

## ISMRM-AAPM Joint Symposium: MR Safety for Experts MR Safety Related AAPM Activities

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## AAPM Policy 1: Definition of A Qualified Medical Physicist

- For purpose of clinical professional service, a Qualified Medical Physicist (QMP) is individual competent to independently provide clinical professional services in medical physics subfield(s) in which they are certified.
- Medical Physics Subfields:**
  - Therapeutic Medical Physics; Diagnostic Medical Physics; Nuclear Medical Physics; Medical Health Physics; **Magnetic Resonance Imaging Physics**
- QMP meets each of the following credentials:
  - Earned a master's or doctoral degree in physics, medical physics, biophysics, radiological physics, medical health physics, or equivalent disciplines from an accredited college or university; and
  - Granted certification in the specific subfield(s) of medical physics with its associated medical health physics aspects by an appropriate national certifying body and abides by the certifying body's requirements for continuing education.
- National **certifying bodies** deemed appropriate for subfields:
  - Therapeutic Medical Physics: ABR, ABMP or CCPM
  - Diagnostic Medical Physics: ABR, ABMP, or CCPM
  - Nuclear Medical Physics: ABR, ABMP CCPM, or ABSNM
  - Medical Health Physics: ABR (MP), ABSNM (Rad Pro), ABMP (MHP) or ABHP (+3 yrs in subfield).
  - Magnetic Resonance Imaging Physics: ABR (d-MP), ABMP (MRI) or CCPM (MRI)**

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## AAPM Policy 17: Scope of Practice of Clinical Medical Physics

MRI Practice (partial safety related list)		QMP	
		perform	supervise
Acts as the facility's MR Safety Expert or MR Safety Officer.			x
Develops an MRI safety program.			x
Provides consultation regarding patient safety in MRI, such as SAR considerations, prevention of patient burns, implanted devices, etc.			x
Provides MRI safety training to health care team members and emergency responders.			x
Establishes and oversees radiation and/or MR safety programs to meet local and national regulations, accrediting organizations' standards, and national recommendations			x
Provides guidance regarding controlled access to MRI areas			x
Ensures the safety of the MRI environment			x
Ensures the safe and appropriate implementation and use of imaging procedures and equipment as they pertain to diagnostic and interventional equipment and radiotherapy (simulation, treatment planning, and treatment delivery)	x		
Provides imaging protocol consultation with radiologists and other health care providers			general
Performs EPE for MRI systems, including systems used for radiation therapy treatment planning			
- Acceptance			
- Annual/Post-repair	x		direct
- Continuous QA			general
Ensures that all local and national regulations and accreditation requirements as relating to medical physics are met and maintained	x		
Oversees quality assurance and quality control programs to meet local and national regulations, accreditation organization(s) standards, and national recommendations	x		

## MR Safety Related Committees & Task Groups

- MR SC**
    - TG210 - Clinical QMR
    - TG117 - MRI for Treatment Planning and Stereotactic Procedures
    - WG on MRI Testing and Quality Assurance
    - TG225 - Magnetic Field Homogeneity Measurement
    - WG on MR Safety**
      - Proposed TG - Evaluation of Implants and Devices (proposed)**
  - Therapy Imaging SC**
    - WG Imaging for Treatment Assessment
    - WG Imaging for Treatment Planning
      - TG237 - Magnetic Resonance Imaging - Simulation in Radiotherapy**
    - WG Molecular Imaging in RO
      - TG294 - MR Biomarkers in RO
  - Brachytherapy SC**
    - WG on Brachytherapy Clinical Applications
      - TG260 - MRI Guidance in HDR - Brachytherapy Considerations**
  - Vendor Relations & Product Usability Subcommittee**
    - TG247 - Guidance Document to Using RT Immobilization Devices and Accessories in an MR Environment**
  - Board of Directors**
    - Ad Hoc Committee on MR Imaging in RT
  - Technology assessment Committee**
    - WG Assessment of Technologies for Image-Guided Interventions
      - TG233 - MR-guided Focused Ultrasound Quality Assurance
      - TG241 - MR-Guided Focused Ultrasound (MRgFUS)**
- Consult/work with other societies
- ACR
    - Multi-disciplinary blue ribbon panel
  - MRAP
    - technical specifications
  - FDA, IEC, ISO
  - ISMRM

## Working Group on MR Safety (WGMRS)

### Charge

- To monitor and report on emerging MR safety issues;
- To develop methods and recommend procedures for MRI safety testing;
- To establish liaisons with commercial entities regarding the safety of MRI equipment; and
- To develop and recommend safety components for multi-center MR protocols.

## Implants in MRI: Challenges & Changes

- More patients with implants scheduled for MRI**
  - Increased number of MR systems
  - Increased number of indications for MR in diagnosis & therapy
  - Increased number of MR conditional medical implants**
- Challenges due to MRI and medical devices**
  - Increased number of 3T MRI (7T recently cleared)
  - Short and/or wide bore impact on spatial field gradients
  - Increased number of advanced procedures that utilize high end hardware capabilities (increased SAR, dB/dt, multi-channel transmit, etc)
  - Increased number of MR conditional medical implants with complex conditions requiring expert technical knowledge**
  - Evolving conditions confusing to technologists, radiologists and clinicians
  - Poor documentation in patient EMR and lack of centralized information on MR conditions

### Medical Physicist as MR Safety Expert (MRSE)

- Must be able to clearly communicate impact of technical nuance on risks in MRI environment to aid MR faculty and staff in making effective patient management decisions
- Does not make medical decisions (such as to move forward with scanning a specific patient)
  - does not “clear” devices to scan
  - does advise on technical conditions for scanning on label
- May be asked to advise on approaches to scanning off-label and associated risks

Inter Society Working Group on MR Safety, “Recommendations for Implementation of MR Safety,” J Magn Reson Imaging 2016.  
European Federation of Organizations for Medical Physics Policy Statement No. 14, <http://www.efomp.europa.eu/efomp/efomp-policy-statement-no-14-mr-safety>, 2015.  
EFOMP Recommendations, July 2015.

### Medical Devices & Implants in MRI Environment

- Active Implanted Medical Devices (AIMD)
  - CIED (pacemakers, ICD)
  - Stimulators (deep brain, vagal nerve, spinal, bone and bladder)
  - Pumps (pain, drug, insulin)
  - Cochlear implants
  - Cardiac loop recorders
- Passive implants & retained foreign objects
  - Neurological (aneurysm clips & coils, shunts)
  - Orthopedic (prosthetics, rods, screws)
  - Cardiovascular and Vascular (stents, coils & filters)
  - Breast (implants, tissue expanders)
  - Retained foreign objects (i.e., metal in orbits, bullet fragments, etc)
- External objects and devices
  - On body/injectors
  - Permanent makeup, tattoos, piercings, etc

### WGMRS: Proposed Task Group

- Implanted Medical Device Considerations for MR Physicists
  - Review role & expectations of QMP as MRSE consultant for patients with implants, emphasizing assessment and formulation of action plan.
  - Overview physics relevant for understanding implant MR safety concerns.
  - Highlight important literature & standards.
  - Develop methods and promote best practices for QMP assessment of risk in patients with implanted medical devices as well as reporting and communication considerations with staff and/or clinicians.
  - Review general considerations and approaches to modifying MR acquisitions to accommodate conditions for MR safety versus protocol effectiveness.
  - Recommended standard operating procedures for specific device categories with practical examples.
  - Identify common pitfalls and areas requiring research or better standardization.

### Summary

- Increased global use of MRI as well as in radiation oncology have heightened MR Safety awareness within the AAPM membership
- MRI has emerged as a distinct subfield of Medical Physics
  - MR physicists often looked to as MR safety experts
- Challenges that need to be addressed
  - scope of practice in MR safety [... and MR physics]
  - implanted, partially implanted and ancillary devices in the MR environment
  - hybrid suites and special use scanners
  - MR siting and specifications report that addresses modern safety concerns
  - ongoing education & training on par with current efforts in image quality
- Partnering with ISMRM on MR safety issues potentially beneficial

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