BAMRR MRI Safety Week 2026

What is MRI Safety Week?

This week includes the anniversary of the tragic accident that resulted in the death of six-year-old boy, Michael Colombini from a projectile incident (oxygen cylinder) during an MRI scan in America on July 27th, 2001.

https://abcnews.go.com/US/story?id=92745&page=1

To commemorate this, BAMRR will be producing safety and educational materials and collaborating with the British Institute of Radiology (BIR), International Society for MR Radiographers & Technologists (ISMRT), the Society and College of Radiographers (SCoR) and The Institute of Physics and Engineering in Medicine (IPEM) in sharing links.

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What is BAMRR focusing on for MRI Safety Week 2026?

Each day, BAMRR will produce MR safety and educational information from each of the letters below, so check our website daily….

SAR :

The Specific Absorption Rate (SAR) is measurement of the amount of radiofrequency (RF) energy absorbed by body tissue during the time of MR image acquisition.

Radiofrequency (RF) electromagnetic fields are the main cause of tissue heating in MRI.
This heating arises from electric current loops (eddy currents) induced in the body by the oscillating RF field (Faraday's law) that are dissipated as heat due to tissue's resistance.

Faraday's Law:
A changing magnetic field induces an electric field in a conductor

These temperature rises in the body depend on various factors and are very difficult to predict.
Due to these challenges, the Specific Absorption Rate (SAR) is used as an 'indirect measurement' for patient heating, where 'SAR' is defined as the dissipated RF power in Watts per Kilogram of tissue [W/kg].
The estimated SAR will also vary between MR system vendors, where models of the tissue conductivity and density values are assumed. There is no standard for SAR estimation algorithms.

Local hot spots can occur around implants or leads/electrodes, so careful patient positioning and use of appropriate padding is essential to prevent to skin to skin contact and conductive loop pathways occurring, which could result in RF burns.

SAR :

MRI scanners estimate and restrict SAR according to the operating mode of the machine which is set to match limits specified by the International Electrotechnical Commission (IEC). There are different limits relating to different parts of the body, but the key limits often mentioned in guidance on implants are summarised in the table below.

	Volume RF transmit coil			Local RF transmit coil		
	Whole-body	Partial body		Local		
		Head	Other	Head	Trunk	Extremities
Normal Mode	2	3.2	2 – 10	10	10	20
First Level Controlled Operating Mode	4	3.2	4 – 10	20	20	40
Second Level Controlled Operating Mode	> 4	> 3.2	> (4 – 10)	> 20	> 20	> 40

These limits are intended to prevent excessive temperature increases, thermal stress, and tissue injury during MRI scanning

SAR :

Precautions to reduce the SAR to patients can include

- Field strength- use 1.5T instead of 3T
- Accurate patient weight/height- do you always weigh your patient/take their height where possible?
- Ensuring the patient is lightly dressed – hospital scrubs or long sleeved gown.
- Ensuring the scanner ventilation system is turned on in the bore
- Coil choice and RF transmit mode (CP)
- Use Gradient Echo instead of Spin Echo sequences if possible (or SE instead of FSE/TSE)
- Using breaks between high SAR sequences
- Alternating between low SAR and high SAR sequences
- RF Pulse Type- use Low SAR Mode or Variable-Rate Selective Excitation
- Reduce the flip angle
- Reduce number of slices
- Increased Concatenations/number of acquisitions
- Reduce the echo train length/turbo factor
- Reduce refocussing pulse angle down from 180^0
- Minimise use of satbands
- Increase TR
- Reduce phase encoding matrix

SAR

Artefact:

Some artifacts affect the quality of the MRI exam, while others do not affect the diagnostic quality but may mimic pathology.

Some artefacts (eg susceptibility in perfusion weighted MRI) are indeed welcomed…

Common artefacts are a result of:

- MRI hardware and room shielding
- MR Software
- Patient and physiological motion
- Tissue heterogeneity and foreign bodies
- Fourier transform and Nyquist sampling theorem

Artefact:

It is important as MR radiographers to be able to recognise the different types of artefacts and their possible origins and to have knowledge of any foreign bodies/implants as part of the primary clinical evaluation (PCE).

Also to be able to rectify or minimise artefacts (where possible) by adjusting acquisition parameters and to document any issues on the post examination documentation for the attention of the reporting clinician.

New strange artefacts are appearing with AI enhanced sequences.

A proposed strategy may include:

- Try running the sequence again with and without the AI application (eg with and without compressed sense, air recon DL or deep resolve boost etc)
- Use an original sequence from the vendor protocol tree
- Adjust one variable at a time
- Involve your senior radiographer/MR Safety expert

Faraday Cage:

A Faraday cage is used to block electromagnetic fields, named after the 19th-century physicist Michael Faraday. It prevents unwanted RF signals from the outside world from entering the magnet room causing artefacts and distorting images and the signals generated by MR imaging from escaping the magnet room.
Constructed of copper, aluminium or steel, the Faraday (or RF cage) fully encloses the magnet room by forming the walls, floor and ceiling, engineered to maintain continuous conductivity with no gaps or impedance. It is then covered by the decorative wall panels, flooring and ceiling tiles.

Other components of the RF cage include:

- The service/penetration panel, usually at the rear or side of the room, along with quench pipe, medical gases and air conditioning filters and waveguides. These prevent an unintentional RF leak, which could cause artefacts.
- RF window and RF door, which will be discussed next.

Spoiler alert 😊 check out day 3 tomorrow for Waveguide information….

Faraday Cage:

RF window- This observation window between the control room and magnet room consists of two glass panes with an RF shielding layer between them — either a fine copper wire mesh or a transparent conductive coating (indium tin oxide). This blackened mesh is positioned at a precise angle to each other to prevent visual distortion called Fresnel interference.

The shielding layer is electrically bonded to the window frame and the surrounding RF cage to maintain electromagnetic continuity. Ordinary glass is not used as it is an electrical insulator and cannot block RF energy.

It is both vital to be able to visualise your patient and reassuring for the patient to be able to see where the radiographer will be.

Suggested maintenance of the RF window may include:

- Regular cleaning of the glass
- Inspection of the frame for corrosion or gaps
- Checking for any condensation between the panes, as moisture may corrode the copper mesh

Do you have a departmental process in case you need to break through the RF window in an emergency?

Some departments have a switched panel that opacifies the RF glass to offer patient privacy at times.

Faraday Cage:

RF door – Can be of a single or double hinged design, swinging inwards or outwards, sliding or pivot with manual or pneumatic style opening. Inward opening doors should have an emergency pressure relief flap (cat flap) in case of magnet quench and pressure build up within the magnet room preventing the door from opening.

Some RF doors usually seen on mobile MRI units, have a small visual panel within.

The RF door is filled or lined with conductive material (typically copper or aluminium sheet).

The door can be sealed either by little copper/aluminium spring-loaded conductive elements (known as RF fingers) on the RF door, which form contact seals that press against the door frame surface every time the door is closed. Alternatively pneumatic or motor-driven threshold frictionless inflatable seals exist (which look like a mesh wired stent around the edge of the door).

As the RF door must open and close thousands of times per year while maintaining the same level of electromagnetic continuity as the rest of the RF cage enclosure, this mechanical stress can lead to breakdown in RF integrity. Also there have been instances reported where the RF door has jammed.

Do you have a local procedure for RF door failure, stiffness to open or misalignment?

Please see the BIR Risk assessments mentioned in Day 1 and the following publication

https://link.springer.com/article/10.1007/s10334-025-01310-x

It is recommended to perform periodic cleaning of contact surfaces and inspect the RF fingers for damage.

Do you have a maintenance contract for regular service of your RF door?

Emergency Situations:

These are some common emergency situations to consider.
Do you have SOP's in place for these?

Do you have regular practice drills for emergency evacuations?

Do you test your buzzers, intercoms, emergency response bleeps/phones?

Do these form part of your MRI safety audit?

Check out the new Best Practice Statement: Safety During Medical Emergency Situations in the Magnetic Resonance Imaging Scanner
See tomorrow's materials for more information….

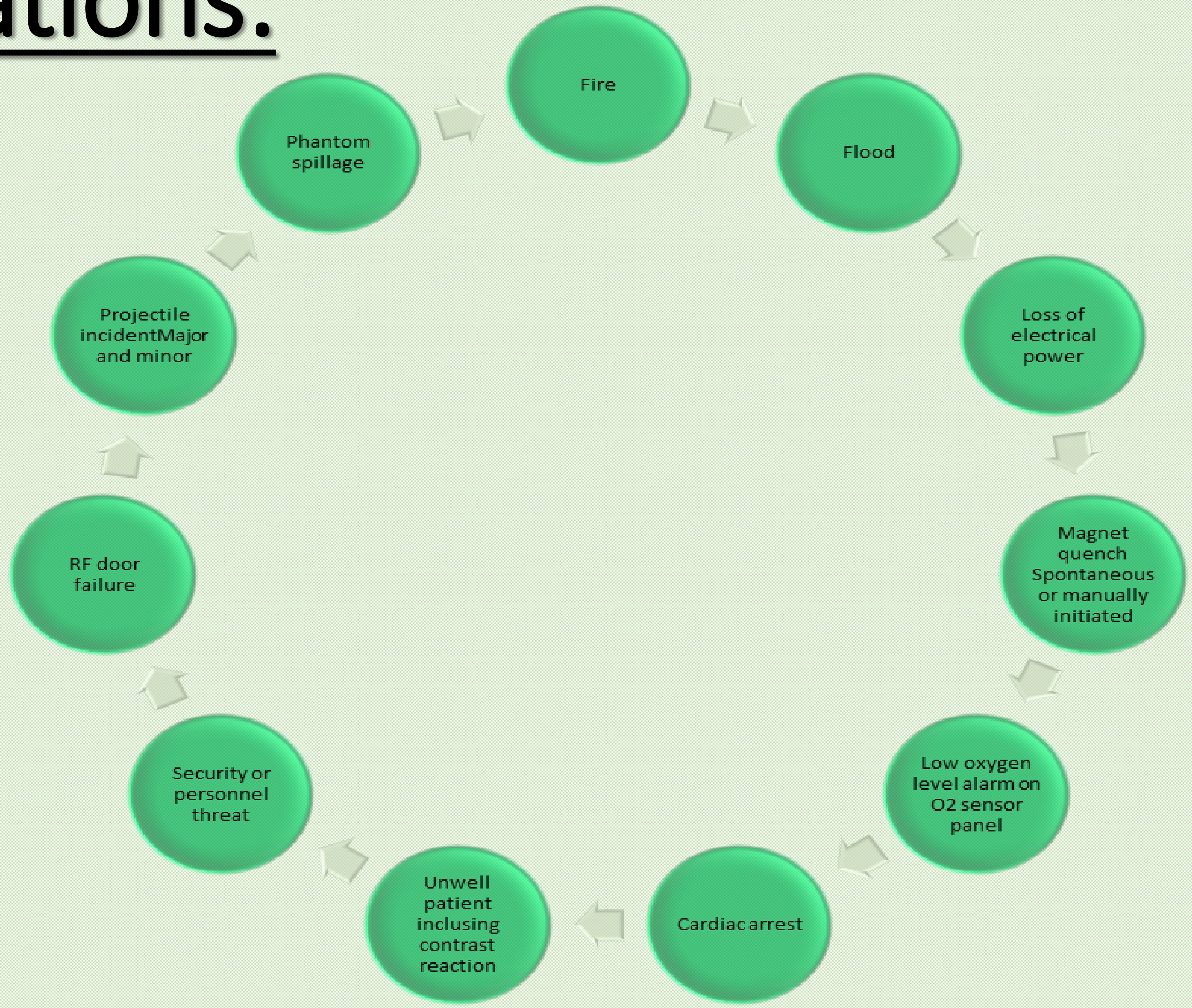


Table:

If you are working in a 'non-mobile' environment, do you offer to show your patient around the back of the table, so they can see it is not all enclosed? Any patient, not just a claustrophobic one can be reassured by seeing there is "light at the end of the tunnel" 😊

Do you know the weight limit for your table?

If you have an un-dockable table, are you familiar with the process and troubleshooting any minor issues?

Do you know where your emergency 'table stop' buttons are and how to re-engage the table/system after pressing them?

Are you familiar with the methods for removing your patient from the scanner in an emergency such as a cardiac arrest? Or a power failure, where the table might not work as normal.

Table:

Some vendors systems notify the patient when the table will move during their scan but if not, do you tell your patient when the table is about to move? Good communication is recommended at all times.

Remote table movement for directly removing patients from the bore at the end of the exam from outside of the magnet room via the scanning console is not seen as safe practice in the UK, due to the risk of pinching/limb entrapment/cables being caught.

When positioning the patient and during all table movement, always be mindful of leads, cables or other equipment associated with the patient, to ensure nothing gets caught or tangled, or patient limbs get injured in table movements by using appropriate supports/arm rests or straps.

Suitable padding must be used to prevent RF burns.

Cleaning the table, pads, coils, buzzer ball and headphones in-between patients is best practice for infection prevention control. The spine coil on the table should be lifted (where possible) and cleaned underneath. Ensure you use the recommended products by the vendor and your IPC team.

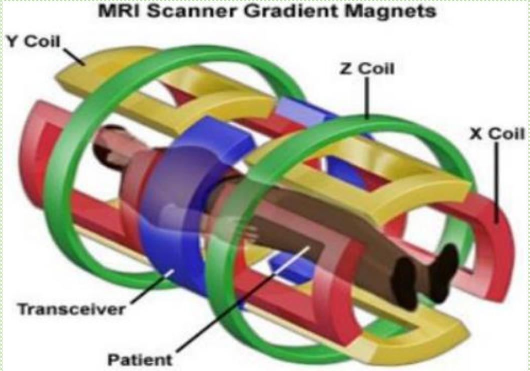
Y- Gradient:

Gradients are coils of wire that, when a current is passed through them, alter the magnetic field strength of the magnet in a linear fashion in the x, y, and z-directions.

They are used to spatially encode the MR signal by causing the resonance frequency of protons to vary as a function of their position.

The Y gradient alters the magnetic field strength along the Y axis.

*Note- Gradient design/directions are different in an upright or open design system



Gradient performance is important for: diffusion weighting, small FOV, increased resolution and short TR/TE times and is characterised by:

- Gradient strength or amplitude, which refers to how strong a gradient is (millitesla per meter mT/m)
- Rise time, which is the time taken to reach the maximum amplitude (milliseconds ms)
- Slew rate, which is peak gradient strength divided by the rise time (Tesla per meter per second T/m/s)
- Duty cycle, which is the percentage of time that the gradient is applied for (%)

Y- Gradient:

Gradient strengths and slew rates may be specified as either:

- Each axis (i.e. individual x-, y-, and z-gradient channels).
- An effective value (i.e. a combination of the three axes vectorially)

Note, the effective value are √3, or approximately 1.73 times more than the individual-axis value when all three axes are driven equally.
Therefore, a scanner with 33 mT/m per axis might have an effective gradient strength of ~ 57 mT/m

- Do you know where to find out information about your systems gradient specifications?
- What gradient mode does your system routinely use in sequences? (eg fast or normal)
- Do you know how to adjust it?
- Do you know about 'whisper/acoustic reduction' mode and in which circumstances you may wish to use this option?
- Do you provide your patient with adequate hearing protection to protect them from the loud noise created by the gradients?
- Do you monitor and communicate with your patient regarding peripheral nerve stimulation which may occur in certain sequences?

BAMRR MRI Safety Week 2026

Hope you have enjoyed the materials from the letters **SAFETY** from Day 2.
Please join us tomorrow to find materials about **WEEK ….**

Also, spoiler alert, **new guidance on resuscitation within MRI coming**….

BAMRR are also pleased to direct you to what BIR, ISMRT and SCoR have produced for MRI Safety Week and encourage you to visit the MRI page for IPEM.

https://bir.org.uk/get-involved/special-interest-groups/bir-magnetic-resonance.aspx

https://www.ismrm.org/mr-safety-links/mr-safety-week-2026

https://www.sor.org/

https://www.ipem.ac.uk/resources/mri/

If you missed our materials from MR Safety Week from previous years, they are available on the BAMRR website https://www.bamrr.org/safety/