MEDICAL PHYSICS PRACTICE GUIDELINES (MPPG)

Russell Tarver MS, DABR

MAC-AAPM - 2015
DISCLOSURES

• No disclosures associated with this content or this meeting
OUTLINE

• Genesis and goals of Practice Guidelines
• Workings of the Subcommittee on Practice Guidelines
• MPPG: published, writing, and forming
• MPPG writing and structure
• TG vs. PG
• Implementing
• Wrap up
AND GOD SAID: “LET THERE BE LIGHT”
And man, immediately understanding the nature of light and future implications, said: “This is good”

I can probe the mysteries of the universe

I can peer inside my body

I can cure mine own self
BUT FIRST, I MUST:

• Quantify this light
• Quantify its effect
• Build an accelerator to make my own light
• Write many reports on using this light
• Ensure performance of my equipment, and thus:
  • Write more reports on equipment performance
AND MAN FURTHER SAID: “THIS IS HOW I WILL DO THESE THINGS”
BUT THE AVERAGE MAN WAS CONFUSED!

Oh what to do, what to dooo?

There’s just too much to do!
BUT A SOLUTION WAS FOUND: ONE RING TO RULE THEM ALL
BACK TO THE FUTURE

• In 2010, the Professional Council presented a proposal for the AAPM to generate Practice Guidelines. This proposal was approved by the BOD in 2011.

• Other societies were creating similar documents; Technical Standards, Practice Parameters, etc.

• Professional Council created a subcommittee: Subcommittee on Practice Guidelines (SPG)
PURPOSE OF PRACTICE GUIDELINES

• Provide the community with a clear description of the minimum level of medical physics support that is considered prudent in all clinical practice settings

  • Support – includes but is not limited to: staffing, equipment, machine access, and training

  • Intentionally different than TG reports which are written by core groups of subject experts on a specific science topic

  • PGs are written by a small group of practicing clinical physicists with expertise in a given area of clinical practice
BENEFITS OF PRACTICE GUIDELINES

• Serves as a resource for practicing clinical physicists
• Serves as support and justification for staffing and equipment needs
• Can serve as a template for regulators and policy makers
• May serve to help standardize the community standard for MP services
### MPPG VS. TG

- There very well may be similarities and differences between a TG and an MPPG

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Application-type tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>non-SRS/SBRT</td>
</tr>
<tr>
<td><strong>Daily</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Planar kV and MV (EPID) imaging</strong></td>
<td>Functional</td>
</tr>
<tr>
<td>Collision interlocks</td>
<td>≤2 mm</td>
</tr>
<tr>
<td>Positioning/repositioning</td>
<td></td>
</tr>
<tr>
<td>Imaging and treatment coordinate coincidence (single gantry angle)</td>
<td>≤2 mm</td>
</tr>
<tr>
<td><strong>Daily</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Safety/interlocks</strong></td>
<td>Functional</td>
</tr>
<tr>
<td>Imaging-treatment isocenter coincidence (SRS only)</td>
<td>1 mm</td>
</tr>
<tr>
<td>Positioning/repositioning (SRS only)</td>
<td>1 mm</td>
</tr>
<tr>
<td>Imaging-treatment isocenter coincidence (SBRT only)</td>
<td>2 mm</td>
</tr>
<tr>
<td>Positioning/repositioning (SBRT only)</td>
<td>2 mm</td>
</tr>
</tbody>
</table>
WHERE TO FIND THEM
SPG FORM AND FUNCTION

• Receive and evaluate requests for Medical Physics assistance from other societies or professional certification programs

• Evaluate TG reports prior to publication (or during development) and determine whether a Practice Guideline would be needed and of benefit to AAPM members

• For TG reports deemed to benefit from a Practice Guideline, generate and publish the Guide through a collaborative effort with the originating TG

• Form the appropriate Practice Guideline working group
SPG IN PRACTICE

• Identify a need in the community where there is either a paucity of guidance, or redundant, conflicting, or overabundance of guidance and recommendations

• Evaluate the need, and constitute an appropriate subcommittee (task group) to review the relevant material

• SPG Task Group is generally made up of practicing clinical medical physicists, with key participation from members of existing relevant TGs

• Emphasis is made on constituting the TG from practicing clinical medical physicists, and not from the well known sources of technical analysis reports or TGs
Once constituted, the MPPG is autonomous, yet reports progress to the SPG so that the final product does not veer too far from the intended scope.

1 year is the planned timeline from constitution to published work (in practice this is a very aggressive timeline).

Review by AAPM Councils prior to public review.

Collaboration and co-publication with other societies when appropriate is encouraged.
RECOMMENDATIONS TO WRITING GROUP

• Constitute the membership by including:
  • 1-2 authors from relevant Science TGs
  • Practicing experts in the field (clinical physicists)
  • Specific guidance to avoid seeking well published subject matter experts (the usual suspects) as MPPGs should be written by physicists intimately familiar with day-to-day clinical practice

• Consider multi-society collaboration when possible

• Consider multiple environments of operation and discussion
  • Hospitals, academia, freestanding, non-profit, physician group
  • Physicians, Hospital Admin, Technical Staff, Vendor Engineers, etc.)
PUBLICATION ROUTE

• TG writes
• SPG reviews
• Professional Council reviews
• Additional Councils review
• Public comment period
• Submission for publication (JACMP)
  • Why not MedPhys?????
• Each MPPG will by necessity have different preambles, content, and recommendations

• But in general:
  • Introduction detailing relevant existing literature (or lack thereof) and the topic to be addressed
  • Definition of the scope of the MPPG and analysis of the topic at hand
  • Definitions as necessary
  • Staffing qualifications where necessary
  • Recommendations (Guidelines)
  • Conclusions
  • References
PUBLISHED MPPGS

• 1.a CT Protocol management and review practice guideline
• 2.a Commissioning and quality assurance of X-ray–based image-guided radiotherapy systems
• 3.a Levels of supervision for medical physicists in clinical training
• 4.a Development, implementation, use and maintenance of safety checklists
• 5.a Commissioning and QA of treatment planning dose calculations
# MPPGS IN-WORKS

<table>
<thead>
<tr>
<th>MPPG</th>
<th>TG</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>PG #6</td>
<td>TG# 257</td>
<td>Selection of a Patient Dose Monitoring System</td>
</tr>
<tr>
<td>PG #7</td>
<td>TG# 259</td>
<td>Medical Physics Extenders</td>
</tr>
<tr>
<td>PG #8</td>
<td>TG# 265</td>
<td>Practice Requirements for Linac QA</td>
</tr>
<tr>
<td>PG #9</td>
<td>TG #277</td>
<td>Implementing SRS / SBRT</td>
</tr>
<tr>
<td>MPPG</td>
<td>TG</td>
<td>Title</td>
</tr>
<tr>
<td>--------</td>
<td>-----</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>PG# 10</td>
<td>TBD</td>
<td>Best practices for electronic chart checking – transitioning from paper to electronic charts</td>
</tr>
<tr>
<td>PG# 11</td>
<td>TBD</td>
<td>Fluoro system acceptance and commissioning</td>
</tr>
<tr>
<td>PG# 12</td>
<td>TBD</td>
<td>Nuclear Medicine, SPECT &amp; SPECT CT, Gamma Cameras, acceptance and routine use and QA</td>
</tr>
<tr>
<td>PG #13</td>
<td>TBD</td>
<td>Proper recording of electronic radiotherapy dose history</td>
</tr>
</tbody>
</table>
EXAMPLE MPPG
CT PROTOCOL OUTLINE

• Introduction
• Definitions
• Staffing Qualifications and Responsibilities
• Protocol Management Review Process
• Conclusion
2. Definitions

a. CT Protocol – the collection of settings and parameters that fully describe a CT exami-

nation.\(^6\) Protocols may be relatively simple for some body part specific systems or

highly complex for full-featured, general-purpose CT systems.\(^7\)

b. Qualified Medical Physicist – as defined by AAPM Professional Policy 1\(^8\)
vi. **Qualifications of the CT Radiologist**

Facilities should refer to the ACR for guidance on the requirements for physicians for accreditation or those in the *Practice Guideline for Performing and Interpreting CT*\(^{(12)}\) and *CT Accreditation Program Requirements*.\(^{(13)}\)

The CT radiologist leads the CT Protocol Management and Review and defines image quality requirements.\(^{(14)}\)
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.
EXAMPLE MPPG
COMMISSIONING AND QUALITY ASSURANCE OF X-RAY BASED IMAGED GUIDED RADIOTHERAPY SYSTEMS

• Introduction
• Definitions and abbreviations
• Staff qualifications and responsibilities
• Implementation guidelines
• Recommendations
• Conclusions
b. Radiation Oncologist — The radiation oncologist **should** meet qualifications outlined in the ACR-ASTRO practice guideline for clinical use of IGRT.(10) In short, the responsibilities of the radiation oncologist in an IGRT program include:

- Specifying patient positioning procedures
- Specifying imaging modalities and frequencies
- Identifying registration targets and repositioning thresholds
- Conducting timely review of clinical IGRT images
- Conducting regular reviews of the IGRT program
- Implementing and managing a quality assurance program
- Developing and implementing standard operating procedures (including imaging protocols and repositioning thresholds)
EXCERPT FROM TPS MPPG

• This is an example of how a PG provides specific guidance on how to do something

• This PG also created freely available software routines to evaluate measured data against calculated data, and provide statistical analysis
OPEN SOURCE MATLAB CODE FOR PG#5

Input:

Output:
RESULTS FROM TEST 5.5 LARGE MLC: D=10 CM INLINE PROFILE FOR 60° WEDGED 6MV FIELD, $\Gamma = 2%/3\text{MM}$

1. Problem in leaf penumbra (T&G) region
2. Problem with jaw/MLC leakage?

<table>
<thead>
<tr>
<th>Region</th>
<th>Evaluation Method</th>
<th>Tolerance* (consistent with RPC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High dose</td>
<td>Relative dose with one parameter change from reference conditions</td>
<td>2%</td>
</tr>
<tr>
<td>Penumbra</td>
<td>Distance to agreement</td>
<td>3 mm</td>
</tr>
<tr>
<td>Low dose tail</td>
<td>Up to 5 cm from field edge</td>
<td>3% of maximum field dose</td>
</tr>
</tbody>
</table>
IMPLEMENTING MPPGS

• Sources of information
  • MPPG itself
  • Presentations at professional meetings
  • Members of writing group
  • In-house committees
IMPLEMENTING MPPGS

• Read the MPPG, attend implementation sessions,
• Create the appropriate internal working group
• Include stakeholders and educate them on the return value
• Identify deficiencies or gaps
  • Consider manpower resources
  • Consider capital equipment
  • Consider staff training
• Develop an implementation plan
• Follow up implementation with a review/audit against the MPPG
• Keep track of what MPPGs you have used; they have a 5 year sunset/rewrite cycle
SUMMARY

• MPPGs are not created to tell you the science behind a widget, or the ‘how to’ of a technical activity
• Instead, they are designed to tell you what the minimum practice standard should be
  • The scope of ‘standard’ includes more than simple equipment performance
• They can be of great value in conversations with administrators, physicians, medical directors, practice managers, etc. YMMV***
• If you have a topic that you think would generate a good PG, contact the SPG via the AAPM website
QUESTIONS
PRACTICE GUIDELINES WERE CREATED TO:

• Instruct young physicists on how to manage by themselves in a clinic
• Define the minimum practice standards for a given clinical scope
• Update existing TG reports that have since expired
• Be used as a tool to determine competency of practicing medical physicists
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HOW MANY MPPGS HAVE BEEN PUBLISHED TO DATE:

• None yet, first two are still in review stage
• 2
• 4
• 6
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  • Reference: http://www.aapm.org/pubs/MPPG/
MPPGS CAN BE FOUND WHERE?

• On various list servers
• In AAPM newsletters
• In the Journal Medical Physics
• On both, the AAPM website and in the Journal of Applied Clinical Medical Physics
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  - Reference:
    http://www.jacmp.org/index.php/jacmp/search/search
RESOURCES

- MPPG 1.a CT Protocol
- MPPG 2.a Image Guidance
- AAPM Practice Guidelines Publication Page
- AAPM Presentation; Practice Guidelines
- AAPM Session on implementing TPS MPPG