MAYO CLINIC

MRI Safety: Fields and Devices

The Mayo Clinic Arizona Experience

Anshuman Panda, PhD

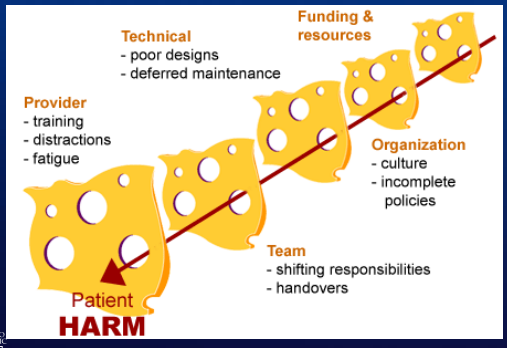
AAPM Annual Meeting
Denver, CO
August 2017

No conflict of interest to declare

MR Safety: Systems Engineering

People	Process	Technology
Administrative Controls	Procedural Controls	Engineering Controls

"Blame the process, not the people" – Deming



MR Safety – Process Designed for People

MR Safety – Starts with Process

People	Process	Technology
• Training	• Personnel	• Connect
• Policies	• Access	• Empower
• Guidelines	• Screening	• Enforce

Process Foundation

JOURNAL OF MAGNETIC RESONANCE IMAGING 37:501–530 (2013)

Special Communication

ACR Guidance Document on MR Safe Practices: 2013

Expert Panel on MR Safety: Emanuel Kanal, MD,[1]* A. James Barkovich, MD,[2] Charlotte Bell, MD,[3] James P. Borgstede, MD,[4] William G. Bradley Jr, MD, PhD,[5] Jerry W. Froelich, MD,[6] J. Rod Gimbel, MD,[7] John W. Gosbee, MD,[8] Ellisa Kuhni-Kaminski, RT,[1] Paul A. Larson, MD,[9] James W. Lester Jr, MD,[10] John Nyenhuis, PhD,[11] Daniel Joe Schaefer, PhD,[12] Elizabeth A. Sebek, RN, BSN,[1] Jeffrey Weinreb, MD,[13] Bruce L. Wilkoff, MD,[14] Terry O. Woods, PhD,[15] Leonard Lucey, JD,[16] and Dina Hernandez, BSRT[16]

Because there are many potential risks in the MR environment and reports of adverse incidents involving patients, equipment and personnel, the need for a guidance document on MR safe practices emerged. Initially published in 2002, the ACR MR Safe Practices Guidelines established de facto industry standards for safe and responsible practices in clinical and research MR environments. As the MR industry changes the document is reviewed, modified and updated. The most recent version will reflect these changes.

Key Words: MR safety; MR; MR safe practices
J. Magn. Reson. Imaging 2013;37:501–530.

THERE ARE POTENTIAL risks in the MR environment, not only for the patient (1,2) but also for the accompanying family members, attending health care professionals, and others who find themselves only occasionally or rarely in the magnetic fields of MR scanners, such as security or housekeeping personnel, firefighters, police, etc. (3–6). There have been reports in the medical literature and print-media detailing Magnetic Resonance Imaging (MRI) adverse incidents involving patients, equipment and personnel that spotlighted the need for a safety review by an expert panel. To this end, the American College of Radiology originally formed the Blue Ribbon Panel on MR Safety. First constituted in 2001, the panel was

Process – Procedural Controls

- Personnel – Level 1, Level 2
- Controlled Access
- Screening Requirements
- Emergency Response

Personnel Classification

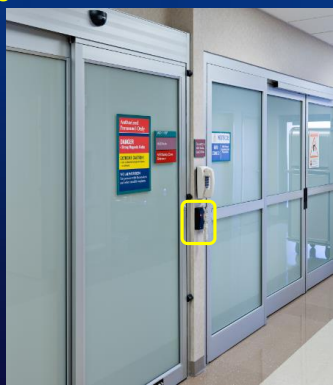
- BASIC: Basic MR safety knowledge
  - Staff who interact with patients in MR area but do not require access
  - Or need supervised access
- Level 1: Enhanced MRI safety knowledge
  - Staff who access Zones 2, 3 and 4
  - Responsible for their own safety
- Level 2: Advanced MR safety knowledge
  - Radiology staff working Zone 3 and Zone 4
  - Responsible for their own safety and safety of others

Personnel Classification

- BASIC: Basic MR safety knowledge
  - General Nursing, Radiology Technologists, Housekeeping
- Level 1: Enhanced MRI safety knowledge
  - Security, Facilities, Clinical Engineering, Rad Nursing, SWAT, Anesthesia, CRNA, Physicists, Radiologists
- Level 2: Advanced MR safety knowledge
  - MR Technologists and PET-MR Nuclear Medicine Technologists

Controlled Access

- Badge access
  - Level 1
  - Level 2
- Who grants access?
  - Security after MR safety committee review
- Annual review
  - Disable access
  - Diligence!



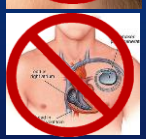
Screening

Patient Screening

Staff Screening

Screening

- Patient Screening
  - Both verbal and paper
    - Reliability
    - Sedated patients
- Staff Screening
  - Verbal screening every time
    - HIPAA
  - Reminders in annual online MR safety training



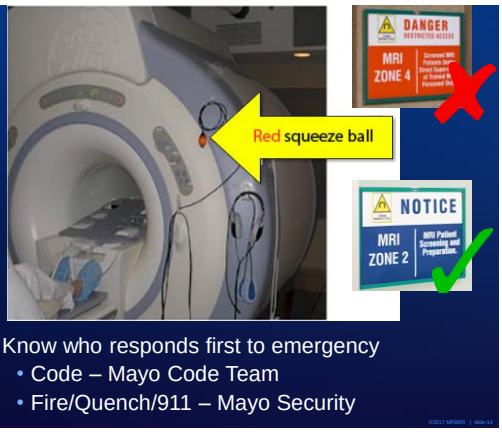
Zone 2 - Staff Screening and Safety

Your **SAFETY** is important!

Notify the MRI technologist if you have ANY medical implants (e.g., pacemakers, neurostimulators, hearing aids, etc.)

It may **NOT** be safe for you to enter the MRI environment.

Emergency Response



- Know who responds first to emergency
  - Code – Mayo Code Team
  - Fire/Quench/911 – Mayo Security

Fire in Restricted Areas

Dial 911 for all medical and equipment emergencies.

It should be stressed that even in the presence of a true fire (or other emergency) in Zone 3 or Zone 4, magnetic fields may be present and fully operational.

Access to Zones 3 and 4 needs to be restricted, even to emergency first-responders.

MRI Personnel ONLY

Emergency Response – Move to Zone 2!

- Stationary vs undockable table
  - All MR scanner tables at Mayo Arizona are undockable
- Level 2 training – MR Techs

Process – Summary

- Personnel
  - Basic, Level 1, Level 2
- Controlled Access
  - Levels of access
  - Periodic review and update access list
- MRI Safety Screening Requirements
  - Patients
  - Staff
- Emergency Response - Move to Zone 2!
  - Stationary vs undockable tables
  - Code, Quench, Fire, Smoke

People – Administrative Control

- MR Safety Training
- Signs and Labels
- MR Safety Committee

MR Safety Training

- BASIC: Basic MR safety knowledge
  - Mandatory online BASIC module on hire (initial) and then annually
- Level 1: Enhanced MRI safety knowledge
  - Mandatory online LEVEL 1 module on hire (initial) and then annually
  - Initial hands-on training
    - Ongoing hands-on training varies with work group
- Level 2: Advanced MR safety knowledge
  - Annual LEVEL 2 online module
  - Annual competency and inservice

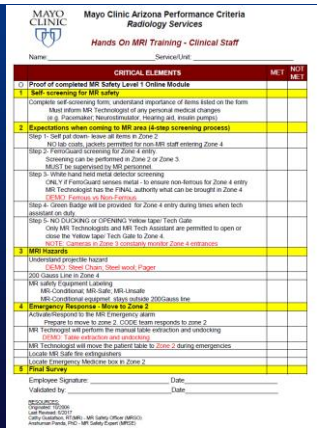
Online Training Modules

- Level BASIC
  - MR is always on! - projectile hazard
  - Workflow and screening
- Level 1
  - Level BASIC, plus
  - Emergency procedures
  - Equipment labels (safe, unsafe, conditional)
- Level 2
  - Patient and staff screening – screeners
  - Burn prevention, PNS
  - Scanning sedated patients

Online Module – Mayo Examples

Hands-on Training

- Four broad areas
  1. Self- screening for MR safety (including filling screening form) (5 mins)
  2. Expectations when coming to MR area (4-step screening process) (10 mins)
  3. Projectile Hazard (10 mins)
  4. What happens in case of emergency (5 mins)
  5. Final Survey



Mayo Clinic Arizona Performance Criteria
Radiology Services

Hands On MRI Training - Clinical Staff

Name:_____Service/Unit: _____

	CRITICAL ELEMENTS	MET	NOT MET
0	**Proof of completed MR Safety Level 1 Online Module**		
1	**Self- screening for MR safety**		
	Complete self-screening form, understand importance of items listed on the form Must inform MR Technologist of any personal medical changes (e.g. Pacemaker, Neurostimulator, Hearing aid, insulin pumps)		
2	**Expectations when coming to MR area (4-step screening process)**		
	Step 1- Self pat down- leave all items in Zone 2 NO lab coats, jackets permitted for non-MR staff entering Zone 4		
	Step 2- FerroGuard screening for Zone 4 entry Screening can be performed in Zone 2 or Zone 3 MUST be supervised by MR personnel		
	Step 3- White hand held metal detector screening ONLY if FerroGuard senses metal - to ensure non-ferrous for Zone 4 entry MR Technologist has the FINAL authority what can be brought in Zone 4 DEMO: Ferrous vs Non-Ferrous		
	Step 4- Green Badge will be provided for Zone 4 entry during times when tech assistant on duty		
	Step 5- NO DUCKING or OPENING Yellow tape/ Tech Gate Only MR Technologists and MR Tech Assistant are permitted to open or close the Yellow tape/ Tech Gate to Zone 4. NOTE: Cameras in Zone 3 constantly monitor Zone 4 entrances		
3	**MRI Hazards**		
	Understand projectile hazard DEMO: Steel Chain, Steel wool, Pager		
	200 Gauss Line in Zone 4		
	MR safety Equipment Labeling MR-Conditional; MR-Safe; MR-Unsafe MR-Conditional equipmet stays outside 200Gauss line		
4	**Emergency Response - Move to Zone 2**		
	Activate/Respond to the MR Emergency alarm Prepare to move to zone 2, CODE team responds to zone 2		
	MR Technologist will perform the manual table extraction and undocking DEMO: Table extraction and undocking		
	MR Technologist will move the patient table to Zone 2 during emergencies		
	Locate MR Safe fire extinguishers		
	Locate Emergency Medicine box in Zone 2		
5	**Final Survey**		

Employee Signature: _____ Date:_____

Validated by: _____ Date:_____

MRSAFE-MRSH-1
Document: 70306
Last Revised: 6/2017
Cathy Gustafson, RT(MR)...MR Safety Officer (MRSO)
Anshuman Panda, PhD - MR Safety Expert (MRSE)

Hands-on Training – Projectile Hazard

Hands-On Training Frequency (Under Review)

- MR and PET-MR Technologists – Annual
- Surgery (Hybrid OR) – Annual
- Security – Annual

- Radiology Nursing – 2 years
- Radiation Oncology Therapist – 2 years

- Anesthesiologist/Resp Therapist – 5 years
- CRNA – 5 years
- Anesthesia Tech – 5 years
- Housekeeping/EVS – 5 years

- Radiologists/Radiology Fellows/Residents – Once

Hands-on Training Survey

Date of training: 7/10/17

Please identify your Department and position:

Department: Anesthesiology

Position: Consultant

	Answer the following questions using a 1-5 scale (1 is the lowest and 5 is the highest)	Circle best answer
1.	Was this training helpful for understanding the hazards in MR environment?	1 2 3 4 (5)
2.	Was this training useful for understanding MR safety policies and processes?	1 2 3 4 (5)
3.	How relevant was this training to your job?	1 2 3 4 (5)
4.	Would you recommend this training to your colleague?	1 2 3 4 (5)

List one thing that was most helpful or informational.

hands-on and in person is superior to online module

Level 2 Training – MR Technologists

- Annual Online Module
  - Common screening gaps
  - Burn prevention
  - Scanning sedated patient
- Scanning/Screening Competencies - FOUR
  1. Inpatient and non-communicative
  2. Outpatient
  3. Interventional MR-OR
  4. Staff Screening
- Annual Hands-On Training
  - Screening equipment
  - Asserting authority

Burn Prevention, Acoustic Noise

Competency – Outpatient

Mayo Clinic Arizona Radiology
Performance Criteria
MRI
Outpatient MRI Screening

Name: _____ Service/Unit _____

CRITICAL ELEMENTS	MET	NOT MET
1. Patient must change to Mayo gown. (NO street clothes permitted at any time)		
2. Verbal Screening • Does the patient have a pacemaker? • Hearing Aids? • Insulin pump? • Ask about any permanent eyeliner tattoo.		
3. Scanning tech to verify and sign MR screening form. • Technologist to initial any discrepancies that come up in verbal screening		
4. Visual Screening (Ferro Guard) Zone 2 • Look for any visible tattoos • Look for hearing aid in the ears		
5. White hand held (If Ferro Guard senses metal- to ensure nonferrous)		
6. Is anyone else accompanying (Family member, staff etc) the patient to Zone 4? • Family members must change into gown and fill out screening form. • Save the family member screening form- give to MR coordinator • Screen family member (use staff 4- step process) • Green badge is for staff (MRI trained) only- NOT family members		
7. Proper patient positioning to remove RF burn risks and setup. • No skin to skin contact • Insulation between scanner bore and patient. (Pads- sheet is not acceptable) • Ear plugs/ hearing protection for the patient		
8. Hearing protection required for everyone in Zone 4 during scans.		
9. Constantly monitor patients and ask about their comfort level.		

Competency – Inpatient/Sedated

Mayo Clinic Arizona Radiology
Performance Criteria
MRI
Inpatient (including non-communicative) MRI Screening

Name: _____ Service/Unit _____

CRITICAL ELEMENTS	MET	NOT MET
1. Scanning tech to verify and sign MR screening form- MUST REVIEW IT ONLINE FIRST		
2. Remove all blankets that arrive with the patient.		
3. Patient must be changed to Mayo gown (no street clothes/pajamas permitted if [illegible])		
4. Visual inspection of patient skin (head to toe) performed- look under gown. • Patient rolled side to side to check under • Any scars noticed? (Look for pacemaker, surgical, gunshot scars) • Any tattoos noticed? • Any ECG leads? • Any other foreign material? • Look closely for hearing aid		
5. When using patient lift- ONLY the sheet under patient is moved to MRI table		
6. Screening performed with hand-held screener (whenever possible)		
7. Proper patient positioning to avoid RF burn risks and setup. CRITICAL FOR NON COMMUNICATIVE PATIENTS • No skin to skin contact • Insulation between scanner bore and patient • [illegible] • NORMAL MODE scan for ALL non-communicative patients. (NOTE: GE default setting is FIRST MODE- you must set it to NORMAL)		
8. Hearing protection is required for patients, staff and anyone else in Zone 4		
9. Constantly monitor patient and ask about their comfort level (communicative only) • For non-communicative patient, it is CRITICAL to monitor that proper insulation maintained. Look after every scan if the patient has moved.		
10. Screen staff individually (provide green badge when possible) • Off hours staff screening may be performed with Ferro Guard and/or white hand held detector in Zone 3- HOWEVER, all personal items must be stored in Zone 2.		

Competency – Interventional MR

Mayo Clinic Arizona Radiology
Performance Criteria
MRI
MR Technologist: Visualase Screening Checklist Competency

Name: _____ Service/Unit _____

CRITICAL ELEMENTS	MET	NOT MET
1. Scanning Tech to verify and sign MRI Screening form. Confirm patient ID using two identifiers. Technologist to initial Visualase SOP Checklist to complete		
2. Remove all blankets that arrive with patient.		
3. Visual inspection of patient skin (head to toe) performed. Check under gown. Check under patient - try your best if patient cannot be rolled. Note scars (pacemaker, surgical, gunshot scars) tattoos, ECG leads, any foreign material.		
4. No lift used for Visualase patients when transferring to MRI table- slide board or manual lift using green sheet. Lift patient legs to look underneath. (You may be able to use lift AFTER exam, when the laser catheter has been removed. Consult the neurosurgery MD/PA)		
5. Provide MR covers- do not use the blankets or mummy wrap that came down from the OR.		
6. Visualase surgical box located and placed in Zone 2.		
7. Proper patient positioning and setup- CRITICAL FOR NON-COMMUNICATIVE PATIENTS *Ear plugs for the patient (Zone 2) *Place marker on right side of skull (Zone 2) *No skin to skin contact *Insulation between scanner bore and patient		
8. Screen the staff individually (provide green badge when possible) Procedural Pause** MR Technologist approves when to move to Zone 3 COMPLETE THE CHECKLIST		
9. Hearing protection for staff		
10. Provide Laser Safety goggles for all staff within Zone 3 and Zone 4 during times when laser is active.		

Competency – Staff Screening

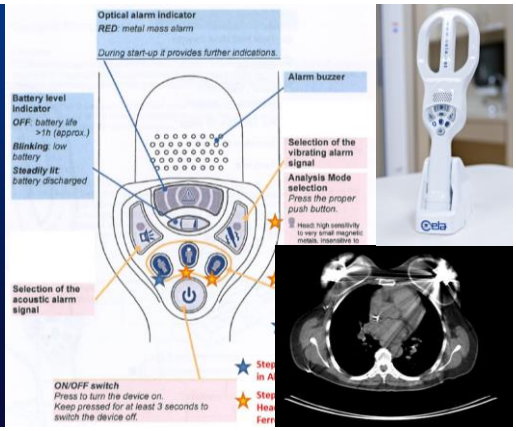
Mayo Clinic Arizona Radiology
Performance Criteria
MRI
Staff Zone 3 and Zone 4 MRI Screening

Name: _____ Service/Unit _____

CRITICAL ELEMENTS	MET	NOT MET
1. Any staff with the responsibility of entering Zone 4 for patient care or a required project will be screened.		
2. Step 1- Self pat down- leave all items in Zone 2 • NO lab coats, jackets permitted for non-MR staff entering Zone 4		
3. Step 2- Visually screened (Ferro Guard) for Zone 4 entry. • Screening can be performed in Zone 2 or Zone 3. MUST be supervised by MR personnel.		
4. Step 2A- Ask staff for any • Pacemaker? • Hearing Aids? • Insulin pump? • Any implanted item?		
5. Step 3- White hand held metal detector (If Ferro Guard senses metal- to ensure non-ferrous) for Zone 4 entry.		
6. Step 4- Green Badge required for Zone 4 entry during times when tech assistant on duty.		
7. Yellow tape/ Tech Gate Authority- MR Technologist has the FINAL authority		
8. Only MR Technologists and MR Tech Assistant are permitted to open or close the Yellow tape/ Tech Gate to Zone 4.		

Validated by: _____ Date: _____

Hands-On Training



Administrative Control: Signs and Labels

- Access and Zone signs
- Workflow signs
- Personnel safety signs
- Safety markers – 200 Gauss
- Equipment labels

Access Sign – Zone 2

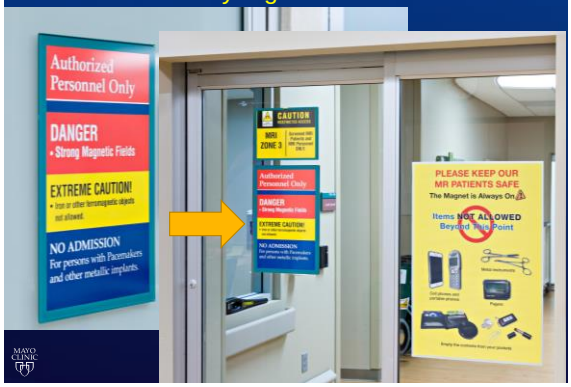
Access Sign – Zone 3

Access Sign – Zone 3

Access Sign – Zone 4

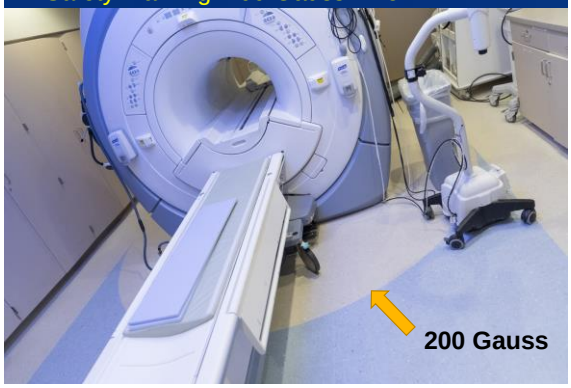
Workflow Signs

Personnel Safety Signs



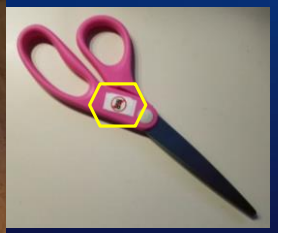
Personnel Safety Signs

Safety Marking: 200 Gauss Line



Equipment Labels

Equipment Labels



Administrative Control: MR Safety Committee

- Radiologist (MRMD)
- Technologist (MRSO)
- Physicist (MRSE)
- Administrators (Supervisors and Managers)
- Radiology Chair – ad hoc

MR Safety Committee: Training and Education

MRI Safety Level 1

Back Forward Progress bar

07.14.2017

eLearning Design & Development Center

Found **48** in **MR > MR Safety**

Arizona

MR > MR Safety	Site(s)
Antimicrobial Dressings Containing Silver MR Imaging Guideline	Arizona, Florida, Rochester, Albert Austin, Cannon Falls, Decorah, Fair Faribault, La Crosse, Lake City, Mar Owatonna, Red Wing
Body Piercing MR Imaging Guideline	Arizona, Florida, Rochester, Albert Austin, Cannon Falls, Decorah, Eau Claire, Fairmont, La Crosse, Lake Ci Mankato, Menomonie, Owatonna, R Wing
Breast Implants and Tissue Expanders - MR Imaging Guideline	Arizona, Florida, Rochester, Albert Austin, Cannon Falls, Decorah, Fair Faribault, La Crosse, Lake City, Mar Owatonna, Red Wing
Burn Prevention: Pad Use To Prevent Bore Contact For MR Imaging Guideline	Arizona, Florida, Rochester, Albert Austin, Cannon Falls, Decorah, Eau Claire, Fairmont, Faribault, La Cross Lake City, Mankato, Menomonie, Owatonna, Red Wing
Conditional Pacemakers MR Imaging Guideline	Arizona, Florida, Rochester, Decor La Crosse
Foley Catheters with & without Temperature Probe and Central Wire MR Imaging Guideline	Arizona, Florida, Rochester, Albert Austin, Cannon Falls, Decorah, Fair Faribault, La Crosse, Lake City, Mar Owatonna, Red Wing
Gastrointestinal (GI) Clips MR Imaging Guideline	Arizona, Florida, Rochester, Albert Austin, Cannon Falls, Decorah, Fair Faribault, La Crosse, Lake City, Mar Owatonna, Red Wing
Halo Traction Devices MR Imaging Guidline	Arizona, Florida, Rochester, Decor Fairmont, La Crosse, Mankato
Heart Valve Prostheses and Annuloplasty Rings MR Imaging Guideline	Arizona, Florida, Rochester, Albert Austin, Cannon Falls, Fairmont, Fari Lake City, Mankato, Owatonna, Red Wing

MR (Magnetic Resonance) Zone 3 Access Policy, Arizona

Scope

This policy applies to all M

Purpose

The purpose of this policy for clearing staff, patients responsibility of MR safety Group on MR Safety (2016

Policy

1. MR safety practice Anesthesiologists
2. The operational re Society Working G
3. The MR Medical D implement MR sa
4. Access restriction
   a. Patients a
      i. All
      ii. Pa
      iii. Pe

MR Safety Education Requirements

Content Applies

Arizona Department o

Scope

Mayo Clinic Building (

Purpose

To define safety educa

Definitions

Magnetic Field: The st operation of sensitive

MR Zones

1. Zone I
   a. Any a
      i.
      ii.

MR (Magnetic Resonance) Medical Emergency Response Procedure, Arizona

Scope

Radiology staff who work in the MR environment.

Purpose

To ensure the safe and timely treatment of patients suffering a medical emergency within the MR Suite.

Equipment/Supplies

N/A

Procedure

Medical Emergency Response

1. Activate Radiology emergency call system.
   a. Radiology nursing and/or Security may respond to the alarm based o scanner location.
2. Move the patient out of Zone 4 and into Zone 2, or other appropriate patient car area, for care and treatment.
3. Secure access to Zone 3.
4. Attend to urgent patent care needs as appropriate to the situation, including initi basic life support (BLS).
5. Notify Radiology Nursing, if not already there, and attending Radiologist or Trair

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MR Safety Committee: Change Management

- Patient Hearing Protection
  - 3M EAR Classic: NRR 29 dB
  - Radians FP80 Foam: NRR 33 dB
    - Highest available!

- Staff Hearing Protection
  - 3M H7 Delux: NRR 27 dB
  - MRI Safe Pro-Ears: NRR 30 dB

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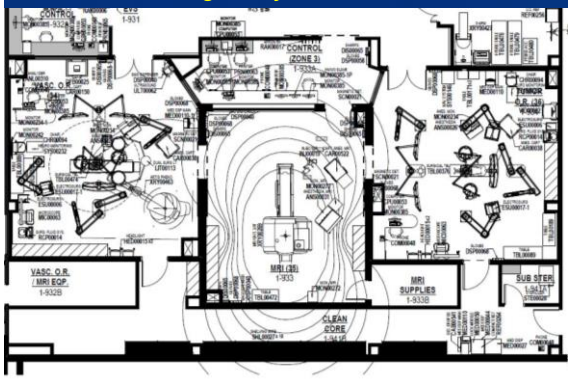
Practice Changes: Hybrid MR-OR



MR-OR Step-by-Step Patient Transfer Workflow

Definitic

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- V

MAYO CLINIC *Neurosurgery MR / OR Checklist*

(Mayo Clinic/Medical Record Number and Name Above)

OR Checklist: Neurosurgery	Met	Not Met
1. MR Screening form completed in Pre-Op.		
2. Where is the Visualase instrument tray? Staff transporting patient to MRI are aware of tray location.		
3. Ensure all pockets are empty. DO NOT bring anything in your pockets to MRI.		
4. Visual inspection of patient skin • Any ECG lead noticed? • Pulse oximetry probe? • Any other foreign material?		
5. Blankets are NOT mummy wrapped (covers will be replaced in MRI)		

MR Zone 2 Checklist: MR Technologist	Met	Not Met
1. Scanning Tech to verify and sign MRI Screening form. Confirm patient ID using two patient identifiers. Verify that Neurosurgery OR Checklist is complete.		
2. Remove all blankets that arrive with patient.		
3. Perform visual inspection of patient skin (head to toe). Check under gown. Roll patient side-to-side to check beneath them. Note scars (pacemaker, surgical, gunshot), tattoos, ECG leads or any foreign material.		
4. Transfer patient to MR table manually. No ceiling lift used for Visualase patients when transferring.		
5. Provide MR linens – replace all blankets/linens that came with the patient from the OR.		
6. Ensure proper patient positioning on MR table in Zone 2, including: • Providing ear plugs for the patient. • Placing a marker on right side of skull.		
7. Verify Visualase instrument tray location and ensure it remains in Zone 2.		

Root Cause Analysis – Safety Report (SERF)

Event Information	
Event Type & Date	ACCIDENTAL INJURY & 07/14/2017 1:00:00 AM
Event Level, Group, Location & Where Occured	ACTUAL EVENT, MRI, MCH & EXAM ROOM
Severity, Triage & Sentinel	2, NO & NO
Event Documents	
Body Part Imaged	ABDOMEN & PELVIS
Department Involved	RADIOLOGY
Division Flag	MR BODY
Event Description Summary	POSSIBLE 1ST DEGREE BURN POST MRI. PATIENT HAD A MR ABDOMEN/PELVIS WITHOUT INCIDENT. THE NEXT MORNING, SHE WOKE UP AND NOTICED REDNESS AROUND HER LOWER ABDOMEN/PELVIS REGION. DESCRIBED IT AS A SUN BURN; A DIME SHAPED AREA AND A COUPLE STRIPED AREAS OF REDNESS. WHEN SHE CALLED, THE REDNESS HAD GONE AWAY. SHE THOUGHT IT MIGHT BE RELATED TO HER UNDERWEAR. THE LABEL STATED 96% POLYESTER, 2% SPANDEX, 2% OTHER FIBER. SHE WILL FOLLOW UP WITH HER PROVIDER AS NEEDED.
Injury & Description	YES, AREA OF REDNESS ACROSS LOWER ABDOMEN/PELVIS. 1 DIME SHAPED AND 2 OR 3 STRIPE-LIKE AREAS.

People – Summary

- MR Safety Training
  - Level BASIC and Level 1
    - Online and hands-on
  - MR Personnel – Level 2
    - Advanced (Screening; Burn prevention)
- Signs and Labels
  - Access and Zone signs
  - Workflow signs
  - Personnel safety signs
  - Safety markers – 200 Gauss
  - Equipment labels

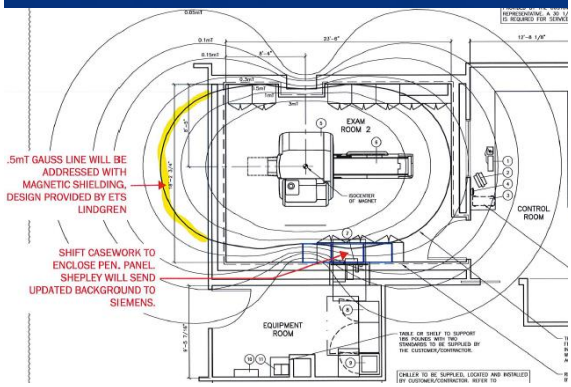
People – Summary

- MR Safety Training
- Signs and Labels
- MR Safety Committee
  - Policies and guidelines
  - Safety compliance – TJC, ACR
  - Change management
    - New equipment evaluation/integration
    - Clinical workflow updates and checklists
  - Safety education and training
  - Root cause analysis
    - Safety incidents/Near misses

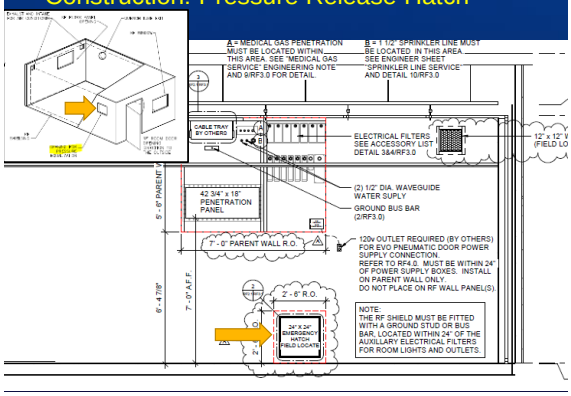
Technology – Engineering Controls

- Construction and Shielding
- MRI Safety Zones
- MRI Screening Equipment
- Barriers and Monitoring

Construction: Fringe Fields (5 Gauss)



Construction: Pressure Release Hatch

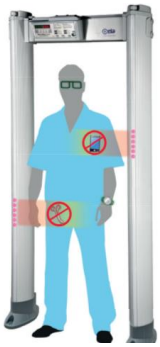


Four Zone Setup

MR Safety Equipment

Ferroguard Screener

Aegys MetalMag



Aegys TechGate

Garrett Hand Wand

CEIA

MR Safety Equipment

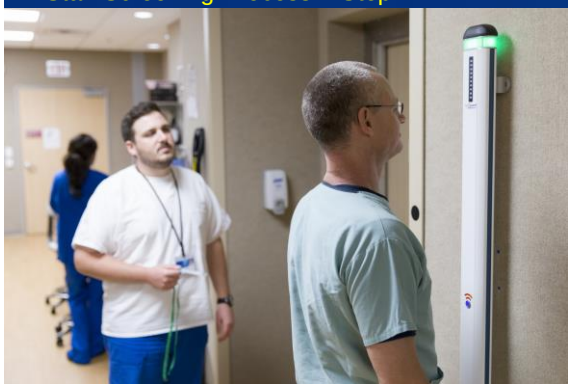
Ferroguard Assure

Staff Screening Process – Equipment Need

- Any staff with possibility of entering Zone 4 for patient care is screened
- Four step process to enter Zone 4:
  1. Verbally, inspired pat down (self-screening) – Zone 2
  2. Visually (Ferroguard) – Zone 2 or 3
  3. CEIA white hand-held (if Ferroguard senses metal)
  4. Respect final barrier yellow tape or Techgate
     - Only MR technologist can open or close
     - MR technologist has the final authority

Staff Screening Process – Step 1

Staff Screening Process – Step 2



Staff Screening Process – Step 3

- Detects ferrous vs non-ferrous metal
- MR technologist has final authority to clear items flagged by screeners for zone 4 entry
- Balance between safety, efficiency and flexibility
- Empowers MR Technologists!

Final Barrier – Step 4

Enforcement

Only MR technologist can open or close the final barrier! No ducking!

Enforcement – Smile, You are on Camera!

Zone 3 - Control Room

Zone 3 is the location of the control room for the MRI scanners. It can be shared between multiple MRI scanners.

The MRI technologists are in charge of patient and staff safety in Zones 3 and 4.

REMEMBER!
MCA MRI Safety policy requires everyone to comply with the MRI technologists instructions in the MRI environment.

This area is video monitored 24/7 by Security.

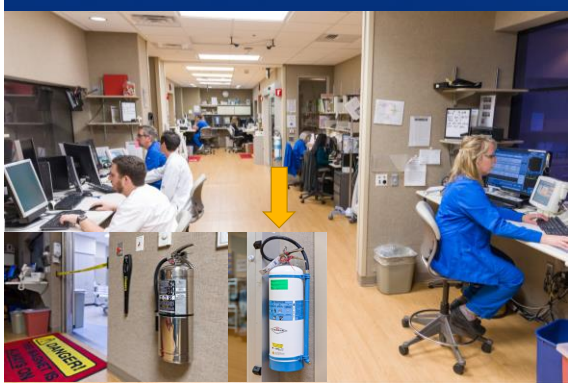
Technology - Summary

- Construction and Shielding
  - Fringe field
  - Pressure release hatch
- MRI Safety Zones
  - Get involved in design phase (just like radiation shielding)
- MRI Screening Equipment
  - Site process will determine what's best
  - Empower the technologists
- Barriers and Monitoring
  - Key for safety enforcement!

PEER REVIEW

BONUS

Peer Review



Peer Review - MR Safety Week!

http://www.ismrm.org/mr-safety-links/mr-safety-week-2017/