

# Pacemakers and Defibrillators (Cardiac Rhythm Management Devices)

Perioperative management of patients with cardiac rhythm management devices mandates consideration of the type and function of the device, level of patient dependence on the device as well as the probability of electromagnetic interference in the perioperative period.

Perioperative goals include monitoring the device for proper operation, preventing device malfunction and emergency treatment of device malfunction or life threatening dysrhythmias.

Generic Pacemaker Code (North American Society of Pacing and Electrophysiology)

Position I: Pacing chamber	Position II: sensing chamber	Position III: Response to sensing	Position IV: Programmability	Position V: multisite pacing
O = none	O = none	O = none	O = none	O = none
A = atrium	A = atrium	I = inhibited	R = rate modulation	A = atrium
V = ventricle	V = ventricle	T = triggered		V = ventricle
D = dual	D = dual	D = (T + I)		D = dual

Generic Defibrillator Code

Position I: shock chamber	Position II: antitachycardia pacing chamber	Position III: tachycardia detection	Position IV: antibradycardia pacing chambers
O = none	O = none	E = electrogram	O = none
A = atrium	A = atrium	H = hemodynamic	A = atrium
V = ventricle	V = ventricle		V = ventricle
D = dual	D = dual		D = dual

## ANESTHETIC CONSIDERATIONS:

- Preoperative device interrogation (type and mode of pacemaker/ICD, proper function and battery life)
- Review of patient's indication for CRMD and underlying rhythm abnormality (patient:CRMD interaction)
- Availability of peripheral pulse monitoring (pulse oximetry vs art line)
- Establishing likelihood of electromagnetic interference in perioperative period
  - Short bursts of cautery
  - Surgical site proximity to pacemaker and pulse generator
  - Bipolar cautery
  - Placement of cautery pad away from pulse generator
  - If MRI or ECT – contact pacemaker manufacturer, cardiologist or pacemaker clinic for compatibility
  - Radiotherapy, radiofrequency catheter ablation, lithotripsy – focus beam away from pulse generator
- Minimizing electromagnetic interference in perioperative period
- Recognition and treatment of anesthetic related alterations in CRMD function and/or CRMD:patient interaction
- Availability of emergency pacing and cardioversion/defibrillation devices as well as magnet
- May have fixed cardiac output due to fixed heart rate

## ANESTHETIC GOALS:

- Minimizing hemodynamic derangement from CRMD and EMI interference
- Anticipation of dysrhythmias and available resources on hand to assess and treat rapidly
- Ensuring pre and postoperative integrity of CRMD

## HISTORY

- Does the patient have a CRMD?
- What type of CRMD? (pacemaker, AICD)
- Is the patient CRMD dependent?
- How well does the CRMD function? (consult pacemaker clinic for preoperative interrogation)
- What procedure is the patient booked for?
- What is the likelihood of electromagnetic interference?
- What is the CRMD response to electromagnetic interference?

## PHYSICAL

- focussed cardiorespiratory exam

## INVESTIGATIONS

- pacemaker interrogation
- cxr to determine lead placement
- ecg

## OPTIMIZATION

- consider reprogramming to asynchronous mode
- suspend rate adaptive functions
- suspend antitachyarrhythmia functions in icd
- use bipolar cautery or ultrasonic scalpel
- ensure availability of crash cart and external pacing and defibrillation devices

## ANESTHETIC OPTIONS

- nothing
- regional
- neuraxial
- general anesthetic

## ANESTHETIC SETUP

- standard CAS monitors +/- 5 lead ECG
- standard emergency medications
- crash cart, external pacing devices, defibrillator
- magnet for reprogramming pacemaker to asynchronous mode
- bipolar cautery

#### MANAGEMENT OF ANESTHESIA

- reduce risk of electromagnetic interference (see above)
- anticipation of EMI and associated arrhythmias

#### DISPOSITION & MONITORING

- ANALGESIA
- OXYGENATION
- POSITIONING
- MONITORING:
  - Consult pacemaker clinic for postoperative interrogation
  - Backup pacing and cardioversion/defibrillation capacity close by
  - Restoration of baseline CRMD settings

#### COMPLICATIONS

- arrhythmia requiring cardioversion or defibrillation
  - minimize current flow through pulse generator or leads
  - pads/paddles as far as possible from pulse generator
  - pads/paddles perpendicular to major axis pulse generators/leads
  - try pads/paddles in AP orientation
- pacemaker malfunction requiring external pacing
  - bradycardia
    - ischemia

#### REFERENCES

- Practice Advisory for perioperative management of patients with cardiac rhythm management devices: pacemakers and implantable cardioverter-defibrillators. A report by the American Society of Anesthesiologists Task Force on Perioperative Management of Patients with Cardiac Rhythm Management Devices. *Anesthesiology* 2005; 103; 186
- Barash *Clinical Anesthesia* page 1586-1587