

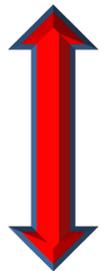
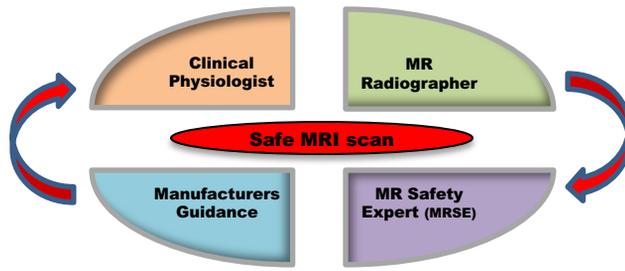
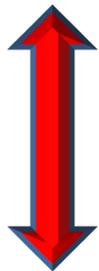


Think 'MRI'... Think 'pacemaker'... Think 'off-limits'... Think again...

Some cardiac pacing systems are classified as MR unsafe and some are MR conditional. Before a patient with an MR conditional pacemaker can safely undergo an MRI scan a comprehensive, multi-disciplinary safety check should be conducted on the pacing system implanted in the individual patient. Each individual stage of this safety briefing is vital in its own right yet is closely interlinked with the other stages in the overall MR safety / MR conditionality check. If a single facet is removed from the safety briefing process then there is real potential for harm to the patient when undergoing an MRI scan. There is no room for complacency where MR safety is concerned.

- Complete 'pacemaker safety assessment checklist' for implanted pacing system - information taken from hospital records and patient's 'pacemaker passport' (generator / leads / date of implantation / revisions or modifications)
- Conduct 1st line check for MR conditionality of pacing system (general overview of MR conditionality)
- Review chest x-ray for redundant / broken leads and pacemaker position - R/L pectoral or right ventricle (leadless)
- Conduct impedance testing on pacing system on the day
- Make clinical decision on the patients 'pacing' status during the MRI scan (continue pacing / halt pacing)
- Programme pacing system into 'MR Safe mode'
- Re-programme pacing system post MRI scan

- Liaise with radiologist to evaluate 'risk versus benefit' (MRI should be rejected if a diagnosis can be achieved by any other diagnostic modality)
- Conduct 2nd line check for specific MR conditionality of pacing system (in-depth specifications— see also MRSE)
- Adhere to local rules concerning cardiac pacemakers
- Complete MRI safety screening for any contraindication
- Thorough safety briefing with patient regarding warmth / heating / sensation at the pacemaker site during scan
- Monitor patient during scan (heart rate & oxygen saturation as a minimum requirement)
- Adhere to all MR conditions for the individual pacing system implanted in the patient

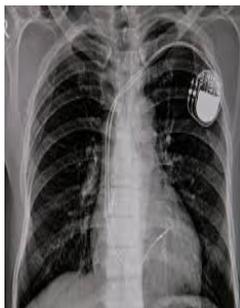


- Provides comprehensive guidance for specific pacing systems regarding whether the generator / lead combination is MR unsafe or MR conditional
- For any MR conditional pacing system specific conditions are stipulated which must be fully adhered to during the MRI scan
- The radiographer must have fully read and understood the manufacturers guidance document before undertaking any MRI scan on a patient with an MR conditional pacemaker

- Has ultimate decision on MR safety / MR conditionality
- Conduct 3rd line check for specific MR conditionality of pacing system (in-depth specifications) with details of:
 - Scanner strength (1.5T / 3T)
 - Exclusion zones
 - Specific absorption rate (normal mode / first level)
 - Slew rate restrictions
 - Spatial gradient restrictions
 - Coil restrictions
 - Temperature restrictions of patient
 - Height restrictions of patient



Expect the unexpected...



In the wake of modern advancements in cardiac technology we need to address the appearance of a modern cardiac pacemaker as viewed on a chest x-ray. Both examples shown display a cardiac pacemaker. The x-ray on the left displays the traditional representation of a pacemaker implanted in the left pectoral region. However, the x-ray on the right shows the modern representation of a 'leadless' pacemaker implanted within the right ventricle of the heart. These newer cardiac devices in current clinical usage are very small and not as immediately apparent on a chest x-ray. They leave no visible scar on the patient's chest. As such, they pose greater risks for MR safety, particularly when dealing with an incapacitated patient in the MRI unit.

