**Disclosures**

- OSU Radiology has research agreements with Siemens Healthineers and Qaelum.
- Our department has worked with a vendor, Qaelum, on a protocol manager prototype. No funding was provided.
- OSU protocols are managed, but the process is time-consuming.

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**What is a protocol?**
- Starting point to achieve **consistent, high-quality** images with **reasonable** radiation and iodine contrast **doses**

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**What is a protocol?**
- Clinical indications for the exam and clinical parameters

**CT Routine Abdomen**

<table>
<thead>
<tr>
<th>Indication</th>
<th>Procedure Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal pain, most other general indications</td>
<td>Oral Contrast: PO Omnipaque with 30, 45, or 60 minute prep time; IV Needle injection protocol; Delay: 80 Second; Respiration: Inspiration</td>
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**What is a protocol?**
- Technical parameters (Siemens)

**What is a protocol?**
- Technical parameters (GE)
What is a protocol?

- Reconstruction parameters (Siemens)

<table>
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<tr>
<th>Axial</th>
<th>Coronal</th>
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Protocol review requirements

- Regulatory (varies from state to state)

  - Ohio Dept. of Health: A hospital’s radiation dose review committee for CT “shall determine and review written protocols to improve image quality and minimize patient dose. The review shall include acquisition and reconstruction protocols, image quality, and radiation dose.” ORC 3701.1-66-04
  - Team includes RSO, physicist, physician, and technologist
  - Annual review requirement for adult & pediatric head & abdomen, adult chest, and brain perfusion.

- Accreditation

  - The Joint Commission
  
    - Protocols are reviewed and kept current with input from an interpreting physician, medical physicist, and lead imaging technologist.
    - Time frame for review is specified by the hospital.

  - ACR

    - CT Protocol and Management Team that includes the supervising radiologist, qualified medical physicist, and lead technologist “design[s] and review[s] all new or modified CT protocol settings to ensure that both image quality and radiation dose are appropriate.”
    - Review all protocols periodically, no less than 24 months, with common protocols reviewed annually.

Protocol review

- OSU Radiology’s diagnostic CT fleet:
  - 17 systems
  - 9 geographically separate locations
  - 10 models from 2 manufacturers
  - Master protocols are maintained as an Excel spreadsheet on SharePoint
  - Organized by body section, then by Adult/Peds, then by manufacturer

- Protocols are reviewed with each body section (abdomen, neuro, cardiac (including cardiology), MSK, thoracic, vascular)
  - Goal: One section every two months and all sections each year
  - Protocol changes are made based on image quality and/or dose feedback radiologists, physicists, and technologists
    - Often changes are made mid-year, before the annual review
    - Changes are usually piloted on limited studies before changing the master protocol
Protocol maintenance

- Parameters must be changed at the scanner to make sure the protocol on the scanner matches the master protocol.
- It was extremely time-consuming initially to make sure all protocols matched the master protocols.
- It is very time-consuming to make individual protocol updates that are decided at each review.
- It can take two technologists over an hour per scanner to make the updates & check the existing protocols for one body section (dual energy scanners take considerably longer).

Sometimes important protocol settings are not obvious.
Protocol maintenance

- Sometimes important protocol settings are not obvious

Potential Solutions

- Homegrown solutions
  - Export protocol as a CSV, XML, or other semi-readable format at each scanner
  - Use a script to read in protocol parameters for display and review.
  - While this can save time after the initial time investment, there is no guarantee that a vendor software update won’t change the protocol export format.
  - Each unit still needs to be accessed individually to export protocols.

Potential Solutions

JOURNAL OF APPLIED CLINICAL MEDICAL PHYSICS, VOLUME 17, NUMBER 8, 2016

Implementation and evaluation of a protocol management system for automated review of CT protocols

Joshua Grimes, Shuai Leng,F Yi Zhang, Thomas Vrieze, and Cynthia M. Zdeblick
Department of Radiology, Mayo Clinic, Rochester, MN, USA

Received 27 October 2015; accepted 22 April, 2016

Potential Solutions

- Manufacturer’s offer solutions with their analytics tools:
  - Siemens teamplay Protocols
  - GE Imaging Protocol Manager
  - Philips Incisive CT
  - Canon Vitality XT CT Applications
  - Most can view protocol parameters on their vendor’s scanners
  - Depending on the software, the ability to “push” to scanners may be limited
  - None (that I know of) can manage protocols for other vendors

A Wiki-Based Solution to Managing Your Institution’s Imaging Protocols

Timothy P. Szczyglowski, PhD, Nicholas Rickett, PhD, Sean Belden, BS, Amanda Coven, BS, Andrea Duplais, Ashley Herrmann, Stephen Monette, BS, Elliot Janczew, Sallature

Reduces the number of “free” parameters by having most protocols reference parameters in a “master” protocol for a given body section and contrast phase.
Potential Solutions

- Management of Acquisition Protocols (MAP) IHE profile would allow for vendor-neutral protocol management

Conclusions

- CT protocol management includes thousands of scan and reconstruction parameters.
- Access to make protocol changes should be restricted to a small team.
- When done manually, protocol updates can be time consuming.
- Tools are beginning to become available from vendors that allow viewing and (in some cases) editing of protocols remotely.
- Bug your vendor to support the Management of Acquisition Protocols (MAP) IHE profile for vendor-neutral protocol management