Coronary angioplasty and coronary bypass surgery

Heart Information Series Number 10

British Heart Foundation

This is one of the booklets in the *Heart Information Series*. For a complete list of booklets, see page 41.

We welcome your comments on this booklet. Please fill in the feedback form on page 57.

We update this booklet regularly. However, you may find more recent information on our website **bhf.org.uk**

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About this booklet

This booklet is for people with coronary heart disease whose condition is not helped enough by drugs, and who have been advised to have further treatment. It describes what is involved in:

- coronary angioplasty (done either as a planned treatment or as an emergency), and
- coronary bypass surgery.

It also describes some other treatments, and some newer procedures which are still being researched.

This booklet is not a substitute for the advice your doctor or cardiologist (heart specialist) may give you based on his or her knowledge of your condition.

If you need to have coronary bypass surgery, you can find more information on what will happen in hospital, both before and after your operation, in our booklet *Having heart surgery*.

Who needs to have coronary angioplasty or coronary bypass surgery?

If you have coronary heart disease, it means that the inside walls of the main arteries to your heart (the coronary arteries) have become narrowed by a build-up of fatty material called atheroma. Coronary heart disease can cause angina and heart attacks.

Many people live with 'stable angina'. This is when the symptoms of angina do not vary much and can be controlled using medicines. Most people with stable angina – if they take medicines for their heart and make certain lifestyle changes – live a normal or nearly normal life for many years. For others, a cardiologist (a doctor specialising in the heart) or a heart surgeon may advise 'revascularisation treatment'. ('Revascularisation' means making the blood vessels wider, or replacing blocked arteries with grafts.) This can control the angina symptoms more effectively and, for some people, can prolong life.

There are several different types of revascularisation treatment. They include:

- coronary angioplasty with a stent (or, occasionally, coronary angioplasty without the stent)

- coronary bypass surgery, and
- other treatments, such as transmyocardial revascularisation.

We explain all these on pages 7-31.

Before the doctors decide what treatment to advise they will ask you to have a coronary angiogram (also called cardiac catheterisation). This test shows where your arteries are narrowed and how narrow they are. For more information on this test, see our booklet *Tests for heart conditions*. Sometimes, if the person has agreed to it beforehand, the doctors will do a coronary angioplasty at the same time as the coronary angiogram.

Coronary angioplasty and heart surgery are often planned in advance. However, some hospitals now also use coronary angioplasty to treat people with acute coronary syndrome. (We explain what acute coronary syndrome is on page 8.)

Coronary angioplasty with a stent

Also called balloon angioplasty *or* balloon dilation *or* PTCA (percutaneous transluminal coronary angioplasty) *or* PCI (percutaneous coronary intervention)

Coronary angioplasty is a technique for treating coronary artery disease. It was first used in 1977 and has developed rapidly since then. About 45,000 angioplasties are now done each year in the UK.

Coronary angioplasty 'squashes' the atheroma (fatty tissue) in the narrowed artery, allowing the blood to flow more easily.

Who can have a coronary angioplasty?

Sometimes coronary angioplasty is done as a treatment that is planned in advance, and sometimes it is done as an emergency procedure.

As a planned treatment

Coronary angioplasty cannot be used for everyone who has angina. Before you are accepted for coronary angioplasty, you will need to have a coronary angiogram (see page 6). Three out of every 10 people who have a coronary angiogram

go on to have an angioplasty. Of the others, some will not need treatment, some may need coronary bypass surgery, and some will need treatment with drugs.

Angioplasty can also be used if you have had coronary bypass surgery but your graft has become narrowed.

As an emergency treatment, for people with acute coronary syndrome

Coronary angioplasty is also used, as an emergency treatment, to treat some people with 'acute coronary syndrome'. Acute coronary syndrome is a general term which covers the following conditions.

- A heart attack (which is sometimes called a coronary thrombosis or myocardial infarction).
- Unstable angina (angina that comes on with less and less physical activity, or even while the person is resting).

When someone gets a chest pain or chest discomfort, it is sometimes difficult for the doctor to tell whether the person is suffering from unstable angina or having a heart attack. So, if this happens to you, your doctor may say that you have acute coronary syndrome.

The technique involved in an emergency coronary angioplasty is the same as for a planned coronary angioplasty. But, if you have acute coronary syndrome, you may be given extra drugs when the angioplasty is carried out (see page 12).

For more information on heart attacks, see our booklet *Heart attack and rehabilitation*.

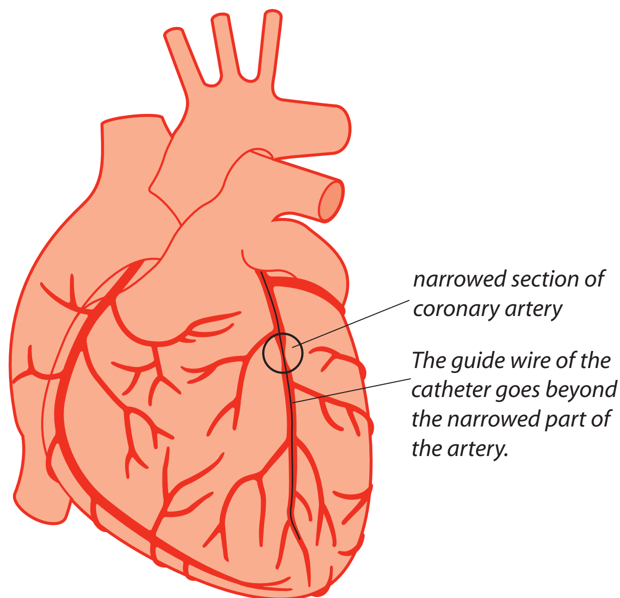
What happens

Before you have the angioplasty you will be given a local anaesthetic. A catheter (a fine, flexible, hollow tube) with a small inflatable balloon at its tip is passed into an artery in either your groin or your arm. The operator then uses X-ray screening to direct the catheter to a coronary artery until its tip reaches the narrowed or blocked section. The balloon is then gently inflated so that it squashes the fatty tissue responsible for the narrowing. As a result, this widens the artery (see the illustration on page 11). The catheter contains a 'stent' which is a short tube of stainless-steel mesh. As the balloon is inflated, the stent expands so that it holds open the narrowed blood vessel. The balloon is then let down and removed, leaving the stent in place.

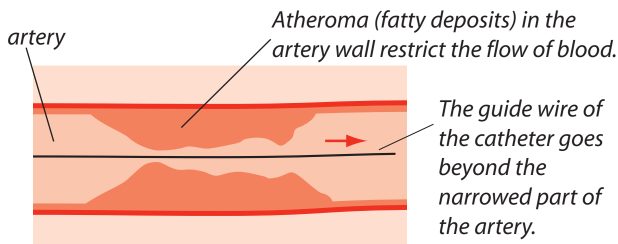
In the past, angioplasty was done without using stents, but stenting is now routine, unless the artery is not large enough to accept one.

Although it sounds simple, angioplasty is technically very difficult to do. It is very similar to the coronary angiogram test (see page 6). However, it can take much longer to get the balloon catheter into exactly the right position.

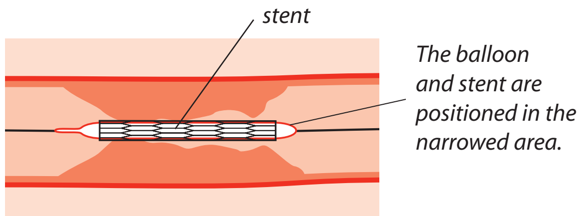
Coronary angioplasty with a stent



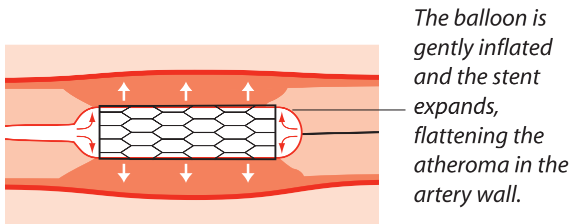
Coronary angioplasty with a stent



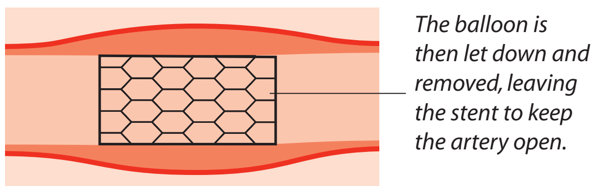
The guide wire of the catheter goes beyond the narrowed part of the artery.



The balloon and stent are positioned in the narrowed area.



The balloon is gently inflated and the stent expands, flattening the atheroma in the artery wall.



The balloon is then let down and removed, leaving the stent to keep the artery open.

While the balloon is being inflated, you may get angina symptoms, but the pain eases very quickly when the balloon is let down again.

If you are going to have a coronary angioplasty with a stent, you will need to take certain 'anti-platelet drugs' to help reduce the risk of clots forming around the stent afterwards. (Platelets are tiny particles in the blood which are the first step in forming clots that may block the new stent. Anti-platelet drugs combat this effect.) You will probably be given aspirin if you are not taking it already, and an anticoagulant such as heparin. Your doctors will probably also give you another anti-platelet drug called clopidogrel before you have the angioplasty. You will need to take this for between two weeks and six months, depending on the type and number of stents that you have. At the time when you are having the angioplasty, the doctor may also give you other anti-platelets such as glycoproteins IIb/IIIa inhibitors. See our booklet *Medicines for your heart* for more information on all these drugs.

Types of stent

Two types of stents are used for angioplasty with a stent – **bare metal stents** (or uncoated stents) and

drug-eluting stents. Bare metal stents have been available for many years and are the most commonly used. Drug-eluting stents are coated with a drug which reduces the risk of the artery becoming narrow again after the angioplasty. Two types of drug-eluting stents are licensed for use in the UK – stents that are coated with a drug called sirolimus and stents coated with a drug called paclitaxel.

There are guidelines for doctors on which type of stents to use for different patients. The guidelines, which were produced by the National Institute for Clinical Excellence, say that a bare metal stent can be used to treat most narrowings in the average-sized artery. They also say that drug-eluting stents should be used in coronary arteries that are small and where the narrowing is of a certain length and width. This is because arteries that are small and have become very narrow are more likely to become blocked again (restenosis) than average-sized arteries. We explain more about restenosis on the next page.

How successful is coronary angioplasty with a stent?

In at least 9 out of 10 coronary angioplasties, the blood flow through the treated artery is improved.

A small number of patients may have complications. Sometimes the treatment completely blocks off the narrowed artery. If this happens and the doctor thinks this will do serious damage to the heart, he or she may ask a surgeon to do an immediate bypass graft operation. So, if you are having angioplasty, you need to understand that you may have to have urgent heart bypass surgery and you must be prepared for this. Urgent surgery is needed in no more than 5 in every 1,000 cases, and the results of this type of surgery are good.

If you have the angioplasty but it does not clear the narrowed artery successfully, your doctor may recommend that you have heart surgery (see page 19). However, you won't need to have the operation immediately.

Sometimes the stent which has been inserted into the artery becomes blocked later on. This is called restenosis. If this happens, it means that not enough blood can flow through the artery with the stent and this can cause the symptoms of angina to return. In people who have angioplasty with a bare metal stent, between 1 and 3 in every 10 will need further treatment for the artery with the stent within 6 months. The risk varies depending on:

- the size of the artery
- how narrow the artery has become, and
- the medical history of the person.

In most cases where the artery is average sized, the need for further treatment is closer to 1 in 10 than 3 in 10. Among people who have drug-eluting stents, no more than 1 in 10 will need further treatment for the artery containing the stent within 1 year.

After the angioplasty

After the angioplasty, a nurse will check your blood pressure and heart rate regularly for four to eight hours. The nurse will also check the place where the catheter was inserted (the 'puncture site'), and the pulses in your feet or arm.

If the puncture site was in your groin, you will have to stay in bed lying on your back for a few hours after the operation. If the puncture site was in your arm, you may be able to sit up.

The introducer sheath (the device through which the catheter was passed into your artery) is usually removed several hours later, when the anticoagulant drugs (blood-thinning drugs) used at the time of the angioplasty have worn off. (This is

to help avoid bleeding when the sheath is taken out.) The nurse or doctor will put pressure on the puncture site for about 20 minutes or until there is no bleeding. Sometimes 'collagen plugs' are used to close the hole in the artery so that the sheath can be removed immediately after the angioplasty.

You should not get chest pain after the angioplasty. However, if you do get chest pain, tell the nurse or doctor immediately. They will arrange for you to have an ECG and a blood test to find out if the pain is related to your heart.

Going home

Most people can go home the day after the angioplasty. Or, if your angioplasty was done as a day case, you can go home on the same day. When you are making your plans for going home, arrange for someone to take you and, if possible, to stay the first night at home with you. If you have had an angioplasty as an emergency procedure to treat acute coronary syndrome, how long you will need to stay in hospital after the angioplasty will depend on how quickly you recover.

Before you leave the hospital the doctor or nurse will tell you what you can and cannot do when you get home. They will tell you about what drugs you

need to take and about your follow-up appointment. They will also offer advice on how you can improve your diet and lifestyle once you get home.

For the first few days after you get home, check your puncture site. You can expect to have some bruising, but if there is any redness, if you have swelling, or if the bruising is very widespread, contact your GP (family doctor) or the hospital doctor.

It is best to avoid doing any demanding activities, like heavy lifting, for at least a week. If your GP says it's OK, you should gradually increase your activity. However, if you get chest pain when you are being active, avoid further exercise and tell your GP about the pain immediately.

Cardiac rehabilitation programme

Some hospitals now invite people who have had an angioplasty to go to a cardiac rehabilitation programme. Ask your hospital's cardiac rehabilitation team if they do this. The programme includes exercises and advice on lifestyle including healthy eating and relaxation techniques. For more information on these programmes, see page 34.

Driving

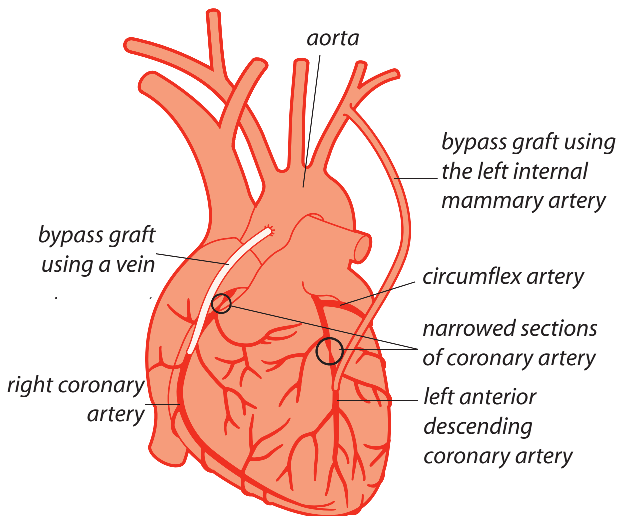
If you have an ordinary driving licence, you should not drive in the first week after having your angioplasty.

If you have an LGV (large goods vehicle) or PCV (passenger-carrying vehicle) licence, you should not drive for at least six weeks after your angioplasty and you will need to have further tests before you can drive an LGV or PCV again.

Coronary bypass surgery

The aim of coronary bypass surgery is to bypass (get around) the narrowed sections of coronary arteries. The heart surgeon does this by grafting a blood vessel between the aorta (the main artery leaving the heart) and a point in the coronary artery beyond the narrowed or blocked area (see the illustration below).

Coronary bypass surgery



Doctors can carry out a bypass graft for each of the main coronary arteries affected. Most people have three, four or sometimes more grafts as the surgeon tries to do as thorough a job as possible to make sure that the operation lasts. In most cases at least one of the blood vessels used for the grafts is made using an artery from inside the chest called the internal mammary artery. (The left and right internal mammary arteries supply blood to the breastbones but this area does also have other sources of blood supply.) The internal mammary artery is less likely to narrow over time than a vein graft. Blood vessels from other parts of the body are used for the other grafts – usually from the leg or an artery in the arm, or both.

The traditional way of doing coronary bypass surgery is for the surgeon to make an incision (a cut) down the middle of the breastbone. However, some surgeons are now operating through smaller wounds (see page 23).

In most cases, the surgeon uses a heart-lung bypass machine to circulate blood around the body while operating on the heart. While the heart-lung bypass machine is doing the work of

your heart and lungs, the surgeon can temporarily stop your heart with potassium, or stop its rhythmical beating electrically. The heart starts to beat again as soon as the blood supply is restored. (Some surgeons carry out coronary bypass surgery without using a heart-lung bypass machine. This is called 'beating-heart surgery'. For more information on this, see page 24.)

After the operation, you will have a scar down the length of your breastbone. You are bound to feel discomfort in your chest immediately after surgery, but this usually eases off over the next few weeks. If a vein has been removed from your leg, you will also have some discomfort and swelling there. Most people are sitting out of bed a day or two after the operation, and return home in about a week. (For more information on what happens after the coronary bypass surgery, see page 32.)

How successful is the operation?

Most people who have a bypass operation find that they get excellent relief from their angina after the operation. However, the bypass operation does not affect the cause of atheroma. So your angina may return if the atheroma builds up inside the graft. This is more likely to happen if you carry on smoking, or don't control your blood pressure or

cholesterol. Up to 4 in every 100 people who have had coronary bypass surgery will need to have another bypass operation or a coronary angioplasty within a year. (For information on angioplasty, see page 7.) If the angina does come back, you will probably need to have another coronary angiogram and, depending on the results, you may be advised to take medicines, or have an angioplasty or another heart operation.

Over 28,000 patients have coronary artery bypass surgery in the UK each year. The risk of death or any serious complication following bypass surgery varies from one person to another. About 2 in every 100 people die in hospital after having coronary bypass surgery for the first time. On average, 2 in every 100 people have a stroke in hospital either during or after the operation. When assessing your risk your surgeon will consider:

- your age and sex
- whether or not you have had a stroke or a heart attack in the past
- whether you have high blood pressure, diabetes, kidney damage, lung problems, or any significant problems to the circulation to your legs, and
- the overall condition of your heart.

New techniques for coronary bypass surgery

Within the last five years, new techniques for carrying out coronary bypass surgery have been developed. These techniques are not available in every hospital and more research is needed before they will replace traditional methods used in coronary bypass surgery.

Findings so far suggest that people who have surgery using these new techniques make a quicker recovery, have fewer complications such as bleeding, pain and breathing problems, and can return to work and other activities earlier than those who have conventional surgery. The new techniques include 'minimally invasive surgery' and 'beating-heart surgery'. You would need a general anaesthetic for both these techniques.

Minimally invasive surgery

Minimally invasive surgery is surgery that is done through a smaller wound than usual. It can be done either with or without a heart-lung bypass machine. When the surgeon makes a smaller wound than usual, not as much of the heart will be exposed and this can make it difficult to carry out the surgery. There are two ways of carrying out minimally invasive surgery.

- 'PortCab' or 'port-access' coronary artery bypass surgery. This involves using a series of small holes or 'ports' in the chest. The heart is stopped so a heart-lung bypass machine is used.
- 'Midcab' or 'minimally invasive direct access coronary artery bypass surgery'. This involves a combination of ports and a small wound directly over the artery which is going to be bypassed. The heart is not stopped, so the heart-lung bypass machine is not used.

Beating-heart surgery

This is surgery that does not need the heart to be stopped, and so avoids the need for a heart-lung bypass machine. It involves using special equipment to keep one part of the heart still, to allow the surgeon to operate on it. Beating-heart surgery is done through a wound along the breastbone.

With both minimally invasive surgery and beating-heart surgery it is always possible that complications may happen during the operation, so a heart-lung bypass machine is always on standby.

The information given on the right about the risks involved in coronary angioplasty with a stent and in coronary bypass surgery is for planned procedures to treat angina. The risks are higher if the procedures are carried out to save a life soon after a heart attack, or if they are done urgently in patients whose angina is very unstable.

Coronary

What sort of anaesthetic is used?

How long do you need to stay in hospital afterwards?

How soon can you return to work?

What are the risks of having the angioplasty or bypass surgery?

How many people need to have coronary angioplasty or coronary bypass surgery again?

angioplasty or coronary bypass surgery?

Coronary angioplasty with a stent	Coronary bypass surgery
Local anaesthetic	General anaesthetic
1 to 2 days	6 to 10 days
After 5 to 7 days	After 2 to 3 months
Fewer than 5 in every 1,000 people die in hospital after having a coronary angioplasty.	About 20 in every 1,000 people die in hospital after having coronary artery bypass surgery for the first time. On average 2 in every 100 people have a stroke in hospital either during or after the operation.
Between 10 and 30 in every 100 people who have angioplasty with a stent will need further treatment for the stented artery within 6 months. The risk varies depending on the size of the artery, and the medical history of the person.	Up to 4 in every 100 people who have had coronary bypass surgery will need to have either another bypass operation or a coronary angioplasty within a year.

Coronary angioplasty or coronary bypass surgery?

Your coronary angiogram may show that nothing needs to be done. However, if it shows that your angina is caused by one or more blockages or narrowings in the coronary arteries, your specialist will decide whether:

- your coronary arteries can be improved by an angioplasty, or
- coronary bypass surgery is the best solution, or
- either treatment can be used in your case.

If you are suitable for either angioplasty or bypass surgery, you can be offered a choice. There are advantages and disadvantages to both procedures, and in the end it is your decision. You can see what the main differences are in the box on the next page. Angioplasty avoids the need for a major operation. However, people who have an angioplasty may be more likely to get angina again than people who have bypass surgery, so they may be more likely to need further treatment or heart surgery later.

Other treatments

The following are some forms of treatments which are used only occasionally, and some treatments which are being developed.

Rotablation

Also called **rotational atherectomy**

Rotablation is another method of improving the blood flow to the coronary arteries but it is only used occasionally. An instrument called a 'rotablator' – a tiny revolving drill – is attached to the end of a special catheter. The catheter is inserted in the same way as for a normal angioplasty (see page 9). When it reaches the blocked area, the rotablator revolves at a high speed and cuts tiny pieces of fatty deposits from the lining of the artery. It does not damage the artery lining. The tiny pieces of fatty deposits travel away safely from the area in the blood stream.

If you are being considered for a rotablation procedure, it is important that you are also suitable for bypass surgery. This is because there is a small danger that the artery wall can split during the procedure. If this happened, you would need an emergency bypass operation to repair it.

This treatment is only performed at a few centres in the UK. It is particularly useful for treating vessels which are difficult to reach, and it may also be useful for treating grafts which were done during a bypass operation and which have become narrowed again. Researchers are still trying to find out whether this new method has definite advantages over angioplasty with stenting. In most cases balloon angioplasty with a stent is the treatment most doctors choose.

Transmyocardial revascularisation

Also called **TMR**

Transmyocardial revascularisation (TMR) is a procedure used to relieve severe angina in people who are not suitable for bypass surgery or angioplasty. The surgeon makes a small wound in the chest so that they can see the heart, and uses a laser to drill a number of holes from the outside of the heart into the heart's pumping chamber. It is thought that the laser treatment may stimulate new blood vessels to grow. It may also destroy the nerve fibres to the heart – which means that you wouldn't be able to feel chest pain or angina any more. A very small number of patients may be able to have TMR at the same time as they have a bypass operation. In these cases, the wound along

the breastbone is used. There have also been a few cases where the procedure was done using a catheter which is placed under the skin and then threaded up to the heart. This is called percutaneous transmyocardial revascularisation or PTMR.

TMR is most likely to be used for people:

- who are considered to be at high risk of developing complications after a second bypass or angioplasty
- whose blockages are too severe to be treated with bypass alone, or
- who have had a heart transplant and who develop atherosclerosis (narrowing to their coronary arteries).

Although research has shown that transmyocardial revascularisation improves symptoms in the short term, there is not enough evidence to prove it is effective in the long term. The procedure is not available in every hospital in the UK and it is not carried out very often.

Gene therapy

Gene therapy is a new approach that may be able to treat or help prevent disease by delivering genes to help repair cells or tissue. Gene therapy can

target the cells of a specific part of the body, or it can act more generally. It is still in its early stages and many treatments are still being researched and evaluated before they can be used more widely. In future, it may be possible to use gene therapy for conditions which affect the blood vessels and circulation. For example, it may be possible to use gene therapy to help grow new blood vessels or muscle cells in the heart after a heart attack, to prevent the arteries from becoming narrow again after an angioplasty or after coronary bypass surgery, or to prevent clots from forming in the arteries.

Managing pain

If you have chronic angina and are not suitable for angioplasty or bypass surgery, your doctor may refer you to a pain specialist to manage your pain.

What happens after coronary bypass surgery?

Convalescence

After bypass surgery, many people find that they have a mixture of emotions – happy to be home again, but at the same time feeling anxious and perhaps afraid. So we recommend that somebody is with you at home for the first week or two. If you live alone, arrangements could be made for extra care during the early days. For example, it may be possible to arrange for a district nurse to visit you from time to time. Your hospital or GP might be able to arrange this.

As soon as you get home, you or your family should let your GP know that you are out of hospital, so that he or she can give you the care you need.

It takes most people about two to three months to recover fully after the operation. Obviously, the recovery time varies greatly depending on how severe your heart disease is and how old you are. For the first three to six months you are likely to feel very tired, especially at the end of the day. This should gradually improve over 12 to 18 months.

Pain

The breastbone that was split for the operation takes many weeks to heal. During this time, you may often feel pain in your muscles, especially in the centre of your chest, and in your neck, back and arms. This is part of the normal healing process and you don't need to worry about it.

If a vein was removed from your leg for the bypass graft, your leg may also feel uncomfortable. Many people feel a numbness or pins and needles around the scar on their legs. This is quite usual and you don't need to worry about it. You may also have some swelling in your leg. It will help if you wear an elastic support stocking and keep your leg raised when sitting down for the first few weeks at home.

Emotional reactions

Quite a few people feel depressed a few days after the operation. This is a natural reaction to the considerable stress and upheaval of major heart surgery. You may also be understandably anxious, and worry that you are not making good progress. If you feel anxious or depressed, contact your GP, who may be able to help or reassure you.

Memory and concentration

Some people have problems with their attention span, concentration and short-term memory loss after having coronary artery bypass surgery. This problem affects quite a lot of people but it usually improves within six months.

Cardiac rehabilitation programme

All hospitals should invite patients who have had bypass surgery to a cardiac rehabilitation programme, usually starting about four to six weeks after heart surgery. The programme includes exercise sessions and advice on lifestyle including healthy eating and relaxation techniques. It usually involves going once or twice a week for about six to eight weeks. Or, you may be able to do a rehabilitation programme at home. The aim of cardiac rehabilitation is to get you back to as full a life as possible. Once the programme is over you may want to join a heart support group. This will give you and your partner or family the chance to meet and talk to people who have gone through similar experiences.

For more information on rehabilitation programmes and heart support groups see our booklet *Having heart surgery*.

Sex

Most doctors suggest waiting about four weeks after the operation before having sex again. You will need to find a position which is comfortable for you. Remember – do not put pressure on your chest wound or restrict your breathing.

How soon can I go back to work?

Many people return to work after bypass surgery. How soon you can return depends on the kind of work you do. People who do non-manual work can usually go back to work any time from around two months after the operation. If you have a heavy, manual job you may not be able to return to work for at least three months after the surgery. Your body will need this time for the muscles, bones and joints of the chest wall to heal completely.

Driving

If you have an ordinary driving licence, you don't need to contact the DVLA (Driver and Vehicle Licensing Agency) after bypass surgery. However, you should not drive for at least four weeks after your bypass operation.

If you have an LGV (large goods vehicle) or PCV (passenger-carrying vehicle) licence, you should not drive for at least six weeks after bypass surgery. You must let the DVLA know about your operation. Before you can get your licence back, you will need to have a satisfactory exercise test result.

If you have had bypass surgery, you should contact your car insurance company to let them know. If you have any problem with continuing your insurance policy, the British Heart Foundation can send you a list of insurance companies who are 'sympathetic' to heart patients (address on back cover).

What can I do to help myself?

This booklet has explained what other people will do to make sure your bypass operation or angioplasty is successful and that you have a smooth and happy recovery period. There is also a lot you can do, both before and after your treatment, to help yourself. Remember that angioplasty and bypass surgery do not cure the atherosclerosis (the build-up of fatty material) in your arteries. They are ways of improving the blood flow to the heart in spite of the disease. Heart disease can get worse over time, so it is very important to do everything you can to help your heart and arteries.

If you smoke, give up smoking

Your doctors cannot overemphasise the fact that smoking is bad for you, and is particularly bad for your heart. See our booklet *Smoking and your heart*. Or call QUITLINE® on 0800 002200. This phone helpline offers practical help for those who want to give up smoking.

Watch your weight

If you are overweight when you are referred for heart surgery, your doctor will give you advice on healthy eating and on how to lose weight before

the operation. Overweight people have a higher risk of complications than those people who are not overweight.

Watch your cholesterol level

Your doctor will check your cholesterol level and give you advice on how to eat well to keep it within normal limits. You may also be given medicines to lower your cholesterol level. For more information, see our booklet *Reducing your blood cholesterol*.

Be positive

Try to be confident and positive, especially when you come into hospital for the operation. For more information, see our booklet *Having heart surgery*.

Keep physically active

Try to keep physically active. Choose activities that you know you will enjoy and do regularly. Don't try to push yourself too hard. You can ask your doctor or consultant about how much activity you should be doing. For more information, see our booklet *Physical activity and your heart*.

For more information

British Heart Foundation website

bhf.org.uk
For up-to-date information on the BHF and its services.

Heart Information Line • 08450 70 80 70

(A local rate number.)
A helpline service for the public and health professionals, providing information on a wide range of issues relating to heart conditions.

Publications and videos

The British Heart Foundation (BHF) also produces other educational materials that may interest you. To find out about these or to order your **Publications and videos catalogue**, please go to **bhf.org.uk/publications**, call the **BHF Orderline on 01604 640 016** or e-mail **orderline@bhf.org.uk**
You can download many of our publications from **bhf.org.uk/publications**

Our publications are free of charge, but we would welcome a donation.

Heart Information Series

This booklet is one of the booklets in the *Heart Information Series*. The other titles in the series are as follows.

1 Physical activity and your heart
2 Smoking and your heart
3 Reducing your blood cholesterol
4 Blood pressure
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Better than before – Life after heart surgery

Heart health magazine

Heart health is a free magazine, produced by the British Heart Foundation especially for people with heart conditions. The magazine, which comes out four times a year, includes updates on treatment, medicines and research and looks at issues related to living with heart conditions, like healthy eating and physical activity. It also features articles on topics such as travel, insurance and benefits. To subscribe to this **free** magazine, call **01604 640 016**.

For more information on coronary angioplasty

Coronary artery stents. Understanding NICE guidance – information for people with heart disease, their families and carers, and the public
Published by the National Institute for Clinical Excellence (NICE). Available from www.nice.org.uk

Heartstart UK

For information about a free, two-hour course in emergency life-support skills, contact Heartstart UK at the British Heart Foundation. The course teaches you to:

- recognise the warning signs of a heart attack
- help someone who is choking or bleeding
- deal with someone who is unconscious
- know what to do if someone collapses, and
- perform cardiopulmonary resuscitation (CPR) if someone has stopped breathing and his or her heart has stopped beating.

For more information on statistics quoted in this booklet

Statement	Where you can find out more about this
Page 7 About 45,000 angioplasties are now done each year in the UK. **Page 7** Three out of every 10 people who have a coronary angiogram go on to have an angioplasty. **Page 13** In at least 9 out of 10 coronary angioplasties, the blood flow through the treated artery is improved. **Page 14** Urgent surgery is needed in no more than 5 in every 1,000 cases [of coronary angioplasty].	From: BCIS *Audit Returns of Interventional Procedures 2002*. Accessed from the website of the British Cardiovascular Intervention Society: www.bcis.org.uk
Page 14 In people who have angioplasty with a bare metal stent, between 1 and 3 in every 10 will need further	From: 'Clinical review: New approaches to preventing restenosis', by B Bhargava, G Karthikeyon et al. Published in

treatment for the artery with the stent within 6 months. The risk varies depending on the size of the artery, how narrow the artery has become, and the medical history of the person.	2003, in the *British Medical Journal*, volume 327, pages 274-279; and 'Coronary disease: Intervention in coronary artery disease', by S Windecker and B Meier. Published in 2000, in *Heart*, volume 83, pages 481-490.
Page 15 In most cases [of angioplasty] where the artery is average sized, the need for further treatment is closer to 1 in 10 than 3 in 10.	From: *Guidance on the Use of Coronary Artery Stents. Technical Appraisal Guidance 71*. Published in 2003, by the National Institute for Clinical Excellence.
Page 15 Among people who have drug-eluting stents, no more than 1 in 10 will need further treatment for the artery containing the stent within 1 year.	From: 'A polymer-based, paclitaxel-eluting stent in patients with coronary artery disease' by GW Stone et al. Published in 2004 in the *New England Journal of Medicine*, volume 350, pages 221-231; and 'Sirolimus-eluting stents for treatment of patients with long atherosclerotic lesions in small coronary arteries: double-blind, randomised controlled trial (E-SIRIUS)', by J Schofer et al. Published in

	2003 in *The Lancet*, volume 362, pages 1093-1099; and 'Randomised study to assess the effectiveness of slow- and moderate-release polymer-based paclitaxel-eluting stents for coronary artery lesions', by A Colombo et al. Published in 2003 in *Circulation,* volume 108, pages 788-794.
Page 21 Most people who have a bypass operation find that they get excellent relief from their angina after the operation.	From: *Patient Information: Coronary Artery Bypass Grafting*. Accessed from the website of the Society of Cardiothoracic Surgeons of Great Britain and Ireland at http://www.sts.org/doc/3706
Page 21 Up to 4 in every 100 people who have had coronary bypass surgery will need to have another bypass operation or a coronary angioplasty within a year.	From: 'Coronary artery bypass surgery versus percutaneous coronary intervention with stent implantation in patients with multivessel coronary artery disease (the Stent or Surgery trial): a randomized controlled trial', by the SoS Investigators. Published in 2002, in *The Lancet*, volume 360, pages 965-970.

Page 22 Over 28,000 patients have coronary artery bypass surgery in the UK each year.	From: *National Adult Cardiac Surgical Database Report*. Published by the Society of Cardiothoracic Surgeons of Great Britain and Ireland in 1999. www.scts.org
Page 22 About 2 in every 100 people die in hospital after having coronary bypass surgery for the first time.	From the website of the Society of Cardiothoracic Surgeons of Great Britain and Ireland: www.scts.org/doc/6151
Page 22 On average, 2 in every 100 people have a stroke in hospital either during or after the [coronary bypass] operation.	From: 'Adverse events in coronary artery bypass graft (CABG) trials: a systematic review and analysis', by L Nalysnyk, K Fahrbach, MW Reynolds, SZ Zhao and S Ross. Published in 2003 in *Heart*, volume 89, pages 767-772.
Page 27 Fewer than 5 in every 1,000 people die in hospital after having a coronary angioplasty. *Details of the other statistics mentioned on page 27 are given above.*	From: *BCIS Audit Return: Adult Interventional Procedure 2002.* Accessed from: www.bcis.org.uk

About the British Heart Foundation

The British Heart Foundation (BHF) is the leading national charity fighting heart and circulatory disease – the UK's biggest killer. The BHF funds research, education and life-saving equipment and helps heart patients return to a full and active way of life.

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Notes

Notes

Technical terms

acute coronary syndrome	When someone has a chest pain, it is sometimes difficult for the doctor to tell whether the person is suffering from unstable angina or having a heart attack. 'Acute coronary syndrome' is the term used when this happens.
angina	Heaviness or tightness in the centre of the chest.
angiogram	See 'coronary angiogram'.
angioplasty	See 'coronary angioplasty'.
anti-platelet therapy	Medication to stop the blood clotting.
atheroma	Fatty material that can build up within the walls of the arteries.
balloon angioplasty	See 'coronary angioplasty'.
bypass surgery	See 'coronary bypass surgery'.
cardiac catheterisation	A test to assess the condition of the heart.
catheter	A fine, flexible, hollow tube.
catheterisation	See 'cardiac catheterisation'.
coronary angiogram	An X-ray picture of the heart.
coronary angioplasty	A treatment to improve the blood supply to the heart muscle.
coronary bypass surgery	An operation to bypass a narrowed section, or sections, of a coronary artery and improve the blood supply to the heart.

coronary heart disease	When the walls of the arteries become narrowed by a gradual build-up of fatty material called atheroma.
restenosis	When an artery gets blocked again after treatment.
revascularisation	A procedure that either opens up the blood vessels or encourages new ones to form.
rotablation	A treatment to improve the blood supply to the heart muscle.
stent	A short tube of mesh used to support an artery.
transmyocardial revascularisation	A treatment to improve the blood supply to the heart muscle.
unstable angina	Angina that comes on with less and less physical activity, or even while the person is resting.

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Your comments please

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Acknowledgements
The British Heart Foundation would like to thank all the GPs, cardiologists and nurses who helped to develop the booklets in the *Heart Information Series*, and to all the patients who commented on the text and design.

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