

HEART VALVE SURGERY

The heart is a pump made up of four valves that only allows blood to flow in one direction. For this to happen, all valves need to function normally, ensuring that enough blood is delivered to the lungs, the body and to the heart itself.

Should a valve become damaged due to disease or worn from age, it will place strain on the heart. This in turn affects other organs in the body such as the lungs, brain and kidneys. People with an abnormally functioning valve sometimes need surgery to repair or replace it. This kind of surgery has become quite commonplace in Australia and New Zealand with some of the best results in the world.

The Aortic & Pulmonary Valves

The aortic and pulmonary valves are outlet valves. These valves have three cusps that are attached to a corresponding ventricle at what is known as the annulus.

Sometimes the annulus or the cusps become stretched causing the valve to leak. If this damage is limited a repair is possible. But sometimes the cusps become thickened, fused together or calcified to such an extent that a total replacement of the valve is necessary.

The Mitral & Tricuspid Valves

The mitral and tricuspid valves have leaflets that attach to the annuli in the inlet part of both ventricles. These leaflets are held in place by strings that are known as chordae. These chordae are then attached to special muscles in the ventricles known as papillary muscles. In less severe cases repair of abnormalities of the leaflets, annulus or chordae is sometimes possible. If there is very severe degeneration, thickening or calcification of the leaflets of these valves replacement will be necessary.

Types of Artificial Valves

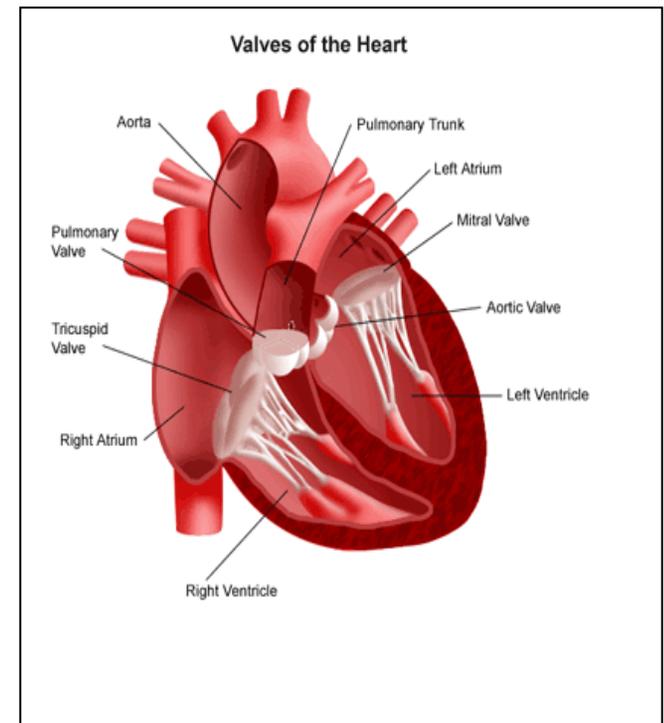
Should a diseased heart valve not able to be repaired, your surgeon will decide to replace it with an artificial valve that is either mechanical or bioprosthetic. Your surgeon will discuss with you the differences between these two valve types and which device will best suit your circumstance and needs.

Mechanical Valves

Mechanical valves are made of durable synthetic materials that will last a whole lifetime. Should you require a mechanical valve, life-long anticoagulation with Warfarin will be needed to reduce the risks of developing blood clots. Some patients report being able to hear a slight ticking noise as the valve opens and closes.

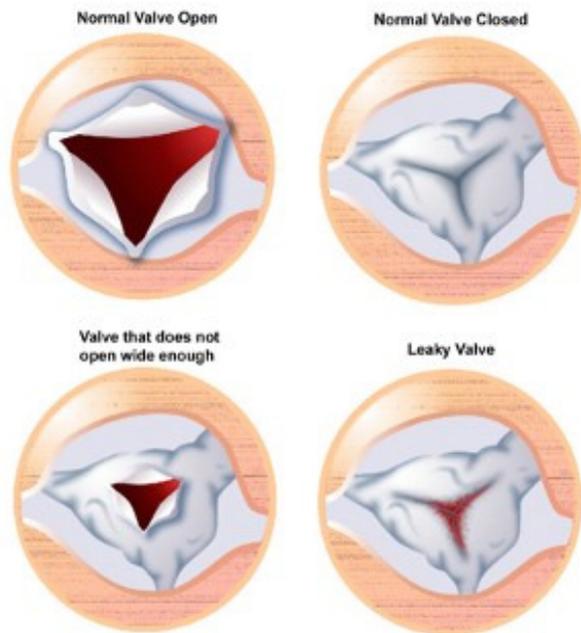
Bioprosthetic or Tissue Valves

Bioprosthetic or tissue valves are taken from animals or humans. The tissue of these valves has been specially treated to reduce the risk of rejection. Tissue valves have a limited life span that is dependent upon age and other factors of the patient. Anticoagulation with Warfarin is not necessary with the use of these valves.



The Ross Procedure

In certain patients (generally younger than 50 years) the aortic valve is able to be replaced with the patient's own pulmonary valve. The pulmonary valve is then replaced with a tissue valve. The advantage of this kind of procedure is that lifelong anticoagulation with Warfarin is not necessary.



Heart Valve Disease

The most commonly affected valves by heart valve disease are the mitral and aortic valves. This is because they are subjected to very high pressure. The tricuspid and pulmonary valves work in the low pressure side of the heart and less subject to this kind of strain. There are two types of problems that affect heart valves: stenosis and regurgitation.

▶ “Stenosis” means narrowing or a stiffness of the valve restricting the passage of blood through it. Stenosis of the aortic valve causes the heart to work much harder; this in turn causes it to thicken (hypertrophy). This thickening if left uncorrected can cause permanent damage to the left ventricle. Mitral stenosis causes the left ventricle to not fill properly, with blood backing up to the lungs.

▶ “Regurgitation” (incompetence, insufficiency, leakage) is caused by failure of the valve to close properly. Because the valve remains partially open, blood is now able to flow backwards.

When this happens the heart needs to beat much more strongly in an attempt to move this extra blood with each beat. This extra work makes the ventricle enlarge or dilate causing the muscle to stretch and thicken. Should the heart become over-stretched recovering normal function is less likely, even after the valve is replaced.

Symptoms

Symptoms of aortic valve stenosis become apparent when the left ventricle:

- Can no longer pump enough blood through the narrowed opening of the valve, causing light headedness/dizziness and/or blackouts.
- Becomes so thickened that its need for oxygen exceeds its own blood supply causing pain or discomfort like angina.

In aortic valve regurgitation, symptoms may only appear after the heart becomes severely dilated. The main symptom in this instance is shortness of breath.

The heart can compensate for a faulty valve for a long time. The appearance of symptoms usually means that the heart no longer is able to compensate and is beginning to fail. Therefore the appearance of symptoms usually occurs quite late in the course of valve disease.

Anyone showing signs of valve disease, even if there are no symptoms should have tests to determine the extent of the malfunction and the effects on the heart. These tests would usually include clinical examination with echocardiography, ECG and chest x-ray. The aim is to determine the best time for surgery, preferably before the effects on the heart are irreversible.

Causes of Valve Disease

Causes of heart valve disease would include:

- Stretching of the valve due to tissue weakness
- Valve and chordae abnormalities causing regurgitation
- Calcium build-up on the valve due to age or structural abnormalities
- A birth defect also known as a congenital defect
- An infection of the inner lining of the heart including the valves known as bacterial endocarditis
- Rheumatic fever, triggering an immune response in the body causing damage to the heart muscle and valves
- Coronary artery disease and myocardial infarction (heart attack) which can damage the papillary muscles

Anaesthesia

Valve surgery is always performed under a general anaesthetic (GA) given to you by a specialist anaesthetist. You will meet your anaesthetist on the day of admission into hospital.

Today, modern anaesthetic drugs are safe with very few risks. However

some people find they do have reactions to them which can be quite serious.

If you have ever had a previous reaction to an anaesthetic drug tell your surgeon or anaesthetist when you meet him. Your anaesthetist will explain to you more about the type of anaesthetic that is best for you and the risks and benefits.

Heart Valve Replacement Surgery

The length of your breastbone or sternum will be cut and opened allowing your surgeon easier access to your heart. The soft tissues positioned in front of your heart are separated and the membrane that surrounds your heart (pericardium) is opened.

The beating of your heart is stopped, and a heart-lung machine takes over the role of circulating your blood to your head and brain and the rest of your body; this is known as “cardiopulmonary bypass”.

Now that the heart is still, your surgeon is able to expose the diseased valve through an incision in the heart or the aorta. Your surgeon will then partially or completely remove the valve, and replace it with an artificial valve sewn into place. The incision made into the heart or aorta is then closed with very tiny sutures (stitches).

The surgeon now restarts the heart allowing it to resume its own rhythm and disconnects the heart-lung machine, now allowing blood to be pumped through the heart and lungs once again. Air is also removed from the heart.

The surgeon checks that the new valve is working properly with good blood flow and that there is no other bleeding from tissues. Drain tubes are placed within the chest to remove blood and fluids which can collect during and after the surgery. Pacing wires are also placed on the heart with the ends brought through the skin. These are in case the heart rhythm needs to be corrected or its rate controlled following surgery. These are gently removed later on.

The breastbone in most cases is closed with strong stainless steel wire (which will be left in place) and the chest wall and skin is closed with either sutures or clips.

Heart valve surgery takes anywhere from 3 to 6 hours to complete.

Mechanical Valves



Biological Valves



Heart Valve Repair Surgery

Rather than replacing your diseased heart valve, sometimes your surgeon will be able to repair it. The decision to do this will only happen if your surgeon believes this procedure is likely to restore adequate long term function. Mitral and tricuspid valves are more frequently able to be repaired than aortic valves.

Mitral valves can be repaired by:

- Tightening the annulus by insertion of a ring or band, also known as annuloplasty
- Modifying the leaflets by removing excess tissue
- Shortening or totally replacing the chordae (heart strings)

Tricuspid valves can be repaired by:

- Tightening the annulus

Aortic valves can be repaired by:

- Splitting the cusps where they have fused together
- Modifying the annulus or where the cusps have attached if they are not diseased

If the valve cannot be repaired it has to be removed and then replaced with a valve of appropriate size as described previously in “Heart Valve Replacement Surgery”.

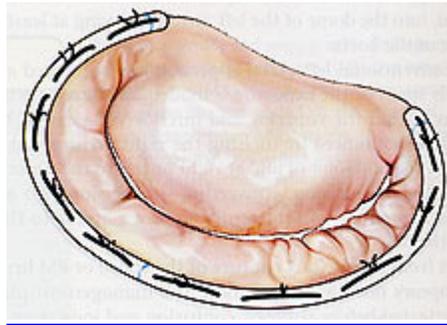


Figure 1 Tightening of the valve with a ring - also known as Annuloplasty

Should I Go Ahead?

Only after discussion with your cardiologist or your surgeon should the decision to have valve surgery be made. The decision to go ahead is yours and should not be rushed or coerced by others. Only once you are satisfied with the information you have received and you believe you have enough information should you make your decision.



Figure 2: Discuss your options

Remember your surgeon cannot guarantee that the surgery will meet your expectations or that your proposed surgery carries no risks.

Queensland Heart and Lung Surgery encourage you to seek the opinions of other surgeons if you feel uncertain about the advice you have received.

Have realistic expectations!

Everyone is different, your outcome may not be the same as that of your neighbour or your relative. Not everyone will have the same result.

Before Your Surgery

Before your surgery, your surgeon will need to know your medical history.

Tell your surgeon if you have ever had:

- An allergy or bad reaction to any antibiotics, anaesthetics, other drugs, surgical tapes or dressings
- Prolonged bleeding or excessive bruising when injured
- Previous problems with blood clots
- Recent or long-term illnesses
- Psychological or psychiatric illness
- Poor healing or bad scar formation after previous surgery or injury

Medicines: Make sure you give your surgeon a complete list of all medications and vitamins or herbal remedies you are taking or have recently taken. Include also medicines such as insulin, Warfarin and the contraceptive pill.

Medicines that increase the risk of bleeding include:

- Aspirin and medicines containing Aspirin such as cold preparations or cough mixtures
- Low molecular weight Heparins such as Clexane and Fragmin
- Anti-inflammatory medications (such as those to treat arthritis)
- Anti-platelet medications other than Aspirin, such as Plavix, Persantin, Asasantin, Iscover and Ticlid
- Large doses of Vitamin E

Often the above medications are withheld for a time before surgery – your doctor will advise you. Please feel free to ask your doctor any questions about your medications. Sometimes antibiotics or small doses of blood thinning drugs may be prescribed prior to your surgery.

Smoking: Smoking is the leading risk factor for coronary artery disease and reduces lung function.

Smoking will also increase the risks of your surgery and anaesthetic and should be stopped as early as possible before your operation. Smokers who do not stop this habit permanently cannot expect a good long-term result from their surgery.



Sources of Infection: Abnormal and/or diseased heart valves are susceptible to infection. It is therefore very important that any source of infection (such as dental infection, skin ulcers or wounds) are properly treated and healed prior to your operation. See your dentist before your surgery. To protect your valve antibiotics can be prescribed to you by your cardiologist, GP or your surgeon.

Your Recovery

Following your surgery, you will be moved into the Intensive Care Unit and will stay there for approximately 2 days.

When you wake up you may find you feel cold, thirsty and possibly confused. All of these sensations are normal effects and will soon pass.

You may be aware of a breathing tube in your mouth and throat, this will be removed once you awaken properly and begin breathing on your own.

You will be cared for by specially trained nurses, one for each patient so you will always have someone close by. Your pain is always kept under control through medication. Your nurse will give you a sponge bath and assist in your personal care. You will be assisted to sit in a chair the day after surgery for a short time.

Physiotherapy will begin with a simple breathing programme including deep breathing exercises and coughing as well as arm and leg exercises. This programme reduces the risk of pneumonia and improves circulation whilst not disturbing the breastbone area.

Drain tubes in the chest are removed once no longer required. A catheter that has been placed in your bladder is to drain urine. This is for your comfort and to allow doctors and nurses to monitor your kidney output. The catheter is usually removed by the 2nd day following your surgery.

It is normal to not have a bowel motion for a couple of days following surgery, but it is important that you do have one within 4 – 5 days following your operation. Eating prunes and drinking pear juice can assist in this process. You should mention to your doctor or nurse if you are having trouble.

Wound Care: Following your surgery you will have a chest wound where your surgeon opened your breastbone. Dressings will be removed 2 – 3 days following your operation. Make sure you do not have the water too hot in your shower, and pat dry the wounds afterwards. Use a soft soap only but no talcum powder or creams or lotions.

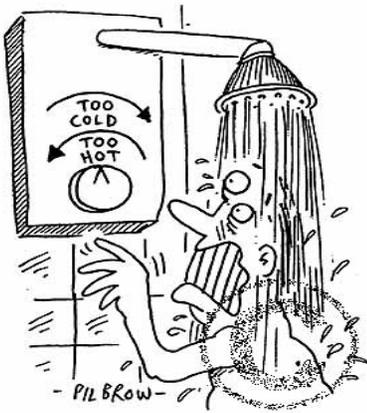


Figure 3: Make sure your shower is not too hot!

Once your doctor is happy you can move around without assistance, you will be discharged from hospital.

When you're home: It is important to gradually resume activities to help your recovery. Your doctor will recommend an exercise programme suitable to help you regain your strength.



Figure 4: Don't over exert yourself

It is important to remember not to lift heavy weights such as small children, baskets of wet laundry or drive until approved by your doctor (usually around 6 weeks).

After surgery many patients report a variety of problems or symptoms that usually resolve themselves over time. These include tiredness, blurred vision, nausea, poor appetite, poor concentration, memory loss, constipation and sleep disturbances.

Pain Relief: There have been many changes in pain relief options in recent years. These are best discussed with your anaesthetist. After the first few days, medications such as paracetamol and codeine are usually sufficient to control pain.

Anticoagulants (Blood Thinners)

Anticoagulant drugs or blood thinners are used to reduce the risk of developing blood clots on the surfaces of mechanical or tissue valves which can cause sticking or jamming. The most commonly used anticoagulant is a drug called Warfarin (Coumadin) which is taken once a day orally.

To begin with the dose is adjusted every second day based on the results of a blood test called the INR. This test measures the time it takes for the patient's blood to clot.

Once the correct dose is established to maintain an acceptable clotting time, the test is done weekly and then finally monthly. The dose varies from patient to patient and may vary in the same person and can be influenced by diet.

Patients given a mechanical valve will require Warfarin permanently. Patients with tissue valves are usually able to stop taking Warfarin somewhere between 6 – 12 weeks. This will be decided by your surgeon.

The most frequently reported side effect of Warfarin is bleeding, which can be life threatening. This is a very rare complication if the correct dose is taken.

Should you notice any of the following symptoms report them immediately to your doctor.

-  Bleeding from a cut or wound that will not stop
-  Nosebleeds
-  Bleeding gums after brushing
-  Red or black tarry stools
-  Blood-stained urine
-  Any unusual pain, swelling or discomfort

Possible Complications of Surgery

As with any invasive medical procedure, valve surgery has associated risks despite the highest medical and surgical standards. Your surgeon will make every attempt to minimize risks and complications but they can still occur and may have permanent effects.

It is not usual for a surgeon to outline every possible or rare complication of an operation.

It is however important to be given enough information to fully assess the benefits and risks of surgery for yourself. Most patients undergoing surgery will not have a complication, but if you are concerned about the possibilities, you should discuss this with your surgeon.

General Risks

Wound Infection: All surgery, major or minor has a risk of wound infection. This can occur days or weeks following the operation. Infections of the wound are usually treated quite effectively with antibiotics.

Blood Clots: Blood clots can develop in a deep vein, most usually in the leg or thigh (deep vein thrombosis or DVT). This is a life-threatening condition and requires urgent treatment.

Scarring: Generally speaking, most incisions heal well but some people find they develop raised or widened scars. Infections of the wound or movement of the wound area increase the incidence of scarring.

Specific Risks

Death (Mortality): Overall, the mortality rate in Australia and New Zealand is about one or two patients for every 100 heart valve procedure performed. However with a faulty valve the risk of NOT having the surgery may be higher for the patient. Risk of death increases with age, other serious illnesses, previous heart damage, urgency of the operation and recurrent surgery.

Stroke: The incidence of stroke (cerebrovascular accident) increases significantly with age and disease of the aorta, but it is an uncommon complication. The effects of stroke can be temporary and disappear over a few days or may be permanent and include:

- ✚ Loss of feeling and sensation in a part of the body
- ✚ Paralysis of one side of the body or limb (complete or partial)
- ✚ Speech and/or swallowing difficulties
- ✚ Visual disturbances

Patients suffering stroke following surgery will require some form of rehabilitation as either an in-patient or out-patient.

Infection of Breastbone: Infections of the breastbone require in-patient treatment with prolonged administration of antibiotics and possible further surgery.

Non-healing (non-union) of the Breastbone: Rarely, the incision of the breastbone does not heal or knit normally. This is most likely to happen following prolonged coughing after surgery. Sometimes the wires holding the breastbone together pull out. This may require further surgery to repair the breastbone. This complication can also be caused by infection of the bone.

Bleeding: This is the most common complication. About 5% of patients (5 in 100) need further surgery to control bleeding. Usually this complication resolves with no further ill-effects.

Irregular Heart Rhythm

(Arrhythmia): The most common irregular heart rhythm following surgery is atrial fibrillation (AF). This affects up to 1 in 3 patients in the first week following surgery. It is usually treated with medication. Uncommonly, a serious irregular rhythm can occur that requires electrical shock to correct. If you experience an irregular rhythm once you are home, contact your cardiologist. If these palpitations do not subside after a few minutes or cause dizziness or feeling unwell, call an ambulance.

Mood Swings: It is not uncommon for some patients to feel anxious and lacking in confidence about their heart and health in general. As the patient heals and convalesces this usually improves.

Kidney Failure: Some patients with previously normal kidney function suffer this complication – it is very rare.

Areas of Collapsed Lung: This typically responds well to physiotherapy.

Cognitive Function: It is common for patients to have some impairment of short-term memory, difficulty with concentration, reading and/or perhaps visual blurring. As these symptoms are most likely to occur in the first few weeks it is important that you do not drive for at least 6 weeks following your surgery. It can be possible for 6 to 9 months to pass before all of these symptoms disappear.

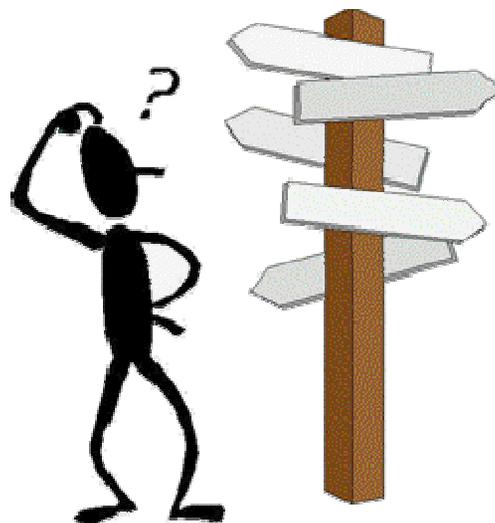


Figure 5: Confusion is common after surgery

Chest Wall Pain: Persistent pain from healing breastbone and ribs.

Other Risks:

- ✚ Respiratory failure requiring tracheotomy
- ✚ Blood infection
- ✚ Permanent pacemaker due to chronic changes in heart rhythm
- ✚ Accumulation of fluid around heart and lung cavities requiring drainage
- ✚ Accumulation of air in chest cavity (pneumothorax) requiring temporary drainage

Late Risks After Surgery

Bacterial Endocarditis: The heart chambers and valves are all covered with a membrane called the endocardium. As mentioned previously patients with diseased or artificial valves are more susceptible to developing an infection on their valve. This condition is known as infective endocarditis and is very serious. To reduce the chances of this occurring it is important you take prophylactic antibiotics for any dental or surgical procedure including endoscopy or skin lesion removal for the rest of your life.

If you have an artificial valve make sure you always tell your treating doctor or dentist so they may take precautions.

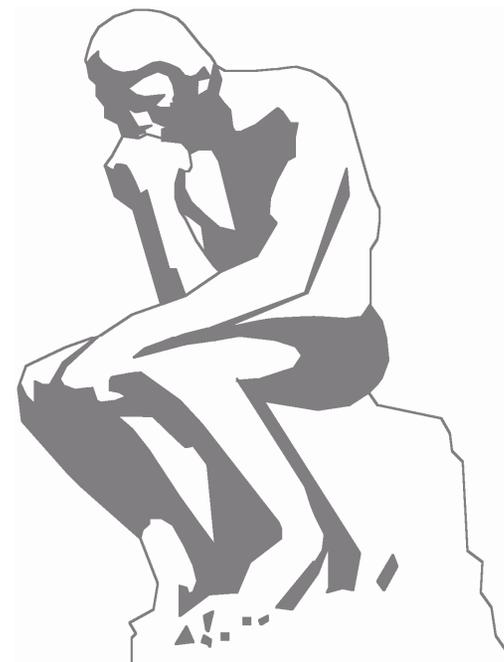
Valve Failure: It is very rare for a mechanical valve to fail. If a tissue valve eventually fails it is usually slowly and progressively.

Peri-valvular Leak: Sometimes a small leak can begin between the valve prosthesis and where the valve was sewn in. If this occurs further surgery may be needed to correct this.

Haemolysis: This is a rare condition causing anaemia and in some instances jaundice. This complication is more likely to occur if a peri-valvular leak develops late after valve surgery.

Remember to.....

- While the breastbone is healing avoid lifting, or pushing and pulling activities using your arms
- Showers are permitted, but baths or spas should be avoided for 4 – 6 weeks or until your incision is healed. Avoid very hot water which may make you dizzy and gently wash (don't rub) your incisions with soap. Do not use creams or lotions until the incision is healed.
- Avoid driving your car for 6 weeks after surgery. Your reaction time will be delayed due to weakness, fatigue and/or medication. You may also risk injury to the sternum. When riding in a car for long periods stop every 1 -2 hours to stretch your legs.
- Do not cross your legs when lying in bed or sitting. If you have swelling of feet or legs put them on a stool or chair while sitting.
- Avoid isometrics – straining to move your bowels, pushing or pulling heavy objects or working with your arms overhead all increase blood pressure putting added strain on a healing heart.
- Pace yourself to minimize fatigue. If you feel tired – STOP. Don't push yourself to finish a task.
- A rest period should be taken at least once a day for a few weeks - two if possible morning and afternoon. Napping is not necessary but resting is. Be sure to dress in your daily street clothes. This will help in your sense of recovery and that you are well on your way!
- Stair climbing is safe but avoid pulling yourself up by the handrail and go slowly.
- It is important to distinguish between incisional pain and chest pain (angina) you may have experienced prior to surgery. Contact your doctor if you are experiencing chest pain.
- If your chest incisions do not appear to be healing contact your doctor.
- Check your weight every morning for one week following discharge. Notify your doctor if you notice a sudden weight gain.
- Try to avoid becoming upset, your heart works harder then. Try to avoid situations, people or topics of conversation that make you tense or angry.
- Remember your diet, medications and exercise regime are prescribed specifically for you. Do not expect your friend or neighbour who has a heart condition to have the same prescriptions.
- Keep a record of your medications and medical history when you are traveling.



Reasons to Call the Surgeon's Office

If you experience any of the following symptoms, report them to our office, or if after hours contact the hospital where your surgery was performed or your GP.

- Fever (more than 38°C) or chills
 - Night sweats
 - Loss of appetite
 - Joint pains
 - Bleeding from the surgical area
 - Blood in the urine or dark or black stools
 - Severe headache
 - Excessive oozing, redness, swelling or tenderness at your incision site
 - Sudden breathlessness
 - Persistent or frequent palpitations
 - Dizziness or blackouts
 - Eye symptoms such as loss of vision or spots before your eyes
 - Weakness in any part of your body or slurring of speech
- Abnormal pain or other symptoms that are not relieved by your medications
 - Any other concerns you may have about your surgery

