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ROUTINE PEDIATRIC HEAD (BRAIN)

Indications

Acute head trauma
Child abuse
Craniosynostosis/ plagiocephaly
Calvarial bone lesions (Langerhans cell histiocytosis, neuroblastoma, etc)
Suspected acute intracranial hemorrhage;
Immediate postoperative evaluation following brain surgery (evacuation of hematoma, abscess drainage, etc);
Suspected shunt malfunctions, or shunt revisions if rapid brain MRI is not available;
Increased intracranial pressure;
Acute neurologic deficits;
Suspected acute hydrocephalus;
Brain herniation;
Suspected mass or tumor;
Non-febrile seizures;
Detection of calcification;
When magnetic resonance imaging (MRI) imaging is unavailable, contraindicated, or if the supervising physician deems CT to be most appropriate due to an urgent health situation or if sedation is contraindicated.

Diagnostic Task

- Detect collections of blood;
- Identify brain masses;
- Detect brain edema or ischemia;
- Identify shift in the normal locations of the brain structures including in the cephalad or caudal directions;
- Evaluate the location of shunt hardware and the size of the ventricles;
- Evaluate the size of the sulci and relative changes in symmetry;
- Detect abnormal collections;
- Detect calcifications in the brain and related structures;
- Evaluate for fractures or other osseous abnormalities of the calvarium (skull);
- Detect any intracranial air.
- Detect abnormal densities

Key Elements

- Scan may be performed axially/sequentially. It also may be performed helically in scanners with this capability (see below for discussion of pros and cons of axial versus helical);
- Contrast enhancement (if indicated by radiologist).
- Patient positioning is very important (see below)
- Radiation dose management is very important (see below)

Radiation Dose Management

- Tube Current Modulation and/or Automatic Exposure Control may be used if a site has CT scanners that are configured appropriately for pediatric patients;
- According to ACR CT Accreditation Program guidelines:
  - The diagnostic reference level ($CTDI_{vol}$) is 35 mGy.
  - The pass/fail limit ($CTDI_{vol}$) is 40 mGy.
  - These two values are for a routine head exam of a 1-year-old patient.
  - Volume CTDI values for an individual patient with unique indications may be different (higher or lower).
- **Patient doses to the head are not expressed as a Size Specific Dose Estimate (SSDE) because SSDE has not yet been defined for the head.**

NOTE: All volume CTDI values are for the 16-cm diameter CTDI phantom.

PATIENT POSITIONING:

- Patient should be placed supine, head first into the gantry, with the head in the head-holder whenever possible.
- Table height should be set such that the external auditory meatus (EAM) is at the center of the gantry.
- To reduce or avoid ocular lens exposure, the scan angle should be parallel to a line created by the supraorbital ridge and the inner table of the posterior margin of the foramen magnum. This may be accomplished by either tilting the patient's chin toward the chest ("tucked" position) or tilting the gantry. While there may be some situations where this is not possible due to scanner or patient positioning limitations, or contraindications to tilting of the head, it is considered good practice to try to perform one or both of these maneuvers whenever possible. Some newer scanners may allow helical acquisitions to be performed while the gantry is tilted.
- Immobilization strategies should be used to minimize patient motion – this is essential to acquiring quality images
- If lead shielding is used it must be positioned well away from the scan range
- Bismuth shields are easy to use and have been shown to reduce dose to anterior organs in CT scanning. However, there are several disadvantages associated with the use of bismuth shields, especially when used with automatic exposure control or tube current modulation. Other techniques exist that can provide the same level of anterior dose reduction at equivalent or superior image quality that do not have these disadvantages. The AAPM recommends that these alternatives to bismuth shielding be carefully considered, and implemented when possible. More information can be found here.

SCAN RANGE: Foramen magnum through top of calvarium.

CONTRAST:

- **Oral**: None.
- **Injected**: Some indications require injection of intravenous or intrathecal contrast media during imaging of the brain.
- Intravenous contrast administration should be performed as directed by the supervising radiologist using appropriate injection protocols and in accordance with the *ACR-SPR Practice Parameter for the Use of Intravascular Contrast Media*.
- Contrast administration for pediatrics is typically based on patient size.

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

AXIAL VERSUS HELICAL SCAN MODE (both are provided in the following sample protocols):
There are advantages and disadvantages to using either axial or helical scans for routine head CT exams. ***The decision as to whether to use axial or helical should be influenced by the specific patient indication, scanner capabilities, and image quality requirements.*** Users of this document should consider the information in the following table and consult with both the manufacturer[1] and a medical physicist to assist in determining which mode to use.

AXIAL SCANS	CHARACTERISTICS	HELICAL SCANS
Longer	Acquisition Time	Shorter
Less artifacts in some cases, especially for < 16 detector row scanners – motion artifacts more likely due to longer scan times	Artifacts	More artifacts for < 16 detector row scanners; close to or equivalent to axial for ≥ 64 detector row scanners – motion artifacts less likely due to shorter scan times, and therefore less need for repeats
Better in some cases, especially for < 16 detector row scanners	Image Quality	Equivalent in most cases; close to or equivalent to axial for ≥ 64 detector row scanners
Depends more on protocol than on axial or helical mode of acquisition	Radiation Dose	Depends more on protocol than on axial or helical mode of acquisition
Present in both helical and axial scans	Over Beaming (x-ray beam extending beyond the edge of active detector rows)	Present in both helical and axial scans
None or very little over ranging (limited to that caused by over beaming)	Over Ranging (irradiation of tissue inferior and superior to desired scan range)	Helical scans all have over ranging[2]. Some scanners have features that minimize this. Scan range may extend to thyroid and/or orbit regions.
Detector configuration is often narrower than for body scans	Detector Configuration (N x T mm)	Detector configuration is often narrower than for body scans
Gantry can be tilted	Gantry Tilt	Gantry cannot be tilted on some scanners
Limited to thicknesses allowed by detector configuration	Image Thickness	Limited to thicknesses allowed by detector configuration
Limited to only a few commercial CT systems	Multiplanar Reformation Capability	Coronal and sagittal reformations possible on nearly every CT system with 16 or more detector rows

[1]*Manufacturers may have recommendations for specific scanner models regarding use of axial versus helical for routine head CT. Please consult manufacturer specific protocols below (if a scan mode is not recommended, this will be noted).*

[2]*The amount of tissue inferior and superior to the prescribed scan range that is irradiated by over ranging can vary, depending on the scanner model and how the scan is performed (pitch value, collimation, etc.).*

ADULT VERSUS PEDIATRIC PROTOCOL SELECTION:
Because of differences in size and attenuation, manufacturers have created specific reference protocols for children where technical parameters have been adjusted according to the physical characteristics of children. **Thus, it is recommended that users select pediatric reference protocols when scanning children, rather than selecting adult reference protocols and simply scaling technique factors (e.g. kV, mAs).**

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

ROUTINE PEDIATRIC HEAD (BRAIN) *(continued)*

Additional Discussion*:*

- Pediatric imaging practices have evolved since Image Gently published pediatric CT technique scale factors in 2008. The 2008 scale factors were designed to deliver an average dose to soft tissue of pediatric heads equal to the facility's average dose to soft tissues of an adult head.
- In October, 2014 [1], Strauss published in *Pediatric Radiology* new and detailed pediatric scale factors to be applied to adult head, thorax, and abdomen/pelvis CT protocols. These scale factors replace those published by Image Gently in 2008 in order to reflect current pediatric image practices.
- The tables within the *Pediatric Radiology* manuscript are published on the Image Gently website.
- The 2014 scale factors use a volume CTDI of less than 35 mGy for a head exam in a one year-old child. This aligns the Image Gently scale factors with the ACR CT Accreditation Program's pediatric head reference level.
- Only five patient sizes are used for head exams. The head size of a one and five year-old child is approximately 80% and 90% of an adult's head size, respectively.
- Strauss' article provides details on how to create appropriate pediatric CT protocols for various exam types. Other resource materials can be found at the Image Gently website.
- More aggressive dose reduction may be used for examinations that can tolerate higher noise, e.g. shunt evaluation. In these cases, a radiologist and a qualified medical physicist should work together to assure adequate image quality and appropriate dose reduction.
- The technique factor tables in this document are based on the application of Strauss' 2014 scale factors and the previously published AAPM WGCTNP Routine Adult Head CT protocols (available here). However, some CT manufacturers have developed advanced features specifically designed for pediatric applications, and the WGCTNP has worked with the manufacturers to incorporate these features into the protocols that follow.
- Adjusting the tube potential (kV) and/or image reconstruction thickness, either from these protocols or the manufacturer-provided reference protocols, should only be done with the assistance of a qualified medical physicist and a radiologist. Shorter rotation times should be considered if the required tube current-time product (mAs) can be reached at the shorter rotation time (focal spot size may also be a factor in this case).

The purpose of this document is to provide safe and reasonable starting points for routine pediatric head CT protocols. *The provided parameters are not necessarily the same as those from the manufacturers' reference protocols, primarily so that the same age brackets could be used across manufacturers, each of which adjust to individual patient size or age differently. Thus, while we consider these parameters to be reasonable and safe, not all parameter combinations have been tested by the manufacturers.*

[1] Strauss, KJ. Developing patient-specific dose protocols for a CT scanner and exam using diagnostic reference levels. Pediatr Radiol (2014) 44 (SUPPL 3):S479-S488. DOI 10.1007/s00247-014-3088-8

Additional Resources

Image Gently website
ACR–ASNR Practice Guideline For The Performance Of Computed Tomography (CT) Of The Brain, http://www.acr.org/Quality-Safety/Standards-Guidelines/Practice-Guidelines-by-Modality/CT.
ACR CT Accreditation Program information, including Clinical Image Guide and Phantom Testing Instructions, http://www.acraccreditation.org/Modalities/CT.

INDEX OF ROUTINE PEDIATRIC HEAD PROTOCOLS

AXIAL / SEQUENTIAL scan protocols (by manufacturer)

HELICAL / SPIRAL scan protocols (by manufacturer)

PEDIATRIC HEAD – ROUTINE (AXIAL) (selected GE scanners)

(Back to INDEX)

SCOUT: Lateral, 120 kVp, 40 mA, from base of skull through vertex, angle to Reid's baseline to avoid orbits

GE	LightSpeed 16 BrightSpeed 16	LightSpeed Pro 16	Optima CT660	Optima CT660 w/ASiR
Scan Type	AXIAL	AXIAL	AXIAL	AXIAL
Rotation Time (s)	1*	1*	1*	1*
Detector Configuration	16 x 0.625 (10mm, 8i)	16 x 0.625 (10mm, 8i)	32 x0.625 (20mm, 8i)	32 x0.625 (20mm, 8i)
Table Feed/Interval (mm)	10	10	20	20
kV	120	120	120	120
Manual mA approach	0-1yr: 110 1-2yrs: 130 2-6yrs: 170 6-16yrs: 220 16+yrs: 280	0-1yr: 110 1-2yrs: 130 2-6yrs: 170 6-16yrs: 220 16+yrs: 280	0-1yr: 150 1-2yrs: 190 2-6yrs: 250 6-16yrs: 315 16+yrs: 400	0-1yr: 100 1-2yrs: 125 2-6yrs: 165 6-16yrs: 210 16+yrs: 265
Auto-mA approach	Not recommended	Not recommended	Not recommended	Not recommended
SFOV	HEAD	HEAD	HEAD	HEAD
ASiR	no	no	no	SS30
CTDI-vol (mGy)	0-1yr: 21.8 1-2yrs: 27.0 2-6yrs: 36.4 6-16yrs: 45.7 16+yrs: 58.2	0-1yr: 23.6 1-2yrs: 29.2 2-6yrs: 39.3 6-16yrs: 49.3 16+yrs: 62.8	0-1yr: 26.8 1-2yrs: 34.0 2-6yrs: 44.7 6-16yrs: 56.3 16+yrs: 71.6	0-1yr: 17.9 1-2yrs: 22.4 2-6yrs: 29.5 6-16yrs: 37.6 16+yrs: 47.4
Recon 1				
Plane	Axial	Axial	Axial	Axial
Algorithm	Stnd	Stnd	Stnd	Stnd
Recon Mode	Full	Full	Full	Full
ASiR	None	None	None	SS40
Thickness (mm)	5	5	5	5
Interval (mm)	5	5	5	5
Recon 2				
Plane	Axial	Axial	Axial	Axial
Algorithm	Bone	Bone	Bone	Bone
Recon Mode	Full	Full	Full	Full
ASiR	None	None	None	SS30
Thickness (mm)	5	5	5	5
Interval (mm)	5	5	5	5

* Shorter rotation times should be considered if the required tube current-time product (mAs) can be reached.

PEDIATRIC HEAD – ROUTINE (AXIAL) (selected GE scanners)

(Back to INDEX)

SCOUT: Lateral, 120 kVp, 40 mA, from base of skull through vertex, angle to Reid's baseline to avoid orbits

GE	LightSpeed VCT	Discovery CT750 HD	LightSpeed VCT w/ASIR	Discovery CT750 HD w/ASIR
Scan Type	AXIAL	AXIAL	AXIAL	AXIAL
Rotation Time (s)	1*	1*	1*	1*
Detector Configuration	32 x 0.625 (20 mm, 8i)	32 x 0.625 (20 mm, 8i)	32 x 0.625 (20 mm, 8i)	32 x 0.625 (20 mm, 8i)
Table Feed/Interval (mm)	20	20	20	20
kV	120	120	120	120
Manual mA approach	0-1yr: 115 1-2yrs: 140 2-6yrs: 185 6-16yrs: 240 16+yrs: 300	0-1yr: 120 1-2yrs: 150 2-6yrs: 200 6-16yrs: 250 16+yrs: 320	0-1yr: 85 1-2yrs: 105 2-6yrs: 135 6-16yrs: 175 16+yrs: 220	0-1yr: 95 1-2yrs: 115 2-6yrs: 150 6-16yrs: 195 16+yrs: 245
Auto-mA approach	Not recommended	Not recommended	Not recommended	Not recommended
SFOV	HEAD	HEAD	HEAD	HEAD
ASiR	no	no	SS30	SS30
CTDI-vol (mGy)	0-1yr: 23.5 1-2yrs: 28.7 2-6yrs: 37.9 6-16yrs: 49.1 16+yrs: 61.4	0-1yr: 24.0 1-2yrs: 30.0 2-6yrs: 39.9 6-16yrs: 49.9 16+yrs: 63.9	0-1yr: 16.3 1-2yrs: 20.1 2-6yrs: 25.8 6-16yrs: 33.5 16+yrs: 42.1	0-1yr: 19.0 1-2yrs: 23.0 2-6yrs: 29.9 6-16yrs: 38.9 16+yrs: 48.9
Recon 1				
Plane	Axial	Axial	Axial	Axial
Algorithm	Stnd	Stnd	Stnd	Stnd
Recon Mode	Full	Full	Full	Full
Thickness (mm)	5	5	5	5
Interval (mm)	5	5	5	5
Recon 2				
Plane	Axial	Axial	Axial	Axial
Algorithm	Bone	Bone	Bone	Bone
Recon Mode	Full	Full	Full	Full
Thickness (mm)	5	5	5	5
Interval (mm)	5	5	5	5

* Shorter rotation times should be considered if the required tube current-time product (mAs) can be reached.

PEDIATRIC HEAD – ROUTINE (AXIAL) (selected HITACHI scanners)

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SCANOGRAM: Lateral, 120 kVp, 40 mA, from base of skull through vertex, angle to Reid's baseline to avoid orbits

HITACHI	CXR4	ECLOS 16	Scenaria 64
Scan Type	Axial (Normal)	Axial (Normal)	Axial (Normal)
Rotation Time (s)	1.0*	1.0*	1.0*
Detector Configuration	2i (2.5 x 4)	0.625x16	0.625 x 32
Table Feed (mm)	10	10	20
kVp	120	120	120
Manual mA approach	0-1yr: 115 1-2yrs: 140 2-6yrs: 185 6-16yrs: 235 16+yr: 300	0-1yr: 95 1-2yrs: 120 2-6yrs: 155 6-16yrs: 200 16+yr: 250	0-1yr: 115 1-2yrs: 140 2-6yrs: 185 6-16yrs: 235 16+yr: 300
Adaptive mA/IntelliEC	Not recommended	Not recommended	Not recommended
SFOV (mm)	240	240	240
CTDI-vol (mGy)	0-1yr: 22.8 1-2yrs: 27.8 2-6yrs: 36.7 6-16yrs: 46.6 16+yr: 59.5	0-1yr: 18.9 1-2yrs: 23.9 2-6yrs: 30.8 6-16yrs: 39.8 16+yr: 49.7	0-1yr: 20.0 1-2yrs: 24.3 2-6yrs: 32.1 6-16yrs: 40.8 16+yr: 52.1

Multi-Recon 1

Series Description	Brain Routine	Brain Routine	Brain Routine
Type	Axial	Axial	Axial
Start	Base of Skull	Base of Skull	Base of Skull
End	Top of Head	Top of Head	Top of Head
Gantry Angle	None	None	None
Image Order	Inferior to Sup.	Inferior to Sup.	Inferior to Sup.
Image Filter	Head STD 1	Head STD 12	Head STD 12
Slice Thickness (mm)	5	5	5
Interval (mm)	5	5	5

Multi-Recon 2

Series Description	Bone	Bone	Bone
Type	Axial	Axial	Axial
Start	Base of Skull	Base of Skull	Base of Skull
End	Top of Head	Top of Head	Top of Head
Gantry Angle	None	None	None
Image Order	Inferior to Superior	Inferior to Superior	Inferior to Superior
Image Filter	Lung/Bone 9	Bone 42	Bone 42
Slice Thickness (mm)	2.5	2.5	2.5
Interval (mm)	2.5	2.5	2.5

* Shorter rotation times should be considered if the required tube current-time product (mAs) can be reached.

PEDIATRIC HEAD – ROUTINE (AXIAL) (selected NEUSOFT scanners)

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SURVIEW: Lateral, 120 kVp, 40 mA, from base of skull through vertex, angle to Reid's baseline to avoid orbits

NEUSOFT	NeuViz 64i/e with ClearView	NeuViz 16
Scan Type	Axial	Axial
Rotation Time (s)	1*	1.5*
Collimation	32 x 0.625***	12 x 1.5 mm**
kVp	120	120
Reference mAs	0-1yr: 105 1-2yrs: 130 2-6yrs: 175 6-16yrs: 220 16+yrs: 280	0-1yr: 135 1-2yrs: 170 2-6yrs: 225 6-16yrs: 285 16+yrs: 360
Pitch	N/A	N/A
FOV (mm)	250	250
Resolution	Standard	Standard
Dose Modulation	O-Dose	n/a
ClearView	30%	N/A
CTDIvol (mGy)	0-1yr: 14.6 1-2yrs: 18.0 2-6yrs: 24.3 6-16yrs: 30.5 16+yrs: 38.8	0-1yr: 21.5 1-2yrs: 27.1 2-6yrs: 35.8 6-16yrs: 45.4 16+yrs: 57.3

RECON 1

Type	Axial	Axial
Filter	F20	SB
Thickness (mm)	5	4.5
Increment (mm)	5	4.5

RECON 2

Type	Axial Bone	Axial Bone
Filter	F60	EB
Thickness (mm)	5	4.5
Increment (mm)	5	4.5

* Shorter rotation times should be considered if the required tube current-time product (mAs) can be reached.
**Flying focal spot techniques is used to obtain twice as many projections with x-y deflection.
***Quad Sampling- Indicates that a z-axis "flying focal spot" technique is used to obtain twice as many projections as detector rows. Simultaneous x-y deflection is also incorporated.

PEDIATRIC HEAD – ROUTINE (AXIAL) (selected PHILIPS scanners)

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SURVIEW: Lateral, 120 kVp, 40 mA, from base of skull through vertex, angle to Reid's baseline to avoid orbits

PHILIPS	Brilliance 16 slice	Brilliance 64 channel	Ingenuity CT	Brilliance iCT SP	Brilliance iCT
Scan Type	Axial	Axial	Axial	Axial	Axial
Rotation Time (s)	1.0/1.5*	0.75/1.5*	0.75/1.5*	0.4/0.5*	0.4/0.5*
Collimation	16 × 1.5 mm	16 × 0.625 mm	16 × 0.625 mm	16 × 0.625 mm	16 × 0.625 mm
kV	100	100	100	100	100
Manual mAs approach	0-1yr: 240 1-2yrs: 300 2-6yrs: 400 6-16yrs: 500 16+yr: 640	0-1yr: 215 1-2yrs: 260 2-6yrs: 340 6-16yrs: 440 16+yr: 550	0-1yr: 215 1-2yrs: 260 2-6yrs: 340 6-16yrs: 440 16+yr: 550	0-1yr: 180 1-2yrs: 220 2-6yrs: 300 6-16yrs: 375 16+yr: 480	0-1yr: 180 1-2yrs: 220 2-6yrs: 300 6-16yrs: 375 16+yr: 480
AEC approach	Not recommended	Not recommended	Infant DRI = 33 Child DRI = 36	Infant DRI = 33 Child DRI = 36	Infant DRI = 33 Child DRI = 36
Couch Increment (mm)	24	10	10	10	10
FOV (mm)	250	250	250	250	250
CTDI-vol (mGy)	0-1yr: 17.7 1-2yrs: 22.1 2-6yrs: 29.6 6-16yrs: 36.9 16+yr: 47.2	0-1yr: 20.8 1-2yrs: 25.2 2-6yrs: 32.9 6-16yrs: 42.6 16+yr: 53.2	0-1yr: 20.8 1-2yrs: 25.2 2-6yrs: 32.9 6-16yrs: 42.6 16+yr: 53.2	0-1yr: 20.2 1-2yrs: 24.7 2-6yrs: 33.7 6-16yrs: 42.1 16+yr: 53.9	0-1yr: 20.2 1-2yrs: 24.7 2-6yrs: 33.7 6-16yrs: 42.1 16+yr: 53.9
RECON 1					
Type	Axial	Axial	Axial	Axial	Axial
Reconstruction Filter	UB	UB	UB	UB	UB
Thickness (mm)	6	5	5	5	5
Increment (mm)	6	5	5	5	5
RECON 2					
Type	Axial	Axial	Axial	Axial	Axial
Reconstruction Filter	YB/YD	YB/YD	YB/YD	YB/YD	YB/YD
Thickness (mm)	6	5	5	5	5
Increment (mm)	6	5	5	5	5

* Shorter rotation times should be considered if the required tube current-time product (mAs) can be reached.

PEDIATRIC HEAD – ROUTINE (SEQUENTIAL) (selected SIEMENS scanners)

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TOPOGRAM: Lateral, 120 kVp, 40 mA, from base of skull through vertex, angle to Reid's baseline to avoid orbits

GENERAL: Scans are provided within a maximum scan field of 300 mm with respect to the iso-center. No recon job with a field of view exceeding those limits will be possible.
Gantry tilt is available for sequence scanning, not for spiral scanning. Gantry tilt is not available for dual source scanners. Use Kernel C30s for reconstructing **Neonate** scans.

Note: Users may select a manual approach or an AEC approach, according to their site's preference.

- Manual – scaling factors according to [1] are applied to an equivalent adult protocol. Tube voltage setting is kept constant.
- AEC – manufacturer recommended setting, where the exposure (mAs- as well as kV-value, if available) is automatically adjusted to patient attenuation

SIEMENS	Emotion 16	Sensation 64	Perspective 64	Definition Dual Source
Rotation Time (s)	1.5*	1.0*	1.0*	1.0*
Detector Configuration	2 x 5	24 x 1.2	32 x 0.6	24 x 1.2
Manual Approach				
Manual kV approach	110	120	110	120
Manual mAs approach	0-1yr: 175 1-2yrs: 220 2-6yrs: 290 6-16yrs: 365 16+yr: 464	0-1yr: 165 1-2yrs: 200 2-6yrs: 265 6-16yrs: 340 16+yr: 430	0-1yr: 145 1-2yrs: 180 2-6yrs: 235 6-16yrs: 300 16+yr: 378	0-1yr: 160 1-2yrs: 195 2-6yrs: 260 6-16yrs: 330 16+yr: 420
CTDIvol(mGy)	0-1yr: 22.3 1-2yrs: 28.0 2-6yrs: 36.9 6-16yrs: 46.4 16+yr: 59	0-1yr: 23.0 1-2yrs: 27.9 2-6yrs: 37.0 6-16yrs: 47.4 16+yr: 60	0-1yr: 26.5 1-2yrs: 32.9 2-6yrs: 42.9 6-16yrs: 54.8 16+yr: 69	0-1yr: 22.5 1-2yrs: 27.4 2-6yrs: 36.5 6-16yrs: 46.4 16+yr: 59
AEC Approach				
CARE Dose4D	ON	ON	ON	ON
Quality.ref.mAs	464	190 [f]	378	420
CARE kV	N/A (use kV from manual approach)	N/A (use kV from manual approach)	N/A (use kV from manual approach)	[c]ON
CTDI vol (mGy)	30 (with 232 mAs) [e]	26.5 (with 190 mAs) [e]	35 (with 189 mAs) [e]	30 (with 210) [e]

RECON 1

Type	Axial – Soft Tissue	Axial – Soft Tissue	Axial – Soft Tissue	Axial – Soft Tissue
Kernel	H31	H31	H31 J30(2) [d]	H31 J30(2) [d]
Slice (mm)	5	5	5	4.8
Increment (mm)	5	5	5	-

RECON 2

Type	Axial – Bone	Axial – Bone	Axial – Bone	Axial – Bone
Kernel	H60	H60	H60 J70(2) [d]	H60 J70(2) [d]
Slice (mm)	5	5	5	4.8
Increment (mm)	5	5	5	-

* Shorter rotation times should be considered if the required tube current-time product (mAs) can be reached.
[a] indicates that a z-axis "flying focal spot" technique is used to obtain twice as many projections per rotation as detector rows
[b] with IVR (Interleaved Volume Reconstruction) to improve spatial resolution
[c] if scanner is equipped with automatic kV selection (CARE kV), this should be activated by selecting "On". For head exams, a "Dose saving optimized for" slider position of 3 is recommended
[d] with ADMIRE, SAFIRE or IRIS
[e] CTDIvol will be generated upon acquisition of the topogram. CAREDose4D will adjust the mAs/eff. mAs to the patient based on the topogram. CTDIvol values for any given patient should be comparable or lower than the values associated with the manual mAs and kV approach. The value in brackets is the value for a 20 kg/5y ears old child.

PEDIATRIC HEAD – ROUTINE (SEQUENTIAL) (selected SIEMENS scanners)

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TOPOGRAM: Lateral, 120 kVp, 40 mA, from base of skull through vertex, angle to Reid's baseline to avoid orbits

GENERAL: Scans are provided within a maximum scan field of 300 mm with respect to the iso-center. No recon job with a field of view exceeding those limits will be possible.
Gantry tilt is available for sequence scanning, not for spiral scanning. Gantry tilt is not available for dual source scanners. Use Kernel C30s for reconstructing **Neonate** scans.

Note: Users may select a manual approach or an AEC approach, according to their site's preference.

- Manual – scaling factors according to [1] are applied to an equivalent adult protocol. Tube voltage setting is kept constant.
- AEC – manufacturer recommended setting, where the exposure (mAs-as well as kV-value, if available) is automatically adjusted to patient attenuation

SIEMENS	Perspective 128	Definition AS+/ Edge (128-slice)	Definition Flash (Dual source 128-slice)	Somatom Force (Dual source 192-slice)
Rotation Time (s)	1.0*	1.0*	1.0*	1.0*
Detector Configuration	32 x 0.6	[a]128 × 0.6 (64 x 0.6 = 38.4)	[a]128 × 0.6 (64 x 0.6 = 38.4)	[a]192 x 0.6 (96 x 0.6 = 57.6)
Manual Approach				
Manual kV approach	110	100	100	100
Manual mAs approach	0-1yr: 145 1-2yrs: 180 2-6yrs: 235 6-16yrs: 300 16+yr: 378	0-1yr: 220 1-2yrs: 275 2-6yrs: 360 6-16yrs: 460 16+yr: 582	0-1yr: 220 1-2yrs: 275 2-6yrs: 360 6-16yrs: 460 16+yr: 582	0-1yr: 155 1-2yrs: 190 2-6yrs: 250 6-16yrs: 320 16+yr: 407
CTDIvol(mGy)	0-1yr: 26.5 1-2yrs: 32.9 2-6yrs: 42.9 6-16yrs: 54.8 16+yr: 69	0-1yr: 21.2 1-2yrs: 26.5 2-6yrs: 34.6 6-16yrs: 44.3 16+yr: 56	0-1yr: 23.4 1-2yrs: 29.3 2-6yrs: 38.4 6-16yrs: 38.4 16+yr: 62	0-1yr: 16.8 1-2yrs: 20.5 2-6yrs: 27.0 6-16yrs: 34.6 16+yr: 44
AEC Approach				
CARE Dose4D	ON	ON	ON	ON
Quality.ref.mAs	378	582	582	495 [d]
CARE kV	N/A (use kV from manual approach)	[c]ON	[c]ON	[c]ON
CTDI vol (mGy)	35 (with 189 mAs) [e]	28 (with 291 mAs) [e]	31 (with 291 mAs) [e]	22 (with 204 mAs) [e]

RECON 1

Type	Axial – Soft Tissue	Axial – Soft Tissue	Axial – Soft Tissue	Axial – Soft Tissue
Kernel	H31 J30(2) [d]	H31 J30(2) [d]	H31 J30(2) [d]	Hr40(3) [d]
Slice (mm)	5.0	6.0	5.0	5.0
Increment (mm)	5.0	6.0	5.0	5.0

RECON 2

Type	Axial – Bone	Axial – Bone	Axial – Bone	Axial – Bone
Kernel	H60 J70(2) [d]	H60 J70(2) [d]	H60 J70(2) [d]	Hr59(3) [d]
Slice (mm)	5.0	6.0	5.0	5.0
Increment (mm)	5.0	6.0	5.0	5.0

* Shorter rotation times should be considered if the required tube current-time product (mAs) can be reached.
[a] indicates that a z-axis "flying focal spot" technique is used to obtain twice as many projections per rotation as detector rows
[b] with IVR (Interleaved Volume Reconstruction) to improve spatial resolution
[c] if scanner is equipped with automatic kV selection (CARE kV), this should be activated by selecting "On". For head exams, a "Dose saving optimized for" slider position of 3 is recommended
[d] with ADMIRE, SAFIRE or IRIS
[e] CTDIvol will be generated upon acquisition of the topogram. CARE Dose4D will adjust the mAs/eff. mAs to the patient based on the topogram. CTDIvol values for any given patient should be comparable or lower than the values associated with the manual mAs and kV approach. The value in brackets is the value for a 20 kg/5 years old child.

PEDIATRIC HEAD – ROUTINE (AXIAL) (TOSHIBA)

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Toshiba does not recommend axial CT scanning for pediatric routine head exams. Therefore, only helical protocols are provided.

PEDIATRIC HEAD – ROUTINE (HELICAL) (selected GE scanners)

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SCOUT: Lateral, 120 kVp, 40 mA, from base of skull through vertex, angle to Reid's baseline to avoid orbits

GE	Optima CT660 w/ASiR	LightSpeed VCT	Discovery CT750 HD	LightSpeed VCT w/ASIR	Discovery CT750 HD w/ASIR
Scan Type	Helical	Helical	Helical	Helical	Helical
Rotation Time (s)	0.8*	0.5*	0.5*	0.5*	0.5*
Detector Configuration	32 x 0.625	32 x 0.625	32 x 0.625	32 x 0.625	32 x 0.625
Pitch	0.531:1	0.531:1	0.531:1	0.531:1	0.531:1
Table Feed/Speed (mm/rot)	10.62	10.62	10.62	10.62	10.62
kV	120	120	120	120	120
Manual mA approach	0-1yr: 40 1-2yrs: 50 2-6yrs: 65 6-16yrs: 85 16+yr: 105	0-1yr: 115 1-2yrs: 140 2-6yrs: 185 6-16yrs: 235 16+yr: 300	0-1yr: 115 1-2yrs: 140 2-6yrs: 185 6-16yrs: 235 16+yr: 300	0-1yr: 80 1-2yrs: 100 2-6yrs: 135 6-16yrs: 170 16+yr: 215	0-1yr: 95 1-2yrs: 120 2-6yrs: 155 6-16yrs: 200 16+yr: 250
Auto-mA approach	Not recommended	Not recommended	Not recommended	Not recommended	Not recommended
SFOV	HEAD	HEAD	HEAD	HEAD	HEAD
ASiR	SS30	no	no	SS30	SS30
CTDI-vol (mGy)	0-1yr: 13.1 1-2yrs: 16.4 2-6yrs: 21.4 6-16yrs: 27.9 16+yr: 34.5	0-1yr: 20.8 1-2yrs: 25.3 2-6yrs: 33.4 6-16yrs: 42.5 16+yr: 54.2	0-1yr: 21.0 1-2yrs: 25.6 2-6yrs: 33.9 6-16yrs: 43.0 16+yr: 54.9	0-1yr: 14.4 1-2yrs: 18.0 2-6yrs: 24.4 6-16yrs: 30.7 16+yr: 38.8	0-1yr: 17.4 1-2yrs: 21.9 2-6yrs: 28.3 6-16yrs: 36.6 16+yr: 45.7
Recon 1					
Plane	Axial	Axial	Axial	Axial	Axial
Algorithm	Stnd	Stnd	Stnd	Stnd	Stnd
Recon Mode	Plus	Plus	Plus	Plus	Plus
Thickness (mm)	5	5	5	5	5
Interval (mm)	5	5	5	5	5
Recon 2					
Plane	Axial	Axial	Axial	Axial	Axial
Algorithm	Bone	Bone	Bone	Bone	Bone
Recon Mode	Full	Full	Full	Full	Full
Thickness (mm)	5	5	5	5	5
Interval (mm)	5	5	5	5	5

PEDIATRIC HEAD – ROUTINE (HELICAL) (selected HITACHI scanners)

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SCANOGRAM: Lateral, 120 kVp, 40 mA, from base of skull through vertex, angle to Reid's baseline to avoid orbits

HITACHI	CXR4	ECLOS 16	Scenaria 64
Scan Type	Helical (Volume)	Helical (Volume)	Helical (Volume)
Rotation Time (s)	0.8*	1.0*	1.0*
Detector Configuration	1.25 x 4	0.625 x 16	0.625 x 32
Pitch	1.25	1.0625	1.0938
Table Speed (mm/rot)	6.25	10.63	21.875
kVp	120	120	120
Manual mA approach	0-1yr: 135 1-2yrs: 165 2-6yrs: 215 6-16yrs: 275 16+yrs: 350	0-1yr: 115 1-2yrs: 140 2-6yrs: 185 6-16yrs: 235 16+yrs: 300	0-1yr: 115 1-2yrs: 140 2-6yrs: 185 6-16yrs: 235 16+yrs: 300
Adaptive mA/IntelliEC	Not recommended	Not recommended	Not recommended
SFOV (mm)	240	240	240
CTDI-vol (mGy)	0-1yr: 17.1 1-2yrs: 20.9 2-6yrs: 27.3 6-16yrs: 34.9 16+yrs: 44.4	0-1yr: 21.5 1-2yrs: 26.2 2-6yrs: 34.6 6-16yrs: 43.9 16+yrs: 56.1	0-1yr: 17.1 1-2yrs: 20.8 2-6yrs: 27.5 6-16yrs: 34.9 16+yrs: 44.6
Multi-Recon 1			
Series Description	Brain Routine	Brain Routine	Brain Routine
Type	Axial	Axial	Axial
Start	Base of Skull	Base of Skull	Base of Skull
End	Top of Head	Top of Head	Top of Head
Gantry Angle	None	None	None
Image Order	Inferior to Sup.	Inferior to Sup.	Inferior to Sup.
Image Filter	Head STD 1	Head STD 12	Head STD 12
Slice Thickness (mm)	5	5	5
Interval (mm)	5	5	5
Multi-Recon 2			
Series Description	Bone	Bone	Bone
Type	Axial	Axial	Axial
Start	Base of Skull	Base of Skull	Base of Skull
End	Top of Head	Top of Head	Top of Head
Gantry Angle	None	None	None
Image Order	Inferior to Sup.	Inferior to Sup.	Inferior to Sup.
Image Filter	Lung/Bone 9	Bone 42	Bone 42
Slice Thickness (mm)	2.5	2.5	2.5
Interval (mm)	2.5	2.5	2.5

* Shorter rotation times should be considered if the required tube current-time product (mAs) can be reached.

PEDIATRIC HEAD – ROUTINE (HELICAL) (selected NEUSOFT scanners)

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SURVIEW: Lateral, 120 kVp, 40 mA, from base of skull through vertex, angle to Reid's baseline to avoid orbits

NEUSOFT	NeuViz64i/e with ClearView	NeuViz 16
Scan Type	Helical	Helical
Rotation Time (s)	0.8*	1*
Collimation	32 x 0.625***	16 x 1.5 mm**
kVp	120	120
Reference mAs	0-1yr: 115 1-2yrs: 140 2-6yrs: 185 6-16yrs: 235 16+yrs: 300	0-1yr: 140 1-2yrs: 175 2-6yrs: 230 6-16yrs: 295 16+yrs: 375
Pitch	0.8	0.67
FOV (mm)	250	250
Resolution	Standard	Standard
Dose Modulation	O-Dose	n/a
ClearView	30%	n/a
CTDIvol (mGy)	0-1yr: 17.5 1-2yrs: 21.3 2-6yrs: 28.2 6-16yrs: 35.8 16+yrs: 45.7	0-1yr: 21.5 1-2yrs: 26.8 2-6yrs: 35.3 6-16yrs: 45.4 16+yrs: 57.5

RECON 1

Type	Recon Soft Tissue	Recon Soft Tissue
Filter	F20	SB
Thickness (mm)	5	5
Increment (mm)	5	5

RECON 2

Type	Recon Bone	Recon Bone
Filter	F60	EB
Thickness (mm)	5	5
Increment (mm)	5	5

* Shorter rotation times should be considered if the required tube current-time product (mAs) can be reached.
**Flying focal spot techniques is used to obtain twice as many projections with x-y deflection.
***Quad Sampling- Indicates that a z-axis "flying focal spot" technique is used to obtain twice as many projections as detector rows. Simultaneous x-y deflection is also incorporated.

PEDIATRIC HEAD – ROUTINE (HELICAL) (selected PHILIPS scanners)

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SURVIEW: Lateral, 120 kVp, 40 mA, from base of skull through vertex, angle to Reid's baseline to avoid orbits

PHILIPS	Brilliance 16 slice	Brilliance 64 channel	Ingenuity CT	Brilliance iCT SP	Brilliance iCT
Scan Type	Helical	Helical	Helical	Helical	Helical
Rotation Time (s)	0.5	0.4/0.5*	0.4/0.5*	0.4	0.4
Collimation	16 × 0.75 mm	64 × 0.625 mm	64 × 0.625 mm	64 × 0.625 mm	64 × 0.625 mm
kV	100	100	100	100	100
Manual mAs/slice approach	0-1yr: 215 1-2yrs: 260 2-6yrs: 340 6-16yrs: 440 16+yrs: 560	0-1yr: 240 1-2yrs: 300 2-6yrs: 400 6-16yrs: 500 16+yrs: 640	0-1yr: 240 1-2yrs: 300 2-6yrs: 400 6-16yrs: 500 16+yrs: 640	0-1yr: 240 1-2yrs: 300 2-6yrs: 400 6-16yrs: 500 16+yrs: 640	0-1yr: 240 1-2yrs: 300 2-6yrs: 400 6-16yrs: 500 16+yrs: 640
AEC approach	N/A	N/A	Infant DRI = 34 Child DRI = 37	Infant DRI = 34 Child DRI = 37	Infant DRI = 34 Child DRI = 37
Pitch	0.5	0.4	0.4	0.4	0.4
FOV (mm)	250	250	250	250	250
CTDI-vol (mGy)	0-1yr: 18.1 1-2yrs: 21.9 2-6yrs: 28.6 6-16yrs: 37.0 16+yrs: 47.1	0-1yr: 18.9 1-2yrs: 23.6 2-6yrs: 31.5 6-16yrs: 39.4 16+yrs: 50.4	0-1yr: 18.9 1-2yrs: 23.6 2-6yrs: 31.5 6-16yrs: 39.4 16+yrs: 50.4	0-1yr: 20.2 1-2yrs: 25.3 2-6yrs: 33.7 6-16yrs: 42.1 16+yrs: 53.9	0-1yr: 20.2 1-2yrs: 25.3 2-6yrs: 33.7 6-16yrs: 42.1 16+yrs: 53.9
RECON 1					
Type	Axial	Axial	Axial	Axial	Axial
Reconstruction Filter	HR / UB	HR / UB	HR / UB	HR / UB	HR / UB
Thickness (mm)	5	5	5	5	5
Increment (mm)	5	5	5	5	5
RECON 2					
Type	Axial	Axial	Axial	Axial	Axial
Reconstruction Filter	YD	YD	YD	YD	YD
Thickness (mm)	1	0.9	0.9	0.9	0.9
Increment (mm)	0.5	0.45	0.45	0.45	0.45

*Shorter rotation times should be considered if the required tube current-time product (mAs) can be reached.

PEDIATRIC HEAD – ROUTINE (SPIRAL) (selected SIEMENS scanners)

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TOPOGRAM: Lateral, 120 kVp, 40 mA, from base of skull through vertex, angle to Reid's baseline to avoid orbits

GENERAL: Scans are provided within a maximum scan field of 300 mm with respect to the iso-center. No recon job with a field of view exceeding those limits will be possible.
Gantry tilt is available for sequence scanning, not for spiral scanning. Gantry tilt is not available for dual source scanners. Use Kernel C30s for reconstructing **Neonate** scans.

Note: Users may select a manual approach or an AEC approach, according to their site's preference.

- Manual – scaling factors according to [1] are applied to an equivalent adult protocol. Tube voltage setting is kept constant.
- AEC – manufacturer recommended setting, where the exposure (mAs - as well as kV-value, if available) is automatically adjusted to patient attenuation

SIEMENS	Emotion 16	Sensation 64	Perspective 64	Definition Dual Source
Rotation time (s)	1.5*	1.0*	1.0*	1.0*
Detector Configuration (mm)	16 x 1.2	[a] [b] 64 x 0.6 (32 x0.6 = 19.2)	32 x 0.6	[a] 64 x 0.6 (32 x 0.6 = 19.2)
Pitch	0.55	0.85	0.55	0.80
Manual Approach				
Manual kV approach	110	120	110	120
Manual mAs approach	0-1yr: 1-2yrs: 2-6yrs: 189 6-16yrs: 16+yr: 378	0-1yr: 1-2yrs: 2-6yrs: 190 6-16yrs: 16+yr:380	0-1yr: 1-2yrs: 2-6yrs: 206 6-16yrs: 16+yr: 413	0-1yr: 1-2yrs: 2-6yrs: 195 6-16yrs: 16+yr: 390
CTDIvol (mGy)	0-1yr: 1-2yrs: 2-6yrs: 27 6-16yrs: 16+yr: 54	0-1yr: 1-2yrs: 2-6yrs: 29.8 6-16yrs: 16+yr: 59.7	0-1yr: 1-2yrs: 2-6yrs: 35 6-16yrs: 16+yr: 69	0-1yr: 1-2yrs: 2-6yrs: 30 6-16yrs: 16+yr: 59
AEC Approach				
CARE Dose4D	ON	ON	ON	ON
Quality ref. mAs	378	190[f]	413	390
CARE kV	N/A (use kV from manual approach)	N/A (use kV from manual approach)	N/A (use kV from manual approach)	[c] ON
CTDI vol (mGy)	27 (with 189 mAs) [e]	29.8 (with 190 mAs) [e]	35 (206 mAs) [e]	30 (with 195 mAs) [e]
RECON 1				
Kernel	H31	H31	H31 J30(2) [d]	H31 J30(2) [d]
Slice (mm)	5.0	5.0	5.0	5.0
Position increment (mm)	5.0	5.0	5.0	5.0
RECON 2				
Kernel	H60	H60	H60 J70(2) [d]	H60 J70(2) [d]
Slice (mm)	5.0	5.0	5.0	5.0
Position increment (mm)	5.0	5.0	5.0	5.0

* Shorter rotation times should be considered if the required tube current-time product (mAs) can be reached.
[a] indicates that a z-axis "flying focal spot" technique is used to obtain twice as many projections per rotation as detector rows
[b] with IVR (Interleaved Volume Reconstruction) to improve spatial resolution
[c] if scanner is equipped with automatic kV selection (CARE kV), this should be activated by selecting "On". For head exams, a "Dose saving optimized for" slider position of 3 is recommended
[d] with ADMIRE, SAFIRE or IRIS
[e] CTDIvol will be generated upon acquisition of the topogram. CARE Dose4D will adjust the mAs/eff. mAs to the patient based on the topogram. CTDIvol values for any given patient should be comparable or lower than the values associated with the manual mAs and kV approach. The value in brackets is the value for a 20 kg/5 years old child.

PEDIATRIC HEAD – ROUTINE (SPIRAL) (selected SIEMENS scanners)

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TOPOGRAM: Lateral, 120 kVp, 40 mA, from base of skull through vertex, angle to Reid's baseline to avoid orbits

GENERAL: Scans are provided within a maximum scan field of 300 mm with respect to the iso-center. No recon job with a field of view exceeding those limits will be possible.
Gantry tilt is available for sequence scanning, not for spiral scanning. Gantry tilt is not available for dual source scanners. Use Kernel C30s for reconstructing **Neonate** scans.

Note: Users may select a manual approach or an AEC approach, according to their site's preference.

- Manual – scaling factors according to [1] are applied to an equivalent adult protocol. Tube voltage setting is kept constant.
- AEC – manufacturer recommended setting, where the exposure (mAs- as well as kV-value, if available) is automatically adjusted to patient attenuation

SIEMENS	Perspective 128	Definition AS+/ Edge (128-slice)	Definition Flash (Dual source 128-slice)	Somatom Force (Dual source 192-slice)
Rotation time (s)	1.0*	1.0*	1.0*	1.0*
Detector Configuration (mm)	32 x 0.6	[a]128 × 0.6 (64 x 0.6 = 38.4)	[a]128 × 0.6 (64 x 0.6 = 38.4)	[a]192 x 0.6 (96 x 0.6 = 57.6)
Pitch	0.55	0.55	0.55	0.55
Manual Approach				
Manual kV approach	110	100	100	100
Manual mAs approach	0-1yr: 1-2yrs: 2-6yrs: 206 6-16yrs: 16+yr:413	0-1yr: 1-2yrs: 2-6yrs: 291 6-16yrs: 16+yr: 582	0-1yr: 1-2yrs: 2-6yrs: 291 6-16yrs: 16+yr: 582	0-1yr: 1-2yrs: 2-6yrs: 248 6-16yrs: 16+yr: 495 [d]
CTDIvol (mGy)	0-1yr: 1-2yrs: 2-6yrs: 35 6-16yrs: 16+yr: 69	0-1yr: 1-2yrs: 2-6yrs: 25 6-16yrs: 16+yr: 50	0-1yr: 1-2yrs: 2-6yrs: 25 6-16yrs: 16+yr: 56	0-1yr: 1-2yrs: 2-6yrs: 22 6-16yrs: 16+yr: 44
AEC Approach				
CARE Dose4D	On	On	On	On
Quality ref. mAs	413	582	582	495 [d]
CARE kV	N/A (use kV from manual approach)	[c]ON	[c]ON	[c]ON
CTDI vol (mGy)	35 (with 206 mAs) [e]	25 (with 291 mAs) [e]	25 (with 291 mAs) [e]	22 (with 248 mAs) [e]

RECON 1

Kernel	H31 J30(2) [d]	H31 J30(2) [d]	H31 J30(2) [d]	Hr40(3) [d]
Slice (mm)	5.0	5.0	5.0	5.0
Position increment (mm)	5.0	5.0	5.0	5.0

RECON 2

Kernel	H60 J70(2) [d]	H60 J70(2) [d]	H60 J70(2) [d]	Hr59(3) [d]
Slice (mm)	5.0	5.0	5.0	5.0
Position increment (mm)	5.0	5.0	5.0	5.0

* Shorter rotation times should be considered if the required tube current-time product (mAs) can be reached.
[a] indicates that a z-axis "flying focal spot" technique is used to obtain twice as many projections per rotation as detector rows
[b] with IVR (Interleaved Volume Reconstruction) to improve spatial resolution
[c] if scanner is equipped with automatic kV selection (CARE kV), this should be activated by selecting "On". For head exams, a "Dose saving optimized for" slider position of 3 is recommended
[d] with ADMIRE, SAFIRE or IRIS
[e] CTDIvol will be generated upon acquisition of the topogram. CAREDose4D will adjust the mAs/eff. mAs to the patient based on the topogram. CTDIvol values for any given patient should be comparable or lower than the values associated with the manual mAs and kV approach. The value in brackets is the value for a 20 kg/5years old child.

PEDIATRIC HEAD – ROUTINE (HELICAL) (selected TOSHIBA scanners)

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SCANOGRAM: Lateral, 120 kVp, 40 mA, from base of skull through vertex, angle to Reid's baseline to avoid orbits

TOSHIBA	Aq RXL	Aq 32	Aq 64	Aq PRIME	Aq Premium/ONE
Scan Type	Helical	Helical	Helical	Helical	Helical
*Rotation Time (s)	0.75*	0.75*	0.75*	0.75*	0.75*
Detector Configuration	16 x 0.5	32 x 0.5	32 x 0.5	40 x 0.5	32 x 0.5
CT Pitch Factor	Detail (0.688)	Detail (0.656)	Detail (0.656)	Detail (0.625)	Detail (0.656)
Speed (mm/rot)	5.5	10.5	10.5	12.5	N/A
kV	100 (0-2yrs) 120 (2+yrs)	100 (0-2yrs) 120 (2+yrs)	100 (0-2yrs) 120 (2+yrs)	100 (0-2yrs) 120 (2+yrs)	100 (0-2yrs) 120 (2+yrs)
Manual mA **0-2yrs, 100 kV**	0-1yr: 115 >1-2yrs: 145	0-1yr: 155 1-2yrs: 190	0-1yr: 155 1-2yrs: 190	0-1yr: 120 1-2yrs: 150	0-1yr: 230 1-2yrs: 280
Manual mA **2+yrs, 120 kV**	>2-6yrs: 125 >6-16yrs: 160 >16+yr: 200	2-6yrs: 150 6-16yrs: 190 16+yr: 240	2-6yrs: 150 6-16yrs: 190 16+yr: 240	2-6yrs: 135 6-16yrs: 175 16+yr: 220	2-6yrs: 125 6-16yrs: 160 16+yr: 200
SURE Exposure approach	Not recommended	Not recommended	Not recommended	Not recommended	Not recommended
AIDR 3D	AIDR 3D	AIDR 3D	AIDR 3D	AIDR 3D	AIDR 3D
Scan FOV	240mm (S)	240mm (S)	240mm (S)	240mm (S)	240mm (S)
CTDI-vol (mGy)	0-1yr: 20.1 1-2yrs: 25.3 2-6yrs: 33.3 6-16yrs: 42.6 16+yr: 53.3	0-1yr: 23.8 1-2yrs: 29.1 2-6yrs: 38.6 6-16yrs: 48.9 16+yr: 61.8	0-1yr: 23.8 1-2yrs: 29.1 2-6yrs: 38.6 6-16yrs: 48.9 16+yr: 61.8	0-1yr: 20.3 1-2yrs: 25.3 2-6yrs: 33.3 6-16yrs: 43.2 16+yr: 54.3	0-1yr: 22.2 1-2yrs: 27.1 2-6yrs: 36.2 6-16yrs: 46.3 16+yr: 57.9
VOLUME RECON - BRAIN					
Type	Volume	Volume	Volume	Volume	Volume
SURE IQ*	Pediatric Brain	Pediatric Brain	Pediatric Brain	Pediatric Brain	Pediatric Brain
Image Thickness (mm)	0.5	0.5	0.5	0.5	0.5
Reconstruction Interval (mm)	0.3	0.3	0.3	0.3	0.3
VOLUME RECON - BONE					
Type	Volume	Volume	Volume	Volume	Volume
SURE IQ*	Pediatric Bone	Pediatric Bone	Pediatric Bone	Pediatric Bone	Pediatric Bone
Image Thickness (mm)	0.5	0.5	0.5	0.5	0.5
Reconstruction Interval (mm)	0.3	0.3	0.3	0.3	0.3

REFORMATS: The following reformat table applies to all of the Toshiba volume reconstructions above.

	REFORMAT 1	REFORMAT 2	REFORMAT 3
Type	Axial	Coronal	Sagittal
Start	Base of skull	Anterior	Left
End	Vertex	Posterior	Right
SURE IQ**	Pediatric Brain	Pediatric Brain	Pediatric Brain
Thickness (mm)	5	5	5
Interval (mm)	5	5	5

* Shorter rotation times should be considered if the required tube current-time product (mAs) can be reached.

**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 here refer to the manufacturer default settings.

PEDIATRIC HEAD – ROUTINE (HELICAL) (selected TOSHIBA scanners)

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SCANOGRAM: Lateral, 120 kVp, 40 mA, from base of skull through vertex, angle to Reid's baseline to avoid orbits

TOSHIBA	Aq ONE/ ONE Vision	Aq ONE/ ONE Vision
Scan Type	Helical	Volume
*Rotation Time (s)	0.75*	0.75*
Detector Configuration	32 x 0.5	0.5
CT Pitch Factor	Detail (0.656)	N/A
Speed (mm/rot)	10.5	N/A
kV	100 (0-2yrs) 120 (2+yrs)	100 (0-2yrs) 120 (2+yrs)
Manual mA **0-2yrs, 100 kV**	0-1yr: 230 >1-2yrs: 285	0-1yr: 115 >1-2yrs: 145
Manual mA **2+yrs, 120 kV**	>2-6yrs: 125 >6-16yrs: 160 >16+yr: 200	>2-6yrs: 125 >6-16yrs: 160 >16+yr: 200
SURE Exposure approach	Not recommended	Not recommended
AIDR 3D	AIDR 3D	AIDR 3D
Scan FOV	240mm (S)	240mm (S)
CTDI-vol (mGy)	0-1yr: 22.1 1-2yrs: 27.4 2-6yrs: 36.2 6-16yrs: 46.3 16+yr: 57.9	0-1yr: 21.7 1-2yrs:27.3 2-6yrs: 36.3 6-16yrs: 46.5 16+yr: 58.1
VOLUME RECON - BRAIN		
Type	Volume	Volume
SURE IQ*	Pediatric Brain	Pediatric Brain
Image Thickness (mm)	0.5	0.5
Reconstruction Interval (mm)	0.3	0.3
VOLUME RECON - BONE		
Type	Volume	Volume
SURE IQ*	Pediatric Bone	Pediatric Bone
Image Thickness (mm)	0.5	0.5
Reconstruction Interval (mm)	0.3	0.3

REFORMATS: The following reformat table applies to all of the Toshiba volume reconstructions above.

	REFORMAT 1	REFORMAT 2	REFORMAT 3
Type	Axial	Coronal	Sagittal
Start	Base of skull	Anterior	Left
End	Vertex	Posterior	Right
SURE IQ**	Pediatric Brain	Pediatric Brain	Pediatric Brain
Thickness (mm)	5	5	5
Interval (mm)	5	5	5

* Shorter rotation times should be considered if the required tube current-time product (mAs) can be reached.

**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 here refer to the manufacturer default settings.