UMASS Medical School
Advanced MRI Center
SAFETY TRAINING

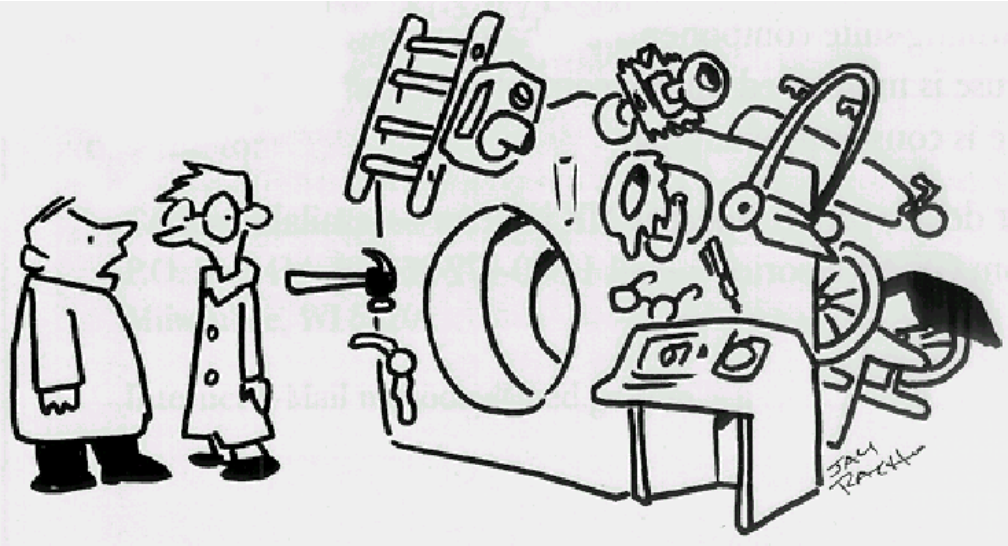
Level 2

THE MAGNETIC FIELD IS AT FULL POWER ALWAYS ....IT IS ALWAYS “ON”.

MRI Safety

Why is MRI Safety so important to you?

The following are unfortunate events that you do not want to happen!



U.S.

Employees of the Westchester Medical Center in Valhalla, N.Y., gather outside after learning of the deadly MRI incident. (ABCNEWS.com)

Hospital Nightmare

Boy, 6, Killed in Freak MRI Accident

ABC NEWS

July 31 — A 6-year-old boy died after undergoing an MRI exam at a New York-area hospital when the machine's powerful magnetic field jerked a metal oxygen tank across the room, crushing the child's head.

The force of the device's 10-ton magnet is about 30,000 times as powerful as Earth's magnetic field, and 200 times stronger than a common refrigerator magnet.

The canister fractured the skull and injured the brain of the young patient, Michael Colombini, of Croton-On-Hudson, N.Y., during the procedure Friday. He died of the injuries on Sunday, the hospital said.

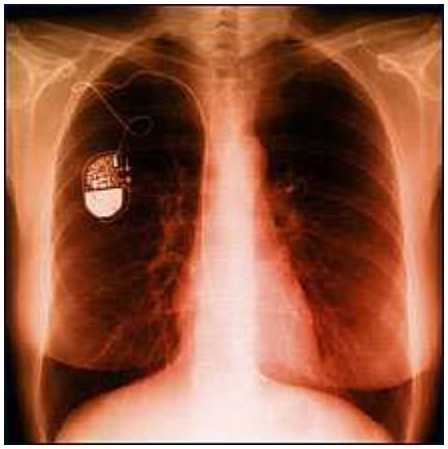
Death Link to Hospital Scan

By Jeremy Calvert and Tanya Taylor

From the Herald Sun page 10

Thursday April 13 2000-04-13

News Corporation Melbourne Australia



The Alfred Hospital has announced a review of its safety procedures after the death of a man whose pacemaker malfunctioned during a magnetic resonance imaging scan.

Hospital spokesman David Faktor admitted safety procedures were not properly followed when an elderly man dies during MRI treatment on April 1.

"The procedure was partly adhered to, but we believe if it was fully adhered to this would not have happened." he said. Electronic pacemakers operate with sensitive metal switches that are disrupted by the massive magnetic charge of MRI equipment.

RE: MRI Safety

Tobias Gilk - 10 Jun - 04:01:10 PM I'm not a firefighter, but as an architect for MRI suites, we address the unique safety issues every day.

First off... there are real and significant hazards for firefighters who aren't familiar with MRI magnets. There's even a story you can read on www.magmedix.com about a German firefighter who was seriously injured, entering a magnet room with his SCBA gear on.

Who is this training for?

MRI safety training is required for all faculty, staff and students who will work around and inside the MRI magnet rooms or will need access to the area, and for staff who will not work around and inside the MRI magnet rooms but will involve in the recruitment and interview of subjects.

ACR Zone Recommendations

ZONE 1: This region includes all areas that are freely accessible to the general public. It is typically outside of the MR environment itself and is the area through which subjects and all personnel access the MR suite. This zone is not marked or labeled.

ZONE 2: This area is between the accessible zone 1 and the strictly controlled zones 3 and 4. subjects and other personnel are able to move throughout this area. However, they must be mindful of where zone 3 begins. This area is marked with a safety sign.

ZONE 3:: This area is the region that non-MR safe equipment can result in serious injury or death if accidentally moved closer or into zone 4. Personnel are not to move freely through this zone. They MUST be accompanied by level 2 MR staff. MR safe practice guidelines must be adhered to for the safety of the subjects and other non-MR staff.

ZONE 4 : This zone is the MR scan room itself. Nobody that has not been screened will enter this zone under any circumstances. If the screening process has taken place, you may enter the suite, but you MUST be accompanied by level 2 MR staff.

ACR Zone


MRI
MRI ZONE I
MRI Access Area
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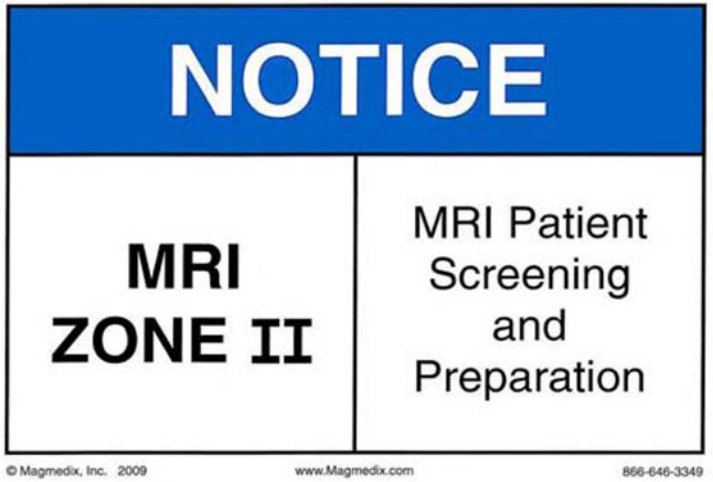
www.Magmedix.com
866-646-3349


NOTICE
MRI ZONE II
MRI Patient Screening and Preparation
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www.Magmedix.com
866-646-3349


CAUTION
MRI ZONE III
Restricted Access
Screened MRI Patients and MRI Personnel Only
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www.Magmedix.com
866-646-3349


DANGER
MRI ZONE IV
Restricted Access
Screened MRI Patients Under Direct Supervision of Trained MRI Personnel Only
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ACR Zone Recommendations

Compliance with the following protects you, subjects and guests:

- If you are the primary person responsible for the study, remember that all subjects, family members or guests must be accompanied by a safety trained personnel.

- **Any person** who will enter the scan room **MUST** be screened. **NO EXCEPTION!**

“Zone 2” Security and Safety

Entrance into 3T Scanner suite “Zone 2” is secured by electronic locking doors. There are two electronic locking doors: 1) from the entrance hallway and 2) from the back entrance hallway. Only those people who have passed the MR safety training level 1 or level 2 have the access to “Zone 2”. All visitors and subjects must be accompanied by MRI Safety trained personnel into “Zone 2”. These doors are locked for your protection and must never be left open as unauthorized personnel may enter jeopardizing you or your subject’s safety. Violations will be subject to review by the UMMS AMRIC Oversight Committee with possibility of, but not limited to, additional MRI Safety training and/or suspension.

“Zone 3” Security and Safety

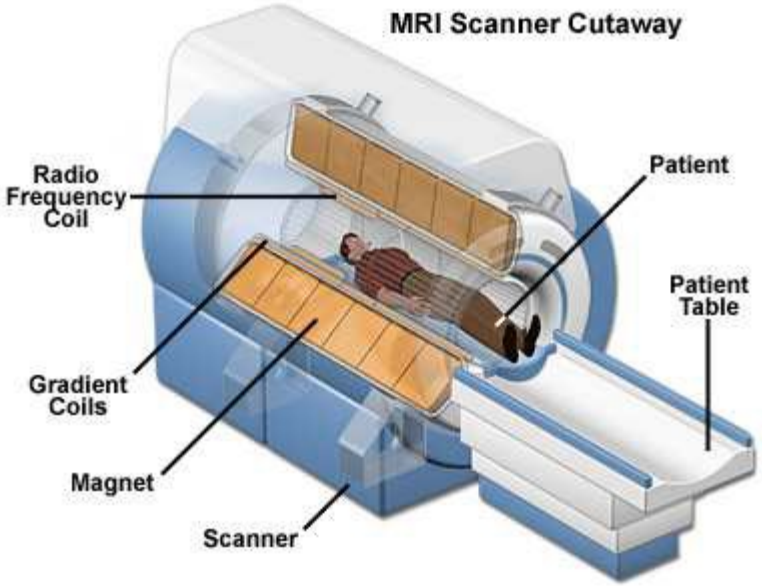
Entrance into 3T scanner suite “Zone 3” is secured by electronic locking doors. There are two electronic locking doors from the hallway. Only those people who have passed the MR safety training level 2 have the access to “Zone 3”. Only screened personnel are allowed to enter “Zone 3”. Violations will be subject to review by the UMMS AMRIC Oversight Committee with possibility of, but not limited to, additional MRI Safety training and/or suspension.

“Zone 3” Security and Safety

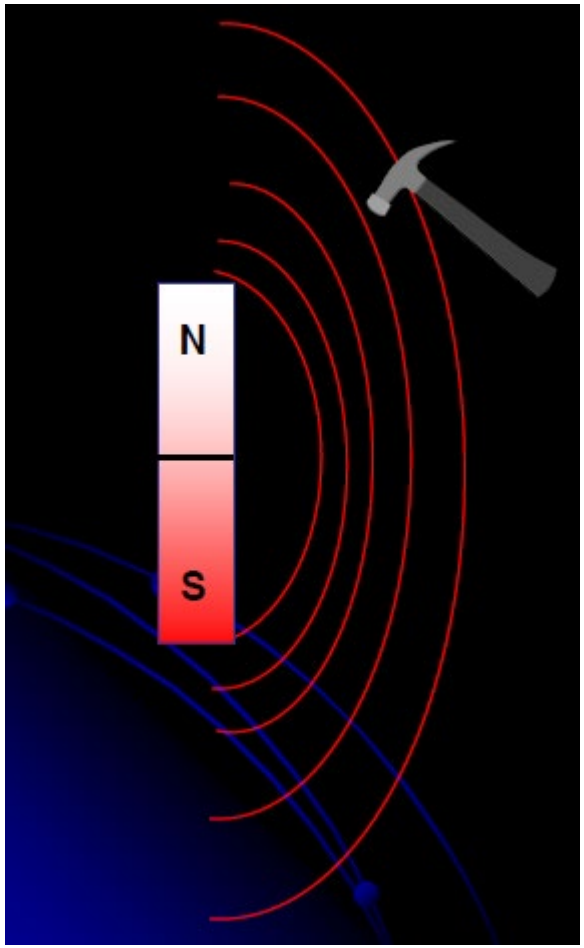
Entrance into 7T scanner suite “Zone 3” is secured by electronic locking doors. There are an electronic locking door from the hallway. Only those people who have passed the MR safety training level 2 have the access to “Zone 3”. Only screened personnel are allowed to enter “Zone 3”. Violations will be subject to review by the UMMS AMRIC Oversight Committee with possibility of, but not limited to, additional MRI Safety training and/or suspension.

Types of Fields in MR

- Static (magnet) Field
- Gradient (time-varying) Field
- Radiofrequency (RF) Field



Static Magnetic Field



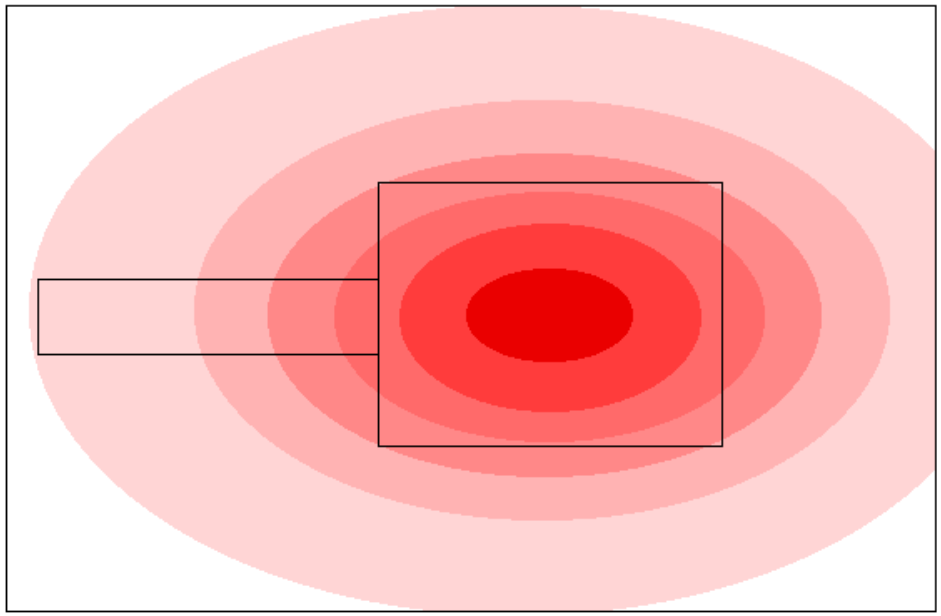
An "Attractive" Force

- Close to the magnet, the field increases in strength rapidly over a short distance.
- The more rapidly the change over distance, the greater the attractive force.
- As field strength and mass increases, so does the attractive force….

Static Magnetic Field--Fringe field

This line specifies the perimeter around a MR scanner within which the static magnetic fields are higher than five gauss. Five gauss and below are considered 'safe' levels of static magnetic field exposure for the general public.

- **As you approach the magnet, the fringe magnetic field gets STRONGER**
- **The 5 Gauss line is at the scan room door for the 3.0T scanner.**



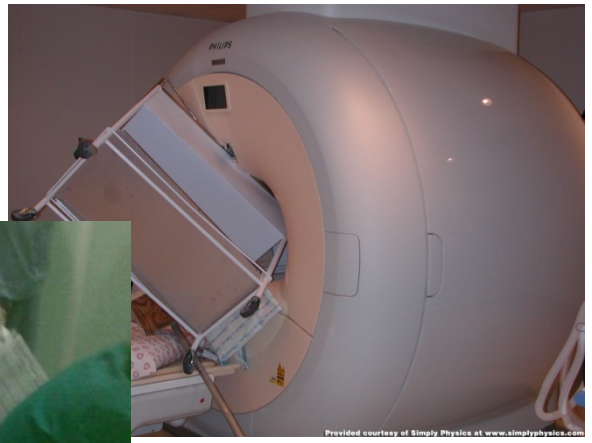
Static Magnetic Field

Primary Concerns:

- Loose ferrous objects become projectile which could harm you or the subject or even damage the MR scanner
- Electronic devices can malfunction such as a heart pacemaker
- Aneurysm clips made of stainless steel can torque and tear loose causing a blood vessel to bleed

Static Magnetic Field

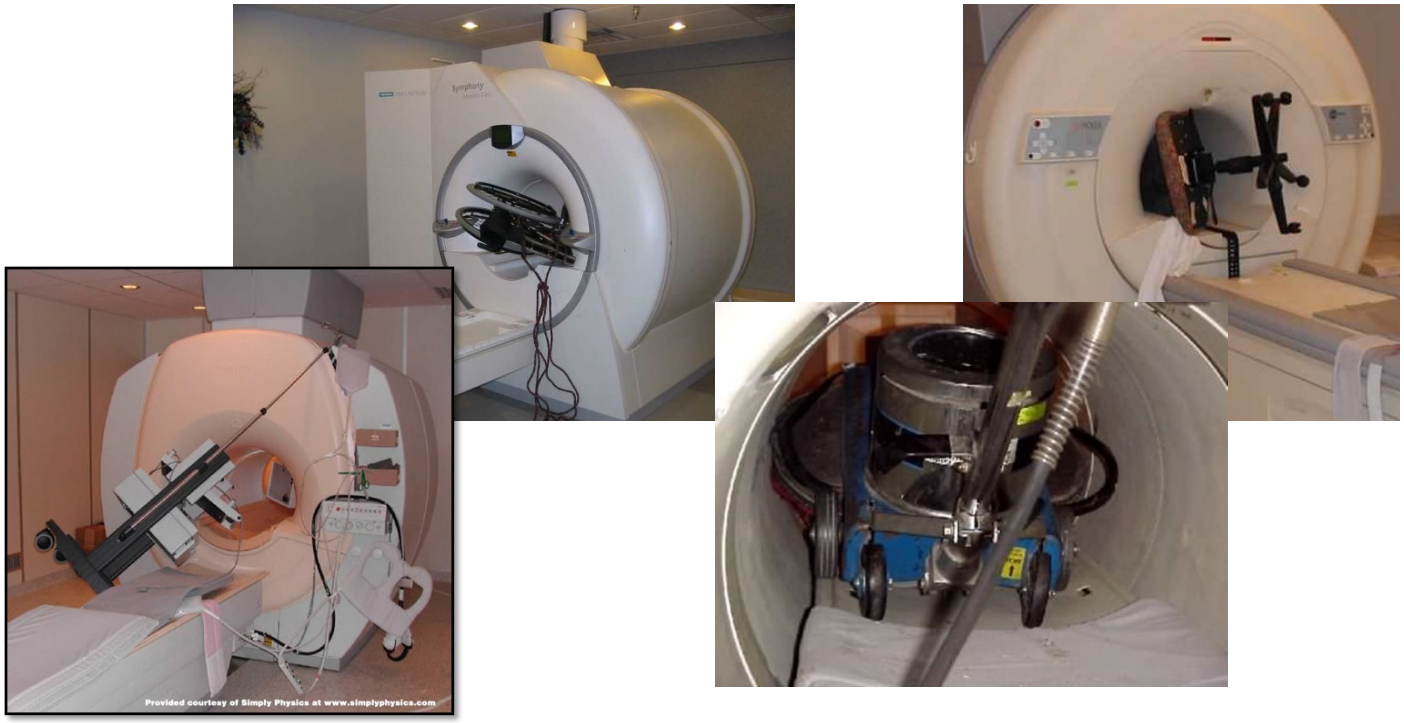
---Potential Projectiles—Large Objects



Don’t let this happen to you!

Static Magnetic Field

---Potential Projectiles—Large Objects



Don’t let this happen to you!

Static Magnetic Field

---Potential Projectiles—Small Objects

- Cell phone
- Keys
- Glasses
- Hair pins / barrettes
- Jewelry
- Safety pins
- Paper clips
- Coins
- Pens
- Pocket knife
- Nail clippers
- Steel-toed boots / shoes
- Tools
- Clipboards



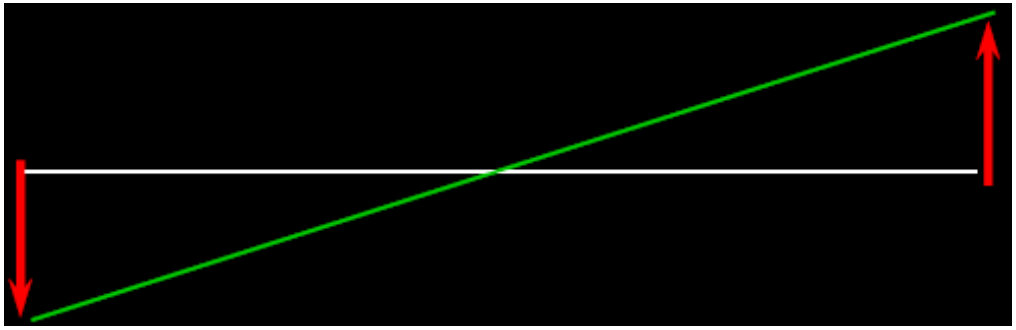




No loose metallic objects should be taken into the Scan room!

Gradient Magnetic Fields

- Gradient Magnetic Fields vary in intensity over distance, used for spatial localization. The loud banging noise is from the gradient magnetic field.
- Rapid switching of the gradient fields can induce current in a conductor (Faraday's Law of Induction)



Gradient Magnetic Fields

---Gradient Safety Concerns

Current Induction

- Peripheral nerve stimulation
- Caution should be used when using any type of wires in the MRI scanner.

Acoustic Noise

- Hearing protection always used
- Greater with faster imaging sequences
- Increases with gradient strength

Gradient Magnetic Fields

---Peripheral Nerve Stimulation

What Is It?

• Rapidly changing magnetic fields can, under certain conditions, cause nerves close to the skin to become stimulated.

• The point where 50% of the population experiences PNS is referred to as the PNS Threshold. Peripheral Nerve Stimulation has been described as a "twitching" of muscles.

• The potential for Subjects experiencing PNS is very low-- but still possible.

What To Do?

Be sure that the subject does not have their extremities crossed. PNS maybe uncomfortable and more common with BOLD sequences.

Gradient Magnetic Fields

---When Might PNS Occur?

Primarily EPI based pulse sequences.

EPI applications include, but are not limited to:

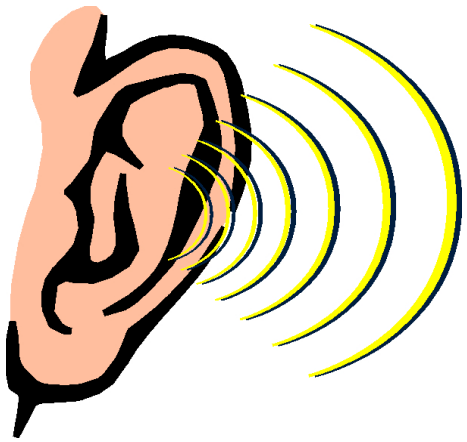
- Rapid brain imaging
- BOLD: Task activation
- Diffusion / Tensor Imaging
- Time Course Imaging
- Abdominal and cardiac imaging

PNS is possible with any sequence, not just EPI, but at the higher slew rates, EPI has a greater potential.

Remember, PNS is not harmful.

Gradient Magnetic Fields

---Acoustic Noise



- The rapid alternation of current within the gradient coils causes the loud banging sounds

- Gradient noise ranges from 65 to 95 dB. The FDA accepts acoustic noise levels established by OSHA, which are, average noise levels must remain below 105dB and peak noise level must remain below 140dB

- Ear plugs and/or headphones are mandatory for all subjects to limit gradient noise.

Radio Frequency (B1 field)

- Oscillating magnetic field
- Responsible for heating of tissues
- Amount of RF (heat) deposition dependent on many factors which include

  Flip angle

  Field strength

  Pulse Sequence
- RF deposition is expressed by the Specific Absorption Rate (SAR)

Radio Frequency (B1 field)

--SAR and RF Power

- SAR is the amount of heat that is absorb by a subject express in watts/kg
- The greater the amount of RF energy used for imaging, the greater the amount of tissue heating (microwave effect)
- SAR increases with magnetic field strength
- Doubling the flip angle (90 to 180) requires a 4x increase in RF power increasing the amount of SAR
- SAR is calculated based on the subject's weight

Radio Frequency (B1 field)

--Safety Concerns

- The FDA limits the amount of SAR – equal or less than 0.4 Watts/kg averaged over the subject's whole body and equal to or less than 8.0 Watts/kg average over any one gram of tissue
- Communicate with your subject and listen for complaints of being too warm
- Larger subjects have a tendency to get warmer quicker, avoid using blankets and use the fan to circulate air

Radio Frequency (B1 field)

--Safety Concerns

Another potential problem is when using EKG cables or other conductive cables. Do not loop the cables because an induced current can occur causing the wires to get hot resulting with burns to your subject.

Who must be screened before entering the scan room? ? ? ? ? ?

EVERYONE!!!

- **SUBJECTS**
- **MEDICAL PERSONNEL**
- **JANITORS**
- **EMERGENCY PERSONNEL**

MRI SAFETY PRECAUTION

- NEVER enter the magnet room with any metal whatsoever.
- No metal in your pockets, no metal in your hands, no jewelry
- No credit cards or ID cards – they will be erased
- No computer disks, pens, scissors, lighters, pocket knives, keys, stools, or other tools – EVER.
- No one should enter the magnet room unless they have been screened for metal and are well aware of this issue.

Subject Screening?

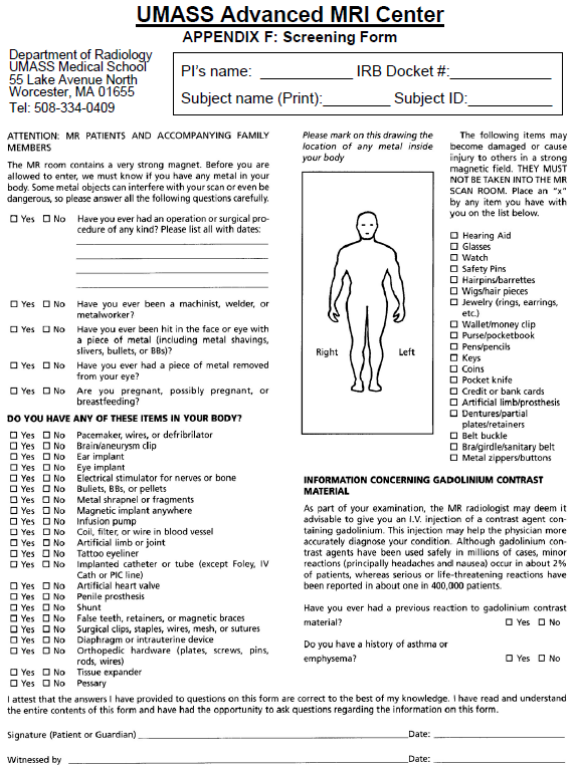
All subjects involved with a research study must have the following two forms completed prior to any MRI scans:

- **IRB Consent** - An institutional review board (IRB), is a committee that has been formally designated to approve, monitor, and review biomedical and behavioral research involving humans with the aim to protect the rights and welfare of the research subjects.
- **MRI Screening** - The establishment of thorough and effective screening procedures for subjects and other individuals is one of the most critical components of a program that guards the safety of all those preparing to undergo magnetic resonance (MR) procedures or to enter the MR environment. (Frank Shellock,Ph.D.)

Subject Screening?

The following are red flags for additional investigation of MRI compatibility prior to performing an MRI scan

- Metallic Foreign Bodies
- Biomedical Implants and Devices
- Aneurysm Clips
- Electronic implants
- Catheters, Coils, Filters and Stents
- Heart Valves
- Pacemakers and Pacing Wires
- Intra-ocular Ferrous Foreign Body
- Personal belongings
- Pregnancy



UMASS Advanced MRI Center

APPENDIX F: Screening Form

Department of Radiology
UMASS Medical School
55 Lake Avenue North
Worcester, MA 01655
Tel: 508-334-0409

PI's name: _____ IRB Docket #:_____

Subject name (Print):_____ Subject ID:_____

ATTENTION: MR PATIENTS AND ACCOMPANYING FAMILY MEMBERS

The MR room contains a very strong magnet. Before you are allowed to enter, we must know if you have any metal in your body. Some metal objects can interfere with your scan or even be dangerous, so please answer all the following questions carefully.

☐ Yes ☐ No Have you ever had an operation or surgical procedure of any kind? Please list all with dates:
_____
_____
_____
_____

☐ Yes ☐ No Have you ever been a machinist, welder, or metalworker?

☐ Yes ☐ No Have you ever been hit in the face or eye with a piece of metal (including metal shavings, slivers, bullets, or BBs)?

☐ Yes ☐ No Have you ever had a piece of metal removed from your eye?

☐ Yes ☐ No Are you pregnant, possibly pregnant, or breastfeeding?

DO YOU HAVE ANY OF THESE ITEMS IN YOUR BODY?

☐ Yes ☐ No Pacemaker, wires, or defribrilator
☐ Yes ☐ No Brain/aneurysm clip
☐ Yes ☐ No Ear implant
☐ Yes ☐ No Eye implant
☐ Yes ☐ No Electrical stimulator for nerves or bone
☐ Yes ☐ No Bullets, BBs, or pellets
☐ Yes ☐ No Metal shrapnel or fragments
☐ Yes ☐ No Magnetic implant anywhere
☐ Yes ☐ No Infusion pump
☐ Yes ☐ No Coil, filter, or wire in blood vessel
☐ Yes ☐ No Artificial limb or joint
☐ Yes ☐ No Tattoo eyeliner
☐ Yes ☐ No Implanted catheter or tube (except Foley, IV Cath or PIC line)
☐ Yes ☐ No Artificial heart valve
☐ Yes ☐ No Penile prosthesis
☐ Yes ☐ No Shunt
☐ Yes ☐ No False teeth, retainers, or magnetic braces
☐ Yes ☐ No Surgical clips, staples, wires, mesh, or sutures
☐ Yes ☐ No Diaphragm or intrauterine device
☐ Yes ☐ No Orthopedic hardware (plates, screws, pins, rods, wires)
☐ Yes ☐ No Tissue expander
☐ Yes ☐ No Pessary

Please mark on this drawing the location of any metal inside your body

Right Left

The following items may become damaged or cause injury to others in a strong magnetic field. THEY MUST NOT BE TAKEN INTO THE MR SCAN ROOM. Place an "x" by any item you have with you on the list below.

☐ Hearing Aid
☐ Glasses
☐ Watch
☐ Safety Pins
☐ Hairpins/barrettes
☐ Wigs/hair pieces
☐ Jewelry (rings, earrings, etc.)
☐ Wallet/money clip
☐ Purse/pocketbook
☐ Pens/pencils
☐ Keys
☐ Coins
☐ Pocket knife
☐ Credit or bank cards
☐ Artificial limb/prosthesis
☐ Dentures/partial plates/retainers
☐ Belt buckle
☐ Bra/girdle/sanitary belt
☐ Metal zippers/buttons

INFORMATION CONCERNING GADOLINIUM CONTRAST MATERIAL

As part of your examination, the MR radiologist may deem it advisable to give you an I.V. injection of a contrast agent containing gadolinium. This injection may help the physician more accurately diagnose your condition. Although gadolinium contrast agents have been used safely in millions of cases, minor reactions (principally headaches and nausea) occur in about 2% of patients, whereas serious or life-threatening reactions have been reported in about one in 400,000 patients.

Have you ever had a previous reaction to gadolinium contrast material? ☐ Yes ☐ No

Do you have a history of asthma or emphysema? ☐ Yes ☐ No

I attest that the answers I have provided to questions on this form are correct to the best of my knowledge. I have read and understand the entire contents of this form and have had the opportunity to ask questions regarding the information on this form.

Signature (Patient or Guardian) _____ Date: _____

Witnessed by _____ Date: _____

Remember this is a **legal** document. All sections, dates, names, signatures must be completed before the subject enters the scan room. If it is incomplete, it is not valid for a subject to be scanned and you could be liable for any damages or injury incurred by the subject.

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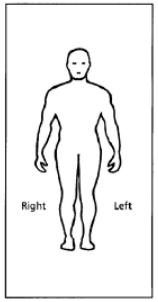

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☐ Pens/pencils
☐ Keys
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☐ Pocket knife
☐ Credit or bank cards
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Signature (Patient or Guardian) _____ Date: _____

Witnessed by _____ Date: _____

Additional Screening?

- **Family / Visitors**
- **Ancillary Staff Education**
  - Housekeeping
  - Construction / Maintenance
  - Nursing
- **Subject Support**
  - Emergency Response
  - Security
  - Fire Department

Final Screening Tips

- Do not rely on the screening procedures from any other MRI facility to be adequate
- Screen all visitors as if they were subjects
- Screening should be done more than once – before entering the magnet room, ask one final time, “have you had any surgery, electronic implants or metal in your body?”
- Screening should be performed by trained individuals

MRI Magnet Room Environment

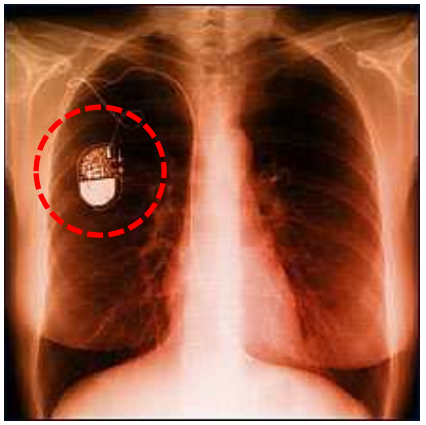
The following equipment must be MRI safe before bringing into the scan room.

- Non-ferrous IV Poles, Wheelchairs, Oxygen Tanks, Crash Carts, Gurneys, etc.
- Monitoring Equipment
- Infusion Equipment

You may see these stickers on some equipment. The green sticker indicates it is safe in the magnet Room, the red sticker indicates that it is not safe in the magnet room.

MRI Screening of Implants

A subject that has an **aneurysm clip or cardiac pacemaker** in question, can become fatal in MRI. If a subject has one of these implants you should find another subject to prevent any potential fatalities causing death. Aneurysm clips can torque in the magnetic field, tearing the vessel causing an artery to bleed without immediate effects. Pacemakers will loose the calibrated settings when placed in the MRI scanner changing the demand causing heart rates to fluctuate significantly.



YOU are the first line of defense!

Aneurysm Clips

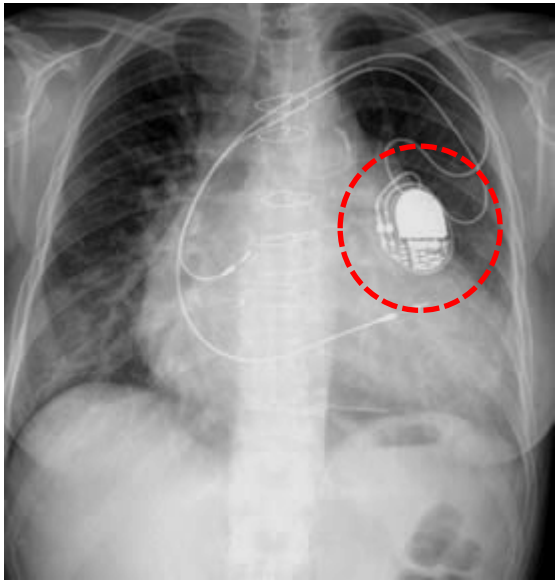
Examples of two types of aneurysm clips. The right picture demonstrates an aneurysm clip that is highly attracted to the magnetic field compared to the left picture.

Thorough MRI screening is important to avoid events leading to fatalities! If the subject has an aneurysm clip don't scan him(her)!

Pacemakers

Must not enter the 5 Gauss line, must remain in Zone 1.

----The 5 Gauss line is at the scan room door for the 3.0T.



"At this time, the presence of a cardiac pacemaker should be considered an absolute contraindication for MR imaging."

-----"Magnetic Resonance Bioeffects, Safety, and Subject Management" Frank G. Shellock, Ph.D, Emanuel Kanal, M.D.

Implants

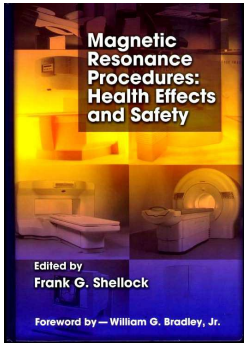
Be sure to check with MR medical director before scanning a subject with implants. Other implants that could cause serious consequences are:

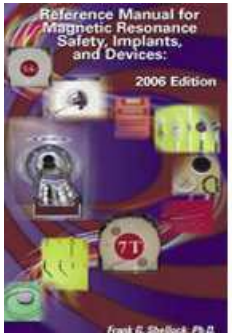
- Bone growth stimulators
- Drug infusion pumps (Syncromed)
- Cochlear implants
- Neurostimulators
- Breast expanders
- Any electronic device

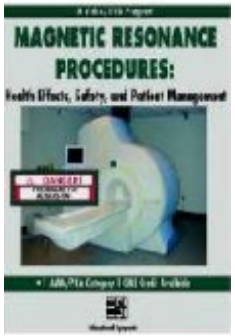
Cochlear Implant

Implants

- Often a risk vs. benefit decision
- Up-to-date information is crucial
- What's safe at 1.5T many NOT be safe at 3.0T!
- www.mrisafety.com gives current information on implants
- http://www.mrisafety.com/



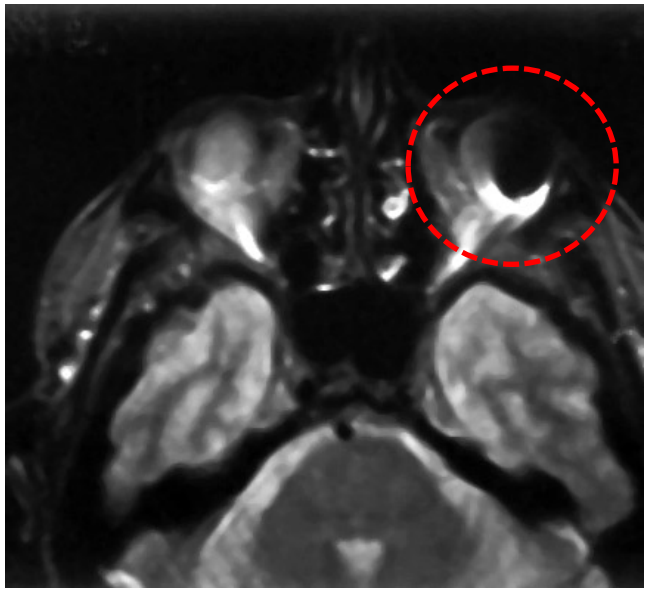




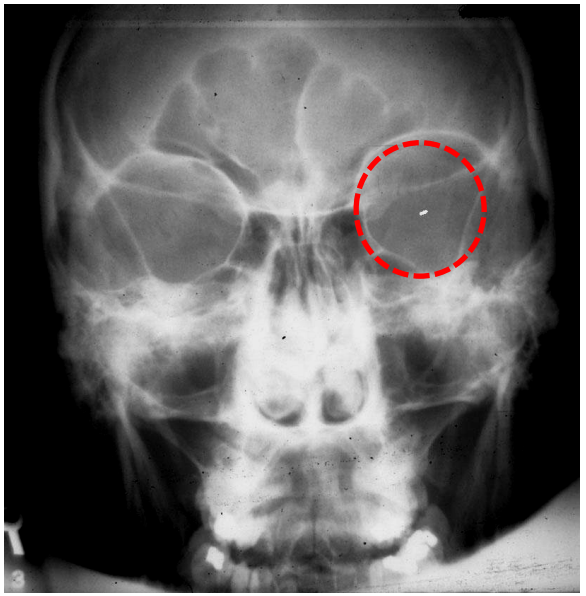
Intraocular Foreign Bodies

Plain Film X-rays or CT Scout of the Orbits are needed to exclude metal foreign bodies in the eye

If a subject is placed in the scanner with metal in the eye this could result in damage to the retina and causing permanent blindness.



Artifact on MRI caused by metal in the eye



Metal in the eye seen on x-ray

Biological Effects

According to latest guidelines from the FDA, clinical MR systems using static magnetic fields up to 8.0T are considered a “non-significant risk” for adult subjects.

----Magnetic Resonance Bioeffects, Safety, and Subject Management"
Frank G. Shellock, PhD, Emanuel Kanal, M.D.

Subject Monitoring

Q. Who should be monitored?

A. All subjects should be monitored verbally and visually

Subject Monitoring

- **Question:**

  Who may require additional monitoring?

- **Answer:**

  Subjects who cannot communicate

  Subjects with weak voices

  Subjects who do not speak English

  Subjects who are sedated

  Subjects with diminished mental capacity

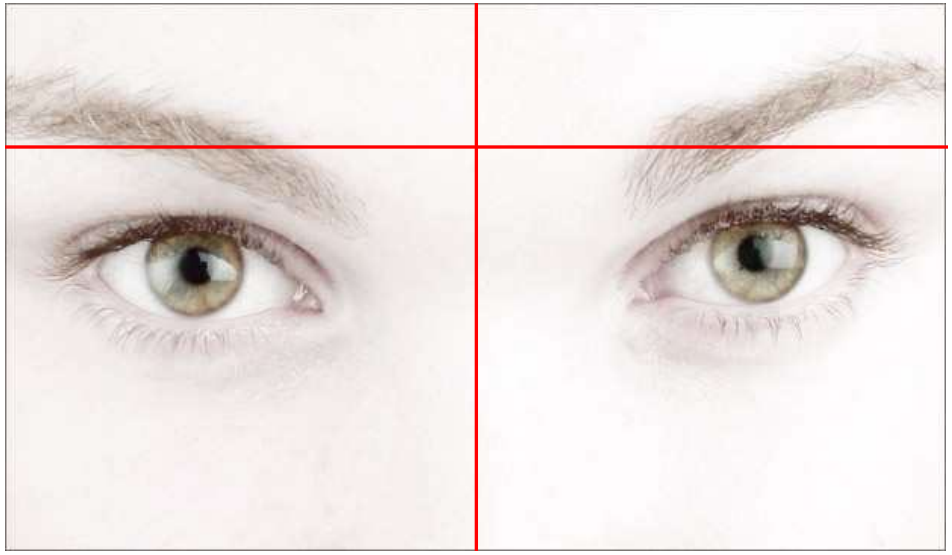
Hearing Protection

Use of earplugs and/or head phone is always required

Required for all persons in the scan room

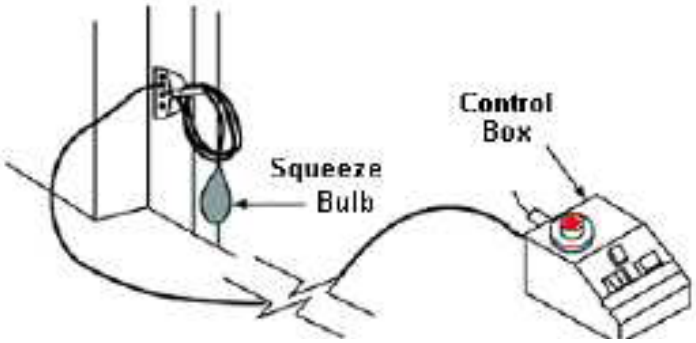
Eye Protection

- Eyes must be protected from laser light
- Instruct Subjects to close eyes when utilizing the laser light for land-marking



Subject Alert System

- When squeezed, the speaker on the control box sounds
- Maintain verbal contact via system intercom
- Make available to all Subjects
- Cover bulb if latex allergies present



Pregnancy

Individuals at risk includes:

- Subjects
- Employees

Use of MR In Pregnant Subjects

"The safety of MR imaging during pregnancy has not been proved." (FDA)

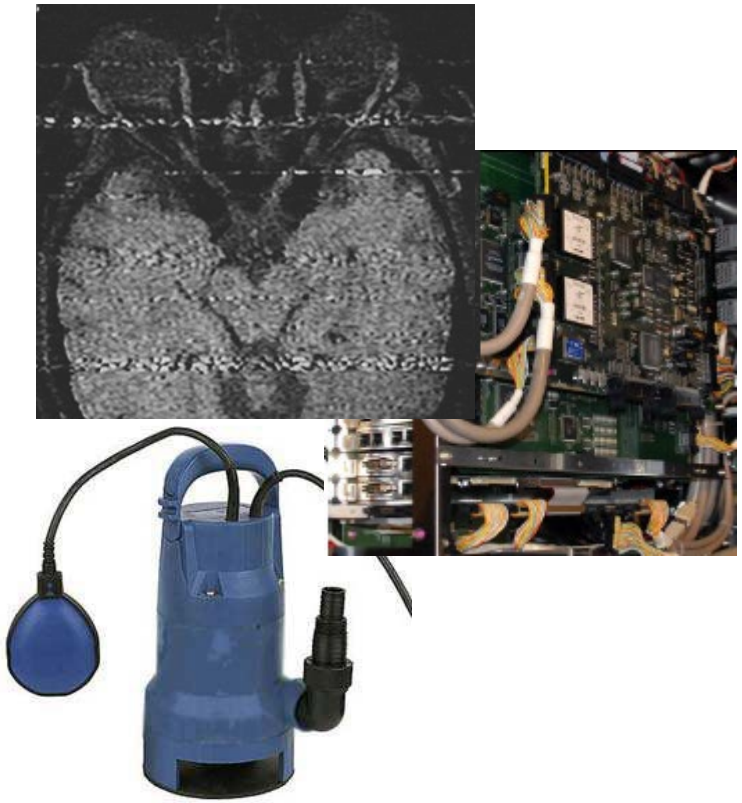
"Importantly, the technologists or healthcare worker [during pregnancy] should not remain within the MR system room or magnet bore during the actual operation of the device." (Frank Shellock Ph.D. Institute for MR safety)

It is the recommendation of the UMMS AMRIC Oversight Committee not to perform MRI scans on pregnant women.

MRI Magnet Room Environment

If you are conducting a study that requires that you bring special equipment into the scan room other than equipment already there, it must be approved by the UMMS AMRIC Oversight Committee .

- Never assume that equipment is safe to bring into the scan room until it has been tested
- Equipment not approved can cause damage and injury
- Equipment not approved can also cause image artifacts and signal loss



Responding to System Emergencies

EMERGENCIES

- Fire
- Medical Emergencies
- Electrical Emergencies
- Magnet Projectile Emergencies

FOR ALL EMERGENCIES
Dial 12345

EMERGENCIES

- Meet emergency personnel at the front doors. Make emergency personnel aware that the magnetic field is on.

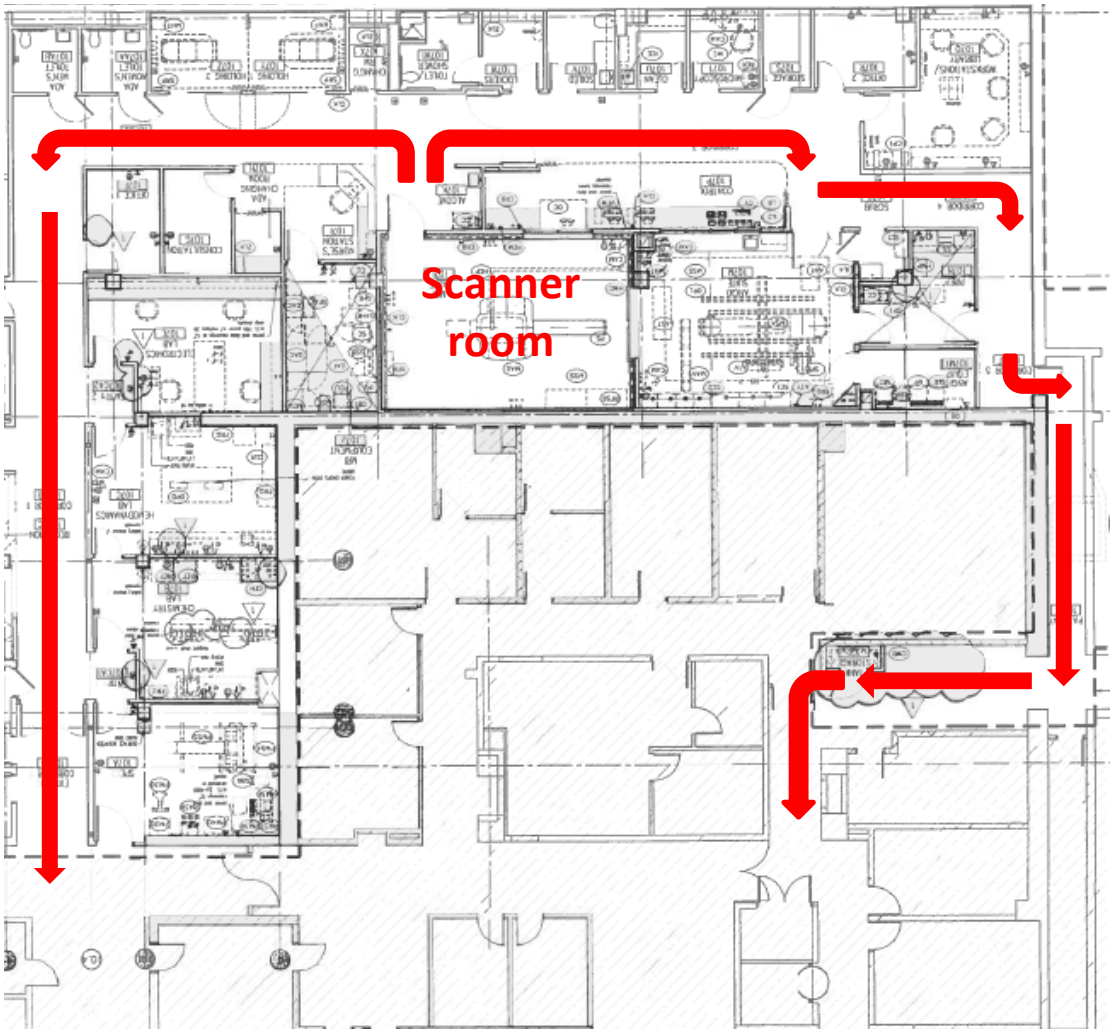
- MR compatible fire extinguisher is in the 3T control room next to the sink (can be used in magnet room).

Emergencies

Note: The red fire extinguishers are not safe to bring into the magnet room.

Emergencies

---Know your evacuation route in case of fire.



EMERGENCIES

- Medical emergency unrelated to magnetic field hazard, e.g. heart attack, stroke, etc.
- Assess the victim's status
- Call 12345
- Remove victim from scan room and into the hall way

- Electrical hazard requires shutting off electrical power.
- Become familiar with the location of the electrical shut down button in the **control room**

Emergency Stop…

Used for emergencies in the control room, scan room and electrical room

- **Fire**
- **Sparks**
- **Loud noises not associated with normal system operation**

Located on the wall next to the door in the control room

Does not turn-off magnetic field

Note: Turns off all electrical power to all system components

Emergency Off…

Disables the following systems:

- RF
- Gradient Power Supply
- Magnet Room Unit
- Table & Subject Support

Located on the wall next to the door in the control room

Does not turn-off magnetic field

Note: Turns off all electrical power to all system components

A superconductive magnet uses cryogens to super-cool the electrical conductor that creates the magnetic field. Liquid helium is used. Temperatures as low as -269°C (-452°F) are achieved! When these cryogens escape, it's known as a

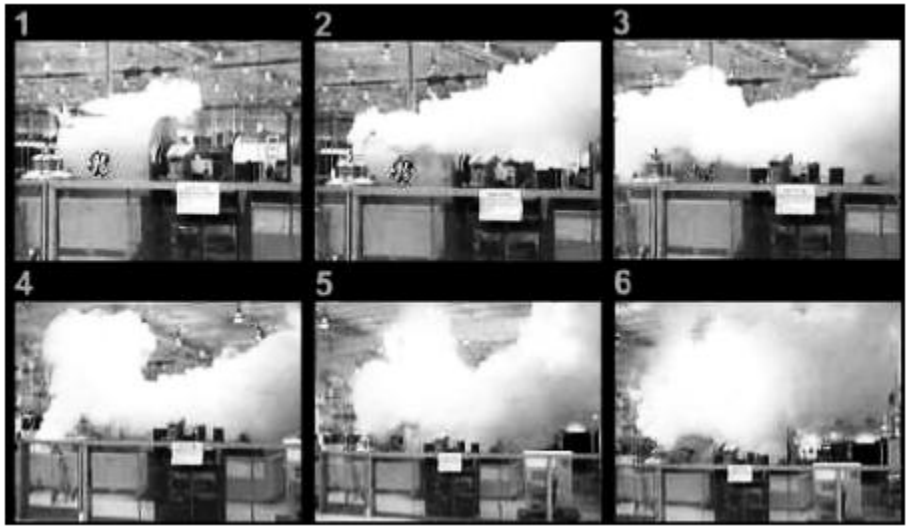
QUENCH

- Only hazardous if the **venting** fails
- The field strength in the center of the magnet will fall to 20 mT or 200 gauss in **2 minutes**.
- Fringe field may expand slightly for several minutes.
- Quenches are indicated by a loud noise, warning message, or the tilting of an image on the image screen.

Magnet Quench What Should You Do?

In the unlikely event of a quench and the vent fails, the procedure is to **evacuate the Subject and all personnel** from the scan room. Failure to follow these precautions can result in serious injury (e.g., asphyxiation, frostbite, or injuries due to panic).

Vent above scanner where cryogen gas escapes



MRI Scanner Superconducting Magnet Quench

Once a superconducting magnet is ramped up and fully magnetized, it literally takes no additional power to keep the magnet going. There's zero resistance -- that's the "superconducting" part -- so the current flowing in the magnet coils will run forever. That is, forever if the liquid helium cooling the magnet is kept cold enough, which is quite close to Absolute Zero. If the cooling system goes on the fritz, the magnet starts to develop resistance, which cause heat, which causes more resistance, and more heat, and so on until all the liquid helium gets hot enough to become a gas, which then erupts in a jet-engine sounding event known as a quench. That's thousands of dollars worth of helium you see in the photo sequence going up in smoke.

Emergency Magnet Quench

Two quench buttons are located inside scan room and in the control room respectively in 3T Suite. Two quench buttons are located inside scan room and in the electronic room respectively in 7T Suite

- Rapid reduction of the magnetic field in about two minutes.
- Boil-off of cryogens, accompanied by loud hissing sound.
- Several days of down time to replace the cryogens.

Used for magnetic field emergencies, such as a life threatening situations, open plastic cover and press button.

A Word About Subject Evacuation…

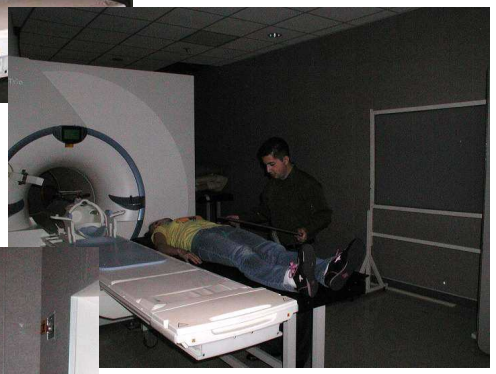
Typically Subjects can be evacuated from the scan room in less than 60 seconds.

If a subject has a cardiac arrest, stops breathing, a seizure, or any emergency requiring medical care, dial 12345 and quickly remove the subject from the scan room and transport them into the hallway-zone 2. When emergency personnel arrive let them know that they are not to enter the scan room with their equipment on or injury could occur.

Subject Evacuation 3.0T

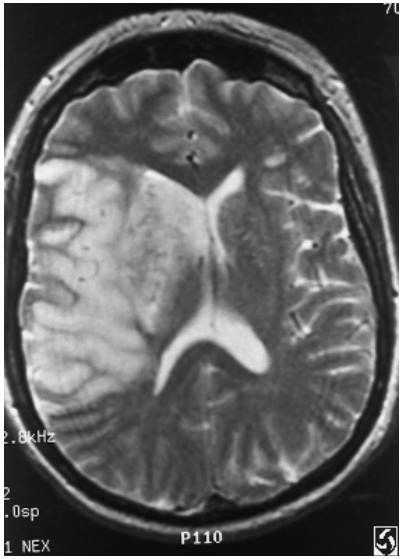
Subject Evacuation

1. Unlock table by pressing emergency table stop button.
2. Pull subject out of the scanner.
3. Put gurney along side of scan table and pull subject on to gurney.
4. Wheel subject into the lobby-zone 2 and secure door to magnet room.

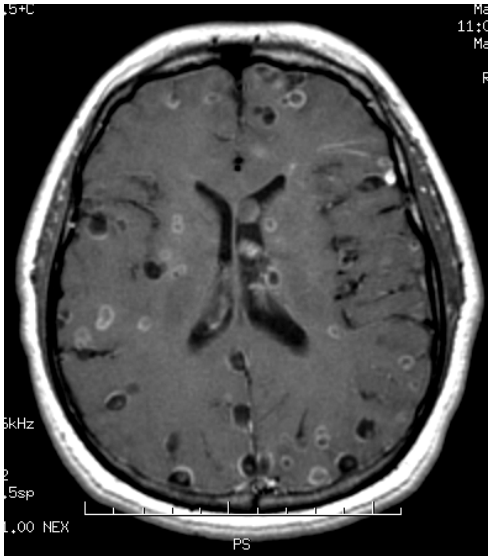


Incidental Findings

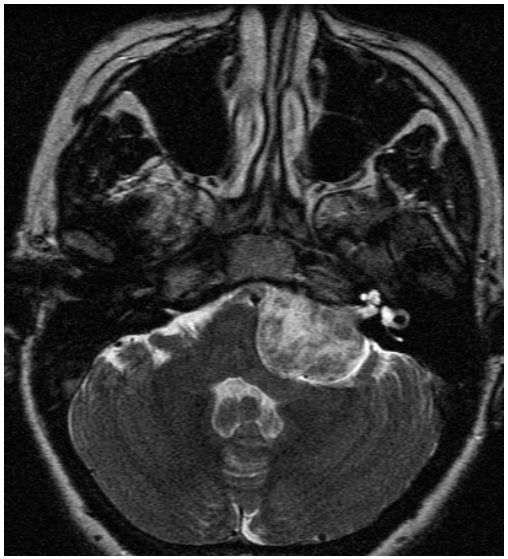
In the event that you see something that appears abnormal on a subject's scan, notify MR medical director and we will follow-up on your subject's scan.



Stroke



Parasites



Acoustic neuroma

Infection Control

The role of AMRIC and scope of participation in infection prevention and control includes those methods used in this department to reduce the risk of cross-contamination within the research subject population.

The MRI scan table and coil must be wiped with disinfectant solution after each use.

After Study Completion

Remember to do the following before leaving:

- Complete the MRI log form.
- Email the AMRIC MR Physicist if you encountered or noticed any equipment problems.
- Place all sponges back in the drawer.
- Return any cables to the same position to avoid any accidents (specifically the response box cables).
- Clean up all trash and remember to gather up all your items.
- Confirm that all switches, buttons, software selections (i.e. audio and video) have been returned to the default position.
- Make sure the projector or monitor has been turned off.
- Put used laundry in the hamper.

After Regular Hours scanning

Always have a minimum of 2 MR Safety Trained personnel when you scan before 9am, after 5:30pm during the week, weekends and holidays.

Restriction in the MRI Scan Suites

Within the MRI suites (Zone 3 and Zone 4), food, beverages and tobacco products are not allowed. There are no exceptions to this policy.

Keep the MR control area safe

- Keep doors to the MR control area (Zone 3) shut all the time
- Do not let people into the MR control area (Zone 3) or scan room (Zone 4)
- Monitor your subjects while they are in the MRI area

Safety Training summary

- Annually review your safety training
- Always be aware of the potential dangers of MRI
- Never take anything metal into the scan room
- Always make safety a top priority while in the MRI environment

THE MAGNETIC FIELD IS AT FULL POWER ALWAYS ….IT IS ALWAYS “ON”.

You Have Completed the level 2 MRI Safety Training Module

Proceed to the MRI Safety Training Quiz. You must pass with at least 80%.