

RENAL RESOURCE CENTRE



An Introduction to
Haemodialysis

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Fresenius Medical Care

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An Introduction to Haemodialysis

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Normal Kidney Function

The kidneys are two vital organs, located in the back of the abdominal cavity on either side of the spine, slightly above the small of the back. Each kidney is bean shaped, weighs approximately 150 grams and measures 11cm x 6cm (the size of a clenched fist). Each kidney is composed of about a million minute filters, which remove waste products and excess fluid from the blood.

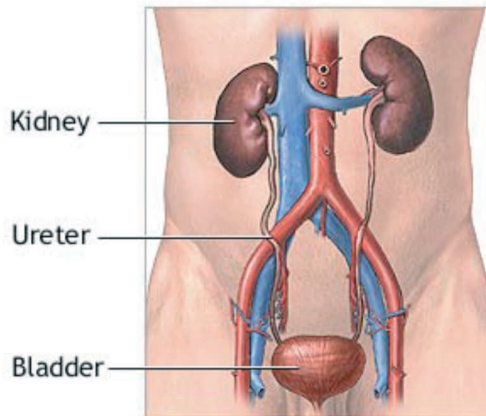
The major function of the kidneys is to control the fluid and chemical balance of the body. In addition, the kidneys produce and regulate 3 main hormones:

(1) ERYTHROPOIETIN: Stimulates the bone marrow to produce red blood cells.

A decrease in red blood cell production may lead to anaemia.

(2) RENIN: Assists to control blood pressure.

(3) ACTIVE VITAMIN D: Stimulates the absorption of calcium from the blood into the bones to keep them strong.



The kidneys help maintain the chemical and fluid balance in the body. The kidneys are located in the back of the abdominal cavity, on either side of the backbone, slightly above the small of the back.

Chronic Kidney Disease and Kidney Failure

When the kidneys cease to function normally, resulting in a build up of waste products (toxins) and fluid in the body, the kidneys are said to be “failing”. Kidney or renal failure may be acute or chronic.

Acute Kidney Injury

Acute kidney injury may occur following severe blood loss, serious kidney infection and various types of kidney disease. The kidneys suddenly cease to function but usually recover with treatment.

Chronic Kidney Disease

Chronic renal failure means that kidney tissue has been destroyed gradually over a long period of time - usually months or years. Many people are unaware of the problem until more than 70% of kidney function has been lost. The aim of early detection of kidney disease and treatment (diet and medication) is to prevent or slow down progression of the disease. However, in some cases, the progression to end stage renal failure, when dialysis or transplantation is necessary, is not preventable.

The most common causes of end stage renal failure in Australian today are diabetes mellitus, glomerulonephritis, hypertension and polycystic kidney disease.

End Stage Kidney Disease

End stage renal failure occurs when the kidneys can no longer function adequately and survival depends on either dialysis or transplantation. You have probably reached or are approaching this stage of kidney disease and your present treatment is aimed at easing the load on your damaged kidneys and minimising the accumulation of waste products in your body.

Causes Of Chronic Kidney Disease

- **Glomerulonephritis:** Inflammation of the kidney.
- **Diabetes Mellitus:** Damage to the small blood vessels of the kidneys.
- **Polycystic Kidney Disease:** Kidney tissue destroyed by cysts.
- **Reflux Nephropathy:** Backward flow of urine causing kidney damage.
- **Hypertension:** High blood pressure.
- **Gout:** Excess uric acid in the blood.

- **Connective Tissue Disorders:** Lupus Nephritis, Polyarteritis Nodosa, Scleroderma.
- **Congenital and Hereditary Abnormalities**
- **Stones and Other Obstructions**
- **Analgesic Nephropathy:** Kidney damage due to excessive intake of pain killing tablets or powders.

Symptoms you may be experiencing at the moment

- Retention of fluid causing breathlessness and swelling
- Tiredness
- Headaches
- Poor memory and concentration
- Irritability
- Sleep disturbances
- Feeling washed out
- Itchiness
- Nausea and loss of appetite
- Weight loss
- Altered sexual function

You will require dialysis when these symptoms are no longer effectively controlled by your present treatment. Following the commencement of dialysis, you will notice a marked improvement in your health, as many of these symptoms are minimised or completely resolved.

The Functions of the Kidneys



Regulation of red blood cell production



Regulation of the blood's acid-base balance



Regulation of blood pressure



Regulation of mineral levels



Elimination of metabolic toxins and excess water through urine

Dialysis

Dialysis is the process of cleansing or filtering the blood and removing excess fluids.

The filter used to cleanse the blood in dialysis treatment is a semi-permeable membrane, i.e. a thin material with holes large enough to let small particles (up to a particular size) through but small enough to retain large particles.

The body's excess water and waste products filter from the blood across the membrane and are washed away by the dialysis solution. Large particles, such as blood cells and proteins, stay behind in the blood where they continue to do their work.

There are two methods of dialysis treatment: **Haemodialysis** and **Peritoneal Dialysis**

Both haemodialysis and peritoneal dialysis work equally well when treatment is undertaken as prescribed and when people take good care of themselves. If you are medically a candidate for either type of dialysis treatment, it is best to select a treatment based on your lifestyle, daily schedule, activities and personal preference. Many factors such as age, where you live, medical condition and support system will influence the decision. If you find that the treatment chosen as your first option does not really suit you, it may be possible to change to another form of dialysis. You are not necessarily permanently committed to one form of dialysis. It is also sometimes medically necessary to change over from one form of dialysis to another. You may wish to discuss the likelihood of this with your renal physician.

Peritoneal Dialysis

In Australia, approximately 25% of patients use some form of peritoneal dialysis.

Peritoneal dialysis works inside the body using the *Peritoneal Membrane* as the semi-permeable membrane through which the blood can be filtered. Peritoneal dialysis is performed daily in the home.

Haemodialysis

In Australia, approximately, 75% of all patients use haemodialysis. In haemodialysis, the blood is circulated and cleansed outside the body via a haemodialysis machine. The blood circulates through an artificial kidney, where it is cleansed of wastes and excess fluid. Each treatment generally lasts about five to six hours and is performed at least three times per week.

If desired and recommended by your physician, overnight and more frequent dialysis at home is also possible.



Home Haemodialysis

Haemodialysis Treatment Location

Haemodialysis can be performed in the home, in a satellite or self-care unit or in a hospital renal unit.

Hospital and Satellite Dialysis

Hospital renal units are especially suitable for the frail elderly or for those people with other medical conditions. Dialysis in a satellite or self-care unit (a unit where people look after their own dialysis with nursing supervision) allows for greater independence and is suitable for those who want to manage their own dialysis but who, for various reasons, cannot manage dialysis at home.

Home Haemodialysis

The greatest haemodialysis flexibility is available at home. This also means greater involvement in your treatment and possibly greater involvement of your partner and family.

Dialysis can be scheduled to fit into your lifestyle rather than your trying to fit your life around fixed dialysis schedules at a hospital or self-care unit. Dialysing in the comfort of one's own home has much to recommend it, most of all, minimising the time spent in hospital and the time spent travelling to and from hospital. For most people considering home haemodialysis, the greatest hurdle is overcoming their fear of needles and self-cannulation. With good training, confidence building and the discovery that this is a pain-free procedure, these fears can very successfully be overcome.

Most people dialyse with the help of a partner (usually a spouse or a parent). However, in recent years, an increasing number of people are choosing to dialyse solo at home, as an alternative to attending a self-care or satellite unit. These people either live alone or choose, for a variety of reasons, to dialyse without the help of their partner. In addition, many others are choosing nocturnal haemodialysis. This is performed overnight at home, where each treatment is of about eight hours duration. Nocturnal dialysis results in improved feelings of well-being, fewer medications and dietary restrictions and reduced intrusion into daily life. Many home patients are now choosing this form of dialysis. At present, such treatment is not usually available in hospital.

Your renal physician, social worker and nursing staff will be available to discuss your dialysis preferences and help you to decided upon the most suitable treatment for you.

Haemodialysis Treatment Schedules

Renal Unit Schedules

For those who are working, every effort is made by renal unit staff to schedule your treatments to fit in with your hours of work. However, this is often difficult to achieve for full-time employees, as most dialysis centres do not operate an overnight shift. Many operate on Saturdays. Most shifts start at either 7.00am or 2.00pm. It is obviously easier to accommodate the demands of full-time work when dialysis is carried out at home, either after arriving home or overnight.

Home Dialysis Schedules

The frequency and duration of treatments will be decided in consultation with your physician and nursing staff. You may dialyse daily, second daily, overnight or during the day. It is not necessary to dialyse at exactly the same times each session. It is important simply to spread your dialysis treatments evenly throughout the week. Be as flexible as possible, so that you fit your dialysis schedule into your lifestyle and not the other way around. Finding what works best for you may take some trial and error and time.

It is important to note that if dialysing at home, an extra hour or so should be factored in for setting up the machine before dialysis and cleaning up after dialysis.

Transport to Hospital or Satellite Dialysis

It is important to note that a great deal of time can be consumed by travelling to and from the dialysis unit three times per week. For those living some distance from the hospital or satellite unit, many hours can be spent travelling per week, which can be exhausting and frustrating. For those unable to provide their own transport or use public transport, ambulance or community transport may be available. If problems with transport to and from dialysis are expected, discuss these with the renal unit social worker or a member of the nursing staff.



Satellite
Haemodialysis

Dialysis Access

As haemodialysis requires access to the circulation, a minor procedure, requiring a day or overnight hospital stay is necessary to create an arterio-venous fistula. The surgery simply joins, near the wrist, the radial artery in the forearm to a vein in the forearm, so that the vein increases in size, is easy to access and also has an increased blood flow. After creation of the fistula, you will feel a buzzing sensation over it. This is simply due to the flow of blood from the artery into the vein and is a sign that the fistula is working well.

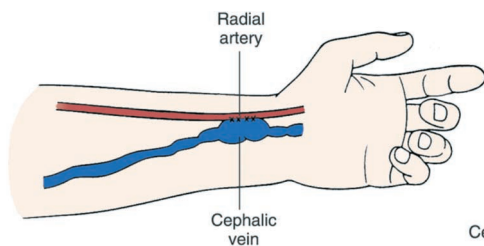
Using this fistula during haemodialysis allows blood to be taken from the body through the artificial kidney or dialyser and returned to the body. It usually takes about 6 weeks before the fistula has matured and can be used for haemodialysis.

Sometimes, the surgeon will recommend a vein graft or artificial graft for dialysis access. The type of access recommended will depend upon a number of factors and the most efficient and reliable will be created for you.

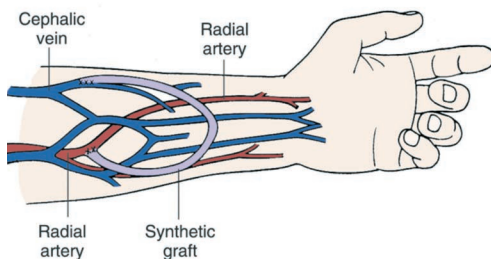
If an artificial graft is recommended, synthetic, bio-compatible material can be used to make a connection between the artery and vein (either in the patient's arm or thigh). The vascular surgeon will recommend the most suitable for you and discuss your preference for the location of the graft.

If dialysis is necessary before the fistula or graft is ready, then the surgeon can create a temporary access, in the form of a central line catheter. These are soft tubes which are placed into the veins on the side of the neck or the upper chest. They can be placed under local anaesthetic and can be used for days or weeks. Of course, most people would prefer to avoid this type of access, making the timely creation of a permanent access a priority.

Arterio-Venous Fistula



Artificial Graft



Above left: a diagram of a fistula, where a vein and artery are joined to be used as access for taking and returning blood from the dialyser. Above right: a diagram of an artificial graft, where a tube, made of synthetic or artificial material, is sewn into place, joining an artery to a vein.

Cannulation

Cannulation refers to the process of using two special needles or cannulas to access your circulation, thus allowing the process of dialysis to take place. Without access to your blood, dialysis is not possible. Most people are anxious about the insertion of the cannulas but this procedure can be performed without any major discomfort. In time, the fear of cannulation diminishes and many patients prefer to cannulate themselves, entirely without nursing assistance.

So, before the commencement of each haemodialysis treatment, a local anaesthetic numbs the area of the arm or leg, where two needles, called cannulas are inserted into the vein to allow the circulation of blood through the dialyser or artificial kidney. One cannula allows for the withdrawal of blood to the dialyser and the other cannula is for the return of the cleansed blood to the body. Most people have an instinctive fear of needles and it is quite normal to be anxious about this.

In the case of patients who elect to dialyse at home, it is expected that they will initially be quite worried about learning how to do this. However, as the procedure is not at all painful, with time and practice, people eventually overcome that fear and anxiety and learn to insert the needles themselves. Most prefer to perform their own cannulation, even when visiting other renal units during holidays.

How Does Haemodialysis Work?

Haemodialysis works by separating two solutions of different concentrations (blood and dialysis solution) by a semi-permeable membrane (the dialyser). Dialysis is a Greek word meaning disintegration and in a sense that is what happens to the particles in the blood during dialysis, where substances that are no longer needed by the body are removed during dialysis.

Diffusion and ultrafiltration are the key components of dialysis treatment. By the process of diffusion, dissolved substances in a solution of high concentration (blood) pass to a solution of low concentration (dialysis solution) through a semi-permeable membrane. By 1960, treatment for acute, reversible renal failure by temporary dialysis was routine in many centres around the world.

During haemodialysis, blood flows continuously through the dialyser and fresh dialysis solution (salts to which water is added) passes continuously on the other side of the dialyser membranes, so that the waste substances pass through the membrane and are washed away down the drain.

Most dialysers remove excess water from the blood by a form of suction, called ultrafiltration. This involves the passage of water and its dissolved salts across the membrane by creating a pressure gradient across the membrane.

The medical and nursing staff caring for you will determine how much fluid needs to be removed during each treatment. This information can be programmed into the machine.

The machine is also equipped with a blood pump and monitoring system to ensure safety. Drugs such as Heparin and Clexane are used during dialysis to prevent the blood from clotting.

What Can I Do During Dialysis?

If you choose to dialyse during the day, then you will probably dialyse in a recliner chair. Unfortunately, it is not possible to walk around during dialysis but it is certainly possible to read, study, watch television, listen to music, chat or snooze. There is no discomfort during dialysis and the hardest part is being chairbound and finding interesting things to pass the time. An increasing number of people now choose to dialyse overnight, while they sleep.



Haemodialysis Costs

Public and Private Hospitals

Haemodialysis is available in Australian public hospitals and some private hospitals and clinics. Renal units in metropolitan areas tend to be located within university teaching hospitals. Satellite units are sometimes located away from the main hospital campus in a cottage or freestanding clinic or, in the case of rural units, at the local hospital.

Medicare covers haemodialysis treatment in public hospital or satellite units, while private health insurance covers private hospital or private satellite treatment. Always check the level of coverage provided by your private health insurer.

Home Haemodialysis

The costs associated with home haemodialysis are borne by government. Dialysis machines, fluids, disposables (blood lines, dialysers, cannulas) and water treatment equipment are supplied at no charge to patients. It is of course extremely important that all this equipment be maintained and safely stored to avoid any damage or waste. Depending on local state health department arrangements, you may be required to provide some items to assist you to perform your treatment at home. For instance, you may be asked to purchase a recliner chair and a set of digital bathroom scales. You may also be required to meet the cost of the plumbing to connect your machine to the water supply and to drainage. In the case of public housing residents, plumbing may be arranged and paid for by the public housing authority.

To compensate for the extra water and power used during treatment, many local authorities provide rebates and concessions to dialysis patients.

There are differences between Australian State Health Departments in the administration of home dialysis programmes. Your renal unit will advise on what you need to purchase. Health Departments are increasingly assisting with the set-up costs associated with home haemodialysis.

Home Haemodialysis Education

The process of learning to undertake home haemodialysis takes on average 6-9 weeks. It will be provided by the home haemodialysis training unit affiliated to your renal unit. Whilst practices may vary between renal units, your dialysis partner will usually be invited to attend for the last week or so of your training. It is not usually necessary for them to attend for the full duration of your training.

Nursing staff will teach you how to perform every aspect of your treatment at home. Once home, you will be provided with on-call nursing and technical back-up and regular visits or contact from both nursing and technical staff thereafter. You will continue to see your renal physician and GP on a regular basis for the usual monitoring of your health.

For many years it was customary for dialysis patients to dialyse with a partner or helper. However, as dialysis technology and machine reliability has improved, many people now dialyse completely independently, without the assistance of a dialysis partner. Of course, this arrangement would not suit everyone. Your renal physician and renal nursing staff can discuss whether such treatment would be suitable for you.

Who is Suitable for Home Haemodialysis?

Your renal physician, social worker and nursing staff will discuss each of the dialysis modes and their suitability from both a medical and lifestyle perspective. Successful home dialysis relies on motivation, a stable and supportive family or network of friends, a desire to remain independent with direct control of one's treatment and a practical and commonsense approach to the process of treatment. It is also essential to be medically stable during haemodialysis treatment.

Nutritional Management

Commencement on haemodialysis will perhaps require some changes in your diet. It is usual to monitor the levels of potassium, phosphate and salt in your diet. The renal dietitian will discuss your individual dietary requirements and tailor a diet to suit you. These guidelines will form a vital part of your treatment programme and compliment dialysis in maintaining a healthy balance of your body's nutritional requirements and electrolytes.

Medications

Medications are a very important part of your treatment. Your medication requirements may change after commencement on haemodialysis and your physician will advise about these. The hormone erythropoietin is commonly prescribed to treat the anaemia often associated with renal failure. The development of this drug has been a major breakthrough in improving the health and quality of life of those with renal failure. Other medications are prescribed to protect the health of your bones and to control hypertension. Vitamins are also prescribed. Taking medications as prescribed is one of the best things you can do to maintain your good health.

Exercise

A regular programme of exercise or participation in a favourite sport is encouraged. It will enhance both your physical and mental well-being. Exercise has been found to improve haemoglobin levels in renal patients and thus, increase energy levels and stamina. Regular exercise will also help to maintain a healthy heart. Exercise also stimulates the release of endorphins, mood-lifting chemicals in your brain and so helps to fight depression and contributes to a positive outlook on life.

It is desirable that you continue to play your favourite sports or choice of exercise because it's a great way to stay fit and to maintain friendships and social outlets. You will feel energised and positive about your treatment and life in general if you maintain or commence a regular programme of exercise.

It is advisable before commencing a new exercise programme, to discuss its suitability with your physician.

Emotional Responses and Relationships

It is common when diagnosed with a chronic illness such as renal failure to feel angry, depressed and cheated. Eventually these feelings will resolve, especially if you take advantage of the professional staff available in the renal unit to assist you. The social worker is expert in these matters and can help you to decide which treatment will best suit your lifestyle and to help you and your family return to a balanced and satisfying life. The social worker is available to discuss the emotional and practical issues associated with your treatment with your partner and close family members.

It is common to feel that your family and friends don't really understand what it's like to have renal failure and undergo dialysis treatment. It is important to share your feelings and concerns with those close to you, whilst also realising that they may also be affected by your illness and treatment. The quality of your relationships depends very much on good communication.

Talk with the staff if you are experiencing difficulties in your relationships. Particularly when you commence dialysis, many personal and family adjustments need to be made and everyone close to you is coming to terms with their reactions to what has happened. Access to accurate information about what to expect and the opportunity to discuss the impact of treatment on your personal, work and social life with staff is invaluable in making the necessary adjustments and restoring the balance in your life. Make sure to attend any educational sessions offered to you and your family.

It is not unusual to find that your sexual desires or activity have changed. The causes for people with renal failure are varied and the changes in sexual interest will occur at different times for different people and will vary in intensity.

Women may notice a decline in their sexual interest and some may stop menstruating. Men may have difficulty in achieving or maintaining an erection and their fertility may be reduced. If you experience these changes, talk it over with your partner so that it is clear that those changes are related to your illness. This may be difficult at first, but by talking through these changes and your feelings with your partner, you will find you have a good chance of resolving them and resuming a satisfactory physical relationship.

As your sense of well-being improves and you manage a level of adjustment to the changes that have occurred in your life, you may notice an improvement in your sexual desires. If difficulties persist, your renal physician can refer you to the appropriate specialist or counsellor. Sexual activity is perfectly safe. Just give yourself time to adjust to your treatment and to feel your well-being return.

Further information on this subject is available in a booklet available from the Renal Resource Centre.



Pregnancy and Contraception

Although women who dialyse can conceive, the chances of the pregnancy reaching full-term with a normal sized baby are low and so conception at this time is strongly discouraged. Men who dialyse can father children, so if a pregnancy is not desired, the most appropriate form of contraception should be discussed with your doctor. It is advised that pregnancy in a woman receiving dialysis treatment be postponed until at least two years after transplantation.

Being open and honest with your partner about your thoughts and feelings will help you to maintain and strengthen your relationship, resolving any difficulties as they occur.

Holidays

It is important to recognise that the routine of haemodialysis treatment can at times seem relentless, just like anything we must do on routine basis. It is useful therefore, to plan regular holidays for a change of scene and to provide a break from this routine for you, your dialysis partner and your family.

Dialysis centres are located in all capital cities and most major rural centres in Australia and the staff of your unit can assist you in planning your holidays. Dialysis is available overseas at no charge in public hospitals (subject to availability) to Australains eligible for Medicare, in New Zealand, the United Kingdom, the Republic of Ireland, the Netherlands, Norway and Sweden, under the Reciprocal Health Care Agreement. Holders of passports for countries that are members of the European Union have access to dialysis in all countries that are members of the Union.

Dialysis treatment in other countries will incur a charge, which is not refundable by Medicare or private health funds. However, it is worth thoroughly checking with your private health fund to ascertain whether reimbursement at the Australian rate is at all possible, on the basis that the health fund would be required to reimburse dialysis costs in Australia if you regularly dialyse or holiday in a private clinic or hospital.

Holiday homes are owned and managed by various state based renal patient associations and are available for rental at very reasonable rates. These are usually located within reasonable distance to a dialysis unit. For home trained patients, temporary installation into your holiday accommodation of a machine, with which you are familiar, may be possible for the duration of your holiday. The feasibility of such an arrangement will require discussion with your home training unit.

Your social worker or nursing staff can provide details and assistance in making holiday arrangements.

A Final Note

We hope that after reading this booklet, you now have a basic understanding of haemodialysis, how it compares to peritoneal dialysis (the alternative method of dialysis) and how it may fit into your lifestyle. To some degree, its impact and suitability will depend on your pre-existing health, age, attitude, commitments and activities and the support of those around you.

It is natural at first to feel overwhelmed and apprehensive about the future and how dialysis will affect your life. Eventually, dialysis will become part of your routine and combined with your prescribed medications, diet and fluid intake, be an effective replacement of kidney function. Your renal physician and the staff at your renal unit will help you to make the best possible treatment choice. Information and counselling will be offered as a routine part of your preparation for dialysis and on-going treatment.

If you are already suffering from some other major or complex health problem and are frail, chronically unwell or in pain, you may be facing a dilemma about whether dialysis is the right choice for you. In such circumstances, it is perfectly understandable to consider declining dialysis. Discuss any reservations you or your family may have with your renal physician, who can advise on the treatment that best matches your special situation.

Take the opportunity to talk with your family about the information you have gathered from this booklet. This will help you to be well prepared for further discussions with your health care team about your treatment choice. The knowledge and understanding you have acquired will help you to regain a sense of control, when life may seem out of control. Being well informed will also help you to participate more fully in decisions about your immediate and future care and contributes to improved long-term health.

The Renal Resource Centre is a national unit established to provide information and educational materials on kidney disease for patients and health professionals.

The primary objective of the Centre is to ensure that patients have easy access to such information, are well informed and can actively participate in their own health care.

The Renal Resource Centre is committed to providing education and service to the renal community.

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