Department: **Electrophysiology**
Protocol:

Original Date:	**10/26/2023**	**Review Date: 12/4/25**
Department Manager:		**Revision Date:**
CEO:		**Revision Date:**

PROTOCOL: MRI NON-CONDITIONAL DEVICE REVIEW PROTOCOL

SCOPE: Alaska Heart and Vascular Institute
PURPOSE: Standardize Advanced Practice Provider (APP) MRI non-conditional device review prior to scheduling.

1. Review the implant note to determine the following:
    a. Implant site – must be right or left pectoral region (pre-pectoral or sub-pectoral).
    b. Implant date – must be more than 6 weeks post implant.
    c. Device model
    d. Lead model(s)
    e. Pin plugs – Per Dr. Compton and Dr. Willcox: OK to do MRI on patients with pin plugs.
    f. Sub-Q coils: very little data on these. UPenn has done some without issue, but all of these need to be approved by Dr. Compton or Dr. Willcox. They may want to do noninvasive programmed stimulation (NIPS) and defibrillation threshold (DFT) testing post MRI.
    g. Abandoned pacing lead – OK to proceed with MRI **with APP present** for capped leads (Will not see a cap on CXR). Prior to clearing the patient for the MRI the EP APP or EP MD will need to have a risk discussion with the patient (can be by phone) explaining that the abandoned lead may allow electricity to follow the lead into the heart causing a ventricular arrhythmia and possible cardiac arrest or heating of the myocardium. *This discussion needs to be documented on the worksheet before signing it.*
    h. Epicardial leads – OK to proceed with MRI **with APP present** for epicardial lead(s). Prior to clearing the patient for the MRI the EP APP or EP MD will need to have a risk discussion with the patient (can be by phone) explaining that the epicardial lead may allow electricity to heat the tip of the lead causing damage to the neighboring tissue and induction of current in the pacing lead may result in inappropriate cardiac stimulation. Only a few small studies of MRI safety with epicardial pacing leads have been published and adverse events have been rare. The benefit of the MRI should have been considered to outweigh the risks based on case evaluation. *This discussion needs to be documented on the worksheet before signing it.*
    i. Fractured leads – discuss with EP MD prior to signing the worksheet. Higher risk with limited safety data. Discussion of risks and benefits should occur prior to imaging and be documented on the MRI worksheet.
    j. Conditional generator and leads but with a mixed system - now considered “MR Conditional” and may proceed with MRI with device representative only (no EP APP needed).
    k. If using a prior “MRI Worksheet” and adding an append for the current review, make SURE that ALL hardware is the same (compare with most recent op-note as well as MURJ). If not, start a new MRI Worksheet.
2. Check the appropriate website to confirm MRI status for leads and device
    a. Boston Scientific: bostonscientific.com/imageready/en-US/home.html
    b. Medtronic: medtronichub.com/mriverify/search/device
    c. Abbott: mri.merlin.net (on this site, you will need to plug in the model numbers to see if the device/leads are MRI conditional)
    d. Biotronik: https://www.promricheck.com/spring/main?execution=e1s1 (on this site, you will need to plug in the model number or serial number to check to see if the device/leads are MRI conditional. More accurate to use serial numbers here.)
3. Review recent device checks for the following:

a. Lead impedances are stable and between 200 – 3000 ohms (200 – 1500 ohms for Advisa device).
b. If ICD: defib impedance is stable and between 20 – 200 ohms
c. Capture thresholds do not exceed 2V @ 1 ms in RA and RV leads; 2.5V @ 1 ms LV lead.
d. EP APPs may clear ICD patients with normally functioning devices with stable leads. If the patient has high impedances or thresholds, review with Dr. Compton or Dr. Willcox. If the MRI is approved, APP should be present for the MRI scan.
e. Patients must have had an in-clinic device check with threshold testing within the past year and either a remote or clinic check within the past 3 months.

4. If implant or generator change was done outside of AHVI then the most recent chest X-ray or chest CT scan images obtained since date of last implant / revision / generator change must be reviewed for:
    a. Leads are intact with no obvious fractures or dislodgements.
    b. Note if there are capped abandoned leads or epicardial (surgically implanted) leads.
    c. No MRIs for patient(s) with **uncapped** abandoned lead(s).
5. Complete the MRI worksheet and send a flag to the MRI / device scheduling in Athena.
6. If the device is deemed "NO MRI" for any reason, put a pop-up note in the AHVI medical record. Include date of review & reason denied. Document same in MURJ in the "patient notes" section.
7. If all the above criteria are met and the patient has a non-MR conditional device, the patient can have an MRI with the device rep and EP APP present for the entire scan.
8. Place **recommendations** for device programming on the MRI worksheet.
9. Programming guidelines
    a. Pacemakers
        i. If patient has an underlying rhythm and paces <5%, can program OOO
        ii. Usually, the best choice is to program in a non-sensing mode (DOO, VOO, AOO) 10-20 bpm faster than the patients programmed rate or the patient's intrinsic rate (whichever is faster)
        iii. Program pacing outputs to 5V @ 1ms in RA/RV leads (only leads that are pacing need to have outputs changed). LV lead voltage is left to provider / representative discretion due to potential for PNS.
        iv. In Boston Scientific devices remember to turn off magnet mode or the patient's device will go into magnet mode at 100 bpm.
        v. Do not end the interrogator session and leave the programmer on. This way, when the scan is complete, you can just hit "program initial values" to restore all previous programming. (Print or save to a thumb drive a copy of initial settings in case of power outage or other unforeseen issue.)
    b. ICDs
        i. Pacing reprogramming as above
        ii. Program all tachycardia detections and therapies off.
10. Stress MRI & ICDs: Per Dr Skolnick, even with new software cannot do stress MRI with an ICD; only function and viability (12/27/21). Only need EP APP for non-conditional ICDs for these studies.
11. Cardiac Contractility Modulator devices (CCM) are MRI conditional. See separate policy.