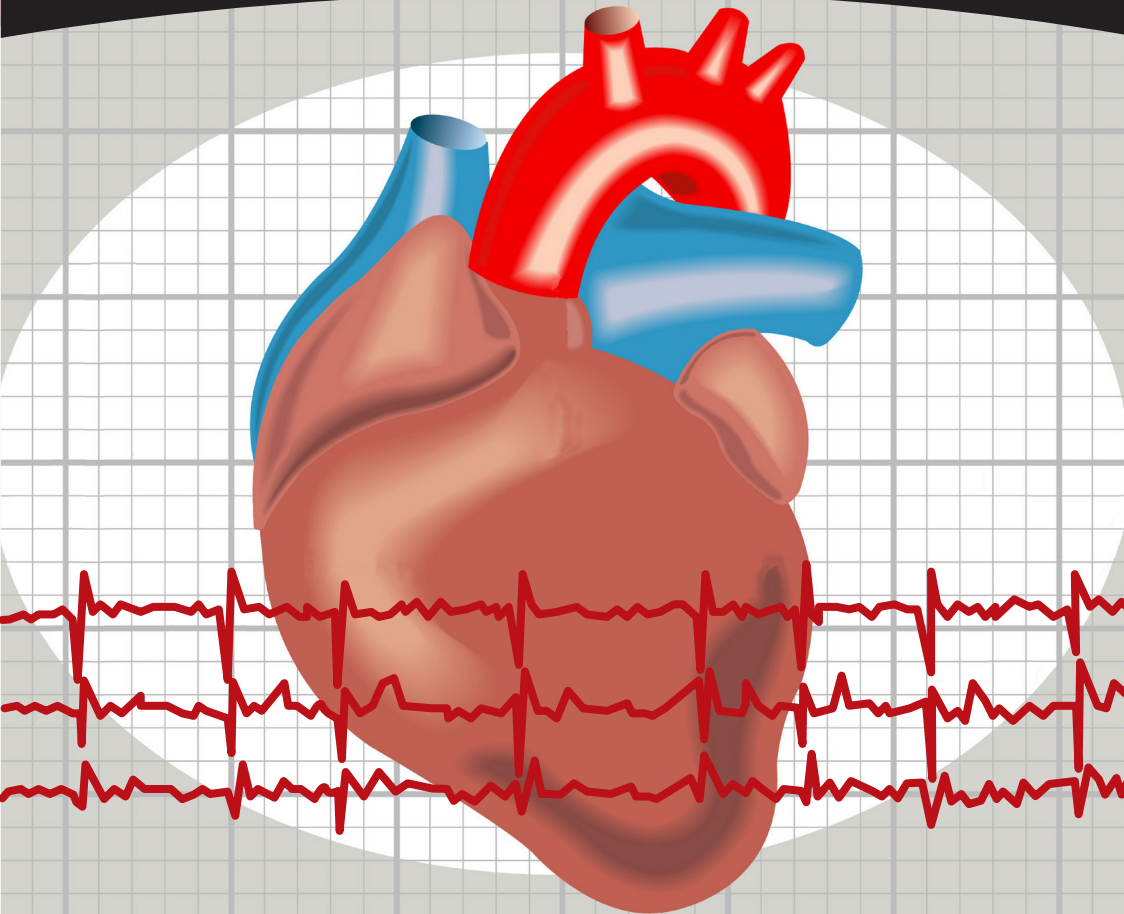


DEPARTMENT OF CARDIOLOGY

# Pacemaker Implantation



National Heart  
Centre Singapore  
SingHealth

## **Introduction**

Welcome to the National Heart Centre Singapore (NHCS).

NHCS specializes in the treatment for abnormal heart rhythm (arrhythmia). We have a team comprising electrophysiologists, cardiologists, cardiac surgeons, medical technologists, physiotherapists and specially trained nurses to offer comprehensive treatment and post-procedure care for patients with arrhythmia.

Pacemaker implantation is a common procedure carried out at NHCS to treat patients with abnormally slow heart rate. This handbook aims to address the questions you have pertaining to pacemaker and the necessary care and precautions for it after the implantation.

We hope you find this handbook useful and if you require more information or clarification, please approach any of our medical technologists or nursing staff for assistance.

Yours sincerely

Medical Director  
National Heart Centre Singapore

## TABLE OF CONTENTS

### **CHAPTER 1: WHAT IS A PACEMAKER?**

What is a pacemaker?	4
Why do I need a pacemaker?	4
What are the parts of a pacemaker?	5

### **CHAPTER 2: AFTER PACEMAKER IMPLANTATION**

What kind of follow-up care do I expect after my device is implanted?	6
What kind of precautions should I take after pacemaker implantation?	7

### **CHAPTER 3: PACEMAKER FOLLOW-UP**

How do I monitor my pacemaker?	7
How often should my device be checked?	7
What is involved in the follow-up visit?	8
Frequently asked questions asked during follow-up:	
1. How long does the battery last?	8
2. How is the battery replaced?	9
3. Will my pacemaker fail?	9

### **CHAPTER 4: PACEMAKER AND MEDICAL PROCEDURES**

Are medical procedures safe?	9
Can I undergo Magnetic Resonance Imaging (MRI)?	9

### **CHAPTER 5: PACEMAKER AND DAILY LIFE**

What are the lifestyle considerations with a pacemaker?	11
Should I carry my identification card (ID) with me all the time?	11
What is electromagnetic interference (EMI) and should I be concerned with EMI at my workplace?	12
Which devices interfere with a pacemaker?	12
Can I use a cellular phone?	13

Can I travel with my pacemaker? What precautions should I take?	13
What should my family do if I passed away?	14
Pacemaker interference Quick Look-up table	15

## **ABOUT NATIONAL HEART CENTRE SINGAPORE**

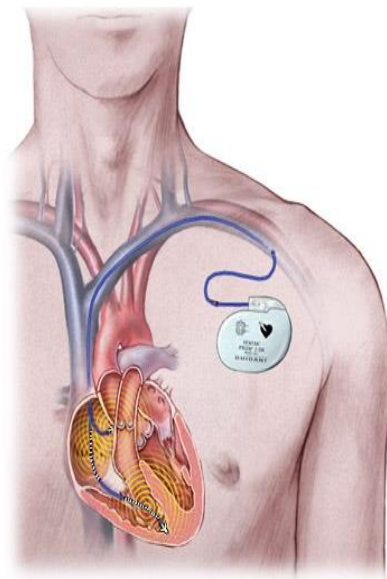
---

About National Heart Centre Singapore	19
---------------------------------------	----

## **Chapter 1: What is a pacemaker?**

### **What is a pacemaker?**

It is an electronic device that is implanted in the heart to regulate the heart's rhythm. The device monitors the heart rate and rhythm, and provides electrical stimulation when the heart does not beat or beats too slowly.



### **Why do I need a pacemaker?**

Your doctor has prescribed a pacemaker to relieve your symptoms of bradycardia (abnormally slow heart rate) such as dizziness, extreme fatigue, shortness of breath or fainting spells.

## Atrial fibrillation with long pause



## What are the parts of a pacemaker?

The pacemaker consists of two parts:

- Pulse Generator
- Pacing lead(s)

**Pulse Generator** – It is a small box about 5cm wide and weighs around 120g. There are some which are smaller and lighter. The pulse generator contains a lithium battery that supplies the electrical energy and circuitry that transforms the energy into small electrical impulses, which are delivered to the heart.

**Pacing lead** – The pacing lead is an insulated wire with an electrode on its tip that carries the electrical impulses to the heart and collects information on your heart's natural activity back to the pulse generator. One end of the lead is connected to the pulse generator and the other end is inserted through a vein and placed in the right or left side of the heart.



*Photo courtesy from Medtronic Inc.*

## **Chapter 2: After pacemaker implantation**

### **What kind of follow-up care do I expect after my device is implanted?**

You will be required to come regularly for post-implant checkups whereby the medical technologist will check your device with a programmer. During the routine checkups, the medical technologist will:

- Review any heart rhythm events that may have occurred since your last checkup
- Ensure that your device functions are set to levels appropriate for your needs and if necessary, make any “fine tuning” adjustments
- Check the status of the battery that powers your device
- Answer any questions that you may have



*Photo courtesy from Medtronic Inc.*

### **What kind of precautions should I take after pacemaker implantation?**

- Avoid lifting heavy objects, doing contact sports or vigorous exercise for several weeks after the pacemaker implantation.
- Do not swing or lift your arm too high on the side where the pacemaker is implanted.
- Ensure that the wound is clean and dry. Do not be alarmed if a hard ridge forms where the incision was closed. It will fade away as the wound heals. If there is any redness or swelling, inform your doctor.

### **Chapter 3: Pacemaker follow-up**

#### **How do I monitor my pacemaker?**

You should know the lowest rate at which your pacemaker has been set and take your resting pulse rate for a full minute every day.

In the event your pulse rate is 5 or more beats below your programmed lowest rate, contact your physician as soon as possible.

#### **How often should my device be checked?**

Your doctor determines the frequency of your follow-up visits. This depends on the type of device you have and your medical condition.

The frequency of monitoring will change as your device is getting closer to the expected replacement date.

- First follow-up: within 2 weeks after discharge from hospital
- Second follow-up: 6-12 weeks after first follow-up
- At least one or twice a year subsequently



## What is involved in the follow-up visit?

The medical technologist uses the programmer to perform the pacemaker check. The programmer is a small computer that retrieves information stored in the pacemaker. This allows the technologist and doctor to evaluate the pacemaker performance and, if necessary make changes to the settings non-invasively.



### Frequently asked question during follow-up:

#### 1. How long does the battery last?

The battery life of your pacemaker depends on how often it is used and the power output. The average battery life is 7-10 years depending on the type and model of the pacemaker.

## **2. How is the battery replaced?**

Your battery is sealed within the pulse generator, or pacemaker. You may need to undergo a minor surgery similar to previous implant to change your pacemaker. The surgery for replacing a pacemaker is typically easier and quicker than the initial implant. A new incision is usually made over the old one and the old pacemaker is removed. A new pacemaker is implanted in its place

## **3. Will my pacemaker fail?**

Pacemaker technology improves every day. Unlike the old pacemakers, the devices manufactured today are reliable and technical problems rarely occur.

## **Chapter 4: Pacemaker and medical procedures**

### **Are medical procedures safe?**

It is always good to tell the medical personnel that you have a pacemaker. With proper precautionary measures, most medical procedures and dental procedures are unlikely to interfere with your pacemaker except for Magnetic Resonance Imaging (MRI). Pacemaker can be reprogrammed before the procedure to lower the chance of interference or damage to the pacemaker's function.

### **Can I undergo Magnetic Resonance Imaging (MRI)?**

You are able to undergo MRI only if your pacemakers are designed to be MRI conditional. Prior to the MRI scan, the medical technologist will perform a pacemaker check and programmed the pacemaker to be in MRI safe mode. After the MRI scan is done, the medical technologist will

perform another pacemaker check and turn off the MRI safe mode, restoring its original parameters setting.

You will know if your pacemaker is MRI conditional through your pacemaker identification card. There will be a MRI safe logo on the pacemaker identification card. Alternatively, during the device check, medical technologists are able to confirm if your pacemaker is designed to be MRI conditional.



MRI safe logo


ST. JUDE MEDICAL		Cardiac Pacemaker Patient Identification Card	
PATIENT:	IC:		
 4	MODEL NO.	SERIAL NO.	IMPLANT DATE:
FIG:			
RA-LEAD:			
RV-LEAD:			
BATTERY VOLTAGE	BOL:	ERI:	
PHYSICIAN:			
HOSPITAL:		TEL:	

Photo courtesy from St Jude Medical.

## Chapter 5: Pacemaker and daily life



### What are the lifestyle considerations with a pacemaker?

You may resume your normal activities but those who intend to take up strenuous sports should speak to your physician so that a healthy exercise program can be designed for you.



### Should I carry my pacemaker identification card (ID) with me all the time?

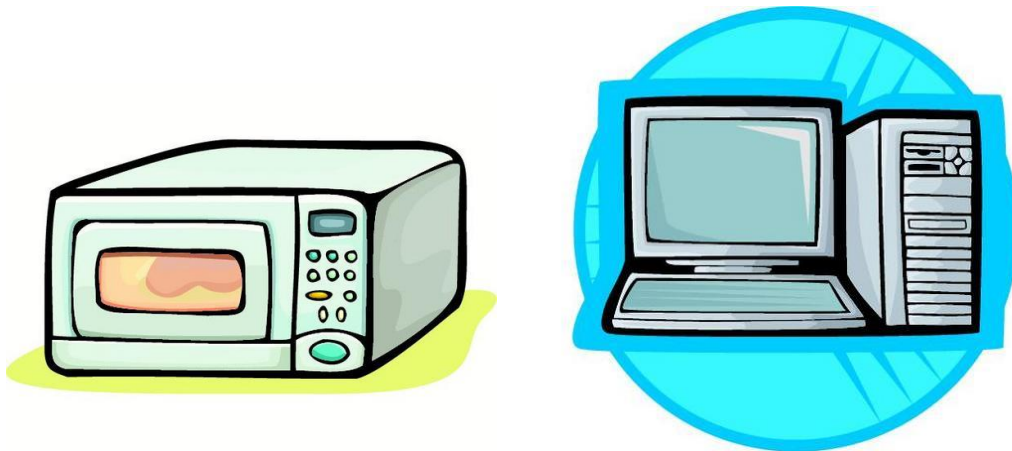
Yes. Your ID card contains pertinent information about yourself, your pacemaker and your physician and this is made available quickly when urgent medical care is needed. If you lose this card, you can ask for a replacement.

ST. JUDE MEDICAL		Cardiac Pacemaker Patient Identification Card	
PATIENT:		IC:	
  4	MODEL NO.	SERIAL NO.	IMPLANT DATE
P/G:			
RA-LEAD:			
RV-LEAD:			
BATTERY VOLTAGE	BOL:	ERI:	
PHYSICIAN:		TEL:	
HOSPITAL:			

*Photo courtesy from St Jude Medical.*

## **What is electromagnetic interference (EMI) and should I be concerned with EMI at my workplace?**

Things that use electricity and magnets have electromagnetic fields around them and may cause Electromagnetic Interference (EMI). These fields are usually weak and will not affect your pacemaker. However, strong electromagnetic fields have the potential to alter the function of your pacemaker. A strong magnetic field can “blind” the pacemaker to send pacing beats when your heart does not need it. If you move away from the source of EMI, your pacemaker will return to normal. Most office and shop equipment are unlikely to interfere with your pacemaker.



### **Which devices interfere with a pacemaker?**

- Airport screening devices are unlikely to affect your pacemaker, but they may detect the metal housing of your device and set off the security alarm. You can request for a hand search.
- Do not linger near the anti-theft system in stores and libraries.
- Properly maintained electrical household items are unlikely to interfere with your pacemaker.

## Can I use a cellular phone?

Cellular phones are unlikely to interfere with your pacemaker if proper precautions are followed:

- A distance of at least 6 inches should be maintained between a cellular phone and your pacemaker.
- When using a cellular phone, you should hold it to the ear opposite the side of the body in which the pacemaker is implanted.
- When the phone is turned on, it should not be carried in a shirt pocket on the same side as the pacemaker.



## Can I travel with my pacemaker? What precautions should I take?

Most people with pacemakers can travel freely unless they are restricted by their underlying medical condition or other unrelated conditions.



## **What should my family do if I passed away at home?**

Prior to cremation, the pacemaker has to be removed from the deceased as lithium batteries will explode when heated under high temperatures during cremation.

In the event of demise at home, the family member will have to call the General Practitioner/ Ambulance to certified death and removal of the pacemaker. Notification of Police is to be made by family member. The pulse generator needs to be completely removed and to return to NHCS Cardiac Clinic during operating hours.

**Pacemaker Interference Quick Look-up Table:**  
**Daily Environment, Medical Equipment & Procedures**

	Safe from Interference	Possible Interference	Interference
<b>Industrial Equipments</b>			
Arc welding equipment			Avoid
Snowblower		Precautions	
Steel furnaces			Avoid
Car engine repair		Precautions	
Saws (Chain, gas powered)			Avoid
Saws (Chain, electrical, radial arm)		Precautions	
Drills		Precautions	
Dryer for clothes	Safe		
Transmission lines for electrical power			Avoid
Electric knives	Safe		
Electric screwdrivers	Safe		
Induction heaters for industry			Avoid
Induction stove	Safe		
Industrial Equipment			Avoid
Industrial magnets			Avoid
Lawn mower		Precautions	
Leaf blower		Precautions	



	<b>Safe from Interference</b>	<b>Possible Interference</b>	<b>Interference</b>
Power plants (Public areas)	Safe		
Broadcasting towers for radio & TV (Public)	Safe		
Broadcasting towers for radio & TV (Restricted)			Avoid
<b>Daily Equipments</b>			
Massagers (Chair, Magnetic)		Precautions	
Electrotherapy massage			Avoid
Magnetic clasps on badges	Safe		
Magnetic pain therapy products (Back supports, bracelets, etc.)	Safe		
Electric blankets	Safe		
Electric can opener	Safe		
Electric shaver	Safe		
Electric stove	Safe		
Microwave oven	Safe		
Modems	Safe		
Computers	Safe		
Copy machines	Safe		
Electric typewriters	Safe		
FAX machines	Safe		
Pagers	Safe		

	<b>Safe from Interference</b>	<b>Possible Interference</b>	<b>Interference</b>
Hair dryer	Safe		
Printers	Safe		
Radio antenna		Precautions	
Radio with large speaker	Safe		
Video cassette recorder (VCR)	Safe		
Remote controls (Garage door, video, radio, vehicle Remote control toys)	Safe	Precautions	
Food processors	Safe		
Security system (Airport, Home, Library, Retail store)		Precautions	
Induction cooker		Precautions	
Sewing machine	Safe		
MP3 player headphones		Precautions	
CD player	Safe		
Cellular phones		Precautions	
TV sets	Safe		
Electric toothbrush	Safe		
Bluetooth		Precautions	
Treadmill	Safe		

<b>Medical Equipments</b>			
	<b>Safe from Interference</b>	<b>Possible Interference</b>	<b>Interference</b>
CAT (or CT) Scan	Safe		
Cautery (Electrocautery)		Precautions	
Defibrillation, external		Precautions	
Dental drill	Safe		
Dental Ultrasonic probes	Safe		
Dental X-ray	Safe		
Diathermy treatment		Precautions	
Fluoroscopy	Safe		
Hearing aid with coil around neck		Precautions	
Magnetic mattress pads			Avoid
Magnetic pillows			Avoid
Magnetic Resonance Imaging (MRI)			Avoid
Mammography	Safe		
Radiation therapy		Precautions	
Surgery that uses cautery		Precautions	
Ultrasound, diagnostic		Precautions	
Electric shavers	Safe		

## **About National Heart Centre Singapore**

The National Heart Centre Singapore (NHCS) is the regional referral centre and preferred training and education centre for cardiovascular medicine in Singapore. It provides one-stop comprehensive services with various cardiac sub-specialties and supporting services.

NHCS has the largest heart specialists group in Singapore and treats complex cases with good outcomes comparable to international benchmarks. It is the first heart centre in Asia to be Joint Commission International (JCI) accredited in 2005, and re-accredited every three years, a stamp of quality and safe patient care.

### **Location**

5 Hospital Drive  
Singapore 169609  
Tel: +65 6704 8000  
Fax: +65 6844 9030  
Email: [nhc@nhcs.com.sg](mailto:nhc@nhcs.com.sg)  
Website: [www.nhcs.com.sg](http://www.nhcs.com.sg)

### **Operating Hours**

Monday – Friday	: 8.00am – 5.00pm
Saturday	: 8.00am – 12noon
Sunday & Public Holidays	: Closed

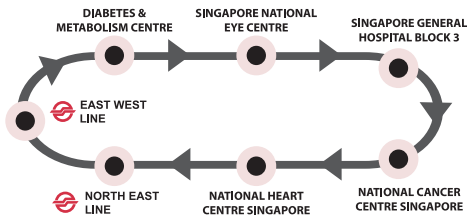
### **Useful Telephone numbers**

Enquiries on Cardiac Procedures	: +65 6704 8410
Appointment Unit	: +65 6704 2000
General Enquiries	: +65 6704 8000

# GETTING TO NHCS



## FREE SHUTTLE BUS ROUTE & OPERATING HOURS



**Monday - Friday**  
8am to 7pm  
**Saturday**  
8am to 2pm  
**Sunday & Public Holidays**  
No Service

## BUS SERVICE

B1	Jalan Bukit Merah (opp Blk 149)	SBS Transit: 120, 147, 196, 197 SMRT: 167, 961
B2	Kampong Bahru Road (before Hospital Drive)	SBS Transit: 120, 124, 143, 147, 166, 196, 197 SMRT: 61, 167, 961
B3	New Bridge Road Bus Terminal (after Hospital Drive)	SBS Transit: 2, 12, 54, 120, 121, 122, 174, 174e, 196, CT8, CT18, CT28 SMRT: 167, 190
B4	Eu Tong Sen Street (before Outram Road)	SBS Transit: 124, 143, 147, 166, 197 SMRT: 61, 961
B5	Outram Road (opp Outram Park MRT)	SBS Transit: 33, 63, 121, 122, 174, 174e SMRT: 75, 851, 970

## MRT SERVICE

Outram Park MRT

East West Line (EW16)

North East Line (NE3)

**PATIENTS. AT THE HEART OF ALL WE DO.®**

## NATIONAL HEART CENTRE SINGAPORE

5 Hospital Drive, Singapore 169609

Tel: (65) 6704 8000 • Fax: (65) 6844 9030

Email: nhcs@nhcs.com.sg • Website: www.nhcs.com.sg

Reg No 199801148C