



Cardiac Resynchronization Therapy

A Guide for Patients and Families

What is a cardiac resynchronization therapy device?

Cardiac resynchronization therapy (CRT) is a small electronic device used to treat heart failure. It delivers tiny amounts of electrical impulses to the heart causing both ventricles to pump together in a coordinated way.

There are 2 types of these devices: a CRT pacemaker (CRT-P) and a CRT defibrillator (CRT-D). Both can send an electrical impulse to your heart, triggering a heartbeat when needed. A CRT-D can also deliver a life-saving shock to return the heart rhythm back to normal.

The CRT device has two parts: a generator and pacing leads.

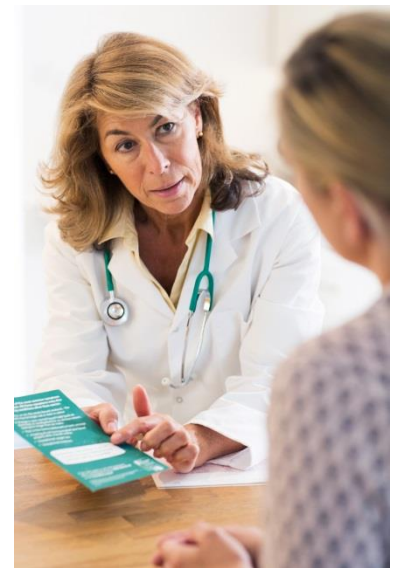
1. The **generator** is a small computer that monitors your heart rate and rhythm. When needed, it sends either an electrical impulse or an electrical shock to your heart. It is powered by a specially designed battery.
2. The **pacing leads** (you could have 1 or more) are insulated wires. One end connects to the generator. The other end attaches to the inside of your heart. The electrical impulse or shock travels from the generator down the lead.

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Why do I need a CRT?

- ♥ Your heart has special cells that make up an electrical system. Electrical impulses trigger your heart muscle to squeeze, and pump blood and oxygen to your body. Normally, the lower chambers of the heart (ventricles) pump at the same time (synchronized).
- ♥ Sometimes this electrical system is damaged by aging or heart disease. The damage can result in:
 - Weakened heart muscle
 - A heart rate that is either too slow (bradycardia) or too fast (tachycardia)
- ♥ When the heart muscle is weakened, less blood is pumped with each heartbeat and the lower chambers do not pump at the same time. This affects your body's need for blood and oxygen.
- ♥ If your heart beats too slowly and the lower chambers are not pumping at the same time, a CRT pacemaker (CRT-P) can send electrical impulses to trigger your heart to beat as well as help both lower chambers to pump at the same time (called resynchronization).
- ♥ When the heart beats too fast, the heart cannot pump enough blood and oxygen to the body. If this is not treated quickly, the heart can stop (called cardiac arrest) and death follows.
- ♥ When there is a chance of the heart stopping from a dangerously fast heartbeat, a CRT defibrillator (CRT-D) can help in 3 ways. It can send an electrical impulse to trigger your heart to beat, help both lower chambers to pump at the same time, and/or send an electrical shock to the heart to stop the dangerously fast heartbeat.
- ♥ A CRT device is an option for people who have:
 - Moderate to severe heart failure
 - An existing heart rate problem (or a greater chance of having a heart rate problem) such as a heart rate that is too slow or dangerously fast



Are there any risks?

- ♥ The procedure to insert a CRT is called implantation. A CRT implant is considered a routine, minor surgical procedure with little chance or risk of problems. Bruising around the implant site is common.
- ♥ However, as with any medical procedure, problems are possible. Although rare, these problems are important to know (listed here from most likely to least likely):

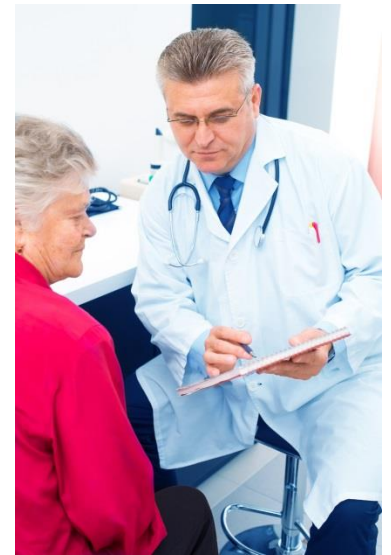
Problem	Chance of it happening	How it is treated
Pacing lead becomes dislodged	3 to 6% chance (30 to 60 people in 1000)	Another procedure would be needed to put the lead back into position.
Bleeding around the CRT site (hematoma)	1 to 2 % chance (10 to 20 people in 1000)	Sometimes the bleeding around the CRT is large enough that the blood needs to be drained off.
Collapsed lung (pneumothorax)	1 to 2 % chance	Chest x-ray is done after the procedure to check for this. Often, it does not need to be treated, but it might need a drain into the chest to help the lung return to normal.
Infection	1 to 2 % chance	To prevent an infection, everyone is given antibiotics before the procedure. They may be required after the procedure if an infection occurs.
Collection of blood around the heart (cardiac tamponade)	0.1 % (1 person in 1000)	Chest x-ray is done after the procedure to check for this. Often, it does not need to be treated, but it might need to be drained.

- ♥ **It is important to ask your doctor about the risks of a CRT implant in your specific situation.**

What can I expect before and after?

How to prepare for the procedure

- ♥ Always bring your BC Services Card (or Care Card) plus a list of the medications you are currently taking to every appointment and the day of your procedure.
- ♥ Since you **cannot** drive home after your procedure, **arrange for someone to drive you** to the hospital and home again.
- ♥ You also need to **arrange for someone to stay with you** at home for the first 24 hours after the procedure.
- ♥ You will get more specific instructions from the hospital or office of the doctor doing the procedure.
- ♥ You will be instructed as to how to take your medications before the procedure. Certain medications (like blood thinners and diabetic pills) might need be adjusted. It is important to review these instructions carefully and take medications as directed.
- ♥ Talk with your doctor about future driving restrictions. The B.C. Motor Vehicle Act has strict rules on when people are allowed to drive after having a CRT implanted.
- ♥ A week or so before the procedure, you might be asked to go for some blood work and an electrocardiogram (E.C.G.), and an echocardiogram.
- ♥ **Do not** eat or drink anything the morning of your procedure, unless you have been specifically told something different by the hospital or your doctor.

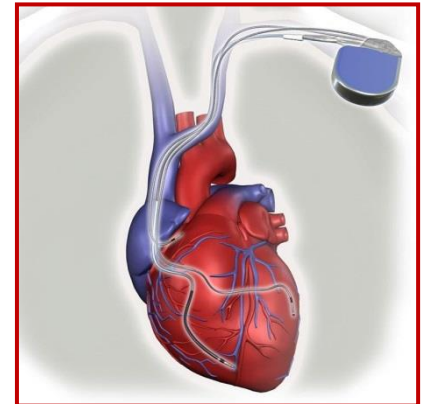


Before the procedure

- ♥ You are admitted and directed to the procedure waiting area.
- ♥ If you are already a patient in hospital, your healthcare team will help you get ready for the procedure.
- ♥ An intravenous (I.V.) is started in one of your arms to give you medicines during the procedure.
- ♥ You have bloodwork drawn and an electrocardiogram (ECG).
- ♥ The doctor reviews the procedure and then you will be asked to sign a consent form.

During the procedure

- ♥ Most people are awake for the procedure. You are given a medicine to help you relax and feel comfortable.
- ♥ The doctor injects a numbing medicine under the skin to freeze the area where the CRT is being implanted.
- ♥ A small cut or incision is made on the right or left side of the upper chest just below your collarbone. Your doctor talks with you beforehand about which side is best for you.
- ♥ The doctor uses a special x-ray to guide the pacing lead(s) through a large vein and into your heart.
- ♥ Once the leads are attached (implanted) in the inside of the heart, they are tested to make sure they are working correctly.
- ♥ The CRT generator is then placed in a space under the skin. The incision is stitched close with stitches that will dissolve on their own over time.
- ♥ The procedure takes about 1 to 2 hours.



After the procedure

- ♥ You are moved to a recovery area. The nurses there monitor your heart rhythm and blood pressure.
- ♥ You might feel some discomfort around the incision and you might have a sore shoulder. Let the nurses know if you are having any pain so they give you medicine to relieve it.
- ♥ The nurses will let you know when it is safe for you to eat and drink.
- ♥ You might go home from this area or you might be moved to another unit if you need to stay in the hospital longer.

Going Home

- ♥ How soon you go home depends on your medical condition and recovery from the procedure. Some people go home the same day. Others need to stay in the hospital for a few days.



♥ Before you leave hospital, you are given instructions for how to care for yourself at home. The nurse reviews this information with you, such as:

- Caring for yourself at home
- Driving restrictions
- Caring for your incision
- Restrictions to arm movements
- Managing pain
- CRT clinic follow-up appointments
- When to take medications
- When to get help

Note: The person staying with you for the first 24 hours should be there to hear these instructions.

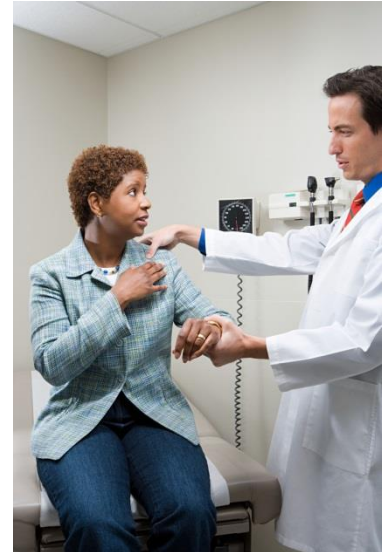
When to get help

♥ Contact your family doctor **right away** if you notice any of the following:

- Any redness, swelling, or coloured liquid coming from your incision
- A fever over 38.5°C (101.3°F)
- New bruising or redness around the incision
- Pain that gets worse or does not improve with pain medicine

♥ **Call 9-1-1** if you notice any of the following:

- A shock from your CRT-D and you do not feel well afterwards
- Trouble breathing or cannot catch your breath
- Really bad chest discomfort or pain
- Feeling really dizzy or confused
- Heart feels like it is racing or beating really fast
- 2 or more shocks within 24 hours



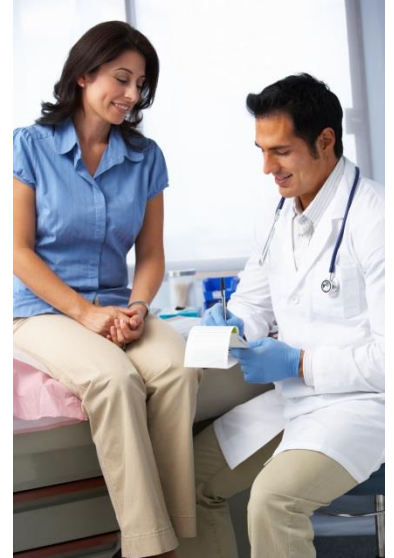
Living with a CRT device

Most people who receive a CRT can return to their normal activities of daily living. Below are tips to help you stay healthy.

Attend follow-up appointments

♥ Every person with a CRT needs to be checked regularly by a CRT clinic. These checks are both in the clinic and remotely from your home.

- ♥ Remote monitoring is a way for your CRT to send information about your heart activity wirelessly from home. Your information is sent through a secure connection to a secure website. If this is an option for you, the CRT team will help you get started.
- ♥ Before you leave the hospital, speak to your nurse or doctor about the CRT clinic closest to your home.
- ♥ Your first appointment will be within 2 to 4 weeks. After this, your CRT must be checked in the clinic at least once every year.
- ♥ Let your clinic know of any changes in your address or phone number.
- ♥ During visits to the clinic, the doctor and clinic staff:
 - Check your CRT battery and leads.
 - Review your CRT settings to make sure it is programmed to best meet your needs.
 - Adjust the CRT settings as needed.



Protect your pacing leads

- ♥ The movement of your arm on the same side as your CRT may be limited for a period of time after the procedure. The instructions from the hospital will include what you can and cannot do.
- ♥ For at least 6 weeks after the procedure, you are not allowed to do any strenuous shoulder activities like golfing, swimming, tennis, shovelling, raking, or vacuuming.
- ♥ These restrictions prevent the pacing leads from being dislodged.

Protect your CRT generator

- ♥ **Do not place magnets near your CRT. Keep magnets at least 6 inches from the generator.**
- ♥ **Never** put a cell phone in a pocket over your CRT.
- ♥ **Walk through anti-theft detectors** at a normal pace without any delay. Do not remain in or near the system for any length of time. They have electromagnetic fields and can temporarily affect your CRT.

♥ **Keep the generator away from these items:**

- **At least 6 inches (15 cm) away** - hand held electric kitchen appliances (e.g. mixers and knives), electric toothbrush charging bases, electric shavers, exercise bikes and treadmills, hand held hair dryers, stereo speakers, vacuums, sewing machines, and radio-controlled items (including the antenna).
- **At least 12 inches or 1 foot (30 cm) away** - electric fences, vehicle ignition systems, green electrical transformer boxes found outside, car battery chargers, generators 20 kW or less, uninterrupted power sources (UPS), and gasoline powered tools (e.g. chainsaws, lawn mowers, weed trimmers, and snow blowers).
- **At least 24 inches or 2 feet (60 cm) away** - induction cook tops, jumper cables, bench mounted or free-standing power tools with 400hp motors or less (e.g. air compressors, drill presses, grinders, pressure washers, table saws, and welding equipment with currents under 160 amps).

♥ **Do not use:** TENS machines, magnetic mattresses or pillows, muscle stimulators.

♥ **Stay away from** large magnets such as the ones found on cranes or in junkyards to lift cars.

♥ If you work in any **high voltage areas**, talk to your doctor or CRT clinic. High voltage is found around things like arc welders, smelting furnaces, radio and television towers, and hydro and radio stations.



Know your shock plan

♥ If you have a CRT defibrillator, review your 'shock plan' regularly with the CRT clinic.

♥ Shocks can be startling and painful, but they are not necessarily a sign of trouble. It is common to feel anxious that you might get a shock at any time.

♥ Talk with the CRT clinic staff about your worries and concerns.

♥ If you get 1 single shock and you feel fine following, write down the time you got the shock and call your CRT clinic as soon as possible.

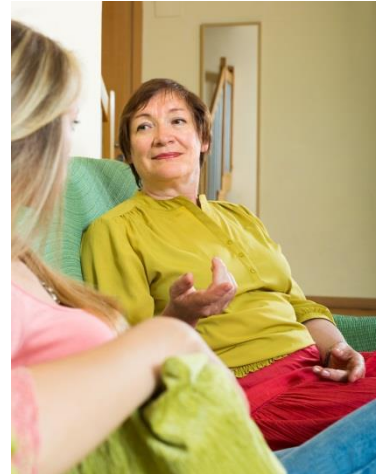
♥ **Call 9-1-1 if:**

- You get 1 shock and do not feel well following.
- You get 2 or more shock within 24 hours.

♥ **Do not drive until you are told it is safe to return to driving.**

Tell others you have a CRT

- ♥ At the hospital, you are given a temporary CRT identification card describing what type of CRT you have. **Always carry your CRT Identification card with you.**
- ♥ The company that made your CRT will mail you a permanent CRT Identification card 4 to 8 weeks after your procedure.
- ♥ Always tell your dentist, physiotherapist, massage therapist, and chiropractor you have a CRT. They might need to take special precautions before starting certain medical procedures or therapies.



Take your medications

- ♥ Make a list your medications, the dosage, and the times you take them.
 - Always bring this list to all your CRT follow-up appointments.
 - Remember to update your list when they change.
 - Take them exactly as instructed.

Stay active

- ♥ Most people return to their usual daily activities, once they have recovered.
- ♥ Include physical and mental activity into your daily schedule.
- ♥ Each person is unique. Talk to your doctor about the kind of activities and exercises that are best for you. **Start slowly and gradually increase.**
- ♥ For most people, it is safe to resume sexual activity after a CRT implant, however try not to support your weight with your arms during sexual activity while your incision is healing.
- ♥ No harm will come to your partner should your CRT give you a shock, even if you get the shock during intercourse.

Ask questions

- ♥ Call your heart doctor or family doctor.
- ♥ Call your CRT Clinic.
- ♥ Call HealthLink BC at 8-1-1 any time of the day or night to speak to a registered nurse. During the night, you can ask to speak to a pharmacist.
- ♥ CRT companies offer online support for non-urgent questions or concerns. Their contact information is available online or in your pacemaker information booklet.

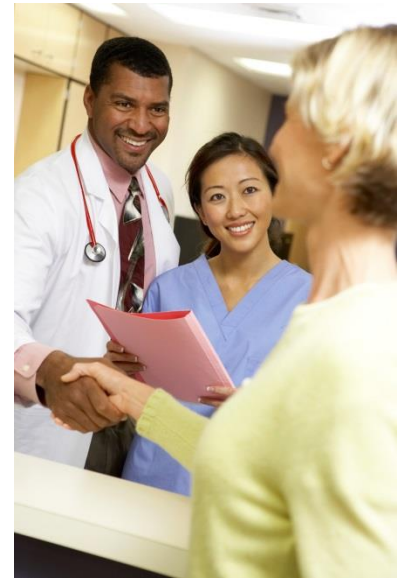
Frequently Asked Questions

When can I drive?

- ♥ The B.C. Motor Vehicle Act says that after a CRT implant:
 - You must have your doctor's approval before you can drive again.
 - You are not allowed to drive a private vehicle (class 5 license) until your doctor says it is safe to drive. This could be anywhere between 4 weeks to 6 months.
 - You are no longer allowed to drive a commercial vehicle (class 1 to 4 license) at any time.

What is electromagnetic interference (EMI)?

- ♥ Any items that generate, transmit, or use electricity have invisible electromagnetic fields around them. This electromagnetic field might affect the normal operation of your CRT. This is called 'electromagnetic interference' (EMI).
- ♥ Most household items are safe to be near and use, including items such as: battery chargers, curling irons, hair straighteners, electric blankets, guitars or toothbrushes, massage chairs, heating pads, hot tubs, saunas, tanning beds, electronic weight scales, and kitchen appliances including microwave ovens.
- ♥ It is also safe to be near and use electronics such as TV's, radios, computers, tablets, MP3 players, fax machines, photocopiers, DVD and CD players with remote control, printers, and GPS devices.



What do I do if I think an item is causing EMI?

- ♥ If you feel dizzy using an electrical item, put it down and move away from it. Your CRT should return to normal.
- ♥ If you continue to feel dizzy or feel worse, contact your CRT clinic or doctor right away.

Can I travel with a CRT?

- ♥ It is safe to travel with a CRT. Let the CRT clinic know if you are planning to travel.
 - Ask how to get help medical help if needed and how to set up your remote transmitter while you are away.
- ♥ Tell airport security personnel you have a CRT and show your ID card. It is safe to pass through the airport metal detector, have a body scan and have a hand-held metal detector used on you.

How long will my CRT last?

- ♥ The CRT battery will need replacing over time. This minor procedure is called a generator (battery) change. Your CRT clinic will organize a replacement when needed.
- ♥ The battery generally lasts 5 to 8 years but will depend on how much your body needs the CRT to pace your heart. If your pacing leads are working well, they are left in place.
- ♥ CRTs do not stop without warning. Even as the battery weakens, your CRT continues to work as it should.

What happens to my CRT at end of life?

- ♥ CRT pacemakers do not keep dying people alive. Should your health decline to the point where death is likely, your CRT pacemaker will not prevent a natural death.
- ♥ If you have a CRT defibrillator, there could come a time when you would prefer NOT to have your death prevented by a shock from your CRT.
- ♥ You might wish to have the shock function turned off or 'deactivated'. Your CRT will still work as a pacemaker for slower heart beats. If your heart beats dangerously fast, the CRT would not shock you, allowing you to die naturally.
- ♥ Talk to your family and your doctor about turning off the shock function. Make sure everyone understands your wishes.
- ♥ If you are thinking of getting the shock function turned off (deactivating), your doctor will help you with the steps.

For More Information

This booklet explains basic information about living with a CRT.

For more detailed information about getting a CRT, read the information given to you by your doctor's office or hospital before the procedure.

For more detailed information about your specific CRT, read the booklet from the company that made the CRT, or visit their website.

If you have questions that are not addressed in this booklet, ask your doctor or clinic.

Helpful Resources

Cardiac Services BC	www.cardiac.bc.ca
BC Heart Failure	www.bcheartfailure.ca
Heart and Stroke Foundation of Canada	www.heartandstroke.ca
Canadian Heart Rhythm Society	www.chrsonline.ca
Heart Rhythm Society	www.hrsonline.org
HealthLinkBC	www.healthlinkbc.ca
Phone: 8-1-1	
Phone: 7-1-1 for deaf or hard of hearing	

Device Company	Website
Medtronic	www.medtronic.com
Abbott / St. Jude Medical	www.sjm.com
Boston Scientific	www.bostonscientific.com
Biotronik	www.biotronik.com
Sorin	www.livanova.sorin.com



Cardiac Services BC

An agency of the Provincial Health Services Authority



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