Improving access to MR imaging for patients with non- MR conditional cardiac devices

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Background:

- The presence of a cardiac pacemaker or defibrillator has traditionally been regarded as an absolute contraindication to MR scanning
- MR conditional devices do now exist, but older cardiac devices were not designed to undergo MR scanning
- However around 75% of patients with a cardiac implantable electronic device (CIED) will have a lifetime indication for a MR scan
- The consequences of not undergoing MR when indicated include late and misdiagnosis, as well as limiting access to treatments that require MR planning
- There is now increasing data suggesting the risk of scanning non-MR conditional devices is minimal provided specific safety protocols are followed
- International guidelines now endorse MR scanning in patients with non-MR conditional devices, with the aim that all centres implanting cardiac devices should be able to offer this service

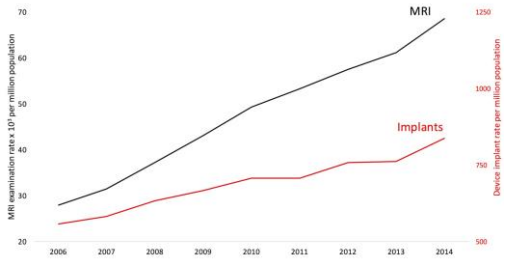


Figure 1. Trends in MRI and Pacemaker implantation in the UK (from mrimypacemaker.com)

OBJECTIVES

- To establish an MR imaging service for patients with non-MR conditional cardiac devices
- To improve the timely diagnosis and management of additional health conditions in these patients

BARRIERS TO CHANGE

MRI departments cite three main barriers to providing a service for patients with non-MR conditional devices:

1. Lack of training
2. Concerns around risk
3. Cross-departmental logistics

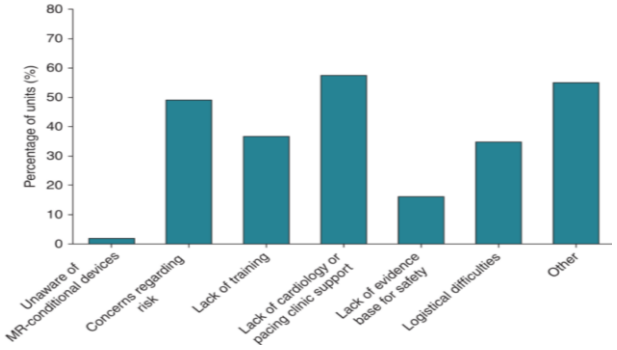
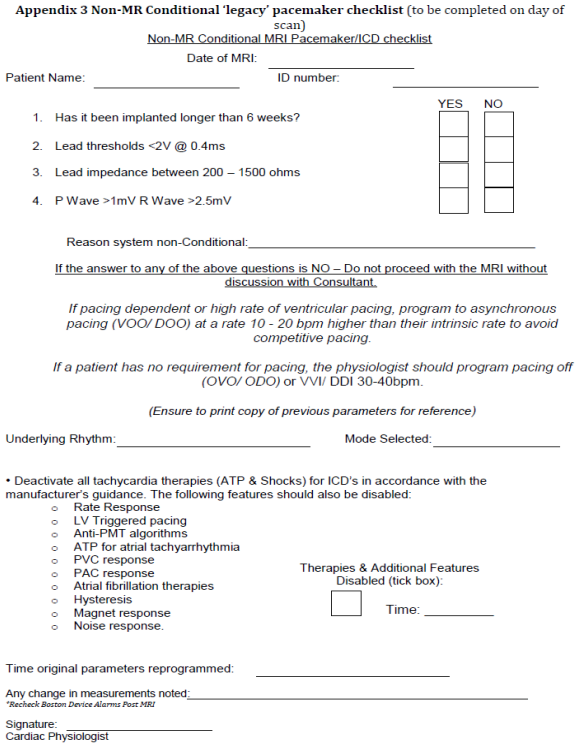


Figure 2. Reasons for not establishing an MRI service for patients with cardiac devices (from Sabzevari et al, EuroPace 2014)

METHODS FOR CHANGE

- Develop a standard operating procedure to ensure all staff had access to the information needed to safely deliver this service
- Create a patient information sheet so that patients had access to the information they needed prior to consenting to MR imaging
- Implement a standard referral form which allows collection of the information needed to weigh up the risks and benefits of MR scanning for each individual patient.



Appendix 3 Non-MR Conditional 'legacy' pacemaker checklist (to be completed on day of scan)

Non-MR Conditional MRI Pacemaker/ICD checklist

Date of MRI: _____

Patient Name: _____ ID number: _____

	YES	NO
1. Has it been implanted longer than 6 weeks?		
2. Lead thresholds <2V @ 0.4ms		
3. Lead impedance between 200 – 1500 ohms		
4. P Wave >1mV R Wave >2.5mV		

Reason system non-Conditional: _____

If the answer to any of the above questions is NO – Do not proceed with the MRI without discussion with Consultant.

If pacing dependent or high rate of ventricular pacing, program to asynchronous pacing (VOO/ DOO) at a rate 10 - 20 bpm higher than their intrinsic rate to avoid competitive pacing.

If a patient has no requirement for pacing, the physiologist should program pacing off (OVO/ ODO) or VVI/ DDI 30-40bpm.

(Ensure to print copy of previous parameters for reference)

Underlying Rhythm: _____ Mode Selected: _____

• Deactivate all tachycardia therapies (ATP & Shocks) for ICD's in accordance with the manufacturer's guidance. The following features should also be disabled:

- Rate Response
- LV Triggered pacing
- Anti-PMT algorithms
- ATP for atrial tachyarrhythmia
- PVC response
- PAC response
- Atrial fibrillation therapies
- Hysteresis
- Magnet response
- Noise response.

Therapies & Additional Features Disabled (tick box): ☐ Time: _____

Time original parameters reprogrammed: _____

Any change in measurements noted: _____

'Recheck Boston Device Alarms Post MRI

Signature: _____

Cardiac Physiologist

Figure 3. Non-MR Conditional Device Checklist

RESULTS

- The Queen Elizabeth Hospital, Birmingham has a well-established service for imaging patients with MR conditional devices, having previously completed > 250 scans
- Prior to the commencement of this initiative seven patients with non-MR conditional devices were referred for MR imaging and declined due to their device
- Following this initiative three patients have been accepted for MR scanning with two undergoing scans for possible malignant cord compression

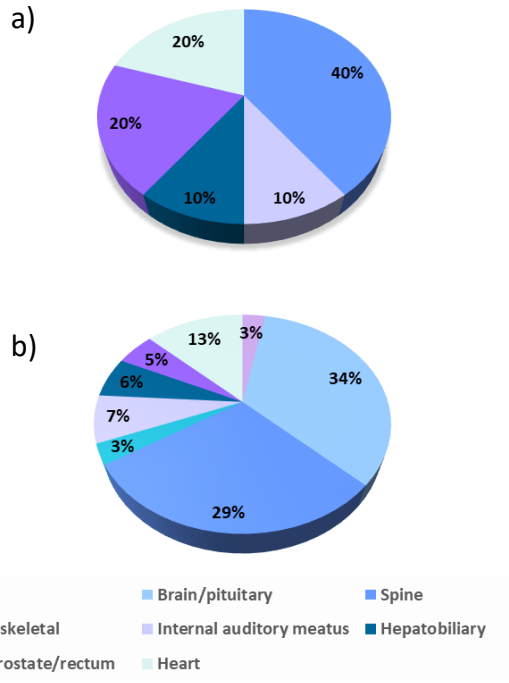


Figure 4. MRI scan requests by site for a) Non-MR conditional and b) MR-conditional pacemakers

CONCLUSIONS

- Development of standard operating procedures enables better access to MR imaging for patients with non-MR conditional devices, reducing misdiagnosis and improving access to treatment options
- As referring clinicians become aware that cardiac devices are no longer an absolute contraindication to MR imaging it is likely demand for this service will continue to grow

REFERENCES

1. mrimypacemaker.com

Emerging Leaders Programme
British Cardiovascular Society