Purpose: To outline the perioperative nursing management of patients who have Cardiac Implantable Electronic Devices (CIEDs), and are scheduled for a surgical procedure.

Background/Supportive Data:
- Addendum A Outpatient CIED Pathway.
- Addendum B Inpatient CIED Pathway.
- Addendum C Emergency CIED Pathway.
- CIEDs are electronic devices that are designed to detect electrical activity from the heart. CIEDs have become very complex, and can perform a number of important functions, including the treatment of bradycardia, heart failure, and life-threatening arrhythmias.
- CIEDs can also detect electrical signals from other sources. In the operating room, these non-cardiac sources of electrical activity are known as Electromagnetic Interference (EMI).
- EMI may be detected by the CIED and cause inappropriate function of the device. CIED malfunctions caused by EMI may be life threatening to patients. Rarely, EMI may damage the CIED, or cause device “reset.”
- It is felt that either a member of the patient’s personal device team, or, in the absence of a member of the patient’s personal device team, a covering cardiologist, is the most appropriate person to provide guidance (in the form of specific orders) for the perioperative management of CIEDs.
- An anesthesia provider must manage all surgical cases involving the care of patients with CIEDs.

Content:
PREOPERATIVE PHASE
- All patients having a CIED should be identified prior to surgery during the Surgery Scheduling/Preadmission process.

- All patients with a CIED having a surgical procedure (with the exception of patients having emergency surgery) should have a copy of the FHS “Surgical Clearance for Cardiac Implantable Electronic Device (CIED)” order set faxed to either 1) a member of their primary device team, or, 2) the FHVA cardiologist on call (after office hours and on weekends).

- One must consider if the procedure and positioning will make the CIED physically inaccessible during surgery. It is critical to communicate to the cardiologist that many patients with Internal Cardiac Defibrillators (ICDs) undergoing procedures in the prone and lateral procedures will require reprogramming of their ICD. Likewise, in patients with pacemakers, it is critical to communicate to the cardiologist that patients who are pacemaker-dependent undergoing procedures in the prone and lateral positions will possibly require preoperative reprogramming of their device to an asynchronous pacing mode.
It is critical to notify the patient’s device cardiologist of situations where the surgical field may involve the skin overlying the CIED, or the procedure will occur within six inches of the CIED generator. This makes temporary magnet placement over the device impossible. In these cases, it will be necessary to reprogram all ICDs. It may also be necessary to reprogram pacemakers in patients who are pacemaker-dependent.

In the “Inpatient CIED Pathway”, the anesthesia provider should obtain the device make and identification number, the device type (can be obtained from the patient’s device card), and a copy of a 12-lead EKG. These will then be faxed with the “Surgical Clearance for Cardiac Implantable Electronic Device (CIED)” order set by the OR charge nurse/House Supervisor.

Completed copies of the FHS “Surgical Clearance for Cardiac Implantable Electronic Device (CIED)” will be placed on the chart by the Preanesthesia nursing staff, or the OR charge nurse (“Inpatient CIED Pathway”). For inpatients, the OR charge nurse/House Supervisor will notify the anesthesia provider when the completed “Surgical Clearance for Cardiac Implantable Electronic Device (CIED)” order set is available for review.

For non-emergency surgery, the primary device cardiologist must have interrogated the CIED within the six months prior to surgery.

The Pre-Admit Clinic RN, the OR charge nurse (see “Inpatient CIED Pathway”), or the PACU/ICU nurse (see “Emergency CIED Pathway”) will notify the device representative if preoperative device reprogramming or postoperative device interrogation is necessary.

Patients who have had an ICD’s anti-tachycardia function reprogrammed to “off” preoperatively must have both continuous EKG monitoring and the immediate availability of defibrillation capability.

Patients who have had their pacemakers reprogrammed to an asynchronous mode preoperatively must have continuous EKG monitoring until reprogrammed.

For emergency cases, please see the “Emergency CIED Pathway.”

**INTRAOPERATIVE PHASE:**

- The patient should be continuously monitored with EKG (to monitor rhythm) and either pulse oximetry or an arterial catheter (to insure perfusion).

- External pacing and defibrillation capability should be immediately available. Defibrillation/pacing pads should be placed on high-risk patients (e.g., patients with history of frequent ICD discharge; patients with minimal underlying heart rhythm).

- The electroscautery dispersion pad should be placed as far from the axis (imaginary line connecting the device generator and the heart) of the CIED as possible. Electroscautery dispersion current should never flow across this axis, if possible.

- A magnet must be immediately available (and located within the anesthetizing site) for any patient with a CIED having a surgical procedure.

- In cases requiring electroscautery, surgeon should use either bipolar electroscautery or harmonic scalpel when feasible.

- Short bursts of electroscautery should be used whenever possible.
POSTOPERATIVE PHASE:

• All patients with a CIED that has been either reprogrammed, or had a magnet applied to the device during surgery will be admitted to a cardiac-monitored site until the device has been reprogrammed by the product representative to preoperative settings (in the case of a device that has been reprogrammed preoperatively), or has been interrogated by the product representative to insure restoration of preoperative settings (in the case that a magnet has been applied to the device).

• All patients being treated with the “Emergency CIED Pathway” must have their device interrogated by a product representative prior to discharge from a cardiac-monitored site.

• The product representative must document restoration of preoperative device settings after reprogramming/interrogation of a device postoperatively. This documentation must include date, time, interrogation strip and name of individual performing reprogramming/interrogation.

• Every CIED that has been reprogrammed preoperatively must be reprogrammed to its preoperative settings postoperatively by a product representative.

• It is only necessary for a device to be interrogated by a product representative postoperatively if 1) a device has had a magnet applied, or 2) the “Emergency CIED Pathway” has been utilized.

References/ Supportive Data:
1. Crossley GH et al. The heart rhythm society expert consensus statement on the perioperative management of patient with implantable defibrillators, pacemakers and arrhythmia monitors: Facilities and patient management. The document was developed as a joint project with the American Society of Anesthesiologists (ASA), and in collaboration with the American College of Cardiology (ACC), the American Heart Association (AHA), and the Society of Thoracic Surgeons (STS). Heart Rhythm 8: 1114-1154, 2011.


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Approved By (May be any one or more of below):
Regional Perioperative Leadership Team
Surgery Scheduler

Phone call from surgeons OR scheduler to FHS OR scheduler

Does Pre-op Risk Screen form indicate that patient has a CIED?

YES

SURGEON’S OFFICE contacts Cardiology –
Obtain clearance or Schedule appointment if necessary

NO

Schedule patient for preadmission appointment (ideally 7 days prior to surgery)

Pre-Admission Clinic

Pacemaker/ICD surgical procedure patient arrives for appointment

RN completes nursing assessment with medical history. Notifies Anesthesia.

RN completes Cardiac Device Pre Admit Information form and fax to Cardiology office.

RN calls pacer clinic at Cardiology office to inform clinic of faxed form

Cardiology office to fax completed Physician Order for Surgical Clearance for CIED Patients

Orders put on patient chart and reviewed by RN

Device needs to be reprogrammed?

YES

RN notifies device rep of scheduled patient

NO

Boston Scientific ICD models H170, H175, H177, H179 or St. Jude ICD (all models)?

YES

No action
Addendum A
Outpatient CIED Pathway

Surgical Admit Unit

Pacemaker or CRT-P

Needs reprogramming? or Surgery position will make device inaccessible?

NO

Hand off to OR circulator and anesthesia

To OR, Have magnet available in OR.

YES

Pacemaker/ICD patient arrives 2 hours prior to surgery/procedure

CAD or CRT-D

Is patient pacemaker dependent? or Needs reprogramming?

NO

Patient placed on cardiac monitor

Device rep to reprogram pacemaker/CRT-P and document in progress notes

To OR

ATTENTION! Magnet cannot be used with Boston Scientific ICD models H170, H175, H177, H179

Follow reprogramming pathway

Patient placed on cardiac monitor

To OR on cardiac monitor with R-2 pads on

NO

Can magnet be used on ICD/CRT-D?

NO

Hand off to OR circulator and anesthesia

To OR

ATTENTION! Magnet cannot be used with Boston Scientific ICD models H170, H175, H177, H179

Follow reprogramming pathway

Patient placed on cardiac monitor

To OR on cardiac monitor with R-2 pads on

YES

Patient placed on cardiac monitor

To OR on cardiac monitor with R-2 pads on

Hand off to OR circulator and anesthesia

To OR

ATTENTION! Magnet cannot be used with Boston Scientific ICD models H170, H175, H177, H179

Follow reprogramming pathway

Patient placed on cardiac monitor

To OR on cardiac monitor with R-2 pads on

Hand off to OR circulator and anesthesia

To OR

ATTENTION! Magnet cannot be used with Boston Scientific ICD models H170, H175, H177, H179

Follow reprogramming pathway

Patient placed on cardiac monitor

To OR on cardiac monitor with R-2 pads on

Hand off to OR circulator and anesthesia

To OR
Addendum A
Outpatient CIED Pathway

PACU/Phase I

Pacemaker or CRT-P → CIED patient admitted from OR to Phase I → ICD or CRT-D

Pacemaker was reprogrammed or magnet applied

NO

No action

YES

Was a magnet applied to device?

ICD/CRT-D has been reprogrammed

NO

Device rep reprograms device and document in progress note

Notify device rep patient in Phase I for reprogramming

Notify device rep patient in Phase I for reprogramming

YES

Rep to interrogate device

Rep to interrogate device

Abnormal values and/or different from Pre-op settings

YES

Contact anesthesia immediately

Notify cardiolist

NO

Device rep reprograms device and document in progress note

Hand off to Phase II RN or unit RN

Notify device rep patient in Phase I for reprogramming
Addendum B
Inpatient CIED Pathway

OR Scheduler asks if patient has a CIED

Yes

OR Scheduler notifies OR Charge Nurse

OR Charge Nurse notifies Anesthesia Coordinator or weekend anesthesia equivalent

Weekday

Attempt to have anesthesia provider evaluate the patient by 4 PM if possible

Is this emergency surgery?

Yes

Follow Emergency CIED Protocol

No

Is the patient's device cardiology office open?

Yes

OR Charge RN/ House Supervisor to fax Cardiac Device Order Set to patient's primary device Cardiologist. Primary device Cardiologist to fax completed Cardiac Device Clearance Order Set to front desk.

OR Charge RN/ House Supervisor notifies Anesthesia provider when completed Cardiac Device Order Set is available to be reviewed.

Does product rep need to be notified?

Yes

OR Charge RN/ House Supervisor contacts product representative

No

Proceed with surgery as per Cardiologist’s orders

Weekend

Is this emergency surgery?

Yes

Follow Emergency CIED Protocol

No

Contact FHVA Cardiologist on-call

OR Charge RN/ House Supervisor to fax Cardiac Device Order Set to FHVA Cardiologist on-call. FHVA Cardiologist on-call to fax completed Cardiac Device Clearance Order Set to front desk.

Does product rep need to be notified?

Yes

OR Charge RN/ House Supervisor contacts product representative

No

Proceed with surgery as per Cardiologist’s orders

ATTEMPT TO OBTAIN THE FOLLOWING INFORMATION PRIOR TO FAXING THE ORDER SET:
1. Device make and identification number.
2. Device type.
3. 12-lead ECG.
Addendum C
Emergency CIED Pathway

Evaluate medical record or interview patient

Able to determine type of device

Yes

No

Examine patient device card and contact company

Able to determine type of device

Yes

No

Examine CXR

Defibrillator Coil(s) visible on CXR?

Yes

No

Device is ICD or CRT-D

Obtain 12-Lead EKG

Yes (patient is likely pacemaker dependent)

Pacemaker spikes precede most or all P-waves or QRS complexes?

Yes

No (patient is unlikely pacemaker dependent)

Pacemaker or CRT-Pacemaker

1) Use short electrocautery bursts
2) Magnet over device for procedures above umbilicus
3) Magnet immediately available for procedures below umbilicus
4) Monitor with either pulse oximetry or arterial line
5) Transcutaneous pacing and defibrillation pads placed
6) Device interrogation prior to discharge from monitored unit

ICD or CRT-Defibrillator

1) Place magnet over device and use short electrocautery bursts
2) Monitor patient with pulse oximetry or arterial line
3) Transcutaneous pacing and defibrillation pads placed
4) Device interrogation prior to discharge from monitored unit

Contact Member of CIED Team
1) If time permits, contact patient’s primary device cardiologist or product rep to provide recommendations for CIED management.
2) Contact product representative to assist in interrogation of device (under direction of physician knowledgeable in CIED function)
3) Perform or review postoperative device interrogation

Pacemaker or CRT-Pacemaker

1) Magnet immediately available
2) Monitor patient with pulse oximetry or arterial line
3) Transcutaneous pacing and defibrillation pads placed
4) Device interrogation prior to discharge from monitored unit

ICD or CRT-Defibrillator

1) Place magnet over device and use short electrocautery bursts
2) Monitor patient with pulse oximetry or arterial line
3) Transcutaneous pacing and defibrillation pads placed
4) Device interrogation prior to discharge from monitored unit