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.*

Note: This algorithm is intended for outpatient use. For inpatients needing evaluation, please place "Cardiac Device Check Inpatient (Bedside)" order for the patient to be evaluated at bedside.

INITIAL EVALUATION

All patients with a cardiac implantable electronic device (CIED) and scheduled for procedure and/or radiation therapy are to be seen prior to treatment at the Cardiac Device (Pacemaker/ICD) Clinic in the Cardiopulmonary Center[1]

PROCEDURE

- Surgery/Procedure → See Page 2
- Central line placement → See Page 3
- Radiation therapy → See Page 4
- MRI → See Page 5
- Patients with Do Not Resuscitate (DNR) status → See Page 6
- Interventional Radiology (IR) Procedure → See Page 7

ICD = Implantable cardioverterdefibrillator

[1] Device check not needed if completed within the prior 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.

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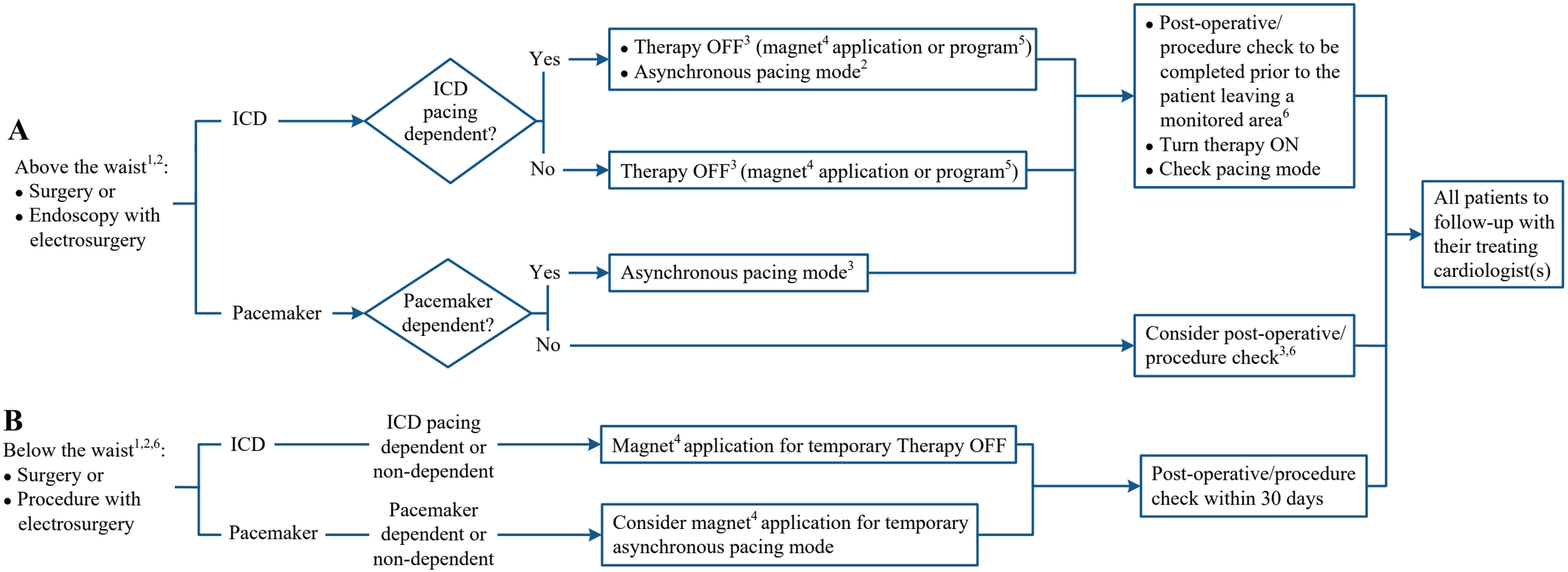
SURGERY/PROCEDURE



[1] 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 dependent patients undergoing prostate biopsy, prostate brachytherapy procedures, and/or cystourethroscopy with only bipolar may be scheduled in ACB
- Pacing non-dependent and surgery below the waist: Recommend scheduling surgery in Main, ACB, or Northwest Houston Area Location (HAL) operating room (see Appendix A)

[2] Abdominal implants: If surgery between thorax and pelvis, refer to *above* the waist; if outside thorax and pelvis, refer to *below* the waist

[3] Follow Cardiac Device (Pacemaker/ICD) Clinic's recommendations note

[4] Refer to Appendix B for Magnet Application

[5] If program OFF, apply external pacing pads **and** connect patient to and turn on the external monitor/defibrillator device

[6] Refer to Appendix A for Conditions Under Which Post-Operative/Procedure Interrogation is Not Necessary

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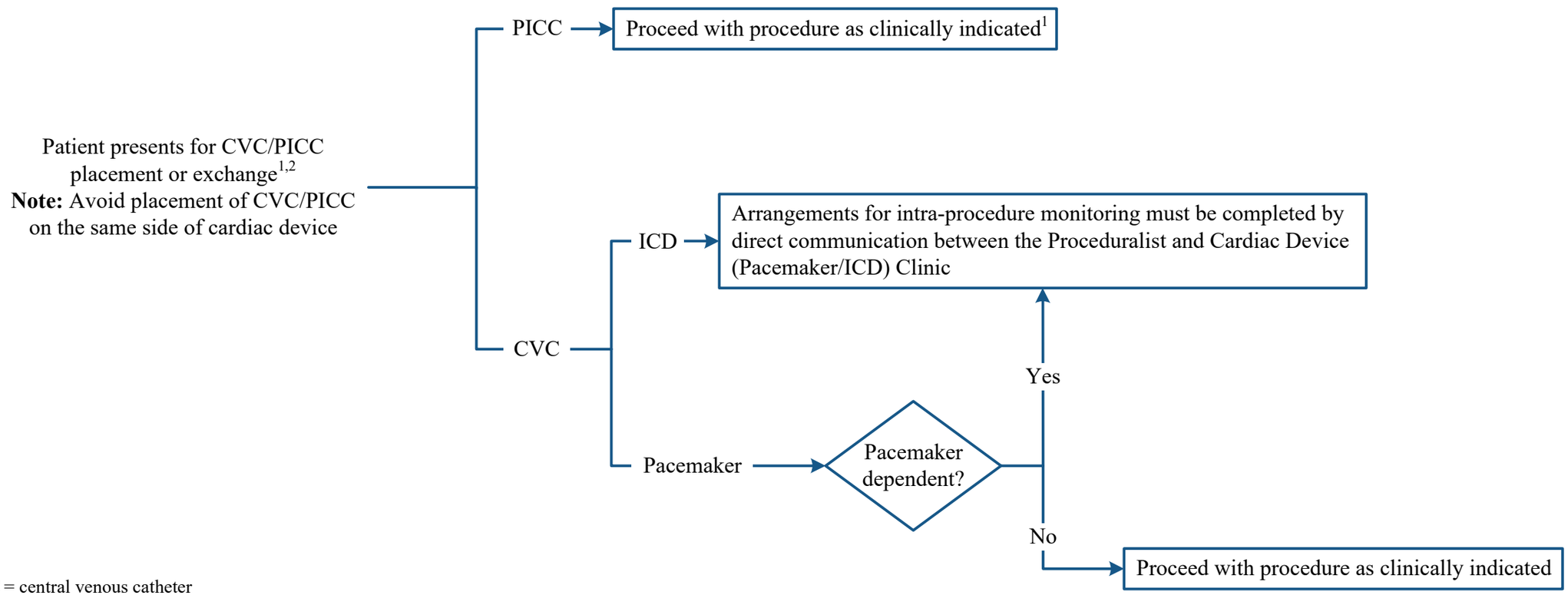
CENTRAL LINE/PERIPHERALLY INSERTED CENTRAL CATHETER (PICC) PLACEMENT



CVC = central venous catheter
PICC = peripherally inserted central catheter

[1] Special circumstance: If CIED was implanted within the prior 3 months, procedure should be performed under fluoroscopy or in the Cardiac Catheterization Lab
[2] For central lines placed in IR, see Page 7

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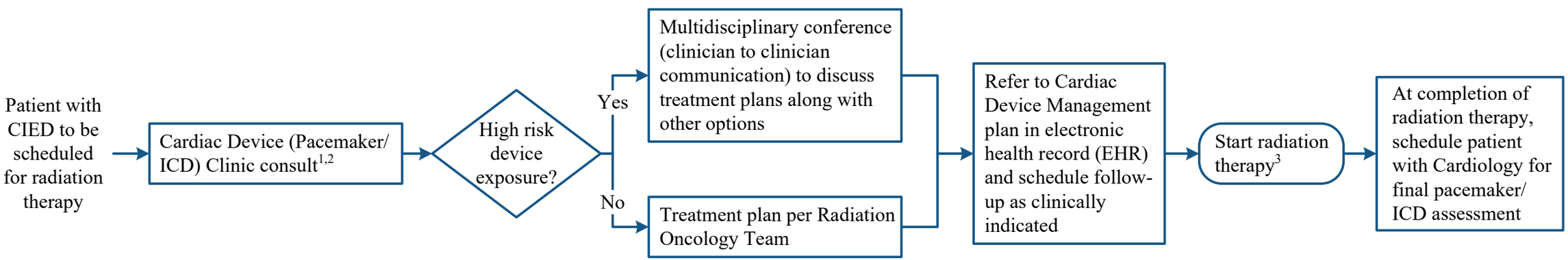
RADIATION THERAPY

PRIOR TO START OF RADIATION THERAPY

POST- RADIATION THERAPY



[1] Radiation dose specification and intended use of neutron producing beams (protons or photons ≥ 10MV) 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 be evaluated in the Cardiac Device (Pacemaker/ICD) Clinic or have a documented plan from a local cardiologist
[3] Start radiation treatment in accordance with Division of Radiation Oncology Electronic Medical Device Clinical Policy

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PRIOR TO SCHEDULING MRI | **MRI** | **PRE-MRI[1]** | **POST-MRI[1]**

Consult to Cardiac Device (Pacemaker/ICD) Clinic noting patient to be scheduled for MRI and has a CIED
or
if prior interrogation within the past 3 months, send results of complete interrogation including underlying rhythm to the Cardiac Device (Pacemaker/ICD) Clinic

- MRI-conditional device → Cardiology to collaborate with Diagnostic Imaging (DI) faculty regarding clinical indication of MRI → MRI approved and scheduled?
  - Yes → • MRI protocoled for implanted devices by DI • Consent patient[2], if not previously obtained → • Monitors applied: ○ Cardiac monitoring ○ Pulse oximetry ○ Blood pressure • Program CIED as indicated[3] → • Post-imaging CIED check • Reprogram device back to original settings → Routine follow-up or as documented in the Cardiac Device Management note in the EHR
  - No → • Cardiac Device (Pacemaker/ICD) Clinic to notify primary team and DI that patient cannot proceed with MRI • DI to recommend alternative imaging study
- MRI-non-conditional device
  - Pacing non-dependent → Cardiology to collaborate with Diagnostic Imaging (DI) faculty regarding clinical indication of MRI
  - Pacing dependent → Cardiac Device (Pacemaker/ICD) Clinic to discuss risks and benefits of MRI with patient[4] → MRI approved?
    - Yes → Cardiology to collaborate with Diagnostic Imaging (DI) faculty regarding clinical indication of MRI
    - No → • Cardiac Device (Pacemaker/ICD) Clinic to notify primary team and DI that patient cannot proceed with MRI • DI to recommend alternative imaging study
  - • Abandoned lead • Epicardial lead → • Cardiac Device (Pacemaker/ICD) Clinic to notify primary team, DI and electrophysiologist that patient cannot proceed with MRI • DI to recommend alternative imaging study

[1] An appropriate, qualified and credentialed clinician to monitor patient during procedure
[2] Patient will need consent for MRI with CIED
[3] Follow Cardiac Device (Pacemaker/ICD) Clinic's recommendations note
[4] Ensure appointment is scheduled for discussion

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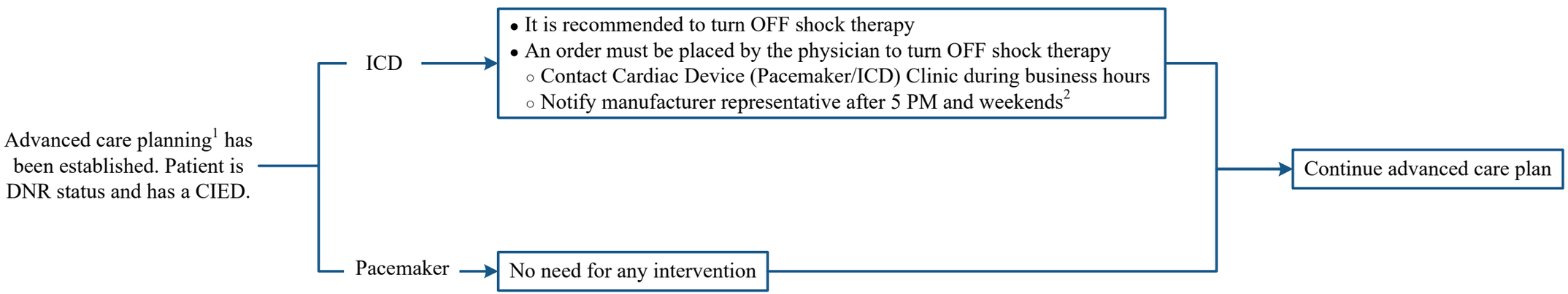
PATIENTS WITH DO NOT RESUSCITATE (DNR) STATUS



[1] The advanced care planning discussion with the patient, or if clinically indicated, Patient Representative should clearly include and be documented 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/Patient Representative has manufacturer's card

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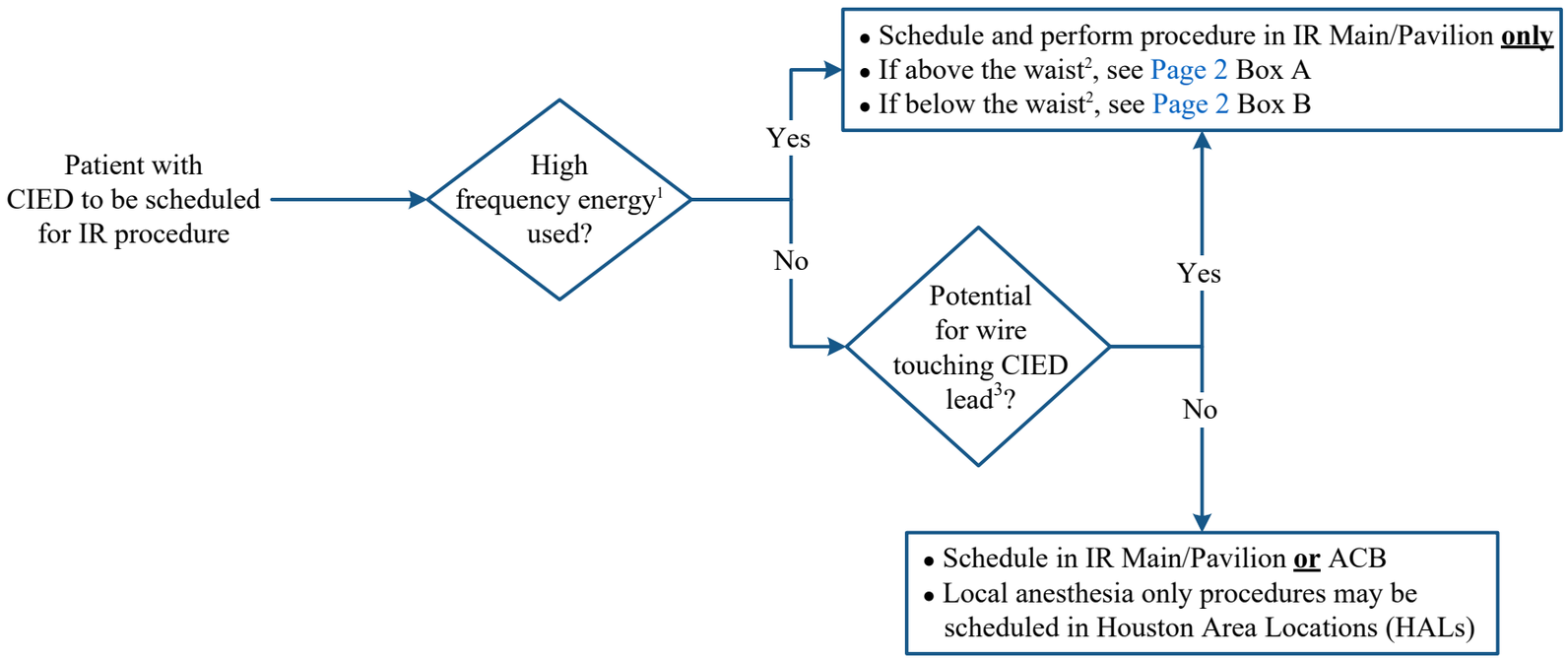
PRIOR TO IR PROCEDURE

IR PROCEDURE



[1] IR Procedures with high frequency energy: includes, but not limited to, microwave ablation, radiofrequency ablation, kyphoplasty or irreversible electroporation (IRE)
[2] Abdominal implants: If surgery between thorax and pelvis, refer to *above* the waist; if outside thorax and pelvis, refer to *below* the waist
[3] IR Procedures with potential for wire touching CIED lead: includes, but not limited to, port placement, central line, inferior vena cava filter placement/retrieval, pulmonary embolism thrombectomy

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

1. Device is checked pre-operative/procedure and found to be working correctly, **and**
2. No programming of device took place peri-operative/procedure, **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

Pacemaker Manufacturer	Most Common Magnet Effect (For ranges listed below, the lower rate indicates a shorter remaining battery life)	Programmable (On-Off)
Biotronik	No sustained asynchronous pacing	Yes
Boston Scientific	Asynchronous pacing at 100 or 90 bpm	Yes
Medtronic	Asynchronous pacing at 85 bpm	No
Sorin	Asynchronous pacing at 85 - 96 bpm	No
St. Jude Medical	Asynchronous pacing at 86 - 100 bpm	Yes

Defibrillator Magnet Application

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

SUGGESTED READINGS

American Society of Anesthesiologists. (2020). Practice advisory for the perioperative management of patients with cardiac implantable electronic devices: Pacemakers and implantable cardioverter–defibrillators 2020: An updated report by the American Society of Anesthesiologists task force on perioperative management of patients with cardiac implantable electronic devices. *Anesthesiology, 132*, 225-252. https://doi.org/10.1097/ALN.0000000000002821

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DEVELOPMENT CREDITS

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