# Perioperative management of patient with pacemaker undergoing non cardiac surgery

## Essay

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## By

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## List of Abbreviations

**4-AP** : 4-aminopyridin

**ACC**: American College of Cardiology

**ACLS**: Advanced Cardiac Life Support

**AF** : Atrial fibrillation

**AHA** : American Heart Association

**ANS** : Autonomic nervous system

**APD** : Action Potential Duration

**ARCO**: Atlantic Richfield Company

**A-V** : Atrioventricular

**AVN** : Atrioventricular node

**BPEG**: British Pacing and Electrophysiology Group

**bpm:** : beat per minute

Ca<sup>2+</sup> : Calcium

**cAMP** : Cyclic Adenosine Monophosphate

**CIED** : Cardiovascular implantable electronic

devices

<u>Cl'</u> : Chloride

**CRMD**: Cardiac Rhythm Management Devices

**CRT** : Cardiac resynchronization therapy

**DAD** : Delayed afterdepolarization

**DC** : Direct current

**EAD** : Early afterdepolarization

#### E List of Abbreviations &

**ECG**: Electrocardiogram

**ECT** : electroconvulsive therapy

**ELT** : Endless-loop tachycardia

**EMGs**: Electromyelograms

**EMI** : Electromagnetic Interference

**ERI** : elective replacement indicator

**ESWL** : Extracorporeal shock wave lithotripsy

**GDMT** : Guideline-directed medical therapy

**HB** : Bundle of His

**HF**: Heart failure

**HOCM**: Hyperobstructive cardiomyopathy

**ICDs** : Intensified follow-up required

**IFI** : Intrinsic heart rate

**IHR** : Inferior vena cava

**IVC** : Potassium

**K**<sup>+</sup> : Kilogram

**Kg**: Left atrium

**LA** : Left bundle branch

**LBB**: Left bundle branch block

**LBBB** : Left flank

**LF** : Left ventricle

LV : Left ventricular ejection fraction

**LVEF** : Left ventricular free wall

**LVW** : Maximum

#### E List of Abbreviations &

: Intensified follow-up required

**Mg** : Milligram

**MI** : Myocardial infarction

min : Minute

**Mm**: Millimeter

mmol/L : Millimole/ liter

**MRI** : Magnetic resonance imaging

**mV** : Millivolt

**MV**: Minute ventilation

<u>Na</u><sup>+</sup> : Sodium

**NASPE**: North American Society of Pacing and

Electrophysiology

**NYHA**: New York Heart Association

P : Posteroinferior fascicle of the left bundle

**PA** : Pulmonary artery

**PF** : Purkinje fiber

**PMT**: PACEMAKER-mediated tachycardia

**RA** : Right atrium

**RBB** : Right bundle branc

**RBBB** : Right bundle branc block

**RCA**: Right coronary artery

**RF** : Radio frequency

**RFA**: Radiofrequency ablation

**RV** : Right ventricle

#### 🕏 List of Abbreviations 🗷

**SA node** : Sinoatrial node

sec : Second

**SSS** : Sick sinus syndrome

**SVC** : Superior vena cava

**SVT** : Supraventricular tachycardia

**TENS**: Transcutaneous electrical nerve stimulation

**TUNA**: Transurethral needle ablation

**TURP**: Transurethral resection of the prostate

**USA** : United States of America

**VA** : Ventricloarterial

**VF** : ventricular fibrillation

**VT** : ventricular tachycardia

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#### Introduction

A pacemaker (or artificial pacemaker, so as not to be confused with the heart's natural pacemaker) is a medical device that uses electrical impulses, delivered by electrodes contracting the heart muscles, to regulate the beating of the heart. The primary purpose of a pacemaker is to maintain an adequate heart rate, either because the heart's natural pacemaker is not fast enough, or there is a block in the heart's electrical conduction system. Modern pacemakers are externally programmable and allow the selection of the optimum pacing modes for individual patients. Some combine a pacemaker and defibrillator in a single implantable device. Others have multiple electrodes stimulating differing positions within the heart to improve synchronization of the ventricles of the heart (McWilliam, 2007).

The first pacemaker was invented by electrical engineer John Hopps and Drs. Bigelow and John Callaghan at the Banting William Institute, University of Toronto, was developed in 1950 (*John*, 2010). In 1958, Senning and Elmqvist performed the first implantation of an electronic pacemaker (*Si Larrson*, 2003). Since then, pacemaker technology has improved enormously to include inhibition by spontaneous beats, rate responsiveness to exercise, dual-chamber pacing, and improvement in adaptability such as hysteresis. Pacemaker software has benefitted from advances in microprocessor technology, and the devices are now controlled by embedded microcomputers. Once reserved for the treatment of intractable recurrent bradycardia and blocks, pacemakers are now placed prophylactically to prevent syncope and bradycardia in at-risk

patients (*Mirowski*, 1980). Nowdays pacemakers are being used with greater frequency that an estimated 4 million people worldwide live with a pacemaker. Annually, 200 000 pacemakers are implanted in the United States. As roughly 10% of the population undergo a surgical procedure each year (*Wood and Ellenbogen*, 2002).

The effect of surgery on pacemaker is unclear. The most common perioperative problem is the presence of major electromagnetic interference, in particular the use of the electrical cautery (*Domino*, 1983).

Pacemaker is constantly increasing in complexity and management strategies so the perioperative period for patients with pacemakers poses unique challenges to ensure a high degree of patient safety and identifies the interactions that may occur during anesthesia and surgery to help prevent device-related complications (*Hayes and Zipes*, 2001).

# Aim of the Work

The aim of this work is to facilitate safe and effective perioperative management of the patient with a pacemaker and reduce the incidence of adverse outcomes.