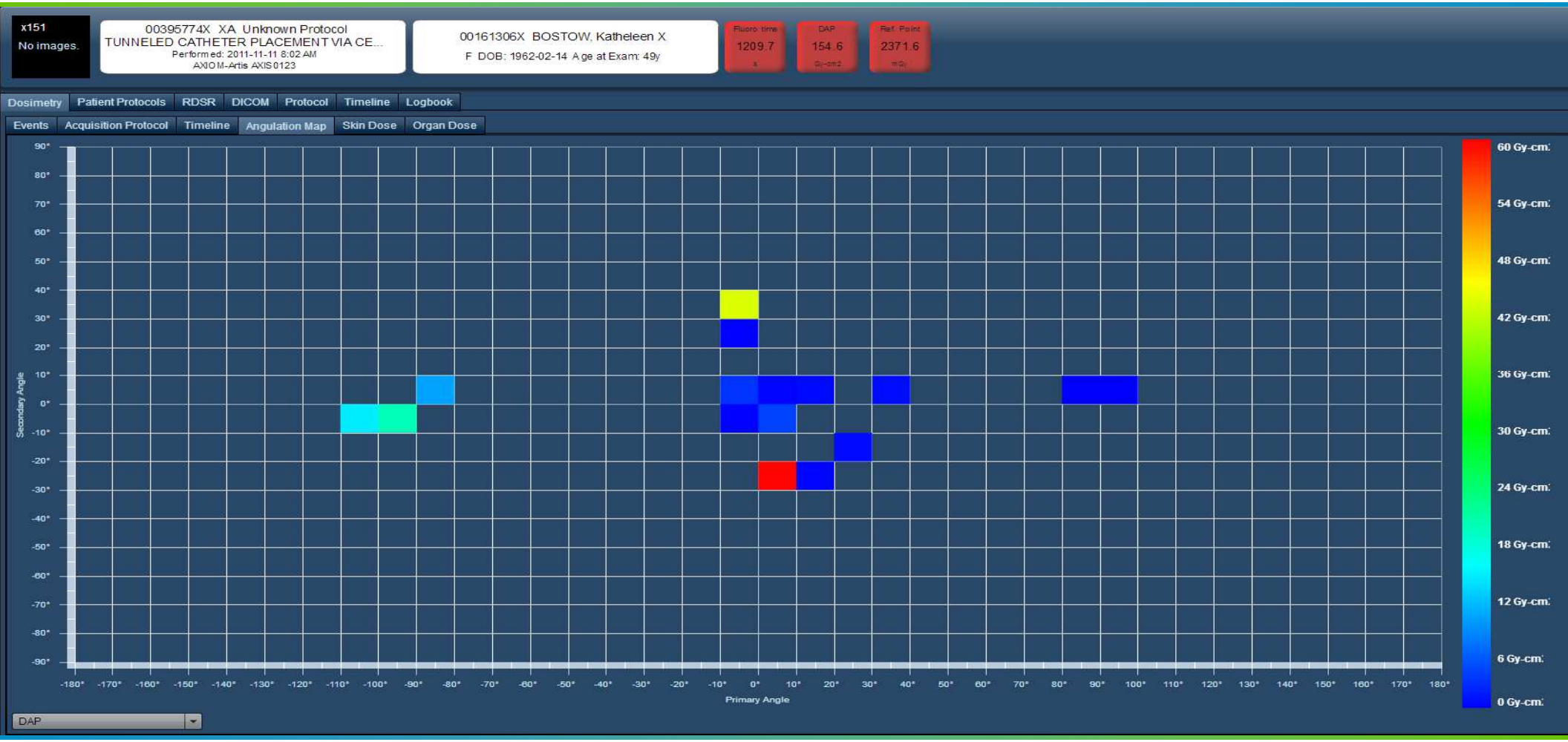
REF. Point
52.1
mGy

KERMA$_{air}$
a.k.a. IR reference point

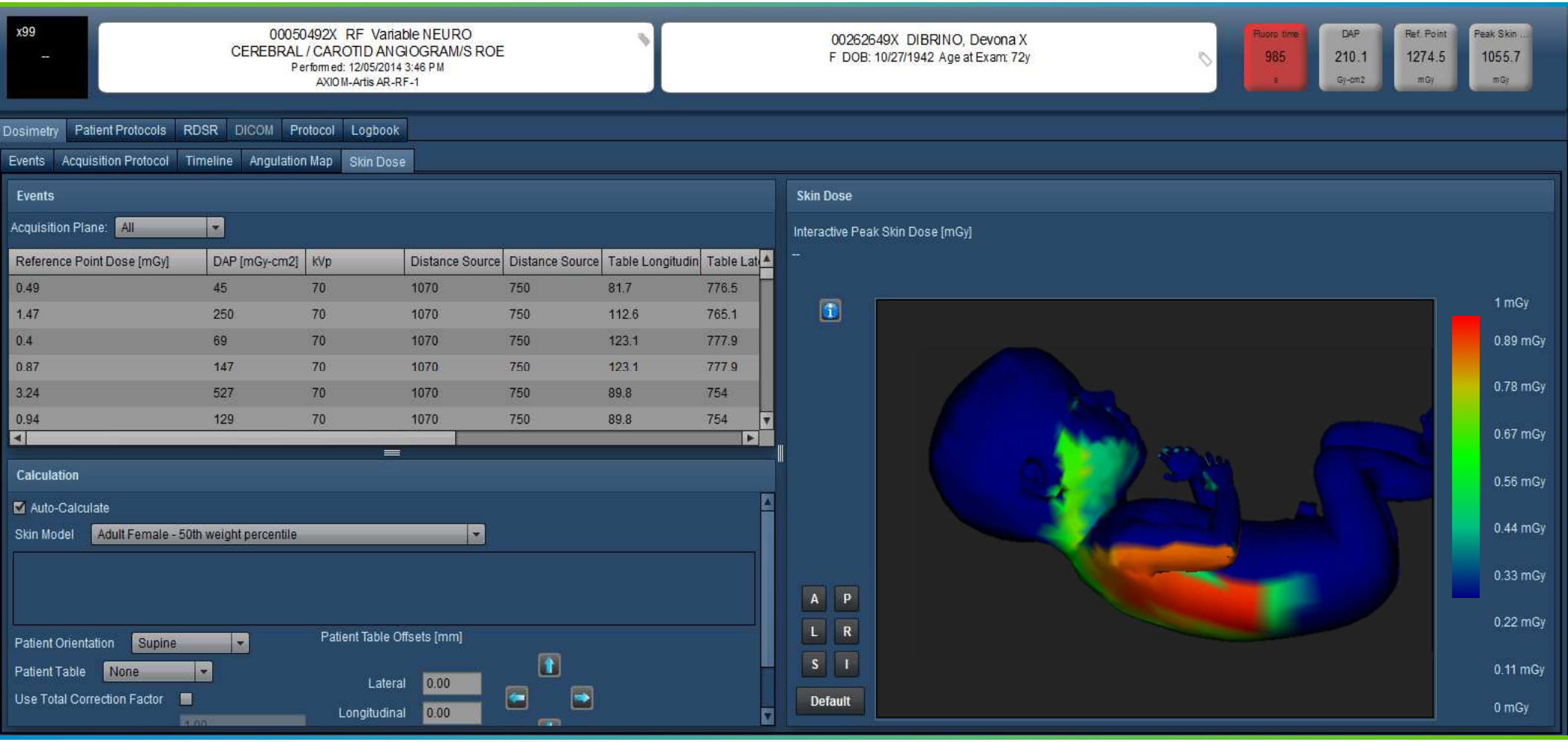
PSD
9.8
mGy

Peak Skin Dose

Angio: XA / IR / CV
Angulation Map

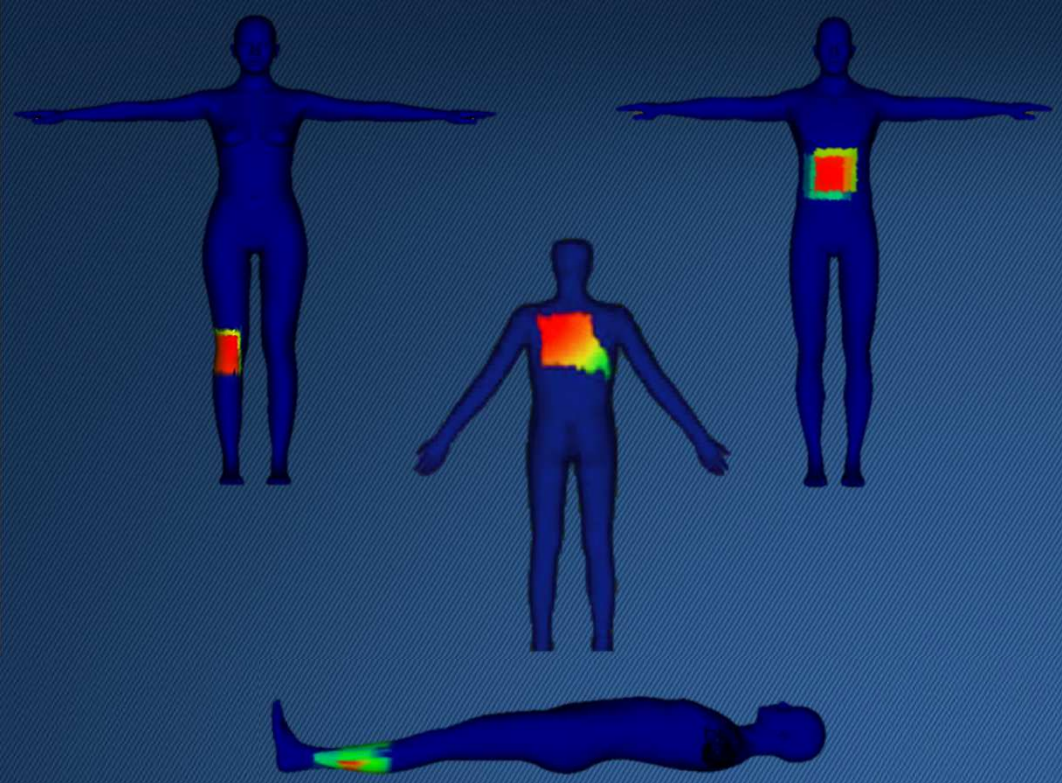


Angio: XA / IR / CV
Peak Skin Dose Map



Phantome
Grundlage für Berechnungen in der Angiographie

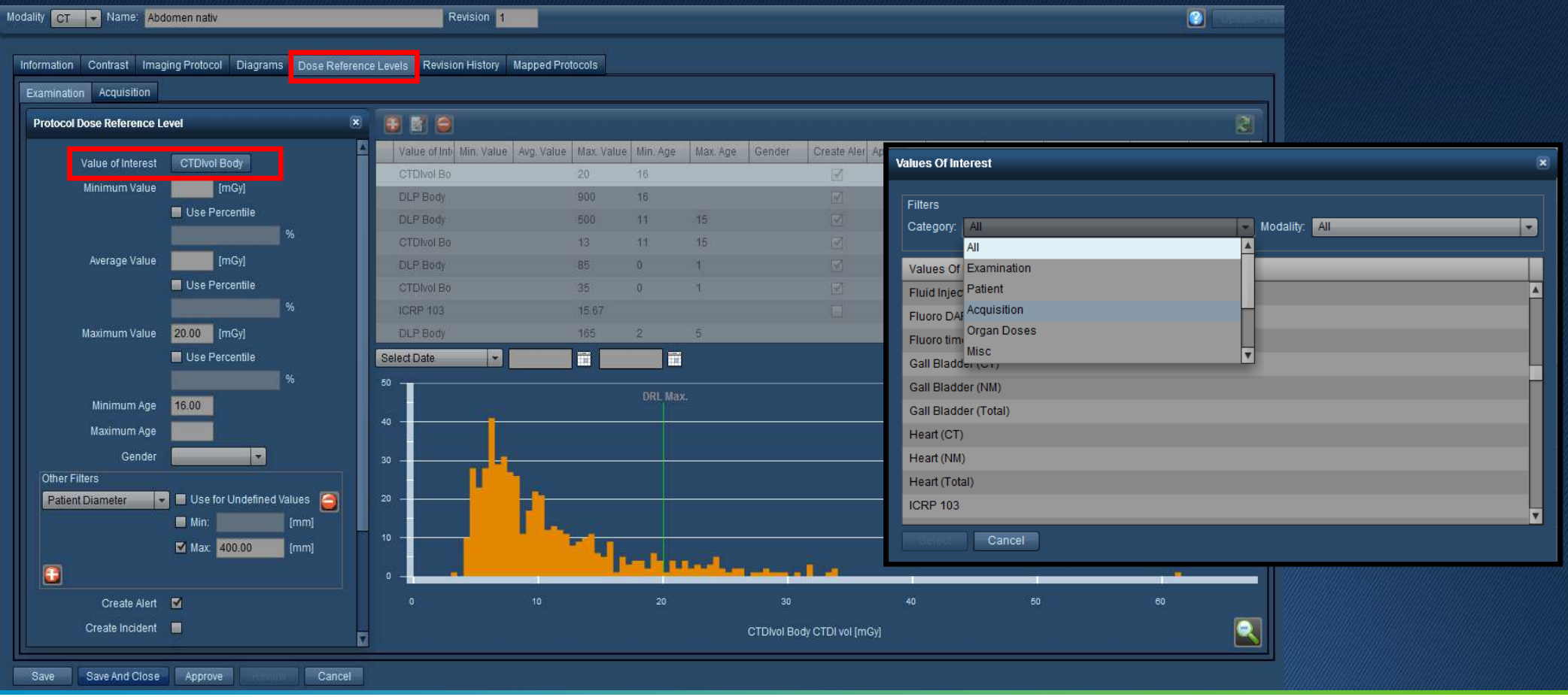
Peak Skin Dose Map - 15 Anthropomorphic Models



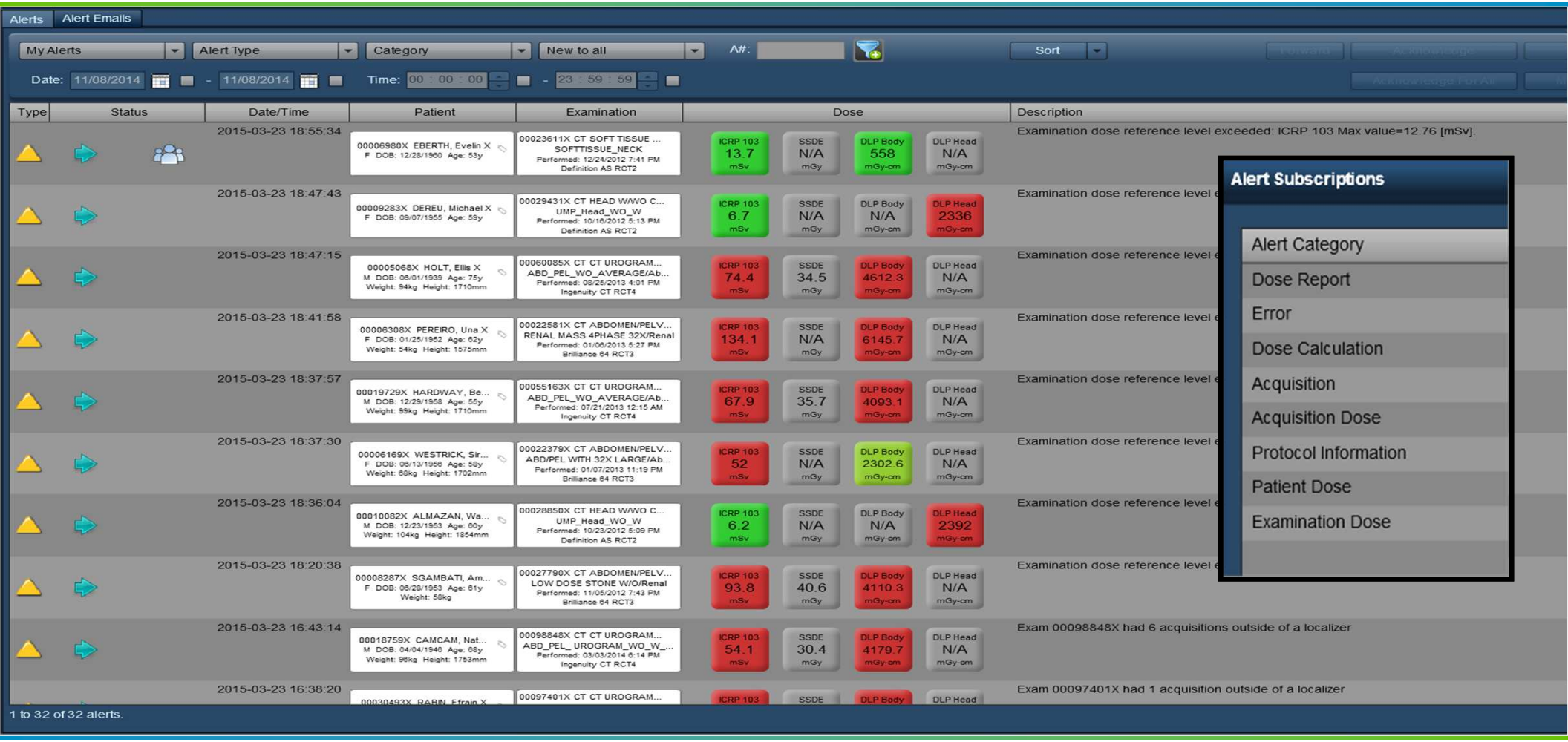
Sex	Default Height (cm)	Approx. Mass (kg)	Body Mass Index	Approx. Diameter* (cm)
M/F	35	2.5	-	8
M/F	63	7	-	10.5
M/F	94	14.5	-	14.5
M/F	114	25	-	17
M/F	144	42	-	19
M	176	58	18.7	23.2
M	176	67	21.6	25.2
M	176	73	23.6	27.4
M	176	86	27.8	32.6
M	176	104	33.6	34.6
F	163	47	17.7	21.2
F	163	56	21.1	23.2
F	163	64	24.1	25.2
F	163	79	29.7	30.2
F	163	96	36.1	32.4

Auswertemöglichkeiten
Definition von Grenzwerten

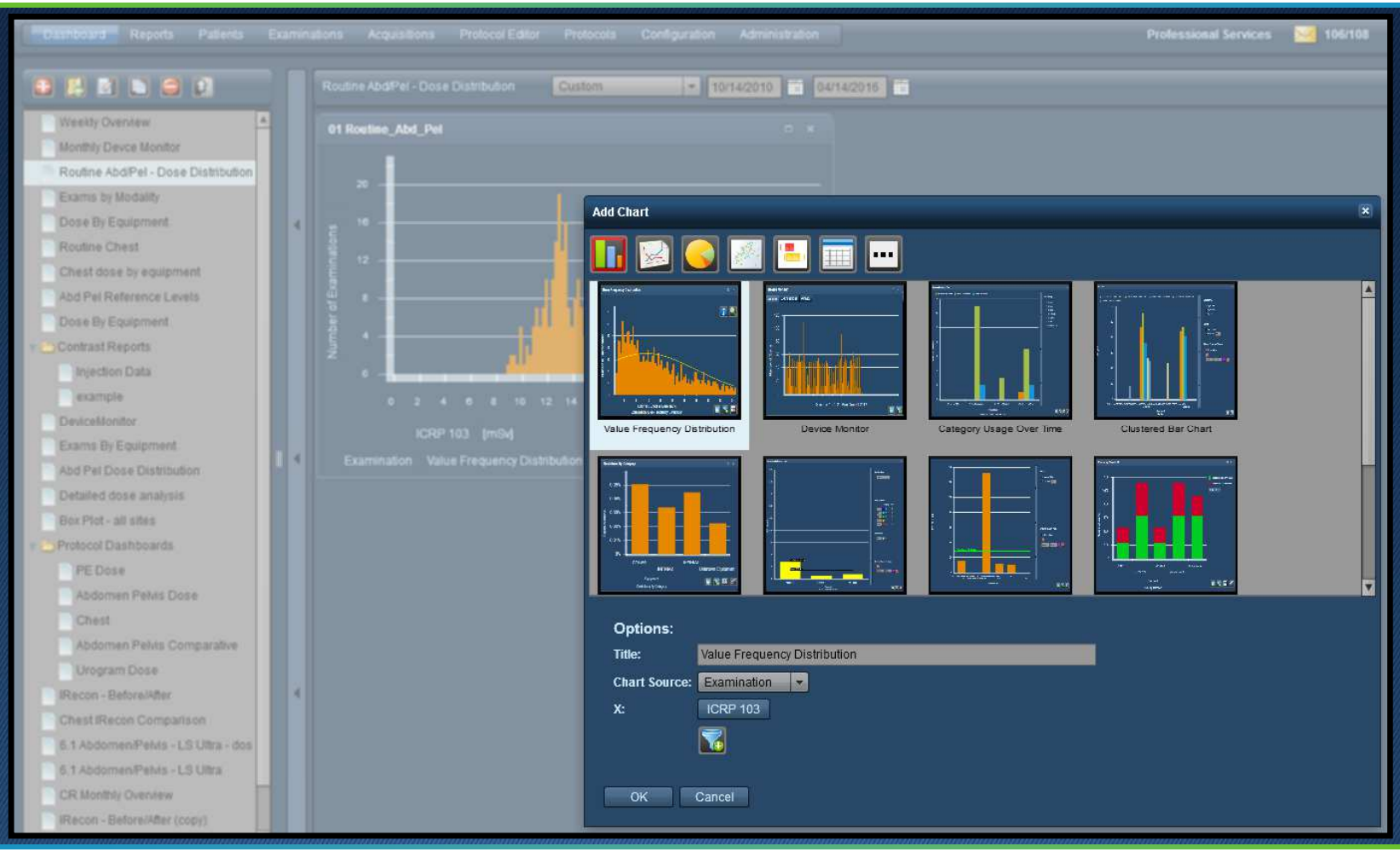
Setzen von individuellen Grenzwerten (DRL) auf beliebige Kenngrößen (VOI)



Auswertemöglichkeiten
Alarme

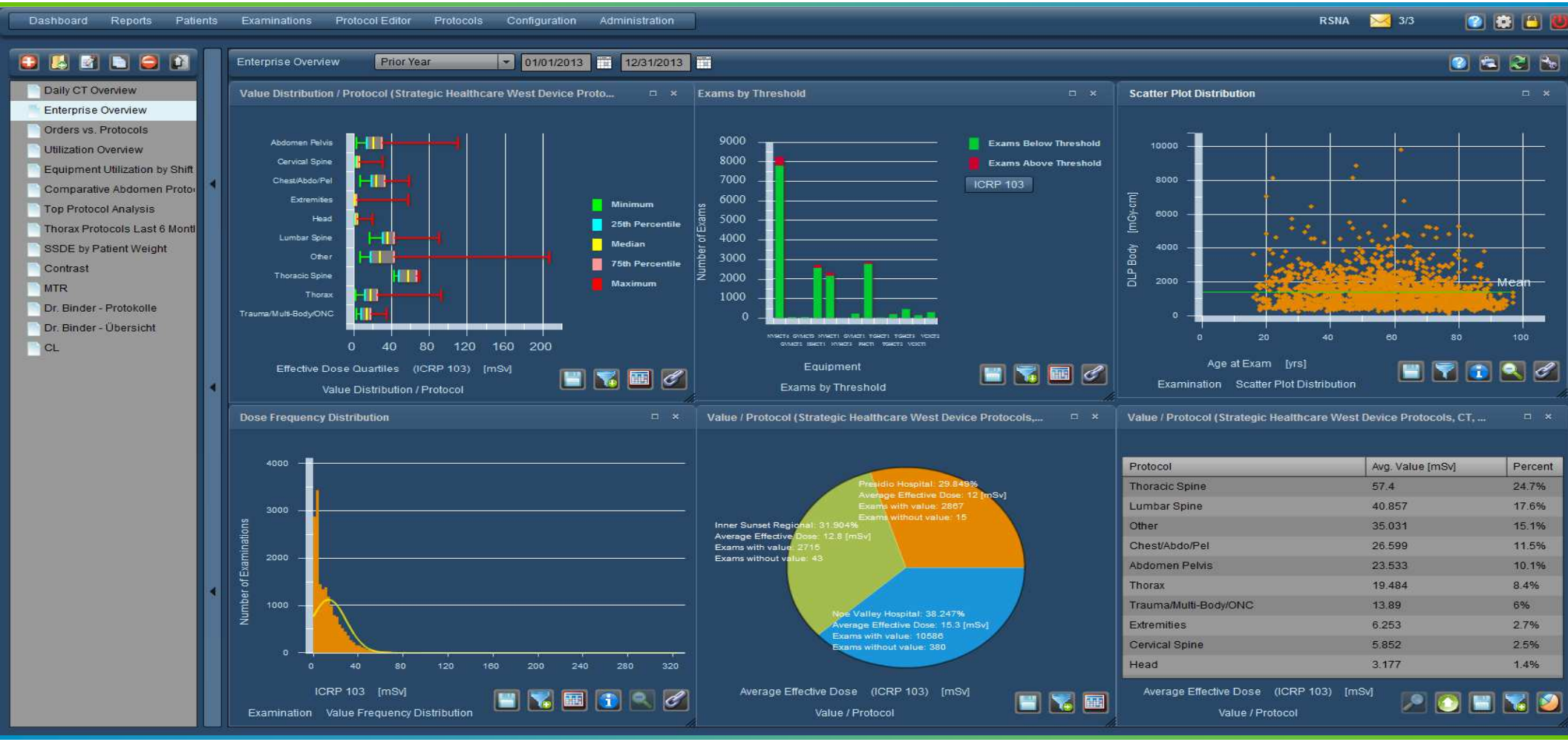


Auswertemöglichkeiten
Reports

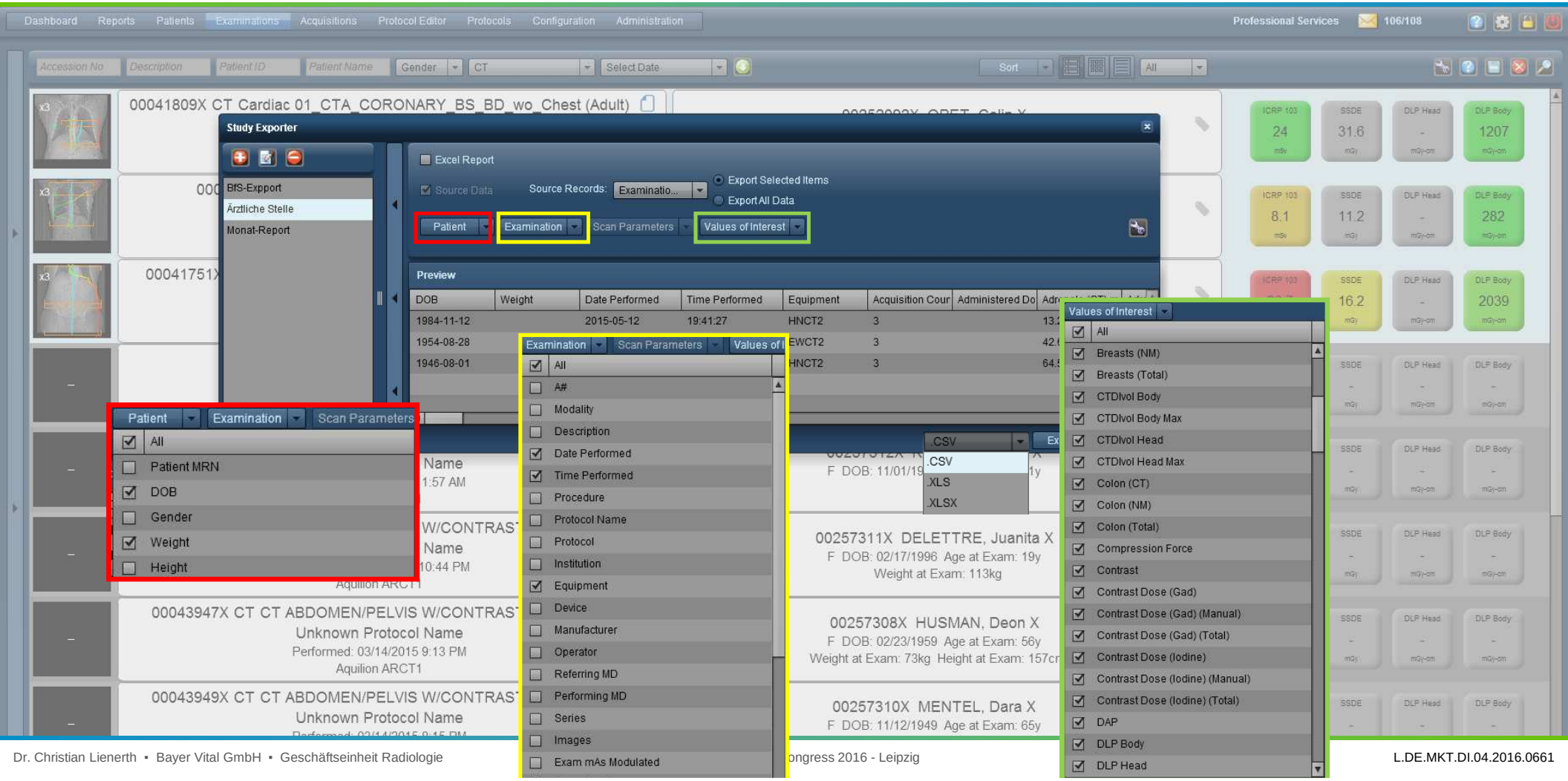


Auswertemöglichkeiten

Intelligentes und frei konfigurierbares Reporting



Auswertemöglichkeiten
Export



KM-Monitoring möglich
CT- / MR- / NM-Injektoren von Bayer

KM-Monitoring möglich

63 Parameter für „Contrast Analytics“

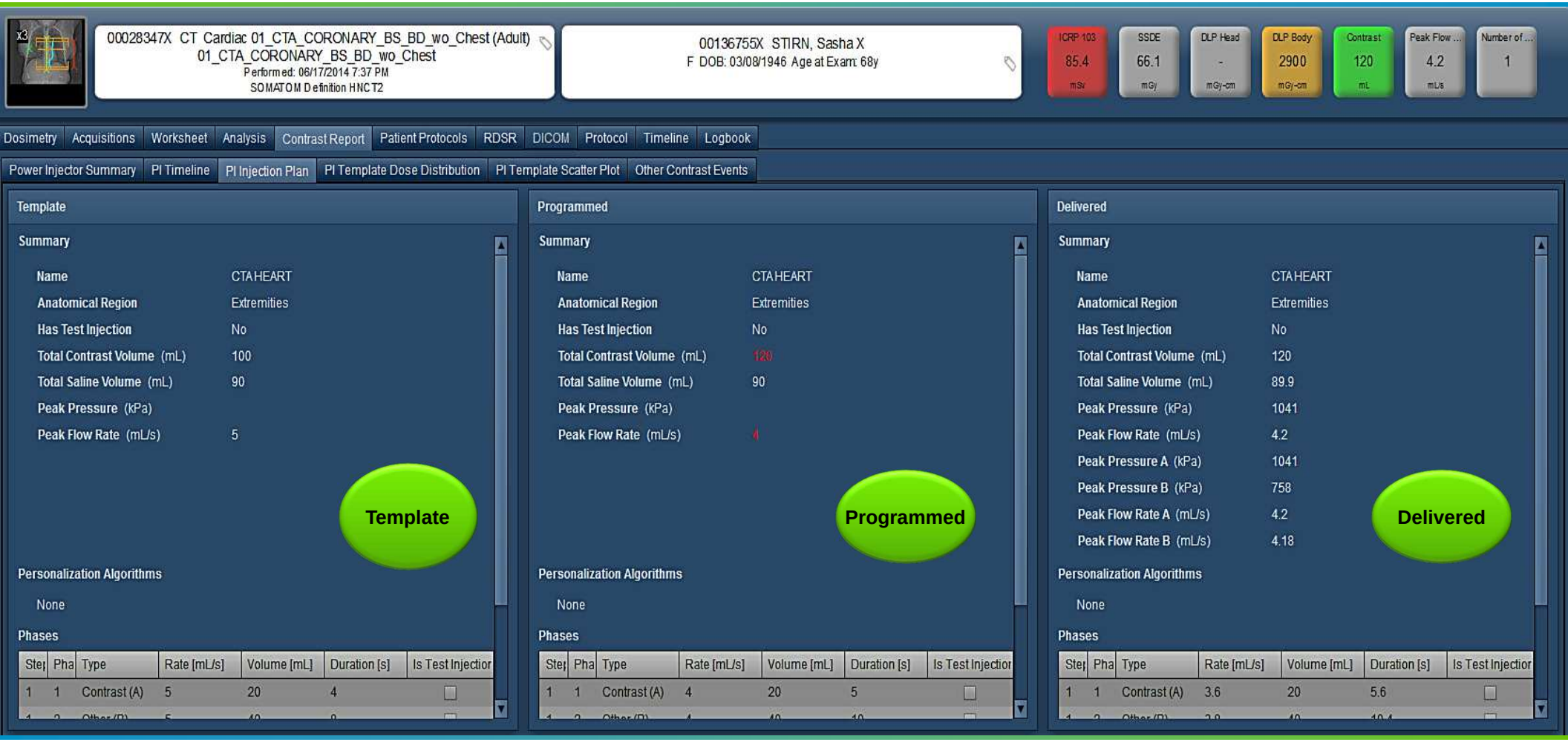
→ Vollautomatische Übergabe aller Kontrastmittelinformationen

Patient ID	MWL
First Name	
Middle Name	
Last Name	
Date of Birth	
Gender	
Height (cm)	
Weight (kg)	
Accession Number	
Study ID	
Study UID	
Study Date	
Study Description	
Match Status	
Archived Status	
Archived AEs	
Technologist ID	INJEKTOR
Injection Site	
Catheter Gauge	
Notes	
A Brand	

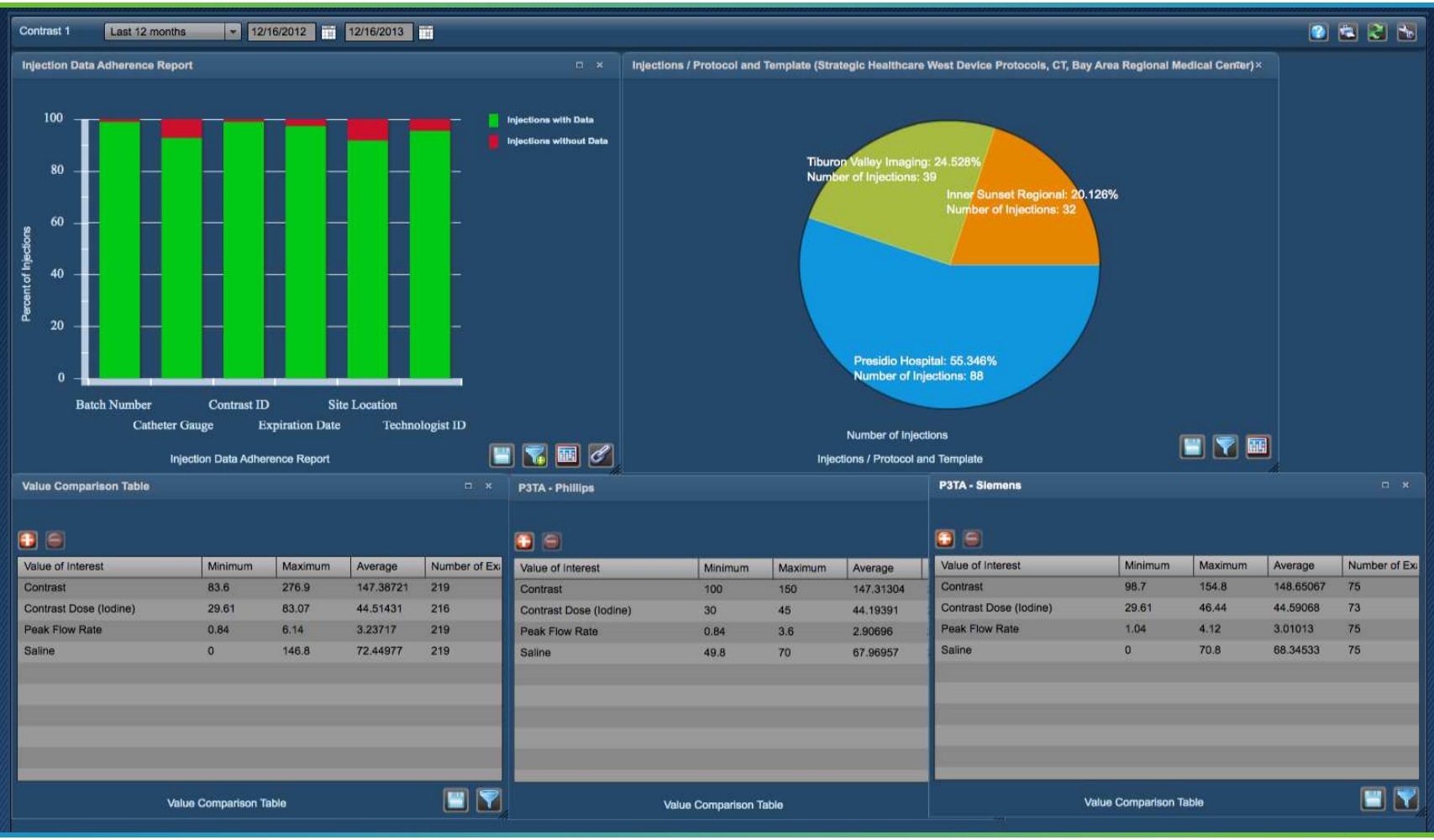
A Concentration
A Lot
A Vial Volume
A Expiration Date
B Brand
B Concentration
B Lot
B Vial Volume
B Expiration Date
Facility
Suite
Scanner Name
Injector Name
Injector Serial Number
Certegra Serial Number
A Loaded (ml)
A Delivered (ml)
A Wasted (ml)
A Peak Flow (ml/s)
A Peak Pressure (kpa)
A Kind

A Fluid Type
A New Syringe (Y/N)
A Syringe Type
A Syringe Dock Count (cumulative)
B Loaded (ml)
B Delivered (ml)
B Wasted (ml)
B Peak Flow (ml/s)
B Peak Pressure (kpa)
B Kind
B Fluid Type
B New Syringe (Y/N)
B Syringe Type
B Syringe Dock Count (cumulative)
Protocol Name
Protocol Type
Start
Stop
Termination
Transient Event Count
Transient Event Descriptions

KM-Monitoring möglich
CT- / MR- / NM-Injektoren von Bayer



KM-Monitoring möglich
CT- / MR- / NM-Injektoren von Bayer



Value of Interest	Minimum	Maximum	Average	Number of Ex
Contrast	83.6	276.9	147.38721	219
Contrast Dose (Iodine)	29.61	83.07	44.51431	216
Peak Flow Rate	0.84	6.14	3.23717	219
Saline	0	146.8	72.44977	219

P3TA - Phillips

Value of Interest	Minimum	Maximum	Average
Contrast	100	150	147.31304
Contrast Dose (Iodine)	30	45	44.19391
Peak Flow Rate	0.84	3.6	2.90696
Saline	49.8	70	67.96957

Value Comparison Table

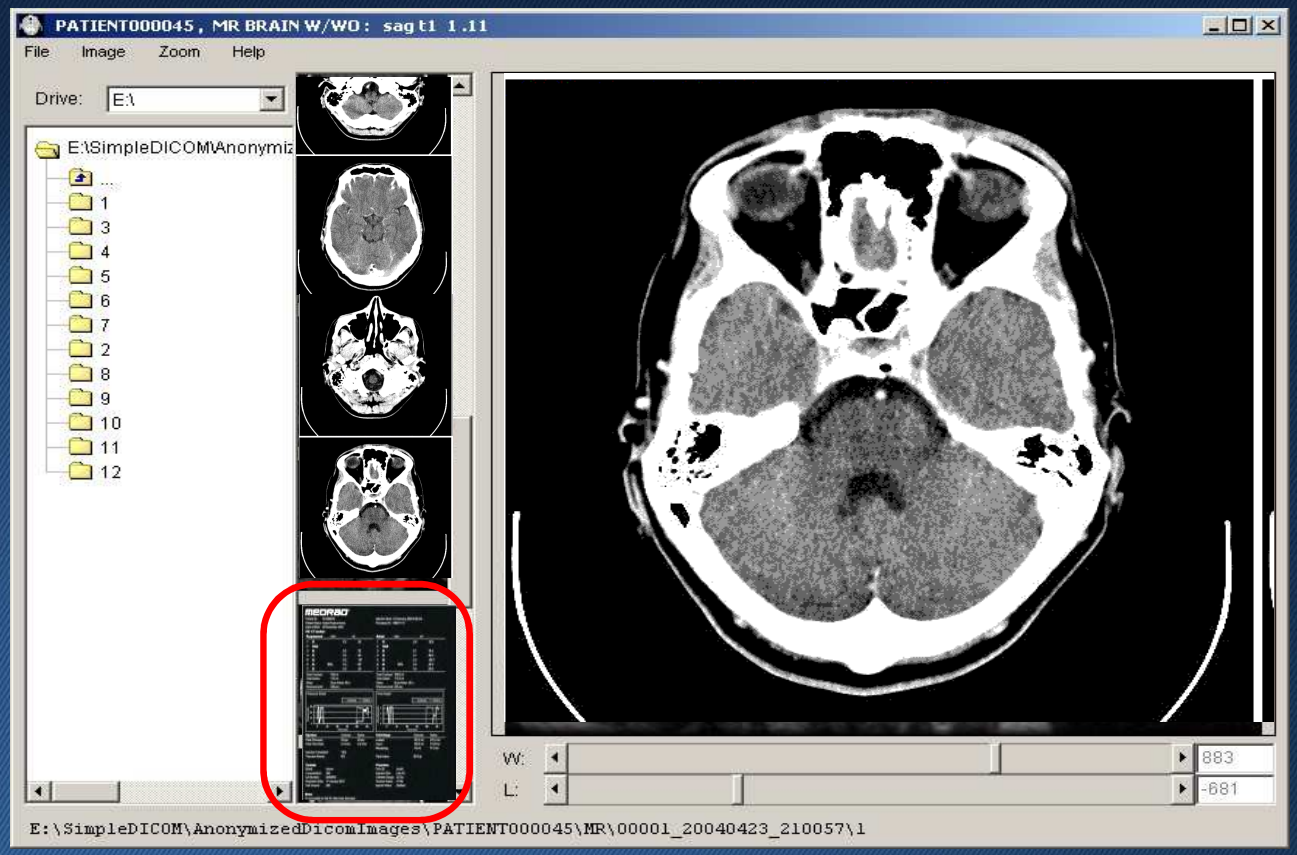
P3TA - Siemens

Value of Interest	Minimum	Maximum	Average	Number of Ex
Contrast	98.7	154.8	148.65067	75
Contrast Dose (Iodine)	29.61	46.44	44.59068	73
Peak Flow Rate	1.04	4.12	3.01013	75
Saline	0	70.8	68.34533	75

Value Comparison Table

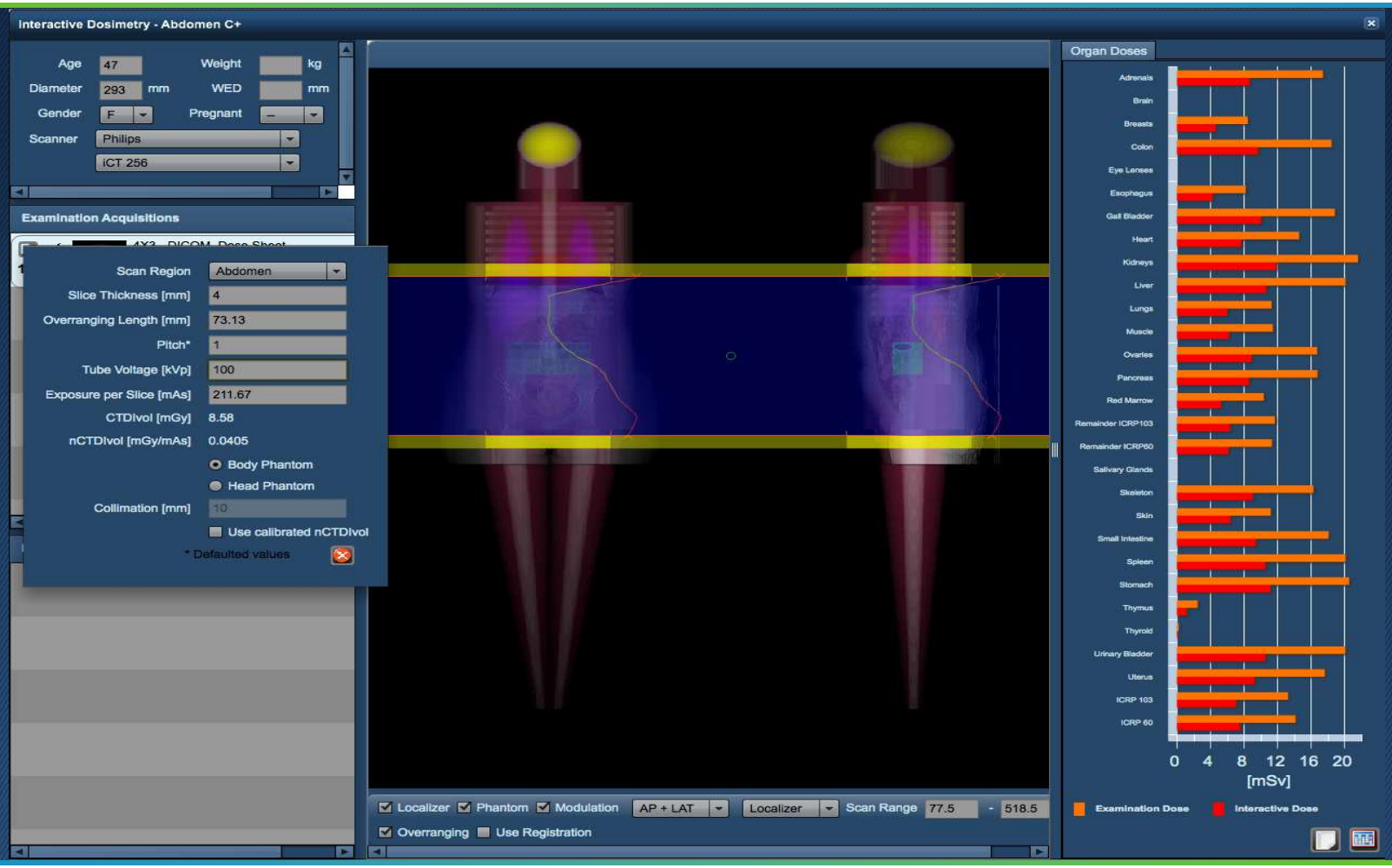
KM-Monitoring möglich

PACS Outbound Interface – Freie Konfiguration eines Secondary Captures



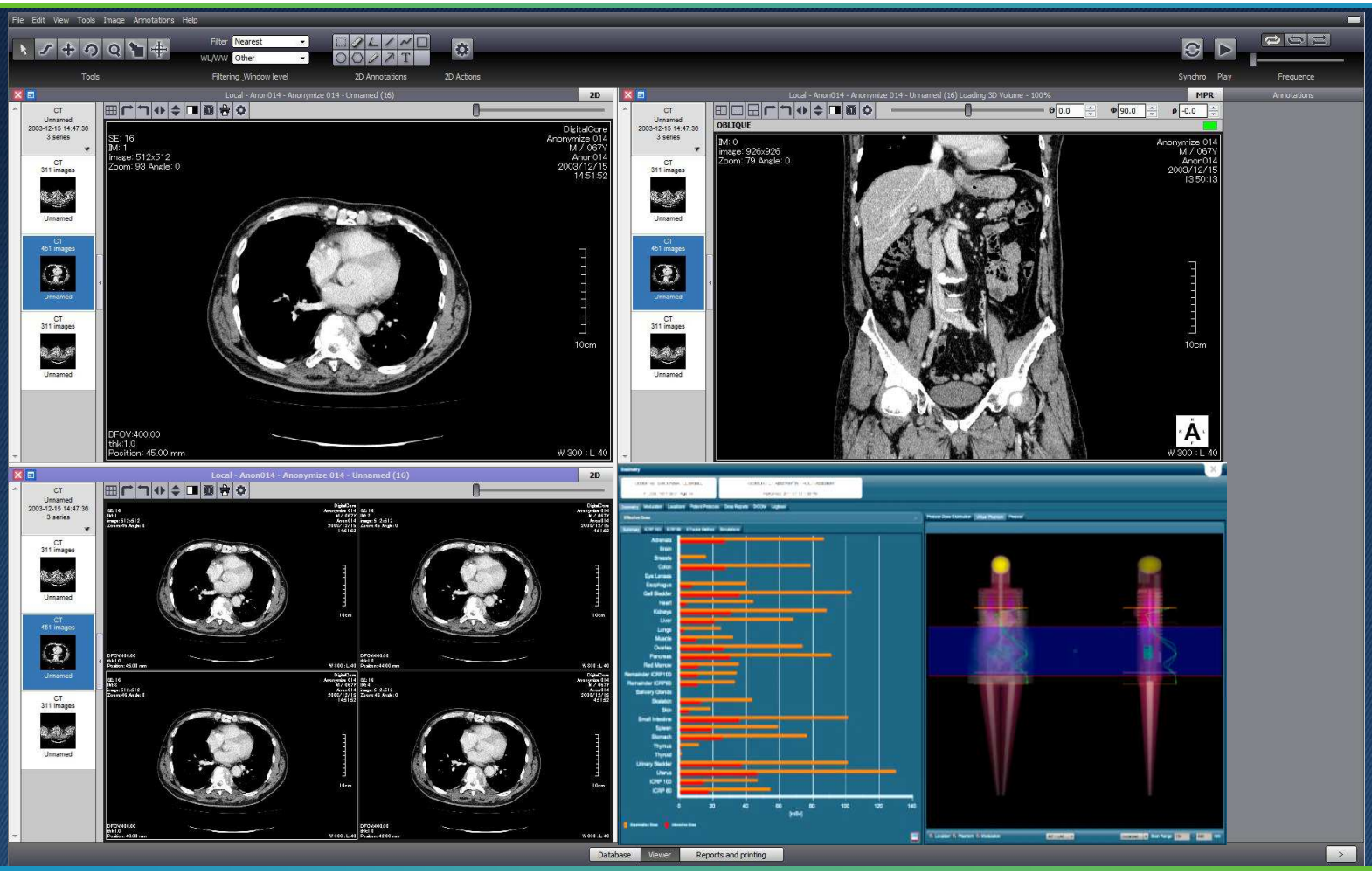
Besondere Funktionalitäten

Interaktiver Dosis-Simulator – „What if Analysis“

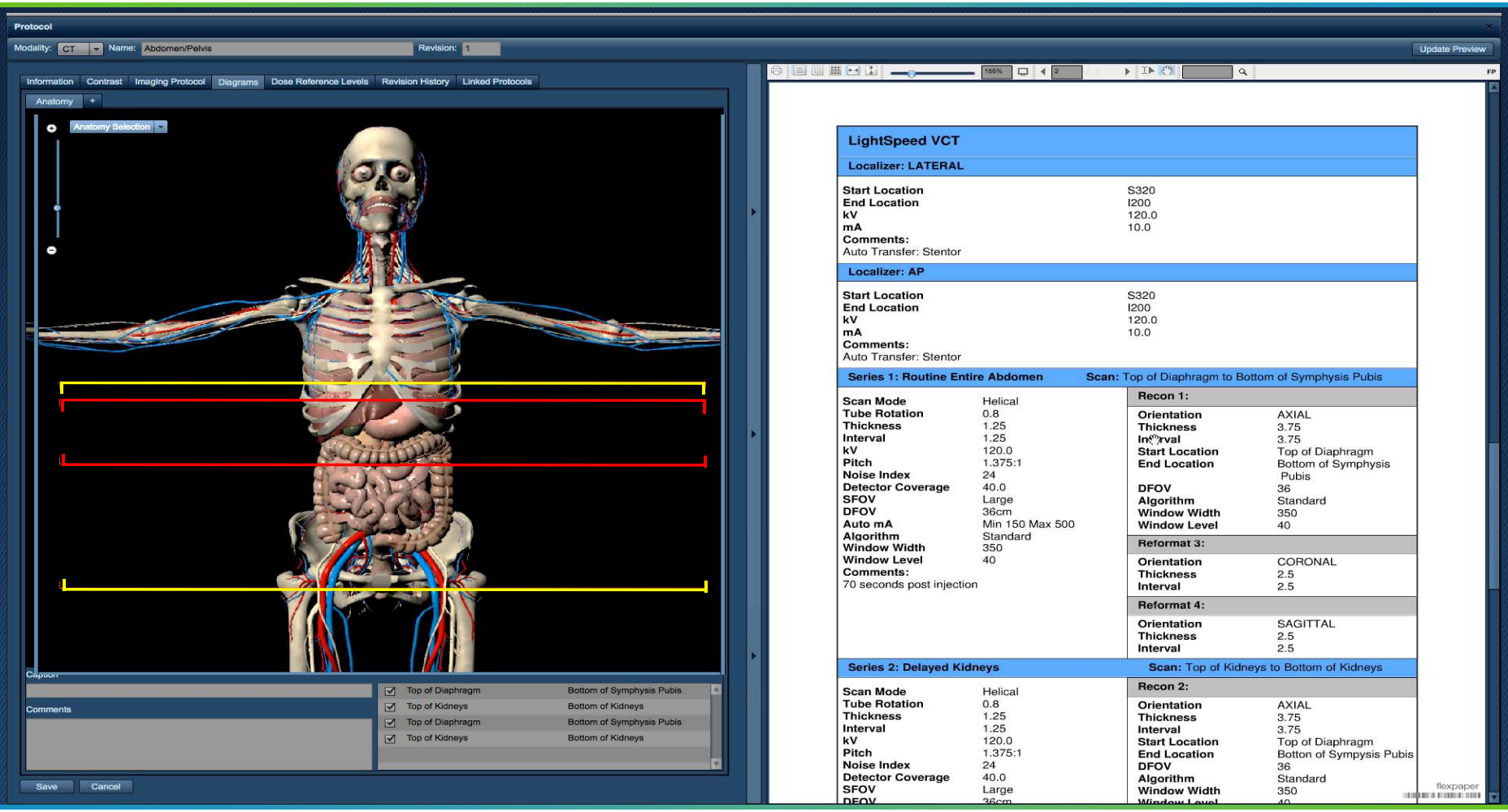


Besondere Funktionalitäten
URL Integration für PACS

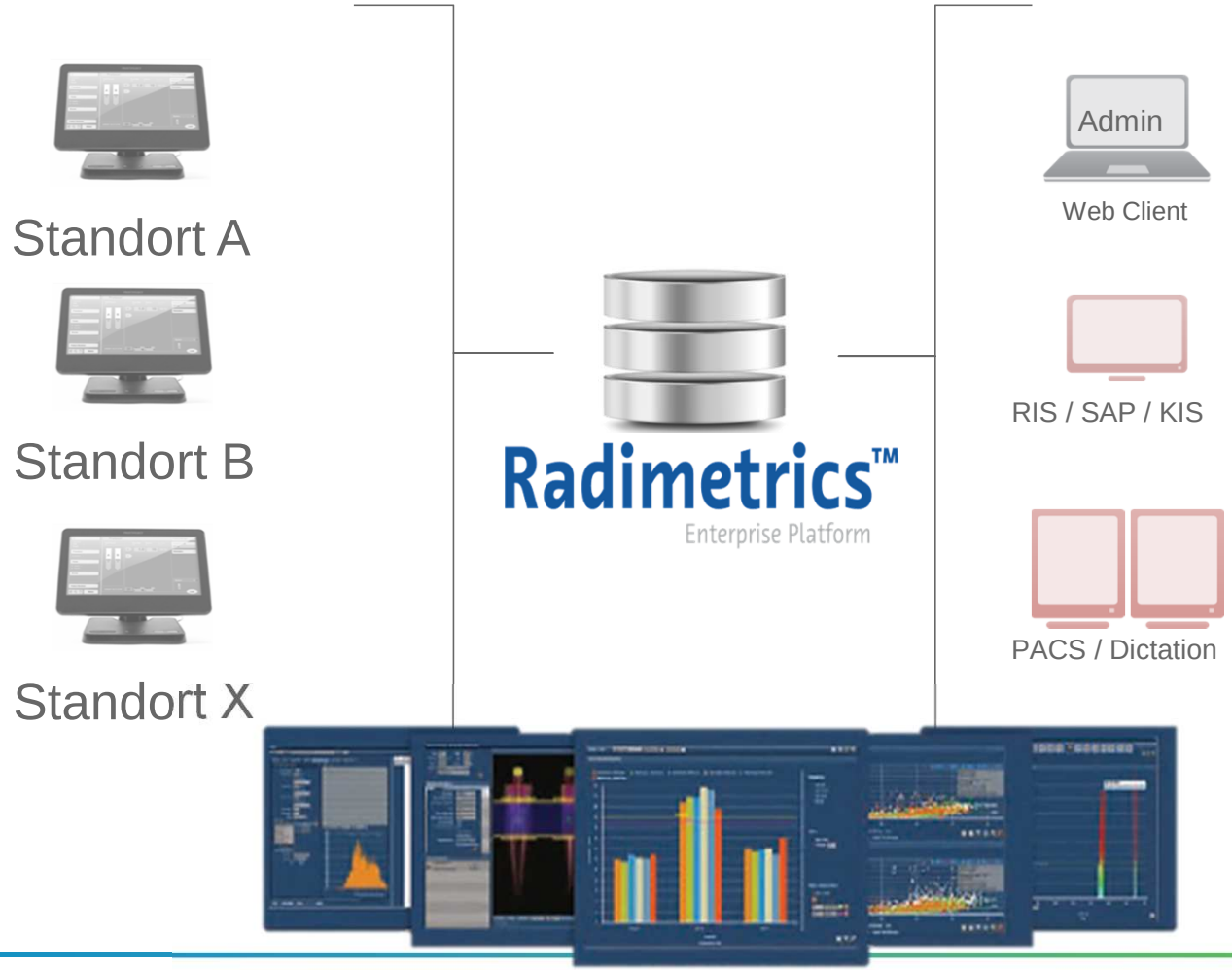
Besondere Funktionalitäten
PACS-Viewer Integration



Besondere Funktionalitäten
Protokollmanagement - QM



Besondere Funktionalitäten
Mandantenfähig



- Autom. Datenintegration
- Verbrauchs-abfragen und Steuerung
- Weniger Bearbeitung pro Abrechnung

Weitere Informationen

• Lizenzmodell	verschiedene Lizenzmodelle möglich (Volumen- bzw. Modalitätenbezogen, Finanzierung)
• Campuslizenz	Mandantenfähiges System, Zentralserver bzw. Anschluss von mehreren Häusern möglich.
• Updateablauf	via Remotezugang als Download File
• Update-Häufigkeit	in der Regel 2x jährlich
• Datensicherung	Verantwortlichkeiten Bayer IT / IT Kunde
• Datenschutz	Datenschutz über SSL Verschlüsselung
• Cloud Lösung	Nein, die Daten bleiben in der Institution
• Anwendertraining / -Schulung	Organisation durch Projektmanagement, Absprache der Inhalte zwischen der Applikation von Bayer und der Institution Nach erfolgter Installation und Konfiguration • Testphase der Schnittstellen • Anwenderschulung und Workflowintegration • Regelbetrieb mit einer Weiterbetreuung vor Ort oder via Remote • Weitere Module oder Applikationstage auf Anfrage

Radimetrics

Enterprise Platform

Science For A Better Life

Danke für ihre Aufmerksamkeit