AAPM Computed Tomography Radiation Dose Education Slides

Siemens Healthcare

Many of the terms used in these slides can be found in the CT Terminology Lexicon

http://www.aapm.org/pubs/CTProtocols/documents/CTTerminologyLexicon.pdf

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  - http://www.aapm.org/pubs/CTProtocols/documents/EducationSlides.pptx
- Modification of the content of these slides is not allowed.

Vendor Specific Slide Details

- The presence of a vendor name in the title of the slide indicates that the slide is vendor specific slide
- White text is used throughout to indicate vendor specific language
- An example of a vendor specific slide follows

Vendor: Generic Parameter/Topic Name

Vendor Specific Name

Vendor screen capture of how the acquisition parameter is set or how information on the topic is displayed

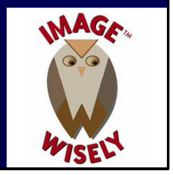
Text describing acquisition parameter or topic

Motivation

- These slides are provided to aid in understanding the factors that affect radiation dose in CT studies
- Image patients wisely and gently
  - A CT study should use as little radiation as possible, while still meeting the image quality needs of the exam
  - A CT study that is non-diagnostic because the radiation dose is too low may require rescanning the patient – increasing the total patient dose

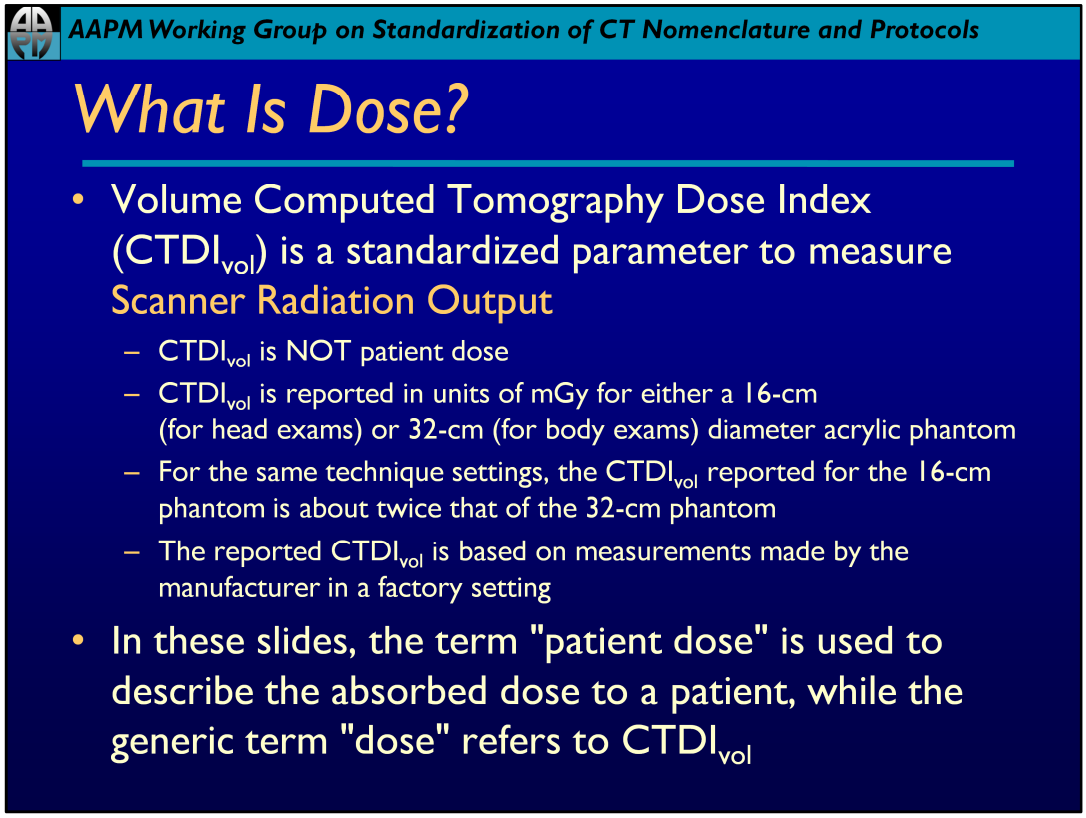
imagegently.org

imagewisely.org

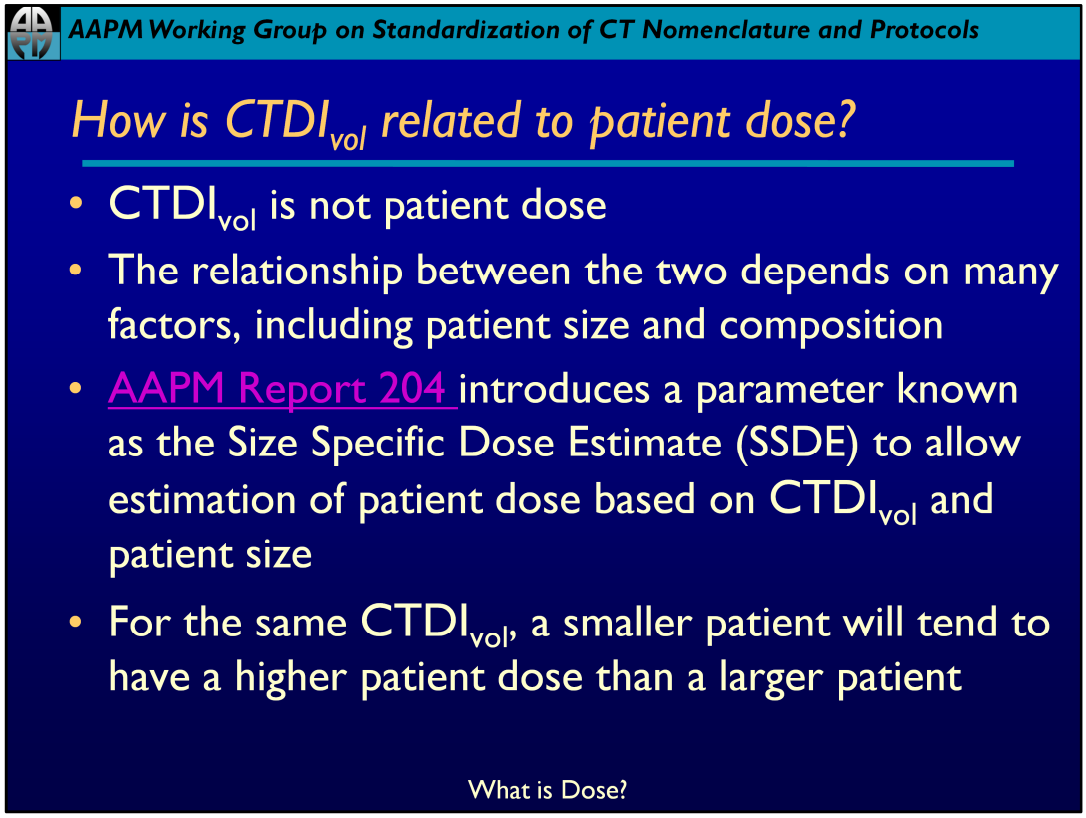


Outline

- What is Dose?
- Acquisition Parameter Settings
- Dose Modulation and Reduction
- Dose Display

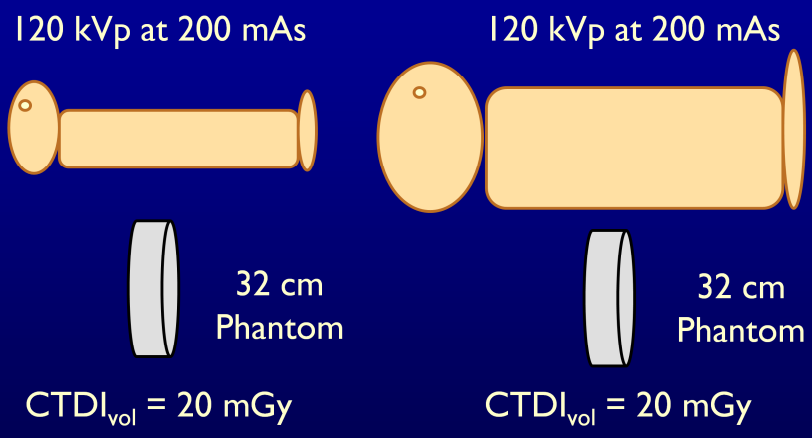


1. Bauhs, J. A., Vrieze, T. J., Primak, A. N., Bruesewitz, M. R., & McCollough, C. H. (2008). CT Dosimetry: Comparison of Measurement Techniques and Devices1. *Radiographics*, *28*(1), 245-253. doi:10.1148/rg.281075024
2. McCollough, C. H., Primak, A. N., Braun, N., Kofler, J., Yu, L., & Christner, J. (2009). Strategies for reducing radiation dose in CT. *Radiologic clinics of North America*, *47*(1), 27-40.
3. International Electrotechnical Commission. *Medical Electrical Equipment. Part 2–44: Particular requirements for the safety of x-ray equipment for computed tomography.* 2.1. International Electrotechnical Commission (IEC) Central Office; Geneva, Switzerland: 2002. IEC publication No. 60601–2–44.



http://www.aapm.org/pubs/reports/RPT_204.pdf

How is $CTDI_{vol}$ related to patient dose?



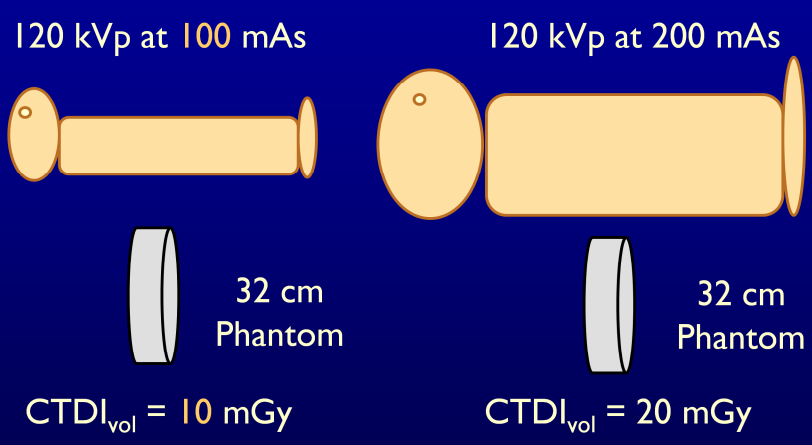
$CTDI_{vol}$ = 20 mGy

$CTDI_{vol}$ = 20 mGy

Both patients scanned with the same $CTDI_{vol}$

Patient dose will be higher for the smaller patient

How is $CTDI_{vol}$ related to patient dose?



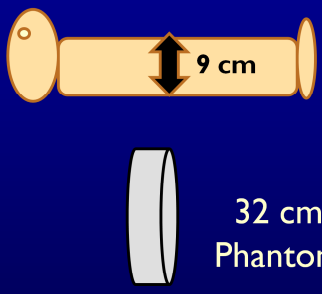
Smaller patient scanned with a lower $CTDI_{vol}$
Patient doses will be approximately equal

Size Specific Dose Estimate (SSDE)

- AAPM report 204 describes a method to calculate SSDE using $CTDI_{vol}$
- Conversion factors based on patient size (e.g., AP or lateral width, effective diameter) are provided to estimate patient dose for a patient of that size
- However, SSDE is still not the exact patient dose, as factors such as scan length and patient composition may differ from the assumptions used to calculate SSDE
- SSDE is not dose to any specific organ, but rather the mean dose in the center of the scanned volume

How is $CTDI_{vol}$ related to patient dose?

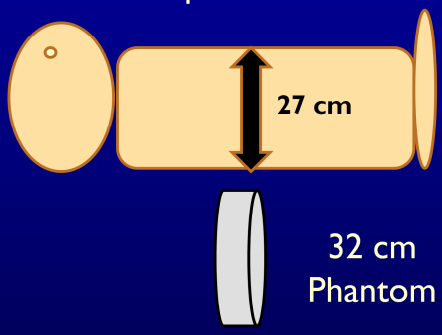
120 kVp at 100 mAs



32 cm Phantom

$CTDI_{vol}$ = 10 mGy
SSDE = 13.2 mGy

120 kVp at 200 mAs

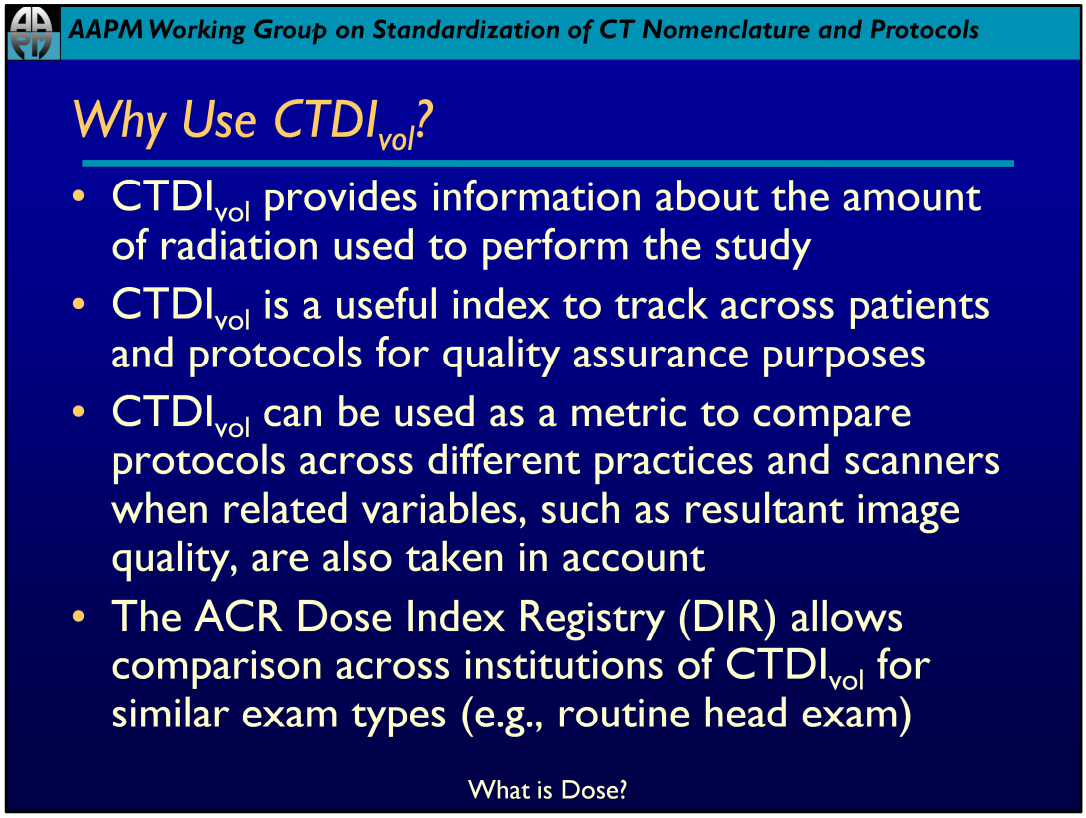


32 cm Phantom

$CTDI_{vol}$ = 20 mGy
SSDE = 13.2 mGy

Patients have equivalent SSDE

What is Dose?



1. McCollough, C. H., Leng, S., Yu, L., Cody, D. D., Boone, J. M., & McNitt-Gray, M. F. (2011). CT Dose Index and Patient Dose: They are Not the Same Thing, EDITORIAL, Radiology *259*(2), 311-316.

Dose Length Product

- The Dose Length Product (DLP) is also calculated by the scanner
- DLP is the product of the length of the irradiated scan volume and the average $CTDI_{vol}$ over that distance
- DLP has units of mGy*cm

Useful Concepts/Terms

- The relationships between acquisition parameters and $CTDI_{vol}$ described in the following slides assume all other parameters are held constant
- The relationship between a parameter and $CTDI_{vol}$ is often described as **proportional** in some way
  - The symbol $\propto$ is used to indicate "proportional to"
- Directly proportional means that a change in the parameter results in the same change in $CTDI_{vol}$
  - Example: Doubling the rotation time from 0.5 to 1.0 seconds will double the $CTDI_{vol}$
- Inversely proportional means that a change in a parameter has the opposite effect on $CTDI_{vol}$
  - Example: Doubling the pitch from 1 to 2 will reduce the $CTDI_{vol}$ by half

Acquisition Parameter Settings

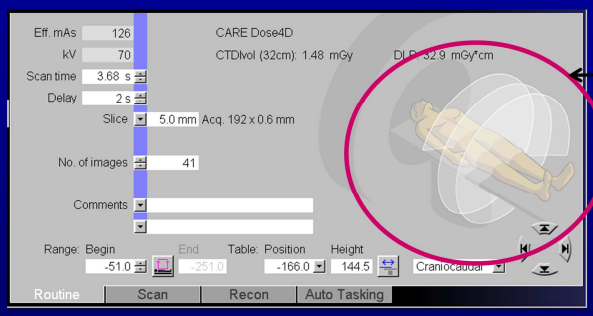
- Acquisition Parameters define the technique that will be used and how the scan will proceed
- Acquisition Parameters are set in the user interface where scans are prescribed
- Changing a single Acquisition Parameter while holding everything else constant will typically affect the $CTDI_{vol}$ for that scan
- The following slides describe what that affect is for each parameter

Scan Mode

- CT Scanners offer a variety of Scan Modes which describe how the table moves during an exam
- Scan Modes include
  - Axial or Sequential
  - Helical or Spiral
  - Dynamic

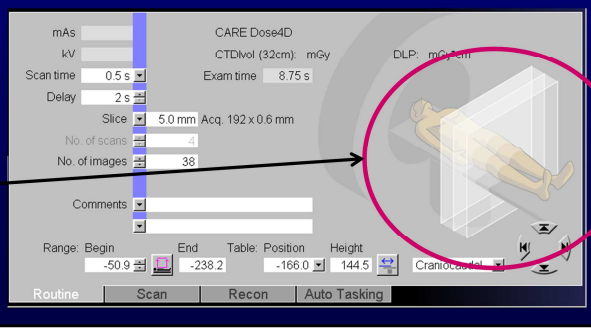
The Acquisition Parameters that affect CTDIvol may change amongst different Scan Modes

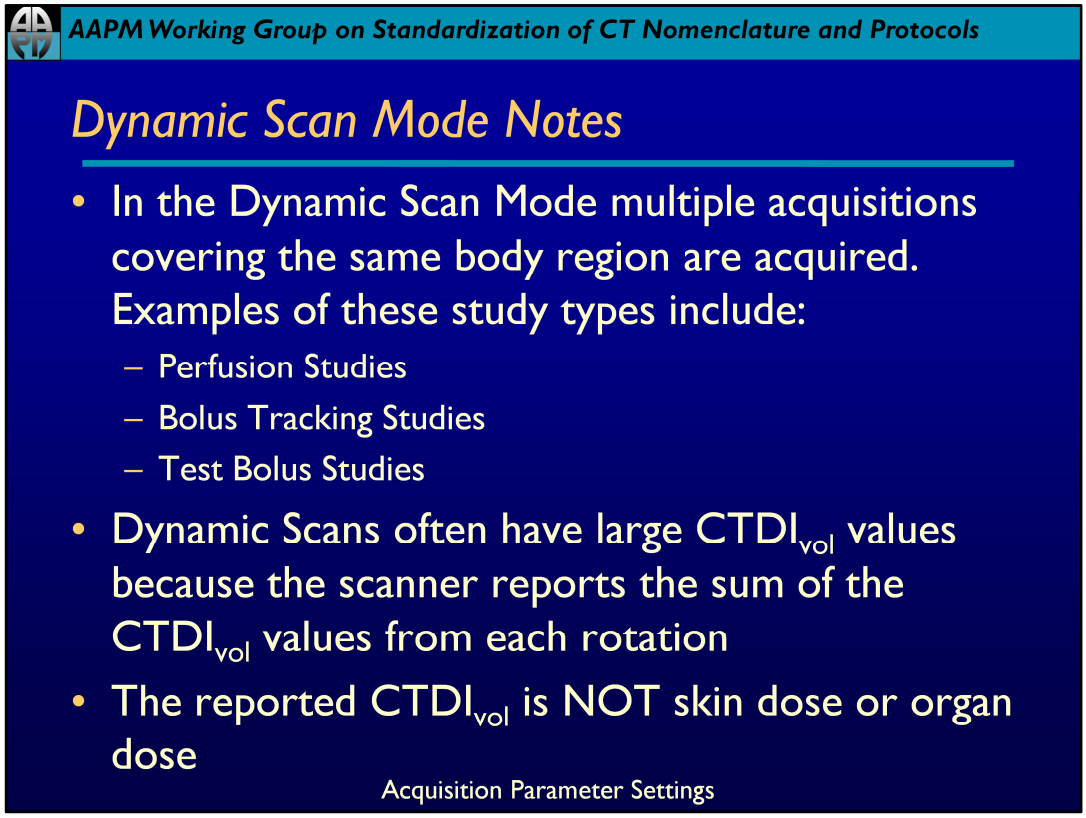
Siemens: Scan Mode – Spiral & Sequential



Spiral

Sequential

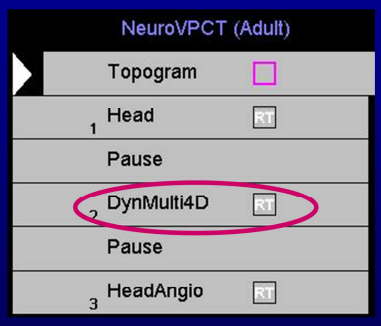




1. Bauhs, J. A., Vrieze, T. J., Primak, A. N., Bruesewitz, M. R., & Mccollough, C. H. (2008). CT Dosimetry : Comparison of Measurement Techniques and Devices. *Radiographics*, *28*(1), 245-254.
2. Zhang, D., Cagnon, C. H., Villablanca, J. P., McCollough, C. H., Cody, D. D., Stevens, D. M., Zankl, M., et al. (2012). Peak Skin and Eye Lens Radiation Dose From Brain Perfusion CT Based on Monte Carlo Simulation. *American Journal of Roentgenology*, *198*(2), 412-417.

Siemens: Dynamic Scan Mode

DynMulti4D, DynMulti, DynSerio



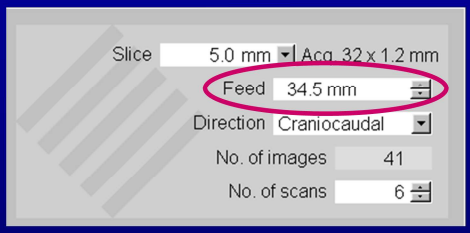
- Dynamic scan modes are clearly labeled in the scan list of the Examination card

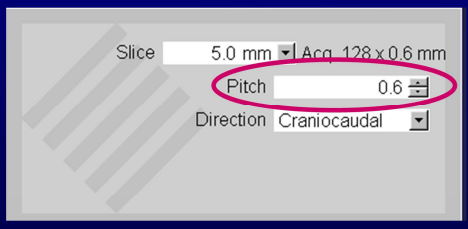
Table Feed/Increment

- Is the movement of the table through the bore of the scanner over a full 360 degree rotation
- Units: millimeters/rotation or millimeters/second
- The parameter is known both as Table Feed (helical/spiral acquisition) & Table Increment (axial acquisition)

Table Feed does not affect $CTDI_{vol}$ through its inclusion in Pitch (discussed later)

Siemens: Table Feed/Increment





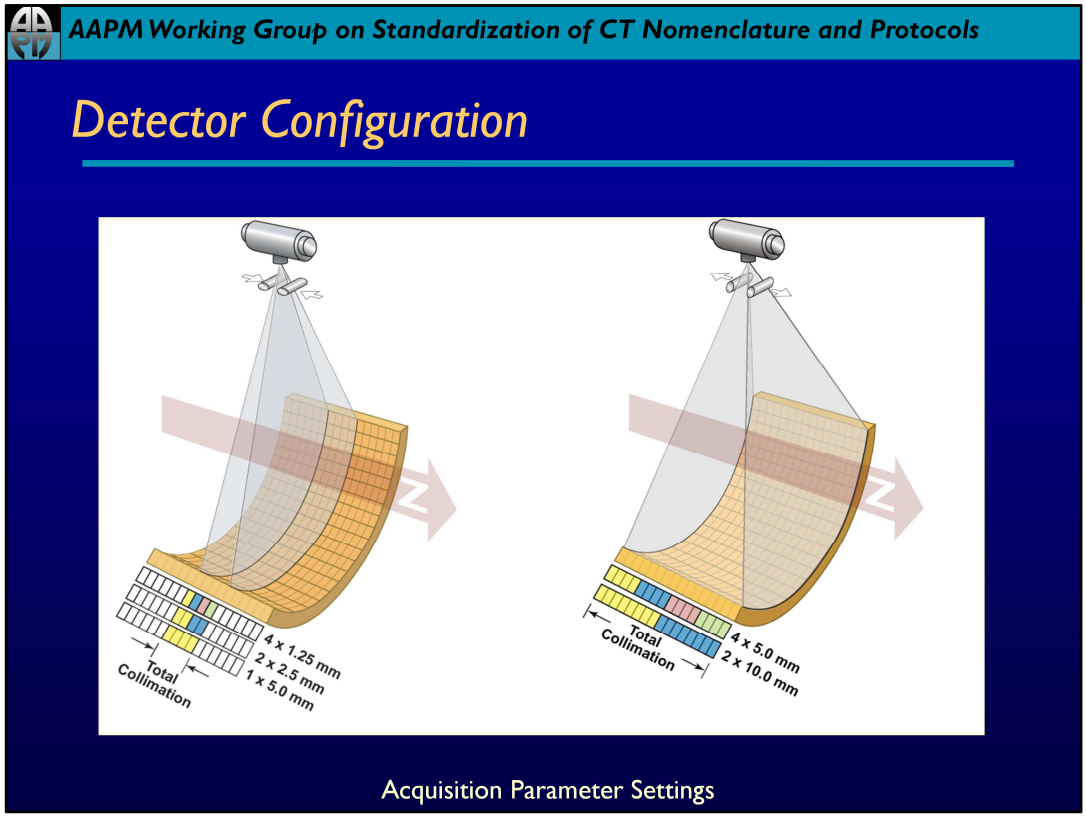
Scan subtask card of the Examination task card.

- In sequence modes, table increment is expressed in mm per rotation
- In spiral modes, pitch is displayed. Table feed can then be accordingly calculated (see slide on pitch).

Detector Configuration

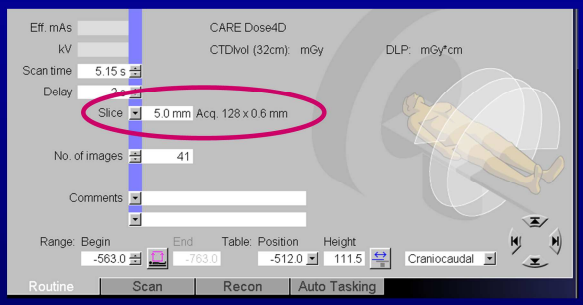
- Is the combination of the number of data channels and the width of the detector associated with each data channel
- The Detector Configuration determines the Beam Width or Beam Collimation (nT), which is the number of channels (n) times the detector width associated with each data channel (T)
- For a selected detector width per data channel, a smaller total Beam Collimation usually has a higher $CTDI_{vol}$ than a larger Beam Collimation
  - Example: On a 16 slice scanner with a detector width per channel of 1.25 mm, a collimation of 4x1.25mm is generally less dose efficient than a collimation of 16x1.25mm

Users should monitor $CTDI_{vol}$ values when changing detector configuration



# of slices vary with the use of FFS (i.e. 64 slices + FFS = 128 slices)

Siemens: Detector Configuration



Acquisition settings are displayed on the Routine subtask card, next to the (reconstructed) Slice thickness.

Acquisition Parameter Settings

Pitch

- Is the Table Feed per gantry rotation divided by the beam width/collimation
- Pitch is the ratio of two distances and therefore has no units
- Users should monitor other parameters when changing Pitch. The scanner may or may not automatically compensate for changes in Pitch (for example, by changing the tube current) to maintain the planned $CTDI_{vol}$.

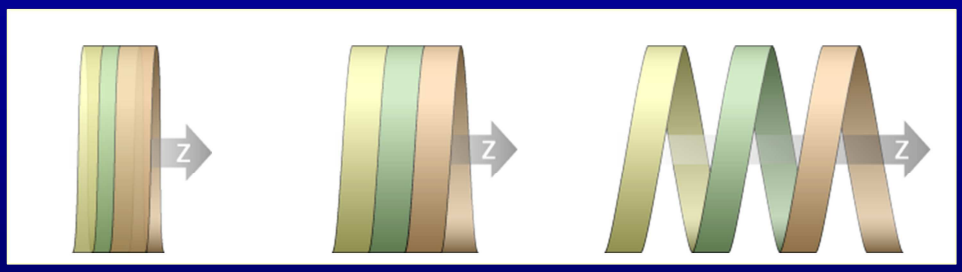
$CTDI_{vol} \propto 1/Pitch$:
GE, Hitachi, Toshiba (no AEC)

$CTDI_{vol}$ independent of Pitch:
Siemens, Philips, Neusoft, Toshiba (AEC)

Pitch

- $CTDI_{vol}$ may not change in the expected manner if the scanner automatically adjust other parameters when the pitch is changed
- The relationships between CTDIvol and pitch for the different vendors are described below
  - $CTDI_{vol}$ inversely proportional to change in pitch: GE, Hitachi
  - $CTDI_{vol}$ constant when pitch is changed due to changes to other parameters: Neusoft, Philips and Siemens
  - The relationship between $CTDI_{vol}$ and pitch depends on scan mode or software version: Toshiba

Pitch



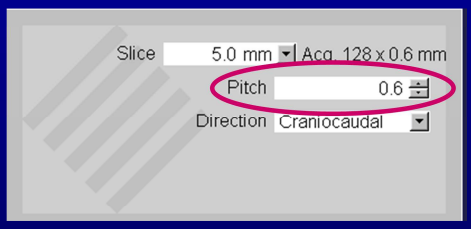
Pitch < 1
Beam Width has some overlap at each view angle from rotation to rotation

Pitch = 1
No overlap of Beam Width at each view angle and no view angles not covered at certain table positions

Pitch > 1
Some view angles are not covered by the beam width at certain table positions

Siemens: Pitch

Pitch



Scan subtask card of the Examination task card.

- Pitch can be changed in increments of 0.05 to set total scan time
- System parameters are automatically adapted such as to keep dose and image quality constant

Exposure Time per Rotation

- Is the length of time, in seconds, that the X-ray beam is "on" during a gantry rotation
  - It takes into account the gantry rotation time and angular acquisition range
- Units: seconds
- Users should monitor other parameters when changing Exposure Time per Rotation. The scanner may or may not automatically compensate for changes in Exposure Time per Rotation(for example, by changing the tube current)

$CTDI_{vol} \propto$ Exposure Time per Rotation

GE, Hitachi, Neurologica, Toshiba (no AEC)

$CTDI_{vol}$ independent of Exposure Time per Rotation:

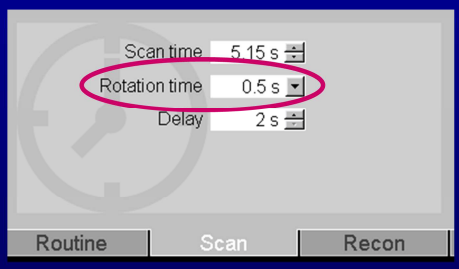
Siemens, Philips, Neusoft, Toshiba (AEC)

Exposure Time per Rotation

- $CTDI_{vol}$ may not change in the expected manner if the scanner automatically adjust other parameters when the exposure time per rotation is changed
- The relationships between CTDIvol and exposure time per rotation for the different vendors are described below
  - $CTDI_{vol}$ proportional to change in parameter: GE, Hitachi
  - $CTDI_{vol}$ constant when the parameter is changed due to changes to other parameters: Neusoft, Philips and Siemens
  - The relationship between $CTDI_{vol}$ and the parameter depends on scan mode or Software version: Toshiba

Siemens: Exposure Time per Rotation

Rotation time



Scan subtask card of the Examination task card.

- In the drop down menu, available rotation times for the selected protocol are displayed
- Rotation time will determine total scan time but does not affect dose

Tube Potential

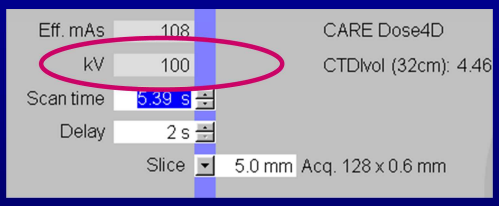
- Is the electrical potential applied across the x-ray tube to accelerate electrons toward the target material
- Units: kiloVolts (kV or kVp)
- $CTDI_{vol}$ is **approximately** proportional to the square of the percentage change in Tube Potential

$$CTDI_{vol} \propto \left(\frac{kV_{new}}{kV_{old}} \right)^{n}$$

n ≈ 2 to 3

Siemens: Tube Potential

kV



Routine subtask card of the Examination task card.

- Tube potential is displayed in kV and can be selected from a dropdown list between 70 and 150 kV, depending on scanner model

Acquisition Parameter Settings

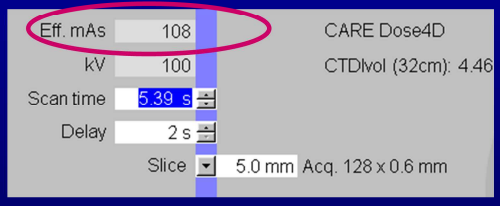
Effective Tube Current Time Product

- Is the product of the Tube Current and the Exposure Time per Rotation divided by the Pitch
- Units: milliAmpere-Seconds (mAs)
- $CTDI_{vol}$ is directly proportional to Effective Tube Current Time Product

$CTDI_{vol} \propto$
Effective Tube Current Time Product

Siemens: Effective Tube Current Time Product

Eff. mAs



- Effective mAs is displayed in mAs

Routine subtask card of the Examination task card.

Acquisition Parameter Settings

Acquisition Parameter Settings Summary

Parameter	Relationship to $CTDI_{vol}$
Scan Mode	Changes in the Scan Mode may affect $CTDI_{vol}$
Table Feed/Increment	Table Feed affects $CTDI_{vol}$ through its inclusion in Pitch
Detector Configuration	Decreasing the Beam Collimation typically, but not always, increases the $CTDI_{vol}$
Pitch	$CTDI_{vol}$ relationship to pitch is vendor dependent
Exposure Time Per Rotation	$CTDI_{vol}$ relationship to exposure time per rotation is vendor dependent
Tube Current	$CTDI_{vol} \propto$ Tube Current
Tube Potential	$CTDI_{vol} \propto (kVp_1/kVp_2)^n$ n ~ 2 to 3
Tube Current Time Product	$CTDI_{vol} \propto$ Tube Current Time Product
Effective Tube Current Time Product	$CTDI_{vol} \propto$ Effective Tube Current Time Product
Field of Measurement	Changes in the Field of Measurement may affect $CTDI_{vol}$
Beam Shaping Filter	Changes in the Beam Shaping Filter may affect $CTDI_{vol}$

Dose Modulation and Reduction

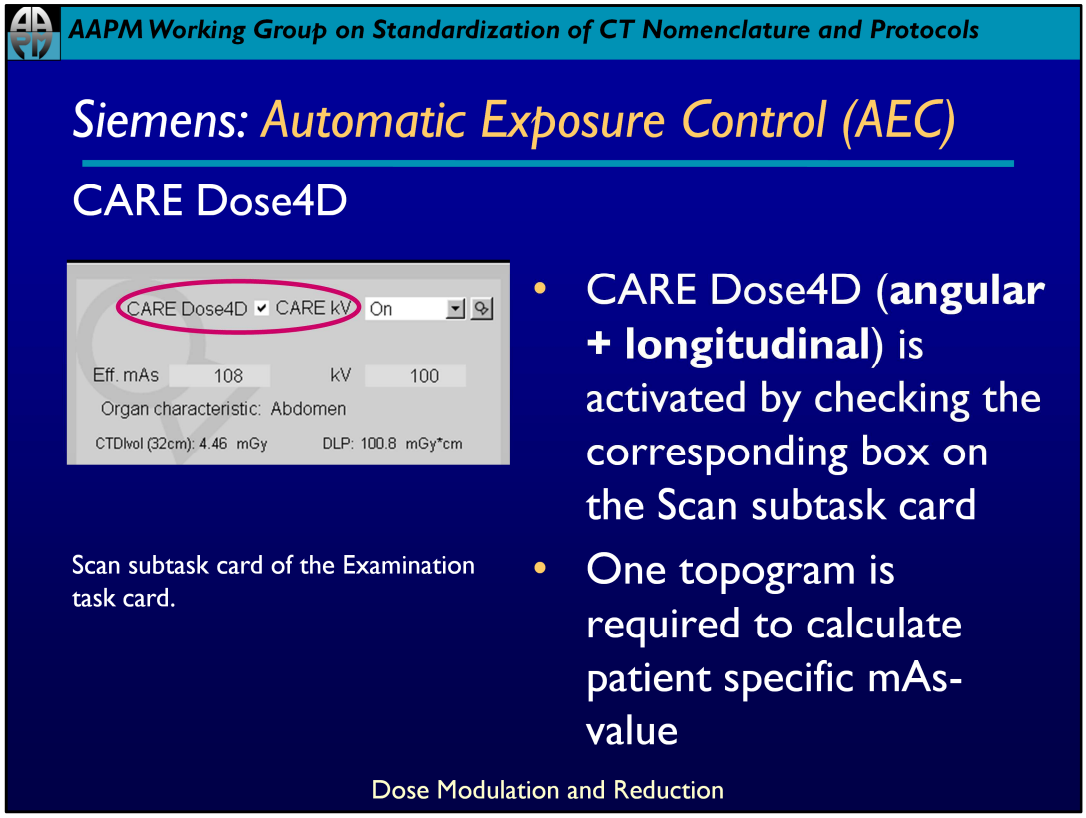
- Many CT scanners automatically adjust the technique parameters (and as a result the $CTDI_{vol}$) to achieve a desired level of image quality and/or to reduce dose
- Dose Modulation and Reduction techniques vary by scanner manufacturer, model and software version

Automatic Exposure Control (AEC)

- Automatically adapts the Tube Current or Tube Potential according to patient attenuation to achieve a specified image quality
  - Automatic adjustment of Tube Current may not occur when Tube Potential is changed
  - **Centering the patient in the gantry is VITAL for most AEC systems**
- AEC aims to deliver a specified image quality across a range of patient sizes. It tends to increase $CTDI_{vol}$ for large patients and decrease it for small patients relative to a reference patient size

The use of Automatic Exposure Control may decrease or increase $CTDI_{vol}$ depending on the patient size and body area imaged and image quality requested

Dose Modulation and Reduction



The exact type of dose modulation used is preset by the selected protocol.
The user cannot change the type of modulation.
The most commonly used mode is XYZ modulation, meaning tube current is modulated in **angular** as well as **longitudinal** directions.

If the protocol calls for two topos, the lateral should be acquired before the PA.
If 2 topos are acquired (same plane), CareDose4D will use the 2nd Topo.

Image Quality Reference Parameter

- Is the AEC parameter that is set by the user to define the desired level of image quality
- Changing the Image Quality Reference Parameter will affect the $CTDI_{vol}$

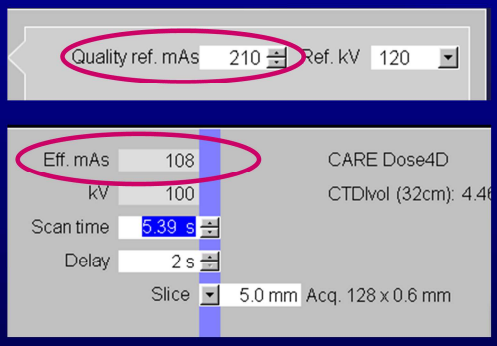
The effect on $CTDI_{vol}$ when changing the Image Quality Reference Parameter is vendor dependent

Image Quality Reference Parameter

- A change in the Image Quality Reference Parameter will affect the $CTDI_{vol}$
- Setting the parameter for "increased" image quality (e.g., lower noise) will result in more dose
  - Increasing the Quality ref. mAs will result in an increase in the $CTDI_{vol}$
- Setting the parameter for "decreased" image quality (e.g., more noise) will result in less dose
  - Decreasing the Quality ref. mAs will result in a decrease in the $CTDI_{vol}$

Siemens: *Image Quality Reference Parameter*

Quality ref. mAs



Routine subtask card of the Examination task card.

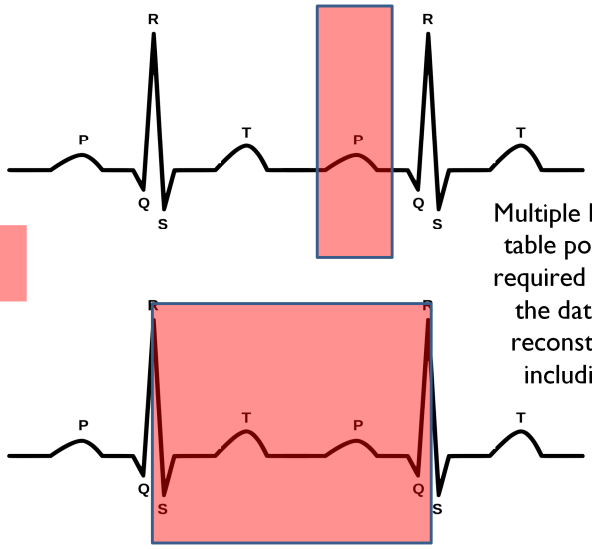
- Quality ref. mAs and kV settings are set for a normal sized patient (75 kg) to achieve a specified image quality
- Patient adapted Eff. mAs for the next exam are displayed after the topogram acquisition

ECG-Based Tube Current Modulation

- Is an AEC feature used with prospectively gated cardiac imaging that adjusts the Tube Current based on the phase within the cardiac cycle
- There are important heart rate considerations to take into account when using prospective gating

The use of ECG-Based Tube Current Modulation with prospective gating will decrease $CTDI_{vol}$ compared to retrospective gating

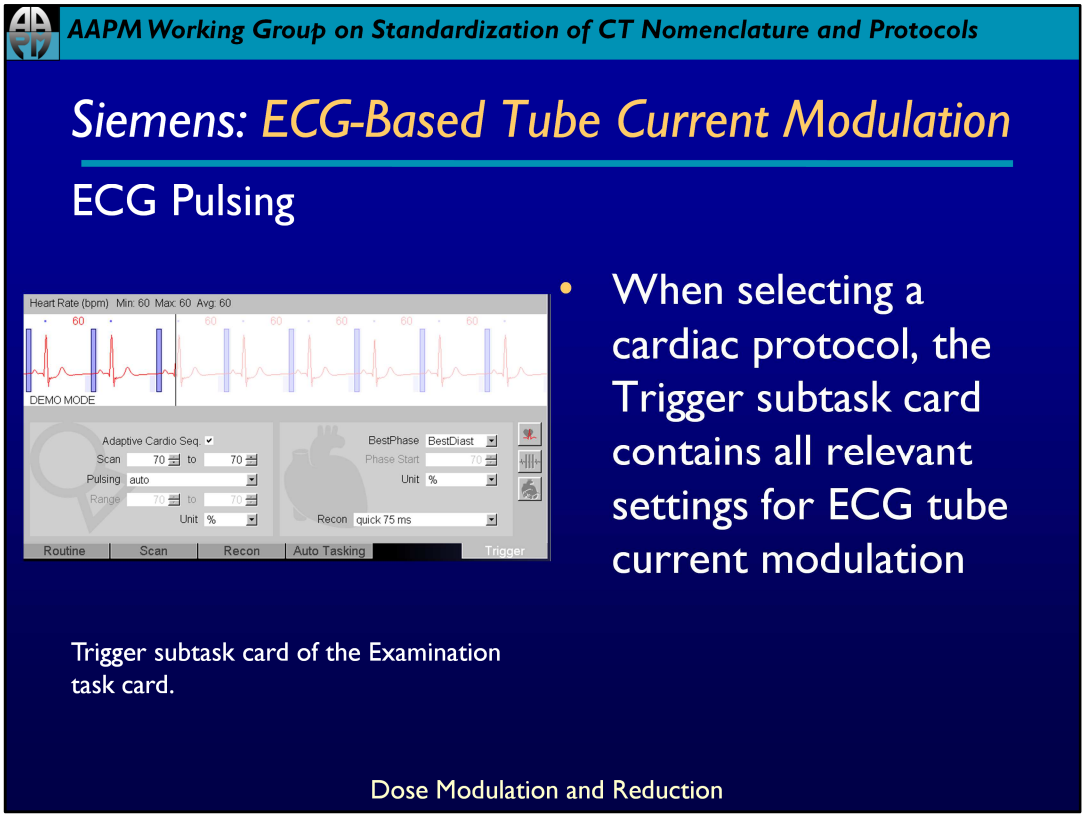
ECG-Based Tube Current Modulation



Radiation On

Multiple heart beats and table positions may be required to collect all of the data required to reconstruct the FOV including the heart

Dose Modulation and Reduction

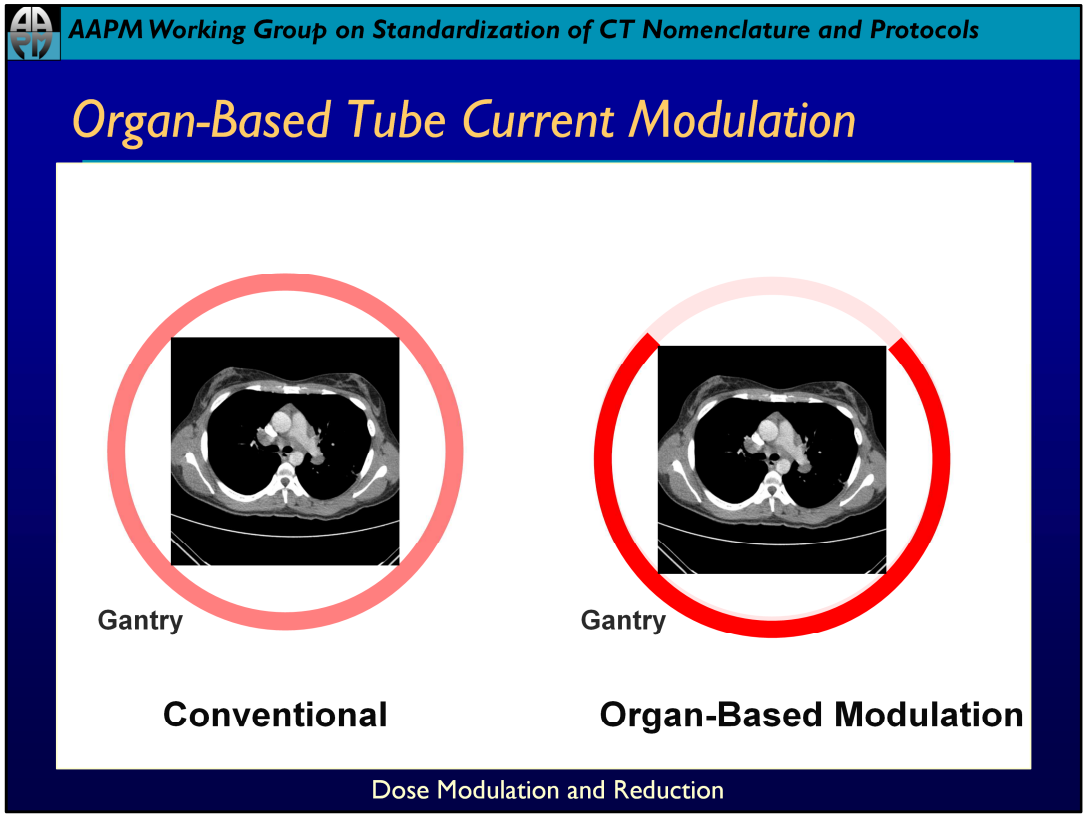


The ECG shows clearly when 100% or 4% of the tube current is applied according to user specified phase interval.

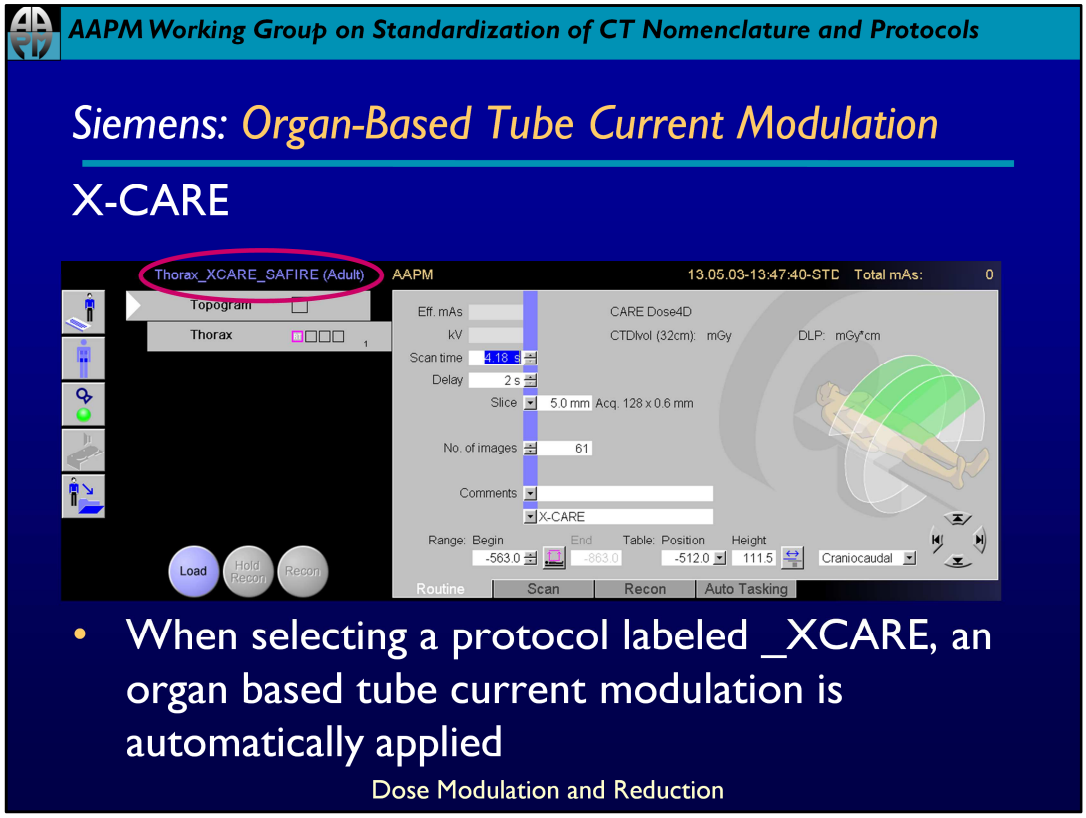
Organ-Based Tube Current Modulation

- Is an AEC feature that allows for the tube current to be decreased or turned off over radiosensitive organs on the patient periphery, such as the breasts or eye lenses
- To maintain image quality, tube current may need to be increased at other view angles

The use of Organ-Based Tube Current Modulation may reduce the absorbed dose to organs at the surface of the body but may increase the absorbed dose to other organs



De-Identified Image used with IRB approval



On the Examination card is clearly indicated by a green segment on the scan illustration if X-CARE is applied.

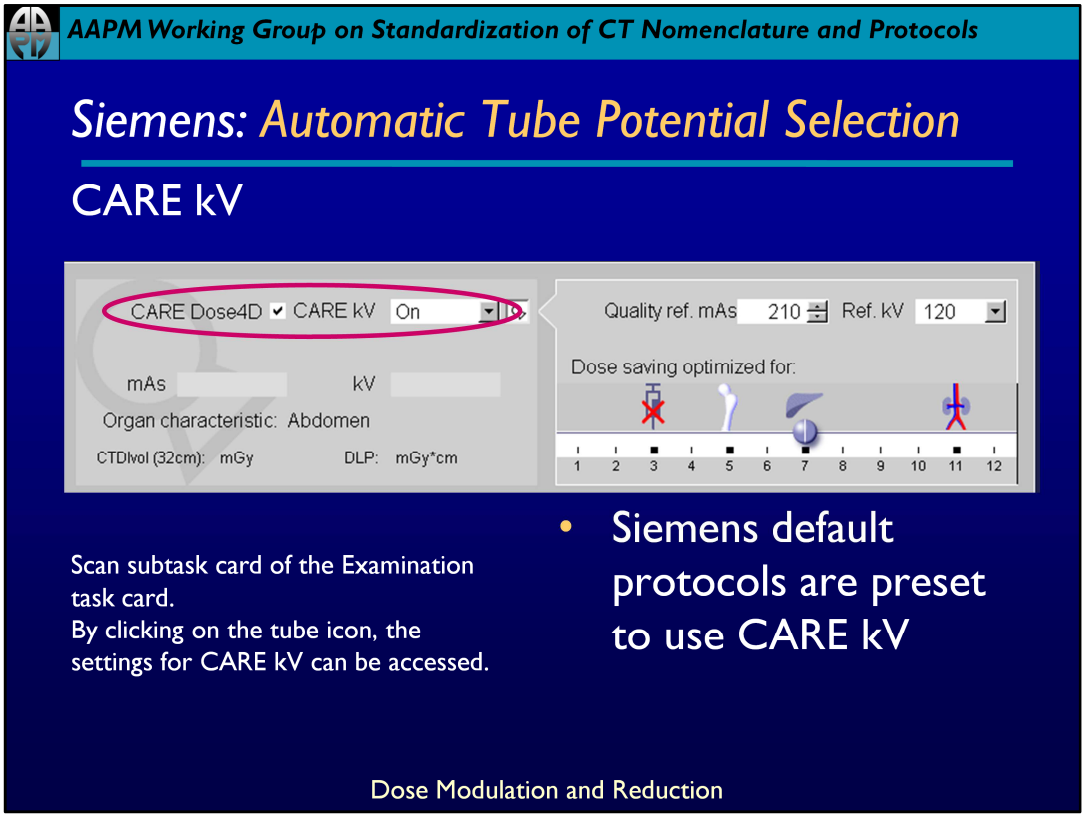
Automatic Tube Potential Selection

- Is an AEC feature that selects the tube potential according to the diagnostic task and patient size in order to achieve the desired image quality at a lower $CTDI_{vol}$

The use of Automatic Tube Potential Selection is intended to decrease $CTDI_{vol}$ while achieving the image quality required for a specific diagnostic task and patient attenuation

Automatic Tube Potential Selection

- Tube Potential is not modulated in the same fashion as Tube Current
- It does not change with different tube positions (view angles) around the patient
- The Tube Potential for a specific patient, anatomic region and diagnostic tasks is selected and held constant for that acquisition, though it may be changed to a different tube potential for a different diagnostic task



CARE kV only works in combination with CARE Dose4D.
CarekV Slider Symbols – from left to right (non-contrast, bone, soft tissue, vascular)
Please refer to the manual for detailed information on setting up CARE kV.

Iterative Reconstruction

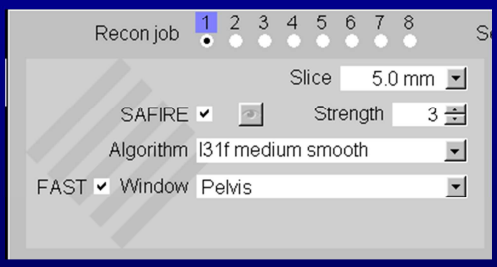
- Is a feature that uses the information acquired during the scan and repeated reconstruction steps to produce an image with less "noise" or better image quality (e.g., higher spatial resolution or decreased artifacts) than is achievable using standard reconstruction techniques

The use of Iterative Reconstruction by itself may not decrease $CTDI_{vol}$; with use of Iterative Reconstruction, image quality will change and this may allow a reduction in the $CTDI_{vol}$ by adjusting the acquisition parameters used for the exam

AAPM Working Group on Standardization of CT Nomenclature and Protocols

Siemens: *Iterative Reconstruction*

IRIS or SAFIRE or ADMIRE



Recon subtask card of the Examination task card.

- Is an option in image reconstruction, activated by clicking the box
- Using IR will change the image quality but will not retrospectively affect dose

Dose Modulation and Reduction

Siemens default protocols that use iterative reconstruction are delivered with dose presets reduced accordingly.
Please refer to the manual for more detailed information on the settings.

Siemens: *Iterative Reconstruction*

- Iterative Reconstruction using IRIS performs noise reduction iteratively in image space.
- Iterative Reconstruction using SAFIRE utilizes both projection space (raw) data and image space data.
- Iterative Reconstruction using ADMIRE utilizes raw data statistical modeling, model based noise cancellation in image space and advanced system modeling to eliminate artifacts

Siemens: *Iterative Reconstruction*

- Changing the Strength of SAFIRE or ADMIRE will affect the resultant image quality; it WILL NOT affect the $CTDI_{vol}$ of the scan
- In consultation, the radiologists and medical physicists may adjust the acquisition parameters for studies reconstructed using IRIS, SAFIRE or ADMIRE based on the imaging task and patient population, dose concerns, and the needs of the interpreting radiologist(s)

Dose Display

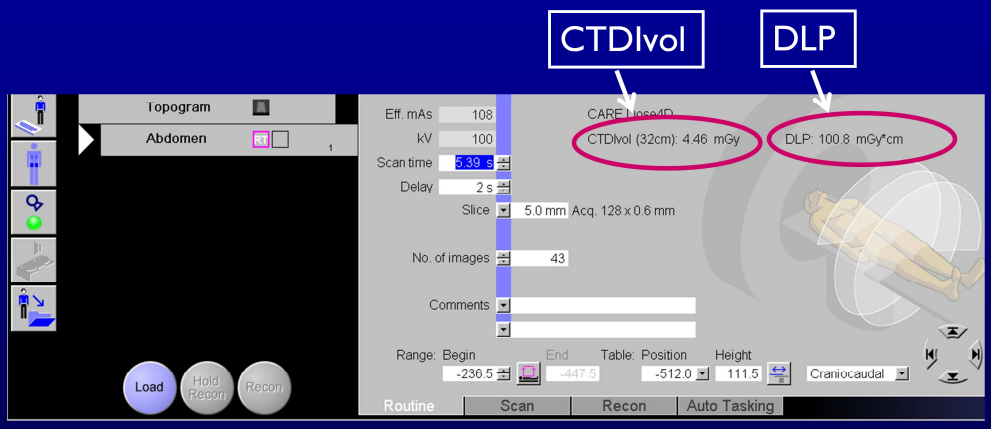
- Information about the $CTDI_{vol}$ planned for each scan is typically displayed before the exam on the user console
- Information about the $CTDI_{vol}$ delivered by each scan is typically reported in a data page or DICOM structured dose report
- Dose information provided after the exam typically also includes the DLP and the CTDI phantom size. These may also be included in information displayed before the scan.

Display of Planned $CTDI_{vol}$

- $CTDI_{vol}$ is displayed before a study is performed based on the selected technique parameters
- It is important to check $CTDI_{vol}$ before a study is performed to ensure that the output of the scanner is appropriate for the specific patient and diagnostic task

$CTDI_{vol}$ is displayed for each planned acquisition

Siemens: Display of Planned $CTDI_{vol}$ & DLP



- An estimated mean CTDIvol and DLP for the scanned volume is displayed prior to the scan

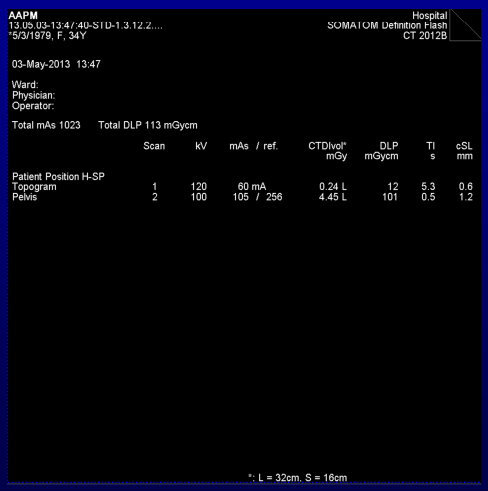
Dose Display

Post Study Data Page

- Following the completion of a study, a Post Study Data Page is created that includes information on the delivered $CTDI_{vol}$ and DLP and the phantom size used to calculate these values
- Information is displayed for each series

Siemens: Post Study Data Page

Patient Protocol


AAPM
13.05.03-13:47:40-STD-1.3.12.2....
*5/3/1979, F, 34Y

Hospital
SOMATOM Definition Flash
CT 2012B

03-May-2013 13:47

Ward:
Physician:
Operator:

Total mAs 1023 Total DLP 113 mGycm

	Scan	kV	mAs / ref.	CTDIvol* mGy	DLP mGycm	TI s	cSL mm
Patient Position H-SP							
Topogram	1	120	60 mA	0.24 L	12	5.3	0.6
Pelvis	2	100	105 / 256	4.45 L	101	0.5	1.2

*: L = 32cm, S = 16cm

- Available as series 501 of the Patient image series in the Patient Browser
- The actual CTDIvol and DLP for the scanned volume

Dose Display

Post Study Data Page - $CTDI_{vol}$

- $CTDI_{vol}$ is displayed for each series after a study is performed and is calculated based on the technique factors used to acquire the data
- It is useful to check $CTDI_{vol}$ after a study is performed to ensure that the output of the scanner was as expected

$CTDI_{vol}$ is displayed for each completed acquisition

Dose Display

Siemens: Post Study Data Page - $CTDI_{vol}$

AAPM
13.05.03-13:47:40-STD-1.3.12.2....
*5/3/1979, F, 34Y

Hospital
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Pelvis	2	100	105 / 256	4.45 L	101	0.5	1.2

$CTDI_{vol}$ is displayed for each completed acquisition

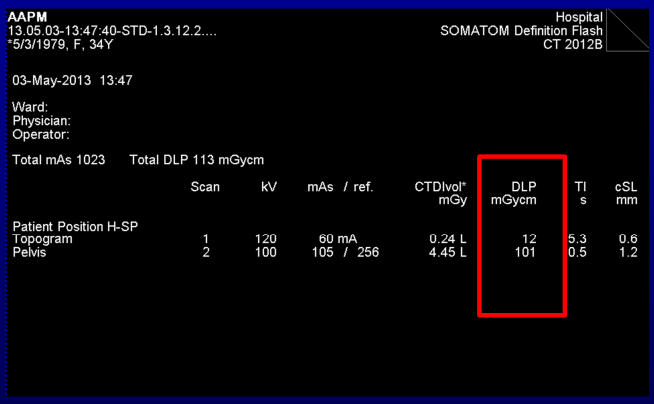
Dose Display

Post Study Data Page - DLP

- DLP is displayed for each series after a study is performed and is calculated based on the technique factors and scan length used

DLP is displayed for each completed acquisition and is typically summed for all of the acquisitions

Siemens: Post Study Data Page - DLP



AAPM
13.05.03-13:47:40-STD-1.3.12.2....
*5/3/1979, F, 34Y

Hospital
SOMATOM Definition Flash
CT 2012B

03-May-2013 13:47

Ward:
Physician:
Operator:

Total mAs 1023 Total DLP 113 mGycm

	Scan	kV	mAs / ref.	CTDIvol* mGy	DLP mGycm	TI s	cSL mm
Patient Position H-SP							
Topogram	1	120	60 mA	0.24 L	12	5.3	0.6
Pelvis	2	100	105 / 256	4.45 L	101	0.5	1.2

DLP is displayed for each completed acquisition and is typically summed for all of the acquisitions

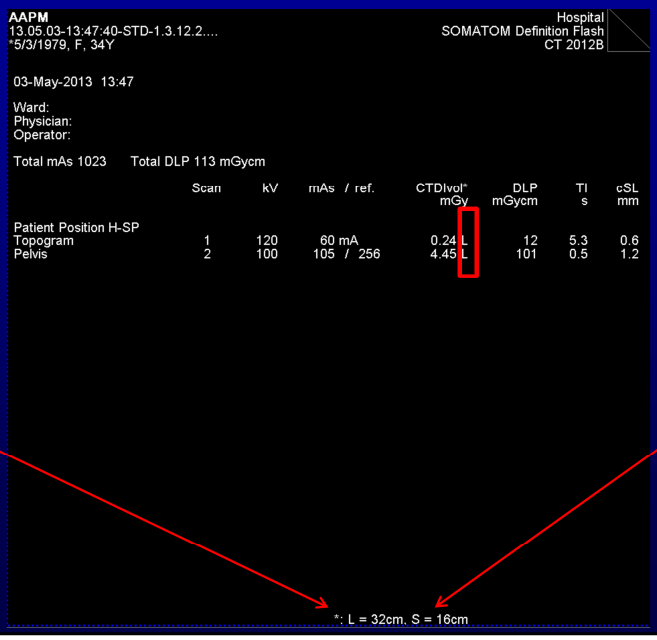
Dose Display

Post Study Data Page – CTDI Phantom

- The CTDI Phantom used for each acquisition in the study is typically displayed
- Different phantoms may be used to calculate the $CTDI_{vol}$ for different acquisitions in the same study (and may vary by vendor)
  - Head and C-Spine Example
    - Body Phantom used to report $CTDI_{vol}$ for C-Spine portion of exam
    - Head Phantom used to report $CTDI_{vol}$ for Head portion of exam

Dose Display

Siemens: Post Study Data Page – CTDI Phantom



AAPM
13.05.03-13:47:40-STD-1.3.12.2....
*5/3/1979, F, 34Y

Hospital
SOMATOM Definition Flash
CT 2012B

03-May-2013 13:47

Ward:
Physician:
Operator:

Total mAs 1023 Total DLP 113 mGycm

	Scan	kV	mAs / ref.	CTDIvol* mGy	DLP mGycm	TI s	cSL mm
Patient Position H-SP							
Topogram	1	120	60 mA	0.24 L	12	5.3	0.6
Pelvis	2	100	105 / 256	4.45 L	101	0.5	1.2

*: L = 32cm, S = 16cm

Body Phantom 32 cm

Head Phantom 16cm

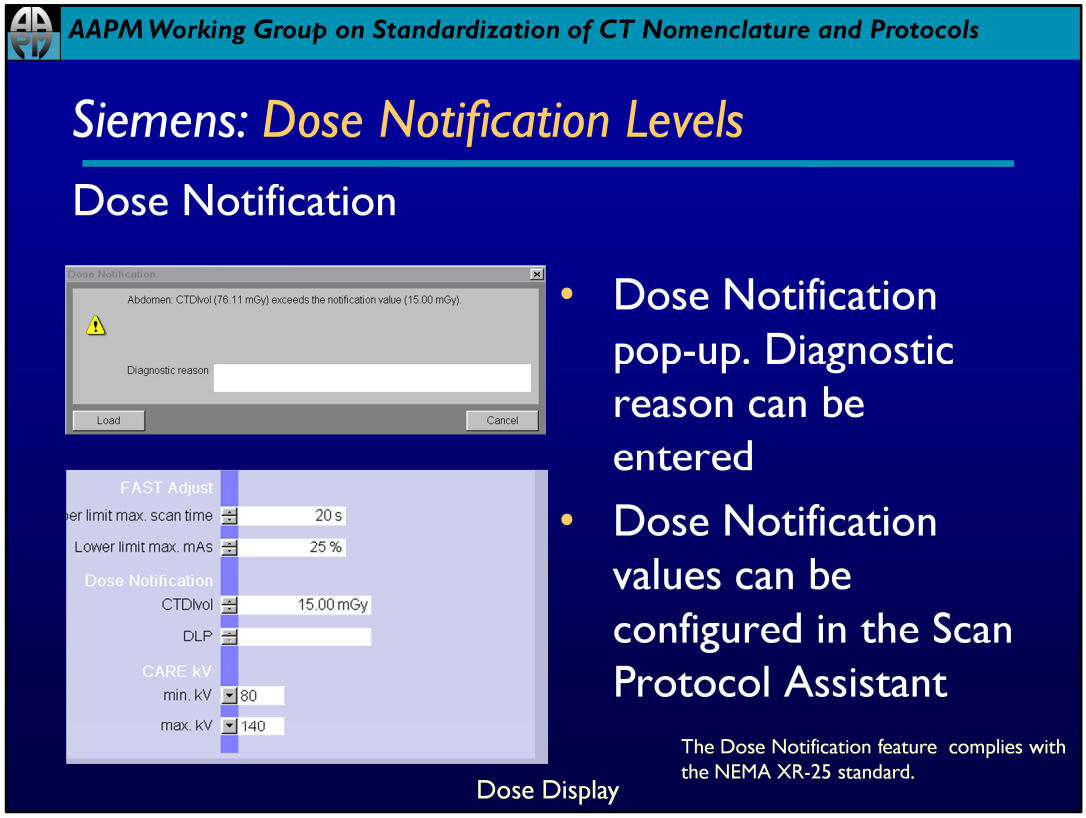
Summing Dose Report Values

- $CTDI_{vol}$ values for separate series are NOT to be summed to give a "total" $CTDI_{vol}$ for a study
  - This is especially true if the series cover different anatomic regions
- DLP is typically summed over all series in the Post Study Data Page to provide an estimate of the total patient exposure
  - Extreme care should be taken when considering summed DLPs because different phantoms may have been used to calculate the $CTDI_{vol}$ values used to determine DLP
- A medical physicist should be contacted if patient specific dose estimates are required

Dose Notification Levels

- Notification Levels may be set on a CT scanner for each series within an exam protocol
- If the planned $CTDI_{vol}$ is above the Notification Level and triggers the notification, the user has the opportunity to edit or confirm the technique settings
- Notification Levels may be exceeded when appropriate for a specific patient or diagnostic task (e.g., in very large patients or contrast bolus monitoring scans)

Dose Display

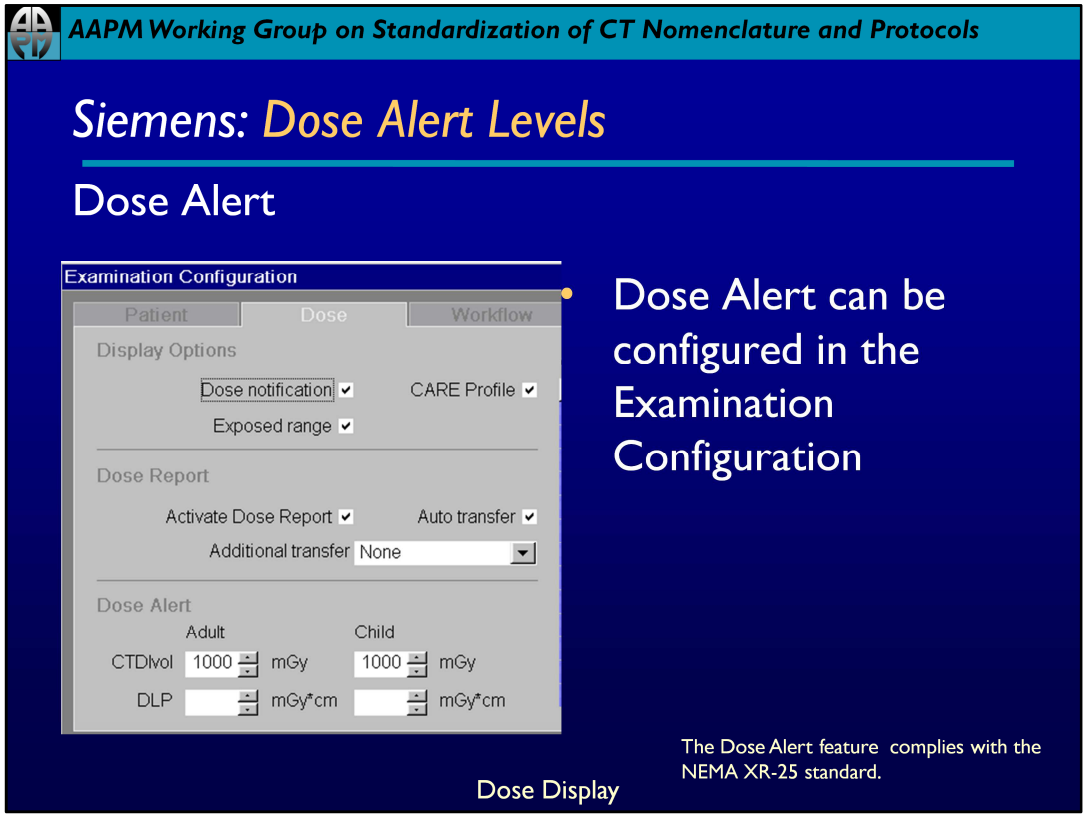


All Dose Notification events are stored on the system (H:\\SiteData\DoseLogs) and can be exported when further investigation is necessary.

Entering 0 will shut off the Dose Alert.

Dose Alert Levels

- Dose Alert Levels require specific action by the operator to continue scanning
- Dose Alert Levels are typically much higher than Notification Levels and take into account all series within the exam
- Triggering a Dose Alert requires that the operator confirm the protocol and settings are correct by entering in his or her name. Optionally, sites may require that the operator provide a brief explanation in the provided field



All Dose Alert events are stored on the system (H:\\SiteData\DoseLogs) and can be exported when further investigation is necessary.

Radiation Dose Structured Reports

- Radiation Dose Structured Reports (RDSRs) are provided in a defined DICOM format
- They provide the most complete set of information regarding the irradiating events
- The reports are very detailed and require an RDSR viewer for easy visualization of relevant information

Siemens: Radiation Dose Structured Reports

DICOM Structured Report

- DICOM Dose SR (Structured Report) on X-Ray Radiation according to DICOM standard

Dose Display

Questions

- Please contact the medical physicist providing support for your CT practice, your lead technologist, supervising radiologist or manufacturer's application specialist with questions regarding these important topics and concepts.

A special thank you to Dr. Mark Supanich for his considerable efforts in leading the working group in developing these slides.

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