Supporting the Small Practice: Advice for the Consulting Physicist

Robert J. Pizzutiello, MS, FAAPM, FACMP
President, Upstate Medical Physics
Sr. Vice-President, Global Physics Solutions
Objectives

• How to
  – Come up to speed on a wide range of scanner types
  – Leverage your experience from one site to others
  – Build relationships that encourages your client to seek your input on protocols
  – Address protocol problems once you find them, particularly if the site isn’t willing to pay for support
Outline

- What is a consultant?
- Scope of the project
- Benefits and Challenges for the Consultant
  - Technical
  - Operational
  - Professional
- Recommendations (Advice)
Who is a consultant?

- 33 year old pregnant (18 weeks) female presents with severe headaches and labored breathing
- ER physician orders CT scans
  - Head
  - Chest (r/o PE)
- OB/GYN consult
- Neurologist consult
- Radiologist consult
- Medical Physics consult
Who is a consultant?

- Main Entry: consultant
- Pronunciation: /kən-səltənt/
- Function: noun
- Date: 1697
- 1: one who consults another
  2: one who gives professional advice or services: expert

http://www.merriam-webster.com/dictionary/consultant
Who is a consultant?

- According to traditional medical use of the term, “consultant” is not the patient’s primary care provider but has expertise that contributes to patient care
- According to dictionary, we are all consultants
- All medical physicists are “consultants”
- Issues for FTE hospital staff medical physicists may be somewhat different
- FTE Staff Medical Physicists share much in common with “consultants”
Technical Benefits, Challenges

• Diversity of manufacturers and models
  – Use same process as when starting ACR CT support
  – Start with one or two sites and CT scanners
  – Allow extra time to refine the process
    • Consider reduced or no-charge at first
  – Choose receptive site (management, personnel, schedule)
  – Form and lead the CT Protocol Review Committee
  – Build your own scanner-specific protocol table
    • Understand terminology for each scanner manufacturer
  – Pilot the project and identify success milestones
Scope of Protocol Review project

- Obtain grassroots support
- Present the case to decision makers
- Lock down all protocols, subject to approval
- Form “CT Protocol Review Committee”
  - Radiologist, CT Technologist, Medical Physicist
- Start with Perfusion and Pediatrics
- Review clinical considerations, dose, protocol details
- Generate recommendations (trial solutions)
- Meet monthly and re-evaluate (Doug Pfeiffer)
- Evaluate more protocols
- Document process and results
Lower Extremity Knee without IV Contrast (9.11)
Indication: Fracture and osseous anatomy evaluation of knee
(Bony Survey)

CTD

No IV Contrast
Q25 64 16
Series 1: Scout
14.15 16.32 13.5

Group 1: Lower extremity Knee without IV contrast
Injection
N/A
Scan Delay
N/A
Scan Method
Helical, fastest tube rotation time available
Starting Location
1 cm above patella
Ending Location
2 cm below the knee joint
Thickness/Speed
1.25/38.37
Interval
0.525 mm
SS
120
Smart mA
Smart mA
Recon Type (Algorithm)
Standard
Noise Index
25

(Protocol # 1.1)

Billing:
1. CT Head without, or with, or without and with
2. Contrast if used

Setup:
1. Supine, AP and lateral scouts, gantry angle
2. Indications for Helical or axial mode
3. Patient Positioning:
4. Scan range (bottom of C1 and scan through the top of the head)

DFOV:
Preferred 20 cm (Range 18-22)

Contrast:
1. Specify volume, concentration, type, rate and time
2. Specify when to begin scanning

CORRECT

IN CORRECT (NOT OBLIQUE)
Diversity of Manufacturers – Models

- Opportunity and challenge
- Start with data from this Summit (AAPM web site)
- Use other web and Mfr resources
- Start your own database – *and grow it!*
  - “At another site with this scanner, we did…”
- Network with other medical physicists
Create a list of “rules of thumb”

- **kVp**
  - 120 kVp for average adults
  - 100 kVp for small adults
  - 80 – 100 kVp for peds
  - 140 kVp for very large adults

- **Change kVp to maintain noise**
  - If increase from 120 – 140 kVp, reduce mAs by 40%
  - Reduces patient dose by about 20%
  - Increasing 120 – 140 kVp to reduce streaking artifacts (shoulders and hips)

Adapted from Frank Ranallo, PhD
Create a list of “rules of thumb”

• **Slice Thickness**
  – Thinner slices produce better axial resolution with less partial volume effect
  – Thinner slices require more mAs for equivalent noise

• **Slice Recon Incrementation**
  – For axial, slice incrementation = slice thickness
  – For helical, best z-axis resolution may be achieved at recon interval = ½ thickness

Adapted from Frank Ranallo, PhD
Create a list of “rules of thumb”

- **Pitch**
  - Pitch <1 improves image quality, less helical artifact
  - Pitch >1 gives faster anatomical coverage (less motion)
  - Motion is important for breath hold, peristalsis, etc.
  - On newer scanners in manual mode, consider
    - lower pitch,
    - adjust rotation time needed for coverage/motion,
    - adjust mA for proper dose
  - Automatic mode, adjust noise index (reference mAs)
    - Increase pitch to reduce scan time
    - Check maximum mA

Adapted from Frank Ranallo, PhD
How do we prepare?

- Study each manufacturer’s features, terms, quirks
  - We engaged an experienced CT physicist to consult with us in January 2010

- Improve your understanding of clinical needs
  - We engaged an experienced CT radiologist to consult with us in March 2010

- Use AAPM resources
  - More to come…. 

- Use web based resources
Let’s image gently when we care for kids! The image gently Campaign is an initiative of the Alliance for Radiation Safety in Pediatric Imaging. The campaign goal is to change practice by increasing awareness of the opportunities to lower radiation dose in the imaging of children.

**IMAGE GENTLY AND CT SCANS**

One size does not fit all...

There’s no question CT helps us save kids’ lives.

But, when we image, radiation matters!

- Children are more sensitive to radiation.
- What we do now lasts their lifetimes.

So, when we image, let’s image gently. More is often not better.

When CT is the right thing to do:

- Child size the kVp and mA
- One scan (single phase) is often enough
- Scan only the indicated area

http://www.pedrad.org/associations/5364/ig/index.cfm?page=614
Whatever role you play in caring for children, you can pledge to image gently.

- Different members of the imaging team and members of the community play different roles in using the image gently philosophy to ensure that CT scans in children are performed in the best way possible.
- Every care setting is unique.

We suggest you read the recommendations for your role below AND scan the others to best implement the changes in your practice to child-size the CT scan protocols at your site.

Pediatric radiologists from across the country have volunteered and stand ready to speak to you or your staff. Contact us.

Protocol Recommendations
- Worksheet
- Radiologists
- Technologists
- Medical Physicists
- Parents
# Image Gently – mAs Reduction Factors for Peds

<table>
<thead>
<tr>
<th>Abdomen Baseline:</th>
<th>kVp</th>
<th>mA</th>
<th>Time (sec)</th>
<th>Pitch Abdomen</th>
<th>Pitch Thorax</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>120</td>
<td>200</td>
<td>0.5</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

### PA Thickness (cm) vs. Approx Age

<table>
<thead>
<tr>
<th>Age</th>
<th>Estimated mAs = BL x RF</th>
</tr>
</thead>
<tbody>
<tr>
<td>newborn</td>
<td>31</td>
</tr>
<tr>
<td>1 yr</td>
<td>36</td>
</tr>
<tr>
<td>5 yr</td>
<td>61</td>
</tr>
<tr>
<td>10 yr</td>
<td>71</td>
</tr>
<tr>
<td>15 yr</td>
<td>77</td>
</tr>
<tr>
<td>small adult</td>
<td>91</td>
</tr>
<tr>
<td>med adult</td>
<td>100</td>
</tr>
<tr>
<td>large adult</td>
<td>133</td>
</tr>
<tr>
<td></td>
<td>1.21</td>
</tr>
<tr>
<td></td>
<td>121</td>
</tr>
</tbody>
</table>
Manufacturer’s web sites and other resources can be helpful.
Operational Benefits, Challenges

- Daunting size of this project
- Requires
  - Significant institutional will
  - Significant resources
  - Significant cooperation
- Could potentially be largest patient benefit
  - From Image quality, Dose and ALARA perspectives
- Process/results useful for
  - Professional development
  - Marketing in a competitive environment (sites and MP)
**Do the math – How many protocols are there?**

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Small</th>
<th>Med</th>
<th>Large</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head</td>
<td>16</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td>Ear</td>
<td>5</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Soft Tissue</td>
<td>1</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Spine</td>
<td>2</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Ortho (Extrem)</td>
<td>2</td>
<td>2</td>
<td>31</td>
</tr>
<tr>
<td>CTA</td>
<td>3</td>
<td>11</td>
<td>15</td>
</tr>
<tr>
<td>Cardiac</td>
<td>0</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Chest</td>
<td>7</td>
<td>17</td>
<td>12</td>
</tr>
<tr>
<td>Abdomen</td>
<td>13</td>
<td>23</td>
<td>15</td>
</tr>
<tr>
<td>Pelvis</td>
<td>2</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>44</strong></td>
<td><strong>88</strong></td>
<td><strong>131</strong></td>
</tr>
</tbody>
</table>
Obstacles

• “There is no $ in the (dept operating) budget”
• “CT schedule is full all the time”
• “We will alienate referring MD’s”
• “No radiologist is willing to spend the time”
• “All radiologists will never agree to standardization”
• “Technologists are too busy”
• “All protocols are fine” (set by manufacturer)
• “No regulatory requirement”
Benefits to the medical physicist

- Make a difference
- Professional development
  - Expand our technical and clinical understanding
  - ABR MOC
- Become “essential” and not easily replaced by others without this understanding
- Build relationships with RT’s and Radiologists
- Increased visibility
  - to staff, radiologists, management, administrators
- Create and refine a new MP service “product”
Costs to the medical physicist

- **Time, travel** (labor intensive project)
  - On-site meetings (monthly, quarterly…)
  - On-going project
  - Documentation of recommendations
  - Telephone calls as project progresses

- **$** (may be difficult to receive optimal compensation)
  - Consider as a partial “loss leader”
    - Professional growth
    - Future new service offering (growth)

- **Do we have the staff?**
  - Consider residents, physics assistants for data collection (R&F, CR, etc.)
  - Use senior CT experienced physicists and residents for this project
Building Relationships

- Need to sell the concept of CT protocol review
- Natural progression from ESE and ESER (R&F)
- RSO is responsible for patient doses
- State regulations may soon specify CT Dose Review
- Medical physicist must commit to, and truly be
  - Available for consultation
  - Knowledgeable (technically, clinically) or willing to learn
  - Willing to participate as a team member
  - Invest the ongoing effort to make this work
  - Step beyond the “testing” comfort zone and truly “consult”

- Recall experience with mammography technique charts
Motivations for Radiologist

• Patient Care (General)
• Useful when answering questions (specific patient)
  – “We have reviewed all of our protocols ….”
• ABR MOC
• Risk Management
• Communication with referring physicians
  – Marketing: “We are doing this new project…”
Diagnostic Radiology

The ABR believes in the value of maintenance of certification. All ABR Trustees participate in ABR-MOC.

Our maintenance of certification process (ABR-MOC) is designed to facilitate and document the professional development of each diplomate through its focus on the essential elements of quality care.

MOC focuses on the essential elements of quality care.

The American Board of Medical Specialties (ABMS) and the American Board of Radiology (ABR), as a member board, have initiated this process. Over the next ten years, ABR-MOC will continue to develop into a comprehensive vehicle through which all diplomates can ensure the public and the radiologic community that they are incorporating new information into their practices, thereby delivering excellence in care.

With this in mind, we recommend that all diplomates participate in the ABR-MOC program.

Those with time-limited certificates are automatically enrolled in the process, though they must initiate their activity. Those with lifetime certificates should consider ABR-MOC as an investment that will ensure continuing education, instill confidence, and promote the best interests of the patient.
PQI Guidelines: Diagnostic Radiologic Physics

Project Examples

1. Category: Safety for Patients, Employees and the Public
2. Category: Safety for Patients, Employees and the Public
3. Category: Practice Guidelines and Standards

These examples address some of the many possibilities for individual PQI projects. Other PQI options are available including participation in a peer review of a self-assessment report or activity within a qualified national project sponsored by a society.

1. Category: Safety for Patients, Employees and the Public

Project: Monitoring of Dose Indices for Lumbar Spine Radiography

BACKGROUND:
With Computerized Radiography (CR) it is quite likely that patient exposures will increase since there are little imaging consequences of overexposure. In addition, the monitoring of this process is more difficult as there are no "waste films."

OBJECTIVE:
To establish a program to monitor exposure indicators and assure that they are as low as reasonably achievable.

PROGRAM:
The Dose Index parameters will be monitored for all Lumbar Spine Radiographs. These will be tracked and reviewed with the Supervisor and overseeing Radiologist.

PROCEDURES:
- Metrics
  1. Develop software to extract Dose Indices from DICOM Headers
  2. Using archived examinations, establish the mean and standard deviation for these indices over the last two years
PQI: Practice Quality Improvement

Guidelines for PQI Projects

Projects in five project areas listed below could be designed by individual radiologists, radiology practice groups or departments, institutions, healthcare systems, or by professional societies. Every radiologist participating may receive PQI credit for the project. (Some projects may offer CME credit as well, through the normal CME approval process.) Because the key competencies to be addressed through PQI projects include systems-based practice, practice-based learning and improvement, and interpersonal/communication skills, it is strongly encouraged that others involved in the provision of care to radiology patients be incorporated into the project team.

Projects selected to meet the practice quality improvement (Part IV) requirement of the ABR’s Maintenance of Certification (MOC) program should:

- Be relevant to your practice
- Be achievable in your practice setting
- Produce results that are suited to repeat measurement during your MOC cycle
- Be reasonably expected to bring about quality improvement

PQI Projects broadly conform to the following template. The appropriate steps within a PQI Project are:

1. Select a topic area in which you would like to see your practice improve, and within it, decide on a challenge that is relevant to your practice
2. Decide what specifically you will measure to assess current performance and future improvement, and create a data collection form to record the measurements (if one does not already exist)
3. Make a baseline measurement in an appropriate number of cases drawn in an unbiased manner
4. Analyze results
5. Identify the potential root causes of error or suboptimal performance
6. Develop a written improvement plan
<table>
<thead>
<tr>
<th>Type</th>
<th>Title</th>
<th>Org</th>
<th>Date Qualified</th>
<th>Abstract</th>
</tr>
</thead>
<tbody>
<tr>
<td>*C T Colonography Registry</td>
<td>ACR</td>
<td>01/30/2008</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Performance of VCUG</td>
<td>Examinations: Safety, Quality of Care: Practice Guideline template</td>
<td>SPR</td>
<td>03/11/2008</td>
<td>N/A</td>
</tr>
<tr>
<td>Universal Protocol/Procedural Pause</td>
<td></td>
<td>RQ</td>
<td>08/11/2008</td>
<td>N/A</td>
</tr>
<tr>
<td>Intravenous Iodinated</td>
<td>Contrast Extravasation During Computerized Tomography</td>
<td>SUR/ACR</td>
<td>10/22/2008</td>
<td>N/A</td>
</tr>
<tr>
<td>Fluoroscopy Dose Recording</td>
<td>SIR</td>
<td>02/04/2009</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Prospective Analysis for</td>
<td>Radiatiod Dose Reduction</td>
<td>SIR</td>
<td>02/04/2009</td>
<td>N/A</td>
</tr>
<tr>
<td>Patient Safety Improvement Program (PSIP)</td>
<td></td>
<td>ABMS</td>
<td>09/22/2008</td>
<td>N/A</td>
</tr>
<tr>
<td>Chest CT Radiation Safety</td>
<td>ARRS</td>
<td>12/31/2008</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>RADPEER</td>
<td>ACR</td>
<td>04/17/2009</td>
<td>RADPEER</td>
<td></td>
</tr>
<tr>
<td>National Mammography Database</td>
<td></td>
<td>ACR</td>
<td>08/03/2009</td>
<td>N/A</td>
</tr>
<tr>
<td>Image Gently: PQI in safety for children undergoing CT scan</td>
<td>Cincinnati Children’s Hospital &amp; SPR</td>
<td>04/17/2009</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>
Radiology Practice Quality Improvement Projects

Who is this site meant to help?

- This site is for Radiologists undergoing Maintenance of Certification (MOC) by the American Board of Radiology (ABR).
- We provide free, easy projects that help you complete and document compliance with MOC Part IV, Practice Quality Improvement (PQI) requirements.

What's the big deal?

- You need to be actively working on a project every year.
- You need to keep documentation to prove it, in case you are audited.
- Completing a project in a single year or over a few years and then stopping is not allowed.
No one wants to be Front-Page Headlines

Patient injury from CT can happen!
• Build on past successes
  – ESE analysis
  – CR Exposure index
    (e.g., N, EI, etc.)
  – ACR CT Accreditation
    (3 protocols)
• Start with CT technologist
  and Radiologist
• Remind others of
  Congressional hearings
  – Statements from AAPM, ACR…
• FDA position April 20, 2010
Initiative to Reduce Unnecessary Radiation Exposure from Medical Imaging

FDA is launching a collaborative Initiative to Reduce Unnecessary Radiation Exposure from Medical Imaging, with a focus on the types of imaging procedures that are associated with the highest radiation doses: CT, fluoroscopy, and nuclear medicine.
FDA White Paper (Executive Summary) states:

• …two principles of radiation protection: appropriate *justification* for ordering and performing each procedure, and careful optimization of the radiation dose used during each procedure.

• These types of imaging exams should be conducted only when medically justified.

• When such exams are conducted, patients should be exposed to an optimal radiation dose – no more or less than what is necessary to produce a high-quality image.

• In other words, each patient should get the right imaging exam, at the right time, with the right radiation dose.
Salesmanship 101 – The Project

• Why should facilities engage in protocol review?
• Quality Patient Care
• Risk Management
• Patients (and board members) are already asking “What is the dose from CT?”
• Would be helpful to respond “We are engaged in an ongoing review process to optimize Dose-Image Quality”
• Potentially emerging regulations, accreditation requirements or interpretations
Salesmanship 101 – Decision makers

- Radiology Manager
- Radiologist (Leader)
- RSO
- Radiation Safety Committee
- Hospital Administrators
- Risk Management
- Hospital Board of Directors
### Personnel to Support Project...

<table>
<thead>
<tr>
<th>Position</th>
<th>Concerns</th>
<th>Time</th>
<th>$$$</th>
<th>Staff</th>
<th>MDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT RT (Spv sr)</td>
<td>Pt care, standardization</td>
<td>☑</td>
<td>?</td>
<td>☑</td>
<td>?</td>
</tr>
<tr>
<td>Radiology Mgr</td>
<td>+ operating budget</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>?</td>
</tr>
<tr>
<td>Radiologist</td>
<td>Pt care, standardization, Referring MDs, legal</td>
<td>☑</td>
<td>?</td>
<td>?</td>
<td>☑</td>
</tr>
</tbody>
</table>

“What have you done to assure media incidents don’t happen here?”
# Essential Personnel to Support Project

<table>
<thead>
<tr>
<th>Concerns</th>
<th>Authority</th>
<th>Time</th>
<th>$$$</th>
<th>Staff</th>
<th>MDs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CT RT (Spvrs)</strong> Pt care, standardization</td>
<td>✓</td>
<td>?</td>
<td>✓</td>
<td>✓</td>
<td>?</td>
</tr>
<tr>
<td><strong>Radiology Mgr</strong> + operating budget</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Radiologist</strong> Pt care, standardization,</td>
<td>✓</td>
<td>?</td>
<td>?</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Referring MDs, legal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RSC - RSO</strong> Avoid incidents; compliance</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Admin</strong> Avoid incidents;</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>?</td>
</tr>
<tr>
<td><strong>Risk Mgmt</strong> Publicity; Legal</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>?</td>
</tr>
<tr>
<td><strong>Brd of Directors</strong> Publicity, personal</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>?</td>
</tr>
<tr>
<td>legal risk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2 Final

- Teaching technologists is win-win
  - How their scanner works
  - Meaning of CTDI and DLP displays
  - Set trigger levels

- Carefully document process and recommendations

of advice...
**Teaching CT Technologists about Dose Info**

---

### Dose Report

<table>
<thead>
<tr>
<th>Series</th>
<th>Type</th>
<th>Scan Range (mm)</th>
<th>CTDivol (mGy)</th>
<th>DLP (mGy·cm)</th>
<th>Phantom cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Scout</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Helical</td>
<td>172.500–189.500</td>
<td>10.40</td>
<td>266.65</td>
<td>Body 32</td>
</tr>
<tr>
<td>3</td>
<td>Helical</td>
<td>176.750–188.750</td>
<td>11.93</td>
<td>271.71</td>
<td>Body 32</td>
</tr>
<tr>
<td>3</td>
<td>Helical</td>
<td>176.750–188.750</td>
<td>11.93</td>
<td>271.71</td>
<td>Body 32</td>
</tr>
<tr>
<td>4</td>
<td>Helical</td>
<td>S13.500–1571.500</td>
<td>10.40</td>
<td>846.31</td>
<td>Body 32</td>
</tr>
</tbody>
</table>

**Total Exam DLP:** 1456.38

**Projected series DLP:** 447.75 mGy·cm

**Accumulated exam DLP:** 0.00 mGy·cm

---

Adapted from Doug Pfeiffer, MS
**How to present/document recommendations**

- **Observation:** The default ______ protocol was initially set for __________, for which (dose, image quality) may not be optimal. These interrelated issues have been discussed with the CT Protocol Review Committee.

- **Recommendation:** Consider modifying this protocol to improve (dose, image quality) as documented in Committee Minutes. Dr. Rogers to assess clinical acceptability. Notify Committee members if problems are reported.

- **Caution:** Changing default protocols without Committee consensus could compromise patient care (image quality and dose).
If facility isn’t willing to pay for more support...

**Added Caution:** Changing default protocols without a medical physics consultation could compromise patient care.

**CTDI displays are not patient dose displays** and can be complex to interpret. Without further medical physics consultation regarding protocol changes, we are unable to assess the potential for patient harm due to poor image quality or excessive radiation exposure.
If site is unwilling to start paying for support...

**Added Caution:** This report of routine medical physics service is limited to evaluation of image quality and dose **only for those protocols specified in the ACR CT accreditation program** (routine head, abdomen and pediatric abdomen).

We have not been engaged to participate in an overall review of facility protocols. **Hence, we are unable to assess the potential for patient harm due to poor image quality or excessive radiation exposure from protocols we have not been retained to evaluate.**
Summary

How to

✔ Come up to speed on a wide range of scanner types
✔ Leverage your experience from one site to others
✔ Build relationships that encourages your client to seek your input on protocols
✔ Address protocol problems once you find them, particularly if the site isn’t willing to pay for support
Thank you!

Do your homework before your bath tonight!