Experiences and challenges with MPPGs and other living documents

2019 AAPM Spring Clinical Meeting

Dustin A. Gress, MS, DABR, DABSNM
Senior Advisor for Medical Physics
American College of Radiology
Outline

- MPPG 1a (2013)
- MPPG 6a (2017)
- Practice Parameters & Technical Standards
- Appropriateness Criteria
MPPG 1a (2013)

- CT Protocol Management and Review

TG-225 Members:
Dianna D. Cody, Chair, PhD, FAAPM
Tyler S. Fisher, MS
Dustin A. Gress, MS
Rick Robert Layman, Jr., MS
Michael F. McNitt-Gray, PhD, FAAPM
Robert J. Pizzutiello, Jr., MS, FAAPM
Lynne A. Fairobent, AAPM Staff
Two-second CT scan turns into 65-minute ordeal for toddler

November 10, 2008
By Donna Donalmo
Cedars-Sinai investigated for significant radiation overdoses of 206 patients

The finding prompts the FDA to issue an alert urging hospitals nationwide to review their safety protocols for CT scans.

October 10, 2009 | Alan Zarembo
Safety Investigation of CT Brain Perfusion Scans: Initial Notification

**Recommendations for Hospitals and CT Facilities:**

FDA encourages every facility performing CT imaging to review its CT protocols and be aware of the dose indices normally displayed on the control panel. These indices include the volume computed tomography dose index (abbreviated \( CTDI_{vol} \), in units of "milligray" or "mGy") and the dose-length product (\( DLP \), in units of "milligray-centimeter" or "mGy-cm").

For each protocol selected, and before scanning the patient, carefully monitor the dose indices displayed on the control panel. To prevent accidental overexposure, make sure that the values displayed reasonably correspond to the doses normally associated with the protocol. Confirm this again after the patient has been scanned.

American College of Radiology
CT Dose Summit:
Scan Parameter Optimization
April 29-30, 2010
The Renaissance Concourse Atlanta Airport Hotel
Atlanta, GA
An interdisciplinary approach to optimizing image quality and managing patient dose

Rapid developments in CT scanner technology over the last decade have yielded new clinical capabilities and substantial improvements in patient care. The greater complexity of today’s CT scanners, however, creates considerable challenges for CT users, who must master a wide range of equipment features and clinical applications.

This summit will demonstrate how scan acquisition and image reconstruction parameters should be selected and managed to improve image quality and reduce radiation dose. Faculty members will explain the essential criteria for specific diagnostic tasks, and participants will have an opportunity to practice the selection of optimum scan protocols. The goal of the summit is to provide practical information for users that will help them operate their CT scanners wisely, improving the quality and usefulness of CT images while reducing the radiation dose to patients.

Now Available

- Registration
- Housing
Radiology Stewardship and Quality Improvement: The Process and Costs of Implementing a CT Radiation Dose Optimization Committee in a Medium-Sized Community Hospital System

Jenifer R. O. W. Siegelman, MD, MPH\textsuperscript{a,b}, Dustin A. Gress, MS\textsuperscript{c}

**Purpose:** The aims of this study were to measure the effectiveness of a multidisciplinary CT dose optimization committee and estimate its costs and to describe a radiation stewardship quality improvement initiative in one CT department at a medium-sized community hospital system that used a participatory design committee methodology.

**Methods:** A CT dose optimization committee was conceived, funded, and formed, consisting of the following stakeholders: radiologists, technologists, consultant medical physicists, and an administrator. Volume CT dose index (CTDI\textsubscript{vol}) and repeat rate were monitored for 1 month, for one scan type, during which iterative protocol adjustments were made through committee interaction. Effects on repeat rate and CTDI\textsubscript{vol} were quantified and benchmarked against national diagnostic reference levels after retrospective medical record review of 100 consecutive patients before and after the intervention. Labor hours were reported and wage resources estimated.
Serendipitous timing

- Initial phase of CT protocol project wrapping up
- Interviewing and going to work for TG-225 Chair
- Projects were well aligned
- Manuscripts happening at same time
ii. **Responsibilities of the QMP**

In the context of CT Protocol Management and Review, the QMP’s responsibilities may vary, depending on the type of facility being supported; regardless, the QMP **must** be involved in the review of all protocols. These considerations **should** be balanced with adequate response times to facility inquiries.

A QMP’s time at a facility **should** include but not be limited to:

a. meeting with the CT Protocol Management and Review team;
b. clinical observation; phantom measurements;
c. **side-by-side image review with radiologist(s):**
d. **artifact review with technologist(s) and/or radiologist(s);**
   and
e. discussion of equipment performance and operation, etc.

While regular dialogue is important, the QMP **should** also remember that facility personnel themselves, in particular the **Lead CT Radiologist**, **should** lead the CT Protocol Management and Review process; the QMP is an integral member of the team. The QMP may elect to perform baseline dose measurements and image quality tests at the outset of the project, particularly if the QMP does not have personal historical experience with the scanner(s) in the facility.
iii. **In-house QMP**
For the in-house QMP, this ongoing CT protocol review project may consume much of his/her time, so the QMP **should** be sure to adequately communicate with his/her supervisor(s), with other team members, and with department/hospital management in this regard. The facility **should** understand that the CT Protocol Management and Review process is an ongoing investment in improved quality of patient care.

iv. **Consulting QMP**
It is important to note that CT Protocol Management and Review services are above and beyond normal QMPs consulting services (e.g., the annual physics survey), which have traditionally been limited to image quality, dosimetry, and basic protocol review for a few selected examinations. Consultant QMPs **should** make this clear to their clients, and negotiate their services appropriately.
A. The supervising radiologist’s responsibilities relative to the optimization of patient dose in CT consist of the following:

1. Convene a team that includes the supervising radiologist, the medical physicist, and the lead CT technologist to design and review all new or modified CT protocol settings to ensure that both image quality and radiation dose are appropriate.

2. Develop internal radiation dose thresholds during any new CT protocol design.

3. Implement steps to ensure patient safety and to reduce future risk if an estimated dose value is above the applicable threshold for any routine clinical exam.

4. Institute a review process, which occurs at least annually, for all protocols to ensure no unintended changes have been applied that may degrade image quality or unreasonably increase dose. This review should be done by the same team of the supervising radiologist, the medical physicist, and the lead CT technologist.

5. Establish a policy stating that the CT dose estimate interface option is not to be disabled and that the dose information is displayed during the exam prescription phase.
Responsibilities of the Qualified Medical Physicist

The responsibilities of the qualified medical physicist relate to equipment performance, including image quality and patient safety. A CT equipment performance review must take place at the time the equipment is installed and at least annually thereafter. The qualified medical physicist should repeat appropriate tests after major repair or upgrade to the CT system, which includes a tube change.

Specific tests include the following:

1. Review of clinical protocols...
   1. Together, the lead radiologist, lead CT technologist, and QMP should design and review all new or modified protocol settings to ensure that both image quality and radiation dose are appropriate.
   2. Institute a regular review process of all protocols to be sure that no unintended changes have been applied that may degrade image quality or unreasonably increase dose. Review at least 6 clinical protocols (more if required by state or local regulatory body), including:
      a. Pediatric head (1 year old)
      b. Pediatric abdomen (5 years old; 40-50 lb or approx. 20 kg)
      c. Adult head
      d. Adult abdomen (70 kg)
      e. High-Resolution chest
      f. Brain perfusion (if performed at the facility)
#synergy

**ACR CTAP Physics SC**
- Dianna Cody, PhD
- Doug Pfeiffer, MS
- **Mike McNitt-Gray, PhD**
- Tom Ruckdeschel, MS
- Keith Strauss, MS

**AAPM TG-225**
- Dianna Cody, PhD
- Tyler Fisher, MS
- Dustin Gress, MS
- Rick Layman, PhD
- **Mike McNitt-Gray, PhD**
- Bob Pizzutiello, MS
Success

- Feb 2012 – Sep 2013 publication
- Things *can* go smoothly
- Regular calls
- Do your homework
- Work together
“Selection of a Patient Dose Monitoring System”
AAPM medical physics practice guideline 6.a.: Performance characteristics of radiation dose index monitoring systems

Dustin A. Gress\textsuperscript{1} | Renee L. Dickinson\textsuperscript{2} | William D. Erwin\textsuperscript{1} | David W. Jordan\textsuperscript{3} | Robert J. Kobistek\textsuperscript{4} | Donna M. Stevens\textsuperscript{5} | Mark P. Supanich\textsuperscript{6} | Jia Wang\textsuperscript{7} | Lynne A. Fairbent\textsuperscript{8}
Issues (02/2014 – 01/2017 pub)
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- Shared cloud storage
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- Setting up the next call
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- Reviews: divide & conquer, consistency is key
- JACMP submission
 Practice Parameters and Technical Standards
PP & TS – collaborative

- Free guidance, expert consensus
  - https://www.acr.org/Clinical-Resources/Practice-Parameters-and-Technical-Standards
Scope of PP & TS

- 5 year review cycle
- Several staff members
- 30-40 per year
- Investment
## Appropriateness Criteria

- **ACR AC → CDS**

<table>
<thead>
<tr>
<th>Diagnostic</th>
<th>Topic Name</th>
<th>Narrative &amp; Rating Table</th>
<th>Evidence Table</th>
<th>Lit Search</th>
<th>Appendix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast</td>
<td>Breast Cancer Screening</td>
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<td></td>
<td>Breast Imaging of Pregnant and Lactating Women</td>
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<td></td>
<td>Breast Implant Evaluation</td>
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Atherosclerotic cardiovascular disease is the leading cause of death for both men and women in the United States. Coronary artery disease has a long asymptomatic latent period and early targeted preventive measures can reduce mortality and morbidity. It is important to accurately classify individuals at elevated risk in order to identify those who might benefit from early intervention. Imaging advances have made it possible to detect subclinical coronary atherosclerosis. Coronary artery calcium score correlates closely with overall atherosclerotic burden and provides useful prognostic information for patient management. Our purpose is to discuss use of diagnostic imaging in asymptomatic patients at elevated risk for future cardiovascular events. The goal for these patients is to further refine targeted preventative efforts based on risk. The following imaging modalities are available for evaluating asymptomatic patients at elevated risk: radiography, fluoroscopy, multidetector CT, ultrasound, MRI, cardiac perfusion scintigraphy, echocardiography, and PET.

The ACR Appropriateness Criteria® evidence-based guidelines for specific clinical conditions that are reviewed every 2 years by a multidisciplinary expert panel. The guideline development and review include an extensive analysis of current medical literature from peer-reviewed journals and the application of a well-established consensus methodology (modified Delphi) to rate the appropriateness of imaging and treatment procedures by the panel. In those instances where evidence is lacking or not definitive, expert opinion may be used to recommend imaging or treatment.

**Key Words:** Appropriateness criteria, coronary artery calcium score, coronary artery disease, asymptomatic, multidetector CT (MDCT)
Inside the AC

- RRLs
- Published guidance balances benefit and risk

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### American College of Radiology
ACR Appropriateness Criteria®
Breast Cancer Screening

#### Variant 1:

<table>
<thead>
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<th>Appropriateness Category</th>
<th>Relative Radiation Level</th>
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<tbody>
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<td>Usually Appropriate</td>
<td>🌟🌟</td>
</tr>
<tr>
<td>Digital breast tomosynthesis screening</td>
<td>Usually Appropriate</td>
<td>🌟🌟</td>
</tr>
<tr>
<td>US breast</td>
<td>May Be Appropriate</td>
<td>🌟</td>
</tr>
<tr>
<td>MRI breast without and with IV contrast</td>
<td>Usually Not Appropriate</td>
<td></td>
</tr>
<tr>
<td>MRI breast without IV contrast</td>
<td>Usually Not Appropriate</td>
<td></td>
</tr>
<tr>
<td>FDG-PEM</td>
<td>Usually Not Appropriate</td>
<td>🌟🌟</td>
</tr>
<tr>
<td>Tc-99m sestamibi MBI</td>
<td>Usually Not Appropriate</td>
<td>🌟</td>
</tr>
</tbody>
</table>

#### Variant 2:
Breast cancer screening. Intermediate-risk women: women with personal history of breast cancer, lobular neoplasia, atypical ductal hyperplasia, or 15% to 20% lifetime risk of breast cancer.

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Outline Summary

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All of our QC manuals are now available for our members on the Medical Physics Resources web page:

- [https://www.acr.org/Clinical-Resources/Medical-Physics-Resources](https://www.acr.org/Clinical-Resources/Medical-Physics-Resources)
Fin.