Effective Ways to Improve Patient Cooperation and Safety in MRI Exam

Lecture Topics

- MRI patient preparation
- Department MRI Safety Policies and Procedures
- MRI patient safety screening
- MRI patient comfort ideas
- MRI Positioning Techniques
- MRI Imaging Techniques and tips

MRI Department Goals

- Efficient MRI Schedule Stay on time
- Improve Patient Comfort and Patient Satisfaction
- Improve Image accuracy/Image quality
Patient Preparation
Before the MRI Exam

At the time of scheduling, screen patients for surgical implants such as, cardiac pacemakers, aneurysm clips, stents, and shrapnel.
The Radiology receptionist should call patients 1-2 days before the MRI appointment to perform an MRI safety screening and confirm the MRI patient’s appointment.

MRI Safety Screening Device Form

Patient Name: ____________________________
MRN: ____________________________
MRI appointment Date: ____________________________

Does the patient have a Cardiac Stent, Vascular stent, and or Filter?

Type: __________________________________________________
Date of Implant: __________________________________________
Physician or Facility that placed the device: _____________________
Additional Information: ___________________________________

Does the patient have a Brain Aneurysm Clip?

Type: _________________________________________________
Date of Implant: ________________________________________
Physician or Facility that placed the device: _____________________

Does the patient have a Heart pacemaker or Heart Valve?

Heart Valve type: _________________________________________
Date of Implant: ________________________________________
Physician or Facility that placed the device: _____________________

Does the patient have a history of metal in their eye or metal removed from their eye. Patient should arrive 1 hour prior to the MRI appointment time for screening x-rays.

*If the patient has a heart pacemaker cancel the MRI and inform the referring physician’s office.

MRI Patient Greeting

Acknowledge the patient. Introduce yourself to the patient and tell the patient who you are.
Confirm the patient’s identification with 2 patient identifiers. Name and DOB.

Review MRI Safety Screening form with the patient.
Explain the MRI procedure.
Inform patient of any MRI imaging effects and reason for the study.

Clarian Health 2010
Laurie Owens BSRT (MR)
Patient Dressing Area

- Provide patients with comfortable hospital garments that are the correct sizes. Provide a private area to change their clothes, and a secure place to lock up their personal items.
- Remind your patient to use the restroom before beginning the MRI procedure.

Patient Comfort Positioning Ideas

- All patients, claustrophobic patients, pediatrics patients, larger patients

Patient Comfort Ideas

- Patient Tempur-Pedic pads
- Blanket Warmers
- Knee Rest
Larger bore Magnets
70cm
Siemens 3T Verio, 1.5T Espree, and Pink Espree
GE 1.5T 450w, 3T 750w
Table limit is 550lb

Provide extra padding

Mirrors, Prism glasses, Blindfold
Claustrophobic patients
Patient Communication

- Always give your patient the call button.
- Always stay in constant contact with the patient.
- Never leave the computer while imaging a patient.
- Check with your patient regularly to make sure they are ok.
- Inform your patient of scanning procedures.
Pediatric Imaging

- Explain the MRI to the child. Invite the child to bring an MRI safe toy with them.
- Involve the child and their parents.
- Play music, kid songs, stories on a CD.
- Snuggle, knee rest, blanket.
- Anesthesia/Sedation

Explain the MRI Procedure

- Before imaging, explain the MRI procedure in detail.
- Include the noise the scanner makes, breath holds, contrast injection, scan time duration.
- Provide Ear Protection

MRI Safety
MRI Safety Program

- MRI Safety Policy
- MRI Equipment Safety policy
- Emergency Procedure
- MRI Safety Screening form
- MRI Safety Training

MRI Safety Policy

- Safety policy may include:
  - Metallic objects
  - Annual MRI Safety training
  - MRI screening form
  - Surgical implant screening
  - Ear Protection
  - Call button

MR Zone Configuration
MR Zone Configuration

- Zone 1: General Public areas. Typically MR patient waiting.
- Zone 2: Typically Zone 2 is the MR screening area and patients are under the supervision of MR personnel. Dressing area, IV start room.
- Zone 3: Should be strictly restricted and is directly adjacent to the magnet room. Zone 3 is typically the MR control room and the entry space before entering the magnet room.
- Zone 4: Magnet room

MRI Magnet room
- MRI Entry and RF Door includes Danger Signs in English and Spanish.

MRI compatible
- Fire Extinguisher
Zone 3 and 4 locking systems

Card Reader
Magnet room keypad

MRI Equipment Labels


Use of Medical Equipment in the MRI Scanner Room

- A policy for the safe use of medical equipment and devices in the MRI magnet room. MRI compatible equipment may have limitations.
- The safe use of medical equipment in the MRI scanner room should be reviewed by the department MRI safety committee. MRI equipment will be reviewed, determined MRI safety level, equipment is labeled MRI safe or MRI conditional.
- If MRI conditional, safe use will be determined and additional safety precautions will be followed.
Servo i MRI Ventilator Positioned in a Magnet Room

- Maquet Inc.
- Servo i Ventilator will be placed outside the 20mT (200 gauss) line. For open MR scanners it should be placed outside the 10mT (100 gauss) line.
- Brakes on, Tether Secured
- MRI Technologists should position the Servo i Ventilator

MRI Compatible Anesthesia Machines

- Datex Ohmeda placed outside the 30mT (300 gauss) line.

MR Safety Screening Form, English and Spanish

MRI Safety Screening form for all patients before entering the MR magnet room.

Research Surgical Implant for MRI compatibility and prove that the device is MRI safe.

Follow all surgical device imaging guidelines.

Screen patients for foreign metal, such as orbital metal X-Rays can be obtained to locate potential foreign metal.
Preventing Patient Injury

- Check for metallic ECG pads and tattoos.
- Document surgical implants and determine MRI safety.
- Do not image patients with Pacemakers/Defibrillators. Patients with pacemakers should be outside the scanner line.

MRI Emergency Procedure

- In the event of a patient medical emergency, remove patient from the MRI scanner room, call Radiologist/Code team. Emergent intervention should always occur in zone 3 outside the scanner room.
- For fire emergencies, remove patient from the scanner room, activate fire alarm, activate emergency power stop button to turn off electrical power. Provide assistance.
- Quench Magnet only to prevent person injury.

Safety Concerns from Quenching

- As liquid oxygen becomes gas, it will displace room air and oxygen. Persons breathing in this environment may suffocate.
- Cold gas may cause skin & body injury.
MRI Safety Training Location

Implant and Device Safety Database

www.mrisafety.com
by Frank G. Shellock

magresource.com

Consult Implant device company, such as Medtronic, Cook

Imaging Techniques and Tips
Knee Positioning

Center knee joint in the center of the coil. For Cor/Sag Knee sequences the knee joint should be positioned 1/3 from the bottom of the FOV to see the full extent of the patellar tendon insertion into the tibia.

Knee ACL Angles

Shoulder MRI

- Externally rotate the patient’s arm.
- If the patient is in too much pain position their arm in a neutral position. Never position the patient’s arm on their abdomen.
- Use MRI safe sand bags and restraints to minimize patient motion.
- Externally rotate the patient’s arm.
External Shoulder rotation for the Right Shoulder

- **THE BICEPS TENDON SHOULD BE IN THE** 11 O'CLOCK POSITION FOR THE RIGHT SHOULDER AND THE 1 O'CLOCK POSITION FOR THE LEFT SHOULDER

---

Wrist MRI

- **Position patient feet first supine with the arm down to the patient's side.**
- **Provide extra padding under their arm.**
- **Use restraints to position the wrist coil and minimize patient motion.**
- **Position the patient as far as possible to the opposite side to optimize fat saturation.**

---

3D (SPACE/CUBE), T2 TSE, Stir

---
Composing (stitching)

Image from different table positions

Abdominal MRI

- Give your patient oxygen if they feel that they won't be able to hold their breath adequately.
- Coach your patient with the breathing instructions before the MRI. Expiration is the best technique to ensure consistent anatomy position.
- Provide headphones so that breathing instructions can be heard consistently.

Give your patient oxygen if they feel that they won't be able to hold their breath adequately.

Coach your patient with the breathing instructions before the MRI. Expiration is the best technique to ensure consistent anatomy position.

Provide headphones so that breathing instructions can be heard consistently.
Blade/Propeller

Radial k-space reduces motion due to breathing, pulsation, patient motion, MSK, abdomen, Neuro-applications.

Metallic Imaging Techniques

Tips for reducing metallic artifacts

- Bandwidth: Increasing the receiver bandwidth (rBW) reduces the mis-registration of signal in the frequency encoding direction.

- 3D Space sequences will minimize metallic artifacts. 3D sequences with smaller voxels will decrease intra voxel dephasing. 3D Space has a very high echo train and a long rBW.

- TSE sequences with very long echo trains have minimal refocusing RF pulses and short echo spacing that will reduce the amount of RF dephasing.
Conclusion:
Prepare your patient before the MRI procedure to keep your schedule efficient.
Making the patient as comfortable as possible will improve patient satisfaction.
Safely screen your patients, and keep your department safe from potential accidents.
Keep current on new MRI applications to improve image quality.

Thank you

Thank you, Chen Lin, Siemens Medical, Bracco Diagnostics, Drew Owens