

# **MRI SAFETY JEOPARDY (NON-Technologist Edition)**

## **Questions**

**For MRI Safety Week, 2009**

**Provided Courtesy of Mednovus, Inc.**

**[www.Mednovus.com](http://www.Mednovus.com)**

**PowerPoint MRI Safety Quiz available for free download from**

**[http://mrimetaldetector.com/media/proving\\_grounds/MRI\\_safety\\_week.html](http://mrimetaldetector.com/media/proving_grounds/MRI_safety_week.html)**

Welcome to MRI Safety Jeopardy. The game is played by selecting a category, a point value, and 'answering' by asking the appropriate question that would produce the provided statement. Your responses must be in the form of a question.

When a statement is read, signal when you believe that you have the correct response. If you do, you get the number of points indicated. If you don't have the correct response, your competitors will have the opportunity to signal, and respond. The person who answers the question correctly gets to select the next question category and point value.

Good luck!

# ENTERING

## Entering 10 -

What is 'False'

Despite the fact that MRI doesn't use ionizing radiation, the powerful magnetic and radiofrequency (RF) fields can present hazards to certain people and equipment.

## Entering 20 -

What is 'False'

For the vast majority of MRI scanners, the largest part of the scanner's magnetic field is always on. Even when not scanning patients. Even overnight, weekends and holidays when the department is closed. The scanner's magnetic field is always on.

## Entering 30 -

What is "does NOT"

Different MRI facilities have different screening and access requirements. Just because you've been admitted into the department does NOT necessarily mean that it would be safe for you to enter the MRI scanner room. Without comprehensive screening you may be a danger to yourself, others in the room, or even jeopardize millions of dollars of MRI equipment.

## Entering 40 -

What is 'false'?

Most building materials are virtually 'invisible' to the magnetic fields generated by an MRI. Without special shielding, the magnetic energies may escape the MRI room to rooms adjacent, as well as spaces above and below. Depending on the particular MRI system, it is possible that rooms / areas outside the MRI scanner room itself may have magnetic field values of 5 gauss (the FDA's threshold for safety for unscreened persons) or greater.

## Entering 50 -

What is 'Prevented' or 'Prohibited' or 'Refused'?

Even in the event of a power outage, or fire, or emergency situation, the powerful magnetic field of the MRI will remain on. A firefighter in Germany was almost killed when he entered an MRI room with his steel breathing tank on (the power to the entire hospital had been cut off!). Emergency responders should never be allowed to enter the MRI room unless they've been properly screened or unless an MRI staff person can confirm that the magnetic field has been dissipated.

# MAGNETS

## Magnets 10 -

What is 'Rotate' or 'Turn' or 'Twist'?

Like a compass needle, ferromagnetic objects will attempt to rotate to align themselves with the magnetic field. The longer an object is (the less spherical), the greater that rotational force will be. Also, the rotational force increases as you approach the magnet.

## Magnets 20 -

What is 'Attract' or 'Go To'?

Magnetic forces increase exponentially as you get close to the magnet so that even small changes in distance can produce HUGE changes in attractive effects. Now, imagine that same effect only this time with a magnet that's 1,000 times bigger and 1,000 times stronger!

## Magnets 30 -

What is 'Earth's.'

The average strength of the Earth's magnetic field in North America and Europe is about 0.5 gauss (slightly weaker near the equator and slightly stronger as you approach the north or south pole). It generally takes about a minimum of 75 gauss at the surface of a magnet to get it to stick to your refrigerator door. The most common type of MRI scanner, a 1.5 Tesla (1 Tesla is equal to 10,000 gauss) is 30,000 times stronger than the Earth's magnetic field!

## Magnets 40 -

What is 'Pole'?

Magnets are not uniformly attractive. They will have one positively-charged side / end, and one negatively-charged side / end. The attraction occurs between a positive and negative pole. Two positive poles (or two negative poles) will repel each other.

## Magnets 50 -

What is 'Electromagnet'?

Running electrical current through a coiled wire will produce a magnetic field. The more electricity, the stronger the magnetic field. There are some types of MRI's that use permanent magnets, often referred to as low-field open MRI scanners. The 'tunnel' format MRI's, however, use electromagnets.

# POTPOURRI

## **Potpourri 10 –**

What is ‘True’.

This is one of the reasons that MRI is strongly preferred, particularly for young patients or those who need recurrent imaging to monitor a condition or therapy. Some people may experience brief vertigo moving around the magnet, or even nerve stimulation that may produce a tingling sensation or a metallic taste in your mouth during the MRI exam, but even in the rare cases when these effects occur, these sensations have typically fully dissipated within minutes.

## **Potpourri 20 –**

What is ‘sound pressure’, ‘volume’, ‘banging’ or ‘gradient noise’?

It is known that some FDA approved scans may be loud enough to cause hearing damage. For this reason, it is important to provide hearing protection for MR patients as well as any clinical provider or visitor who remains in the magnet room during the imaging process.

## **Potpourri 30 –**

What is ‘False’.

MRI makes use of radiofrequency (RF) energy, which turns into small quantities of heat in your body. If your skin is touching the part of the MRI that is transmitting the RF energy, it can get a high-enough concentration that a burn is possible at the point of contact. Also, because of the way that energies move through your body during the MRI exam, skin-to-skin contact may also create spots where focal heating can occur. It is very important to follow the staff instructions about not touching the walls of the MRI, or crossing arms, or legs, or allowing your hand to touch your bare thigh, for example.

## **Potpourri 40 –**

What is ‘False’?

People have been pinned against the MRI by the force of a pound or less of steel caught in the attractive pull of an MRI. One woman had to have a bobby pin surgically removed from her sinus cavity when it flew up her nose while she was lying in the MRI. One man lost his eye when he pulled his nail clippers out of his pants pocket during an MRI and they slipped from his hand. Yes, there are many, many stories and pictures of larger objects (floor polishers, gurneys, wheelchairs, push-carts, etc...) that crashed into MRI magnets, but it only requires a few ounces of ferromagnetic material in the MRI room to seriously harm someone.

## **Potpourri 50 –**

What are ‘Metal Detectors’?

While ‘airport style’ detectors have been specifically recommended against (both for difficulty in distinguishing magnetic from non-magnetic metals and for a lack of sensitivity), a new breed of ferromagnetic-only detectors have been specifically recommended by the American College of Radiology, the Department of Veterans Affairs, the American Society of Healthcare Engineers, even cited as an example in the recent Joint Commission Sentinel Event Alert on MRI safety. Examples of these types of safety screening detectors include both the hand-held and pass-through Mednovus SAFESCAN® products.

# METAL

## Metal 10 -

What is "False"?

The MRI, itself, is made from metal, so not all types of metal are equally hazardous. Any type of metal inside the machine has the potential for it to heat up and, potentially, burn the patient. The primary risk of metal, however, is that it is attracted to the enormous power of the MRI's magnetic field.

## Metal 20 -

What is 'Aluminum' or 'Titanium' (either would be an acceptable answer)?

While steel may be one of the cheapest and strongest metals available, it is unsafe for use around MRI magnets. It is for this reason that most medical equipment, tools and instruments built to be used around MRI scanners are made largely from non-magnetizable metals, such as aluminum and titanium.

## Metal 30 -

What is 'False'?

While the awareness of magnetic risks to implant patients undergoing MRI exams *is* well known by the manufacturers of implants and devices, there are still some that are made from magnetic materials. It is vital for persons to identify to the MRI staff specifically what implants may have been placed in their body before even entering the room in which the MRI scanner lives.

## Metal 40 -

What is 'Ferromagnetic'?

Iron is the most common ferromagnetic material, but it is not the only one. Metals which contain iron are referred to as ferrous metals, and they are one subset of ferromagnetic metals. Nickel and Cobalt are the other two common ferromagnetic metals.

## Metal 50 -

What is 'Stainless Steel'.

There are actually many different alloys, or recipes, for stainless steel, with very different characteristics. Some stainless steel alloys are inherently magnetic. Others may be made in such a way that they are non-magnetic, but can become magnetic again if they're stressed. So even 'non-magnetic' stainless steels can become magnetic in the process of being machined from a block of steel into the final product. One should never assume that stainless steel is non-magnetic and safe in the MRI environment.

# SCREENING

## Screening 10 -

What is 'True'?

MRI exams not cookie-cutter tests. Different MRI machines, different medications, different scan types, and changes to your clinical condition can all impact the safety of an MRI exam. Having successfully undergone one MRI does not prove anything regarding the safety of your next MRI, so you must go through a comprehensive screening process immediately prior to each MRI exam.

## Screening 20 -

What is 'Medical / Clinical Screening'?

From contrast safety, to thermoregulation difficulties, to shrapnel or implanted medical devices, there are a number of clinical conditions that can make MRI the normally safe exams quite dangerous. It is important to fully disclose ALL surgeries and medical conditions as a part of the MRI pre-screening process.

## Screening 30 -

What is 'Physical screening' ?

Physical screening is intended to identify objects or materials that would be dangerous if brought into the MRI room, including ferromagnetic objects that may become projectiles and electrically-conductive materials that may experience focal heating during the MR exam. This may involve having patients empty their pockets, remove metal and jewelry, or even change into a hospital gown or 'scrubs.' Many MRI providers now use ferromagnetic screening systems, such as the SAFESCAN® products, to help make sure that patients, staff and visitors aren't bringing ferromagnetic objects into the MRI room.

## Screening 40 -

What is "Pacemaker"?

The new pacemaker, which is currently in FDA clinical trials and has recently received approval in Europe, promises to be the first cardiac pacemaker to receive the MR Conditional designation. Pacemakers, however, are not the only medical implant or device that pose major MRI safety risks. Others include implanted cardio defibrillators, cochlear implants, insulin pumps, nerve stimulators, bone-growth stimulators, shunt valves, deep-brain stimulators, prosthetics, and many others.

## Screening 50 -

What are 'Kidneys'

Though very rare, there is a link between patients with impaired kidney function who received injected MRI contrast and a disease known by its abbreviation, NSF. To protect from the risk of this disease, patients are often screened for low-kidney-function risk factors, and may be given blood tests to help assess kidney function. To date, there have been no cases of NSF for persons that had full kidney function at the time of their contrast-enhanced MRI exam.