

INTERNAL ELECTRONIC DEVICES – IEDs

Cardiac - CIEDs		Indication
Permanent Pacemaker	PPM	Bradyarrhythmia or AV node ablation
Leadless Pacemaker	TPS-Micra	Bradyarrhythmia or AV node ablation
(Automatic) Internal Cardiac Defibrillator	AICD or ICD	Ventricular arrhythmia history or CMP prophylaxis
Leadless Subcutaneous Cardiac Defibrillator	S-ICD	Ventricular arrhythmia history or CMP prophylaxis
Cardiac Resynchronization Therapy	CRT-P	Biventricular pacing to improve EF in HF
Cardiac Resynchronization Therapy with Internal Defib	CRT-ID	Same as above, plus automatic antiarrhythmic function
Internal Loop Recorder	ILS	Arrhythmia recording device

Non-cardiac - NCIEDs		Indication
Deep Brain (<i>Activa</i>)	DBS	Parkinson's and other movement disorders, epilepsy, psychological disorders, chronic pain
Spinal Cord	SCS	Chronic pain
Intrathecal Pumps		Chronic pain, spasticity
Vagal Nerve (<i>Aspire</i>)	VNS	Epilepsy, migraine, depression
Hypoglossal Nerve (<i>Inspire</i>)		OSA
Phrenic Nerve	PhNS	Impaired respiratory drive (e.g. high cervical injury)
Sacral Nerve (<i>Interstim</i>)	SNS	Incontinence
Gastric Nerve (<i>Enterra</i>)		Gastroparesis
Retinal Nerve (<i>Argus</i>)		Retinitis pigmentosa

EXPOSURE TO INTRA-OP ENERGIES MAY CAUSE:

- **EMI** (electromagnetic interference) – intra-op device suppression or activation requiring device shut off or safe mode
- **Generator alteration** - reprogramming or failure from energy exposures listed below. Any exposure requires postop interrogation
- **Diathermic injury** - thermal injury to patient tissue, electrodes or generator. Diathermy is almost always contraindicated in presence of an IED. Thermal damage can occur whether device is on or off

	EMI	Generator Alteration	Diathermy
Unipolar electrocautery	✓	✓	
Unipolar Ligasure	✓	✓	
ECT		✓	
External cardioversion/defibrillation/pacing		✓	
ESWL		✓	
Magnet placement		✓	
Spinal monitoring – Sensory (SSEP) ± evoked potentials (EP)		✓	
Spinal monitoring – Motor (MEP)		✓	✓
Radiofrequency ablation (RFA)	✓	✓	✓
Microwave ablation (MWA)		✓	✓
Ultrasonic devices (Phacoemulsification, Harmonic scalpel, Cavitron, CUSA, Autosonix, Sonosurg, etc.)			+/-

IED - GENERAL MANAGEMENT

- Obtain device type and manufacturer
- Obtain date of last device check
- Obtain contact info for the product rep and physician overseeing management
- Patients with CIEDs having non-minor surgery require cardiology consult if no device check within 12 months
- Cardiac surgery: CIEDs should be shut off pre-op
- Patients with DBS or VNS require consult from overseeing physician
- Patients with PhNS or Argus should be done at tertiary center
- Does the patient have a controller?
- Does the device respond to a magnet?
- **Never have the device generator or leads between the surgical site and the dispersion pad**
- **Use bipolar cautery whenever possible – bipolar cautery is compatible with all devices**
- **Arrange for post-op interrogation of device if there was exposure to an energy**

CONT'D

IED - SPECIFIC MANAGEMENT

	PPM CRT	(A)ICD CRT-ID	Micra Pacer	S-ICD	SCS	Interstim	Inspire	DBS	VNS
Unipolar Cautery Contraindicated	No	No	No	No	No	No	Preferably avoid for cephalad procedures – see below	Yes, for cephalad procedures	Yes, for cephalad procedures
Device Management	Magnet only if EMI pacer inhibition occurs	Magnet for cephalad procedures if EMI possible. Consider placing defib pads	Not responsive to magnet. Rep must turn off if EMI is a concern	Magnet for all procedures if EMI possible	Preferably turned off. No epidural anesthesia. Spinal ok if below the level of SCS	Preferably turned off. No epidural anesthesia, but spinal is ok	Keep off until fully recovered from anesthesia	Must never be turned off. Avoid brachial plexus blocks	Must be turned off. Avoid brachial plexus blocks
Diathermy Contraindicated	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Ultrasonic devices contraindicated	No	No	No	No	No	No	No	Yes	Yes
ECT contraindicated	No	No, but should be turned off	No	No, but should be turned off	No	No	Yes	Yes	Yes

Notes:

- Cephalad procedures include surgery above umbilicus, EGD, ERCP
- Can still use unipolar cautery with Inspire if stay further than 6” from generator and leads
- ILS does not require any special considerations

