MR Safety Program: Learning from Past Mistakes

Maureen N. Hood, PhD, RN, RT (MR), FSMRT

Assistant Professor
Department of Radiology & Radiological Sciences
Uniformed Services University of the Health Sciences
Bethesda, Maryland USA
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I have an in-kind research relationship with GE Healthcare.
Outline

- Physical layout
- Staff
- Training
- Policies
Safety – What do you need?

- Proper facility design
- Warning signs
- Access Control
- Policies/Procedures
- Safety Training/Education
- Qualified MR technologists
- Adequate staffing
**Myth #1**

- All you need is a walk-through ferromagnetic detector and a tech.
- Wrong!!!
- Need multiple layers of protection
- **Nothing can replace a good MR Technologist**
- Must use screening forms AND interviews
- Use tools such as hand held magnets, ferromagnetic detectors and hand held wands to check for incidental items as needed.
- Four Zone System – ACR Recommendation
  - Swiss Cheese Model of Safety
Zones I & II

- **Zone I**
  - Freely accessible to the general public.
  - Outside the actual MRI environment.

- **Zone II**
  - Interface between the public area and the controlled MRI environment.
  - In general – this is the reception area for MRI. Patients and non-MRI personnel check-in here.
Zones III & IV

- **Zone III** - Controlled access area.
  - ONLY MR Personnel have free access to Zone III.
    - Restricted at all times.
  - No access by any non-MR persons unless escorted by MRI personnel.

- **Zone IV** - The MR scan room.
  - Only screened persons may enter.
    - Pts, visitors, staff
  - Only screened and approved equipment.
  - NO Exceptions - The scanner is ALWAYS ON!
Supplies

- Buy made for MRI or metal free supplies and working items whenever possible
- Examples:
  - Trash cans
  - IV poles
  - Step stools
  - Sand bags
  - Storage
  - Chairs for use inside the scan room
Labeling of Equipment

- **MR Safe**: an item that poses no known hazards in all MRI environments.

- **MR Conditional**: an item that has been demonstrated to pose no known hazards in a specified MRI environment with specified conditions of use. Additional conditions, including specific configurations of the item, may be required.

- **MR Unsafe**: an item that is known to pose hazards in all MRI environments. MR Unsafe items include magnetic items such as a pair of ferromagnetic scissors.

American Society of Testing and Materials
Myth #2

- Warning signs work great.
- Do not rely solely on signs
- Many people don’t read signs
- People think the signs don’t pertain to them
- People think the scanner is off when it is quiet
  - So wrong, yet so common
  - Never let your guard down
Warning Signs

- **DANGER**
  - Restricted Access
  - Strong Magnetic Field
  - No Entry by Unauthorized or Unaccompanied Individuals or Patients

- **DANGER!**
  - MRI Zone IV
  - Screened MRI Patients Under Constant Direct Supervision of Trained MRI Personnel Only

- **CAUTION**
  - MRI Zone III
  - Screened MRI Patients and Personnel Only

- **DANGER!**
  - Powerful Magnet Always On
Myth #3

- When the noise stops, the scanner is off
  - NOT!
- Amazing how many people don’t grasp that the scanner is ALWAYS ON.
  - Trust NO ONE!
ICU Bed – NOT Safe
MR technologists must have advanced knowledge of MRI safety
- MR Registry
- Continued education and training in MR safety

Never work solo
- Dangerous on many levels
- Minimum:
  - 2 techs, or
  - Tech + aide
Radiologists working in MR must have advanced training in MR safety

Radiologists ultimately make the decisions on who gets scanned

- Risk / Benefit analysis
- Radiologist need to support their technologists
Myth # 4

- Blanket policies are best
  - Very dangerous – there’s always an exception
  - Example: All stents are safe
    - Not true – best to know what the stent is to make a logical decision
    - Stacked? Is there a potential heating issue?
    - 1.5 T, 3T? 7T?
- All stainless is the same
  - 316L – mainly non-ferrous; 303, 304 - slightly ferrous; 400 series – very ferrous
  - Radiologists need to learn about metal alloys

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Training

- All MR staff given regular MR safety training
- Radiologists & MR Techs
  - Advanced Training
- Administrative Staff
  - Basics, plus roles in an emergency
- Anesthesiology, sedation teams, etc
  - Basic + safety pertaining to their working environment
- Other regular users
Training

- Courses
- Conferences
- Videos
- In-house trainers
All scanners are the same

- Field strengths, surface coils, gradient coils, etc. vary
- Hot spots cannot be predicted in advance – too many variables
- Bare skin touching can cause burns, especially at higher field strengths
Policies & Procedures

- SOP must include safety policies
- Implants
- IV infusion pumps
- Ventilators
- Clothing
- Family/Visitors
- 100% supervision of non-MR people in Zones III & IV.
Policies & Procedures

- Safety Training
  - annually
- Screening
  - form and interview
- Increased safety for Tesla systems above 1.5T
- Medication/Monitoring
  - Follow institution policies
Check everything!
- Sometimes the MR Medication Infusion pump may be on the wrong IV pole
- Snaps on gowns
- EKG leads
  - everywhere
- Foley catheters
  - may have thermometer

burn from pulse ox
Questions?

Magnetic Nail Polish
A revolutionary magnetic nail lacquer used to create stunning 3D nail art designs in chic metallic shades.
References


References