Implanted Cardiac Pacemaker and Defibrillator Management

Disclaimer: This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson’s specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient’s care. This algorithm should not be used to treat pregnant women.

INITIAL EVALUATION

- **Above the waist**: Pacemaker dependent?
  - Yes: Therapy OFF, Asynchronous pacing mode
  - No: Therapy OFF

- **Below the waist**: Pacemaker dependent?
  - Yes: Asynchronous pacing mode
  - No: Consider post-operative check

SURGERY/PROCEDURE

- **Central line placement**: See Page 2
- **MRI**: See Page 4
- **Patients with Do Not Resuscitate (DNR) status**: See Page 5
- **Therapy OFF**: Post-operative check to be completed prior to the patient leaving a monitored area.
  - Turn therapy ON
  - Check pacing mode

- **Magnet application for temporary Therapy OFF**: Consider magnet application for temporary asynchronous pacing mode
  - Post-operative check can occur up to 30 days after surgery

All patients need to follow-up with their treating physician(s)

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3 Recommend all surgical procedures to be scheduled early in the morning.
- Pacing dependent or surgery above the waist: Recommend scheduling surgery in main operating room.
- Pacing non-dependent and surgery below the waist: Recommend scheduling surgery in either main or ACB operating room.

4 Abdominal implants: If surgery between thorax and pelvis, refer to above the waist; if outside thorax and pelvis, refer to below the waist.

5 IR procedures that need a post-operative check prior to the patient leaving a monitored area and being discharged include radiofrequency ablation, microwave ablation and irreversible electroporation.

6 Follow Cardiac Device (Pacemaker/ICD) Clinic’s recommendations note:
   - Refer to Appendix A for Conditions Under Which Post-Operative Interrogation Is Not Necessary.
   - Refer to Appendix B for Magnet Application.

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Special circumstance: If ICD or pacemaker was implanted less than 3 months prior, procedure should be performed under fluoroscopy or in the Cardiac Catheterization Lab. Proceed with procedure as clinically indicated.

Patient presents for CVC/PICC placement or exchange

Note: Avoid placement of CVC/PICC on the same side of cardiac device

Arrangements for intra-procedure monitoring must be completed by direct communication between the Vascular Access and Procedures (VA&P) team and Cardiac Device (Pacemaker/ICD) Clinic

Pacemaker dependent?

Yes

No

Proceed with procedure as clinically indicated

CVC = central venous catheter
PICC = peripherally inserted central catheter

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PRIOR TO START OF RADIATION THERAPY

Patient to be scheduled for radiation therapy → Pacemaker or ICD → Cardiac Device (Pacemaker/ICD) Clinic consult? → High risk device exposure?

Yes → Multidisciplinary conference (clinician to clinician communication) to discuss treatment plans along with other options

No → Treatment plan per Radiation Oncology Team

Refer to Cardiac Device Management plan in electronic health record (EHR) and schedule follow-up as clinically indicated → Start radiation therapy

POST- RADIATION THERAPY

At completion of radiation therapy, schedule patient with Cardiology for final pacemaker/ICD assessment

1 Radiation dose specification and intended use of neutron producing beams (protons or photons ≥ 10 MV) documented in clinic note is recommended prior to Cardiac Device (Pacemaker/ICD) Clinic consult

2 Patients in the Houston Area Location (HALs) clinics receiving radiation therapy can go to the Cardiac Device (Pacemaker/ICD) Clinic or have a documented plan from an outside cardiologist

3 Start radiation treatment in accordance with Division of Radiation Oncology Electronic Medical Device Policy
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**PRIOR TO SCHEDULING MRI**

- **MRI-conditional device**
  - MRI-approved and scheduled?
    - Yes
      - Cardiology to collaborate with Diagnostic Imaging (DI) faculty regarding clinical indication of MRI
    - No
      - Cardiac Device (Pacemaker/ICD) Clinic to discuss risks and benefits of study with patient

- **MRI-non-conditional device**
  - Pacing non-dependent
    - MRI-approved?
      - Yes
        - Cardiac Device (Pacemaker/ICD) Clinic to notify primary team and DI that patient cannot proceed with MRI
      - No
        - DI to recommend alternative imaging study
  - Pacing dependent
    - Abandoned lead
    - Epicardial lead

**PRE-MRI**

- MRI protocolled for implanted devices by DI
- Consent patient, if not previously obtained
- Monitors applied:
  - Cardiac monitoring
  - Pulse oximetry
  - Blood pressure
  - Program device as indicated

**POST-MRI**

- Follow-up less than or equal to 3 months or as noted in the Cardiac Device Management note in the EHR

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CIED = cardiovascular implantable electronic device

1 There will be an appropriate, qualified and credentialed clinician to monitor patient during procedure

2 Patient needs two consents: one for MRI study and one for MRI with CIED

3 Ensure appointment is scheduled for discussion

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Department of Clinical Effectiveness V6
Approved by the Executive Committee of the Medical Staff on 01/18/2022
Advanced care planning has been established. Patient is DNR status with an implanted cardiac device.

1. It is recommended to turn OFF shock therapy
2. An order must be placed by the physician to turn OFF shock therapy
   - Contact Cardiac Device (Pacemaker/ICD) Clinic during business hours
   - Notify manufacturer representative after 5 PM and weekends

If there is no need for any intervention, continue advanced care plan.

The advanced care planning discussion with the patient/family member should clearly include and document whether or not shock therapy will be turned OFF.

Manufacturer’s information may be obtained in the following manner:
- Cardiac Device (Pacemaker/ICD) Clinic progress note
- Patient/Family member has manufacturer’s card

No need for any intervention

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APPENDIX A: Conditions Under Which Post-Operative Interrogation is Not Necessary

1. Device is checked preoperatively and found to be working correctly, and
2. No programming of device took place perioperatively, and
3. No monopolar electrosurgery used (bipolar is acceptable), and
4. No blood transfused, and
5. No hemodynamic issues noted, and
6. Procedures not involving electrosurgery (e.g., endoscopic ultrasonography)

APPENDIX B: Magnet Applications

<table>
<thead>
<tr>
<th>Pacemaker Manufacturer</th>
<th>Most Common Magnet Effect</th>
<th>Programmable (On-Off)</th>
<th>Defibrillator Manufacturer</th>
<th>Most Common Magnet Effect</th>
<th>Magnet Confirmation</th>
<th>Programmable (On-Off)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biotronik</td>
<td>No sustained asynchronous pacing</td>
<td>Yes</td>
<td>Biotronik</td>
<td>Enables tachy therapy</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>Boston Scientific/Guidant CPI</td>
<td>Asynchronous pacing at 100 or 90 bpm</td>
<td>Yes</td>
<td>Boston Scientific/Guidant CPI</td>
<td>Enables tachy therapy</td>
<td>Defibrillator will beep with each R wave or 1/second</td>
<td>Yes</td>
</tr>
<tr>
<td>Intermedics</td>
<td>No sustained asynchronous pacing</td>
<td>No</td>
<td>Medtronic</td>
<td>Enables tachy therapy</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>Medtronic</td>
<td>Asynchronous pacing at 85 bpm</td>
<td>No</td>
<td>Sorin</td>
<td>Enables tachy therapy</td>
<td>Change pacing rate to 90 bpm</td>
<td>No</td>
</tr>
<tr>
<td>Sorin</td>
<td>Asynchronous pacing at 85 - 96 bpm</td>
<td>No</td>
<td>St. Jude Medical/Pacesetter</td>
<td>Enables tachy therapy</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>St. Jude Medical/Pacesetter</td>
<td>Asynchronous pacing at 86 - 100 bpm</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SUGGESTED READINGS

Crossley, G. H., Poole, J. E., Rozner, M. A., Asirvatham, S. J., Cheng, A., Chung, M. K., … Irefin, S. (2011). The Heart Rhythm Society (HRS)/American Society of Anesthesiologists (ASA) expert consensus statement on the perioperative management of patients with implantable defibrillators, pacemakers and arrhythmia monitors: facilities and patient management: this document was developed as a joint project with the American Society of Anesthesiologists (ASA), and in collaboration with the American Heart Association (AHA), and the Society of Thoracic Surgeons (STS). *Heart Rhythm, 8*(7), 1114-1154. doi: https://doi.org/10.1016/j.hrthm.2010.12.023

This practice consensus statement is based on majority opinion of the Pacemaker workgroup at the University of Texas MD Anderson Cancer Center for the patient population. These experts included:

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