Implanted Cardiac Pacemaker and Defibrillator Management

INITIAL EVALUATION

Implantable cardioverter defibrillator (ICD) pacing dependent?

- Yes: Therapy OFF, Asynchronous pacing mode

Pacemaker dependent?

- Yes: Asynchronous pacing mode

- No: Therapy OFF

Pacemaker dependent or non-dependent?

- Yes: Place magnet for temporary Therapy OFF

- No: Consider post-op check

Surgery or procedure with electrosurgery above the waist?

- Yes: Therapy OFF

- No: Therapy OFF

Surgery or procedure with electrosurgery below the waist?

- Yes: Consider magnet for temporary asynchronous pacing mode

- No: Postoperative check can occur up to 30 days after surgery

Central line placement: See Page 2
Therapeutic radiation: See Page 3
MRI: See Page 4
Patients with Do Not Resuscitate (DNR) status: See Page 5

All patients need to follow-up with their physician

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1 Device check not needed if completed within the last 3 months and with documented NORMAL battery, impedances, and pacing safety margins. Device to be rechecked when transitioning from one treatment to another (i.e., radiation, surgery). After 4:30 PM, weekends, and holidays, cardiology service on-call can be contacted for emergency device checks.

2 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

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

4 Therapy OFF: Turn therapy ON, Check pacing mode

5 Consider post-op check

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

7 Refer to Appendix A for Conditions Under Which Postoperative Interrogation is Not Necessary

8 Refer to Appendix B for Magnet Application

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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.

Approved by the Executive Committee of the Medical Staff on 06/25/2019

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**Central Line/Peripherally Inserted Central Catheter (PICC) Placement**

- **Patient presents for CVC/PICC placement or exchange**
  - **Note:** Avoid placement of CVC/PICC on the same side of cardiac device.

- **ICD**
  - Arrangements must be completed by direct communication between Infusion Therapy Team and Cardiac Device (Pacemaker/ICD) clinic for intra-procedure monitoring.

- **CVC**
  - **ICD**
  - **Pacemaker**
    - Pacemaker dependent?
      - Yes
      - **Proceed with procedure as clinically indicated**
      - **No**
        - **Proceed with procedure as clinically indicated**

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**CVC** = central venous catheter  
**PICC** = peripherally inserted central catheter

1 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.

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**Disclaimers:**

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THERAPEUTIC RADIATION

PRIOR TO START OF RADIATION THERAPY

Patient to be scheduled for radiation treatment → 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 (morning radiation treatment appointment recommended)

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

Start radiation treatment

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

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1 Radiation dose specification documented in clinic note is recommended prior to Cardiac Device (Pacemaker/ICD) clinic consult

2 Start radiation treatment in accordance with Division of Radiation Oncology Electronic Medical Device Policy
Implanted Cardiac Pacemaker and Defibrillator Management

Prior to Scheduling MRI

Consult to Cardiac Device (Pacemaker/ICD) clinic noting patient to be scheduled for MRI and has a CIED

MRI

Cardiology to collaborate with Diagnostic Imaging (DI) faculty regarding clinical indication of MRI

MRI approved and scheduled?

Yes

MRI protocol for implanted devices by DI
Consent patient, if not previously obtained

No

Monitor devices applied:
- Cardiac monitoring
- Pulse oximetry
- Blood pressure
- Program device as indicated

During MRI

Yes

Electrophysiologist to notify primary team and DI that patient cannot proceed with MRI
DI to recommend alternative imaging study

No

Cardiac Device clinic to notify primary team, DI and electrophysiologist that patient cannot proceed with MRI
DI to recommend alternative imaging study

Post MRI

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

MRI approved?

Yes

CIED checked
Reprogram device back to original settings

No

MRI-conditional device
MRI-non-conditional device
Pacing dependent
Pacing non-dependent
Abandoned lead
Epicardial lead

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

Department of Clinical Effectiveness V5
Approved by the Executive Committee of the Medical Staff on 06/25/2019

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PATIENTS WITH DO NOT RESUSCITATE (DNR) STATUS

Advanced care planning\(^1\) has been established. Patient is DNR status with an implanted cardiac device.

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

ICD

Pacemaker

No need for any intervention

Continue advanced care plan

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\(^1\) The advanced care planning discussion with the patient/family member should clearly include and document whether or not shock therapy will be turned OFF.

\(^2\) Manufacturer’s information may be obtained in the following manner:
- Cardiac Device (Pacemaker/ICD) clinic progress note
- Patient/Family member has manufacturer’s card
APPENDIX A: Conditions Under Which Postoperative 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

### Pacemaker Magnet Application

<table>
<thead>
<tr>
<th>Pacemaker Manufacturer</th>
<th>Most Common Magnet Effect (For ranges listed below, the lower rate indicates a shorter remaining battery life)</th>
<th>Programmable (On-Off)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biotronik</td>
<td>No sustained asynchronous pacing</td>
<td>Yes</td>
</tr>
<tr>
<td>Boston Scientific/Guidant CPI</td>
<td>Asynchronous pacing at 100 or 90 bpm</td>
<td>Yes</td>
</tr>
<tr>
<td>Intermedics</td>
<td>No sustained asynchronous pacing</td>
<td>No</td>
</tr>
<tr>
<td>Medtronic</td>
<td>Asynchronous pacing at 85 bpm</td>
<td>No</td>
</tr>
<tr>
<td>Sorin</td>
<td>Asynchronous pacing at 85 - 96 bpm</td>
<td>No</td>
</tr>
<tr>
<td>St. Jude Medical/Pacesetter</td>
<td>Asynchronous pacing at 86 - 100 bpm</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Defibrillator Magnet Application

<table>
<thead>
<tr>
<th>Defibrillator Manufacturer</th>
<th>Most Common Magnet Effect (NO defibrillator has asynchronous pacing with magnet)</th>
<th>Magnet Confirmation</th>
<th>Programmable (On-Off)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biotronik</td>
<td>Disables tachy therapy</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>Boston Scientific/Guidant CPI</td>
<td>Disables tachy therapy</td>
<td>Defibrillator will beep with each R wave or 1/second</td>
<td>Yes</td>
</tr>
<tr>
<td>Medtronic</td>
<td>Disables tachy therapy</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>Sorin</td>
<td>Disables tachy therapy</td>
<td>Change pacing rate to 90 bpm</td>
<td>No</td>
</tr>
<tr>
<td>St. Jude Medical/Pacesetter</td>
<td>Disables tachy therapy</td>
<td>None</td>
<td>Yes</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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