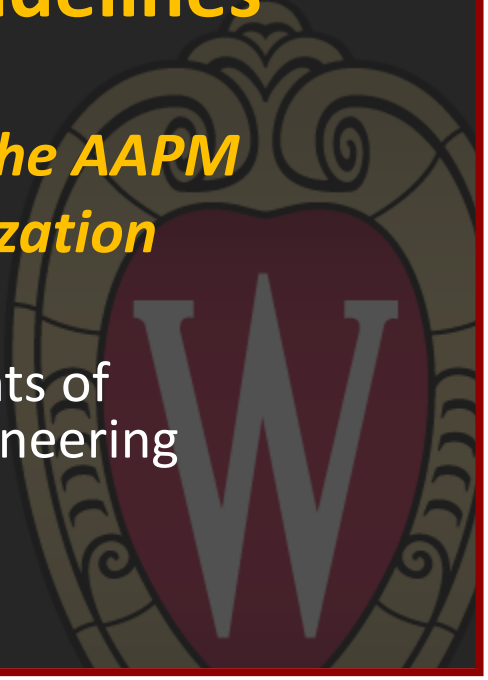
Compliance with the AAPM CT Clinical Practice and Joint Commission Guidelines

An overview of ACR, Joint Commission, and the AAPM Practice Guidelines on CT Protocol Optimization

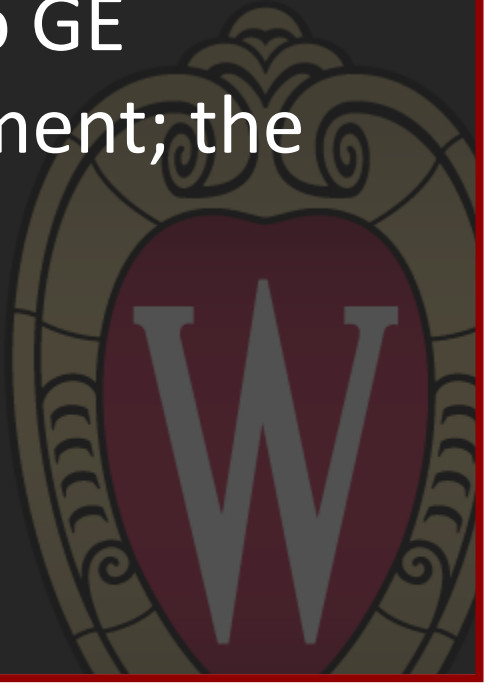
Timothy P. Szczykutowicz Ph.D., DABR

University of Wisconsin Madison Departments of Radiology, Medical Physics and Biomedical Engineering



Disclosures

- TPS Equipment Grant and Consultant GE HealthCare; supplies CT protocols to GE HealthCare under a licensing agreement; the founder of protocolshare.org



Outline

- Symposium Overview
  - 1:45-1:55 (10 minutes) An overview of ACR, Joint Commission, and the AAPM Practice Guidelines on CT Protocol Optimization, Tim Szczykutowicz Ph.D.
  - 1:55-2:20 (25 minutes) An overview of the CT Protocol optimization team at Johns Hopkins, Mahadevappa Mahesh, Ph.D.
  - 2:20-2:45 (25 minutes) An overview of the CT Protocol optimization team at The University of Washington, Kalpana Kanal, Ph.D.
  - 2:45-3:10 (25 minutes) An overview of the CT Protocol optimization team at MD Anderson Cancer Center, Dianna Cody Ph.D.
  - 3:10-3:45 (25 minutes) Diagnostic Imaging: Surveyor Education, Survey Experience, and trends, Andrea Browne, Ph.D.
  - 3:45-3:45 (10 minutes) Questions and Answers
- ACR/TJC standards touching on CT
- The composition of a CT protocol team and why it is needed

Standards/Regulations/guidelines and CT

Multiple facets that include: personnel training, acceptance/annual scanner testing, shielding, quality assurance, testing after repairs, monitor evaluation, protocol evaluation (multiple facets here), dose compliance (dose check, expected dose ranges, dose reduction options, dose incident reporting), staff dose monitoring

“new” standards that require a team

- TJC PI.02.01.01 A6
  - Review and analyze dose incidents and compare to external benchmarks
- TJC PC.01.03.01 A25
  - Establish protocols based on current standards of practice addressing contrast usage, age, indication, patient size, and expected dose
- TJC PC.01.03.01 A26
  - Mandates the **team** approach for annual protocol review!
    - The time frames they speak of here can be over 1 year, but not over two is what I have heard verbally from TJC

“old” standards that should have a team approach

- ACR CT accreditation (from 2012 ACR Quality Control Manual for CT)
  - Requirement to annually review clinical protocol by medical physicist
  - ACR actually pre-dates TJC in require review for ALL protocols
    - “Convene a team that includes the supervising radiologist, the medial 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.”
    - But what is actually enforced (what admin is going to be willing to pay for) is review of “at least six clinical protocol including…pediatric head, pediatric abdomen, adult head, adult abdomen, high-resolution chest, brain perfusion”
      - These are the ones you will be sending to the ACR for review

SAM questions

- ACR standards do not equal TJC standards
  - Lots of similarities, but TJC in general go further than ACR
    - One exception being that TJC does not get into the details of specific acquisition parameters like the ACR does
- Neither ACR nor TJC requires an IT based dose monitoring system be in place
  - I find the belief one needs such a system to be a common misconception. However, without such a system it is hard to fulfill the other requirements in my opinion.
- TJC standards do not have a # of units tested minimum to do CT scanner testing for physicists (just need to be boarded)

CT protocol optimization team

- "AAPM Medical Physics Practice Guideline 1.a.: CT Protocol Management and Review Practice Guideline" published in the **Journal of Applied Clinical Medical Physics** (JACMP). Volume 14, Number 5 (2013). [ISBN: 978-1-936366-27-9]
  - Siegelman, Jenifer RQW, and Dustin A. Gress. "Radiology stewardship and quality improvement: the process and costs of implementing a CT radiation dose optimization committee in a medium-sized community hospital system." *Journal of the American College of Radiology* 10.6 (2013): 416-422.
  - Szczykutowicz, Timothy P., et al. "Compliance with AAPM Practice Guideline 1. a: CT Protocol Management and Review—from the perspective of a university hospital." *Journal of Applied Clinical Medical Physics* 16.2 (2015).
- The practice guideline has enjoyed 4,937 downloads as of 6/13/2016 (published 9/2013, online for 3.75 years)
- Our compliance paper has enjoyed 1,586 downloads as of 6/13/2016 (published 3/2015, online for 1.25 years)

CT protocol Team

- Main players are
  - Physicist
  - Technologist
  - Radiologists
- You need a champion to make this work. At my academic hospital, that person is a radiologist, at non-academic sites this person seems to usually be an administrator
  - You need a champion because this is not cheap, it costs a lot of time and money
  - We burn through ~250k/year at the UW[1]
  - The Siegelman study estimated $165k to optimize 4 scanners/30 protocol per scanner[2]

1 Szczykutowicz and Pozniak. “The absolute importance of a team approach for CT protocol optimization”. Submitted to Radiology Management 2016

2 Siegelman, Jenifer RQW, and Dustin A. Gress. "Radiology stewardship and quality improvement: the process and costs of implementing a CT radiation dose optimization committee in a medium-sized community hospital system." *Journal of the American College of Radiology* 10.6 (2013): 416-422.

CT protocol team

- I am going to skip discussing in detail how we do things at the UW (references below) and provide a few illustrating examples on why a team approach is needed.
- The other speakers will provide you with a robust account of how their teams function

- https://www.radiology.wisc.edu/protocols/CT/ This link takes you to our UW CT protocol Optimization Team homepage
  - Online videos explaining CT protocols from clinical and technical perspectives
  - DoseCheck manual
  - Report of CT doses for all UW protocols broken down by series level
  - List of CT protocol project publications

Motivation

- The next three slides will hopefully motivate the following
  - CT physicists are now being asked to do far more than scanner QA/QC
  - Without a team approach protocol changes will result in unforeseen errors being made
  - A desire to see how some top notch institutions tackle this problem

The case for a team

- **Scenario 1: A protocol change is executed without the oversite of the complete CT protocol optimization team**
- The premise: A change to the liver donor protocol is required by the hospital's surgery department. A radiologist, CT technologist, and medical physicist all meet and agree to the change. The new protocol is updated on all of the main radiology scanners, but not the scanners located in cardiology or the emergency department.
- Clinical Impact: Four months later, one of the main radiology scanners goes down for a tube replacement and a patient is scheduled on the cardiology scanner for the liver donor protocol. The patient is scanned using the non-updated protocol and the resulting study does not meet the criteria required to satisfy the surgical team. Had the original protocol change been made by the institution's CT protocol optimization team, this scenario could have been avoided. The dedicated team would use a checklist approach for implementing protocol changes that ensures changes are made system wide.

The case for a team

- **Scenario 2: Combine a lower extremity run off exam with a trauma chest/abdomen/pelvis**
- The premise: Having had several trauma patients that needed a lower extremity (LE) CTA combined with a trauma chest abdomen pelvis (CAP), the lead night CT technologist created a new protocol for this situation on the emergency department scanner. The new protocol simply combined both unique CT CAP and CTA LE protocols. No changes, however, were made to the settings when they were combined and a radiologist was not consulted.
- Clinical Impact: When combining protocols that use contrast, multiple facets must be considered:
  1. How will the contrast from the first exam affect the next?
  2. What will be the total load of contrast and is it below recommended limits?
  3. Should the order of the exams be optimized and the phases within each exam altered to best use the timing of the contrast bolus/boluses?
  4. If we are combining exams, which dose level to pick?

Clinical impact for this case → all or some of these facets will be done incorrectly/inconsistently if left to scan time decisions by the technologist or physician

The case for a team

- **Scenario 3: Change in beam energy to optimize image dose**
- The premise: A CT physicist notices that two phases of an adrenal gland protocol are at the same beam energy. The first is a portal venous phase and the second a delayed phase. The CT physicist, knowing that lower kV can be used for angiographic imaging, lowers the beam energy for the venous phase relative to the delayed phase.
- Clinical Impact: Using the same kV in this case was by design. The venous phase is not a true angiographic phase. Since clinical decisions that characterize adrenal masses rely on CT number changes between the different scan phases, an effort should be made to ensure no extraneous factors could influence CT number between the phases. In this case, a change in beam energy will change the CT number regardless of the contrast uptake and washout properties of any suspect lesions. In other words, the radiologist is now faced with the task of differentiating if the measured change in tumor CT number is truly due to the properties of the tumor or erroneously affected by the beam energy change. The physicist should have consulted with the radiologist and understood the true intent of these multiple phases

Conclusions

- New regulations will probably continue to mandate a team approach
- A team approach is needed, we have a lot of buttons and knobs and interplay between things on and off the scanner to consider

My suggestion for tackling this is starting with documentation. You need to document your protocols before you can manage them. Search for “CT protocol wiki” on youtube for an example from UW-Madison.