AAPM Working Group on Standardization of CT Nomenclature and Protocols
Charge

- Develop consensus protocols for frequently performed CT examinations, summarizing the basic requirements of the exam and giving several model-specific examples of scan and reconstruction parameters.

- Develop a set of standardized terms for use on CT scanners
Membership

- AAPM
  - Mike McNitt-Gray, Bob Pizzutiello, Jim Kofler
- ACR
  - Mark Armstrong, Penny Butler
- ASRT
  - Kevin Reynolds
- FDA
  - Thalia Mills
Manufacturers

- **GE**
  - John Jaeckle

- **Hitachi**
  - Mark Silverman

- **Philips**
  - Mark Olszewski

- **Siemens**
  - Christianne Liedecker

- **Toshiba**
  - Rich Mather

- **MITA**
  - Stephen Vastagh
Scanner Protocols

- Peer review process
- Protocol databases for sites to confirm their approach is reasonable
- AAPM Working Group on Standardization of CT Nomenclature and Protocols
  - Protocols to provide “reasonable” benchmarks
  - Terminology Lexicon

http://www.aapm.org/pubs/CTProtocols/
### CT Scan Protocols

<table>
<thead>
<tr>
<th>Available Protocols</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adult Protocols</strong></td>
</tr>
<tr>
<td>- Brain Perfusion CT (added 10/7/2010) [Give Feedback]</td>
</tr>
</tbody>
</table>

Your feedback regarding the content of this website is welcome. Feedback regarding this website will not be monitored daily. **Users experiencing problems in performing an exam should contact their service provider.**
ADULT BRAIN PERFUSION CT

Indications
- Suspected acute infarction;
- Assessment of reperfusion after treatment of acute stroke;
- Vasculitis;
- New neurological symptoms after subarachnoid hemorrhage suggesting vasospasm;
- Evaluation of the hemodynamic significance of a carotid stenosis;
- Transient ischemic attack;
- Evaluation of the cerebral vascular reserve using acetazolamide challenge;
- Evaluation of brain perfusion after significant head trauma;
- Brain tumor.

Diagnostic Task
- Detect brain ischemia in stroke, transient ischemic attack, vasculitis;
- Distinguish already-infarcted brain from brain at risk of infarction;
- Identify regions of brain made ischemic by vasospasm;
- Detect altered brain perfusion downstream a significant carotid stenosis;
- Assess altered cerebral vascular reserve in patients with ischemic symptoms;
- Assess altered cerebral perfusion after traumatic brain injury;
- Identify early brain tumor recurrence and higher-grade tumor components.

Key Elements
- Time-resolved scans are used to track the flow of iodinated contrast media through the brain;
- Multiple images (20-40) are acquired over the same section of anatomy;
- Patients must be able to remain still during the exam in order to avoid motion misregistration;
- The table may remain stationary during the entire exam, or move back and forth between a few table positions;
- Whole-brain perfusion CT can be accomplished using CT systems with wide detector arrays (8-16 cm); alternatively, scan modes that move the patient back and forth over the desired scan volumes can be used;
- Acquisitions are repeated at predetermined time intervals (e.g., every second to every 2-3 seconds) for a predetermined duration (e.g., 40-60 seconds);
- Relatively thick image widths are used to minimize image noise (5-10 mm is common);
- Image quality is inferior to a routine head CT. That is, images are noisier and thicker;
- Data are used to generate color maps of hemodynamic significance:
  - Blood-volume (BV) and flow (BF), mean transit time (MTT), time to peak perfusion (TTP);
  - A non-contrast-enhanced head CT and/or a CT angiogram may be combined with a perfusion CT scan.

Dose Management
- 80 kV should be used to increase iodine signal brightness;
- Low dose per single scan (i.e., one tube rotation) is critical, since repeated scanning will result in a relatively high cumulative dose;
- Time manual between scans, and hence the total number of scans over the exam duration, should be set carefully, taking into account the analysis algorithm (some approaches require relatively dense data points);
- Dose (tube current) modulation should not be used, as it may interfere with the calculation of the BV and BF parameters.

Additional Resources
- ACR Practice Guidelines for the Performance of Computed Tomography (CT) Perfusion in Neuroradiologic Imaging (www.acr.org/SecondaryMainMenuCategories/quality_safety/guidelines/ds/head-neck/or Perfusion.aspx);
CT Dose Check Feature

- New MITA Standard
- Intended to serve as safety feature on new scanners
- Two levels of dose checking:
  - Alert: 1Gy
  - Notification: By exam
- Dose check levels will be adjustable by site
- Scanners to be delivered with initial default values
# CT Scanner Terminology Lexicon

<table>
<thead>
<tr>
<th>Generic description</th>
<th>GE</th>
<th>PHILIPS</th>
<th>SIEMENS</th>
<th>TOSHIBA</th>
<th>HITACHI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automatic exposure control (AEC) system</td>
<td>Available in Auto-mA</td>
<td>Available in DoseRight Automatic Current Selection (ACS)</td>
<td>Available in CARE Dose4D</td>
<td>SURE Exposure</td>
<td>Available in IntelliEC</td>
</tr>
<tr>
<td>X-ray tube modulation around patient x, y</td>
<td>SmartScan (CT/i only)</td>
<td>D-DOM (Dose Modulation)</td>
<td>CARE Dose</td>
<td>not available as a separate item</td>
<td>Adaptive mA</td>
</tr>
<tr>
<td>X-ray tube modulation in longitudinal (z) direction</td>
<td>AutomA</td>
<td>Z-DOM</td>
<td>not available as a separate item (automatically used in head exams)</td>
<td>SURE Exposure</td>
<td>n/a</td>
</tr>
<tr>
<td>X-ray tube modulation system in all dimensions (x, y, and z)</td>
<td>SmartmA (x, y, z)</td>
<td>Work in progress</td>
<td>available in CARE Dose4D</td>
<td>SURE Exposure 3D (X, Y and Z Modulation)</td>
<td>IntelliEC</td>
</tr>
</tbody>
</table>
Technologist Education

• Scanners are increasingly complex
• Current training models are insufficient
  – Train one or two lead techs
  – Expect them to train group of techs
• Techs often dis-incentivized to understand as protocols are locked down more securely
• Future? Internet based training potential?