



SOP Number      OCMR\_008

SOP Title         Scanning of patients with MR conditional pacemakers

	NAME	TITLE	SIGNATURE	DATE
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**1. PURPOSE**

The purpose of this SOP is to provide guidance on the process for assessing the safety and suitability to carry out a cardiac MRI scan (CMR) on a patient with an MR conditional pacemaker.

**2. SCOPE**

This SOP applies to clinical patients only. Research participants with MR conditional pacemakers will not be scanned at OCMR, unless specific ethical approval has been granted.

**3. INTRODUCTION**

Pacemakers have traditionally been regarded as absolute contraindications to MR scanning. However there is now a generation of MR conditional pacemakers which are safe to scan under certain conditions. Nevertheless there are still risks involved in these procedures and they should only be carried out if the clinical need for diagnosis by CMR is thought to be higher than the risks involved in performing the scan.

**4. RESPONSIBILITIES****Referring consultant**

The referring consultant is responsible for discussing the clinical need for a scan with the patient, ensuring that they are aware of the potential problems and risks. The referring consultant must forward a clinical referral to OCMR and complete the relevant initial sections of the conditional pacemaker safety checklist (see appendix A).

**OCMR consultant**

The cardiac consultant in OCMR is responsible for reviewing the case and assessing the clinical appropriateness of the request. It is ultimately the decision of the OCMR consultant as to whether or not the scan will take place. The OCMR consultant should complete the relevant section of the conditional pacemaker safety checklist (appendix A).

**OCMR Radiographer**

The OCMR Radiographer is responsible for ensuring that the conditional pacemaker safety checklist has been completed satisfactorily and ensuring that the scan is carried out within the parameters detailed on the checklist.

**Cardiac Rhythm Management Team (CRM)**

The CRM team are responsible for obtaining details of the pacemaker and leads from the relevant pacing department and providing these to the referring consultant for subsequent risk assessment by OCMR. Once the scan has been approved by the OCMR consultant, OCMR staff are responsible for liaison with the CRM team to organise an appointment for a pacing check before and after the scan.

**5. SPECIFIC PROCEDURES**

The referring consultant should discuss the possibility of a Cardiac MRI scan (CMR) with the patient, outlining that a risk assessment will be completed. The consultant should then complete a clinical referral form and also contact the CRM team to ensure that all relevant

sections of the conditional pacemaker safety checklist (appendix A) are completed prior to forwarding the referral and checklist to OCMR.

For MR conditional pacemakers it is important that all parts of the system are MR conditional and that there are no other pacing systems present (e.g. older pacing wires). Information on pacing leads may be obtained from recent chest x-rays but in some cases additional x-ray imaging may be required if uncertainties remain. It is the responsibility of the CRM team to provide details of the pacemaker and leads from the relevant pacing department and pass these to the referring consultant (by means of the safety checklist)

The referral and checklist should then be forwarded to OCMR. The consultant cardiologist in OCMR will review the referral request and make a decision regarding the appropriateness of the scan.

If a scan is considered appropriate then an appointment will be made for the patient and this will be communicated to the patient and the referring consultant by OCMR staff.

For safety reasons, on the day of the scan the patient will be escorted to the pacing clinic by a member of staff who must be a cardiology fellow, consultant cardiologist or cardiac physiologist.

The CRM team will programme the pacemaker into safe mode and record this on the safety checklist. The patient will then be escorted back to OCMR for their scan.

During the scan the patient should be monitored by ECG and at least one other type of monitoring; pulse oximetry and or blood pressure measurement.

The radiographer will complete the scan using the minimum number of sequences required to obtain the clinical information and the minimum energy delivery from the scanner (as detailed on the safety checklist).

At the conclusion of the scan the patient will be escorted back to the pacing clinic, again by either a cardiology fellow, consultant cardiologist or cardiac physiologist. The pacemaker will then be reprogrammed to its original settings by the CRM team. This will be recorded on the safety checklist.

All clinical referral forms and safety checklists will be stored within the OCMR patient file.

## 6. INTERNAL AND EXTERNAL REFERENCES

Appendix A – Safety Checklist for Patients with MRI Conditional Pacemakers undergoing CMR studies in OCMR. This is attached below at Page 5 and is also available via the OCMR website (<http://www.ocmr.ox.ac.uk/documents>)

## 7. CHANGE HISTORY

SOP no.	Effective Date	Significant Changes	Previous SOP no.
OCMR_008	September 2016	New SOP	N/A

## Safety Checklist for patients with MR Conditional Pacemakers undergoing CMR studies in OCMR

Patient Name:	DOB:
MRN:	Appointment Date:
CMR referral accepted by (Consultant Cardiologist):	

### Information and actions required of Cardiology / Pacing Clinic

Referring cardiologist / hospital:	
Name and model of pacemaker and leads:	
Date of implantation (>6 weeks at time of scan):	
Confirm the following: (tick <input checked="" type="checkbox"/> )	Confirmed by (signature):
<ul style="list-style-type: none"> <li>• Pacemaker is fitted in LEFT <input type="checkbox"/> or RIGHT <input type="checkbox"/> pectoral region ONLY</li> <li>• There are no fractured or non-conditional leads <input type="checkbox"/></li> <li>• Lead impedance value 200Ω - 1500Ω <input type="checkbox"/></li> </ul>	
Pacemaker set to MR "safe" mode by (Cardiac Physiologist):	
Date:	Time:
Pacemaker re-set to "normal" mode post scan by (Cardiac Physiologist):	
Date:	Time:

### Information and actions required of Consultant Cardiologist

CMR to be supervised by Consultant Cardiologist (insert name):			
The scan protocol should be the minimum required to answer the clinical question. Non-product sequences should <b>NOT</b> be acquired. The scan must only be performed at 1.5T			
A cardiology fellow, consultant cardiologist or cardiac physiologist <b>MUST</b> accompany the patient between OCMR the pacing clinic.			
Accompanied by (insert name):			
Type of monitoring used (tick all that apply):	ECG <input type="checkbox"/>	Non-invasive BP <input type="checkbox"/>	SPO <sub>2</sub> <input type="checkbox"/>

### Information and actions required of Imaging Staff

Radiographer / fellow performing CMR study:	
The following must be adhered to	Tick ( <input checked="" type="checkbox"/> )
Imaging performed at 1.5T with the patient supine	<input type="checkbox"/>
Maximum slew rate per axis does <b>NOT</b> exceed 200T/m/s	<input type="checkbox"/>
Ensure whole body SAR <2 W/kg	<input type="checkbox"/>
Use local receive coils only (transmit only and transmit-receive coils must <b>NOT</b> be placed over the pacemaker)	<input type="checkbox"/>