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ROUTINE ADULT ABDOMEN/PELVIS CT PROTOCOLS

Indications (include but are not limited to)

- Evaluation of abdominal, flank, or pelvic pain
- Evaluation of known or suspected abdominal or pelvic masses or fluid collections
- Evaluation of primary or metastatic malignancies
- Evaluation of abdominal or pelvic inflammatory processes
- Evaluate infections of the abdomen and pelvis
- Evaluate patients with fever or suspected abscess
- To identify the cause of bowel obstruction
- Evaluation of weight loss
- Clarification of findings from other imaging studies or laboratory abnormalities.
- For reference, see [ACR–SPR Practice Guideline for the Performance of Computed Tomography \(CT\) of the Abdomen and Computed Tomography \(CT\) of the Pelvis](#)

Diagnostic Tasks (include but are not limited to)

- Detect soft tissue masses and abnormal fluid collections and determine sizes
- Identify abnormal collections of blood
- Identify air outside the intestinal tract
- Detect nodules or soft tissue masses adjacent to vascular structures
- Detect calcifications in abnormal locations or in abdominal and pelvic organs
- Characterize soft tissue edema around the organs of the abdomen and pelvis

Key Elements

- Patient positioning is especially important when using tube current modulation.
- Scanning should be performed helically whenever possible.
- Automatic Exposure Control (AEC): Each manufacturer has unique nomenclature and operating characteristics for their AEC system(s). Users must become very familiar with how the AEC systems on their particular scanners operate. *See Singh et al. Automatic Exposure Control in CT: Applications and Limitations. JACR 2011;8(6):446-449.*

Contrast

- **Oral:** Per radiologist
- **Injected:** Certain indications require administration of intravenous contrast media.
- Intravenous contrast enhancement should be performed as directed by the supervising radiologist using appropriate injection protocols and in accordance with the [ACR-SPR Practice Guideline for the Use of Intravascular Contrast Media](#) and the [ACR Manual on Contrast Media](#).

Patient Positioning

- Center the patient within the gantry; this is critical for proper functioning of AEC systems.
- Patient supine, typically feet first

Scan Range

- Scan from top of liver to either iliac crest or pubic symphysis, depending on clinical indications.

Suspension of Respiration

- Patient should be instructed to hold his/her breath at end of inspiration.

Additional Image Reconstructions

- Certain indications may require that images be reconstructed in coronal and/or sagittal planes.
- Very thin images (approximately ≤ 1 mm) may need to be reconstructed to serve as source images for the sagittal and/or coronal reformatted images.
- Creation, use, and archival of these additional images are at the discretion of the supervising radiologist and/or departmental policy. Very large datasets may result from these additional reconstructions.

Radiation Dose Management

- AEC should be used whenever possible.
- Pay careful attention to the values selected to define the desired level of image quality (eg, Noise Index, Quality Reference mAs, Standard Deviation).
- Each manufacturer will have recommendations unique to their systems and system features. Be sure to work with your CT equipment manufacturer and a qualified medical physicist to ensure safe and appropriate operation of AEC systems.
- If more than one CT localizer radiograph is acquired, AEC systems from different manufacturers can differ with respect to which one is used to determine mA and/or kV settings. Please refer to individual manufacturer protocol instructions.

CTDI measurements and calculations

- Some manufacturers utilize a z-axis “flying focal spot”, in which two unique projections are acquired at the same z-axis table position. When this technique is used, we identify it with **. The CTDIvol on the console accurately accounts for use of this feature.

Approximate Volume CT Dose Index (CTDIvol) Values

- Approximate values for CTDIvol are listed for three different patient sizes:

	Approx. Weight (kg)	Approx. Weight (lbs)	Approx. CTDIvol (mGy)
Small Patient	50-70	110-155	10-17
Average Patient	70-90	155-200	15-25
Large Patient	90-120	200-265	22-35

The approximate CTDIvol values are for reference only and represent a dose to the CT Dose Index phantom under very specific conditions. The CTDIvol displayed on the scanner for a patient of a given size should be similar, but not necessarily an exact match, to those listed in the above table. The provided values are all based on the 32 cm diameter “body” CTDI phantom.

It is essential that users recognize that the CTDIvol values reported on the user console prior to acquiring CT localizer radiographs on a particular patient do not represent the CTDIvol that will be delivered during that patient’s scan. CT systems rely on the CT localizer radiograph to 1) estimate the patient’s size, 2) determine the tube current settings for each tube angle and table position that will yield the requested level of image quality, and 3) calculate the average CTDIvol for the patient over the prescribed scan range. Until the CT localizer radiograph is acquired, the reported CTDIvol is not patient-specific, but is based on a generic patient size.

The CTDIvol values provided here are approximate, and are intended only to provide reference ranges for the user to consider. They are for a routine CT of an adult’s abdomen/pelvis for the general indications given at the beginning of this document. Other indications or diagnostic tasks may have different image quality and dose requirements, and hence reasonable ranges of CTDIvol may differ according to those requirements.

In this document, a small patient is considered to be approximately 50-70 kg (110-155 lbs), an average patient approximately 70-90 kg (155-200 lbs), and a large patient 90-120 kg (200-265 lbs). However, weight is not a perfect indication of patient size. A person’s height, gender and distribution of weight across the body also must be taken into account. The thickness of the body over the area to be scanned is the best indication of patient size. Bodymass index (BMI) may also be considered:

- Underweight = BMI <18.5
- Normal weight = BMI of 18.5–24.9
- Overweight = BMI of 25–29.9
- Obesity = BMI of 30 or greater

It is recognized that the median (50th percentile) patient size for adults in the USA is larger than 70 kg. However, the 70 kg patient represents the “Reference Man”, as defined by the International Commission on Radiation Protection (ICRP), upon which AEC systems and tissue weighting factors (used for effective dose estimation) are based.

INDEX OF ADULT ROUTINE ABDOMEN-PELVIS PROTOCOLS (by manufacturer)

[GE](#)

[Hitachi](#)

[Neusoft](#)

[Philips](#)

[Siemens](#)

[Toshiba](#)

ADULT ABDOMEN & PELVIS ROUTINE (Selected GE scanners)

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SCOUT: AP if automatic exposure control is used. PA if manual mA is used. Landmark at xyphoid process. Range: S60-I500. Lateral scout optional, but recommended to ensure accurate vertical (AP) centering for AEC operation. If two Scouts are obtained, the second one must cover the entire intended scan range, as it is used to determine mA settings.

GE	LightSpeed Ultra (8)	BrightSpeed 16 Select	LightSpeed 16 BrightSpeed 16	LightSpeed Pro 16
Scan Type	Helical	Helical	Helical	Helical
Rotation Time (s)	0.6	0.8	0.5	0.5
Detector Configuration	8 x 1.25 mm (10 mm, 2i)	16 x 1.25 mm (20 mm, 4i)	16 x 1.25 mm (20 mm, 4i)	16 x 1.25 mm (20 mm, 4i)
Pitch	1.375	0.938	1.375	1.375
Table Feed/Interval (mm)	13.5	18.75	27.5	27.5
kV	120	120	120	120
Auto-mA range	50-440	50-350	100-440	50-650
Noise Index (NI)*	11.57	12	11.57	11.57
SFOV	Large	Large	Large	Large

RECON 1

Plane	Axial	Axial	Axial	Axial
Algorithm	Std	Std	Std	Std
Recon Mode	Plus	Plus	Plus	Plus
Thickness (mm)*	5	5	5	5
Interval (mm)	5	5	5	5

RECON 2

Plane	Axial	Axial	Axial	Axial
Algorithm	Std	Std	Std	Std
Recon Mode	Plus	Plus	Plus	Plus
Thickness (mm)	1.25	1.25	1.25	1.25
Interval (mm)	1.25	1.25	1.25	1.25

*The Noise Index value and the primary (RECON 1) image reconstruction thickness both strongly impact CT DIvol and patient dose. See: Kanal KM et al. Impact of Operator-Selected Image Noise Index and Reconstruction Slice Thickness on Patient Radiation Dose in 64-MDCT. *AJR* 2007; 189: 219-225.

	Approx. Weight (kg)	Approx. Weight (lbs)	Approx. CT DIvol (mGy)
Small Patient	50-70	110-155	10-17
Avg. Patient	70-90	155-200	15-25
Large Patient	90-120	200-265	22-35

ADULT ABDOMEN & PELVIS ROUTINE (selected GE scanners)(continued)

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SCOUT: AP if automatic exposure control is used. PA if manual mA is used. Landmark at xyphoid process. Range: S60-I500. Lateral scout optional, but recommended to ensure accurate vertical (AP) centering for AEC operation. If two Scouts are obtained, the second one must cover the entire intended scan range, as it is used to determine mA settings.

GE	LightSpeed VCT	Discovery CT750 HD	LightSpeed VCT (w/ASiR)	Discovery CT750 HD (w/ASiR)
Scan Type	Helical	Helical	Helical	Helical
Rotation Time (s)	0.5	0.5	0.5	0.5
Detector Configuration	64 x 0.625 mm (40 mm, 8i)	64 x 0.625 mm (40 mm, 8i)	64 x 0.625 mm (40 mm, 64i)	64 x 0.625 mm (40 mm, 64i)
Pitch	1.375	1.375	0.984	0.984
Table Feed/Interval (mm)	55	55	39.37	39.37
kV	120	120	120	120
Auto-mA	50-650	100-650	50-670	80-750
Noise Index (NI)*	11.57	11.57	18.0 (DR 50%)	25.2
SFOV	Large	Large	Large	Large
ASiR	None	None	SS50	SS50

RECON 1

Plane	Axial	Axial	Axial DMPR create Sag/Cor reformat	Axial DMPR create Sag/Cor reformat
Algorithm	Std	Std	Std	Std
Recon Mode	Plus	Plus	Plus	Plus
Thickness (mm)*	5	5	5	5
Interval (mm)	5	5	5	5
ASiR	None	None	SS50	SS50

RECON 2

Plane	Axial DMPR create Sag/Cor reformat	Axial DMPR create Sag/Cor reformat	Axial	Axial
Algorithm	Std	Std	Std	Std
Recon Mode	Plus	Plus	Plus	Plus
Thickness (mm)	0.625	0.625	0.625	0.625
Interval (mm)	0.625	0.625	0.625	0.625
ASiR	None	None	SS50	SS50

*The Noise Index value and the primary (RECON 1) image reconstruction thickness both strongly impact CTDIvol and patient dose. See: Kanal KM et al. Impact of Operator-Selected Image Noise Index and Reconstruction Slice Thickness on Patient Radiation Dose in 64-MDCT. *AJR* 2007; 189: 219-225.

	Approx. Weight (kg)	Approx. Weight (lbs)	Approx. CTDIvol (mGy)
Small Patient	50-70	110-155	10-17
Avg. Patient	70-90	155-200	15-25
Large Patient	90-120	200-265	22-35

ADULT ABDOMEN & PELVIS ROUTINE (selected HITACHI scanners)

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SCANOGRAM: PA, scan from above diaphragm to below ischium.

HITACHI	CXR4	ECLOS 16	SCENARIO 64
Scan Type	Volume	Volume	Volume
Rotation Time (s)	0.8	0.8	0.75
Detector Configuration	2.5 mm x 4	1.25 mm x 16	0.625 mm x 64
Pitch	1.25	1.0625	0.578
Speed (mm/rot)	6.25	21.25	23.125
kV	120	120	120
mA	225	300	IntelliEC
Adaptive mA/IntelliEC	YES	YES	SD-9.5
SFOV	500	500	500

RECON 1

Series Description	Abdomen Pelvis Routine	Abdomen Pelvis Routine	Abdomen Pelvis
Type	Volume	Volume	Volume
Algorithm	Abd STD 4	Abd STD 32	Abd STD 30
Thickness (mm)	5	5	5
Interval (mm)	5	5	5

RECON 2

Series Description	Thins	Thins	Thins for MPR
Type	Volume	Volume	Volume
Algorithm	Abd STD 4	Abd STD 32	Abd STD 30
Thickness (mm)	2.5	1.25	1.0
Interval (mm)	1.25	0.625	0.5

	Approx. Weight (kg)	Approx. Weight (lbs)	Approx. CTDIvol (mGy)
Small Patient	50-70	110-155	10-17
Avg. Patient	70-90	155-200	15-25
Large Patient	90-120	200-265	22-35

The disclaimer found on page 1 is an integral part of this document.

ADULT ABDOMEN & PELVIS ROUTINE (selected NEUSOFT scanners)

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SURVIEW: AP, 120 kVp, 40 mA. Scan from above diaphragm to below ischium.

NEUSOFT	NeuViz DUAL	NeuViz 16
Scan Type	Helical	Helical
Rotation Time (s)	1.0	0.75
Collimation	2 x 5 mm	16 x 1.5 mm
kVp	120	120
mAs	265	368
Pitch	1.5	0.8631

RECON 1

Type	Axial	Abdomen/Pelvis (Axial)*
Filter	Body Standard (B)	SB
Thickness (mm)	5.0	5.0
Increment (mm)	5.0	5.0

RECON 2

Type	N / A	Small Recon (Axial)*
Filter		B/C
Thickness (mm)		2.0
Increment (mm)		2.0

RECON 3

Type	N / A	Coronal*
Filter		SB
Thickness (mm)		5.0
Increment (mm)		5.0

*Adaptive Filter and Metal Artifact Reduction can be selected prospectively or retrospectively.

	Approx. Weight (kg)	Approx. Weight (lbs)	Approx. CTDIvol (mGy)
Small Patient	50-70	110-155	10-17
Avg. Patient	70-90	155-200	15-25
Large Patient	90-120	200-265	22-35

ADULT ABDOMEN & PELVIS ROUTINE (selected PHILIPS scanners)

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SURVIEW: AP, 500 mm length (or adjusted to patient size), starting at mid-sternum (feet first) or pubic symphysis (head first). If two Surviews are obtained, the first one must cover the entire intended scan range, as it is used to determine mA settings.

PHILIPS	Brilliance 16	Brilliance 64	Ingenuity CT	Brilliance iCT SP	Brilliance iCT
Scan Type	Helical	Helical	Helical	Helical	Helical
Rotation Time (s)	0.75	0.5	0.75	0.5	0.5
Collimation	16 x 1.5 mm	64 x 0.625 mm	64 x 0.625 mm	64 x 0.625 mm	128 x 0.625 mm
kVp	120	120	120	120	120
mAs	DoseRight	DoseRight	DoseRight	DoseRight	DoseRight
DoseRight ACS	ON	ON	ON	ON	ON
Pitch	0.93	0.75	1.0	1.17	1.0
SP Filter	Yes	Yes	Yes	Yes	Yes
Adaptive Filter	Yes	Yes	Yes	Yes	Yes
Resolution Setting	Standard	Standard	Standard	Standard	Standard

RECON 1

Type	Axial	Axial	Axial	Axial	Axial
Filter	B/C	B/C	B/C	B/C	B/C
Thickness (mm)	5	5	5	5	5
Increment (mm)	5	5	5	5	5

RECON 2

Type	Coronal	Coronal	Coronal	Coronal	Coronal
Filter	B/C	B/C	B/C	B/C	B/C
Thickness (mm)	3	3	3	3	3
Increment (mm)	3	3	3	3	3

RECON 3

Type	Axial	Axial	Axial	Axial	Axial
Filter	YA	YC	YC	YC	YC
Thickness (mm)	2	0.9	0.9	0.9	0.9
Increment (mm)	1	0.45	0.45	0.45	0.45

RECON 4

Type	Coronal	Coronal	Coronal	Coronal	Coronal
Filter	YA	YC	YC	YC	YC
Thickness (mm)	1	1	1	1	1
Increment (mm)	1	1	1	1	1

	Approx. Weight (kg)	Approx. Weight (lbs)	Approx. CTDIvol (mGy)
Small Patient	50-70	110-155	10-17
Avg. Patient	70-90	155-200	15-25
Large Patient	90-120	200-265	22-35

ADULT ABDOMEN & PELVIS ROUTINE (selected SIEMENS scanners)

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TOPOGRAM: AP, 512 or 768 mm. Scan from above diaphragm to below ischium. If two Topograms are obtained, both will be used to determine mA settings.

SIEMENS	Sensation 16	Sensation 64	Definition (dual source, 64-slice)	Definition AS (128-slice)	Definition Flash (dual source, 128-slice)
Software version	VB30	VB30	VA34	VA44	VA44
Scan mode	Spiral	Spiral	Spiral	Spiral	Spiral
Tube voltage (kV)*	120	120	120	120	120
Qual. Ref. mAs (QRM)	200	200	210	210/150***	210/150***
Rotation time (s)	0.5	0.5	0.5	0.5	0.5
Acq. (Detector Configuration)	16 x 1.5 mm	**64 x 0.6 mm (32 x 0.6 mm = 19.2 mm)	**64 x 0.6 mm (32 x 0.6 mm = 19.2 mm)	**128 x 0.6 mm (64 x 0.6 mm = 38.4 mm)	**128 x 0.6 mm (64 x 0.6 mm = 38.4 mm)
Pitch	0.8	1.4	0.6	0.6	0.6
Dose modulation	CARE Dose4D	CARE Dose4D	CARE Dose4D	CARE Dose4D	CARE Dose4D

RECON 1

Kernel	B30f	B30f	B30f	B30f/I30f***	B30f/I30f***
Slice (mm)	5	5.0	5.0	5.0	5.0
Slice increment (mm)	5	5.0	5.0	5.0	5.0

RECON 2

Kernel	B20f	B20f	B20f	B20f/I26f***	B20f/I26f***
Slice (mm)	1.0	1.0	1.0	1.0	1.0
Slice increment (mm)	0.7	0.7	0.7	0.7	0.7

* If scanner is equipped with automatic kV selection (CARE kV), this should be activated by selecting "On".

- For non-contrast-enhanced exams, a Reference kV of 120 and a "Dose saving optimized for" slider position of 3 is recommended.
- For contrast-enhanced exams, a Reference kV of 120 and a "Dose saving optimized for" slider position of 7 is recommended.
- For exams requiring both a non-contrast-enhanced and a contrast-enhanced scan, where the change in mean CT number of a region may be relevant to the diagnosis, it is important that the kV be the same for both scans. Hence, the same slider position should be used for both scans. Typically, the slider position for the contrast-enhanced scan (e.g. 7) is used in this scenario.

** Indicates that a z-axis "flying focal spot" technique is used to obtain twice as many projections per rotation as detector rows.

*** With SAFIRE and a strength setting of 3.

	Approx. Weight (kg)	Approx. Weight (lbs)	Approx. CTDIvol (mGy)
Small Patient	50-70	110-155	10-17
Avg. Patient	70-90	155-200	15-25
Large Patient	90-120	200-265	22-35

ADULT ABDOMEN & PELVIS ROUTINE (selected TOSHIBA scanners)

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SCANOGRAM: Dual Scano: AP and LAT, from 800 mm above diaphragm to below ischium.
Both scanograms are used for tube current modulation.

Toshiba	Aq16	Aq32	Aq64	AqPremium	AqONE
Scan Type	Helical	Helical	Helical	Helical	Helical
Rotation Time (s)	0.5	0.5	0.5	0.5	0.5
Detector Configuration	16 x 1.0 mm	32 x 0.5 mm	64 x 0.5 mm	160 x 0.5 mm	160 x 0.5 mm
Pitch	Std (0.9375)	Std (0.844)	Std (0.828)	Std (0.869)	Std (0.869)
Speed (mm/rot)	15	13.5	26.5	69.5	79.5
kV	120	120	120	120	120
mA	^{SURE} Exposure	^{SURE} Exposure	^{SURE} Exposure	^{SURE} Exposure	^{SURE} Exposure
^{SURE} Exposure	Std (SD = 12.5)	Std (SD = 12.5)	Std (SD = 12.5)	Std (SD = 12.5)	Std (SD = 12.5)
SFOV	L	L	L	L	L

RECON 1

Type	Axial	Axial	Axial	Axial	Axial
^{SURE} IQ Setting*	Body Std Axial	Body Std Axial	Body Std Axial	Body Std Axial	Body Std Axial
Thickness (mm)	5	5	5	5	5
Interval (mm)	5	5	5	5	5

VOLUME RECON

Type	Axial	Axial	Axial	Axial	Axial
^{SURE} IQ Setting*	Body Std Volume	Body Std Volume	Body Std Volume	Body Std Volume	Body Std Volume
Thickness (mm)	1	0.5	0.5	0.5	0.5
Interval (mm)	5	5	5	5	5

RECON 2

Type	Coronal	Coronal	Coronal	Coronal	Coronal
^{SURE} IQ Setting*	Body Std	Body Std	Body Std	Body Std	Body Std
Thickness (mm)	4	4	4	4	4
Interval (mm)	4	4	4	4	4

RECON 3

Type	Sagittal	Sagittal	Sagittal	Sagittal	Sagittal
^{SURE} IQ Setting*	Body Std	Body Std	Body Std	Body Std	Body Std
Thickness (mm)	4	4	4	4	4
Interval (mm)	4	4	4	4	4

*The ^{SURE}IQ setting determines the reconstruction FC as well as other post-processing and reconstruction options, such as AIDR. The ^{SURE}IQ settings listed in this document refer to the manufacturer's default settings.

	Approx. Weight (kg)	Approx. Weight (lbs)	Approx. CTDIvol (mGy)
Small Patient	50-70	110-155	10-17
Avg. Patient	70-90	155-200	15-25
Large Patient	90-120	200-265	22-35