



What is an MRI?

MRI = Magnetic Resonance Imaging is a medical test used to look inside your body for disease or injury

Uses **powerful magnetic fields** (up to 60,000 times stronger than Earth's magnetic field)

No radiation, but extremely dangerous MAGNETIC environment that is ALWAYS ON







Why It's Dangerous for Firefighters and Police

➤ Always Active Magnet

- The magnet is **ALWAYS ON** even during emergencies
- Cannot be turned off easily unless magnet is QUENCHED. This takes several minutes and costs tens of thousands of dollars



➤ Projectile Risk

- Metal objects can become lethal projectiles
- Air tanks, tools, radios, helmets, axes, and even stretchers can be sucked into the scanner
- ONLY use MRI conditional/safe equipment which is non-ferrous (non-magnetic)- WHEN IN DOUBT-KEEP IT OUT!

➤ Interference with Gear

- SCBA, radios, and other firefighting equipment may malfunction or be pulled in
- Pacemakers/defibrillators, medical implants, or metal shrapnel in your body can be dangerous or fatal
- Can cause a gun to discharge spontaneously

Zone Signage provides clear direction to MRI scanner

- Avoid entering ZONE 4 until permission from MRI Personnel.
- They will need to confirm MAGNET has been inactivated (Quench)











MRI is ALWAYS ON

24 HOURS/DAY
7 DAYS/WEEK
365 DAYS/YEAR





MRI SAFETY ACCIDENTS



Boy Killed In Freak MRI Accident

A team of investigators from the state Health Department is on the scene at the Westchester Medical Center north of New York City, where a 6-year-old boy was fatally injured by a flying oxygen tank while undergoing an MRI exam.

Health Department spokesman Robert Kenny said investigators were checking records and interviewing staffers in the wake of the boy's death, which came after his skull was fractured when the tank was pulled through the air by the MRI machine's powerful magnet. The hospital and the Westchester district attorney's office also are reviewing the case.

The boy, Michael Colombini of Croton-on-Hudson, died Sunday, two days after he was hit by the tank, which is about the size of a fire extinguisher. The county medical examiner's office said the boy's death was caused by blunt force trauma, a fractured skull and a bruised brain.

The medical center in Valhalla said the tank had been accidentally "introduced into the exam room" after the boy was in the magnetic resonance imaging machine and the 10-ton electromagnet was switched on.

The oxygen tank was "immediately magnetized and drawn to the center of the machine, causing head trauma to the child," the medical center said in a news release.

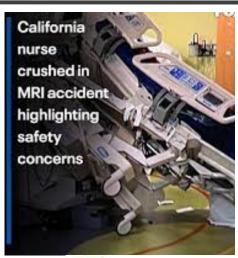
The boy was sedated when he was struck, the hospital said. The MRI was scheduled to check his progress after an operation to remove a benign brain tumor, which was discovered last week after he fell down at home, friends and relatives said.

"You'd think that if you had survived all of that. you'd be sort of home free," said Diana Heaton, Michael's kindergarten teacher last year. "We're all shocked and saddened by this. He was just an awesome kid who liked having fun."

Edward Stolzenberg, president and chief executive officer of the medical center, said in a statement that the hospital assumes full responsibility and "will do anything it can to ease the family's grief."

"The trauma was due to what can only be described as a horrific accident, and the entire medical center is grieving," Stolzenberg said.

MRI SAFETY ACCIDENTS





EMERGENCY RESPONSE CALLS/ PROCESS

In the event of an EMERGENCY or FIRE during normal operating hours, contact with a level 2 personnel onsite to assist in decision making to access zones 3 and 4 and avoid potentially disastrous accidents with the equipment is required.

In the event of an EMERGENCY or FIRE after hours where urgent time sensitive situations arise, there may not be enough time to contact level 2 MRI personnel. This **PowerPoint** along with **Fire Team Walkthrough Training** done annually with local fire departments, will allow fire teams to make necessary decisions to QUENCH the magnet ONLY if they need to enter the magnet (zone 4) due to emergency or fire.

MR safe /MR Conditional fire extinguishing equipment is physically present and clearly labeled in zone 2 and 3. Non-MR compatible fire extinguishers/ UNSAFE must be restricted from zone and 4 while magnet is at full field to prevent projectile missile effect force

If firefighters or emergency response personnel <u>must enter zones 3 or 4</u>, a decision to **QUENCH** the magnet should be seriously considered to protect the lives and safety of these personnel and all other involved. If a quench is performed, the emergency personnel shall be excluded until the magnetic field is no longer detectable or attenuated to the point that no longer poses a potential hazard.



Magnet Quench

- Rapidly reducing the magnetic field by releasing helium, which can displace oxygen and create a pressure build up in the room. May cause asphyxiation or death if not evacuated during quench
- Extremely expensive to bring magnet back to full strength
- Firefighters and Police must ensure the area is clear of patients and personnel, use non-magnetic extinguishers, and if necessary, activate the quench button to allow safe entry only in life threatening emergencies
- Failed QUENCH is extremely rare. If blockage of vent, the room can fill quickly with helium rather than expelling outside. ENSURE the magnetic field is gone before entering (toss item into the magnet from door to see if it drops or sticks to magnet)





What happens during a QUENCH?

1000 liquid liters of helium to rapidly boil off, turning liquid into a gas

1 liter of liquid helium expands to 750 liters of helium gas

Helium will displace oxygen in the magnet room

Pressure lock on inward swinging magnet door

Pressure-relief hatch is designed to safety vent outward and prevent pressure allowing scanner door to open

Can take seconds to several minutes for the magnet field to decrease.

ALWAYS CONFIRM MAGNETIC FIELD IS OFF BEFORE ENTERING BY TOSSING

MAGNETIC ITEM INTO THE ROOM FROM THE DOOR TO SEE IF IT STICKS TO MAGNET



Emergency Power OFF

 Quench is NOT the first option for a fire. If sparks or smoke, make sure electrical power has been shut off by pushing labeled switch on wall (remember this does not remove the magnetic field)

ONLY use MRI Conditional fire extinguishers









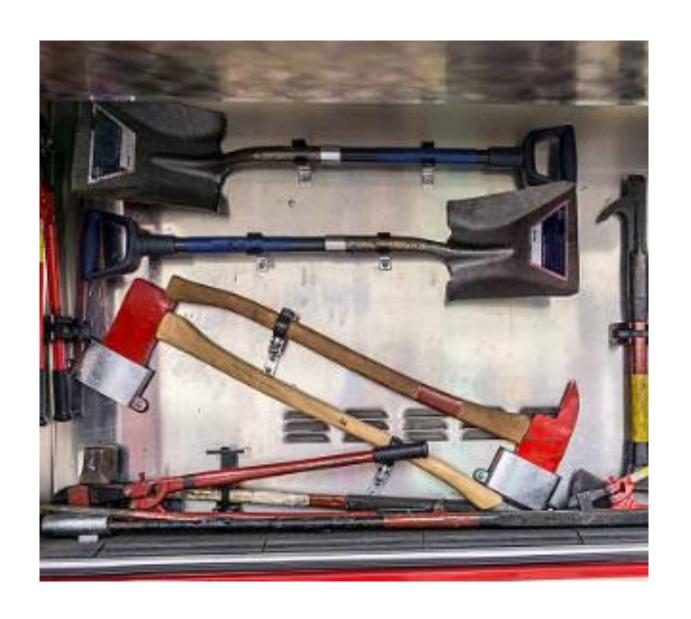
MRI-Certified Fire Extinguisher (H2O)

MRI CONDITONAL / SAFE

Uses deionized water as the extinguishing agent. Nonmagnetic with all-metal valve construction and exclusive crevice-free, butt-welded stainless steel cylinder with antiseptic white paint finish. Includes wand for operator safety. Manufactured and tested to ANSI/UL Standards. MR-conditional to 3Tesla. Available in 1.75- or 2.5-gallon capacity



FIREFIGHTER



Firefighter Tools and Gear

DO NOT

bring tools or gear into the MRI unless the magnetic field has been confirmed to be inactive. Remember the MAGNET IS ALWAYS ON, unless a QUENCH has been performed.







DO

X DON'T

Get MRI safety training and ask about magnet status before entry

Bring tools, air tanks or regular fire extinguishers into MRI room (zone 4)

Wait for MRI tech before entering during normal operating hours

Assume the magnet is turned off

Use MRI-safe extinguishers

Enter Zone 4 without clearance or witnessed QUENCH

Turn electrical power off if fire

Use standard stretchers in MRI room (zone 4)

QUENCH if fire or lifethreatening emergency requires you to enter MRI room (zone 4)

QUENCH unless life threatening situation or severe risk of fire in adjacent area that likely will spread to MRI area



POLICE OFFICER



PRISONERS/ INMATES



Ensure 2 officers present in MRI department – Screen for metals in /on your body

One stays in zone 2 (fully armed)

One stays in zone 3 (removed ferrous metals and firearms and placed in provided combination locker in MRI designated area)



Officers are required to remove all prisoners metal shackles and replace with plastic ZIP CUFFS





Metal free officers to stay with technologist in zone 3 while they complete exam







X DON'T

Get MRI safety training

Wait for MRI tech before entering

Turn electrical power off if fire

Ask about magnet status before entry

Bring FIREARMS, BELT or **VEST** into ZONE 3 or 4

Assume the magnet is turned off

Enter Zone 4 without clearance

QUENCH unless life threatening situation requires MR Safety Director -MRMD **Dr. Jenny Wu, M.D.** 216-210-6268

MR Safety Expert (MRSE) **Dr. Ashraf Morgan, Ph.D.**216-904-5980

MR Safety Officer (MRSO) **Cyndi Stanard RT (R)(MR)**216-212-03099



In Case of MRI – Emergency or Fire



- Contact MRI tech or radiology department IMMEDIATELY if during normal operating hours
- MRI personnel to notify MRI Safety team listed to left during normal operating hours
- MRI team or Fire Department / Police to Secure the area keep untrained personnel out
- DO NOT enter zone 4 while MRI magnet is at full field
- Use Electrical power shut off if sparks or fire in zone 3 or 4
- Use MRI SAFE/Conditional Fire extinguisher only
- Quench only if emergency DO NOT quench magnet unless directed or obvious life-threatening emergency
- During non-operational hours ONLY- QUENCH can be performed by Fire Department or Police if felt to be urgent life- threatening situation. CONFIRM Quench is complete and no magnetic field before entering the magnet room (zone 4) with other equipment







Final Safety Tips

- Treat MRI suites like **hazmat zones** invisible, powerful hazards
- Pre-plan with local MRI facilities and hospitals and do annual walk throughs to become familiar with the area including water source, power and quench switches
- **DO NOT ENTER** unless with MRI personnel or cleared for no magnetic field present (Quench)