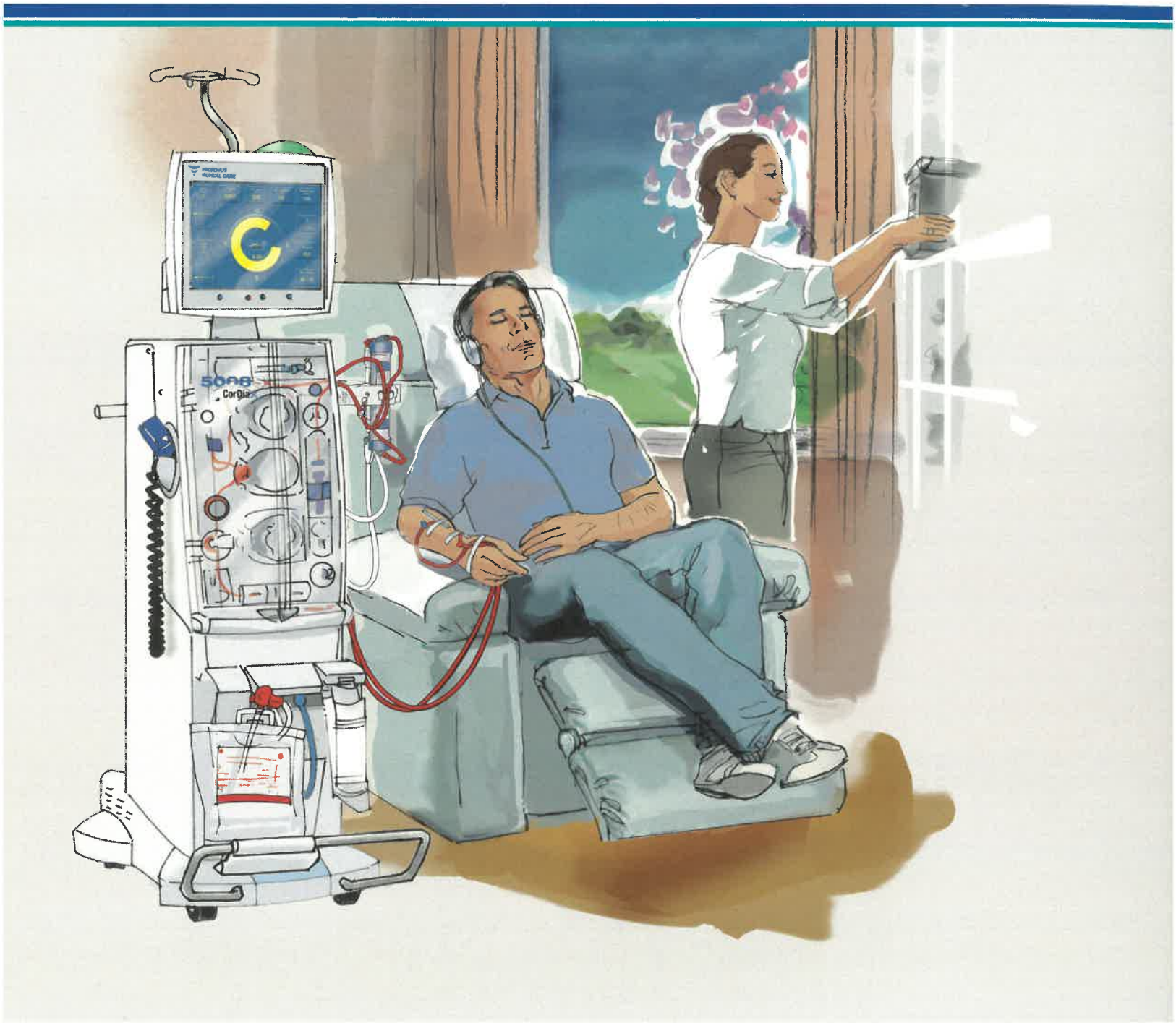
5008S Therapy System

Patient Training Binder



HOME HEMODIALYSIS PATIENT MANUAL 2025

FRESENIUS MEDICAL CARE

What to Expect

How Kidneys and Dialysis Work

How to Prevent Infection

Record Keeping & Vital Signs

HOME HEMODIALYSIS

1. A GUIDE FOR PATIENTS AND FAMILIES

This book can help you learn about hemodialysis and how to do your treatments at home.

Home hemodialysis is a safe and effective way to treat your kidney disease.

Giving yourself dialysis treatments at home has many benefits:

- ✓ You can decide when and how to dialyze.
- ✓ You can be more independent and in control of your life.
- ✓ You may feel better and have better results.

You will learn all about home hemodialysis from the dialysis team. We will help you learn:

- How dialysis works
- How to use the dialysis machine
- How to respond to alarms and solve problems as they come up
- How to stay safe at home

Training gives you the knowledge, skills and confidence to safely treat yourself at home, with support from your dialysis team.

This training takes 8 weeks or more. During your training, we will give you lots of information and support. We welcome your questions at any time.

When you are ready to begin treatment at home, we will continue to support you. We will work closely together through home visits, clinic visits, emails and phone calls. Help and support will always be available, day and night.

Why nocturnal home hemodialysis is your best choice

Hemodialysis: The more the better!

Hemodialysis does the work that your kidneys are no longer able to do. Kidneys normally work 24 hours a day. Although it is not possible to have dialysis all the time, we do know that the more dialysis you have, the better you will feel.

Long, slow dialysis treatments at night (nocturnal hemodialysis) provides more hours of treatment each week, which removes more waste from your blood.

How you will benefit

- ✓ **There are no restricted or forbidden foods.** You can eat foods such as oranges, bananas, milk, potatoes and cheese - **in moderation**.
- ✓ **There are no fluid restrictions.** If you dialyze 5 or 6 nights a week, there is usually no need to drink less.
- ✓ **There is less need for medication.** Slow nocturnal dialysis does a good job of getting rid of phosphate, so you may not need to take phosphate binders. You may need less blood pressure medicine and other medicines.
- ✓ **You experience fewer dialysis 'crashes' –** the periods of low blood pressure, vomiting or passing out that can occur with regular hemodialysis. This makes it very safe to dialyze at home, even when you are by yourself.
- ✓ **It is easier on your heart and your body.** Nocturnal dialysis removes fluid very slowly and gently. Your heart can work better. Symptoms such as thirst, dizziness, headache, cramps and tiredness may get better or go away.
- ✓ **Your sleep may return to normal.** With nocturnal dialysis, you may sleep more soundly and wake up more refreshed. Snoring and other sleep problems may get better or go away.
- ✓ **Your days are free.** With nocturnal dialysis, you start dialysis in the evening before bed and finish when you wake up in the morning.

More proven benefits include:

- ✓ More energy
- ✓ Better appetite
- ✓ More interest in sex

Although each person's experience is different, research and our patients tell us that this is the best form of dialysis we can offer.

Being accepted to the Home Hemodialysis Program

Before you start training, you and your dialysis team must decide if the Home Hemodialysis Program is right for you.

Here are the questions we will consider:

Are you able to do this?

- ❑ You will be considered for training, even if you have physical, visual or hearing problems.
- ❑ You may choose a partner (caregiver) to train in your place.
- ❑ A nurse can stop the training, if he or she feels that your disability makes it unsafe for you to dialyze at home.

Can you understand the training?

- ❑ Training is provided in English. If you do not speak English, you must provide an English-speaking interpreter.
- ❑ Your interpreter must be present at all training sessions and all hemodialysis treatments in your home.

Do you have health and home insurance?

- ❑ You must be covered by the Ontario Health Insurance Plan (OHIP). Your Health Card shows that you are entitled to health services covered by OHIP.
- ❑ You must also have home insurance.

Is your home suitable?

- ❑ The technologist from the dialysis team will check your home to make sure it is suitable to install the dialysis equipment and supplies.

Does your homeowner or landlord agree?

- ❑ The owner or landlord of your home must agree to have a dialysis system installed in your home and **sign** the contract "Authorization for Installation of Dialysis System".

Home Hemodialysis Program Expectations

The average training period is 8 weeks or more. Your training may be shorter or longer, depending on your needs.

Training sessions are on Mondays, Wednesdays and Fridays, from 7:30 am to 3:30 pm.

The Home Hemodialysis Unit will keep a spot for you during your training period.

Your responsibilities during training

- ❑ You must attend each training session. If a caregiver is required, he or she must also attend each training session.
- ❑ During training, nurses will check your skills. We must be sure that you can do all the tasks of hemodialysis correctly.
- ❑ You and/or your caregiver will complete all tests before "graduating" from training.
- ❑ The passing mark is 85%. If your mark is less than 85%, the nurse will teach you all the information again before you rewrite the tests.
- ❑ You will have 2 skills assessments carried out by an independent observer mid-training and at the end of training.
- ❑ You may need further training if you are not following instructions or doing tasks correctly, or if there are concerns about infection or safety.
- ❑ Training may be stopped at any time if program expectations are not being met, or you choose to stop training. Arrangements will be made for you to dialyze elsewhere. If training is stopped, and you dialyzed at another facility, we will arrange for you to return to your original Hemodialysis Unit for dialysis treatments.
- ❑ When you are ready to go home, you will spend at least a week dialyzing on your own, in a room separate from the home hemodialysis unit - the home simulation room.
- ❑ When you finish training, the nurse will visit your home to make sure it is organized and safe for dialysis.

Your responsibilities after training

Following these steps keeps you safe at home!

1. Fill out your **dialysis log** (run sheet) for every dialysis treatment.
2. Follow the medical team's instructions for your dialysis.
3. Follow **all instructions** in this manual.
4. Order supplies as directed by your nurse. Do not overstock supplies.
   - Someone must be at home when your supplies are delivered.
   - Check the expiry date on your supplies. Move the supplies around, so that the oldest supplies are used first.
5. Keep the equipment and dialysis area clean and orderly.
6. Dispose of garbage related to your treatment in the proper way.
7. Use the safety devices provided by the hospital.
8. Report all bad events to the home hemodialysis staff.
9. Keep all appointments at the clinic. Bring your dialysis log and a list of your medicines.
10. Do your blood tests every month.

Call the Home Hemodialysis Unit right after each monthly blood test, so the staff can track your results.

Tell them:

- ✓ If the blood test was "fasting" (no food or drink for 12 hours before the test)
- ✓ Your weight before and after dialysis
- ✓ Your blood pressure before and after dialysis
- ✓ Number of hours dialyzed
- ✓ Number of days dialyzed for the week

11. Call the Home Hemodialysis Unit:

Home Hemodialysis

416-340-3736

7:30 am to 3:30 pm

- ❑ If there are any changes in your treatment:
  - Clotting
  - Dry weight
  - Blood pressure
  - Medicines
- ❑ If you have had medical tests or procedures, visited other doctors or the Emergency Department.
- ❑ If you plan to travel or go on vacation.
- ❑ If your dialysis equipment needs servicing. Report problems as soon as they come up.
- ❑ Do not wait until Friday, as there may be no chance to arrange dialysis back-up.
- ❑ If you have any concerns or questions about your care.

Other responsibilities at home

- ❑ During home dialysis, you will use more water and electricity in your home. The government will reimburse a portion of your water and electricity use.
- ❑ You must agree to return to the Hemodialysis Unit anytime the dialysis team feels that your safety is at risk.
- ❑ Hemodialysis can affect your needs for medicine. Tell your pharmacist and all the doctors who care for you that you are on dialysis.
- ❑ Return equipment to the hospital when you stop dialysis.

Home visits

Members of the dialysis team will visit you at home regularly - twice a year or more often if needed. You will have a home visit when:

- ❑ You finish training
- ❑ Team members feel a visit is needed
- ❑ You request a visit

What is the purpose of home visits?

Home visits are important to make sure you are receiving the care and support that you need.

Nurses visit to check your health and your dialysis skills. They may ask you to do all or part of your dialysis procedure, to see if you are doing these tasks correctly.

Technologists visit to check that your equipment is working properly. They may test, service, install or repair equipment during a visit.

What can I expect of staff during a home visit?

You can expect staff to:

- ❑ Tell you ahead of time when they will visit.
- ❑ Reschedule a visit if the weather is bad.
- ❑ Ask to see where you do dialysis treatments and where you store the equipment.
- ❑ Answer your questions and concerns.
- ❑ Arrange back-up at the hospital or with community care if dialysis cannot be done.
- ❑ Keep their shoes on during a visit, for safety reasons.
- ❑ Take a break outside of your home, when needed.

What do staff expect from me?

Before a visit:

- ❑ Tell staff as soon as possible if you need to change the date or time of a visit.
- ❑ Make sure the dialysis area of your home is easy to get to, well-lit and free of hazards.
- ❑ Report any problems as they come up, do not wait for the next visit.
- ❑ Clean and disinfect the dialysis machine.

During a visit:

- ❑ Have your dialysis log and medicines ready for staff to review.
- ❑ Do not smoke during a visit.
- ❑ Keep pets behind closed doors.
- ❑ Staff do not expect you to provide meals.

Training Outline

	Use this checklist to track your progress during training	WK 0	WK 1	WK 2	WK 3	WK 4	WK 5	WK 6	WK 7	WK 8	→
1	My orientation to the Unit										
	Knowing what to expect										
2	How kidneys work and how dialysis works										
3	Handwashing and no touch technique										
4	Self-assessment and record keeping										
5	How to prepare the machine										
6	How to program and connect the machine										
7	How to disconnect and clean up										
8	How to care for my access:										
	Cannulation										
	CVC										
9	Anticoagulation										
10	Dialysis procedures:										
	Monitoring the treatment										
	Normal saline bolus/flush										
	Circulation of the blood										
	Blood collection – pre and post										
	Centrifuge										
	Giving medicines										
	Manual reinfusion										
11	How to manage alarms and warnings										
12	How to manage complications										
	Low blood pressure										
	Muscle cramps										
	Headache										
	Restless legs										
	Air Embolism										
	Breakdown of red blood cells										
	Bruising										
	Fever and chills										
	Infection										
	Line displacement/dislodgement										
	Poor blood flow										
	Difficulty with cannulation										
	Non-adherence complications										
13	Water training										
14	How to order supplies										
15	What to do when travelling										
16	Healthy eating during dialysis										
17	Demonstrate my care independently										
18	Written tests										
19	How to install equipment and supplies										
20	First home visit										

Helpful websites

- Ontario Ministry of Health and Long Term Care: Information about health and services
  www.healthyontario.com
  www.health.gov.on.ca

- Ontario Health Insurance Plan (OHIP):
  www.health.gov.on.ca/en/public/programs/ohip/

- Kidney Foundation of Canada
  www.kidney.org

- Renal Support Network:
  Online Health Library for people with kidney disease
  www.rsnhope.org/

- Consumer health information
  www.emedicinehealth.com

Telephone contact list

Name	Phone number
Nurses	
• **Home Hemodialysis Unit** 7:30 a.m. to 3:30 p.m.	416-340-3736
• Unit Manager	416-340-4800, ext. 2399
Nephrologists	
• Dr. C. Chan	416-340-3073
• Dr. A. Kaushal	416-340-3889
Technical help	
• Technical Manager, Renal Engineering	416-340-4800, ext. 3158
• Technologist Office	416-340-4288
• Page the Technologist during the night • Paging hours - 4 p.m. to 8 a.m. & weekends	416-719-5299 - pager
Vascular Access Coordinator	
• Access Coordinator	416-340-4800, ext. 3518 416-340-4800, ext. 6158
Dietitian	
• Dietician	416-340-4800, ext. 4625
Social Worker	
• Social Worker	416-340-4800, ext. 3983
Pharmacy	
• Toronto General Pharmacy	416-340-4075
Chiropody	
• Chiropodist	416-340-4800, ext. 6007

2. How kidneys and dialysis work

What do the kidneys do?

The kidneys:

- ✓ Remove waste products from your blood
- ✓ Balance the amount of fluid in your body
- ✓ Balance salts, minerals and electrolytes in your body
- ✓ Help to control blood pressure
- ✓ Help to make red blood cells
- ✓ Help to keep bones strong and healthy

Removing waste

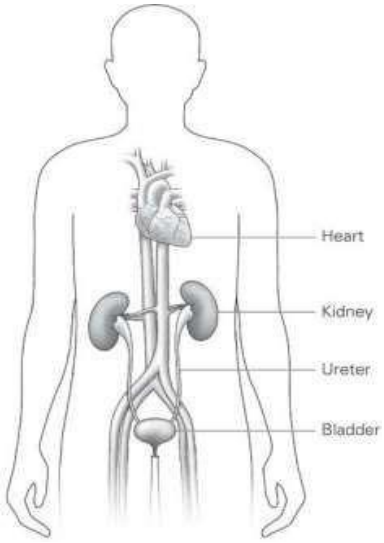
As blood flows around your body, it carries substances your body needs. It also carries unwanted substances that are left over from breaking down food and other normal body activities. These waste products can be harmful (toxic) if allowed to build up in your body.

Urea and creatinine are common waste products.

Having some of these wastes in your blood is normal. Having too much can make you sick.

When blood enters the kidneys, it goes through millions of tiny filters, called glomeruli. The glomeruli filter out the waste, leaving just the right amount of the substances your body needs.

- The filtered blood flows back to your heart. The heart pumps to keep the blood flowing around your body.
- The waste leaves your kidneys in the urine. Urine flows down to the bladder where it is stored until you pass urine.



Did you know?

- About 190 litres of blood enter the kidneys every day.
- Most people pass about 2 litres of urine every day.

Balancing fluids

Kidneys balance the amount of fluid entering and leaving your body:

- ❑ Fluids enter your body in what you eat and drink.
- ❑ Fluids leave your body in your urine, bowel movements, sweat and breath.

The kidneys adjust how much urine is made.
For example:

- ❑ If you drink a lot, the kidneys remove extra fluid by making more urine.
- ❑ If you don't drink enough or sweat a lot, the kidneys keep fluid in your body by making less urine.

Did you know?

- In women, fluids make up about 55% of their total weight.
- In men, fluids make up about 60% of their total weight.

Balancing salts, minerals and electrolytes

Healthy kidneys filter out the right amount of salts, minerals and electrolytes from the blood, leaving just what the body needs.

The right balance of electrolytes is needed for everything in the body to work well.

For example, balancing bicarbonate helps keep a normal level of acid (pH) in your blood.

Electrolytes include:

- Sodium (salt)
- Potassium
- Chloride
- Calcium
- Magnesium
- Bicarbonate
- Phosphate

Controlling blood pressure

Kidneys make hormones, such as renin and angiotensin, that control:

- How much salt and fluid the body keeps.
    - If there is too much fluid in the body (overload), blood pressure goes up.
    - If there is too little fluid in the body (dehydration), blood pressure drops.
- How well blood vessels (arteries) expand and contract.
    - The narrower the arteries, the higher the blood pressure.

Helping to make red blood cells

Kidneys make a hormone called erythropoietin (EPO). EPO is carried in your blood from the kidneys to the bone marrow. This is the centre of your bones where blood cells are made. EPO helps the bone marrow to make red blood cells, which carry oxygen throughout your body.

Helping bones stay strong

Kidneys make a form of Vitamin D that helps to control how much calcium goes into bones. Calcium makes your bones strong and healthy.

Kidneys also control the amount of phosphate in your blood. Too much phosphate causes calcium to come out of the bones, making them weak.

How do you know if kidneys are working well?

The most common way to see how well the kidneys are working is to estimate the **Glomerular Filtration Rate** (GFR).

Healthy kidneys have a GFR of about 120 ml/minute.

The GFR shows how well the kidneys remove or "clear" a waste product called creatinine. This is why the test is also called the creatinine clearance.

The test compares the amount of creatinine in the blood and in a sample of urine collected over 24 hours.

What is kidney failure?

Kidney failure means the kidneys are not doing their job. If they have stopped working completely, this is called end-stage renal disease.

Did you know?

- About 1 in every 2,000 people has kidney failure.
- 'Renal' describes things related to the kidneys

Kidneys may stop working suddenly. This is called **acute kidney failure**.

- This may happen when blood flow to the kidneys is reduced or blocked, or when the kidney is injured.
- Acute kidney failure may be temporary and get better with treatment.

Kidneys may gradually lose their ability to do their job. This is called **chronic kidney failure**.

- The exact causes of chronic kidney failure are not always known.
- We do know that conditions such as diabetes and high blood pressure increase the risk of kidney failure.

Some people are not aware that their kidneys are not working properly. This is because kidneys can adapt. When part of a kidney is not working, the remaining parts work harder to make up for it. Kidney function may be less than 10% before a person begins to feel ill.

What are the symptoms of kidney failure?

When kidneys are no longer working effectively, waste products and fluid build-up in the body, and symptoms start to appear.

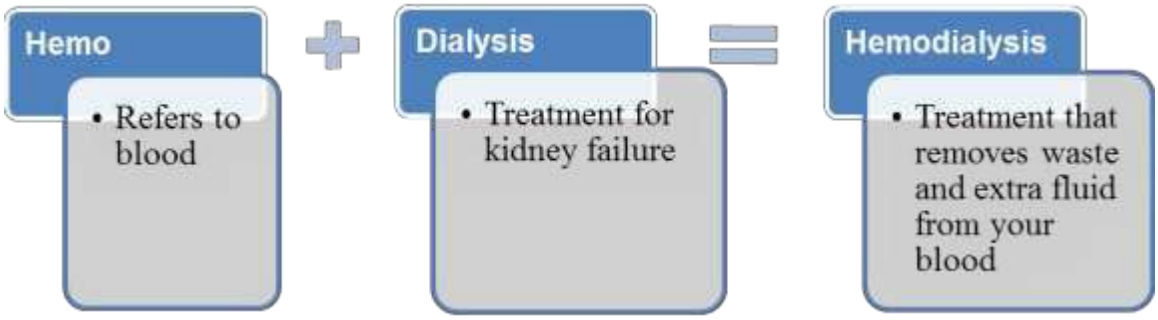
Symptoms	What may be happening
Feeling sick Loss of appetite Itchy skin	• Your kidneys are not removing waste from your blood. • There is a build-up of waste products, such as urea and creatinine, in your blood.
Swollen ankles Puffy face	• Your kidneys are not removing extra fluid from your blood. • Fluid is collecting in your body tissues.
Shortness of breath High blood pressure	• Your kidneys are not removing extra fluid from your blood. • Fluid is collecting in your lungs, making breathing difficult and straining your heart.
Pale skin Feeling weak, cold and tired	• Your kidneys are not making enough EPO, the hormone that helps the bone marrow make red blood cells. • You do not have enough red blood cells. This is called anemia.
Weak and painful bones, especially in the back, hips, legs and knees.	• Your kidneys are not making enough hormones and vitamin D to keep bones strong and healthy. • Your bones are losing calcium and becoming weak. This is called renal bone disease.

How is kidney failure treated?

When symptoms first appear, changing your diet and taking medicine can help your body stay in balance.

As symptoms get worse, diet and medicine are not enough. You need dialysis treatments to do the work your kidneys are no longer able to do. Dialysis uses a machine to remove waste and extra fluid from your blood.

What is hemodialysis?



You will have a procedure to create an '**access**'. This is a way for blood to be removed and returned to your body. There are three main types:

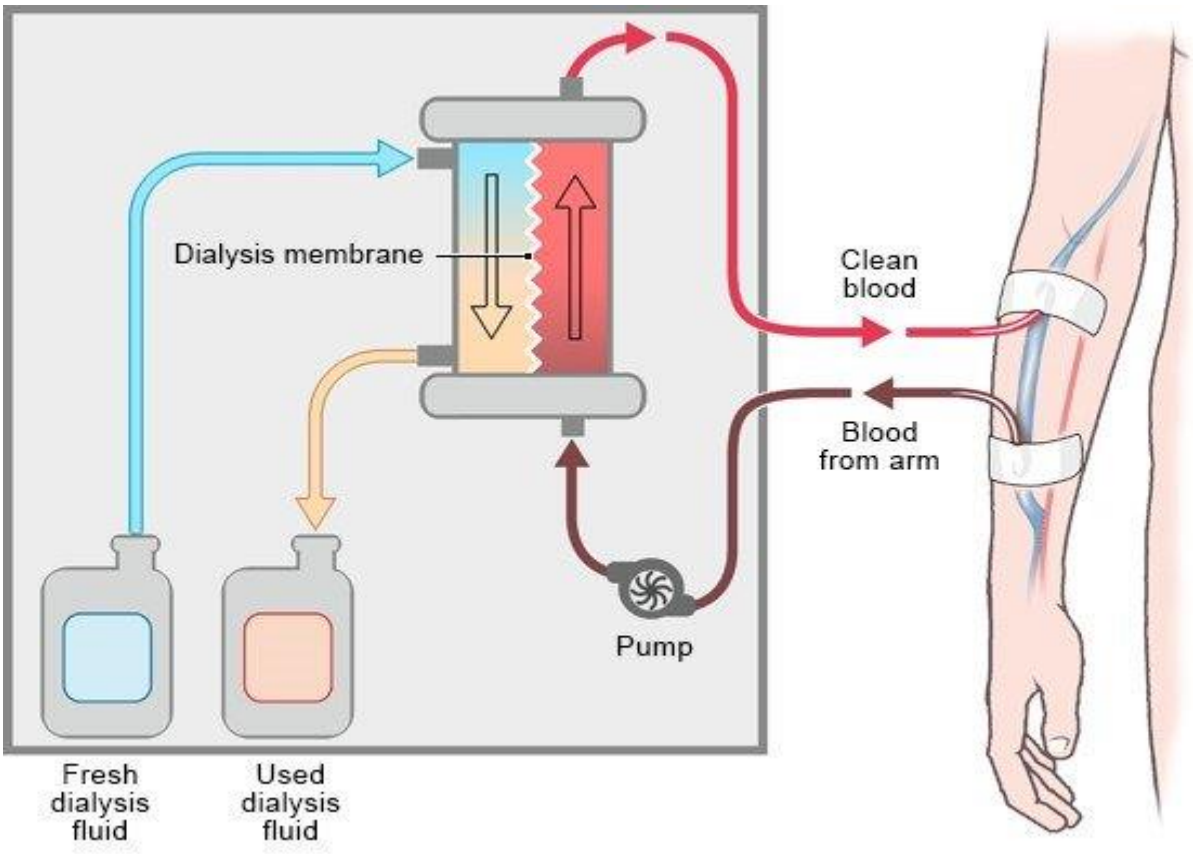
- Arteriovenous (AV) fistula ➔ **This method is most recommended.**
- Arteriovenous (AV) graft
- Central venous catheter (CVC)

Hemodialysis has 3 main steps:

1. Blood leaves your body through a needle or catheter placed in your body.
2. Blood travels through tubes or blood lines to the dialyzer, where it is filtered.
3. The clean blood travels back to your body through a second needle or the central venous catheter (CVC).

Your blood is filtered by an artificial kidney or dialyzer.

This picture shows how hemodialysis works



What does the dialysis machine do?

The dialysis machine has a pump to keep blood flowing from your body, to the dialyzer, and back to your body.

The dialysis machine has a computer that keeps track of:

- Blood flow
- Blood pressure
- How much fluid is removed
- Other important information

Did you know?

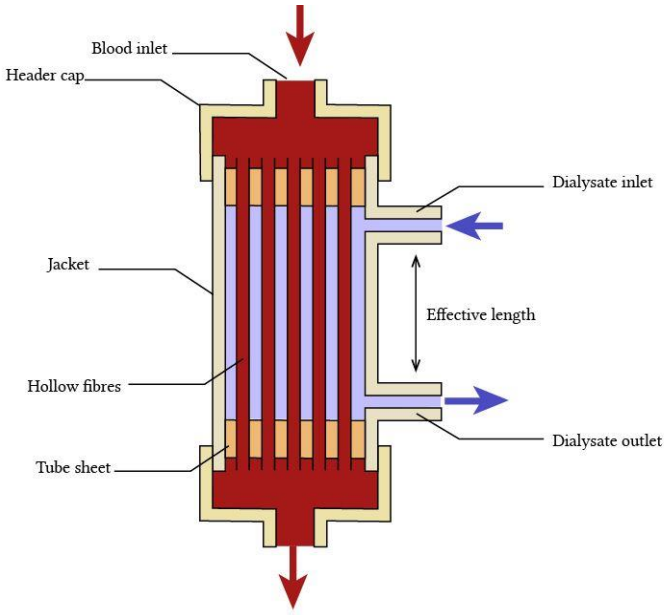
- The average person has 4 to 6 litres of blood.
- During dialysis about 200 ml (less than one cup) of blood is outside the body.

The dialysis machine mixes the fluid that goes into the dialyzer to remove waste and extra fluid from your blood. This is called dialysate or dialysis solution or the '**bath**'. Your doctor will prescribe a specific mixture of water and electrolytes for your treatments.

The dialysis machine has many safety features to protect you.

What does the dialyzer do?

The dialyzer does some of the work your kidneys used to do. Some people call it an artificial kidney.



The dialyzer:

1. Removes waste from your blood
2. Removes extra fluid from your blood
3. Balances electrolytes in your blood

Dialyzers come in different sizes with different 'clearance'. This refers to the rate at which the dialyzer can remove waste. Your doctor will prescribe the dialyzer that is best for you.

The dialyzer is a plastic tube filled with many tiny filters. It has 2 sections; one for the dialysate and the other for the blood.

Between the sections there is a membrane that is 'semi-permeable". The membrane does not allow the blood and dialysate to mix, but it has very tiny holes that allow some substances to cross from one section to another. Water and waste can pass through the membrane, but blood cells cannot.

How the dialyzer works

1. Removing waste from your blood.

Waste is removed through a process called diffusion.

- Diffusion explains what substances do in water. Substances move from areas of high concentration to areas of low concentration, to make the concentration equal.
- In the dialyzer, blood flows through one side of the semi-permeable membrane and dialysate flows by on the other side.
- The blood has a high concentration of waste, the dialysate is free of waste (e.g., creatinine and urea), and so the waste moves to the dialysate side and is swept away by the dialysate.
- The cleansed blood is returned to your body. The dialysate solution with wastes from the blood goes down the drain.

2. Removing extra fluid from your blood

Extra fluid is removed through a process called ultrafiltration.

- The pressure in the blood section is higher than the pressure in the dialysate section.
- This pushes extra fluid from the blood through the membrane into the dialysate.

3. Balancing electrolytes in your blood

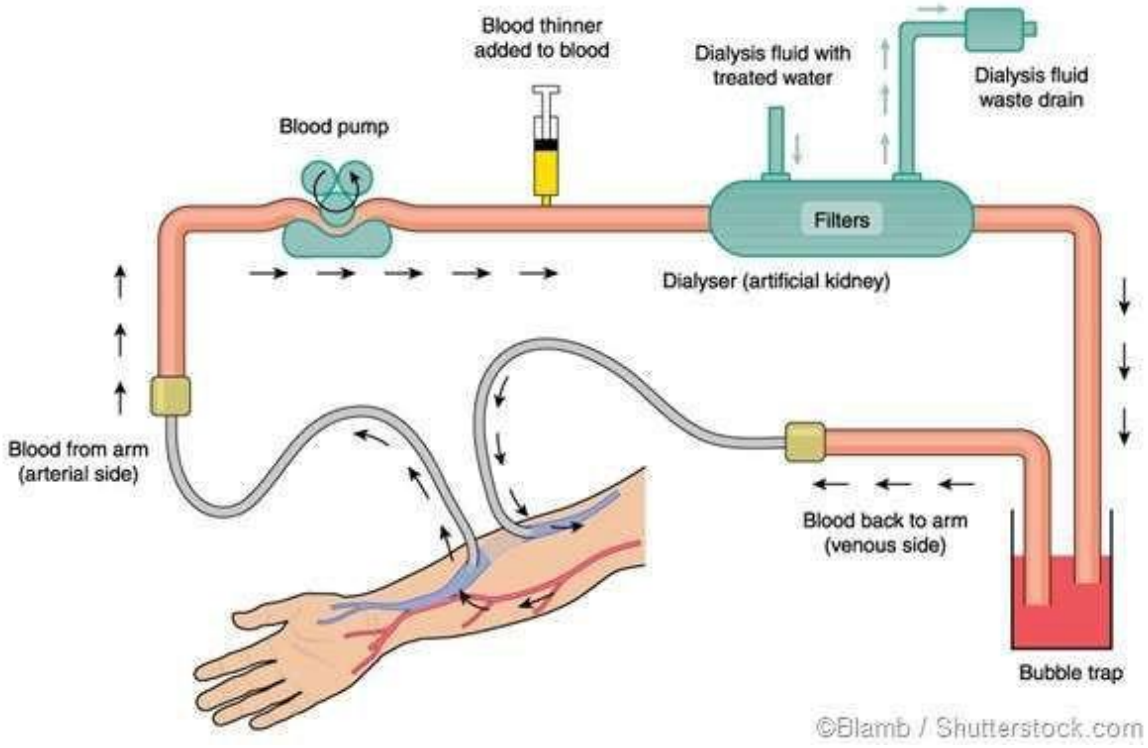
Diffusion also balances electrolytes in your blood. For example:

- If the amount of potassium is too high in your blood, the dialysate will be made with a low concentration. Potassium will move from the blood into the dialysate.

It takes several hours for the dialyzer to clean the blood.

These pictures show how the dialyzer works.

1.



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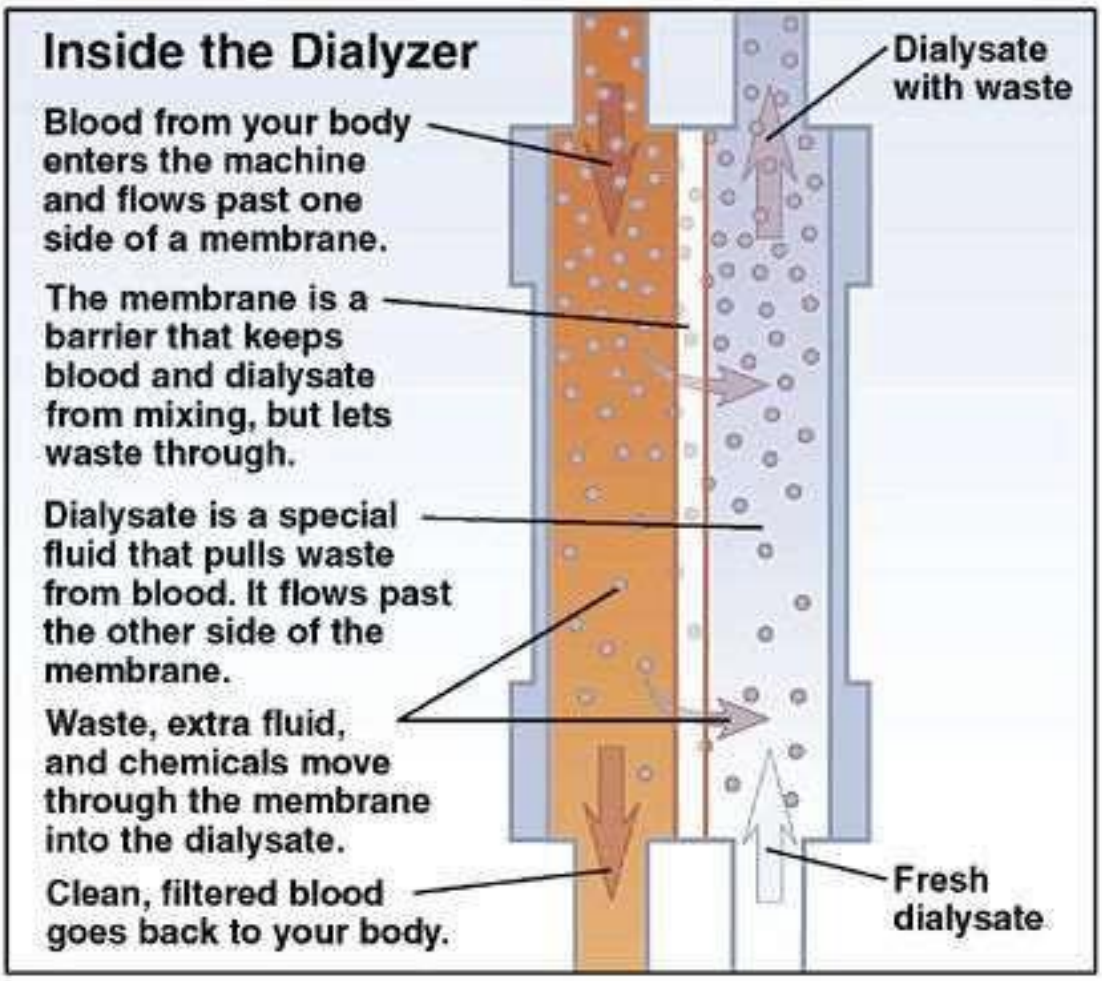

Inside the Dialyzer
Blood from your body enters the machine and flows past one side of a membrane.
The membrane is a barrier that keeps blood and dialysate from mixing, but lets waste through.
Dialysate is a special fluid that pulls waste from blood. It flows past the other side of the membrane.
Waste, extra fluid, and chemicals move through the membrane into the dialysate.
Clean, filtered blood goes back to your body.
Dialysate with waste
Fresh dialysate

3. How to prevent infection

Your risk of infection

Kidney disease affects your immune system. This means your body is not able to fight infection as well as it should. If you get an infection, it could last longer than it would in someone with healthy kidneys.

Dialysis requires frequent access to your bloodstream. There is always a possibility that germs (such as bacteria or viruses) could get into your blood and cause an infection.

For these reasons, you have a greater risk of infection.

As a dialysis patient, you need:

- ✓ Extra safety measures to prevent infections, and
- ✓ Stop treatment if you think you have a fever and other symptoms of infection.

Preventing infection

Preventing infection is an important responsibility for you and your health care providers.

Working together to prevent infection	
Everyone	✓ Wash hands often (see instructions on page 25 and 26). ✓ Use the "**no touch**" technique (see instructions on page 27). ✓ Clean and disinfect equipment and surfaces.
Hospital staff	✓ Follow hospital guidelines for infection control.
Patients	✓ Follow instruction in this manual. ✓ Have a blood test each year to check for viruses that are spread through blood, such as Hepatitis B and C. These viruses can cause serious liver disease. ✓ Get a shot (vaccination) that protects you from Hepatitis B. There is no shot to prevent Hepatitis C. ✓ Tell all your doctors that you are on dialysis. ✓ Take antibiotics before any procedure, such as getting your teeth cleaned, dental work, or a biopsy. When you are scheduled for a procedure, call the Home Hemodialysis Unit for more advice.

*** Sterile means completely free of germs**

Washing your hands

1. Wash your hands

- Handwashing removes dirt and germs that could enter your blood stream or affect your dialysis supplies.
- Start by removing your jewelry.
- Use liquid soap and warm water. Soap removes dirt, oils and germs. Do not use antibacterial or bar soaps.
- Scrub hands for 15 seconds (sing the “Happy Birthday” song twice).

Washing your hands is the best way to prevent infection!

2. Use hand sanitizer

- Hand sanitizer contains alcohol, which kills germs and disinfects your hands.
- Hand sanitizer does not clean dirt from your hands. If your hands are dirty, it is better to wash your hands with soap and warm water.
- Start by removing your jewelry.

The “No Touch” technique

“No Touch” technique stops germs from entering your equipment, catheter, needle insertion site or your blood stream.

1. Always begin with washing your hands for 15 seconds. Followed by using hand sanitizer.
2. Use the antiseptics as directed by the dialysis team.
3. Clean medicine vials before using them.
4. Do not touch an area after it is cleaned with antiseptic.
5. Do not lift the needle off the cannulation site* once it is placed on the skin.
6. Do not touch open ends of the catheter.
7. Do not touch open ends of the dialysis lines or dialyzer.
8. Do not touch open end of the syringe.
9. Do not touch open ends of the needle.
10. Keep needle and syringe sterile.
    - If you touch the uncapped area of the syringe and needle, it is contaminated.
    - Dispose of that needle and syringe in your sharps container.
    - Replace it with a sterile needle and syringe.

    ❖ All sharps containers need to be returned to the unit.

***A cannulation site is where you put the needle in to access your blood for hemodialysis.**

4. Recording your vital signs and weight

Recording your vital signs and weight

Record your vital signs and weight before (pre) and after (post) each dialysis treatment on your dialysis log.

Logs are an important tool in assessing your response to treatment.

Vital signs include:

- Temperature
- Blood pressure
- Pulse

Enter this information in your dialysis log (run sheet). Bring your log with you to all appointments and clinic visits. The dialysis team uses this information to assess your health and response to treatment.

Your temperature

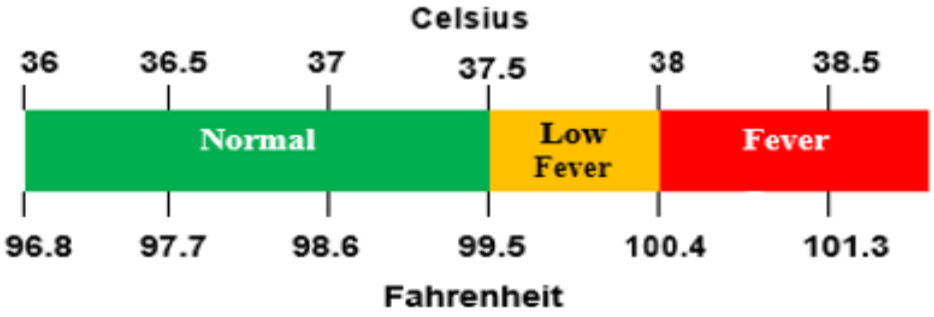
Check and record your temperature:

- ✓ Before and after dialysis
- ✓ When you feel warm or think you have a fever
- ✓ When you shiver or feel cold

Your temperature varies depending on the time of day, your activity level and the effects of your medicines. Review your log to get to know what is usual for you.

Normal temperature	=	36ºC to 37.5ºC
A low grade fever	=	37.6ºC to 37.9ºC
A fever	=	38ºC or higher

A temperature above normal is a sign of infection.



If you have a fever

A fever is a sign of infection. If you have a fever, you will have a blood test (blood cultures) to find out if there is an infection.

If you have an infection, it will need to be treated quickly.

If you suddenly get a fever after you have started dialysis:

- Stop dialysis
- Return the blood
- Call the Home Hemodialysis Unit and tell the nurse or doctor that you have a fever
- Go to the Emergency Department for care

Your blood pressure

Blood pressure (BP) is the force of blood pushing against the walls of an artery. When you check your blood pressure, the monitor takes two measurements:

Systolic pressure:

- The pressure in the blood vessels as the blood is pumped from the heart.
- Normal systolic blood pressure is 110 to 139 mmHg (millimeters of mercury).

Diastolic pressure

- The pressure in the blood vessels when the heart is at rest between beats.
- Normal diastolic blood pressure is 60 to 89 mmHg.

Blood pressure is usually written this way:

120
80

Systolic is the top number
Diastolic is the bottom number

Check and record your blood pressure:

- ✓ Right before dialysis
- ✓ At the start of dialysis
- ✓ During dialysis:
  - If you dialyze 4 hours (conventional dialysis) check your BP every hour.
  - If you dialyze during the night (nocturnal dialysis) you do not need to check your BP during treatment.
- ✓ At the end of dialysis, after you have returned your blood and before you disconnect yourself from the machine.
- ✓ After dialysis
- ✓ Anytime you have concerns or symptoms such as dizziness, cramping or nausea.

Taking your blood pressure

- You must check your BP while standing, sitting or lying down. Your BP will vary depending on your position. A standing BP is usually lower than a sitting BP.
- It is common for your BP to be high before dialysis. This is due to the extra fluid in your body. After your treatment starts, your BP may drop as about 200 ml of blood is out of your body in the blood lines and dialyzer.
- Review your log to get to know your usual BP pattern.

Call the Home Hemodialysis Unit:

- ✓ If your BP suddenly drops.
- ✓ If your blood pressure is higher or lower than usual.

Your pulse

Check and record your pulse (heart rate):

- ✓ Before and after dialysis.

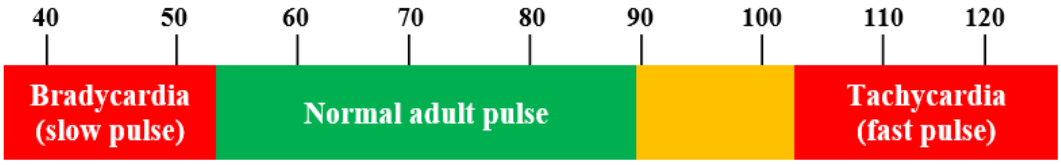
Taking your pulse:

- It is normal for your heart to beat slower when you are resting and speed up when you are active.
- Your pulse will be higher if your BP is low or you are dry.
- Some medicines can slow your heart rate.
- Review your records to get to know your usual pulse.

Normal adult pulse = **60 to 80 beats per minute**

Slow pulse (bradycardia) = **Less than 60 beats per minute**

Fast pulse (tachycardia) = **Greater than 100 beats per minute**



Call the Home Hemodialysis Unit:

- ✓ If your pulse rate is higher or lower than usual.

Your breathing

Breathing problems may be due to having too much fluid in your lungs and other parts of your body. As dialysis removes the extra fluid, your breathing problems should improve.

Call the Home Hemodialysis Unit:

- If you have trouble breathing, shortness of breath at rest or on exertion or coughing.
- If your breathing does not get better as dialysis removes extra fluid.
- If you have trouble breathing when lying flat.

Your weight

Check and record your weight:

- ✓ Before and after dialysis.

Weighing yourself

- Put the scale on a hard, flat, level surface (not carpet).
- Always weigh yourself without shoes and with about the same amount of clothes on.
- Check the accuracy of your scale regularly.
- Follow the manufacturer's instructions to zero the scale. Change the battery regularly, if needed.

Your target weight is what your health care team thinks you should weigh, when all the extra fluid is removed from your body, you are symptom free and your Blood Pressure has normalized.

Compare your actual weight with your **target weight**. The difference between your actual weight and target weight is the amount of fluid you need to remove during dialysis.

This fluid is known as the ultrafiltration goal. Ultrafiltration is the removal of the gained fluid as a force or pressure helps the gained fluid pass across the semipermeable membrane of the dialyzer.

For example:

Your current weight is 51.5kg

Your target weight is 50.0kg

51.5 – 50.0 = 1.5Kg

You have gained 1.5 kg of fluid.

The ultrafiltration goal is 1.5 Kg or 1500ml.

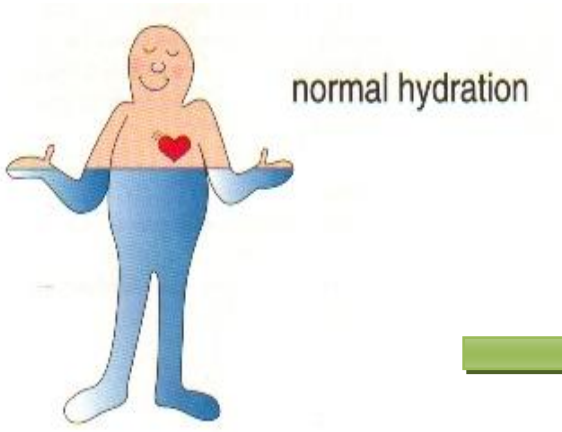
The Home Hemodialysis Unit nurses and doctors will change your target weight when needed.

You may increase your weight by no more than 0.5 kg in an emergency situation. Remember to tell staff about the weight change.

Removing too much fluid (target weight set too low) **Weight needs to be increased**	**Not removing enough fluid (target weight set too high)** **Weight needs to be lowered**
Signs and symptoms: • Low blood pressure • Muscle cramps • Nausea and vomiting • Feeling the urge to have a bowel movement.	**Signs and symptoms:** • High blood pressure • Shortness of breath and breathing problems • Swelling

	Problem	**What to do**
Signs of weight gain:		
• You have been eating more than usual. • Your blood pressure is lower than usual, especially after dialysis. • You have low blood pressure or cramps during dialysis. • Your heart rate is fast, over 100 beats per minute. • You feel tired, weak and dizzy	**You are too dry** ➡	**Increase your target weight**
Signs of weight loss:		
• You have been eating less. • You have been exercising more. • Your blood pressure is higher than usual. • You have problems with breathing. • You have swelling of ankles, feet etc.	**You are too wet** ➡	**Decrease your target weight**

WHAT IS MY TARGET WEIGHT?



You have enough body water:

- You are symptom free

Blood pressure may range:
110 - 139
60 - 80

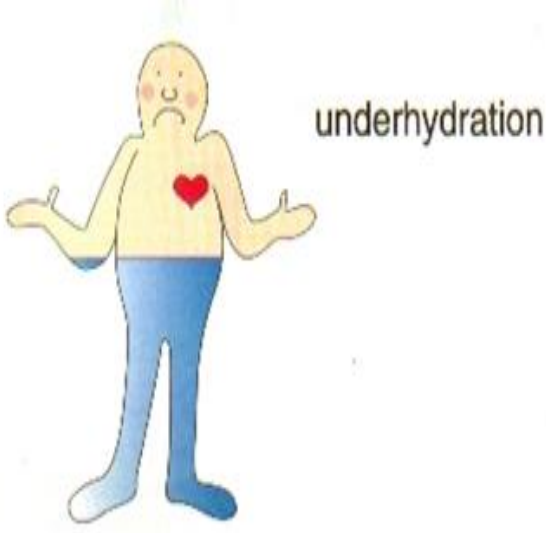
HOLD TARGET WEIGHT

You have extra body water:

- Shortness of breath
- Swelling
- Headache

Blood pressure may range:
140 - 200
80 - 120

DECREASE TARGET WEIGHT



You do not have enough body water:

- Dizziness
- Sweating
- Nausea
- Vomiting
- Cramping
- Tiredness
- Blurred vision
- Fainting

Blood pressure may range:
70 - 110
40 - 60

INCREASE TARGET WEIGHT

Vascular Access

- Arteriovenous Fistula
- Arteriovenous Graft
- Catheter
- Access Alarms during Dialysis

VASCULAR ACCESS

Types of Vascular Access

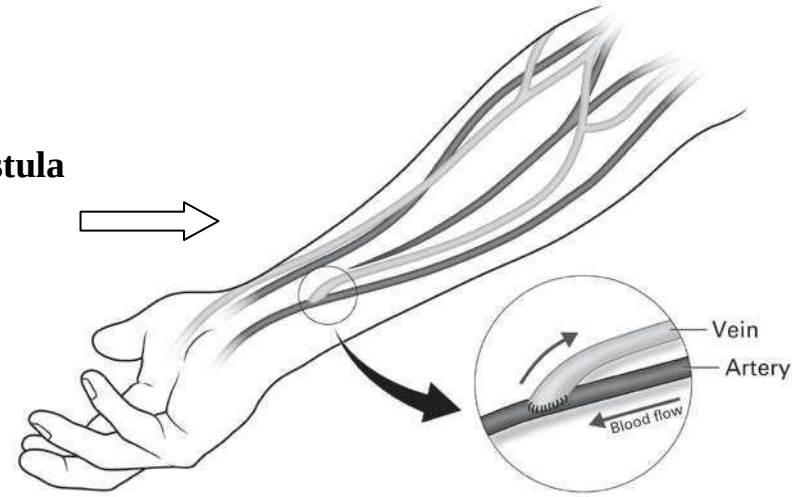
"Vascular access" means a way to get to your blood. There are three methods of vascular access for hemodialysis.

Method	Description
❑ **Arteriovenous (AV) fistula**	• This method is recommended most often, as it lasts the longest and has the least problems. • An artery is joined to a vein. This is usually done in the lower or upper part of your arm. • Pressure from the artery makes the vein get bigger and stronger. This takes about 2 months. Then the AV fistula is ready to use.
❑ **Arteriovenous (AV) graft**	• This method is chosen when veins are too small or weak to make a fistula. • An artery in your arm is connected to a vein using a soft tube (graft). The graft may be straight or in a "U" shape (loop graft). • The graft becomes an "artificial blood vessel", used to access your blood for hemodialysis. • If you have a loop AV graft, the Home Hemodialysis nurse will check the direction of blood in the graft. This will show which part of the loop graft is considered arterial or venous.
❑ **Central venous catheter (CVC)**	• A CVC is a soft, plastic tube inserted into a large vein in your neck. The tip of the catheter rests in the right atrium. This is the upper chamber of the heart where blood returns from the body. • Much of the catheter is under the skin. The "exit site" is where it comes out of the body. • The catheter has two ports. One port allows blood to be removed. The second port allows clean, dialyzed blood to return to the body. • A CVC tends to clot more easily and has a greater chance of getting infected than an AV fistula or graft.

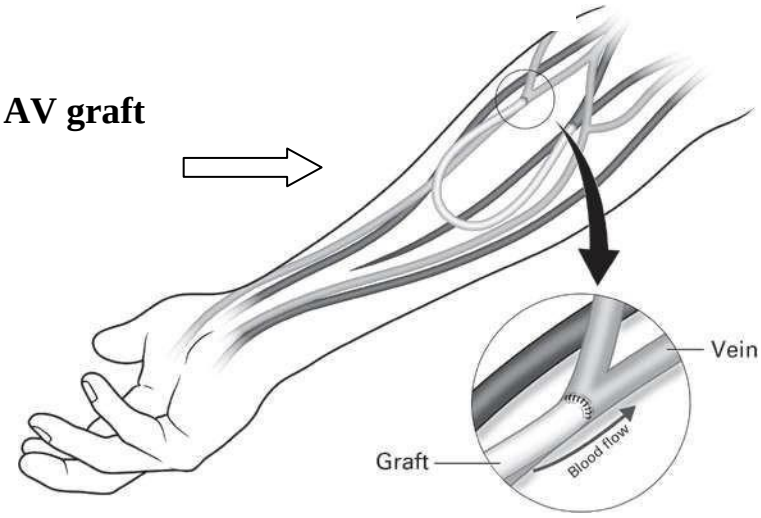
The next section of this guide describes the care and use of your access.

Caring for an arteriovenous access AV fistula or AV graft

AV fistula



AV graft



What to do every day

Exercise

- To help the AV fistula develop, exercise that arm by squeezing a sponge ball frequently.
- No exercise is needed for an AV graft.

Check for the "thrill"

- You can feel a vibration (buzz or throb) as blood goes through your access. This is called the "thrill". Check the thrill several times a day.

- If the thrill changes or stops, call the Home Hemodialysis Unit right away or go to the Emergency department. A blood clot may have formed.

Listen to the "bruit" (pronounced "bruee")

- When you put your ear to the access, you can hear the sound of blood flowing through the access. This is called the "bruit".

- If the bruit changes or sounds like a whistle, your blood vessels may be narrowing. This is called stenosis. Call the Home Hemodialysis Unit, as this can reduce or block the flow of blood.

Check for signs of infection

- Check for redness, warmth, swelling, pain or discharge.

- If you notice any signs of infection, call the Home Hemodialysis Unit right away. An infection will need to be treated quickly.

Prevent infection

- Keep the area around the access clean and dry.
- Before using the access, wash your hands and the access area with soap and warm water for 15 seconds. Then clean with antiseptic.

	What not to do
	• Do not wear tight clothing or jewelry that could restrict the flow of blood to the access. • Do not sleep on the AV access arm. • Do not take blood pressure on the AV access arm. • Do not have blood samples taken from the AV access arm, except by a trained dialysis nurse. • Do not use the AV access for giving intravenous medicines, unless directed by your dialysis team.

Cannulation procedures for arteriovenous access (AV)

During your training, you will learn how to put needles into your AV access. This is called cannulation. The procedure you use will depend on whether you have an AV fistula or AV graft.

Needle Type	AV fistula	AV Graft
Rope ladder – cannula or sharp steel needles	✓	✓
Buttonhole – cannula or dull needles	✓	X

About Rope Ladder

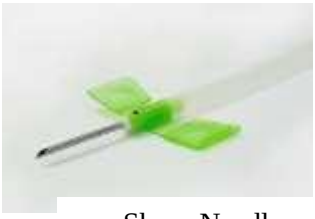
Rope ladder cannulation technique rotates the needle placement sites each time you dialyze.

- ❑ Rope ladder uses fistula or cannula needles.
- ❑ Rope ladder uses new cannulation sites for each hemodialysis treatment.
- ❑ Rope ladder is the only way to cannulate an AV graft.
- ❑ Rope ladder prevents bumps forming on the access.

A. Fistula Needle – Rope Ladder Procedure for AV fistula or AV graft

Supplies

- ❑ Clean towel
- ❑ Two Fistula needles
- ❑ Two 10ml preloaded normal saline syringes
- ❑ Two antiseptic swabstick
- ❑ Tourniquet
- ❑ Two IV dressing
- ❑ One package of 4 x 4 gauze
- ❑ Warm compress if needed – optional



Sharp Needle

1. Clean work surface. Allow the surface to dry.
2. Wash your hands and the access area with soap and warm, running water for 15 seconds. Dry with clean towel.
3. Open and prepare supplies. Maintain sterility. Prepare fistula needles: Attach 10ml preloaded normal saline syringe to each needle. Prime needles. Leave clamps open.

Arterial cannulation:

4. Landmark the access. Determine arterial and venous cannulation sites.
5. Cleanse the arterial site of the AVF or AVG with antiseptic swabstick. Allow the antiseptic to dry.
6. Apply tourniquet for AVF only. Ensure clamp on fistula needle is open.
7. Pinch the wings of fistula needle. Carefully remove the tip protector.
8. Insert the needle, bevel up at a 45-degree angle. Advance the needle.
9. Blood will flow back into fistula needle. Release the tourniquet if in use.
10. Assess the position of the needle. Aspirate the blood into the syringe. Then gently inject normal saline and check the flow. Clamp the fistula needle.
11. Secure fistula needle with IV dressing.

Venous cannulation:

12. Repeat steps 4 to 11 for rope ladder venous needle cannulation using fistula needle.
13. Continue with the procedure to start dialysis.

B. Cannula Needle – Rope ladder Procedure

Cannula Needle

Supplies

- ❑ Clean towel
- ❑ One package of 4x4 gauze
- ❑ Tourniquet
- ❑ Two antiseptic swabsticks
- ❑ Two Cannula needles
- ❑ Two IV dressing
- ❑ Two scissor clamps
- ❑ Two 10ml preloaded normal saline syringes
- ❑ Warm compress if needed – optional

1. Clean the work surface. Allow the area to dry.
2. Wash your hands and the access area with soap and warm, running water for 15 seconds. Dry with clean towel.
3. Open and prepare the supply. Maintain sterility.

Arterial cannulation:

4. Landmark the access to determine cannulation sites. Cleanse the area with antiseptic swabstick. Allow antiseptic to dry. Apply tourniquet for AVF only.
5. Remove cannula from protective cover. Twist the inner metal needle within the cannula to break the seal between the needle and the cannula.
6. Loosen the cap on cannula and retighten lightly. Note some cannulas may not have a cap.
7. Insert cannula needle bevel up at a 45-degree angle into the access. Blood will flow back into the cannula hub. Lower the angle of the cannula needle. Continue to advance the cannula needle approximately 0.5cm.
8. With free hand hold the end of the cannula needle with thumb and forefinger.
9. Extend the thumb and pull the inner steel needle out of the cannula. Continue to advance the cannula catheter while withdrawing the inner steel needle until the cannula is threaded within the access. Release the tourniquet if in use.
10. Secure the cannula needle with strips from the IV dressing over the catheter hub.
11. Clamp the cannula. Note some cannulas may have a hemostatic valve and do not require clamping.

12. Remove the cap from the cannula. Attach 10ml preloaded normal saline syringe to cannula.
13. Remove the clamp and pull back on plunger of syringe. Flush the cannula with the normal saline. Clamp the cannula.
14. Secure the cannula with IV dressing.
15. **Venous cannulation:**
16. Repeat steps 4 to 14 for rope ladder venous needle cannulation using cannula needle.
17. Continue with the procedure to start dialysis.

C. Cannula Needle – For Buttonhole – AV Fistula ONLY

❑ The buttonhole procedure is also known as "**constant site**" cannulation. Instead of rotating sites, you choose two sites: one for each needle. You put each needle into the exact same spot, at the same angle, at the same depth for each dialysis treatment.

❑ After placing the needle in the same site **6 to 10 times**, the skin heals to form a tiny tunnel or tract, like the hole in a pierced ear. The opening looks like the hole in a button.

❑ The first step is removing the scab over the buttonhole from the previous treatment. This lets you see the opening of the buttonhole and prevents germs in the scab from entering your bloodstream.

Supplies

- ❑ Clean towel
- ❑ One package of 4x4 gauze
- ❑ Tourniquet
- ❑ Two 18 gauge needles – to aid in removal of scabs
- ❑ Two antiseptic swabsticks
- ❑ Two antiseptic wipes
- ❑ Two Cannula needles
- ❑ Two IV dressing
- ❑ Two scissor clamps
- ❑ Two 10ml preloaded normal saline syringes
- ❑ Warm compress if needed – optional

Cannula Needle

Cannula Needle – For Buttonhole

1. Clean work surface. Allow area to dry.
2. Wash your hands and the access area with soap and warm, running water for 15 seconds. Dry with clean towel.
3. For **buttonhole cannulation**, soak buttonhole site with antiseptic wipes or gauze soaked with normal saline for 5 to10 minutes.
4. Clean the **buttonhole** with antiseptic swabstick.
5. Remove the scab from the **buttonhole** sites to be cannulated, using one sterile needle for each site.
6. Clean the **buttonholes** again with antiseptic swabstick. Allow antiseptic to dry.

Arterial cannulation:

7. Apply tourniquet.
8. Remove the cannula needle from protective cover.
9. Twist the inner steel needle within the cannula to break the seal between the needle and the cannula.
10. Loosen the cap on cannula and retighten lightly. Note some cannulas may not have a cap.
11. Insert cannula needle bevel up at a 45-degree angle into the buttonhole. Blood will flow back into the cannula needle hub.
12. Lower the angle of the cannula needle. Continue to advance the cannula needle approximately 0.5cm.
13. With free hand hold the end of the cannula needle with thumb and forefinger.
14. Extend the thumb and pull the inner steel needle out of the cannula. Continue to advance the cannula catheter while withdrawing the inner steel needle until the cannula is threaded within the access.
15. Blood will flash-back into dull needle. Release the tourniquet if in use.
16. Secure the cannula with strips from IV dressing over the catheter hub.
17. Clamp the cannula. Note some cannulas may have a hemostatic valve and do not require clamping.

18. Remove the cap from the cannula.
19. Attach 10ml preloaded normal saline syringe to the cannula.
20. Remove the clamp and pull back on plunger of syringe.
21. Flush the cannula with the normal saline. Clamp the cannula.
22. Secure the cannula needle with the IV dressing.

Venous cannulation:

23. Repeat steps 7 to 22 for venous needle cannulation.
24. Continue with the procedure to start dialysis.

Reminder: It may take up to 10 cannulation events with sharp needle or cannula needle to create the buttonhole. Once the buttonhole track is formed you may convert to cannulations using a dull needle.

D. Dull (blunt) Bevel Needle – Established Buttonhole Procedure for AV Fistula only

- ❑ This procedure is also known as "**constant site**" cannulation. Instead of rotating sites, you choose two sites; one for each needle. You put each needle into the exact same spot, at the same angle, at the same depth for each dialysis treatment.
- ❑ After using a sharp needle to cannulate the same site **6 to 10 times**, the skin heals to form a tiny tunnel or tract, like hole in a pierced ear. The opening looks like the hole in a button.
- ❑ Once there is a tunnel, you can cannulate with a needle that has a **dull or blunt** bevel.
- ❑ The first step is removing the scab over the buttonhole from the last treatment. This lets you see the buttonhole and prevents germs in the scab from entering your bloodstream.

Supplies

- ❑ Clean towel
- ❑ Two Dull Bevel Buttonhole needles
- ❑ Two 10ml preloaded normal saline syringes
- ❑ Two packages of 4x4 gauze
- ❑ Tourniquet
- ❑ Two antiseptic swabsticks
- ❑ Two antiseptic wipes
- ❑ Two IV dressing
- ❑ Warm compress – optional

Dull or Blunt Needle

Dull (Blunt) Bevel Buttonhole Procedure

1. Clean work surface. Allow area to dry.
2. Wash your hands and the access area with soap and warm, running water for 15 seconds. Dry with clean towel.
3. Open and prepare the supply. Maintain sterility. Prepare dull needles: Attach a 10ml preloaded normal saline syringe to each needle. Prime needles. Leave clamps open.
4. Soak buttonhole sites with antiseptic wipes or gauze soaked with saline for 5 to 10 minutes.
5. Clean area with antiseptic swabstick.

6. Remove the scabs from the buttonhole sites to be cannulated, using one sterile needle for each site.
7. Clean the area again with antiseptic swabstick. Allow antiseptic to dry.

Arterial cannulation:

8. Apply tourniquet.
9. Pinch wings of needle together. Carefully remove tip cover.
10. Line up the dull bevel needle over the buttonhole site, with bevel facing up. Insert needle into buttonhole.
11. Advance the dull bevel needle along tunnel track. If you feel a little resistance, turn the dull needle as you advance it forward, using cork-screw motion and gentle pressure.
12. Blood will flow back into the dull needle.
13. Release the tourniquet if in use.
14. Check the position of the needle. First, pull back blood into 10ml preloaded normal saline syringe. Then flush and check the return flow. Clamp needle.
15. Secure the needle in place with IV dressing.

Venous cannulation

16. Repeat steps 8 to 15 to cannulate the venous buttonhole site.
17. Continue with the procedure to start dialysis.

If you are not able to cannulate with a dull bevel needle, you may need to change to a sharp needle.

Note buttonhole technique is more prone to infection.
Your nurse will determine the best cannulation technique for your AVF.

Tips for arteriovenous cannulation

Choosing cannulation sites

- The arterial and venous cannulation sites should be:
  - At least 5 cm (2 inches) apart from each other
  - At least 2.5 cm (1 inch) away from the access surgery scar
- New cannulation sites must be about 0.25 cm from the site used for the last treatment.

Inserting needles

- Hold the needle at a 45-degree angle.
- Put the dialysis needle in **bevel up**. This makes a clean cut in the skin and the blood vessel.
  - Bevel sideways leaves a slit.
  - Bevel down can make the site bleed longer after treatment.
- Do not lift the needle off the cannulation site once it is placed on the skin.
- If you do, discard it and use a new needle

To prevent a serious infection, always follow the steps you have been taught.

Checking blood flow through an AV access

During home hemodialysis, you will have outpatient tests and procedures to monitor the blood flow through your AV access. This is an important part of your care. The Home Hemodialysis team will schedule your tests and give you further instructions.

Transonic flow study

- Checks the amount of blood flowing through your access.
- The transonic monitor lines are connected to the dialysis blood lines to measure blood flow through the access.

You must have a transonic flow study at least once a year.

- Low blood flow means that your access may be narrowed (stenosis). You will need to have further tests.
- The Transonic Flow Study is done in the Home Hemodialysis Unit. This requires cannulation and connection to the dialysis machine.

Ultrasound

- Doppler ultrasound is used to check blood flow and detect any narrowing in the AV fistula and AV graft.
- Ultrasound is done in the Vascular Department.

Fistulogram or angiogram

- A needle is inserted into the fistula or graft.
- Dye is injected through the needle.

Fistulogram or angiogram are the best ways to detect narrowing in an AV fistula or AV graft.

- The dye lets the doctor see inside the access on moving x-ray images. The doctor can check for any narrowing (stenosis) or problem areas.
- An angiogram is done in the Radiology Department by an Interventional Radiologist.

Angioplasty

- ❑ Angioplasty is a procedure to treat narrowing (stenosis).
- ❑ A thin, flexible tube (catheter) is put into the access. Dye is used to see the access on moving x-ray images. A tiny balloon is gently inflated to stretch and open up the narrowed area.

Before the procedure

- ❑ Let the nurse or doctor know if you are allergic to dye, iodine or shellfish. You will need medicine before the procedure to stop any allergic reaction.
- ❑ You must fast for 5 hours before the procedure
- ❑ You may take your pills (except Insulin and Warfarin) with a little water.
- ❑ Your heart and BP will be monitored.
- ❑ A nurse will put in an intravenous (IV) to give you medicine.

After the procedure

- ❑ You will need someone to take you home.
- ❑ It is best to dialyze after the procedure. Check with the Home Hemodialysis team.
- ❑ You will have a transonic flow study in the Home Hemodialysis Unit within 2 weeks after the angioplasty to check that blood flow has improved.

Managing problems with an AV access

Pain and swelling after access surgery	
Description	• It is common to have some pain and swelling after surgery. This should get better in 7 to 10 days.
Symptoms	• The area around the access area is swollen and painful.
Action	• Keep the access area raised to ease pain and reduce swelling.

Failure of fistula to fully develop	
Description	• Blood vessels can form at the side of the AV fistula and drain blood away from the fistula. This stops it from developing. • Sometimes a vein is too small and does not develop enough to be cannulated.
Symptoms	• The AV fistula is flat. • You cannot feel the thrill (buzz or throb).
Action	• The surgeon may need to tie off the side "branches" of blood vessels.

Infection	
Description	• Infection can happen after access surgery, and later on, around the cannulation sites. • Infection of the access can lead to a serious blood infection called sepsis.
Symptoms	• Fever and chills. • Redness, pain, swelling or discharge at the access incision or a cannulation site. • Low blood pressure. Feeling unwell.
Action	• After access surgery, check the **incision** for redness, pain, swelling, or discharge. • Check your **access** daily for redness, pain, swelling or discharge. • Check your temperature before and after dialysis, when you feel warm or think you have a fever, and when you shiver or feel cold. • Washing your hands is the best way to prevent infection. • Always use the 'no touch technique". • Before cannulation, wash your hands and the access area with soap and warm, running water for 15 seconds. • Follow the cannulation procedure carefully. • Take antibiotics as prescribed, before any surgery or procedure such as getting your teeth cleaned, dental work, or a biopsy.
 **If you have signs of infection:**	
	• Call the Home Hemodialysis Unit right away. The nurse will need to check you. Outside of the Unit's hours, go to the hospital emergency department. • Take antibiotics as ordered. You will be shown how to give antibiotics at home. • Continue to use your access for hemodialysis, unless you are told not to.

Aneurysm or Pseudo aneurysm (false aneurysm)	
Description	• Thinning of the skin over the AV fistula or AV graft causes a bulge or bump on the access. • May be caused by blood leaking outside the fistula, or cannulating in the same area, creating a '**pin cushion**' effect.
Symptoms	• A bulge or bump on the access.
Action	• Do not cannulate the areas where these bumps develop. • Change cannulation sites with each dialysis treatment. • If you have an AV fistula, using the buttonhole procedure can lessen the problem of aneurysms.

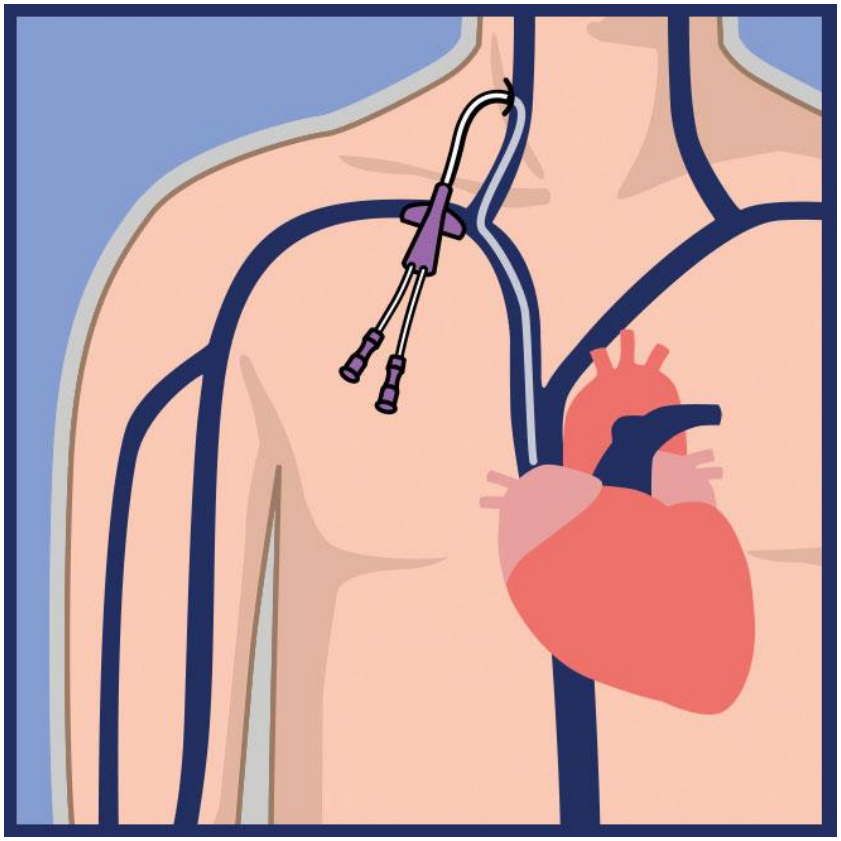
Steal syndrome	
Description	• The blood supply that should go to your hand goes to the access instead. The access is "stealing" blood away from your hand. • There is not enough blood flow to your hand.
Symptoms	• The wrist and hand of your access arm may be cold, painful, numb or swollen.
Action	• Lower your hand to improve the blood flow to that area. • Wear a woolen glove during dialysis. • Check with your nurse to see if you can slow down the pump speed. • Use a warm compress to ease pain. • If pain continues, you may need surgery to improve the blood flow to your hand or arm.

Thrombosis (clotting)	
Description	A blood clot may form in the access due to: • Narrowing of the blood vessel (stenosis) • Bruising or swelling of the access • Constant low blood pressure • Dehydration
Symptoms	• No thrill (buzz or throb) felt over the access. • Your access arm may be warm, painful and swollen.
Action	• Check your access daily. Feel the thrill and listen to the bruit. • Make sure your target weight is correct, as low blood pressure or dehydration may lead to thrombosis.
 **If you have signs of thrombosis:**	
	• Call the Home Hemodialysis Unit right away if you notice anything unusual when you check your access or you have difficulty with cannulation. • A transonic flow study will be done. This test checks blood flow through the access. • Thrombosis can be treated in the Radiology Department. You may need angioplasty, a procedure to remove the clot and open up any narrowed areas. • Go to the hospital emergency department. Your potassium and fluids will be checked as you may need dialysis. • If you need dialysis, a temporary catheter will be put in and dialysis will be provided.

Infiltration or hematoma	
Description	• The dialysis needle is not in the correct place, causing blood to leak into the tissues around the access. • This may occur if the needle is inserted at the wrong angle, or if the needle moves during dialysis. • Infiltration can happen right away or after you start hemodialysis.
Symptoms	• The cannulation site is swollen and painful. Leaking around the venous needle will trigger **Max** venous pressure alarm. Leaking around the arterial needle will trigger **Min** arterial pressure alarm.
Action	**If this happens <u>before</u> dialysis:** • Remove the bad needle. Put ice on the swollen area. • Re-cannulate with a new needle, above the swollen area if possible. • Start treatment.
	If this happens <u>during</u> dialysis: • Recirculate the blood. • Flush the good needle with normal saline. • Cap off the bad needle. • Put ice on the swollen area for 10 to 15 minutes. • Try to cannulate above the swollen area.
	If you are <u>not able</u> to re-cannulate:
	• Return your blood through the **good needle**. • Stop dialysis. • Inform the Home Hemodialysis Unit. • Put ice on the access after removing the needles. • Put a warm compress on the access the following day.

Stenosis (narrowing of the access)	
Description	• Narrowing of the access may occur naturally or from repeated cannulation. This can cause increased pressures during hemodialysis treatment. • A narrowing can cause a sharp rise in venous pressure. • Narrowing can cause failure to cannulate the AV fistula or AV graft.
Symptoms	• Higher venous pressure. • Poor arterial flows. • The thrill is not as strong or is very weak. • Problems with cannulation.
Action	 **If you have signs of stenosis:**
	• Call the Home Hemodialysis Unit as soon as possible. • Your access will need to be checked. This will include a transonic flow study. You may need angioplasty, a procedure to open up the narrowed area.

Central Venous Catheter (CVC or dialysis catheter)



Central venous catheter ports

- ❑ There are two ports. One port allows blood to be removed. The second port allows clean, dialyzed blood to return to the body
- ❑ After each use, each port is filled with medicine to stop blood from clotting in the catheter between uses. This is called "locking" the catheter.
- ❑ Each port has a clamp. Always make sure that both port clamps are closed when not dialyzing.

Accessing the CVC
• Central venous catheters should only be handled by the members of the hemodialysis health care team. • Only a hemodialysis team member is allowed do activities such as giving intravenous medicine or blood collection using the CVC.

Caring for a CVC

What to do
Prevent infection • Before any activity involving the CVC, wash your hands with liquid soap and warm, running water for 15 seconds. • Try not to talk during any activity involving the CVC. Turn away from the catheter if you have to cough or sneeze. This keeps germs from your nose and mouth away from the catheter.
Check and change the CVC dressing • Check the dressing over the exit site every day. It should be dry and intact. Make sure it completely covers the exit site. • Change the dressing once a week - before or after hemodialysis treatment. Never change the dressing during treatment. • Change the dressing after a shower, or if the site gets wet or dirty. • You do not usually need to wear a mask when you change the dressing. Wear a mask if you have a cough or the flu.
Care for the exit site When you change the CVC dressing: • Check the exit site for signs of infection: redness, pain, swelling, discharge or a bad smell. • Disinfect the exit site and surrounding area with an antiseptic swabstick. Let the disinfectant dry on the skin. Do not dry the skin with gauze. • Put a dab of antibiotic ointment on sterile gauze and place it over the exit site. Discard the gauze.

If you have any problems or complications, call the Home Hemodialysis Unit right away or go to the Emergency department.

Changing the CVC dressing

A clean, dry dressing over the CVC exit site protects it from germs that could cause an infection. A dressing should be changed every 7 days or if it begins to detach from the skin or if there is evidence of drainage from the exit site. Inform your nurse if you do see evidence of drainage or bleeding.

Supplies

- ❑ Clean towel
- ❑ Two antiseptic swabsticks OR
- ❑ Cleanse with 0.9% normal saline saturated gauze if sensitive to antiseptic agents
- ❑ Antibiotic ointment
- ❑ One package 2x2 gauze
- ❑ One Dressing

Procedure

1. Wash hands with soap and warm, running water for 15 seconds. Dry with clean towel.
2. Disinfect work surface. Allow the surface to dry before preparing materials.
3. Open and prepare supplies, maintaining sterility.
4. Carefully remove old dressing. Peel back the edges of the dressing away from the skin towards the exit site. Discard the dressing.
5. Check CVC exit site for signs of infection: redness, swelling, discharge, bad smell, exposed grommet or cuff. Call the Home Hemodialysis Unit to report any signs of infection.
6. Note the length of the CVC. Call the Home Hemodialysis Unit to report any change in the length of the catheter.
7. Wash hands again.
8. Clean the exit site with the antiseptic swabstick.
9. Then use a circular motion to clean around the exit site and surrounding area. Discard swabstick.
10. Clean the exit site and surrounding area again, using a new swabstick.
11. Wait for the area to dry.
12. Apply a dab of antibiotic ointment to the centre of a 2x2 gauze.
13. Apply the ointment over the CVC exit site. Discard the gauze.
14. Apply the CVC dressing securely, to completely cover the exit site.

Showering with Hemodialysis Catheter
WATER RESISTANT DRESSING

Prior to shower or dressing change observe for potential signs & symptoms of catheter infection:

- ❑ Bleeding
- ❑ Bad smell
- ❑ Skin breakdown
- ❑ Drainage
- ❑ Fever
- ❑ Redness
- ❑ Swelling
- ❑ Pain or tenderness
- ❑ Exposed grommet or cuff
- ❑ Change in length of catheter from exit site

Contact your home hemodialysis nurse promptly if you have any of the signs and symptoms of a potential infection.

Supplies

- ❑ Ensure water-resistant dressing applied to catheter exit site
- ❑ Two antiseptic cleansing swabsticks
- ❑ Two antiseptic wipes
- ❑ Plastic cover (bag or wrap) and waterproof tape if dressing not intact
- ❑ Dressing material if dressing change required – see dressing change protocol, page 23

Procedure

1. Gather supplies require before entering shower.
2. Ensure the water-resistant dressing is intact. If dressing is not intact, secure with plastic cover and waterproof tape.
3. Ensure needle-free caps on catheter ports are secure before entering shower.
4. Have a shower. Dry off.
5. Change dressing as per protocol, every 7 days or if dressing is not intact.
6. Using antiseptic cleansing wipes, clean down each catheter port to needle-free cap.
7. Ensure clamps are closed on both ports of catheter.

Showering with Hemodialysis Catheter
CLOTH ADHESIVE DRESSING (Not Water resistant)

Prior to shower or dressing change observe for potential signs & symptoms of catheter infection:

- ❑ Bleeding
- ❑ Bad smell
- ❑ Skin breakdown
- ❑ Drainage
- ❑ Fever
- ❑ Redness
- ❑ Swelling
- ❑ Pain or tenderness
- ❑ Exposed grommet or cuff
- ❑ Change in length of catheter from exit site

Contact your home hemodialysis nurse promptly if you have any of the signs and symptoms of a potential infection.

Supplies

- ❑ Large piece of plastic (bag or wrap) to cover the CVC dressing
- ❑ Waterproof tape
- ❑ Two antiseptic cleansing swabsticks
- ❑ Two antiseptic wipes
- ❑ Dressing supply – see dressing change protocol, page 23

Procedure

1. Ensure needle-free caps on catheter are secure.
2. Cover the catheter dressing with plastic wrap and tape down with waterproof tape.
3. Have a shower. Dry off.
4. After the shower, change the catheter dressing. Follow the procedure for catheter dressing change.
5. Using antiseptic cleansing wipes, clean down each catheter port to needle-free cap.
6. Ensure clamps remain closed on both ports of catheter.

Application of new needle-free cap
&
Preparing for hemodialysis through CVC

Supplies

- ❑ Clean towel
- ❑ Two 10ml preloaded normal saline syringes
- ❑ Four Antiseptic wipes
- ❑ Two 10ml syringes
- ❑ Two needle-free caps

Change Needle-free Cap every 7 days before you start dialysis.

1. Clean work surface and allow area to dry.
2. Wash hands with soap and warm, running water for 15 seconds. Dry with a clean towel.
3. Open and prepare supplies, maintaining sterility.
4. Ensure the clamps on both ports of the catheter are closed.
5. Using no touch technique, attach needle-free cap to 10ml syringe. Set aside.
6. Place a second clamp on to the arterial catheter port.
7. Remove the old needle-free cap from the arterial port on the catheter.
8. Place the arterial port hub into the open end of the cleansing wipe packet.
9. Soak the arterial port hub for 30 seconds.
10. Scrub the arterial port hub for 30 seconds. Discard the wipe.
11. Allow 30 seconds for the cleanser to dry.
12. Attach the 10ml syringe with needle-free cap to clean arterial port hub.
13. Remove the clamp from arterial port.
14. Repeat steps 4 to 13 to change venous port needle-free cap.
15. Continue to Procedure to Access the CVC on page 27, steps 14 to 29.

Procedure to access the CVC

1. Clean the surface area and allow area to dry.
2. Wash hands.
3. Open the 10ml syringe and leave in sterile package.
4. Remove the preloaded syringes from the package, loosen the tip and remove air from the syringe.
5. Tear open package of 2 antiseptic wipes.

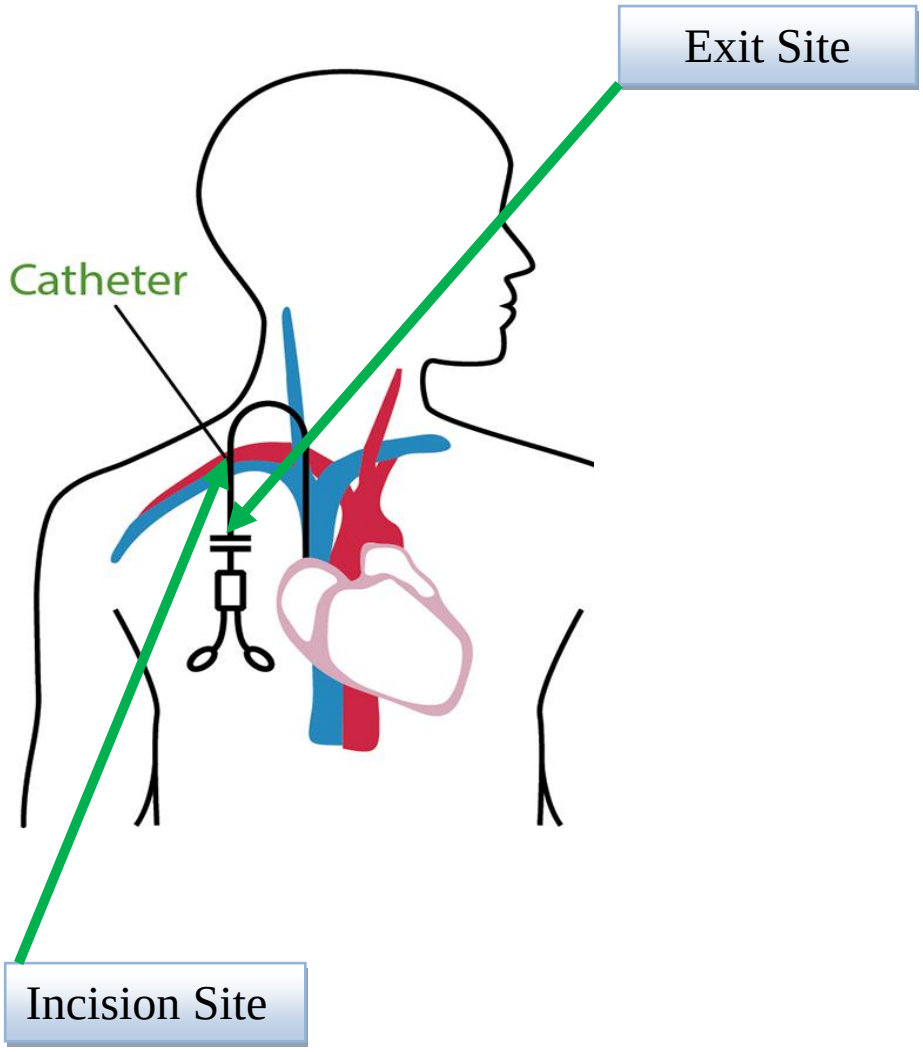
Prepare catheter for dialysis

6. Wash hands with soap and warm, running water for 15 seconds. Dry with clean towel.

Preparing the arterial port

7. Ensure the clamps on both ports of the catheter are closed.
8. Place arterial port with needle-free cap into open packet of antiseptic wipe.
9. Soak the needle-free cap for 30 seconds.
10. Scrub the needle-free cap for 30 seconds.
11. Discard the antiseptic wipe.
12. Allow 30 seconds for the needle-free cap on arterial port to dry.
13. Attach 10ml syringe to needle-free cap on arterial port.
14. Open clamp on the arterial port and withdraw 3 - 5ml of blood.
15. Clamp catheter.
16. Remove and discard the 10ml syringe containing blood.
17. Attach 10ml preloaded normal saline syringe to port.
18. Open the clamp on the port.
19. Inject the normal saline into the port. With the same syringe, pull and push the blood in the arterial port several times.
20. Close the clamp on the port.
21. Attach a second 10ml preloaded normal saline syringe to the arterial port.
22. Open arterial port. Flush arterial port with normal saline.

23. Close arterial port.
24. Repeat steps 7 – 23 for the venous port.
25. Follow procedure to start the treatment.



Locking CVC after hemodialysis

Supplies

- ❑ Clean towel
- ❑ Two antiseptic wipes
- ❑ Two 10ml preloaded normal saline syringes
- ❑ Two syringes of locking medication

Procedure

1. Wash hands or use hand sanitizer.
2. Open and prepare the supplies. Maintain sterility.
3. Ensure the clamps on both ports of the catheter are closed.
4. Ensure the arterial and venous blood lines are clamped.

Lock the arterial port

5. Disconnect arterial bloodline from the catheter.
6. Place arterial port with needle-free cap into open packet of antiseptic wipe.
7. Soak the needle-free cap for 30 seconds.
8. Scrub the needle-free cap for 30 seconds. Discard the antiseptic wipe.
9. Allow 30 seconds for the needle-free cap on arterial port to dry.
10. Attach 10ml preloaded normal saline syringe to the arterial port with needle-free cap.
11. Open the clamp on the arterial port. Inject the normal saline. Flush until clear.
12. Close the clamp on the port. Discard the 10ml syringe.
13. Attach syringe of locking medication to arterial port with needle-free cap.
14. Open the clamp on the port.
15. Inject the prescribed amount of locking medication.
16. Close the clamp on the port.

Lock the venous port

17. Disconnect venous bloodline from the catheter.
18. Repeat steps 5 to 16 for the venous port.

Managing problems with a CVC

Thrombosis (clotting)	
Description	• The most common problem with dialyzing using a CVC. • Clots usually form at the tip of the catheter.
Symptoms	• Poor blood flow with bad pressure readings (arterial or venous pressure is greater than 250 mmHg, or pressures are fluctuating - triggering alarms)
Prevention	• Flush the CVC by removing 3 – 5ml blood from each port. Then flush each port with 10ml normal saline. • After dialysis, sodium citrate solution or other medication is put into each port to prevent clots forming in the catheter. This is called locking the catheter.
Action	**If you have signs of thrombosis:**
	• Call the Home Hemodialysis Unit as soon as possible. • The Home Hemodialysis nurse may put Alteplase (Cathflo®) into the CVC to help dissolve the clot. • If the problem is severe, the CVC may need to be changed.

Poor blood flow	
Description	The most common and upsetting problem. May be caused by: • A kink or twist in the catheter. • A clot within one of the two lumens. • Poor position of the catheter, causing the catheter tip to be against the vessel wall. • Low blood pressure.
Symptoms	• Unable to withdraw blood and/or inject saline smoothly. • When on dialysis, very negative arterial pressure and/or high venous pressures.
Action	• Move the clamps on the CVC port in case the line is pinched. • Flush the CVC ports with normal saline. • Lower the blood pump speed (no less than 250 ml/min) • Reverse the lines. • Put Alteplase (Cathflo®) into the CVC to help dissolve the clot.

Central Venous Stenosis (narrowing of the vessel)	
Description	• The vein in the neck can become narrow after repeated CVC insertions.
Symptoms	• Swelling of the arm on the catheter side.
Action	• You may need an angiogram and angioplasty, a procedure to detect narrowing and open up the vein.

Infection and sepsis	
Description	• Infection of the exit site, tunnel, and catheter are common. • Infection involving the CVC can lead to a serious blood infection called sepsis.
Symptoms	• Fever and chills. • Exposed grommet or cuff. • Exit site infection: Pain, redness and/or oozing around the exit site. The exit site may have a bad smell. • Tunnel infection: Pain, redness and swelling along the catheter track. • Catheter infection: Low blood pressure. Feeling unwell.
Prevention	• Check the CVC dressing every day. It should be dry and intact. • Check the exit site for redness, pain, swelling, discharge or a bad smell. • Try to handle the catheter as little as possible. Try not to tug at the catheter. • Wash your hands with soap and warm, running water for 15 seconds before handling the CVC or changing the dressing. • Change the CVC dressing once a week - before or after hemodialysis treatment (never during treatment). • Change the CVC dressing if dressing not intact. • Change the CVC dressing after a shower, if the site gets wet.

Action	If you have signs of infection:
	• Go the Home Hemodialysis Unit or to the Emergency Department to be checked. Never ignore symptoms of infection. • If the exit site looks infected, the nurse will take a sample with a swab to be tested for infection. • You will have a blood test (blood cultures) to check for infection. • The doctor will prescribe antibiotics to treat the infection. • Continue to dialyze using the CVC unless told not to by the Home Hemodialysis team. • The catheter may have to be removed and a new one put in.
	If you develop chills and fever during hemodialysis:
	• Return your blood. • Stop the treatment. • Go to the hospital emergency department for immediate medical help.

Catheter becomes displaced or dislodged	
Description	• The CVC is not in the correct position. • The CVC may become dislodged after an infection or if the sutures are removed too early. • The CVC has fallen out.
Symptoms	• The length of the catheter may be longer than when it was put in. • Exposed cuff or grommet. Cuff is visible outside the exit site. • Swelling and bloody discharge from the exit site.
Prevention	• When the CVC it put in, it is held in place with stitches (sutures). The stitches are removed in 6 to 8 weeks. • Do not tug on the CVC. • Secure the blood lines during dialysis by taping them down. • Note the length of the catheter outside the exit site. Check that the length remains the same.
Action	**If the catheter is dislodged:**
	• Return the blood (retransfuse), if possible and stop treatment. If swelling develops, STOP returning the bloods. • If bleeding or swelling occurs, try to remain flat. Do not remove the catheter. • Apply pressure to the incision site over the collar bone. • Tape down the CVC to prevent further movement. • Call the Home Hemodialysis Unit or go to the hospital emergency room for medical help. • If you need dialysis, a temporary catheter will be inserted in your groin area. It will be removed after treatment. • Arrangements will be made to insert a new CVC. **Catheter has fallen out completely:** • If there is bleeding, stay flat and apply pressure at the incision site by the collar bone. • Go to hospital emergency room for medical help.

Air embolism	
Description	• Air enters the blood stream. • An air bubble can block a small blood vessel. This cuts off the blood supply to a part of the body.
Symptoms	Symptoms vary depending on the location and extent of the blockage. Symptoms may include: • Chest pain • Difficulty breathing • Coughing • Headache • Loss of consciousness
Prevention	• Before changing the caps, make sure both ports are clamped. **Then apply a second set of clamps** to catheter ports to change the caps. • When the CVC is not in use, make sure the clamps and caps on both ports are closed securely. • Before using the catheter for dialysis, check that the port clamps are closed. • Do not use scissors or any sharp object near the catheter. • Check connections to make sure they are tight and secure. • Always use the wet detector device.
Action	**If the lines separate and air enters:**
	• Close the port clamps on the catheter immediately. • Close bloodline clamps. • Do not return the blood. • Remain flat and turn onto your left side. • Call 911 for emergency medical help.

More on Catheter Dysfunction (Problems)

Catheter dysfunction or problem is defined as failure to reach and maintain the desired blood pump speed necessary to perform hemodialysis treatment. In general, this is taken to be:

- A blood flow less than 250ml/min
- Arterial negative pressure of -250mmHg to -300mmHg
- Venous pressure 250mmHg or greater
- Multiple arterial and venous pressure alarms during the dialysis session

Poorly functioning catheter can be due to many reasons, including mechanical causes such as kinking or improper positioning of the catheter tip; patient positioning; clot formation or development of fibrin sheath, a protein lining the catheter that can result in catheter clotting.

MANAGING CATHETER DYSFUNCTION

- Attempt to manage the catheter dysfunction **before** initiating therapy.
- Management of catheter dysfunction **during** hemodialysis therapy may increase the risk of infection.

Management of Catheter Problems

1. Flush ports vigorously with normal saline.
2. Reverse the blood lines to start therapy.
3. Reduce pump speed to no lower than 200ml/minute.
4. Administer Cathflo.
5. Report catheter problems to home hemodialysis team.

Alarms and Warnings

Alarms related to vascular access

This chart tells you how to respond to these alarms related to vascular access:

- Arterial pressure too negative
- Arterial pressure less negative than usual
- Venous pressure too low
- Venous pressure too high
- Arterial line separation – Arteriovenous access
- Arterial line separation – CVC
- Venous line separation – Arteriovenous access
- Venous line separation – CVC

In this section of the guide, the Home Hemodialysis Unit is called "the Unit".

<table>
<tr><th colspan="3">Arterial Pressure too negative (e.g. -300mmHg) – ARTERIAL NEEDLE</th></tr>
<tr><th>Machine effect</th><th>Possible causes</th><th>Actions</th></tr>
<tr><td rowspan="2">Written and sound alarm.
Arterial & Venous clamp close.
Blood pump stops.
Dialysis time and fluid removal stops.</td><td>Poor arterial needle position</td><td>Try to reposition the needle. Re-cannulate.
If you are unable to re- cannulate, stop treatment and call the Unit.</td></tr>
<tr><td>Arterial needle infiltration
Needle is outside the AV fistula or AV graft</td><td>If this occurs <u>before</u> hemodialysis:
Remove the needle.
Put ice on the affected area.
Re-cannulate new site.
If this occurs <u>during</u> hemodialysis:
Recirculate blood.
Flush the good needle.
Put ice on the affected area.
Re-cannulate new site.
Restart treatment.
Call the Unit to report the problem.
If you are unable to re-cannulate, stop treatment.
Return the blood through the venous needle.
Call the Unit to report the problem.</td></tr>
</table>

Arterial Pressure too negative (e.g. -300mmHg) – ARTERIAL NEEDLE CONTINUED		
Machine effect	**Possible causes**	**Actions**
	Vessel spasm	• Put a warm compress on the access. • Reduce the blood speed. • Allow spasm to settle before increasing the blood pump.
	Stenosis • Narrowing of AV fistula or AV graft	• Check and record arterial pressure on dialysis log. • Call the Unit to report changes in arterial pressure. • Fistulogram and angioplasty may be needed to detect and treat stenosis. • Transonic flow study will be arranged to check flow through the access.
	Thrombosis • Clotting in AV fistula or AV graft	• Check for the bruit. • Call Unit to report changes in bruit. • If there is clotting, angioplasty will be done to remove the clot. • A transonic flow study will be done after angioplasty to recheck flow through the access.
	Low blood pressure (BP)	• Check BP. • Give normal saline. • Check if target weight needs to be increased. • If BP remains low, stop treatment and call the Unit to report the problem.
	Blocked arterial line	• Check for clamps, kinks and clots.

Arterial Pressure too negative (e.g. -300mmHg) – CATHETER		
Machine effect	**Possible causes**	**Actions**
• Written and sound alarm. • Arterial & Venous clamp close. • Blood pump stops. • Dialysis time and fluid removal stops.	**Arterial Port of CVC:** • Partially blocked • Clotted	• Reduce pump speed. • Flush the port with normal saline. • Reverse the lines. • Change your position. • Give Alteplase (Cathflo®). • CVC may need to be removed and replaced with a new CVC.
	CVC • Catheter may be dislodged	• Do not return the blood. • Apply pressure at old incision on collar bone. • Tape down the CVC. • Go to the hospital emergency room.
	Low blood pressure (BP)	• Check BP. • Give normal saline. • Check if target weight needs to be increased. • If BP remains low, stop treatment and call the Unit to report the problem.
	Blocked arterial line	• Check arterial bloodline for clamps, kinks.

Arterial Pressure less negative or even positive (e.g. -60 to -100mmHg) – FISTULA / GRAFT / CATHETER

Machine effect	Possible causes	Action
• Written and sound alarm. • Arterial & Venous clamp close. • Blood pump stops. • Dialysis time and fluid removal stops.	Normal saline is running (infusing)	• Stop infusion of normal saline if no longer needed.
	Pump speed too slow	• Ensure the blood flow is set at the desired flow rate.

Venous pressure is too low (e.g. 40 to 100mmHg) – FISTULA / GRAFT / CATHETER

Machine effect	Possible causes	Actions
• Written and sound alarm. • Arterial & Venous clamp close. • Blood pump stops. • Dialysis time and fluid removal stops.	Blood pump flow	• Ensure the blood flow is set at the desired flow rate.
	Normal saline infusion	• Stop infusion of normal saline, if it is no longer needed.
	Dialyzer clotting (Note: transmembrane pressure [TMP] alarm may occur)	• Flush the blood lines to assess for clotting in the dialyzer. • Stop dialysis. Do not return blood. • Call the Unit to report the problem.
	Venous access monitoring (VAM) alarm	• VAM detects a pressure loss, which may result from a disconnection of venous needle / catheter or when venous pressure settles after starting dialysis.

<table>
<tr><th colspan="3">Venous pressure too high (e.g. 260mmHg to 400mmHg) – VENOUS NEEDLE</th></tr>
<tr><th>Machine effect</th><th>Possible causes</th><th>Actions</th></tr>
<tr><td rowspan="2">Written and sound alarm.
Arterial & Venous clamp close.
Blood pump stops.
Dialysis time and fluid removal stops.</td><td>Poor venous needle position</td><td>Try to reposition the needle.
Re-cannulate.
If you are unable to re-cannulate, stop treatment.
Call the Unit to report the problem.</td></tr>
<tr><td>Venous needle infiltration
Needle is outside the AV fistula or AV graft</td><td>If this occurs <u>before</u> hemodialysis:
Remove the needle.
Put ice on the affected area.
Re-cannulate new site.
If this occurs <u>during</u> hemodialysis:
Recirculate blood.
Flush the good needle.
Put ice on the affected area.
Re-cannulate new site.
Restart treatment.
Call the Unit, report the problem.
If you are unable to re-cannulate, stop treatment.
Return blood through the good needle.
Attach the venous line to the arterial needle.
Call the Unit, report the problem.</td></tr>
<tr><td rowspan="2"></td><td>Vessel spasm or tremor</td><td>Put a warm compress on the access.
Reduce the blood speed.
Allow spasm to settle before increasing blood pump.</td></tr>
<tr><td>Stenosis
Narrowing of AV fistula or AV graft</td><td>Check and record venous pressures on the dialysis log.
Call the Unit to report changes in venous pressure.
Fistulogram and angioplasty may be needed to detect and treat stenosis.
Transonic flow study will be arranged to check flow through the access.</td></tr>
</table>

Venous pressure too high (e.g. 260mmHg to 400mmHg) – VENOUS NEEDLE CONTINUED		
Machine effect	**Possible causes**	**Actions**
• Written and sound alarm. • Blood pump stops. • Arterial & Venous clamp close • Dialysis time and fluid removal stops.	Thrombosis • Clotting in • AV fistula or AV graft	• Check the thrill and bruit of your access. • Call the Unit to report changes of absence in thrill or bruit. • If there is clotting, an angioplasty procedure will be done to remove the clot. • A transonic flow study will be done after angioplasty to recheck flow through the access.

Venous pressure too high (e.g. 260mmHg to 400mmHg) – CATHETER		
Machine effect	**Possible causes**	**Actions**
• Written and sound alarm. • Arterial & Venous clamp close. • Blood pump stops. • Dialysis time and fluid removal stops.	CVC Venous PORT / LUMEN: • Partially blocked or clotted	• Reduce pump speed. • Flush the port with normal saline. • Reverse the lines. • Change your position. • Give Alteplase (Cathflo®). • Call the Unit to report the problem. • CVC may need to be removed and replaced with a new CVC.
	CVC • Catheter may be dislodged	• Do not return the blood. • Apply pressure at the incision site near the collar bone. • Tape down the CVC. • Go to the hospital emergency room.
	Blocked venous line	• Check for clamps, kinks and clots.
	Venous chamber clotting (bubble catcher)	• Stop treatment. Do not return blood. • Consider an increase in the dose of heparin. • Call the Unit to report the problem.

Venous pressure too high (e.g. 260mmHg to 400mmHg) – FISTULA / GRAFT / CATHETER		
Machine effect	**Possible causes**	**Actions**
• Written and sound alarm. • Blood pump stops. • Arterial & Venous clamp close • Dialysis time and fluid removal stops.	Blocked venous line Venous chamber Clotting	• Check for clamps, kinks and clots along the venous line. • Stop treatment. Note it may not be possible to return the blood. Discard the blood circuit. • Consider an increase in the dose of heparin. • Call the Unit to report the problem.

Arterial Line Separation – ARTERIAL ACCESS (Fistula / Graft)	
Possible causes	**Actions**
Arterial line separation from arterial needle **Alarms** • Arterial pressure alarm • Level dropped in venous bubble catcher • Microbubble alarm	• Close all clamps - access clamps as well as line clamps. • Do not return the blood. • Stop treatment. • Apply pressure on the arterial needle site until bleeding stops. • Call the Unit to report the problem. • In future, make sure you tape connections correctly. • Make sure you use the wet detector device.

Arterial Line Separation – CATHETER	
Possible causes	**Actions**
Arterial line separation from arterial port of CVC **Alarms** • Arterial pressure alarm • Level dropped in venous bubble catcher • Microbubble alarm	**A. Disconnection from <u>needle-free cap</u>** • Close all clamps - access clamps as well as line clamps. • Stop treatment. • Call the Unit to report the problem. • Always check line connections are firmly secured to needle-free caps. • Make sure you use the wet detector device.
	**B. Direct disconnection from <u>CVC</u> If there is a line separation, you may get an air embolism and also lose a lot of blood. This can be fatal.**
	• Close all clamps - access clamps as well as line clamps. • Do not return your blood. • Stay flat. Turn on your left side. • Call 911.

Venous Line Separation – VENOUS ACCESS (Fistula / Graft)	
Possible causes	**Actions**
Venous line separation from venous needle **Possibly VAM Alarm** **OR** **No Alarm**	• Close all clamps- access clamps as well as line clamps. • Do not return the blood. • Stop treatment. • Make sure you follow the correct taping procedure. • Always check line connections are firmly secured to the needles. • Call the Unit to report the problem. • Make sure you use the wet detector device. **If you have significant blood loss, it may be difficulty to manage your care. Do the following:** • Close all clamps - access clamps as well as line clamps. • Do not return the blood. • Stay flat. • Call 911.

Venous Line Separation – CATHETER	
Possible causes	**Actions**
Venous line separation from venous port of CVC **Possibly VAM Alarm** **OR** **No Alarm**	**A. Disconnection from <u>needle-free cap</u>** • Close all clamps - access clamps as well as line clamps. • Stop treatment. • Call the Unit to report the problem. • Always check line connections are firmly secured to needle-free caps. • Make sure you use the wet detector device. **It may be difficulty to manage your care, if you have significant blood loss. Do the following:** • Close all clamps - access clamps as well as line clamps. • Do not return the blood. • Stay flat. • Call 911. • Make sure you use the wet detector device.
	**B. Direct disconnection from <u>CVC</u>** **If there is a line separation, you may get an air embolism and also lose a lot of blood. This can be fatal.**
	• Close all clamps - access clamps as well as line clamps. • Do not return your blood. • Stay flat. Turn on your left side. • Call 911.

REMINDER: Use the Blood Leak Detector!

Heparin and Anticoagulation

Coagulation – Blood Clotting

What is a blood clot?

A blood clot is a clump of solid blood.

When a blood vessel is damaged, tiny blood cells called platelets respond by clumping together. This starts a chemical reaction that forms a blood clot.

When liquid blood forms a solid mass, this is called ‘clotting’. Other names for this are ‘coagulation’ and ‘thrombosis’.

Clotting can be helpful or harmful:

- ❑ It is a normal response to stop bleeding after a cut or injury.
- ❑ It can be harmful when it blocks the flow of blood. Clotting can cause a heart attack or stroke.

Preventing blood clots during hemodialysis – Anticoagulant

It is normal for blood to form clots when it leaves your body. However, when blood leaves your body for dialysis, it must continue to flow freely through the blood circuit, without forming clots.

Did you know?

- The ‘circuit’ refers to the circular route your blood takes - away from your body, through the dialyzer, and back again.

Clots can be harmful, as they may slow or block the flow of blood in the blood circuit.

A medicine called an **anticoagulant** is needed with every dialysis treatment to prevent clots from forming. An anticoagulant is commonly known as a blood thinner. Heparin is the name of the anticoagulant that is used in hemodialysis. It is drawn up in a syringe and attached to the arterial circuit.

Anticoagulants:

- Are also known as 'blood thinners'.
- Work by decreasing the blood's ability to form clots.

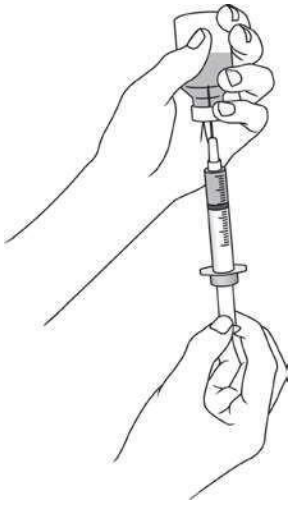
Anticoagulants prevent blood clots from forming.
They keep your blood flowing freely through the blood circuit.

Anticoagulation with heparin

The most commonly used anticoagulant medicine during dialysis is heparin (heparin sodium). In dialysis, it is given into the blood circuit.

Heparin is given in two ways:

- **BOLUS**: A single dose, given to boost the amount of heparin in the blood at the start of dialysis.
- **CONTINUOUS INFUSION**: A small amount is slowly and evenly delivered throughout dialysis by a pump set at a specific hourly rate.



The Home Hemodialysis team will prescribe the amount of heparin that best meets your needs. Most patients will have:

- ❑ Routine (standard) heparin infusion, **OR**
- ❑ Tight (reduced dose) heparin infusion, if they have a greater chance of bleeding.

Routine (standard) Heparin infusion	The Routine dose of heparin is: Bolus: 1000 to 2000units (1 to 2 ml) Hourly rate: 1000 to 2000units per hour (1 to 2 ml/hr.) The Home Hemodialysis team will prescribe your dose.
	The goal is to use just the right amount of heparin to prevent blood clots from forming.
	• Too little heparin can lead to clotting. • Too much heparin can cause bleeding problems.

Tight (Reduced dose) heparin infusion	The Tight or reduced dose of heparin is: Bolus: 1000units (1ml) Hourly rate: 500units per hour (0.5 ml/hr.) The Home Hemodialysis team will prescribe your dose.
	The goal for patients who are at risk for bleeding is to prevent clotting but with the use of less heparin.
	✓ When using tight heparin, watch the blood circuit closely for signs of clotting. ✓ Flush the system every hour with normal saline.

When to stop heparin

- ❑ If you have an AV fistula or AV graft, stop the heparin infusion 1 hour before the end of your dialysis treatment (or at the time determined by your nurse).

Heparin remains in the body for about 30 to 120 minutes after the medicine has been stopped.

- ❑ If you have a CVC, heparin should continue to the end of dialysis.

Watch for these signs that you may be using too much heparin:

- Unusual bruising or bleeding.
- Blood in your urine.
- Dark or bloody bowel movements.
- Vomit that looks bloody or like coffee grounds.
- Heavy periods (for women).

Call the Home Hemodialysis Unit to report any bleeding problems.

Heparin-free dialysis

There are times when it is not safe to take anticoagulants.

The Home Hemodialysis Team may recommend **Heparin-free** dialysis if you:

- ❑ Are going to have, or have had surgery recently
- ❑ Are going to have, or have had a minor procedure recently, such as dental work or a biopsy
- ❑ Have bleeding problems
- ❑ Have active bleeding, such as a new wound or injury
- ❑ You are allergic to heparin

If you are going to have any procedure done that could result in bleeding, tell the Home Hemodialysis staff at least 2 days ahead of time.

The goal of heparin-free dialysis to prevent clots by flushing the blood circuit with normal saline many times.

- ✓ Flush the blood circuit with 200 ml of normal saline every hour.
- ✓ Flushes can be increased to every 30 minutes, if needed.
- ✓ Do not forget to include this extra saline when you calculate your total weight loss (ultrafiltration goal).
- ✓ Dialysis sessions will be shorter: 3 to 4 hours rather than 7 to 8 hours.

Restarting heparin during dialysis treatment should happen ONLY with the help and permission of the Home Hemodialysis Team.

Checking for signs of clotting

The best way to check the blood circuit for clotting is to flush the blood circuit system with 200 ml of normal saline.

Watch for these signs of clotting:

- The blood in the circuit is extremely dark.
- There are streaks of dark blood in the dialyzer.
- Foaming in the bubble catcher (venous chamber), as this can lead to clotting.
- Blood backs up into the transducer line (hydrophobic filter).
- There are clots at the arterial or venous ends of the dialyzer.
- Arterial and/or venous pressure alarms. Arterial and venous pressure may change, depending on the location of the clot in the blood circuit.
- Transmembrane pressure (**TMP**) alarm. TMP is the amount of force necessary to push water through the dialyzer membrane. If water cannot be removed due to clotting, TMP alarm will occur.

Call the Home Hemodialysis team right away:

If you notice clotting in the blood circuit:

- An occasional clot in the circuit can be expected. This does not usually require a change in the dose of heparin.
- If clotting happens often, the heparin dose may need to be changed.

If you are experiencing bleeding:

- You may need to decrease the hourly rate of heparin, if there is a lot of bleeding from needle puncture sites or any other area.

The causes of clotting

Clotting in the blood circuit may be caused by:

- ❑ Low blood flow.
- ❑ High hemoglobin.
- ❑ Dialysis access recirculation due to a poorly functioning access.
- ❑ High fluid removal rate (ultrafiltration).
- ❑ Air and foam in the arterial or venous chambers.

Clotting may also be caused by technical or operator errors

Dialyzer priming errors	• Air in dialyzer - due to not enough priming or poor priming of the dialyzer. • Poor priming of the heparin line. • Air in the heparin syringe.
Heparin dispensing errors	• Wrong hourly rate of heparin for continuous infusion. • Wrong bolus dose of heparin. • Delay in starting the heparin pump. • Kink or clamped heparin line.
Vascular access errors	• Poor blood flow due to needle or catheter positioning. • Frequent interruptions in blood flow due to access alarms during dialysis.

What to do during heparin-free dialysis

Before starting treatment, change the machine's parameters to turn off heparin.

1. Press HEPARIN menu.
2. Press Heparin I/O, indicator light will turn GREY.

Important information	
Dialyzing heparin free	• A flush of 200ml of normal saline is required after every hour of heparin free dialysis.
 Give flushes	• When you calculate your total weight loss (ultrafiltration goal) **add** in the total amount of saline used to flush the blood circuit.
For example	• If you dialyze for 3 hours, you will give 400ml of flushes and 300ml of reinfusion fluid. ❑ End of 1st hour – 200ml flush ❑ End of 2nd hour – 200ml flush ❑ End of treatment – 300ml reinfusion fluid ❑ You will give a total of 700ml of normal saline ❑ Ultrafiltration goal = Weight gained + 700ml Note: Depending on your needs, reinfusion fluid can be omitted from the total weight loss (ultrafiltration goal). Your nurse will advise you.

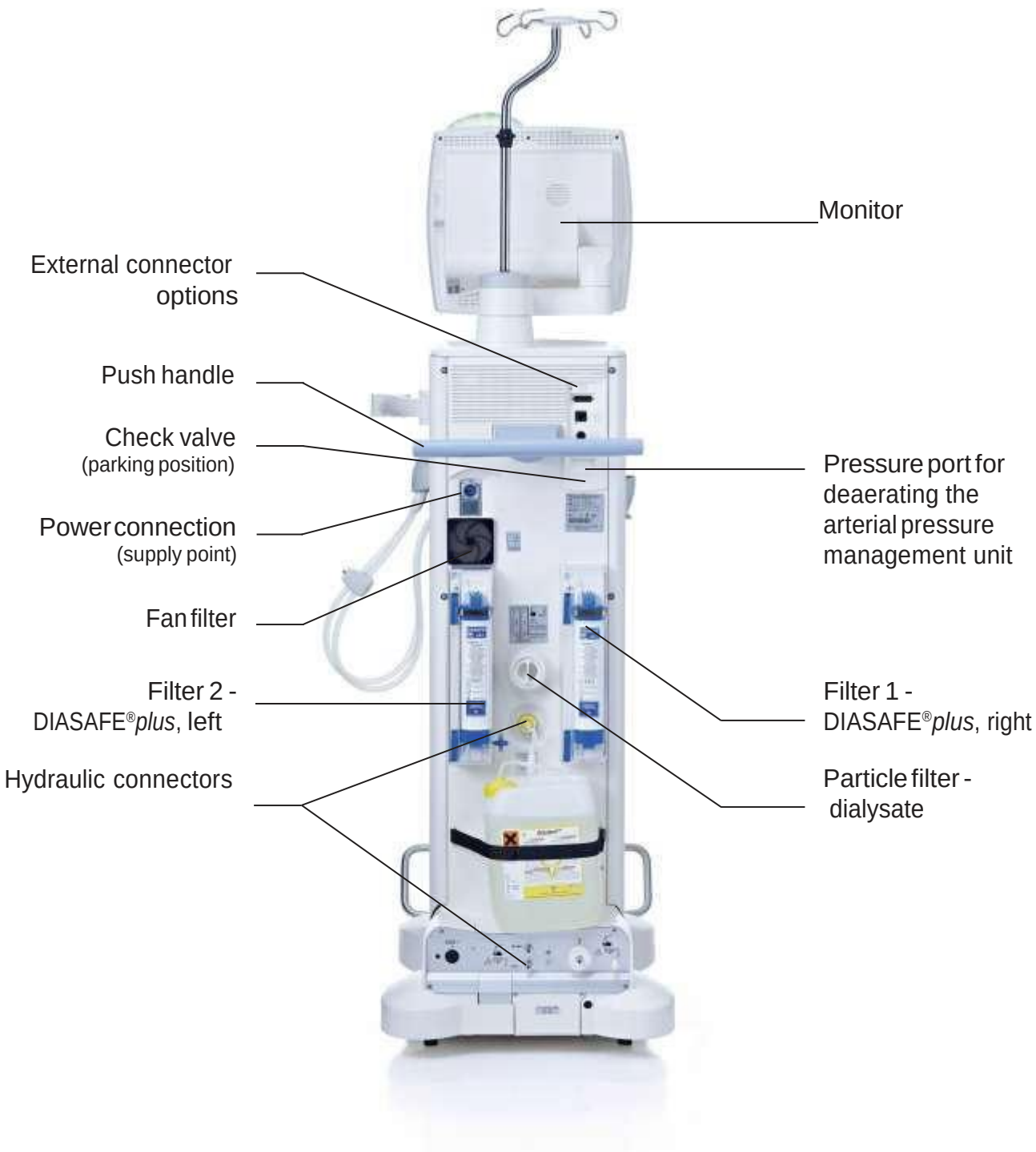
Fresenius 5008s CorDiax

Equipment Design

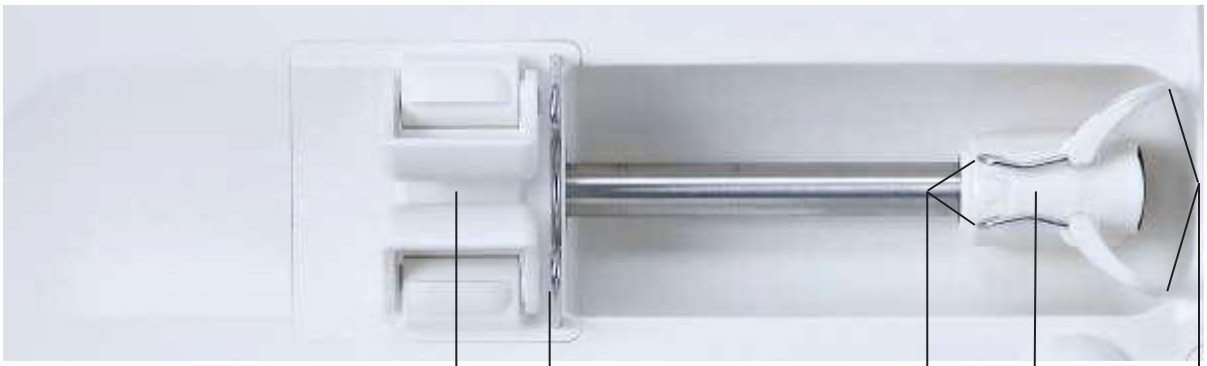
Front View

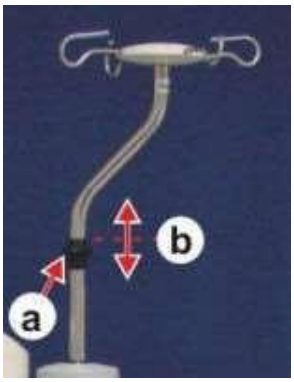
Fresenius 5008s CorDiax Dialysis Module

Rear View

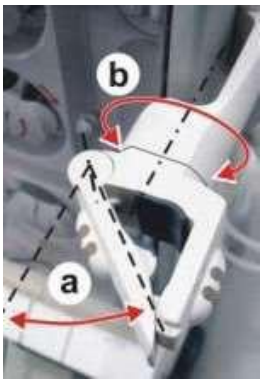

Monitor
External connector options
Push handle
Check valve (parking position)
Pressure port for deaerating the arterial pressure management unit
Power connection (supply point)
Fan filter
Filter 2 - DIASAFE®*plus*, left
Filter 1 - DIASAFE®*plus*, right
Hydraulic connectors
Particle filter - dialysate

Extracorporeal Blood Circuit Module

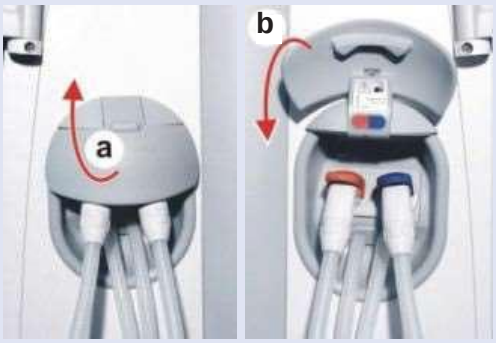

Barrel holder with syringe detector
Bracket
Fixation for plunger
Grip handle
Clamping brackets



To adjust the IV pole:
Push knob (a) upward and simultaneously raise or lower the IV pole (b).



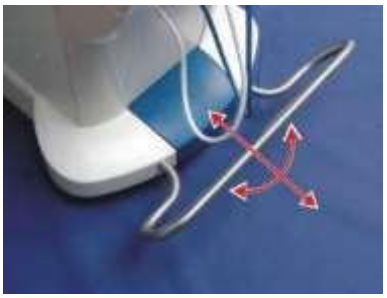
Dialyzer holder:
Push lever (a) out to insert the dialyzer. The dialyzer can be turned to any desired position (b). When the right-hand door is opened, the dialyzer holder will automatically move to the right.



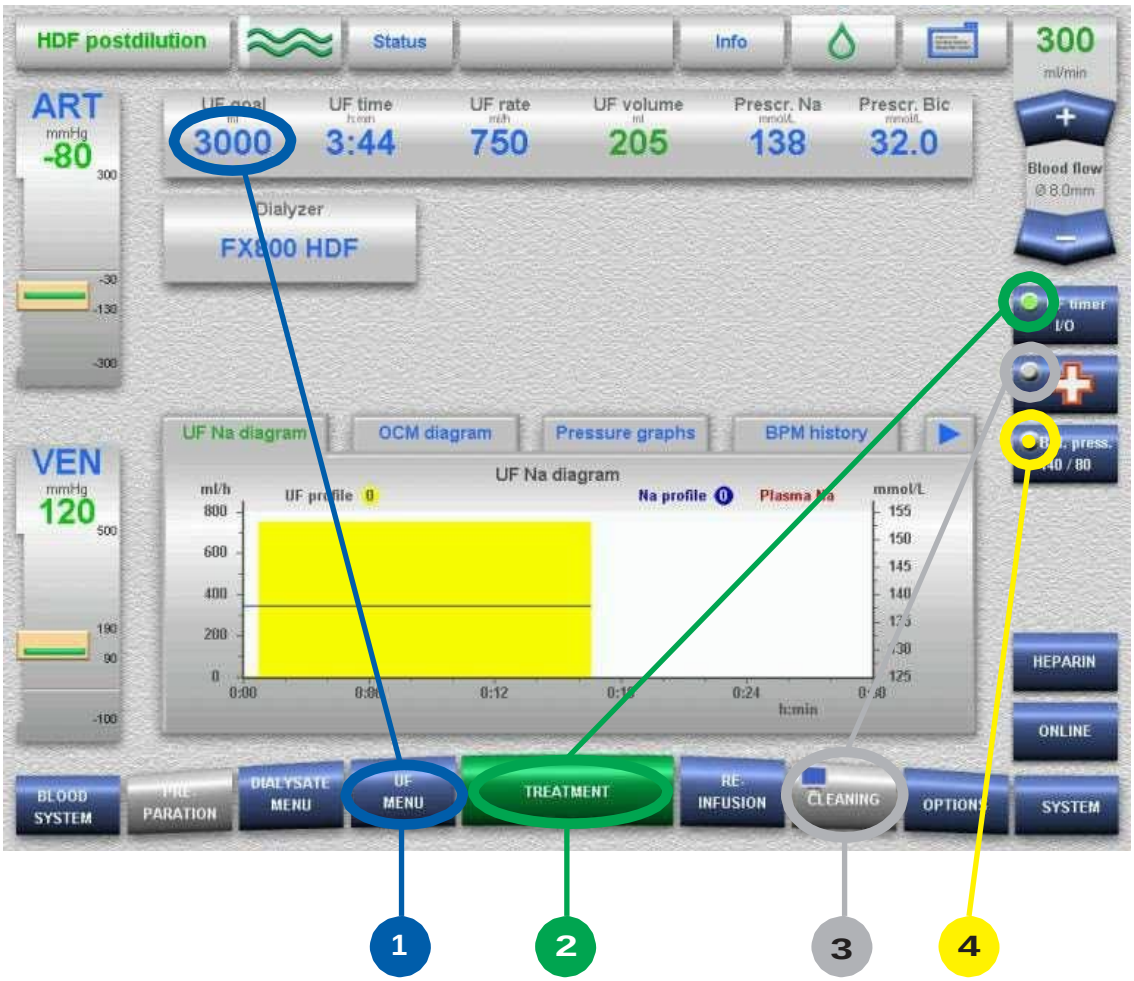
To open or close the shunt cover:
Open the shunt cover by flipping it up (a). Close the shunt door by flipping it down (b).

To remove dialyzer couplings:
Push the lever down and hold it, and remove the dialyzer coupling.
If the dialyzer couplings are in the shunt interlock, they must be connected according to the colour coding. The flow direction (inlet, outlet) is indicated by an arrow on the dialyzer couplings.

To open the doors to the Extracorporeal Blood Circuit Module:
Open or close the doors on the upper side as shown.



To move the hemodialysis system:
The hemodialysis system can be moved in all directions.



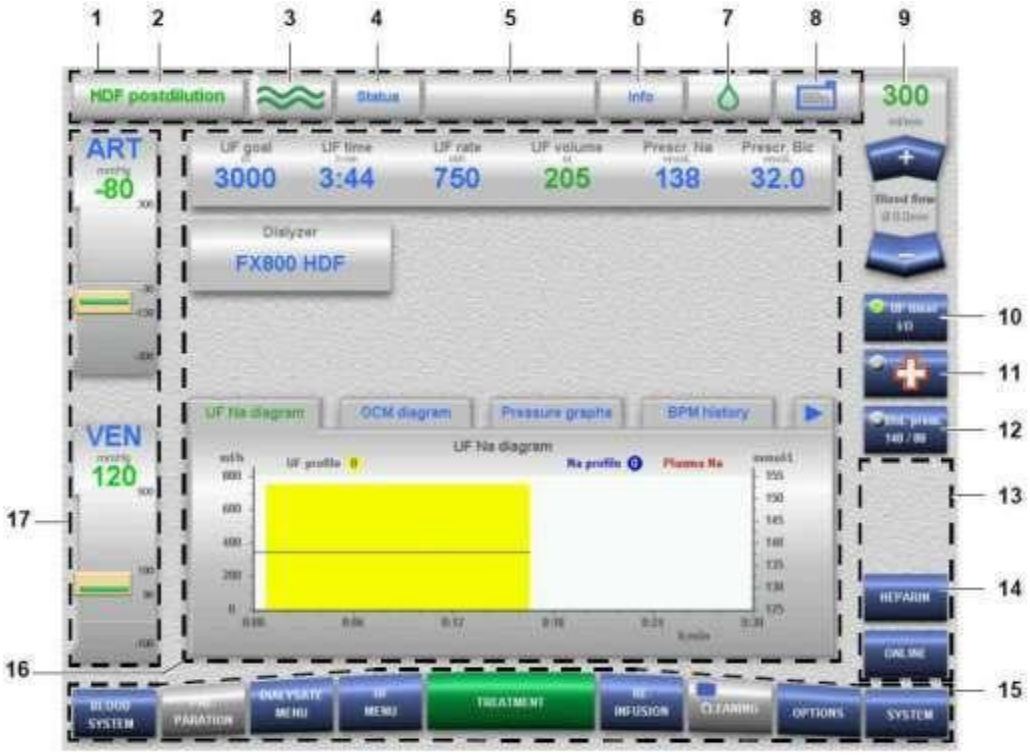
1 Available for selection
Examples: UF goal value field, UF MENU key

2 Active
Examples: UF timer I/O indicator, TREATMENT key

3 Not active / cannot be selected
Example – Not active: Emergency menu I/O indicator,
Example – Cannot be selected: CLEANING key

4 Not yet active
The automatic start of a function is programmed, but the function is not active yet. Example: BPM interval (long-term interval measurement)

Overview



1 Status bar
The fields in the status bar are:

- Grey in the normal operating mode.
- Orange during the functional test (T1 test).
- Orange during rinse procedure of the extracorporeal blood circuit, until the minimum rinse volume has been reached.
- Yellow during the cleaning programs.

2 Operating mode (display)
Displays the operating mode of the device (e.g., HDF Post dilution) and the option used (e.g., BTM). In addition, a progress bar is displayed, depending on the operating mode, e.g. in the Rinse mode.

3 Dialysate flow (display):

- Flow turned on – green waves (Grey bar is moving).
- Bypass – green waves (Grey bar is not moving).
- Flow turned off – grey waves.

4 Status (key)
Displays device condition data (software version, error memory, cleaning status, device information, calibration status, network status).

5 Current messages (display / key)
Allows retrieval of information, warnings and alarms (maximum of 3).

Overview (cont'd)

6 Info (key)
Displays information on the current warning, information or alarm message.

7 Heparin (display)
Pump switched on – green drop (Grey bar is moving.)
Pump switched off – grey drop.

8 Patient ID (patient identification) (display / key)
Treatment data sheet will be displayed. Combined with the use of the PatientCard, it is possible to retrieve current treatment data. Storage of 3 previous treatments.

9 Blood flow (display / key)
Displays the effective blood flow.
Rocker switch for increasing + / reducing – the effective blood flow.

10 UF timer I/O (key)
Key for starting / stopping the ultrafiltration and the timer function.

11 Emergency key
Up to 4 functions can be preset: UF Timer I/O, QB 200ml, Blood Pressure, Bolus.

12 Bld. press. (display / key)
(Displayed only, if BPM option is available.)

13 Options menus (key)
Via the OPTIONS menu key, it is possible to program up to four option menus with direct access.

14 HEPARIN (key)
(Displayed only, if selected in the User setup.)

15 Menu bar
Corresponding menu opens automatically during operation OR press the key to open the respective menu.

16 Menu panel
In the center of the screen, the appropriate data for each menu is displayed. Displays or indicators / keys / diagrams / graphics are displayed depending on the User setup settings.

17 Pressure displays (display / key)
ART (arterial pressure)
VEN (venous pressure)
The actual value is displayed as a numerical value and as a bar. The alarm limits are displayed in block representation. Press the ART or VEN field for setting the alarm limits.

Screen Saver Overview

The HomeHD option uses a specific operating screen, referred to as a screen saver, which can be accessed with the remote control.

Most operations are possible directly from this screen, including:

- Blood flow setting
- BP measurement
- Handling of messages

On this screen, the following conventions are in place:

- Buttons that are framed and **green** are active
- Buttons that are framed and **blue** are available
- Buttons that are not framed (and blue) cannot be changed and are for information only.

Note: Navigating the screen saver requires the use of the remote control.

Screen Saver Overview

1. Pressure displays (display/key)
   ART (arterial pressure)
   VEN (venous pressure)
   The actual value is displayed as a numerical value and as a bar. The alarm limits are displayed in block representation. Press the ART or VEN field for setting the alarm limits.

2. UF goal (display/key)
   Displays the UF goal.
   Select the UF goal field to adjust the settings.

3. UF Time (display / key)
   Displays the remaining UF time.
   Select the UF time field to adjust the settings.

4. UF timer I/O (display/key)
   Select the UF timer I/O field to start or stop ultrafiltration or the timer function.
   UF timer turned on – green.
   UF timer turned off – grey.

5. Blood flow (display/key)
   Displays the effective blood flow.
   Select the Blood flow field to increase the blood flow using the + key or to reduce it using the - key on the remote control.

6. Bld. system I/O (display/key)
   Select the Bld. system I/O field to start or stop the blood systems.
   Blood system turned on – green.
   Blood system turned off – grey.

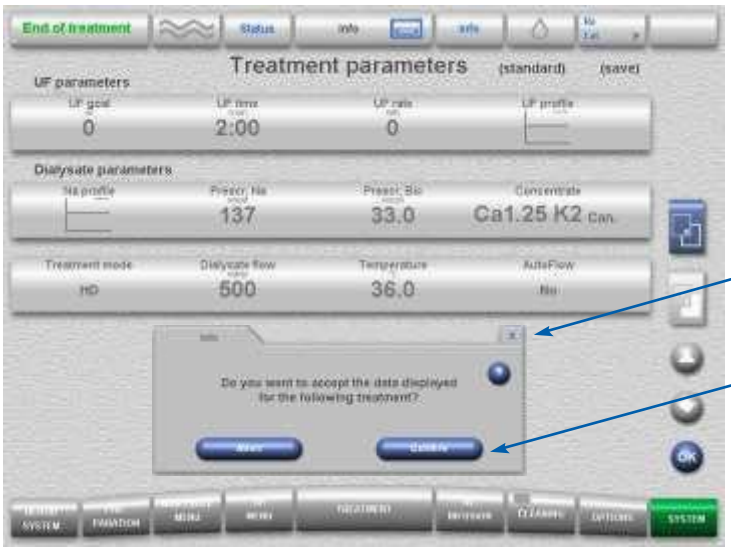
7. Bld. press. I/O (display/key)
   Displays the last measured pressure values (systolic pressure/diastolic pressure).
   Select the Bld. press. I/O field to start or stop the blood pressure measurement.
   (If the BPM option is not available, I/O will be displayed in grey).

8. UF vol. (display)
   Displays the UF volume removed.

9. UF rate / UF profile (display)
   “UF rate” and the current UF rate in ml/min will be displayed. If a UF profile is selected, the UF profile and the current UF rate in ml/min will be displayed.

10. Treatment time (display)
    The remaining treatment time will be displayed in the center of the screen. (If the BPM option is available, SYS, DIA and PULSE will be displayed in the center of the screen during measurement).

Insert card in card slot.
When the Info message appears, touch the OK button.



Park the message if you wish to see the following screens.

Touch CONFIRM to accept the data.

Note: You cannot make changes on these screens, but once the data has been downloaded, changes can be made in each individual menu.

Performing Dialysis Using Patient Cards (cont'd)

This information will be downloaded from the card, if confirmed:
(Does not download UF or Na profiles, nor UF goal)

- Dialyzer
- Dialysate menu
- UF menu
- Single-Needle
- Heparin
- BPM (Blood Pressure)

After treatment is started, prescribed dialysate flow and treatment mode will be displayed.

Note: You can change the information in each screen once download is complete.

Performing Dialysis Using Patient Cards (cont'd)

At the end of the treatment the messages will be:

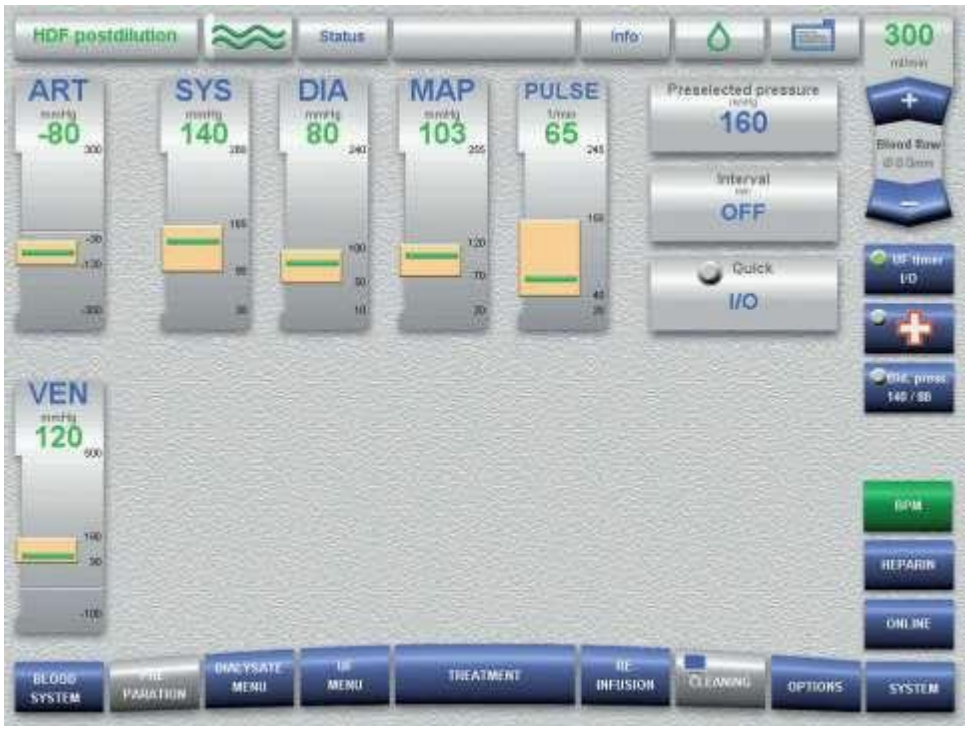
Save the modified treatment parameters on the PatientCard?

Do you accept the data?

Save data to card?

Do not remove card.

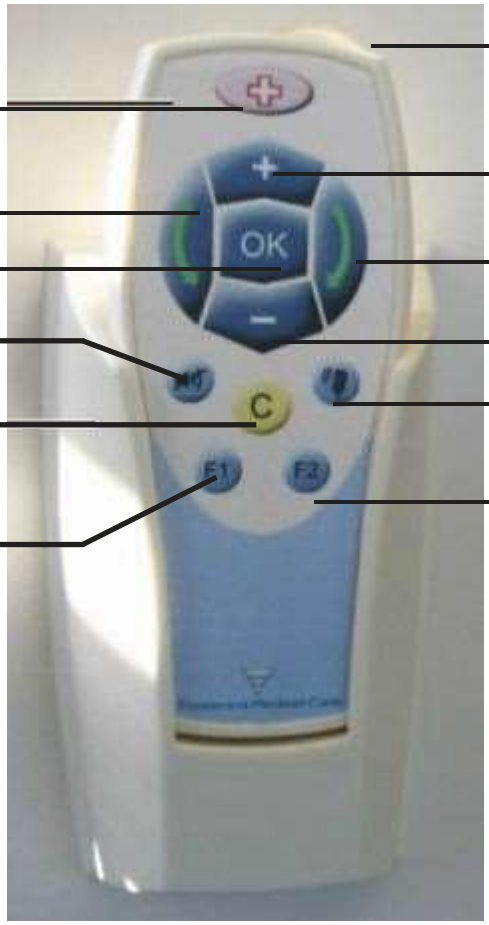
Saving data to card.



In the BPM menu, check the SYS, DIA, MAP, and PULSE alarm limits.

- If necessary, set the desired parameters.
- Touch the OK button to confirm the values entered.
- Visually check the confirmed values.

Design



Understanding the Operating Status Indicator

<u>When the remote control is outside the charging station:</u>

= correct operation
= warning or info
= alarm

<u>When the remote control is inside the charging station:</u>

(flashing) = remote control is charging
(constant) = remote control is completely charged
(flashing) = error

5008s CorDiax Equipment:

- Set Up
- Patient Connection
- Patient Disconnection
- Dismantle - Tear Down
- Place in Disinfection

Machine Preparation

5008s CorDiax Procedure

Expected Outcome

- T1 test completed and passed
- Machine will be set up, circuit primed, rinsed and ready for HD treatment

Alert

- T1 test must be completed before dialysis can proceed
- Strict adherence to aseptic technique is required due to the risk of bacterial contamination

Equipment

- Fresenius 5008 CorDiax Module
- Fresenius5008 CorDiax blood line set
- Dialyzer
- Acid and bibag® concentrates
- Saline bag, intravenous (IV) line, and prime bag
- Disinfectant test strips, if required
- 20ml syringe prepared with Heparin 1:1000units/ml or other anticoagulant

Procedure

Machine startup

1. Place reverse osmosis unit (R/O) in supply mode, allow R/O to rinse
2. Turn machine on by pressing **I/O** (on/off) button
3. Verify last disinfection, press, Status Menu, press Cleaning Status
4. Verify absence of disinfectant, if required – Screen message indicates "*Check for residual disinfectant*"
5. Press RINSE (9 minute rinse)
6. Change AUTO OFF to **NO**

Arterial and venous lines can be placed onto machine during rinse and T1 Test.

7. Wash hands
8. Place dialyzer into dialyzer holder, venous end up (blue up)
9. Hang saline bag and prime bag
10. Open blood line set and tighten all connectors (*connections may have loosened during sterilization process)*
11. Open outer doors
12. Insert line guide (alpha clip) into blood pump until signal sounds
13. Insert arterial blood line into line holder
14. Connect arterial blood line to dialyzer, dialyzer arterial end down (red down)

15. Insert arterial pressure dome into pressure measurement unit
16. Insert line into arterial clamp
17. Optional: Insert arterial blood line into blood temperature module or BTM and close cover
18. Attach patient end of arterial line to prime bag
19. Attach 20ml Heparin syringe prepared with Heparin 1:1000units/ml
20. Insert venous bubble catcher into level detector
21. Insert venous line into optical detector/bubble detector
22. Insert venous blood line into venous clamp
23. Optional: Insert venous blood line into blood temperature module or BTM and close cover
24. Attach patient end of venous line to prime bag
25. Insert venous line into line holder
26. Connect venous blood line to dialyzer
27. Attach venous transducer (hydrophobic filter) to venous pressure transducer port
28. Close 2 clamps on venous injection ports
29. Close both outer doors
30. Tighten cap on IV line medication port
31. Attach IV line to arterial blood line injection port
32. Spike saline bag with IV line
33. Arterial line will prime by gravity; once saline reaches prime bag, clamp arterial line

A. 9 minute rinse complete, implement water assessment and documentation:

- **Carbon tank – chlorine test**
- **Micron filter in and out pressures and Delta PSI**
- **R/O unit parameters**

B. 9 minute rinse complete, press *TREATMENT* or respond to message: *START T1 TEST*, press *START* – *YES*

34. Connect acid and bibag concentrates
35. Insert PatientCard into card slot and confirm the information
36. System automatically switches to PREPARATION screen
37. Press Blood Pump **I/O**
38. Rinse volume preset at **800**ml, pump speed preset at **150**ml/min
39. Once rinse volume of 800ml is reached, message: "*Circulation – Start or Rinse Continue*"

40. Replace the empty saline bag with the second saline bag
41. Unclamp arterial blood line
42. Clamp white clamp on prime bag
43. Press **CIRCULATION** start
44. Increase pump speed to **400**ml/min

Once T1 test is completed, dialysate connectors can be connected.

45. Screen message indicates, "*Connect dialyzer couplings!*"
46. Open shunt door
47. Connect dialysate lines to dialyzer (red to red, blue to blue)
48. Close shunt door
49. Fill dialyzer arterial end up (red up)
50. Program the parameters:
    - UF goal
    - Treatment time
    - Heparin – bolus, hourly rate, stop time
51. Check program for the following:
    - Dialyzer type
    - Sodium – 138mmol/L or as directed by your nurse
    - Bicarbonate – 35mmol/L or as directed by your nurse
52. Check level in bubble catcher
53. Return to preparation menu

Patient Connection – Prime OFF

5008 CorDiax Procedure

Expected Outcome

Patient connected in an aseptic manner.

Alert

- Machine must be internally and externally disinfected prior to preparation
- Strict adherence to aseptic technique required due to risk of bacterial contamination

Equipment

Fresenius 5008 CorDiax in preparation state

Procedure

Ensure machine preparation is complete as per Machine Preparation procedure

1. Press Preparation menu
2. Rotate dialyzer venous end up (blue up)
3. Tighten blood line connections to dialyzer
4. Decrease pump speed to **150**ml/min
5. Press Blood Pump **I/O**, blood pump stops
6. Open white clamp on prime bag
7. Clamp arterial blood line and red clamp on prime bag
8. Clamp white clamp on arterial injection port and close roller clamp on IV line
9. Connect arterial blood line to the patient arterial access
10. Unclamp arterial blood line and patient arterial access
11. Press Blood Pump **I/O,** blood pump starts
12. Once optical detector senses blood, alarm sounds, blood pump stops, clamps close, Mute LED flashes
13. If no heparin syringe installed, message reads "*Syringe not attached; please insert syringe – Start / Switch off.*" If no heparin required, press Switch off
14. Message reads "*Blood detected – Dialysis* – Start"
15. Clamp venous blood line and blue clamp on prime bag
16. Connect venous blood line to the patient venous access
17. Unclamp venous blood line and patient venous access
18. Press Start, system automatically changes to the TREATMENT MENU
19. Ultrafiltration automatically begins
20. Heparin infusion automatically starts, heparin bolus administered automatically
21. Set the blood flow to the desired rate
22. Alarm limits set automatically
23. Take blood pressure, complete documentation
24. Review programming

Patient Connection – Prime ON

5008 CorDiax Procedure

Expected Outcome

Patient connected in an aseptic manner.

Alert

- Machine must be internally and externally disinfected prior to preparation
- Strict adherence to aseptic technique required due to risk of bacterial contamination

Equipment

Fresenius 5008 CorDiax in preparation state

Procedure

Ensure machine preparation is complete as per Machine Preparation procedure

1. Press Preparation menu
2. Rotate dialyzer venous end up (blue up)
3. Tighten blood line connections to dialyzer
4. Decrease pump speed to **150**ml/min
5. Press Blood Pump **I/O**, blood pump stops
6. Clamp arterial and venous blood lines
7. Clamp prime bag
8. Clamp white clamp on arterial injection port on blood line
9. Close roller clamp on IV line
10. Connect arterial and venous blood lines to the patient access and unclamp 4 clamps (patient access and blood line)
11. Press Blood Pump **I/O,** blood pump starts
12. Once optical detector senses blood, alarm sounds, blood pump stops, clamps close, Mute LED flashes
13. If no heparin syringe installed, message reads "*Syringe not attached; please insert syringe – Start / Switch off.*" If no heparin required, press Switch off
14. Message reads "*Blood detected – Dialysis* – Start"
15. Press Start
16. System automatically changes to the TREATMENT MENU
17. Ultrafiltration automatically begins
18. Heparin infusion automatically starts, heparin bolus administered automatically
19. Set the blood flow to the desired rate
20. Alarm limits set automatically
21. Take blood pressure
22. Complete documentation
23. Review programming

End of Treatment Reinfusion Connect to NaCl

5008 CorDiax Procedure

Expected Outcome

Patient disconnected from machine using NaCl 0.9%.

Alert

Reinfusion must be performed using NaCl 0.9%.

Equipment

- 1000ml bag NaCl 0.9%
- Intravenous (IV) line

Procedure

End of Treatment

1. Audible alarm sounds once and screen message indicates "*Treatment goal achieved"* – Dialysis Continue – Reinfusion Start
2. Press Start
3. Blood pump stops
4. System switches automatically to Reinfusion screen
5. Screen message indicates "*Connect a bag of NaCl*" – *Start Reinfusion – OK – Treatment*
6. Clamp arterial blood line and arterial patient access
7. Disconnect arterial blood line from patient arterial access
8. Remove cap on IV line medication port
9. Connect arterial blood line to IV line medication port
10. Open roller clamp on IV line and unclamp arterial blood line
11. Press OK
12. Blood pump commences at preset rate, **200**ml/min
13. When optical detector senses clear fluid, alarm sounds, pumps stop, clamps close and Mute LED flashes
14. Screen message indicates "*Blood reinfused" – Reinfusion Continue – Machine Remove lines*
15. If further rinse is required, press Continue
16. Stop reinfusion when blood lines clear or required rinse is achieved
17. Clamp venous blood line and patient venous access
18. Take blood pressure
19. Administer more normal saline if blood pressure is below target or if symptomatic
20. Ensure blood pressure is stable
21. Check clamps closed on patient access

Procedure

Remove Blood lines

22. Ensure all clamps are closed on the blood lines
23. Press Remove lines

24. Screen message indicates "*Please open the doors to continue"*
25. Open outer doors
26. Secure venous blood line to hydrophobic filter
27. Screen message indicates "*Please remove the blood lines completely and close the doors!*"
28. Remove and discard all lines and close outer doors
29. Replace concentrate wand into holder
30. bi*b*ag will empty automatically; remove when empty and close cover

Procedure

PatientCard and Dialyzer Couplings

If using a PatientCard:

- Screen message indicates "*Saving data to card. Leave card inserted!"*
- Screen message indicates "*Save modified treatment prescription on the card?"– No – Yes*
- Press Yes
- Treatment parameters screen appears. Press OK.
- Screen message indicates "*Saving data to card. Leave card inserted!"*

31. Screen message indicates "*Please insert dialyzer coupling into shunt interlock to empty the dialyzer"*
32. Open shunt door, place the blue dialysate line onto shunt and close door
33. Drain program is in progress
34. Screen message indicates "*The dialyzer is being emptied"*
35. Once dialyzer is completely drained, message indicates "*The dialyzer is now empty. Please insert both dialysate couplings into the shunt interlock!"*
36. Cap the venous end (blue) of dialyzer
37. Open shunt door and place red line onto shunt and close door
38. Cap the arterial end (red) of dialyzer
39. Press Cleaning menu to select disinfection mode
40. Remove PatientCard from card slot
41. Perform external cleaning as per External Cleaning procedure

End of Treatment Reinfusion – Arterial via Gravity

5008 CorDiax Procedure

Expected Outcome

Patient disconnected from machine using NaCl 0.9%.

Alert

Reinfusion must be performed using NaCl 0.9%.

Equipment

- 1000 ml bag NaCl 0.9%
- Intravenous (IV) line

Procedure

End of Treatment

1. Audible alarm sounds once and screen message indicates "*Treatment goal achieved"* – Dialysis Continue – Reinfusion Start
2. Press Start
3. Blood pump stops
4. System switches automatically to Reinfusion screen
5. Screen message indicates "*Connect a bag of NaCl*" – *Start Reinfusion – OK – Treatment*
6. Clamp arterial blood line
7. Open roller clamp on IV line
8. Unclamp arterial blood line medication injection connector (white clamp)
9. Press OK
10. Blood pump commences at preset rate, **200**ml/min
11. When optical detector senses clear fluid, alarm sounds, pumps stop, clamps close and Mute LED flashes
12. Screen message indicates "*Blood reinfused*" – *Reinfusion Continue – Machine Remove lines*
13. If further rinse is required, press Continue
14. Stop reinfusion when blood lines clear or required rinse is achieved
15. Clamp venous blood line and patient venous access
16. Unclamp arterial blood line
17. Allow normal saline to reinfuse arterial blood line via gravity
18. When arterial blood line clear, clamp arterial (red) blood line and patient arterial access
19. Take blood pressure
20. Administer more normal saline if blood pressure is below target or if symptomatic
21. Ensure blood pressure is stable
22. Close clamps on patient access

Procedure
Remove Blood lines

23. Ensure all clamps are closed on blood lines
24. Press Remove lines
25. Screen message indicates "*Please open the doors to continue"*
26. Open outer doors
27. Secure venous blood line to hydrophobic filter
28. Secure arterial blood line to medication port on venous bubble catcher (chamber)
29. Screen message indicates "*Please remove the blood lines completely and close the doors!*"
30. Remove and discard all lines and close outer doors
31. Replace concentrate wands into holders
32. Bi*b*ag will empty automatically; remove when empty and close cover

Procedure
PatientCard and Dialyzer Couplings

If using a PatientCard:

- Screen message indicates "*Saving data to card. Leave card inserted!"*
- Screen message indicates "*Save modified treatment prescription on the card?"*
  No – Yes
- Press Yes
- Treatment parameters screen appears. Press OK.
- Screen message indicates "*Saving data to card. Leave card inserted!"*

33. Screen message indicates "*Please insert dialyzer coupling into shunt interlock to empty the dialyzer*"
34. Open shunt door, place the blue dialysate line onto shunt and close door
35. Drain program is in progress
36. Screen message indicates *"The dialyzer is being emptied"*
37. Once dialyzer is completely drained, message indicates "*The dialyzer is now empty. Please insert both dialysate couplings into the shunt interlock!"*
38. Cap the venous end (blue) of dialyzer
39. Open shunt door and place red line onto shunt and close door
40. Cap the arterial end (red) of dialyzer
41. Press Cleaning menu to select disinfection mode
42. Remove PatientCard from card slot
43. Perform external cleaning as per External Cleaning procedure

Expected Outcome

- Dialysis machines will be thermally disinfected and decalcified with Citrosteril-C to ensure micro-organisms and calcium deposits are removed from the dialysate pathway
- Heat disinfection is required after each use
- After a downtime of more than 72 hours, it is imperative to disinfect the machine prior to treatment

Equipment

- Citrosteril-C cleaner/decalcifying agent fitted to rear of the Fresenius 5008 CorDiax

Procedure

Heat disinfection performed after every dialysis treatment.

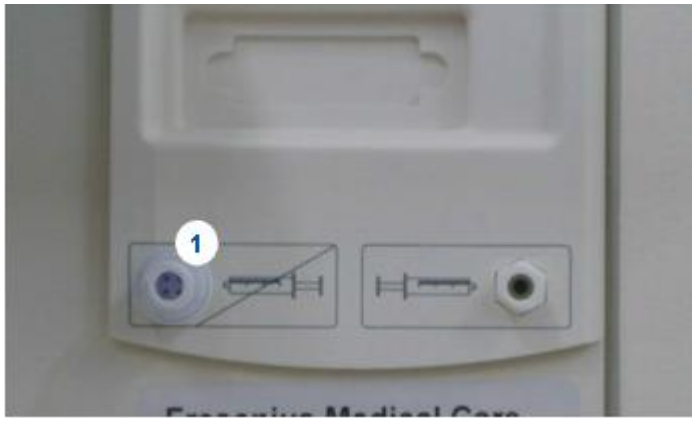
1. Ensure power and water supply is connected to machine
2. Turn machine on
3. Press Cleaning, cleaning menu displayed
4. Press Heat disinfection
5. Press Start Cleaning Program
6. Machine automatically shuts off after disinfection cycle completed

Pre-programmed heat disinfection: The machine is programmed for disinfection cycles throughout the week.

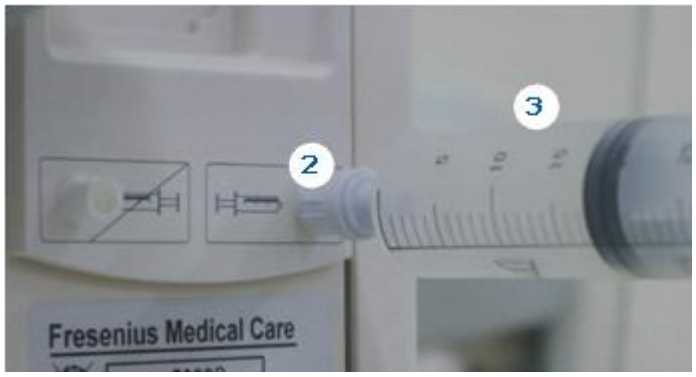
Opening the Arterial Pressure Measurement Unit Manually

If unable to remove arterial dome, follow this procedure.

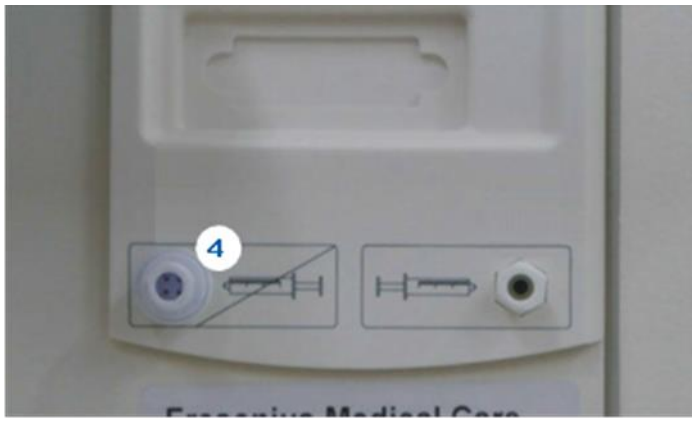
The parking position for the check valve and the pressure port are provided on the rear of the device.



Remove the check valve (1) used for repeatedly positioning the syringe from the parking position.



Screw the check valve onto the deaeration Luer- Lock (2). Connect a syringe (3) to the pressure port and the check valve. Use an air-filled syringe to open the arterial pressure measurement unit. Depending on the syringe size, several syringe strokes may be necessary (approximately 60 cc).



Then install the check valve back onto the parking position (4).

TIP SHEET

5008 CorDiax Procedure

CorDiax 5008s Start-Up

- Turn 5008s monitor on
- Start 9 min Rinse
- Check for residual disinfection, if necessary
- Check Water, document
- Start T1 Test or Press Treatment
- Insert card
- Install acid concentrate and Bibag

PREPARE THE DIALYSIS CIRCUIT:

- Hang saline
- Hang prime bag
- Install dialyzer – blue end up
- Prepare heparin syringe
- Open doors
- Install arterial line
- Install the heparin syringe
- Install the venous line and clamp 2 injection ports
- Close doors
- Connect IV line to arterial injection port
- Spike IV line into normal saline bag
- Gravity prime arterial line
- Close RED arterial clamp
- Preparation menu - Start the pump
- 800ml rinse complete
- Change the normal saline bag
- Close white clamp on prime bag
- Open red clamp on arterial line
- Circulation – Increase pump to 400ml/min
- T1 Test complete – connect couplings – red end up
- Program: Time, UF, Na, Bicarb, Heparin

START TREATMENT:

- Turn dialyzer blue end up, tighten connections
- Stop pump, reduce flow to 150ml/min
- Manage clamps – prime bag, arterial line, IV line
- Connect arterial line to patient
- Open patient line, open arterial clamp red
- Start pump
- Wait for Message Blood Detected
- Clamp venous line
- Connect venous line to patient
- Open patient line, open venous line clamp blue
- Press START TREATMENT
- Set blood flow
- Take blood pressure
- Document
- Re-checkprogramming
- Return to preparation screen

CorDiax 5008s Reinfusion 1 - NaCl

- Message – UF goal achieved
- Select – Reinfusion I/O Key
- Pump stops
- Clamp patient line
- Clamp arterial line
- Disconnect arterial line from patient
- Remove cap on IV line medication port
- Attach arterial line to IV line medication port
- Unclamp arterial line
- Open roller clamp on IV line
- Message – Connect to NaCl – Press OK
- Reinfuse the blood
- Clamp patient line
- Clamp venous line
- Take blood pressure
- Disconnect venous line from patient
- Disconnect venous transducer
- Connect venous line to hydrophobic filter
- Select remove lines
- Return dialyzer couplings
- Remove Bibag
- Return acid wand
- Open door – Remove lines / Remove Card / Disinfect

CorDiax 5008s Reinfusion 2 - Gravity

- Message – UF goal achieved
- Select – Reinfusion I/O Key
- Pump stops
- Clamp arterial line
- Open 2 clamps on IV line (white and IV roller)
- Message – Connect to NaCl – Press OK
- Reinfuse the blood
- Pump stops
- Clamp venous line
- Clamp venous access
- Unclamp arterial line
- Reinfuse blood in arterial line via gravity
- Clamp arterial line
- Clamp arterial access
- Take blood pressure
- Disconnect blood lines from patient
- Disconnect hydrophobic filter from transducer
- Connect venous blood line to hydrophobic filter
- Connect arterial line to bubble catcher injection port
- Select remove lines
- Return dialyzer couplings
- Remove Bibag
- Return acid wand
- Open door – Remove lines / Remove Card / Disinfect

Fresenius 5005s CorDiax

- During Dialysis

Home-HD Screen Saver

The remote control unit must be logged in at the 5008S CorDiax at the start of treatment or after each manual logout.

- If remote control login fails, you can Stop or Repeat login.
- To repeat login, follow onscreen instructions.

If a remote control connection is not possible a message is displayed.
If the machine detects a low battery charging status a message is displayed.

To use the *Find Remote Control* function:

- Touch Options
- Touch HomeHD
- Touch Find; *Remote control found?* Yes or Repeat
- Press Yes if remote was found; press Repeat to continue the search
- When remote is found, music plays and the Operating Status Indicator lights up.

Changing Heparin Syringe During Treatment

5008S Machine Procedure

Alert

- Heparin syringe pump operation is designed to ensure patient safety during treatment.
- Ensure syringe is securely locked into syringe holder and grip handle is secured to prevent heparin syringe being emptied. This is important because heparin pump is before blood pump.

Equipment

- Fresenius 5008S CorDiax
- Appropriately sized luer lock syringe
- Heparin prescription

Procedure

1. Wash hands
2. Prepare new heparin syringe
3. Stop heparin infusion
4. Stop blood flow using hard key or remote control
5. Open both doors
6. Clamp heparin line
7. Release grip handle
8. Remove heparin syringe
9. Attach new heparin syringe:
   a. Insert syringe, ensuring wings are between barrel holder and metal bracket
   b. Push syringe to right, ensuring no syringe movement
   c. Pinch clamping brackets and slide grip handle to left, securing bottom of plunger
10. Open heparin line clamp
11. Close doors
12. Start blood flow
13. Start heparin infusion.

    Note: If Heparin connection test failed message appears. Recheck syringe placement. Verify syringe position and make sure clamp is open. Repeat test. If test fails again, do not skip test, call the technologist.
14. Check and change heparin rate and stop time as required in Heparin menu
15. Confirm heparin pump is on (drop in top right corner of screen will be green)

1. Open venous limits
2. Change width of limits (40-200)
3. Change width or position
4. Change position of limits
5. Accept changes
6. Cancel changes

Circulation During Treatment

5008S Machine Procedure

Alert

- Blood within the extracorporeal circuit can only be recirculated for 60 minutes

Equipment

- Two 10ml preloaded normal saline syringes
- Gloves
- Sterile recirculator connector

Procedure

1. Touch OPTIONS button
2. Touch CIRCULATION button
3. Touch circulation Start button
4. The blood pump will stop automatically
5. Message reads – *Extracorporeal circuit will be recirculated! – Circulation – Treatment Continue*
6. Clamp arterial and venous lines and access
7. Connect the arterial and venous lines together with a sterile recirculator, unclamp lines
8. Flush access as required with 10ml preloaded normal saline syringes
9. Touch Circulation button
10. Blood flow commences at 200 ml/min
11. Message reads – *Stop Circulation?* – OK
12. When the patient is ready to be reconnected, touch OK button; blood pump will stop automatically
13. Message reads – *Has the patient been reconnected? Circulation – Treatment Continue*
14. Clamp blood lines
15. Reconnect patient; unclamp blood lines and patient access
16. Touch Continue button
17. Gradually increase Blood Flow Rate as desired
18. Reprogram BP interval if using interval features

Monitor and traffic light will be dimmed when machine has been alarm free and screen has not been touched for a preset time.

1. Touch System button, then touch Brightness button
2. Toggle dimming levels from 0 to 10 using Brightness + / -
   - 0 is completely black
   - Default value is 10
3. Touch OK

Note: dimming is interrupted in case of an alarm or when the screen is touched.

Emptying / Changing the bi*b*ag

Press DIALYSATE MENU key

Press Empty the bags field

The drain program is in progress

Message: *The bibag is empty and it can now be removed* or *Empty the bibag - Repeat*

Remove bi*b*ag

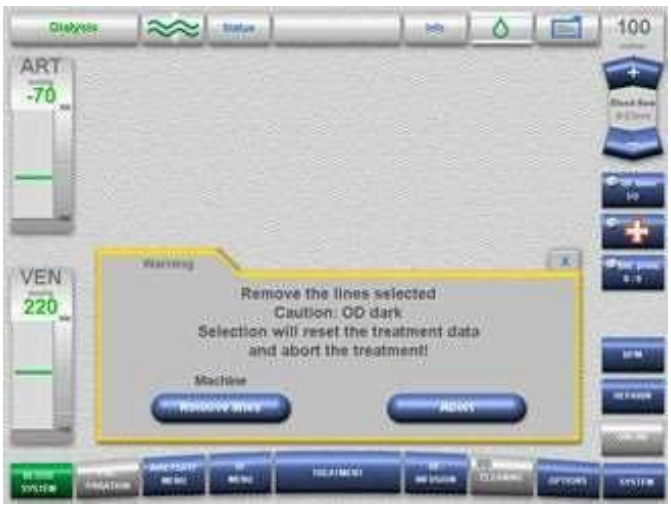
Connect new bi*b*ag

Alarms and Troubleshooting

Colour Scheme for Warnings and Alarms

Information box

Warning box



Alarm box

Arterial and Venous Alarm Management

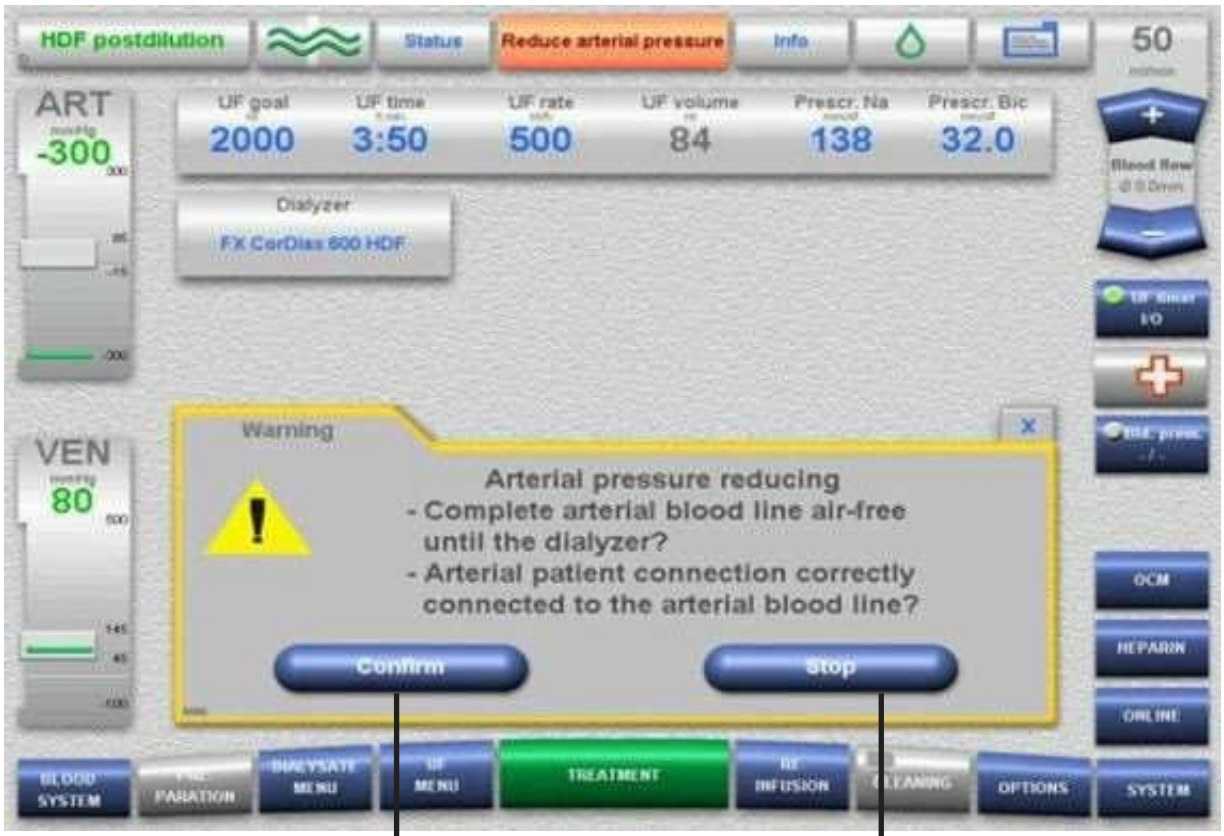
1. Press **Reset alarm** to start the pump.
2. Look at venous pressure reading.
3. If reading is not within limits on left, press **Set new alarm limits**.

* Use ? to troubleshoot.

Arterial Pressure Alarm (-300 mmHg)

The alarm message in case of a lower arterial end-of-scale alarm has three keys. Touching the “Reduce” button starts the pressure relief process.

Arterial Pressure Alarm (-300 mmHg)



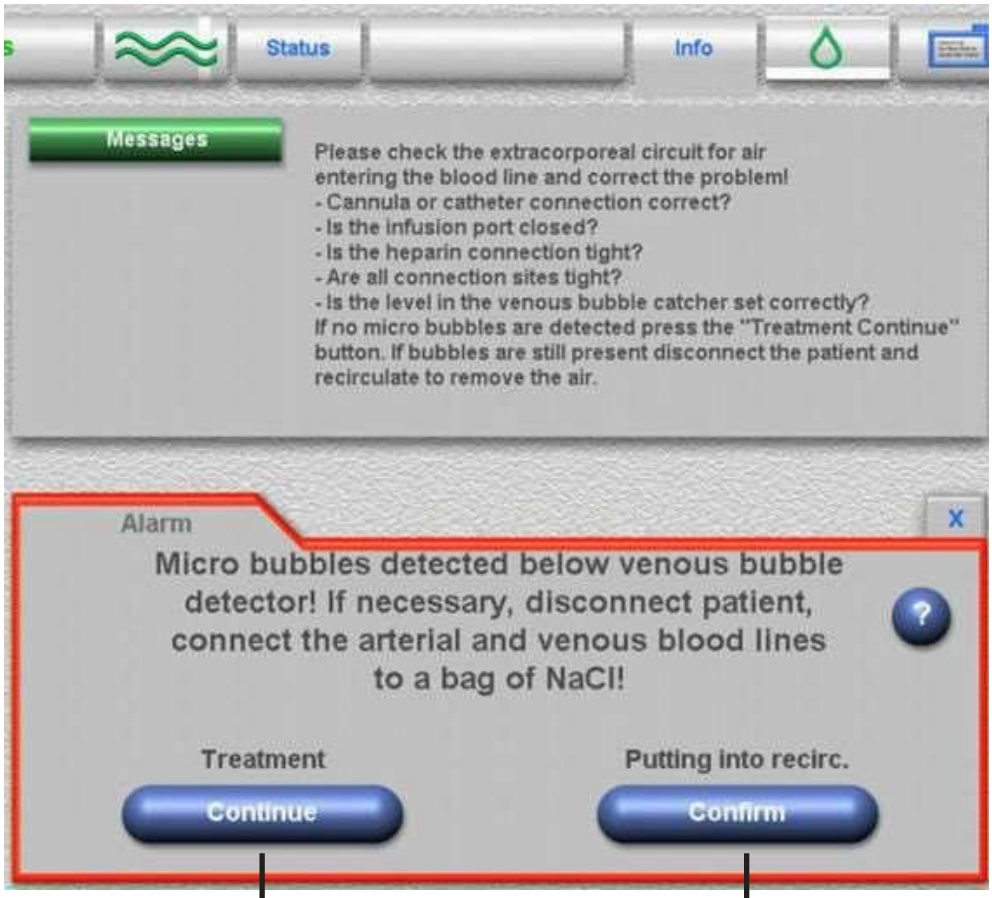
Touch Confirm to continue reducing the arterial pressure (arterial pressure = -300 mmHg)

Press Stop if arterial pressure is released from -300.

- Arterial clamp closed
- Blood pump rotates backward (30 ml/min) against closed arterial clamp to pump up the collapsed blood tubing set

After exceeding 15 ml of backward delivered volume, the blood pump must rotate forward before starting the pressure relief handling again.

Management of Micro Bubbles



- Check all connections.
- Verify status of micro bubbles.
- Decrease blood flow to 200.
- Check level in venous bubble catcher.
- Press Continue if no micro bubbles are detected.
- Alarm message can be parked for **2** minutes, up to **2** times. The third time it appears machine will display a new alarm. Disconnect and return blood.

~~If micro bubbles are visible below venous chamber, put into recirc.~~

Do not recirculate. You do not have all the tools required.

Alert

Presence of air or micro bubbles below the venous bubble catcher presents a hazard for the patient

Message "*Micro bubbles detected below venous bubble detector! If necessary, disconnect patient, connect patient arterial and venous blood lines to a bag of NaCl!"*

FIRST MICRO BUBBLE ALARM

1. Mute alarm
2. Check all connections
3. If no air or micro bubble visible press *Treatment – Continue*
4. If air or micro bubble visible, check for the source of air
5. **If the source of air is coming from the heparin line connection, proceed with the following procedure**

PROCEDURE

TREATMENT CONTINUE with HEPARIN OFF

1. Check the venous bubble catcher air free
2. Open doors
3. Clamp heparin line
4. Press HEPARIN menu
5. Press HEPARIN I/O, green indicator light will turn GREY
6. Close doors
7. Manage alarms, blood pump restarts
8. Raise level in bubble catcher if necessary; Press BLOOD SYSTEM; Press LEVEL SET — ARROW UP

INJECT HEPARIN VIA ARTERIAL BLOOD LINE

Equipment

- 1 — 10ml syringe with 21g x 1½ needle attached
- 2 — Antiseptic wipes
- 1 — Vial of heparin 1:1000units

ADMINISTER THE HEPARIN

1. Prepare **10ml** syringe with heparin 1:1000units as per protocol
2. Wipe RED ARTERIAL sample port with antiseptic swab
3. Inject 1ml of heparin for every hour remaining in therapy in the RED ARTERIAL sample port
   For example, if there are 3 hours of treatment remaining, inject 3ml of heparin
4. Dispose of syringe and needle as per protocol
5. Restart dialysis

SECOND MICRO BUBBLE ALARM

If a second micro bubble alarm occurs, **stop therapy**.

a. If air or micro bubble visible in the blood line and bubble catcher, discard the blood, stop therapy

b. If blood line and venous bubble catcher air free, retransfuse the blood

Note: Alarm message can be parked for 2 minutes, up to 2 times:

PROCEDURE

1. Press Reinfusion
2. Press Reinfusion I/O key to start infusion
3. Proceed with reinfusion protocol
4. Abort therapy

THIRD MICRO BUBBLE ALARM

If hemodialysis treatment is not terminated after the second micro bubble alarm, there is risk of a third reoccurrence of the alarm. If the alarm appears for a third time, the machine will display a new alarm message:

Message "*Air Detected below the venous bubble catcher. Disconnect the patient, connect the arterial and venous blood line to the NaCl solution!"*

PROCEDURE

1. Check blood lines and bubble catcher air free
2. Do NOT reinfuse blood, if air or microbubbles visible, discard circuit, abort therapy
3. If blood line and bubble catcher air free, **MANUALLY** reinfuse the blood as per protocol
4. Abort therapy

Alert

- Strictly follow unit procedure for a blood leak
- Blood leak alarm will activate when machine sensor detects blood loss of 0.5 ml per minute into the dialysate
- If dialysate flow is turned off, a blood leak alarm response is delayed

Equipment

- Fresenius 5008S CorDiax
- Blood Leak Test strip used for testing the presence of blood in dialysate

Required Actions

Immediately look at **red** dialysate outflow coupling to see whether the problem is a severe or minor blood leak. If blood is seen in the red dialysate outflow coupling, treat as a severe leak.

Response

1. Audible alarm sounds – blood pump and dialysate flow stop
2. Message reads *Blood Leak – Override*
3. Do not override
4. Press Mute button
5. Check **red** dialysate outflow coupling

A. Severe Blood Leak – Blood visible in outflow (red) coupling

1. Close all clamps – patient access clamps and blood line clamps
2. Do not reinfuse the blood, disconnect blood lines from patient
3. Press – Blood System menu
4. Press – Remove All Lines
5. Discard contaminated blood lines
6. Perform a Degreasing Cold (chlorine) disinfection on machine

B. Minor Blood Leak – Blood not visible in outflow (red) coupling

If no red cells are seen in red dialysate outflow coupling, proceed with the following:

1. Press Override key and blood pump start key to restart treatment
   RATIONALE: Maintains integrity of extracorporeal circuit by restarting blood pump for a period of 2 minutes. The override key can only be used twice.
2. Collect Blood Leak Test strips used for testing blood in dialysate (check expiry date)
3. Ensure dialysate flow is on (dialysate flow display – green wave)
4. Over a bin, remove red dialysate outflow coupling, allow stent dialysate to saturate the Blood Leak Test strip
5. If presence of blood on test strip is positive, initiate **reinfusion** protocol immediately
6. If presence of blood on test strip is negative, continue with hemodialysis
7. Keep one dialyzer from the same box or note the lot number
8. Perform Degreasing **/** Cold (chlorine) disinfection on the machine
9. Document event and notify the nurse

Heparin Connection Test (during prime/setup)

- Detects whether heparin line clamp is closed
- Detects whether heparin line is kinked
- Tests if Heparin line is connected to syringe
- Tests if there is a leak in heparin line
- Tests for incorrect coupling between grip handle and syringe plunger spindle

Note: Each heparin connection test typically uses 0.5 ml of heparin from the syringe (is diluted in the priming circuit).

Together with the initial heparin line prime volume of 0.6 ml, the syringe may use 1.1 ml total heparin.

Should you correct a problem with any of the tests indicated above, you must consider that each connection test repeat will use an additional **0.5 ml** of heparin from the syringe.

Deviation Alarm or Heparin pump error
(during treatment = same as "infusion alarm")

- Monitors the actual delivered volume vs the prescribed infusion rate *Real volume vs. actual volume in the syringe*
- Alarm triggered only if ≥ 0.6 ml and if 0.6 ml has been delivered (for typical 0.5 ml/ hr rates, this alarm may take more than 60 minutes to trigger)
- Deviation alarms can be reduced with higher hourly infusion rates
- Triggered if the syringe plunger is manually moved

Screen Failure During Treatment

5008S Machine Procedure

Alert

- Blood within the extracorporeal circuit must be returned to the patient in the event of screen failure

Equipment

- 1000 ml bag NaCl
- IV admin set

Procedure

There are two types of screen failure situations:

A. Screen Failure (No screen reaction)

1. In the event that the screen is on but non-reactive, **manual reinfusion** must be performed using normal saline
   Note: Monitoring systems may not be working correctly
2. Touch Blood System Stop button (red external button)
3. All pumps will stop (blood pump, substituate pump, SN pump)
4. Attach arterial patient line to medication injection connector on IV line
5. Open roller clamp on IV line and open clamp on arterial line
6. To return blood to patient, use integrated handle in pump rotor, by pulling out pump handle
7. Remove arterial and venous patient line from clamp and visually observe for air
8. Rotate handle clockwise until blood is returned to patient
9. Clamp venous line and disconnect from patient
10. Open arterial dome manually using a syringe (see chapter 5 - Set up and Tear Down)
11. Remove lines
12. Report event to technologist – machine to be serviced

B. Screen Failure (Screen Dark)

1. In the event of a screen failure where the screen has become blank, normal saline (NaCl) is used to reinfuse patient's blood
   Note: All monitoring systems are active
2. Touch Blood System Stop button (**red external button**)
3. All pumps will stop (blood pump, substituate pump, SN pump)
4. Attach arterial patient line to medication injection connector on IV line
5. Open roller clamp on IV line and open clamp on arterial line
6. Touch Blood System Start button (**green external button**)
7. The blood pump delivery rate will automatically become the preset reinfusion rate
8. Perform reinfusion until desired amount of blood is returned to patient
9. Clamp venous line and disconnect from patient
10. Open arterial dome manually using a syringe (see chapter 5 - Set up and Tear Down)
11. Remove lines
12. Report event to technologist – machine to be serviced

HOW TO GET HELP

The Home Hemodialysis Unit

Phone number: **416-340-3736**

Hours: **7:30 am to 3:30 pm**

Outside of these hours, go to the nearest hospital emergency room.

For medical emergencies, call 911.

Home Hemodialysis Technologists

Phone number: **416-340-4288**

Hours: **8:00 am to 4:00 pm**

After hours, page the technologist on-call.

Making the call

1. After hours, page the technologist on-call at 416-719-5299.
2. Listen to the message.
3. Wait for the tone.
4. Type in your phone number.
5. Press the # Key.
6. Wait for the beep.
7. Hang up.
8. Wait for the technologist to call.

Note if the technologist does not respond, call LOCATING at 416-340-3155.

Ask locating to page the technologist at 416-719-5299 for you.

Make sure you provide locating your name and number.

Fresenius 5005s CorDiax

- Water
- Reverse Osmosis

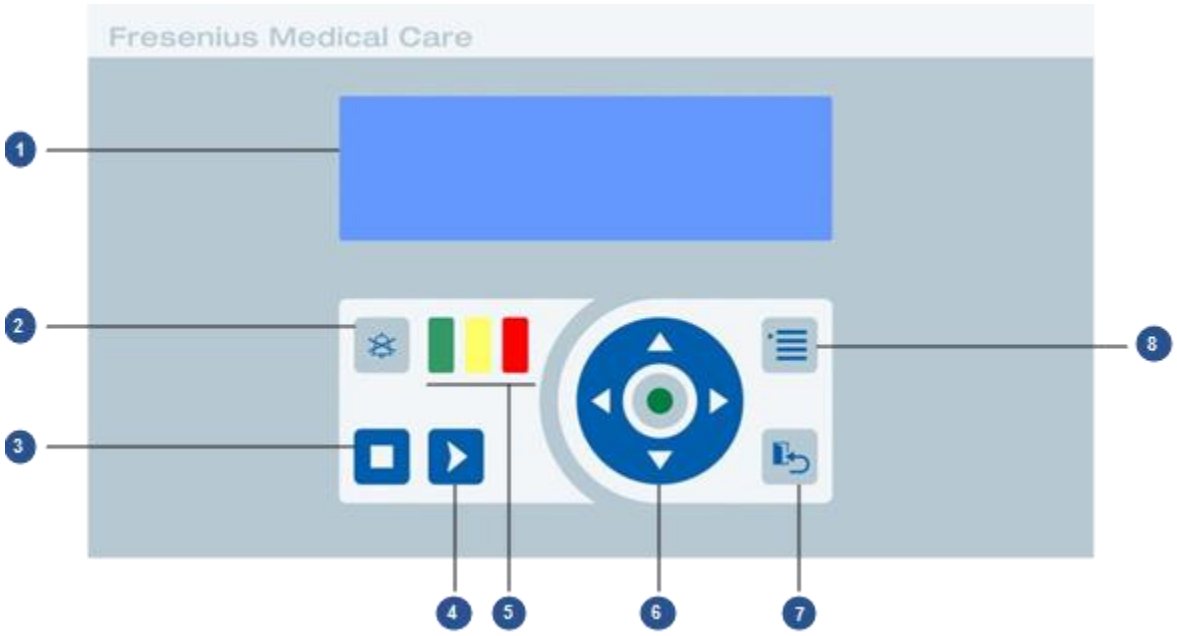
Guide for the care of Portable Water Treatment System

As a home hemodialysis patient, you will be responsible for the operation, cleaning and disinfection of the portable water treatment system. It is important that you follow the instructions and procedures provided to you during your training period. This will help to ensure the best water quality for your dialysis treatments and keep the equipment functioning well.

The Fresenius AquaC UNO H Portable Reverse Omosis (RO) Unit

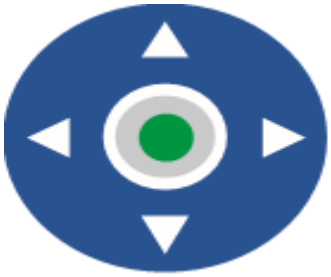
1	Plug for injection port for cleaning agent, disinfectant and preservation solution
2	Display and control keys
3	Permeate connection for dialysis system
4	Castors

User Interface and Display



1	Display	The display is divided into the operating mode bar and the display and navigation section
2	Mute key	Silences an audible alarm for 2 minutes
3	Stop key	Stops the program currently in progress
4	Start key	Starts the SUPPLY mode when the AquaC is in the STANDBY and RINSE modes
5	Visual Indicators	Green = Supply, Yellow = Warning, Red = Alarm
6	Navigation / Enter keys	The arrows are used to select different menu options followed by confirmation of selection with the Enter key
7	Back / Escape key	Exits the current menu
8	Menu key	Displays the main menu

NAVIGATION / ENTER KEYS



▲	Up navigation key
▼	Down navigation key
◄	Left navigation key
►	Right navigation key
●	Enter (Confirm) key

Visual Indicator Status

	(off)	The AquaC is in Standby mode and performs a cleaning program or a disinfection.
	(constant)	The system is in SUPPLY mode.
	(constant)	A warning has occurred.
	(flashing)	An alarm or a malfunction has occurred. An audible alarm will also sound.

Tasks Related to the Use of the Portable Water Treatment System

Note prior to starting the assessment of the water system ensure the 9 minute rinse is complete.

Before Every Hemodialysis:

- Press the Start key on the Reverse Osmosis (**RO**) panel to activate **Supply** mode
- Turn on the dialysis module and select **Rinse**
- Allow 9-minute Rinse to complete

R/O System Checks Prior to Each Dialysis Session:

- Assess carbon tanks for chlorine breakthrough
- Check and Document "Pressure In" and "Pressure Out" from gauges mounted on the micron filter housing (range 30-50 psi)
  - If delta PSI (Pressure in – Pressure Out) is greater than 10, micron filter change required
- Press the down navigation key ▼ on the RO to display the following parameters:
  - Check and Document Permeate conductivity (range 1-10 uS/cm)
  - Check and Document Feed water conductivity (range 100-1000uS/cm)
  - Check and Document Feed water temperature (range 12-20 °C)
  - Check and Document Rejection Rate (target >95%)

Every Week:

- DECALCIFICATION / MODULE HEAT DISINFECTION OF THE RO SYSTEM:
  - Perform this procedure **weekly** or whenever the message "Warning: Decalcify" appears on the RO screen, whichever occurs first
  - There is no need to interrupt dialysis if this message appears during treatment; however, it is important to perform the procedure before your next treatment
- INTERFACE HEAT DISINFECTION:
  - Equipment programmed to perform this function weekly
  - It will activate as programmed without the need for operator intervention
  - **Interphase Heat Disinfection** is scheduled to occur **Sunday at 1:00p.m.**

- DEGREASING / COLD DISINFECTION:
  - Equipment programmed to perform this function weekly
  - It will activate as programmed without the need for operator intervention
  - **Degreasing / Cold Disinfection** is scheduled to occur every **Saturday at 1:00p.m.**
- Test the Floodstop System
- Test the battery operated water detector

Every Month:

- The technologist will visit your home to collect water samples for bacterial testing
- This is to ensure the microbial (bacteria) count in the RO system complies with **The Canadian Standards Association** (CSA)
- Dialysis water testing includes:
  - **LAL levels** – this test detects pyrogens (protein released by dead bacterial cells) and endotoxin (a toxic substance attached to bacterial wall and released when the bacteria cell ruptures)
  - **Microbial** – this test detects microscopic organisms, such as bacteria, fungi, and algae

Every 2 Months:

- The technologist will also replace the micron filter
- The micron filter is generally changed every 2 months

Every 6 Months:

- Carbon tank changed every 6 months
- Technologist to arrange replacement of tank
- The technologist may perform a chemical disinfection of the RO System after carbon tank exchange

Every 12 Months:

- The technologist will collect water samples for annual chemical analysis
- Replace the batteries in the Floodstop System
- Replace the batteries in the water leak detector

Automatic Rinse of the Reverse Osmosis (RO) unit

NOTE: The RO is programmed to RINSE every 4 hours while in Standby mode. Do not turn ON the dialysis machine during this time. Simply wait for the RINSE function to finish. The RINSE program activates at 12a.m., 4a.m., 8a.m., 12p.m., 4p.m. and 8p.m. and only when the RO is in Standby. If needed, it is possible to override the Rinse program by selecting **START KEY**, which will placed the RO in Supply mode.

If dialysis module is powered on during the RO RINSE, the module will prompt you to perform a MANDATORY RINSE. A Mandatory Rinse of 29 minutes must be completed. The mandatory rinse cannot be bypassed.

Documenting and Reporting Alarms on the RO

In the event of an alarm code appearing on the RO display, record the alarm code as it appears in the example below. The alarm code is accompanied by an audible alarm. Once you have documented the alarm code, press the Enter key to confirm. Immediately contact the technical team and report the problem.

Example of RO alarm code: F – 01 – 60 – 01

CONTACTING THE TECHNOLOGISTS:

On-Call Schedule	
MONDAY – FRIDAY, 4:00p.m. TO 8:00a.m. **&** **24 HOURS ON WEEKENDS AND HOLIDAYS**	
Making the call	
1. **After hours, page the technologist On-Call at 416-719-5299** 2. **Listen to the message** 3. **Wait for the tone** 4. **Input your phone number** 5. **Press the # key** 6. **Wait for the beep** 7. **Hang up** 8. **Wait for the technologist to call**	• Note if the technologist does not respond, call **LOCATING** at **416-340-3155** • Ask locating to page the technologist at **416-719-5299** for you • Make sure you provide locating your name and number

Leaving Home for Vacation
Or Hospitalization

It is important to schedule a technical visit for patients going on vacation, so that the machine will disinfect properly while you are away. If possible, you should also arrange for someone to check your machine during that period.

	PORTABLE RO	DIALYSIS MACHINE	MACHINE DISINFECTION FAILURE

Prior to leaving home for your vacation.
 	
Or
 	
Prior to a hospitalization
	• AquaC UNO H R/O is programmed to rinse every 4 hours for 10L for 10 minutes
	• Check the **Floodstop** is functioning
	• Check that the Floodstop sensors are connected and in the right location
		• **Normal Saline Prime**: The machine is programmed to disinfect automatically on **Tuesday, Thursday & Saturday**
		• **ONLINE*plus* Prime**: The machine is programmed to disinfect automatically **every 24 hours**.
		• The time of automatic disinfection to be determined with the technologist in consideration of your personal needs
		• Check the number of Degreasings remaining on the Diasafe filter (the machine needs to perform 1 degreasing per week)
		• Check level of disinfection solutions at the back of the machine to ensure you have enough supply for automatic disinfection
		  ○ **Chlorine**
		  ○ **Citrosteril**
			• If the machine disinfection failed, call the technologist
			• The technologist may have to take a water sample
			• If water sample results (LAL + bacteria) are high, you cannot dialyze a home
			• It may take up to 7 days after re-sampling the water to return to home therapy

WATER SYSTEM PROCEDRUES

1. Assess Carbon Tanks for Chlorine Breakthrough

Materials	• Serim Guardian HiSense Ultra 0.1 test strip (check expiry date) • Sample container
Frequency	• Performed with every dialysis treatment • The RO must be in Supply mode
Rationale	• Carbon tanks remove chlorine and/or chloramines from the water
Procedure	1. Rinse the sample cup by filling and discarding the water twice 2. Obtain a 20ml water sample from the spout mounted directly on the carbon tanks 3. Immerse the test strip in the water sample 4. Vigorously swish the test strip for a full 30 seconds 5. Remove strip and shake off excess water 6. Immediately compare test strip with the closest colour match on outside of test strip bottle 7. This value should read less than 0.1 ppm: • If result is more than 0.1 ppm, the carbon tank is exhausted 8. Call **Technologist** to arrange replacement of the tank 9. Discard used test strip 10. Until the exhausted tank has been replaced, it will be necessary to assess the 2nd carbon tank for chlorine breakthrough 11. Perform chlorine test on water sample from 2nd spout mounted on the micron filter housing: • If result is less than 0.1 ppm, okay to dialyze • If result is more than 0.1 ppm, you cannot dialyze at home, notify the technologists immediately 12. Once exhausted tank(s) replaced, resume daily chlorine tests at spout mounted on the carbon tank

2. Perform Decalcification / Module Heat Disinfection of the Reverse Osmosis (RO) System

Please Note: This procedure must be performed **weekly** or whenever the message "**Warning: Decalcify"** appears on the RO screen, whichever occurs first. There is no need to interrupt a dialysis treatment should the message appear during a treatment; however, perform procedure as soon as possible after treatment.

Materials

- Measuring cup
- Funnel
- CITROSTERIL cleaning solution

Decalcification Procedure:

- The RO must be in Standby mode – press the stop key if needed

- Fill the measuring cup with 200ml of CITROSTERIL
- Remove the fill port plug from the top of the RO and insert the funnel in its place
- Press the Menu key, scroll down to **Cleaning** and press the Enter key

- Scroll down to **START MODULE HEAT DISINFECTION** and press the Enter key

- The RO will now prompt you to "**Decalcify before heating**"
- Scroll down to **Decalcify** and press the Enter key

- When prompted to "**Disconnect dialysis device!"** ignore the message, as this step is not required
- Scroll down to **Start Decalcification** and press the Enter key

- The message "**Please add CITROSTERIL!**" will now appear and an audible alarm sounds

- Carefully pour the 200ml of CITROSTERIL from the cup into the funnel inserted in the RO

- The funnel can now be removed and the fill port plug put back in place
- Press the Enter key to start Decalcification

- The RO will now perform the Decalcification followed by Module Heat Disinfection
- The entire process will take 187 minutes
- Once the process is finished, turn on the RO in Supply mode
- Let the RO run for 5-10 minutes
- Check and verify that the Permeate Conductivity returns to normal values, 1-10 uS/cm
- Return the RO to standby mode by pressing the stop key

3. Change the 1-Micron filter

Change the 1-Micron filter if delta PSI is greater than 10. Otherwise, the technologist will change the filter every 2 months during the technical visit.

- The 1-Micron filter (sediment filter) works like a sieve to remove particles from water.

Supplies

- One 1-Micron filter
- Wrench
- Pail to catch water drips
- Rags

Changing the 1-Micron filter

1. Turn OFF the water supply valve to the RO System
2. The RO Unit should be in Standby mode
3. Ensure that the pressure gauges both read “0”; if not, open the sample port on the filter housing to bleed the pressure until the gauges read “0”, use a container to catch any water that drains from the spout
4. Using the plastic wrench provided, unscrew the blue filter housing
5. Remove the 1-Micron Filter
6. Discard filter
7. Wipe out the filter housing
8. Insert a new 1-Micron Filter into the housing
9. Ensure the filter is positioned correctly
10. Tighten the housing firmly
11. Turn ON the tap water
12. Press the Start key on the RO
13. The RO will turn on in Supply mode
14. Allow the pressure gauges to rise to maximum pressure
15. Observe for leaks; if leaks occur, the casing requires further tightening
16. Press the Stop key to turn the RO off

4. Floodstop Feed Water Control System

The Floodstop device is an electronic water leak detection and automatic water shut-off system. If a water leak detected, the Floodstop valve will shut off the water supply to your dialysis equipment and sound an audible alarm. The device will be connected to an AC outlet in your home and also has battery back-up in the event of a power failure.

Control Panel Functions

1. Open Button opens the Floodstop electromechanical valve.
2. Close Button closes the Floodstop electromechanical valve.
3. Mute Button silences the audible alarm when a leak detected.

Important notes

1. The Floodstop has a battery back-up system. Make sure to replace all 4 AA-batteries yearly. If batteries require changing before one year, a red low battery light will flash and a beep will sound.
2. Once per month the valve will automatically cycle (close/open) to ensure reliable operation. The Floodstop device determines the timing of this maintenance cycle.

Floodstop System Operation

- If a sensor gets wet, the Floodstop controller will alarm and red indicator lamp will flash
- The electromechanical valve will close and the water supply shut off
- Pressure gauges on the sediment filter will drop to 0 psi
- Both the dialysis machine and RO will alarm for No Water
- Mute the alarm on the dialysis machine
- Push the MUTE button on the Floodstop to silence the alarm
- Investigate the source of the leak
- Locate and wipe the wet sensor/s with paper towel, all sensors should be thoroughly dry
- Press OPEN on the Floodstop console, green lamp will start to flash/valve will open
- Check pressure gauges, readings should return to normal values
- Restart the portable RO into operation mode
- Check for fluid leaks, Floodstop alarm will retrigger if sensor gets wet, continue to check for leak around the sensor locations

Note: In case of a major leak from the dialysis module or the RO System, patient cannot continue dialyzing and must return the blood and disconnect from the dialysis module. Immediately report the problem to the home dialysis technologists.

Weekly test of the Floodstop System

1. Locate one of the Floodstop water sensors and touch the surface of the sensor with a wet paper towel
2. The Floodstop controller should alarm and the red indicator lamp flash
3. The Floodstop valve will close to shut off the water supply to the dialysis equipment
4. Press the Mute button to silence the alarm then dry the water sensor
5. Press **OPEN** on the Floodstop console, the green lamp should start to flash and the Floodstop valve will now open
6. Return the water sensor back to the original location
7. If the Floodstop does not work as expected, inform the home hemodialysis technologists

Fresenius 5005s CorDiax

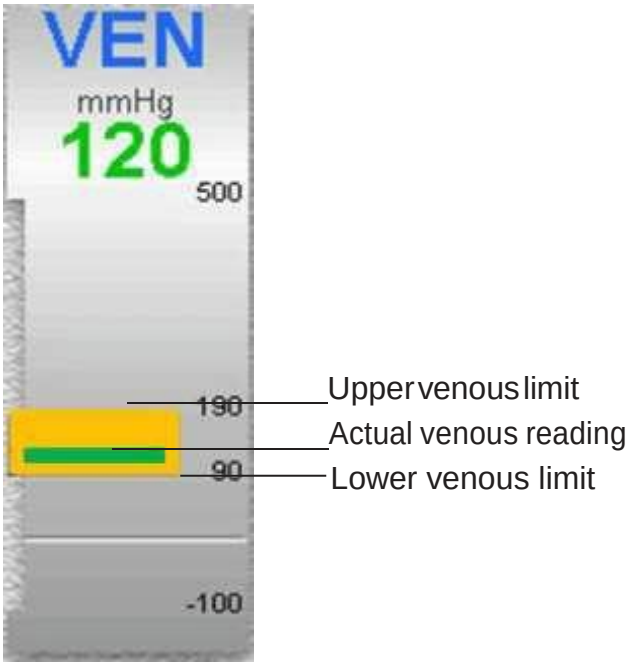
- Safety

Venous Accessing Monitoring (VAM)

5008S CorDiax Machine Procedure

Description

The VAM monitors the venous pressure for a specific pressure loss pattern. It detects sudden drops in venous pressure as small as 15 mmHg, even when the venous pressure does not exceed the lower alarm limit.



The VAM detects a pressure loss at the venous vascular access, which might be the result of a dislocation of the venous needle. This provides increased patient safety, enhancing the existing function of the venous pressure monitoring system.

If a VAM alarm occurs, the blood pump is stopped immediately, the venous clamp is closed and the maximum possible blood loss is limited to 200 ml.

Venous Alarm Limit

The lower venous alarm limit must be set as close as possible to the actual venous pressure value.

Note: A disconnection of the venous needle does not always result in a pressure loss. The patient/partner remains responsible for safe management of access during treatment.

Alarm Processing

It is the patient's responsibility to check the venous pathway for any disconnections or leaks.

There is no such thing as a false alarm!

Pressure drops may also be triggered by clots in the venous bubble catcher, which are not visible.

Press the *Blood pump* Start key after you have checked the condition of the patient, the blood lines and the venous vascular access and have made any appropriate corrections. Continue the treatment only if the patient is safe.

Venous Accessing Monitoring (VAM)

5008S CorDiax Machine Procedure

After the *VAM* Deactivate key has been pressed, a safety prompt is displayed. The safety prompt allows the operator to deactivate the pressure monitoring function of the venous vascular access for the remainder of the treatment.

Press the No key if pressure monitoring of the venous vascular access is to remain active.

Press the Yes key if pressure monitoring of the venous vascular access is to be deactivated for this treatment.

When the VAM is deactivated VAM monitoring is no longer available for the remainder of the treatment. VAM will become active again at the start of the next treatment.

Note: Catheters may lead to frequent VAM alarms. In this case VAM should be deactivated as the VAM does not provide increased safety for these patients.

VAM is not active during Single Needle mode.

Fresenius 5005s CorDiax

- Disinfection

NOTE

1. Interface Heat Disinfection. Equipment programmed to perform this function weekly. It will activate as programmed without the need for operator intervention. Interphase Heat Disinfection is scheduled to occur Sunday at 1:00p.m.

2. Degreasing / Cold Disinfection (chlorine disinfection). Equipment programmed to perform this function weekly. It will activate as programmed without the need for operator intervention. Degreasing / Cold Disinfection is scheduled to occur every Saturday at 1:00p.m.

3. The reverse osmosis device is programmed to RINSE every 4 hours while in Standby mode. Do not turn ON the dialysis machine during this time. Simply wait for the RINSE function to finish. The RINSE program activates at 12a.m., 4a.m., 8a.m., 12p.m., 4p.m. and 8p.m. and only when the RO is in Standby. If needed, it is possible to override the Rinse program by selecting START KEY, which will placed the RO in Supply mode.

4. Ensure the time on the reverse osmosis unit (R/O) is the same as the time on the dialysis machine.

Expected Outcome – Disinfection

- Dialysis machines will be heat disinfected and decalcified daily with citric acid to ensure that micro-organisms and calcium deposits are removed from the dialysate pathway
- Heat disinfection is recommended after each use

Equipment

- Fresenius 5008S CorDiax
- Fresenius approved 20% Citric Acid fitted to rear of the Fresenius 5008S CorDiax
- Standard precaution protective wear

Procedure – Heat Disinfection

Heat disinfection should be performed after every dialysis treatment or after a downtime of more than 72 hours.

Changing the DIASAFE®*plus* Filters

When a filter change is due, a message will prompt you to change the filters.

1

2 Touch Both Filters button.

Wait while filters empty.

3

4 Change both filters <u>before</u>

Changing the DIASAFE®*plus* Filters (cont'd)

5

- Open2newDIASAFE®*plus* filters
- Sign, date and apply orange sticker to each new filter
- Remove filter covers

(a) • Open the upper and lower blue locking levers

(b) • Slide the old DIASAFE®*plus* filters up and out of the slot

- Remove white caps from new filters

(c) • Place the new filters in the slot and slide down into place

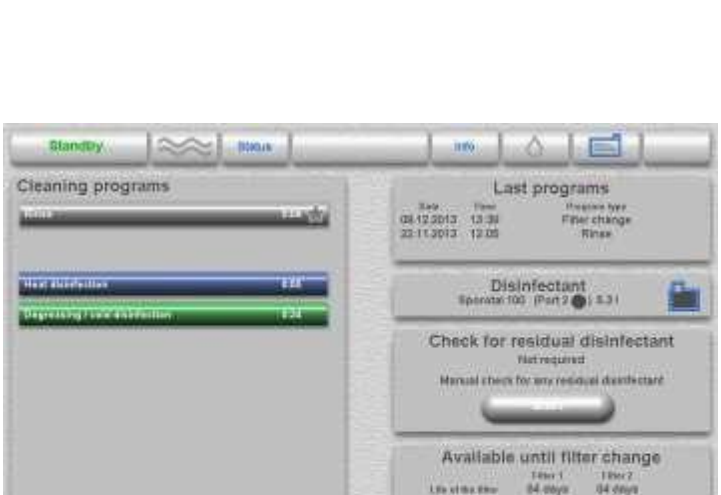
(d) • Close the blue locking levers

- Reattach filter covers

6 Touch Confirm.

Changing the DIASAFE®*plus* Filters (cont'd)

7 Touch Cleaning menu.

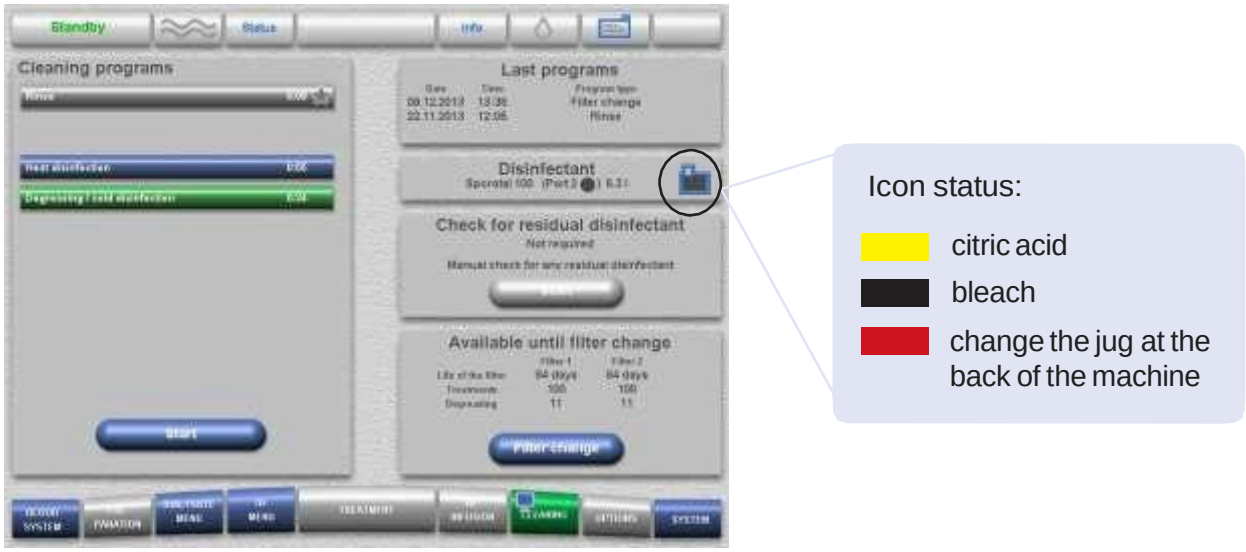


8 Touch Heat disinfection button and Start.

Changing the Citric Acid or Bleach Container

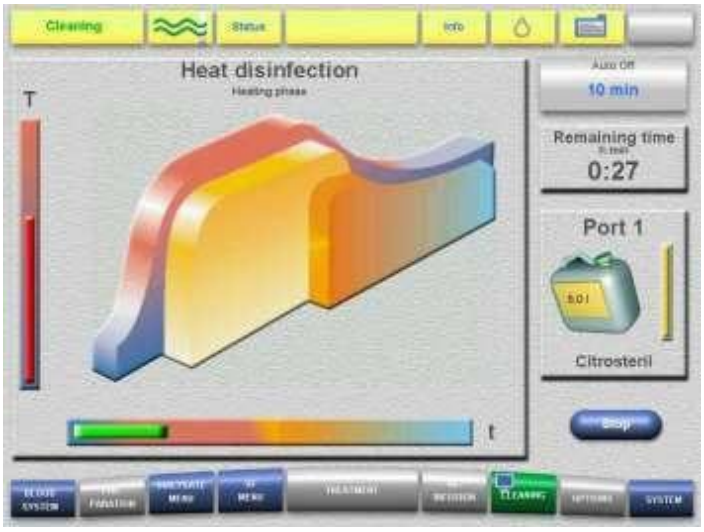
When going into the disinfection screen to start disinfection, always verify the disinfection level in the container first. There is an icon (circled below) on the disinfection screen that displays the current level. If the icon is red then the jug should be replaced with a new one.

Note: Do not refill jugs. Always replace them with new jugs.



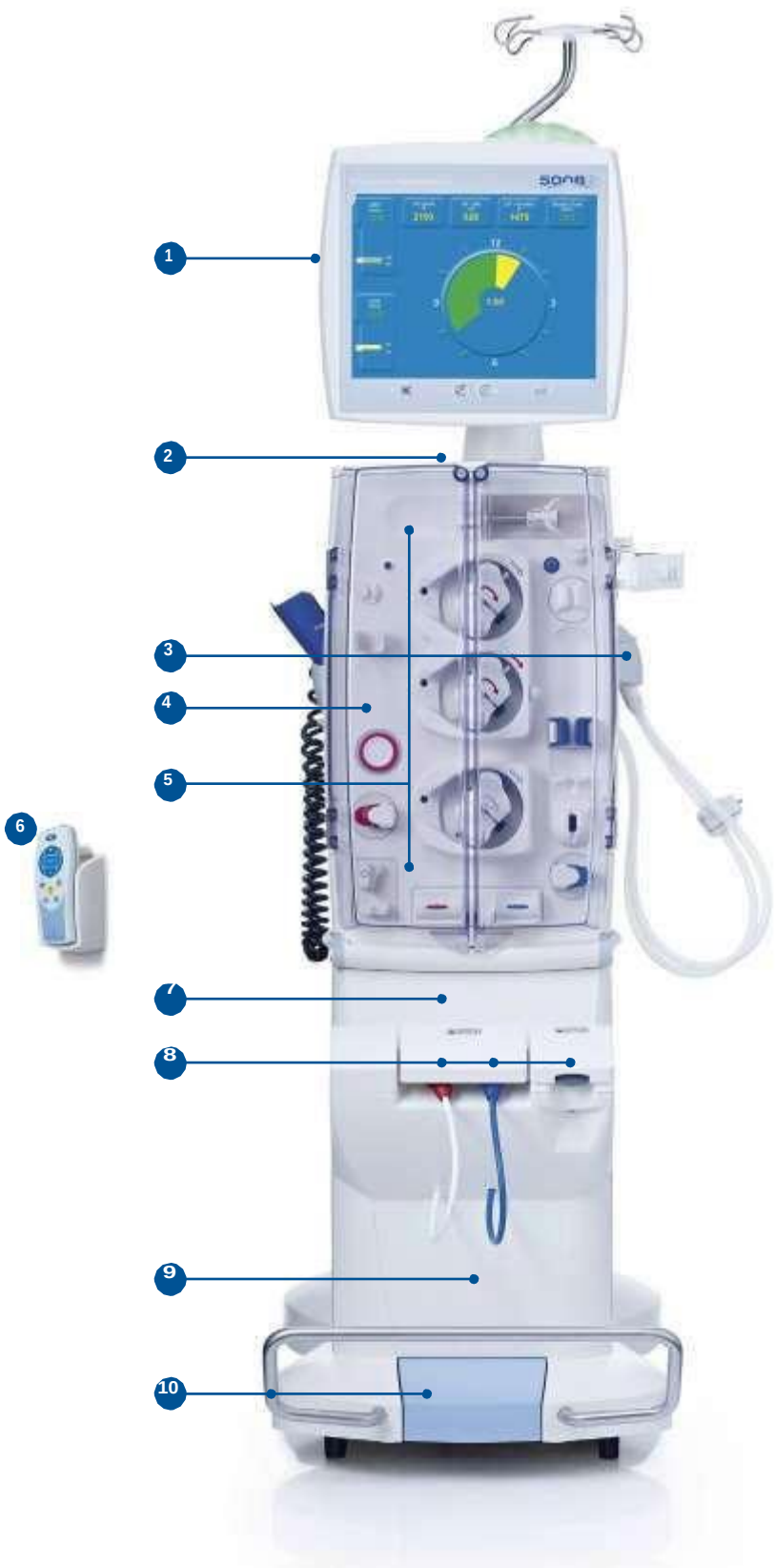
If icon is red and you've changed the container, touch the icon indicated above. You will see the message *Change container?* YES or STOP. Press YES and the icon will fill with the color of the disinfectant chosen.

Once disinfection has started, you cannot reset this icon on the disinfection screen.



Cleaning the 5008S CorDiax

General External Cleaning Instructions



Warning
ONLINE*plus*™ substituate and rinse ports must remain closed during internal and external cleaning to prevent contamination.

1. Using a damp (not dripping) disinfection wipe[1], begin by wiping monitor.
2. Clean top of tray area.
3. Remove red and blue dialyzer couplings. Clean port and shunt interlock. Clean dialyzer couplings and tubing and replace.
4. Clean the front and sides of the double doors, then inside the doors.
5. Clean all components except for the following:
   - BTM sensors (inside flaps)
   - Optical detector sensors
6. Clean remote control.
7. Clean above hydraulics.
8. Open acid and bi*bag*® concentrate doors, remove wands, and clean entire area, including ports and seals. No white residue should be left in this area.
9. Clean below hydraulics.
10. Clean brake platform and bar, if present.
11. Clean each side of machine.
12. Using a dry, clean cloth, wipe monitor to ensure no residue of cleaning product remains on screen.

Clean the exterior with a damp cloth.

Ensure there are no specks of blood.

Dry the exterior doors.

Emergency

Emergencies:

What to do if there is a fire

Keep an emergency kit in your dialysis area at all times.	
	Your emergency kit should contain**:** ○ Tape ○ Scissors ○ Supply to lock the CVC **OR** ○ Supply to remove the dialysis needles

Plan an emergency exit from your home

Identify an emergency exit route and a meeting area outside your home. Make sure every family member knows this plan.

If there is a fire:

Emergency Exit

The situation is dangerous and you must hurry.

1. Stop blood pump.
2. Clamp patient access. Do not return blood.
3. Clamp arterial and venous blood lines.
4. Disconnect or cut blood lines below the blood line clamps.
5. Take the emergency kit – supply to complete access care.
6. Leave the home.
7. When you reach safety, call 911.

OR

Urgent Exit

Your life is in immediate danger.

1. Return the blood if possible. Disconnect or cut the blood lines below blood line clamps.
2. Take the emergency kit – supply to complete access care.
3. Leave the home.
4. When you reach safety, call 911.

Patient Complications

- Hypotension
- Fever
- High or Low Potassium
- Pulmonary Edema
- Air Embolism
- Hemolysis
- And more…

Complications of kidney failure and hemodialysis

This chapter describes problems related to kidney failure and hemodialysis, and how to prevent or manage them. If you are unsure of a problem or what to do, do not hesitate to call the staff at the Home Hemodialysis Unit.

Home Hemodialysis Unit **416-340-3736**	**Call the Home Hemodialysis Unit:** ✓ To report health problems and all bad events. ✓ To get advice when you are concerned.

Problems may arise related to your health or related to the dialysis machine.

Medical complications	**Other complications**
• Low and/or high blood pressure • Muscle cramps • Nausea and vomiting • Headache • Itching • Fever and chills /Sepsis • Irregular heart beat • Dialyzer related complications • Sleeplessness and restlessness • High or low potassium • Pulmonary edema • Complications of not having enough dialysis • Restless leg syndrome	• Air embolism • Hemolysis • Blood leak • Conductivity problems

Medical complications

Low blood pressure (hypotension)

Signs and symptoms	Possible causes	Action and prevention
• Sudden or gradual drop in blood pressure • Dizziness • Nausea • Vomiting • Sweating • Cramping of hands, arms or legs • Stomach (abdominal) cramps • Headache • Feeling unwell • Arterial pressure alarms • Urge to have a bowel movement • Unresponsiveness	• Target weight is set too low • Too much fluid gain between dialysis sessions, leading to removing too much fluid • The fluid removal (ultrafiltration) rate is set too high.; the body cannot keep pace with the fluid removal rate • Ultrafiltration rate (water removal) is too high for the length of dialysis • Effects of high blood pressure medication	1. Select **UF Timer**, function will switch off – gray; this will stop the UF (fluid to be removed) 2. Alternatively, select **Emergency (Red-Cross) Key**; this will stop the UF, slow down the blood pump and open venous pressure limits 3. Give 200 ml of normal saline bolus 4. Lie flat 5. Reduce the total amount of fluid to be removed (UF goal) 6. Stop dialysis treatment if your blood pressure remains very low 7. Raise target weight and tell the staff as soon as possible 8. Avoid eating large meals during dialysis 9. Call the Home Hemodialysis Unit

Ultrafiltration:

- The process of removing water from the blood during hemodialysis.

Ultrafiltration rate:

- The amount of water removed per hour.

High blood pressure during dialysis (intradialytic hypertension)

Signs and symptoms	Possible causes	Action and prevention
• Rise in blood pressure during the last part of dialysis or after the treatment	• Pre-existing high blood pressure • Fluid overload • Stopping of blood pressure medications • Changes in blood volume activates the blood pressure hormone system (renin-angiotensin) • Exact reason may be unknown	• Low salt diet • Increase the dialysis session (hours) with a lower hourly fluid removal rate • More frequent dialysis sessions • Lower your target weight (consult the Home Hemodialysis team first)

Muscle cramps

Signs and symptoms	Possible causes	Action and prevention
• Painful muscle spasms • Low blood pressure during dialysis	• High hourly fluid removal rate • Low blood level of sodium, potassium, calcium and magnesium	• See actions for low blood pressure • Reduce fluid intake between dialysis treatments • Avoid large amounts of fluid removal during dialysis (no more than 2.5 to 3 litres over 7 - 8 hours) • Apply heat to affected area • Massage affected area. • Stretch your legs • Reassess the need to raise the target or dry weight

Nausea and vomiting

Signs and symptoms	Possible causes	Action and prevention
• Low blood pressure • Feeling sick and throwing up	• Target or dry weight set too low	• See actions for low blood pressure • Avoid large fluid removal rates • Target or dry weight may need to be increased

Headache

Signs and symptoms	Possible causes	Action and prevention
• Pain • Abnormal blood pressure	• Low blood pressure • High blood pressure • Removal of large amounts of water during dialysis	• See actions for low blood pressure • Assess medication for high blood pressure • Avoid large amounts of fluid removal during dialysis • Target or dry weight may need to be adjusted

Itching

Signs and symptoms	Possible causes	Action and prevention
• Itchy skin	• Dry skin • High phosphorus levels • Allergic reactions	• Moisturize skin • Reduce phosphate intake • Follow your dialysis prescription • Take phosphate binders

Fever and chills/Sepsis

Signs and symptoms	Possible causes	Action and prevention
• Temperature above 37.5°C (99.5°F) • Feeling cold, shivering • Feeling unwell • Low blood pressure	• Blood infection or **sepsis** • Other infection not related to dialysis (such as influenza or pneumonia) • Water contaminates	• Stop the dialysis treatment • Go to the Home Hemodialysis Unit • If Home Hemodialysis Unit is closed, go to the emergency room or call 911 for emergency medical help

Irregular heartbeat (cardiac arrhythmia)

Signs and symptoms	Possible causes	Action and prevention
• Chest pain or discomfort • Heart beats fast, palpitations • Blood test results show potassium imbalance • Dizziness • Sudden death	• Heart disease • Imbalance of potassium • Low blood pressure	• Irregular heart beat can be dangerous • Do not ignore signs and symptoms • If on dialysis, stop dialysis, return blood, call 911 and go to the emergency room • Follow your dialysis prescription • Do not eat foods high in potassium between treatments • Call Home Hemodialysis Unit

Dialyzer related reactions

Signs and symptoms	Possible causes	Action and prevention
Anaphylactic (life threatening): • Short of breath • Chest pain • Throat tightness • Cardiac arrest	• Occurs within the first few minutes of dialysis	• Call 911 for emergency medical help or go to the emergency room • Medical team to prescribe a different dialyzer • Do not return your blood
Mild Reaction: • Chest and back pain • Low blood pressure • Flushing of face • Itching • Sneezing • Watery eyes • Cough • Stomach pain • Cramps • Diarrhea	• Occurs within first hour of dialysis; however, may occur even after years of exposure	• If the reaction is severe, return your blood and stop dialysis • Call the Home Hemodialysis Unit • Medical team to prescribe a different dialyzer

Sleeplessness and restlessness

Signs and symptoms	Possible causes	Action and prevention
• Tiredness • Sleeplessness • Tingling, burning feeling of feet • Weakness of legs and arms • Anxiety • Depression	• May be related to high urea levels • Sleep apnea • Restless leg syndrome • Exact cause may be unknown	• Dialyze as prescribed • More dialysis may prevent condition from getting worse • Your doctor may prescribe medication • You may need to have a sleep apnea study

High or low potassium

Serious complications can occur when the potassium in your blood is too high or too low. You can have no signs of high or low potassium. However, if you notice any of the signs or symptoms listed below, go to your nearest hospital emergency room for treatment.

	Signs and symptoms	Possible causes
High potassium (hyperkalemia)	• Abdominal pain • Diarrhea • Nausea and vomiting • Tiredness or weakness • Numbness or tingling • Trouble breathing • Palpitations or irregular heartbeats • Muscle weakness, pain or cramps • Shortness of breath • Sudden death	• Eating foods high in potassium • Not following dialysis prescription; for example, not dialyzing regularly, shortening the dialysis session, or skipping/missed dialysis sessions • Not dialyzing due to machine problems • Access problems
Low potassium (hypokalemia)	• Weakness or fatigue • Abdominal cramping or bloating • Nausea or vomiting • Muscle twitching or spasms • Tingling or itchy sensations in hands, arms, feet or legs • Palpitations or irregular heartbeats	• Not eating foods containing potassium • Poor appetite • Vomiting and/or diarrhea • Potassium prescription for the dialysis bath is too low

Pulmonary edema

Pulmonary edema is the accumulation of fluid in lung tissue. This is often called 'water in the lungs'.

Signs and symptoms	Possible causes	Action and prevention
• Difficulty breathing • Shortness of breath • Shortness of breath that is worse lying down • Fast breathing • Restless • Wheezing • Cough • Pink-stained sputum • Bubbling sounds when breathing • Swelling of the hands, ankles or feet	• Target weight needs to be decreased	• Decrease target weight by 0.5 kg • Tell Home Hemodialysis staff • You will need a target weight assessment
	• Not following dialysis prescription; for example, skipping dialysis	• Missing dialysis treatments can lead to a dangerous build-up of fluid in your lungs
	• Intake of fluid and salt is too high	• Speak with the dietitian and reduce salt and water intake
	• Machine problems; for example; machine not removing enough fluid	• If your machine has removed greater or less than 0.5 kg of your programmed weight loss, call the Technologist to check the machine
	• Heart failure; when your heart is not pumping efficiently, fluid builds up in your lungs	• Call the Home Hemodialysis team if you have signs and symptoms of pulmonary edema • You may need medication • You may need more frequent dialysis

Other complications of not having enough dialysis over a period of time

- No appetite, malnutrition
- Increased chance of infection
- Impotence in men
- Irregular periods in women
- Difficulty concentrating or staying on task
- Tiredness and sleep problems
- Urine smell on breath and given off as body odour
- Depression
- Hyperparathyroidism:
    - A condition in which the parathyroid glands make too much parathyroid hormone (PTH). PTH controls the amount of calcium in the blood and within the bones
- Heart failure:
    - A condition in which your heart is not able to pump enough blood to meet the body's needs
- Calciphylaxis:
    - A rare and serious condition in which calcium and phosphate build up in small blood vessels. It causes the skin to die, creating sores that do not heal. This condition can be very painful
- Restless leg syndrome (described on the next page)

Restless leg syndrome

Restless leg syndrome is a medical condition in which you have uncomfortable feelings in your legs and an overwhelming urge to move them. These feelings cannot be explained by other condition, such as leg cramps, leg position, swelling or arthritis.

Signs and symptoms	Possible causes	Action and prevention
• An overwhelming urge to move your legs • Uncomfortable feelings in your legs that may: – Begin or get worse at rest, when you are sitting or lying down – Begin or get worse in the evening or night – Be relieved by movement, such as walking or stretching – Be distressing and interfere with your sleep	• Not enough dialysis • Exact cause may be unknown	• Increase dialysis sessions • May need medications

Other complications

Air embolism

Air embolism:

- An air embolism is a pocket of trapped air that can block the flow in the blood vessel.
- Tiny amounts of air may not cause symptoms or harm.
- A large amount of air can be life threatening.
- This rarely happens, but can be serious when it occurs.

Signs and symptoms	Possible causes	Action and prevention
• Sudden shortness of breath • Chest pain • Cough • Seizures • Loss of consciousness	• Catheter is open to air • Separation of blood lines • Loose connections • Venous line not within venous safety clamp	• Close all clamps • Stop dialysis immediately • Do not return blood • Turn onto and stay on your left side, in a head-down position • Call 911 for emergency medical help • Always use the blood leak detector

Hemolysis

This condition is very rare. Hemolysis is the breakdown or destruction of red blood cells. The damaged cells release potassium into the blood.

Signs and symptoms	Possible causes	Action and prevention
• Cherry coloured blood in venous bloodline • Abdominal pain and/or back pain • Increased heart rate • Nausea and vomiting • Drop in blood pressure • Heart attack due to high potassium	**Mechanical Causes:** • Poor functioning or incorrectly calibrated blood pump; this causes the blood pump tubing to be over compressed • Arterial pressure is too negative (pulling) pressure • Line is kinked **Chemical Causes:** • Failure of the machine conductivity metre • Dialysate mixed with chemicals (such as formaldehyde, bleach, chlorine, copper or nitrates) due to the water unit not working properly **Thermal:** • Overheating of the dialysate to greater than 41^{o}C	• Stop dialysis immediately • Do not return the blood • Call 911 for emergency medical help • You will need dialysis • Treatment of high blood potassium may be necessary

High blood pressure (hypertension)

Most people who begin dialysis can have high blood pressure.

High blood pressure may be caused by:

- Excess fluid in the body
- Kidney failure
- Suddenly stopping your blood pressure medicine
- Sleep apnea
- The effects of medicines such as non-steroidal anti-inflammatory medicines (such as ibuprofen), steroids, and cough syrups

Excess fluid gain will cause hypertension.

Signs and symptoms

- When your blood pressure is high you may not have any symptoms at all
- You may have dizziness, a headache, nausea or vomiting

If untreated, high blood pressure is dangerous.

It can lead to complications such as heart failure, heart attack and stroke.

Treating high blood pressure

The goal of treatment is to prevent damage to your heart and blood vessels.

1. Blood pressure medicines (anti-hypertensive medication)

Your doctor may prescribe one or more medicines to lower your blood pressure. For each of your medicines, make sure you know:

- The name of the medicine
- How much to take
- How often to take it
- What side effects to watch for
- If you need to avoid any foods when taking the medication

The Home Hemodialysis team will help you learn about your medicines.

2. Controlling sodium and fluid

As well as taking medicines, treating high blood pressure includes these important steps:

✓ **Eating less salt**

- Eating too much salt will increase your need to drink

✓ **Removing extra fluid by ultrafiltration**

- Ultrafiltration is the process of removing excess body fluid from the blood during hemodialysis
- You may need to dialyze more frequently to help manage excess fluid stored in the body

✓ **Maintaining your target weight**

- Try to keep your fluid intake between treatments to 1 to 1.5 litres a day

3. Lifestyle changes

In addition to other treatments, these changes in your daily life can help lower your blood pressure:

- Regular physical activity
- Maintaining a healthy weight
- Not smoking or quitting smoking

Anemia

Anemia means your blood has fewer red blood cells than normal.

- The hemoglobin in red blood cells carries oxygen to all the cells in your body. Oxygen helps the cells use energy from food.
- A low amount of red blood cells means less oxygen is carried to the cells, and less energy is available.
- Anemia can cause tiredness, shortness of breath and poor appetite.

Anemia is a common problem for people with kidney failure.

- Unhealthy kidneys do not make enough **erythropoietin** (EPO). This hormone helps your bone marrow make red blood cells.
- Anemia in hemodialysis patients is mainly caused by a lack of erythropoietin (EPO), but it may be caused by a lack of iron in the blood (iron deficiency).

Treating anemia

1. **Increasing iron**
   - If you have anemia from iron deficiency, your doctor may prescribe iron pills (supplements) and/or intravenous injections of iron

2. **Increasing the number of red blood cells**
   - If your anemia is caused by a lack of erythropoietin, your doctor may prescribe a medicine to increase the production of red blood cells
   - Your doctor may prescribe Eprex® (Epotin Alfa) or Aranesp® (Darbepoietin Alfa); these medicines are made to work like erythropoietin

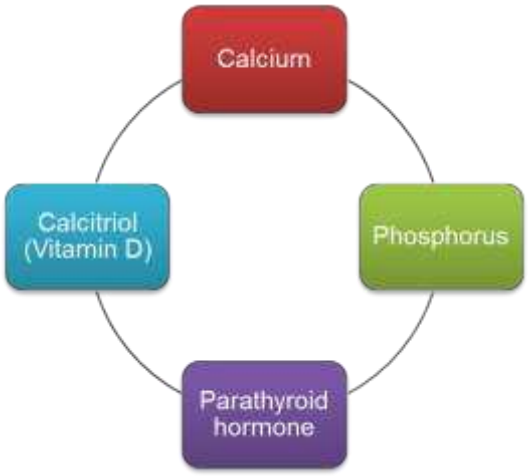
Information about Eprex® and Aranesp®	
Giving this medicine	• Eprex and Aranesp are supplied in pre-filled syringes • These medicines are injected into the blood line injection port during hemodialysis
Storing the medicine	• Store Eprex and Aranesp in the refrigerator
Blood tests	You will need these blood tests once a month: • Complete blood count (CBC) to check the level of your hemoglobin • Ferritin and Iron saturation to check the level of iron
Side effects	• High blood pressure

Renal Osteodystrophy

Healthy, strong bones depend on a balance of calcium, phosphorus, calcitriol and parathyroid hormone.

Kidney failure affects the levels of these substances in your blood.

If your levels are abnormal, over time you may develop a bone disease called **renal osteodystrophy**. It can take years before symptoms appear.



Understanding the balance for bone health	
Calcium	• A mineral that builds and strengthen bones • Calcium is found in many foods, especially milk and milk products
Phosphorus	• A mineral that your body needs, along with calcium, to make healthy bones • Phosphorus and calcium must be balanced in your body • Phosphorus is found in many foods, especially meats, poultry, milk and milk products • When your kidneys cannot remove extra phosphorus, it can build-up in your body • Too much phosphorus upsets the balance, causing calcium to become too low • Hemodialysis treatments help remove extra phosphorus from your blood
Parathyroid hormone	• When calcium is low, the parathyroid glands in your neck respond by releasing parathyroid hormone (PTH) • PTH pulls calcium from the bones into the blood • Too much PTH will remove too much calcium and weaken your bones

Calcitriol (Activated Vitamin D)	• Healthy kidney make an activated form of Vitamin D called calcitriol • Calcitriol helps bones absorb calcium from the blood • Calcitriol and PTH work together to keep a healthy balance of calcium going into and out of the bones • If your kidneys do not make enough calcitriol, your body cannot absorb calcium from foods and it will be removed from your bones

How is renal osteodystrophy diagnosed?

To check your bone health, you will have regular blood tests to measure calcium, phosphorus and PTH levels.

How can renal osteodystrophy be prevented or treated?

Healthy eating	• Eat foods with less phosphorous • The dietitian can help you plan a diet that gives you enough calcium, but is low in phosphorus
Taking phosphate binders	• Your doctor may prescribe a phosphate binder, such as calcium carbonate • For phosphate binders to work properly, they need to be **taken during your meal or snack** (as prescribed by your doctor) • Phosphate binders bind some of the phosphorus from the food in your stomach, so that it doesn't get absorbed in the blood
Dialysis treatments	• Follow your dialysis prescription carefully • This helps restore the balance of calcium and phosphorus in your blood

Medicines	Your doctor may prescribe: • Rocaltrol® or Calcitriol (activated vitamin D) • Longer and more frequent dialysis treatments, so that phosphorus is removed more efficiently • A medicine called Sensipar® (Cinacalcet) that blocks the release of PTH

What are the signs and symptoms of renal osteodystrophy?

There may be no signs or symptoms. However, as long as your blood has too much phosphorus, calcium is removed from your bones.

If this continues for years, your bones will become soft and weak, and may break easily. You may develop bone and joint pain. High phosphorus can cause severe itching.

Calcium and phosphorus may also build-up in the soft tissues of your body, hardening blood vessels and your heart.

Blood Collection

And

Centrifuge

Blood Collection

Blood tests and dialysis

Blood tests are an important way to tell if your hemodialysis treatments are working well. 'Blood work' refers to one or more blood tests.

Some blood tests need to be done before and after hemodialysis, to measure the amount of waste products removed during your treatment. This helps the Home Hemodialysis Team decide if your results are good or your treatments need to be adjusted.

PRE = Before hemodialysis

POST = After hemodialysis

During your training, you will learn how to:

- Take blood samples from the arterial blood line.
- Take blood samples directly from the AV fistula or CVC (collect blood samples before starting hemo dialysis or after disconnecting from the machine).
- Spin your blood before and after dialysis.

The Centrifuge or Spinner

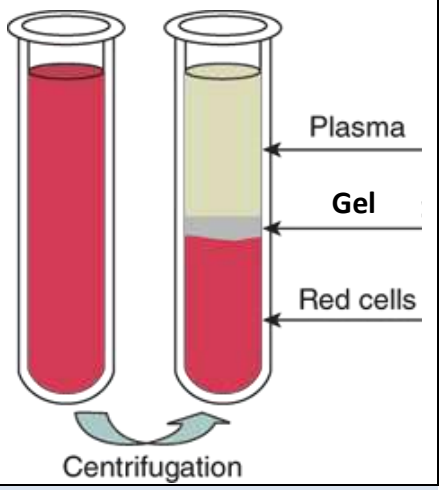
The centrifuge is a machine that spins tubes of blood at very high speeds. Blood samples are collected in vacutainer tubes. The blood sample that you collect will be placed in the centrifuge and spun down into 3 different parts or layers so that the laboratory may check for various blood tests. Centrifuging preserves the blood sample until you are able to deliver the tubes of blood to your local laboratory or home hemodialysis.

You will be given a **centrifuge** and blood collection tubes. Your dialysis nurse will tell you the type or colour of blood tubes need for each blood test.

What to do when collecting your blood.

Spin the blood to preserve the blood sample:

- Spin blood pre and post hemodialysis
- Spin all tubes containing **gel**
- Spin tubes for **15** minutes
- Remove the tubes from the centrifuge after spinning
- Place all the tubes of blood collected in the refrigerator or on an ice pack until you are able to deliver the sample to home hemodialysis or your local lab



Label all blood tubes with full name and date of birth.

Identify blood as pre or post.

Example:

PRE - Doe, Jane 01-Jan-1969

POST - Doe, Jane 01-Jan-1969

You can view your lab results:

Get your UHN personal health record on line – myUHN Patient Portal is a secure website that lets you view your results.

Obtain myUHN registration code from your nurse.

How to register?

1. In your internet browser, go to https://mychartprd.uhn.ca/MychartPRD/.
2. Click the **Sign Up Now** link in the New User box.
3. Enter your one-time myUHN Activation Code exactly as it appears. If you do not sign up before the expiration date, you must request a new code.
4. Read and accept the "Terms of Use" and follow the prompts to complete your sign up.
5. Sign in with your email and password at www.myuhn.ca to access your chart.
6. Alternatively, you can download the MyChart app on your device from Google Play or the App Store.
7. Search for mychart mobile app (EPIC).
8. Download the app to your device and follow the prompts to complete the login.
9. You will be able to view results from both UHN and your community lab.

If you use a local lab:

- You will given blood work requisitions for routine monthly bloodwork.
- You will bring the blood work requisitions with the blood vials to your community lab.
- Label vials with your personal identifiers (name, OHIP and date of birth). Additionally, label vials either **pre** or **post** dialysis.
- Place vials in biohazard bags; each with appropriate pre and post requisition.
- Call the Home Hemodialysis Unit and tell staff each time you send blood samples to your community lab.
- Email your dialysis log to the nursing team. You may also communicate the information by phone. Call the home hemodialysis unit and provide the following information:
    - Pre and post hemodialysis blood pressures
    - Pre and post weights
    - Frequency of dialysis sessions per week
    - Average hours of therapy per dialysis session

You will have a set of routine blood tests every month.

After sending monthly blood samples to the lab, call or email the Home Hemodialysis Unit so the staff can track your results.

Tell them:

- ✓ If you sent the blood samples to a local lab
- ✓ If you were "fasting" (no food or drink) when you collected the blood samples
- ✓ Email your dialysis log record to your dialysis nurse

Common blood tests

Test	What the test measures
CBC	• This test measures the amount of red and white blood cells that you have.
Electrolytes	• These tests measure the amount of electrolytes, such as sodium, potassium and bicarbonate.
PT and **INR** Prothrombin Time and International Normalized Ratio	• Measures how long it takes for your blood to form a clot. • Used to check how well anti-coagulant medicine is working.
Iron saturation and **Ferritin**	• Measures the amount of iron in your body. • Iron is needed to make red blood cells.
Intact PTH Parathyroid hormone test	• Measures the amount of parathyroid hormone (PTH). • PTH helps to control the amount of calcium and phosphorous in your body. This affects your bones and muscles.
Cytotoxic antibodies	• Checks for antibodies in the blood that could affect an upcoming kidney transplant.
Hemoglobin A1C	• Shows your average blood glucose levels over the last 2 to 3 months. • Used to check how well you are managing your diabetes.
Cholesterol	• Checks for fats in the blood. • High levels could increase your risk of heart disease or stroke.
TSH Thyroid stimulating hormone	• Measures the amount of thyroid stimulating hormone (TSH). • TSH affect metabolism, bone health, heart and lung function and muscle control.
Hepatitis screen	• Checks for antibodies that are made when you have a liver infection caused by a hepatitis virus.
HIV screen	• Checks for antibodies that are made when you have infections caused by the Human Immunodeficiency Virus (HIV).

Schedule for routine blood work

For the first 4 weeks of home hemodialysis, you will have blood work before (pre) and after (post) each hemodialysis treatment.

The chart below shows when other regular blood work is scheduled. The Home Hemodialysis team will tell you when you need other tests.

Blood work	Schedule
Every month	Pre and Post hemodialysis blood including Iron Saturation, Ferritin and Intact PTH
As directed by your Nephrologist	PT/INR
Every 3 months Note: For patients listed for transplant. If you are listed, you will be given a **TGLN number**.	Cytotoxic Antibodies or Panel-Reactive Antibody (PRA)
Every 3 months Note: For patients diagnosed with Diabetes.	Hemoglobin A_1C (HbA1C)
Every 6 months	Fasting Cholesterol o Note: Nothing to eat or drink for 12 to 14 hours before this blood work.
Every year	Hepatitis B and C Screening Test HIV Screening Test TSH

Taking blood samples from the arterial blood line – Pre and Post Hemodialysis

Pre-dialysis

Equipment

- Vacutainer needle
- Blood collection vials
- Antiseptic wipe
- Centrifuge

Procedure

1. Press Preparation Menu
2. Stop the pump, set flow to 150ml/min
3. Clamp arterial blood line (2 red clamps)
4. Clamp IV line (roller clamp and white clamp on arterial injection port)
5. Open white clamp on PRIMING bag
6. Connect arterial line to arterial access
7. Open access clamp, open red arterial blood line clamp, start the blood pump at 150ml/min
8. When blood is detected, pump will stop
9. Message: Blood detected – **Do Not Press Start**
10. Clean **RED Arterial sample port** with antiseptic wipe
11. Pierce vacutainer needle into RED specimen port
12. Pierce blood collection vials into vacutainer, collect blood samples, set aside, continue with connection of venous blood line
13. Proceed with patient connection and start the dialysis treatment
14. Label the samples:
    - **Pre Dialysis**
    - **Your full Name**
    - **OHIP**
    - **Date of Birth**
15. Centrifuge the vials containing gel for 15 minutes
16. Place all vials in refrigerator or on an ice pack until you are able to deliver the blood specimens to the lab or home dialysis unit

Post-dialysis

Equipment

- Vacutainer needle
- Blood collection vials
- Antiseptic wipe
- Centrifuge

Procedure

1. Message – T**reatment goal achieved**
2. Message – TREATMENT CONTINUE **or** REINFUSION START, do not select any option at this time
3. Mute alarms
4. Lower the pump speed to **50** to **100ml/min**
5. Clean **RED Arterial sample port** with antiseptic wipe
6. Pierce vacutainer needle into **RED** sample port
7. Pierce blood collection vials into vacutainer, collect blood samples, set aside
8. PRESS **REINFUSION-START**
9. Proceed with reinfusion protocol
10. Label the samples:
    - **Post Dialysis**
    - **Your full Name**
    - **OHIP**
    - **Date of Birth**
11. Centrifuge the vials containing gel for 15 minutes
12. Place all vials in refrigerator or on an ice pack until you are able to deliver the blood specimens to lab or home dialysis unit

Taking blood samples from CVC – Pre and Post Hemodialysis

Pre-dialysis	Post-dialysis
Equipment • Vacutainer needle – Luer-Lok Access Device • Discard-Vial – BD Vacutainer Vial – No Additive • Blood collection vials • Antiseptic wipes • Centrifuge **Procedure** 1. Wash hands 2. Proceed with cleaning one of the CVC ports as per protocol 3. Attach 10m syringe to the clean CVC port 4. Open clamp 5. Aspirate 3 – 5ml of blood 6. Close clamp 7. Attach the vacutainer to CVC port 8. Insert the discard-vial into vacutainer 9. Open port clamp 10. Allow discard-vial to fill 11. Remove discard-vial 12. Insert blood vial(s), collect sample(s) 13. Close port clamp 14. Remove vacutainer 15. Attach 10my syringe with normal saline to port and proceed with protocol for accessing CVC 16. Label the samples: • **Pre Dialysis** • **Your full Name** • **OHIP** • **Date of Birth** 17. Centrifuge the vials containing gel for 15 minutes 18. Place all vials in refrigerator or on an ice pack until you are able to deliver the blood specimens to the lab or home dialysis unit	**Equipment** • Vacutainer needle – Luer-Lok Access Device • Discard-Vial – BD Vacutainer Vial – No Additive • Blood collection vials • Antiseptic wipes • Centrifuge **Procedure** 1. Hand sanitize 2. Message – **Treatment goal achieved** 3. Proceed with reinfusion protocol 4. Cleanse port of CVC with antiseptic wipe as per protocol 5. Attach 10m syringe to the clean CVC port 6. Open clamp 7. Aspirate 3 – 5ml of blood 8. Close clamp 9. Attach the vacutainer to the CVC port 10. Insert the discard-vial into vacutainer 11. Open port clamp 12. Allow discard-vial to fill 13. Remove discard-vial 14. Insert blood vial(s), collect sample(s) 15. Close port clamp 16. Remove vacutainer 17. Attach 10my syringe with normal saline to port and proceed with protocol to lock the CVC • **Post Dialysis** • **Your full Name** • **OHIP** • **Date of Birth** 18. Centrifuge the vials containing gel for 15 minutes 19. Place all vials in refrigerator or on an ice pack until you are able to deliver the blood specimens to lab or home dialysis unit

Taking blood samples from AVF or AVG – Pre and Post Hemodialysis

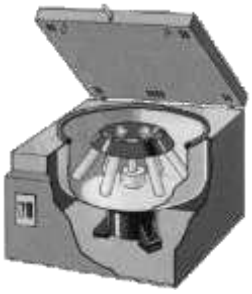
Pre-dialysis	Post-dialysis

Equipment
• Vacutainer needle – Luer-Lok Access Device
• Blood collection vials
• Centrifuge
Procedure
1. Wash hands
2. Cannulate arterial needle as per protocol
  • Do not flush the needle
3. Clamp arterial needle
  • Note clamping may not be necessary, if needle has a hemostatic valve
4. Attach the vacutainer to the arterial needle
5. Open arterial needle clamp
6. Insert blood vial(s), collect sample(s)
7. Clamp arterial needle
8. Remove vacutainer
9. Attach 10my syringe with normal saline
10. Flush arterial needle
11. Clamp arterial needle
12. Proceed to cannulate the venous needle as per protocol
13. Label the samples:
  • **Pre Dialysis**
  • **Your full Name**
  • **OHIP**
  • **Date of Birth**
14. Centrifuge the vials containing gel for 15 minutes
15. Place all vials in refrigerator or on an ice pack until you are able to deliver the blood specimens to the lab or home dialysis unit
	Equipment
	• Vacutainer needle – Luer-Lok Access Device
	• Discard-Vial – BD Vacutainer Vial – No Additive
	• Blood collection vials
	• Centrifuge
	Procedure
	1. Hand sanitize
	2. Message – **Treatment goal achieved**
	3. Reinfuse blood as per protocol
	4. Clamp arterial needle
	  • Note clamping may not be necessary, if needle has a hemostatic valve
	5. Attach the vacutainer to the arterial needle
	6. Insert the discard-vial into vacutainer
	7. Open arterial needle
	8. Allow discard-vial to fill
	9. Clamp arterial needle
	10. Remove discard-vial
	11. Insert blood vial(s), collect sample(s)
	12. Clamp arterial needle
	13. Remove vacutainer
	14. Attach 10my syringe with normal saline
	15. Flush arterial needle
	16. Clamp arterial needle
	17. Proceed to remove the arterial and venous needles as per protocol
	18. Label the samples:
	  • **Post Dialysis**
	  • **Your full Name**
	  • **OHIP**
	  • **Date of Birth**
	19. Centrifuge the vials containing gel for 15 minutes
	20. Place all vials in refrigerator or on an ice pack until you are able to deliver the blood specimens to lab or home dialysis unit

Centrifuge

How to use the centrifuge

1. Starting the running time



- Check the centrifuge is plugged into power.
- Turn on the power switch located at the back of the centrifuge.
- Push the UNLOCK BUTTON to open the lid.

2. Load blood tubes

- Always spin 2, 4 or 6 tubes. Do not spin 1 or 5 tubes.
- Load tubes of about equal weight. Load tubes opposite each other, so they will be balanced while spinning.
- Close the cover.

3. The running time is set for 15 minutes

- Press the start button.
- The centrifuge will start spinning.
- The display window show time counting down.

4. Stop running

- When the running time is out, the centrifuge will decelerate to stop.
- Allow the rotor to stop.
- The centrifuge will beep or the LED indicators will blink.

5. Unload tubes carefully

- Check the rotor has stopped. Open the lid.
- Remove the vials.
- Label the vials pre or post dialysis:
  - **Pre and Post Dialysis**
  - **Your full Name**
  - **OHIP**
  - **Date of Birth**
- Place vials in the refrigerator or on an ice pack.
- Turn OFF the power switch located at the back of the centrifuge.

Safety tips

Keep the centrifuge balanced

- Spin an even number of tubes, of equal weight, set evenly around the centrifuge.

Keep the cover closed

- Never open the cover while the centrifuge is spinning. This will shut off the power.

Cleaning the centrifuge

- Before cleaning, unplug the unit from the power source.
- Wipe shields, rotor and outside of the centrifuge with warm water and mild detergent.

Healthy Eating

A plan for healthy eating

The Registered Dietitian on the Home Hemodialysis team will help you make a plan for healthy eating. To ensure the plan meets your needs, you and the dietitian will need to discuss:

- Your health and any conditions such as high blood pressure or diabetes.
- Your hemodialysis treatments and lab results.
- Your appetite and food preferences.
- How food is bought and prepared in your home.

Nutrition

When your kidneys are not working well, they are unable to remove the wastes that are made by your body. These wastes can build up in your blood and make you feel sick. Dialysis helps to remove the wastes that build up inside you.

The type of diet you should follow depends on how much dialysis you get each week. You also may need to follow a special diet for other reasons such as diabetes or other health problems.

Hemodialysis can only replace part of what your kidneys do. Making good food choices will help keep you healthy.

You may need to eat less or more foods that have:

- Sodium
- Potassium
- Phosphorous
- Fluid

Phosphorus and potassium are minerals in your body that we measure in your blood. When you dialyze more often, your levels may become too low. If you eat too much or have less dialysis, your levels may be too high. Your blood levels help to decide what kind of diet you should follow.

If there is more than one day until your next dialysis session, you may need to be more careful with your food choices. Refer to the food lists in the manual for tips on what foods to eat. Ask your dietitian if you are not sure what kind of diet you should follow.

Protein

Getting enough protein daily is essential for your overall health.

Your body uses protein for many reasons:

- Help build and repair body tissues
- Provides energy
- Fight infection
- Heal wounds

Choose high quality protein, such as:

- Lean meat
- Fish
- Chicken
- Egg whites
- Milk and Milk products

Sodium

Salt in your diet is a major source of sodium. Too much salt causes your body to hold on to fluid. Beware of "hidden" sodium which may be in prepared (boxed or canned) foods. Read labels to help you make good choices.

As sodium and fluid builds up in your body it causes:

- Swelling (edema)
- Blood pressure problems
- Problems breathing
- Extra work for the heart

Tips to reduce salt:

- Use less salt when making meals
- Eat less high salt foods
- Eat more fresh foods
- Eat at home more often

Fluid

Fluid includes more than just what you drink. Fluid is 'hidden' in some foods you eat, such as soups, ice cream, fruits. Keep track of the fluid you eat and drink each day.

Potassium

Potassium is a mineral which helps your nerves and muscles work well. A normal level of potassium in the blood keeps your heart and muscles working well.

If you have too much or too little potassium in your blood it can cause:

- Nausea
- Weakness
- Twitching or tingling
- Changes in your heart beat or heart attack
- Death

Phosphorus (Phosphate) and Calcium

Phosphorus and calcium are minerals that help build strong bones. High phosphate and calcium levels may cause calcium to build up in your blood vessels, lungs, eyes, and heart. You need to keep calcium and phosphate at the right level.

Your doctor may prescribe a phosphate binder to take with meals and snacks. This helps to take out some of the phosphorus in your food. You also may need to take a phosphorus or calcium supplement if your levels are too low.

Vitamin and Mineral Supplements

People on dialysis lose some vitamin and minerals during dialysis. You also get vitamins and minerals from the food you eat. Sometimes they cannot be replaced by diet. All dialysis patients should take a special multi-vitamin such as Replavite®.

Some vitamins and minerals build up in your body when your kidneys are not working. Do not take any vitamin, mineral or herbal supplements without discussing it with your doctor or renal pharmacist.

If you have questions about your diet, contact your dietitian.

Tips for eating a low sodium diet

Salt is also known as sodium chloride.
Sodium is a mineral that impacts your health.

To help lower salt in your diet:

1. Eat a variety of foods each day for a balanced diet.
2. Buy fresh foods when you shop because they are often lower in sodium. For example: buy fresh meats, poultry (i.e. chicken or turkey), fish, fresh or frozen fruits and vegetables.
3. Do not add salt to your food during cooking or at the table. Use herbs and spices to make your food taste better.
4. Do not drink water treated by a water softener. If you have a water softener, it should not supply your drinking water.
5. Avoid salty, ready-to-eat foods, snacks, and fast foods. These foods have a lot of added salt.
6. Read the labels on packaged foods to find foods lower in sodium. Note: Food labels may use the symbol “Na” instead of the word “sodium.
7. Do not use a salt substitute. Some salt substitutes are known to have potassium (K+) in them, which may be harmful.

Take the salt shaker off your table. Do not add salt to your food.

Salt

- ✓ Try a blend of herbs and spices. Use a spice mix such as "Mrs. Dash™," or McCormick's "No Salt Added™."

- ✓ Replace garlic salt, onion salt and celery salt with the fresh product or powder.

  - ❑ Do not use: sea salt, salt substitutes such as "No Salt™," "Half Salt™," "Nu-Salt™," MSG, brine.

  - ❑ Avoid any foods that have been pickled, processed, cured, smoked, or salted such as:

    - Bacon, corned beef, salami, smoked meat, sausage, ham, hot dogs, bologna and other luncheon meats, sardines, herring, anchovies, salt fish.
    - If kosher meats are used, soak them in water and do not use kosher salt when making meals.
    - Processed cheese, cheese slices, cheese spreads.
    - Dried soup mixes, canned soups, restaurant soup and bouillon cubes, powders, and liquids.
    - Pickles, sauerkraut, olives, vegetable juice.
    - Salted snack food (examples: salted crackers, pretzels, potato chips)
    - Convenience items (examples: TV dinners, prepackaged noodles, rice and casserole mixes such as Hamburger Helper)
    - Ketchup, prepared mustard, relish, chili sauce, Worcestershire sauce, Asian sauces (examples: soya, hoisin, black bean), packaged gravies and bases.

Making your food taste great without salt!

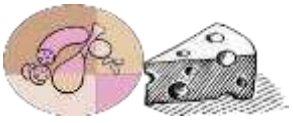
Try one of these spices instead of salt

- All fresh herbs
- Allspice
- Basil
- Bay leaves
- Black pepper
- Cayenne pepper
- Celery powder
- Chili powder
- Chives
- Cinnamon
- Cloves
- Cocoa powder
- Cumin
- Curry
- Dill
- Dry mustard
- Flavoured extracts (vanilla or almond)
- Garlic powder
- Ginger
- Green peppers
- Lemongrass
- Lemon juice
- Marjoram
- Mint Nutmeg
- Onion powder
- Oregano
- Paprika
- Pimento
- Red pepper
- Rosemary
- Saffron
- Sage
- Savory
- Thyme
- Vinegar

Tips for eating a low potassium diet

✓ Eat foods from the ‘low’ list.

❑ Avoid foods from the ‘high’ list.

Milk products 	• Have only 1 to 2 servings “milk and dairy products” each day. • 1 serving = ½ cup
Fruits and vegetables 	• Have only 6 servings each day of juices, fruits and vegetables. • Look at the list for serving sizes for each food. • Measure vegetables raw before cooking. • Use 125 ml (½ cup) serving if there is no serving size listed. • Double boil vegetables to remove extra potassium.
Grain products 	• If you have diabetes, speak to your dietitian about the grain products you can eat.
Protein foods 	• Your dietitian will talk to you about how much protein you should eat. • Tell your dietitian if you do not eat meat, chicken, turkey or fish.

Contact your dietitian if you have questions about your diet.

Did you know?

- The process of leaching and double boiling will help pull potassium out of SOME high potassium vegetables.
- It is important to remember that these methods will not pull all of the potassium out of the vegetable.
- Ask your dietitian about the amount of leached vegetables that you can include in your diet.

How to double-boil potatoes:

1. Peel, cut into small pieces, cover with a large amount of cold water.
2. Bring slowly to a boil; boil 10 minutes; throw out water.
3. Cover with more cold water, bring slowly to boil, cook until done.
4. Throw out water.

To leach potatoes, sweet potatoes, carrots, beets and rutabagas:

1. Peel and place the vegetable in cold water so they won't darken.
2. Slice vegetable 1/8 inch thick.
3. Rinse in warm water for a few seconds.
4. Soak for a minimum of 2 hours in warm water. Use 10 times the amount of water to the amount of vegetables. If soaking longer, change the water every 4 hours.
5. Rinse under warm water again for a few seconds.
6. Cook vegetable with 5 times the amount of water to the amount of vegetable.

To leach squash, cauliflower and frozen greens

1. Allow frozen vegetable to thaw at room temperature and drain.
2. Rinse fresh or frozen vegetables under warm water for a few seconds.
3. Soak for a minimum of 2 hours in warm water. Use 10 times the amount of water to the amount of vegetables. If soaking longer, change the water every 4 hours.
4. Rinse under warm water again for a few seconds.
5. Cook the usual way, but with 5 times the amount of water to the amount of vegetable.

Adapted from: www.davita.com

References:

- Bowes & Church Food Values of Portions Commonly Used, 17th Ed., Pennington,JA, Lippincott, 1998.
- Diet Guide for Patients with Kidney Disease, Renal Interest Group-Kansas City Dietetic Association, 1990

Food lists for potassium

Grain Products

	✓ Low potassium		⚠ High potassium	
Breads	bagel, plain bread sticks (3) egg bread English muffin French/Vienna hamburger bun	hot dog bun Italian Kaiser Bun White bread or roll Pita (white)	cornbread cracked wheat English muffin (whole wheat) oatmeal bread pumpernickel	raisin bread rye bread whole wheat bread or roll pita (whole wheat)
Cereals (cold)	Alphabits Apple Jacks Captain Crunch Corn Bran* (1/2 cup) Corn Flakes (all types) Corn Pops Crispix Froot Loops Frosted Flakes	Honey Nut Chex Kix Puffed Rice Rice Chex Rice Krispies (all types) Special K Team Trix	100% Bran All Bran Bran Buds Bran Flakes Cheerios (all types) Fibre One Frosted Mini Wheats Fruit & Fibre Golden Grahams Granola Grape Nuts (all types) Honeycomb	Just Right Life Cereal Lucky Charms Muesli Muffets Puffed Wheat Raisin Bran Shredded Wheat Shreddies Sugar Smacks Weetabix Wheat Chex Wheaties
Cereals (hot)	corn grits cornmeal cream of rice	cream of wheat Farina	oatmeal Maltex Red River	
Crackers	cream crackers Gerber Zwieback graham crackers matzo cracker Melba toast (white)	rice cake (white) soda crackers taco/tortilla shell tortilla chips (10) water crackers	Any crackers made from whole wheat or grains, or dark rye.	
Grains	egg noodles rice noodles soba noodles	white pasta white rice	brown rice wild rice whole wheat pasta	

Grain products, continued

	✓ Low potassium		⚠ High potassium	
Desserts and baked goods	angel food cake Arrowroot blueberry muffin chocolate chip cookies oatmeal cookies pound cake	shortbread Social Teas (4) sponge cake sugar cookies Vanilla Wafers white cake yellow cake	danish doughnuts date square fruitcake gingerbread Any baked goods made from whole wheat or grains, carrot or chocolate.	gingersnap granola bar peanut butter cookie
Other	couscous (1/3 cup) white flour		barley buckwheat bulgur nuts or seeds, any type	pancake or waffle mix wheat germ whole wheat flour

Fruits

✓ Low potassium		⚠ High potassium	
apple (1)	lemon (1)	apricots	kiwi
apple rings (5)	lime (2)	banana	nectarine
applesauce	loganberries	breadfruit	orange
blackberries	lychees (10)	cantaloupe	papaya
blueberries	mandarin orange	coconut	passionfruit
boysenberries	mango (½ max)	dates	pomegranate
canned fruit (all types)	peach (1)	dried fruit, all types	pomelo (pummelo)
casaba melon	pear (1)	durian	prickly pear
cherries (up to10)	persimmon (2)	elderberries	prunes
clementine (1)	pineapple	figs	sapote
crabapple	plum (1)	guava	soursop
cranberries	raspberries	honeydew melon	**STARFRUIT***
currants	rhubarb	jackfruit, fresh	tamarind
fruit cocktail	sapodilla (½ max)		
gooseberries	strawberries		
GRAPEFRUIT* (½ max)	tangelo (1)		
grapes (20)	tangerine (1)		
kumquats (5)	watermelon		

* Warnings about fruit

Grapefruit can interfere with certain medications.

- Ask your doctor or dietitian if you should avoid grapefruit.

Star fruit (carambola) is harmful to people with kidney problems. You should not eat starfruit.

- Starfruit contains oxalic acid and certain toxins that build up in your body.
- Star fruit may cause a mild to severe toxic reaction, including hiccups, vomiting, asthenia, mental confusion, seizures, coma and death.

Vegetables

✓ Low potassium		⚠ High potassium	
alfalfa sprouts	green beans	acorn squash	kohlrabi
asparagus (6)	green peas	artichoke	lentils
bamboo shoots, canned	kale	avocado	lotus root
bean sprouts	leeks	baked beans	parsnips
beet greens, raw	lettuce (all types)	bamboo shoots, fresh	plantain
beets, canned	mushrooms, white	beans (adzuki, black, kidney, lima, mung, navy, pinto, and white)	portabella mushroom
burdock root	mustard greens		
broccoli	okra	**POTATO ****	
cabbage	onion (all types)	potato chips	
carrots, baby (8)	peppers	beet greens, cooked	pumpkin
cauliflower	radish	beets, fresh/boiled	rapini, cooked
celery	sauerkraut	bok choy	rutabaga
chayote	shitake mushrooms	breadfruit	soybeans
collard or collard greens	snow peas (10)	broadbeans	spinach, cooked
corn	spaghetti squash	brussel sprouts	split peas
cress, raw	spinach, raw	butternut squash	stewed tomato
cucumber	swiss chard, raw	carrot, regular	succotash
eggplant	turnip or turnip greens	cassava	sui choy
endive (1)	watercress	celeriac	sweet potato
escarole	wax (yellow) beans	chickpeas	swiss chard, cooked
fennel	zucchini	chicory greens	taro
fungi, dried		cress, cooked	tempeh
		dandelion greens	tofu
		dock or sorrel	tomato
		dried mushrooms	tomato paste
		fiddleheads	tomato sauce
		french fries	water chestnuts
		green banana	yam
		****Double-boil potatoes to remove potassium**	

Fruit and vegetable juices

1 serving juice = ½ cup (125 ml)

✓ Low potassium		⚠ High potassium	
apple juice	lime juice	carrot juice	pomegranate juice
apricot **nectar**	papaya **nectar**	coconut juice or water	prune juice
blackberry juice	peach **nectar**	grapefruit juice	tangerine juice
cranberry juice	pear **nectar**	guava juice	tomato juice
grape juice	pineapple juice	orange juice	V8 juice, any type
guava **nectar**	Ribena juice	passionfruit juice	vegetable juice
lemon juice			

Additional items

✓ Low potassium	⚠ High potassium
• herbs and spices, or herb mix (example: Mrs. Dash) • butter, margarine, oil, mayonnaise, non-dairy creamer • sugar, sugar substitute, honey, jam, jelly, corn or pancake syrup • regular or decaf coffee and tea • lemonade, Kool-Aid, fruit punch, drink crystals • soft drinks (non-colas) Limit dairy (milk, yogurt, pudding, ice cream) to less than 1 cup daily to reduce potassium in your diet.	• salt substitutes (examples: No Salt, Nu Salt) • brown sugar, molasses, maple sugar or syrup • specialty coffees (cappuccino, espresso, turkish) • colas • cocoa (Ovaltine, Postum) • Chocolate (all types) • Dairy products – milk, yogurt, pudding, ice cream.

Protein

These foods are recommended:

- Lean meat (beef, pork, lamb, rabbit, venison)
- Poultry (chicken or turkey)
- Ricotta or cottage cheese, hard cheese
- Fresh or frozen fish, canned tuna or salmon (bones removed)

These foods can be eaten in limited amounts:

- Whole eggs - no more than 2 or 3 a week.
- Low-fat, natural cheese - no more than 3 ounces (90g) a week if your phosphate level is high.
    - Examples of natural cheese are brick, cheddar, colby, mozzarella, emmenthal, farmers, cheshire, and lappi.

These foods are not recommended:

- Meat that is marbled or streaked with fat
- Chicken wings
- Animal livers or other organ meats
- Processed, smoked, pickled or salted meats or fish. Examples: ham, smoked meat, corned beef, pickled herring, salt cod
- Full-fat cheese, processed cheese, salt-free cheese

Examples of protein portions

Quantity	Protein food and size
1 ounce (28 grams)	• 1 large egg **or** 2 large egg whites • 1 chicken drumstick **or** 1 small loin lamb chop **or** 1 slice cooked meat (4” x 2” x 1/4") • 1 inch cube (30g) low fat natural cheese • ¼ cup (50 ml) cottage cheese, **or** ricotta cheese, **or** grated cheese • 4 medium-size shrimp • ¼ cup (50 ml) cooked ground meat • ½ cup (125 ml) cooked dried beans, split peas or lentils * • ¼ cup (50 ml) nuts, seeds * • 2 tbsp (30 ml) peanut butter
2 ounces (56 grams)	• ½ cup (125 ml) canned fish • 1 chicken thigh **or** 1 small pork chop • 100 ml (100g) tofu
3 ounces (84 grams)	• 1 medium chicken leg **or** 1 medium chicken breast (4 oz raw) • 1 hamburger patty • 1 piece cooked fish (3” x 2” x 1”) • 1 piece of meat about the size of a deck of cards

*** These protein foods are high in potassium and phosphorus.**

A 3-ounce portion of meat

Is about the size of a deck of cards

Food lists for phosphorus

Grain Products

Serving size is ½ cup (125 ml) unless otherwise noted

	✓ Low phosphorus		⚠ High phosphorus	
Breads	plain bagels brioche challah cracked wheat croissant crumpets English muffin French	Italian kaiser roll matzoh raisin bread taco shell white bread white pita	whole grain bran cornbread dark rye multigrain	pumpernickel whole wheat scone tortilla
Cereals	Applejacks Captain Crunch Corn Bran Corn Chex Corn Flakes cornmeal cream of rice cream of wheat Crispix	Froot Loops grits Honeycomb puffed rice Rice Chex rice flakes Rice Krispies Trix	whole grain Alpha-bits bran bulger Cheerios Granola Grape Nuts Life	Mueslix oatmeal puffed wheat Raisin Bran Shredded Wheat Special K Wheetabix
Crackers	Melba toast rusks unsalted soda crackers made with white flour		rye and whole grain crackers (example: Triscuit)	
Grains	white pasta white rice		brown rice barley buckwheat	bulgur wild rice
Desserts and baked goods	angel food cake arrowroot fruit pies pound cake puff pastry Tea biscuits, cake, muffins, pancakes and waffles made with Baking Powder Substitute.	shortbread Social Tea sponge cake yeast donuts	Pies or pastries made with nuts, chocolate, cream or custard, and cake donuts. All store-bought cookies except those listed on the LOW side. Tea biscuits, cake, muffins, pancakes and waffles made with Baking Powder.	

How to make Baking Powder Substitute:

- Mix ½ tsp of cream of tartar with ¼ tsp baking soda.
- Use this mixture to replace 1 tsp baking powder in any recipe.

Milk and dairy products

When substituting milk for another dairy product, keep in mind that portion sizes may differ due to phosphorus content.

✓ Low phosphorus	⚠ High phosphorus
Some non-dairy creamers • Coffee Rich Unenriched rice milk • Rice Dream Original Almond milk • Almond Breeze Original Limit milk, yogurt, ice cream, pudding to less than 1 cup daily for less phosphorus in the diet.	Milk, chocolate milk Processed cheese: • single slices • Velveeta • cheese spread • macaroni & cheese dinner Cream, custard, ice cream, and anything made with milk such as pudding, cream soup, and yogurt.

Fish, poultry, meat, eggs

✓ Low phosphorus	⚠ High phosphorus
• meat, fish, and poultry (such as chicken and turkey) • low sodium cold cuts (roast beef, turkey, chicken) • natural head cheese • heart, spleen, lungs • shrimp, lobster, crab • tofu • cottage cheese • eggs (egg whites) Limit cheese to 28 gram (1 oz) times per week on a low phosphorus diet.	• caviar, fish roe • oyster, clams, mussels, scallops • bones from canned sardines or salmon • liver, brain, kidney, pancreas • all dried beans, peas and lentils (fresh or canned) • nuts, nut butter, seeds • cheese

Fruits and vegetables

✓ Low phosphorus	⚠ High phosphorus
• Most fruits and vegetables. • Corn, raw mushrooms, green peas and potato/French fries must be limited to ½ cup no more than 3 times per week.	
If dietary potassium needs to be restricted, refer to your potassium list for the allowed fruits and vegetables.	

Additional items

✓ Low phosphorus	⚠ High phosphorus	
Some soft drinks (ginger ale, Sprite, 7-Up)	Postum	Horlicks
	Ovaltine	chocolate
	malted milk	cola products
	Myelo	beer

Beware of hidden phosphate. Foods may have phosphate additives.

These words on food labels mean phosphate has been added.

Phosphoric Acid	Sodium Polyphosphate
Pyrophosphate	Sodium Tripolyphosphate
Polyphosphate	Tricalcium Phosphate
Hexametaphosphate	Trisodium Phosphate
Dicalcium Phosphate	Sodium Phosphate
Monocalcium Phosphate	Tetrasodium Phosphate
Aluminum Phosphate	

Fluids

Use up to_____millilitres (ml) of fluid per day 1 cup = 8 fluid ounces = 250 mL

Fluid includes anything that is liquid. Some examples of fluid are:

- Water
- Tea and coffee
- Milk, Cream
- Juices and Fruit Drinks
- Soda Pop
- Soup
- Jello
- Ice cream, Sherbet
- Popsicle
- Ice Cube
- Alcoholic drinks
- Liquid Nutrition Supplements (Ensure®, Boost®)

Helpful tip:

- With a measuring cup, measure the amount of fluid held by your drinking glasses, tea or coffee, and soup bowl.
- Knowing how much liquid they hold will help you to plan how much fluid you can drink for the day.

Tips to help control how much fluid you drink and your thirst

How to limit the fluid you drink:

- ❑ Plan ahead to spread out the fluid you drink over the day (i.e. skip tea at lunch to save fluid for punch at a party).
- ❑ If possible, swallow your pills with soft food, like applesauce. Save your fluid for something you enjoy. Check with your doctor or pharmacist about which pills can be taken with meals.
- ❑ Use a small cup and glass. Learn to sip fluids slowly.
- ❑ Measure out part of your fluid each day and store it in a cup in the freezer. Most people find ice more pleasing than the same amount of water, since it stays in the mouth longer.
- ❑ Be sure you know how much fluid is in one ice cube. Try melting one cube and measure how much fluid it contains.
- ❑ Freeze some of your fruit juice or soda pop in an ice cube tray. Use the cubes as part of your daily fluid amount.
- ❑ Drink your liquid very hot or cold. This may help with thirst.
- ❑ Post some paper on the fridge or have paper where you sit. Measure what you drink and mark down the amount on the paper.

How to feel less thirsty:

- ❑ Brush teeth more often or rinse your mouth with water, but do not swallow it. (Be sure not to over-brush!)
- ❑ Keep your mouth cool and fresh by rinsing with cold mouthwash. Avoid mouthwash with alcohol that can dry out your mouth.
- ❑ Lemon wedges, hard sour candies, chewing gum, breath-mints or breath spray may help to keep your mouth from drying out.
- ❑ Add lemon or lime to your water or ice. The sour taste will help you feel less thirsty.
- ❑ Eat fruits and vegetables ice cold. Frozen grapes or strawberries are very nice.
- ❑ Try licking a lemon or a lime.
- ❑ Use a humidifier to moisten the air. This will help your mouth feel less dry.

Living with Dialysis

And

Travel

Living with dialysis

Getting supplies for home hemodialysis

Supplies that you are responsible for:

- Bed for nocturnal dialysis
- Garbage container and bags
- Cleaning supply
- Thermometer
- Flashlight
- Table and shelving as necessary
- Floor covering to protect against water damage

Supplies provided by the Home Hemodialysis Unit:

- Blood tubes
- Blood work requisitions
- Line clamps (bloodline clamps)
- Tourniquet
- Dialysis logs
- Medicine: Iron and antibiotics
- Blood leak detector alarm

Supplies provided by the Home Hemodialysis Technologists:

- Dialysis machine
- R/O unit or D.I. Tanks
- Plastic tray
- Centrifuge
- Micron wrench
- Scale
- Funnel
- Water detectors

Getting your home ready

- The Technologist will arrange to assess your home and install the equipment.
- We will ask you to sign a contract allowing us to make changes to the electricity and plumbing in your home.
- Please review your Home Insurance policy to make sure you have coverage for water damage.

Tax information

As a home dialysis patient, you can deduct medical expenses related to your treatment.

Remember to keep all your receipts!

Disability Tax Credit

- ❑ A non-refundable tax credit that you can claim for medical and related expenses.
- ❑ For more information, go to the Canada Revenue Agency - www.cra-arc.gc.ca or speak with your Social Worker.

Medical Expense

- ❑ Eligible medical expenses can be claimed on tax returns.
- ❑ For more information, go to the Canada Revenue Agency - www.cra-arc.gc.ca or speak with your Social Worker.

Utility Grant

- ❑ The Ontario Renal Network (ORN) will provide you a small grant to offset utility costs. The grant is calculated to reflect the usage of water and electricity base on the equipment you have in the home and your dialysis schedule. A copy of your bills will be submitted to ORN at the end of your training for the next cycle of reimbursement. Cheques payable to the patient will be issued twice each year – April and October.

PLANNING A VACATION

When you are comfortable with home hemodialysis, you may be ready to plan a vacation. Whether you travel in Ontario or to another country, there are dialysis centres where you can receive treatment. This will need careful planning, so it is best to start early.

The Holiday Dialysis Unit

If you are planning to travel, contact the Holiday Dialysis Unit a few months ahead of time to begin making the arrangements.

The Holiday Dialysis Unit will send you a **travel package**, requesting information about your travel plans and medical history.

The travel package – part one

The first part of the travel package asks for information about:

- Travel dates
- Your dialysis schedule
- Method of payment
- Contact information
- Where you will be staying
- Next of kin

You are responsible for completing the first part of the travel package and sending it to the Holiday Dialysis Unit.

The travel package – part two

The second part of the travel package asks for information about your medical history. This includes:

- Doctor's orders for dialysis
- Doctor's progress notes and summary
- Most recent history and physical exam
- List of health concerns
- Vascular Access history
- Current list of medicines
- Hemodialysis logs
- Chest x-ray within the last year or TB test within the last 30 to 90 days (depending on the centre)
- Electrocardiogram (ECG)
- Results of blood tests within 2 to 3 weeks of travel (depending on the centre):
  - Hepatitis antibody screening (HbsAg)
  - Hepatitis antigen screening (HbsAb)
  - Hepatitis C screening
  - MRSA
  - VRE
- Copies of all insurance cards if traveling in Canada
- Proof of vaccinations

The staff of the Home Hemodialysis Unit will arrange to send these documents to the Holiday Dialysis Unit.

The travel package can take up to 1 month to organize. The time it takes will depend on whether the information is available in your medical record. You may need to have blood tests or other tests done to complete the package. When it is ready, the Home Hemodialysis staff will send it to the Holiday Dialysis Unit.

GETTING REIMBURSED FOR DIALYSIS EXPENSES

The Ontario Renal Network, a division of Ontario Health, will be reimbursing claims for out-of-country hemodialysis. Go to the Ontario Renal Network website www.ontariorenalnetwork.ca:

- ❑ Select Kidney Care Resources
- ❑ Select Dialysis
- ❑ Select out of country hemodialysis program Or enter -

  https://www.ontariorenalnetwork.ca/en/kidney-care-resources/living-with-chronic-kidney-disease/about-dialysis/out-of-country-reimbursement

You are eligible for reimbursement if you meet all of the conditions below:

- You live in Ontario, and have a valid OHIP card.
- You have received hemodialysis treatments while outside of the country.
- The cost of your treatment was not covered by insurance.
- You submit your Out-of-Country Hemodialysis Claim Submission Form and original receipts within 1 year of treatment.

Simply follow these steps to be reimbursed for the cost each hemodialysis treatment you received outside of Canada:

1. Gather your receipts and make copies for your records. One receipt for every dialysis session.
2. Download and print or save **Out-of-Country Hemodialysis Claim Submission Form**.
3. Complete the form, either by hand or by filling out the saved copy.

4. Submit the completed form(s) with original receipts by mail to:

   Out-of-Country Hemodialysis Claims Ontario Health
   525 University Avenue, 5th Floor
   Toronto, Ontario
   M5G 2L3
   Canada

VACCINATIONS

Some destinations require vaccinations. It is up to you to make sure your vaccinations are up to date.

To find out what vaccinations are required at your travel destination:

- Contact a travel clinic near you.

The Travel Clinic can help you prepare for a healthy and safe trip to any destination.

Finding a dialysis unit near your destination

1. Ask your dialysis nurse for help.
2. Check the internet for travel sites.

LOOKING FOR A VACATION CLOSE TO HOME?

The Lions Club has a dialysis camp in Dorset, Ontario. Cottages are available to dialysis patients. The Toronto General Hospital has 1 week at the camp every summer.

If you wish to attend the dialysis camp, please let the staff of the Home Hemodialysis Unit know.

For more information, go to www.lionscampdorset.on.ca

Maintaining home equipment during a vacation

Before you go on vacation, tell the Home Hemodialysis Unit and the Technicians.

Dialysis machine

- Machine will be programmed for automatic disinfection while you are on vacation.
- Check the level of disinfection solution at back of the machine to ensure you have enough supply for automatic disinfection.
- Check the number of Degreasings remaining on the Diasafe filter. Ensure the machine is able to complete the Degreasing disinfection while you are away.

Reverse Osmosis Unit (R/O Unit)

- The AquaC UNO H R/O is programmed to rinse every 4 hours.
- Check the Floodstop is functioning. Check that the Floodstop sensors are connected and in the right location.

The same maintenance of the dialysis machine and R/O Unit is required if you are admitted to hospital.

Requesting a second machine to use during vacation

If you own a cottage or second home in Ontario, you may be able to borrow a second hemodialysis machine to use when you are on vacation.

The Home Hemodialysis Unit have machines available for patients to borrow. The machines are loaned on a first-come, first-served basis.

You may borrow a second machine for 4 weeks, provided there are no other requests at the same time. This may be extended up to 8 weeks. The time will be confirmed in writing before the machine is installed and before your vacation.

You are responsible for the following expenses:

- The cost of installing and removing the machine, including electrical and plumbing expenses, water testing and any renovations.
- Staff costs related to visiting the cottage, such as mileage. The Home Hemodialysis Program will pay for 1 visit during a 4-week loan for 'trouble shooting'.
- Delivery costs will apply, if supplies are delivered to your cottage.

You may prefer to transfer your dialysis supplies from your main residence to the cottage. We will give you an estimate of all expenses. You must pay this amount before your vacation.

After the second machine is removed, we will give you the actual expense bill. Depending on the difference between the estimate and actual amounts, you will pay the balance, or we will give you a rebate.

Conditions:

- You will be asked to sign a written contract for the second machine.
- The University Health Network and the Home Hemodialysis Program can cancel this contract if there are issues relating to safety, negligence, or your health.
- If you have to go into the hospital, you must tell the Home Hemodialysis Unit as soon as possible.
- You must call the Home Hemodialysis Unit 2 weeks in advance, to confirm the removal of the second machine.

16.0

DIALYSIS PROCEDURES

1. Antibiotic Administration – How to Reconstitute
2. Antibiotic Administration – Reconstituted
3. Aranesp
4. Blood Collection
5. Cathflo
6. Changing Wet Hydrophobic Filter
7. Checking for Residual Disinfectant
8. Emergency Button
9. Entering Dialysis Parameters
10. Heparin Preparation
11. Iron
12. Low Molecular Weight Heparin (LMWH)
13. Manual Reinfusion
14. Micro Bubbles
15. Normal Saline Bolus
16. Power Failure During Treatment
17. Single-Needle, Single-Pump

Antibiotic Administration – How to Reconstitute or Dissolve the Medication in Sterile Water

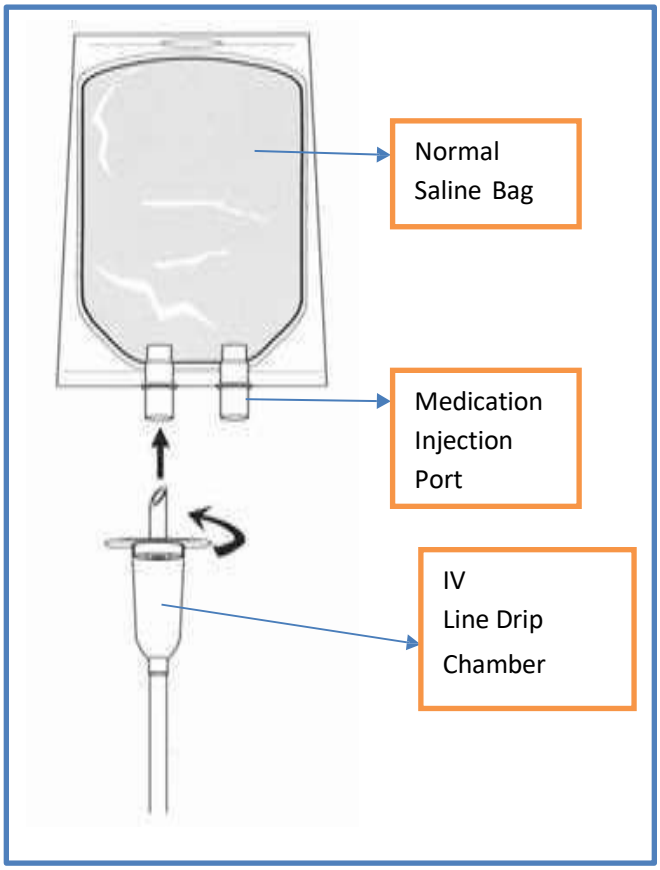
Medication Prescribed	
Dosage and Route	
Duration of treatment	
Quantity of medication dispensed	
Directions for use	

Indication:

1. Blood Infection (Sepsis)
2. Other infections (wounds, etc.)

Equipment

- Medication prescribed by a doctor
- 1 – 100ml or 250ml Normal saline bag as directed
- 1 – 18G x 1½ Blunt fill needle
- 1 – 3ml or 10ml Syringe
- 4 – Antiseptic wipes
- 1 – Intravenous (IV) administration line
- 1 – Ampule sterile water



Prepare the saline bag and IV administration line:

1. Clean preparation surface area
2. Wash hands
3. Close the roller clamp on IV administration line
4. Spike IV administration line into the normal saline bag
5. Squeeze the IV administration line chamber; saline will fill the chamber
6. Gently open the roller clamp on IV administration line mid-way and prime the IV tubing to the end of the line
7. Ensure there the IV line is air free; close the roller clamp

Procedure - Dissolve Medication & Inject into Normal Saline Bag:

1. Check the antibiotic name, dose and expiration date
2. Twist off the cap from the sterile water ampoule
3. Twist on the 10ml syringe to the ampoule opening
4. Flip so the ampoule is above the syringe, then pull the plunger down to extract ____**ml** of sterile water
5. Twist off the 10ml syringe containing sterile water; do not drop the syringe
6. Attach needle to 10ml syringe containing ____**ml** of sterile water; set aside
7. Remove the cap from the medication vial
8. Swab injection site on medication vial
9. Inject sterile water into the injection site of the medication vial
10. Recap needle; set the syringe with the capped needle aside
11. Gently shake the medication vial
12. Allow time for the medication to dissolve
13. Swab the medication injection site with an antiseptic wipe
14. Uncap the needle on the syringe; insert the needle into the medication vial
15. Withdraw the dissolved medication
16. Swab the medication injection port on the normal saline bag with an antiseptic wipe
17. Inject the medication into the injection port of the normal saline bag and shake gently
18. Label the medicated bag – name of antibiotic and dosage
19. Hang the medicated bag on the dialysis machine IV poll

A. 5008s CorDiax - Administration via IV Line Medication Port – End of Treatment:

1. At the start of hemodialysis treatment set an alert – Reminder Time
   - Select **Systems**
   - Select **Reminder Time**
   - Input the time you wish to wake up, to start the infusion of the antibiotic; antibiotics are usually administered 30 – 60 minutes before the end of treatment or as directed by the nurse
   - Select the **I/O** key to activate the reminder time
2. Check roller clamp is closed on the normal saline IV line
3. Remove the injection cap on IV line medication port
4. Connect the MEDICATION line to the medication port on normal saline IV line
5. Open the white clamp on the arterial injection port
6. Slowly open the roller clamp on the MEDICATION IV line
7. Use the roller clamp to control the rate of infusion
8. Allow 30 – 60 minutes to complete the infusion as directed by the nurse
9. The nurse will provide instructions regarding the drip rate; for example, to infuse the medication over 30 minutes the drip rate is 66 drops/min.
10. Once the medication infusion is complete, close the roller clamp on the medication IV line
11. Close the clamp on the arterial line injection port
12. Continue with the end-of-treatment protocols
13. Start Reinfusion protocol

Potential Adverse Reaction:

If an adverse reaction is experienced, discontinue the infusion and seek emergency assistance immediately. Call 911.

B. 5008s CorDiax - Administration Directly Via Vascular Access:

1. Complete all end-of-treatment procedures, except for ACCESS care
2. Ensure the IV line has been primed and is air free
3. Connect the IV administration line with the antibiotic directly to your access
4. Open the clamp on the access
5. Slowly open the roller clamp on the medicated line
6. Use the roller clamp to control the rate of infusion
7. Allow 30 – 60 minutes to complete the infusion or as directed by the nurse
8. The nurse will provide you with instructions regarding the drip rate; for example, to infuse the medication over 30 minutes the drip rate is 66 drops/minute
9. Once the medication infusion is complete, close the access clamp and the roller clamp on the medication IV line
10. Proceed to complete ACCESS care

Potential Adverse Reaction:

If an adverse reaction is experienced, discontinue the infusion and seek emergency assistance immediately. Call 911.

Antibiotic Administration – Reconstituted (Antibiotic in Liquid Form)

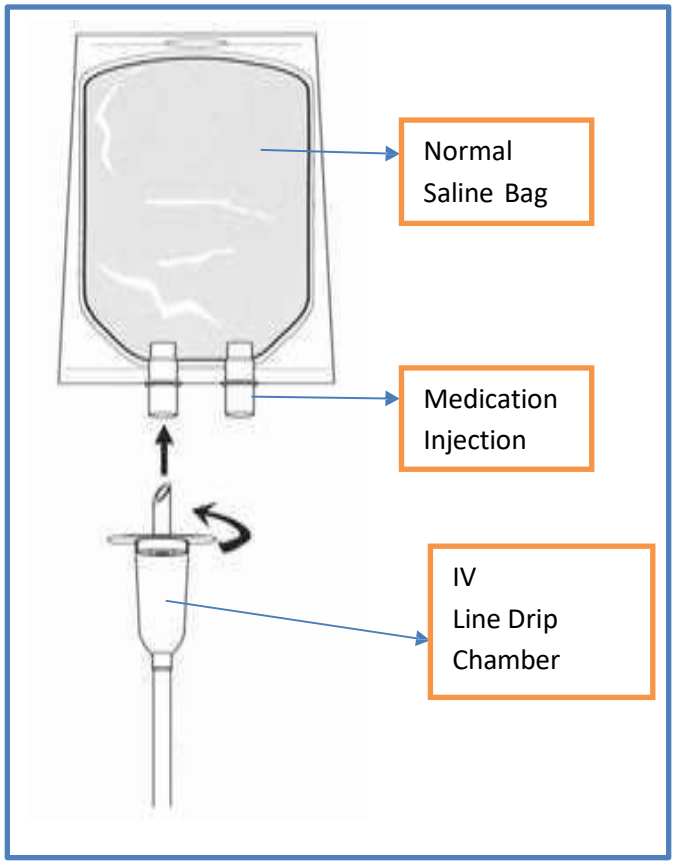
Medication Prescribed	
Dosage and Route	
Duration of treatment	
Quantity of medication dispensed	
Directions for use	

Indication:

1. Blood Infection (Sepsis)
2. Other infections (wounds, etc.)

Equipment

- Medication prescribed by a doctor
- 1 – 100ml or 250ml Normal saline bag as directed
- 1 – 18G x 1½ Blunt fill needle
- 1 – 3ml or 10ml Syringe
- 2 – Antiseptic wipes
- 1 – Intravenous (IV) line



Prepare the saline bag and IV administration line:

1. Clean preparation surface area
2. Wash hands
3. Close the roller clamp on IV administration line
4. Spike IV administration line into the normal saline bag
5. Squeeze the IV administration line chamber; saline will fill the chamber
6. Gently open the roller clamp on IV administration line mid-way and prime the IV tubing to the end of the line
7. Ensure there the IV line is air free; close the roller clamp

Procedure – Inject Medication into Normal Saline Bag:

1. Check antibiotic name, dose and expire date
2. Attach 18g needle to 3ml or 10ml syringe as directed
3. Uncap the medication vial; do not touch the injection site
4. Swab the medication injection site with antiseptic wipe
5. Uncap needle on syringe; draw up air in the syringe
6. Inject the air into the medication vial
7. Invert the medication vial, ensure to keep the tip of the needle below the pocket of air
8. Withdraw the medication; recap the needle
9. Swab medication injection port on normal saline bag with antiseptic wipe
10. Inject medication into the injection port of the normal saline bag and shake gently
11. Label the medicated bag – name of antibiotic and dosage
12. Hang the medicated bag on the dialysis machine IV poll

A. 5008s CorDiax - Administration via IV Line Medication Port – End of Treatment:

1. At the start of hemodialysis treatment set an alert – Reminder Time
   - Select **Systems**
   - Select **Reminder Time**
   - Input the time you wish to wake up, to start the infusion of the antibiotic; antibiotics are usually administered 30 – 60 minutes before the end of treatment or as directed by your nurse
   - Select **I/O** key to activate the reminder time
2. Check roller clamp is closed on the normal saline IV line
3. Remove injection cap on IV line medication port
4. Connect MEDICATION IV line to the medication port on normal saline IV line
5. Open white clamp on arterial injection port
6. Slowly open the roller clamp on the MEDICATION IV line
7. Use the roller clamp to control the rate of infusion
8. Allow 30 – 60 minutes to complete the infusion as directed by the nurse
9. The nurse will provide instructions regarding the drip rate; for example, to infuse the medication over 30 minutes the drip rate is 66 drops/min.
10. Once the infusion of the medication is complete, close the roller clamp on the medication IV line
11. Close the clamp on the arterial injection port
12. Continue with end-of-treatment protocols
13. Start Reinfusion protocol

Potential Adverse Reaction:

If an adverse reaction is experienced, discontinue the infusion and seek emergency assistance immediately. Call 911.

B. 5008s CorDiax - Administration Directly Via Vascular Access:

1. Complete all end-of-treatment procedures, except for ACCESS care
2. Ensure the IV line has been primed and is air free
3. Connect the IV administration line with antibiotic directly to your access
4. Open the clamp on the access
5. Slowly open the roller clamp on the medicated line
6. Use the roller clamp to control the rate of infusion
7. Allow 30 – 60 minutes to complete infusion or as direct by the nurse
8. The nurse will provide you with instructions regarding the drip rate; for example, to infuse the medication over 30minutes the drip rate is 66 drops/min.
9. Once the infusion of the medication is complete, access clamp and the roller clamp on the medication IV line
10. Proceed to complete ACCESS care

Potential Adverse Reaction:

If an adverse reaction is experienced, discontinue the infusion and seek emergency assistance immediately. Call 911.

Darbepoetin Alfa (Aranesp)

Aranesp is a man-made form of a protein that helps your body produce red blood cells. This protein may be reduced when you have kidney failure. When fewer red blood cells are produced, you can develop a condition called anemia.

Indication

1. Anemia due to chronic kidney disease (CKD).
2. Patients receiving chemotherapy.

Special Instructions and Precautions

1. You should not use this medication if you have allergies to Aranesp.
2. Hemodialysis patients should receive the medication by intravenous (IV) injection.
3. Store the medication in the refrigerator.
4. Do not shake the medication.
5. Check the medication for particles and discoloration. If present, do not administer the medication.
6. Administer the medication as directed by your doctor to obtain the best results.
7. It may take 2 to 6 weeks before your red blood cell (hemoglobin) count increases.
8. Tell your doctor or health care team, if you develop any symptoms.

Side Effects

- Headache
- Body aches
- Diarrhea
- Cough
- Stomach/abdominal pain

Symptoms should resolve over time.

Equipment

- Pre-loaded single-dose syringes (dose to be determined by your doctor)
- Antiseptic wipes

Procedure to administer medication

1. Initiate dialysis therapy as per protocol
2. Administer the medication during dialysis treatment
3. Wipe the arterial sample port with an antiseptic swab
4. Inject Aranesp as a bolus dose
5. Dispose of needle/syringe as per protocol

POTENTIAL ADVERSE REACTION: If an adverse reaction is experienced call 911.

Taking blood samples from the ARTERIAL blood line – Pre and Post Hemodialysis

Pre-dialysis

Equipment

- Vacutainer needle
- Blood collection vials
- Antiseptic wipe
- Centrifuge

Procedure

1. Press Preparation Menu
2. Stop the pump, set flow to 150ml/min
3. Clamp arterial blood line (2 red clamps)
4. Clamp IV line (roller clamp and white clamp on arterial injection port)
5. Open white clamp on PRIMING bag
6. Connect arterial line to arterial access
7. Open access clamp, open red arterial blood line clamp, start the blood pump at 150ml/min
8. When blood is detected, pump will stop
9. Message: Blood detected – **Do Not Press Start**
10. Clean **RED Arterial sample port** with antiseptic wipe
11. Pierce vacutainer needle into RED specimen port
12. Pierce blood collection vials into vacutainer, collect blood samples, set aside, continue with connection of venous blood line
13. Proceed with patient connection and start the dialysis treatment
14. Label the samples:
    - **Pre Dialysis**
    - **Your full Name**
    - **OHIP**
    - **Date of Birth**
15. Centrifuge the vials containing gel for 15 minutes
16. Place all vials in refrigerator or on an ice pack until you are able to deliver the blood specimens to the lab or home dialysis unit

Post-dialysis

Equipment

- Vacutainer needle
- Blood collection vials
- Antiseptic wipe
- Centrifuge

Procedure

1. Message – T**reatment goal achieved**
2. Message – TREATMENT CONTINUE **or** REINFUSION START, do not select any option at this time
3. Mute alarms
4. Lower the pump speed to **50** to **100ml/min**
5. Clean **RED Arterial sample port** with antiseptic wipe
6. Pierce vacutainer needle into **RED** sample port
7. Pierce blood collection vials into vacutainer, collect blood samples, set aside
8. PRESS **REINFUSION-START**
9. Proceed with reinfusion protocol
10. Label the samples:
    - **Post Dialysis**
    - **Your full Name**
    - **OHIP**
    - **Date of Birth**
11. Centrifuge the vials containing gel for 15 minutes
12. Place all vials in refrigerator or on an ice pack until you are able to deliver the blood specimens to lab or home dialysis unit

Taking blood samples from CENTRAL VENOUS CATHETER (CVC) – Pre and Post Hemodialysis

Pre-dialysis	Post-dialysis
Equipment • Vacutainer needle – Luer-Lok Access Device • Discard-Vial – BD Vacutainer Vial – No Additive • Blood collection vials • Antiseptic wipes • Centrifuge	**Equipment** • Vacutainer needle – Luer-Lok Access Device • Discard-Vial – BD Vacutainer Vial – No Additive • Blood collection vials • Antiseptic wipes • Centrifuge
Procedure 1. Wash hands 2. Proceed with cleaning one of the CVC ports as per protocol 3. Attach 10m syringe to the clean CVC port 4. Open clamp 5. Aspirate 3 – 5ml of blood 6. Close clamp 7. Attach the vacutainer to CVC port 8. Insert the discard-vial into vacutainer 9. Open port clamp 10. Allow discard-vial to fill 11. Remove discard-vial 12. Insert blood vial(s), collect sample(s) 13. Close port clamp 14. Remove vacutainer 15. Attach 10my syringe with normal saline to port and proceed with protocol for accessing CVC 16. Label the samples: • **Pre Dialysis** • **Your full Name** • **OHIP** • **Date of Birth** 17. Centrifuge the vials containing gel for 15 minutes 18. Place all vials in refrigerator or on an ice pack until you are able to deliver the blood specimens to the lab or home dialysis unit	**Procedure** 1. Hand sanitize 2. Message – **Treatment goal achieved** 3. Proceed with reinfusion protocol 4. Swab CVC port with antiseptic wipe as per protocol 5. Attach 10m syringe to the clean CVC port 6. Open clamp 7. Aspirate 3 – 5ml of blood 8. Close clamp 9. Attach the vacutainer to the CVC port 10. Insert the discard-vial into vacutainer 11. Open port clamp 12. Allow discard-vial to fill 13. Remove discard-vial 14. Insert blood vial(s), collect sample(s) 15. Close port clamp 16. Remove vacutainer 17. Attach 10my syringe with normal saline to port and proceed with protocol to lock the CVC • **Post Dialysis** • **Your full Name** • **OHIP** • **Date of Birth** 18. Centrifuge the vials containing gel for 15 minutes 19. Place all vials in refrigerator or on an ice pack until you are able to deliver the blood specimens to lab or home dialysis unit

Taking blood samples from ARTERIOVENOUS FISTULA OR GRAFT (AVF or AVG) – Pre and Post Hemodialysis

Pre-dialysis

Equipment

- Vacutainer needle – Luer-Lok Access Device
- Blood collection vials
- Centrifuge

Procedure

1. Wash hands
2. Cannulate arterial needle as per protocol
   - Do not flush the needle
3. Clamp arterial needle
   - Note clamping may not be necessary, if needle has a hemostatic valve
4. Attach the vacutainer to the arterial needle
5. Open arterial needle clamp
6. Insert blood vial(s), collect sample(s)
7. Clamp arterial needle
8. Remove vacutainer
9. Attach 10my syringe with normal saline
10. Flush arterial needle
11. Clamp arterial needle
12. Proceed to cannulate the venous needle as per protocol
13. Label the samples:
    - **Pre Dialysis**
    - **Your full Name**
    - **OHIP**
    - **Date of Birth**
14. Centrifuge the vials containing gel for 15 minutes
15. Place all vials in refrigerator or on an ice pack until you are able to deliver the blood specimens to the lab or home dialysis unit

Post-dialysis

Equipment

- Vacutainer needle – Luer-Lok Access Device
- Discard-Vial – BD Vacutainer Vial – No Additive
- Blood collection vials
- Centrifuge

Procedure

1. Hand sanitize
2. Message – **Treatment goal achieved**
3. Reinfuse blood as per protocol
4. Clamp arterial needle
   - Note clamping may not be necessary, if needle has a hemostatic valve
5. Attach the vacutainer to the arterial needle
6. Insert the discard-vial into vacutainer
7. Open arterial needle
8. Allow discard-vial to fill
9. Clamp arterial needle
10. Remove discard-vial
11. Insert blood vial(s), collect sample(s)
12. Clamp arterial needle
13. Remove vacutainer
14. Attach 10my syringe with normal saline
15. Flush arterial needle
16. Clamp arterial needle
17. Proceed to remove the arterial and venous needles as per protocol
18. Label the samples:
    - **Post Dialysis**
    - **Your full Name**
    - **OHIP**
    - **Date of Birth**
19. Centrifuge the vials containing gel for 15 minutes
20. Place all vials in refrigerator or on an ice pack until you are able to deliver the blood specimens to lab or home dialysis unit

PROCEDURE TO LOCK CENTRAL VENOUS CATHETER WITH CATHFLO (ALTEPLASE)

Action:

- Clear blood clots

Uses in Hemodialysis:

- Catheter dysfunction

Possible Side Effects:

- Risk of bleeding, gastrointestinal hemorrhage, genitourinary hemorrhage (blood in urine), bleeding at catheter puncture site, hypotension, fever, bruising, nausea, vomiting
- This is not a complete list of side effects reported. Your health care provider can discuss with you more complete list of side effects.

When to call your Home Hemodialysis team:

- If the first attempt of Alteplase / Cathflo treatment does not clear the catheter, call the Home Hemodialysis unit for further instructions.
- If there is excess bleeding, please call the Home hemodialysis team or go to your nearest emergency department.

Special Instructions and Precautions:

- Do not use Alteplase / Cathflo if you have had recent surgery or recent head injury (including a recent fall). Please consult the Home Hemodialysis nurse first.
- Prepare prior to use. Recombinant Alteplase contains no antibacterial preservatives and should be refrigerated at all times and reconstituted immediately before use.

Supplies required for the administration of Cathflo:

- 6 Antiseptic wipes
- 2 18G x 1½ Blunt Fill Needles with Filter
- 2 3ml syringes
- 2 10ml syringes
- 1 Ampoule 10ml sterile water
- 4 10ml Normal saline syringes
- 2 2ml Vials of Cathflo (Alteplase)

Procedure:

1. Wash hands
2. Gather supplies

Prepare the Cathflo medication:

1. Check the medication; ensure you have the correct drug; check expiration date
2. Twist off cap from sterile water ampoule
3. Twist on 3ml syringe to ampoule opening
4. Flip so ampoule is above the syringe, then pull plunger down to extract ____ of sterile water
5. Twist off 3ml syringe containing sterile water – do not drop syringe
6. Place the ampoule on a surface without contaminating the opening
7. Attach needle to 3ml syringe containing ____ of sterile water; set aside
8. Repeat steps 3 to 7 to prepare the second syringe with sterile water
9. Remove the protective cover from the Cathflo vials, wipe rubber area with antiseptic wipes
10. Inject first syringe containing sterile water into the first vial of Cathflo, remove needle and recap
11. **Do not agitate the vial –** gently swirl the vial, allow medication to dissolve
12. Inject second syringe containing sterile water into the second vial of Cathflo, remove needle and recap
13. **Do not agitate the vial –** gently swirl the vial, allow medication to dissolve
14. Swab both vials of the prepared Cathflo with antiseptic wipes

15. Using first 3ml syringe with needle, withdraw the contents of the first vial of Cathflo; remove and recap needle
16. Using a second 3ml syringe, withdraw the contents of the second vial of Cathflo; remove and recap needle

Prepare the Catheter:

17. Ensure arterial and venous ports of the catheter are clamped
18. Place arterial port with needle-free cap into open packet of antiseptic wipe
19. Soak the needle-free cap for 30 seconds
20. Scrub the needle-free cap for 30 seconds
21. Remove the antiseptic wipe – **do not drop the arterial port**
22. Allow 30 seconds for the antiseptic to dry
23. Attach 10ml syringe to needle-free cap on arterial port
24. Open arterial port clamp
25. Withdraw 3 to 5 ml of blood
26. Clamp arterial port
27. Remove 10ml syringe containing blood – **do not drop the arterial port**
28. Attach 10ml normal saline syringe to the needle-free cap on arterial port
29. Open arterial port clamp
30. Inject normal saline into arterial port
31. With the same syringe try to pull and push the blood in arterial port several times
32. Close arterial port clamp
33. Attach a second 10ml normal saline syringe to needle-free cap on arterial port
34. Open arterial port
35. Flush arterial port with normal saline
36. Clamp arterial port
37. Repeat steps 17 - 37 for the venous port

Inject Cathflo Medication into Catheter:

38. Ensure arterial port is clamped
39. Remove empty saline syringe
40. Attach syringe prepared with Cathflo to needle-free cap on arterial port

41. Open arterial port clamp
42. Inject the entire content of Cathflo
43. Clamp arterial port
44. Discard syringe from arterial port
45. Repeat steps 38 to 44 for the venous port
46. Remove Cathflo as per accessing protocol prior to initiating next dialysis or as directed by the home hemodialysis nurse

Changing Wet Hydrophobic Filter

Message

“Check if the hydrophobic filter on the venous pressure line is wet!” – Device adaptation correct – Problem corrected confirm

Equipment

- Pressure line with hydrophobic filter (transducer)

Procedure to change filter

1. Stop blood pump, open the doors
2. Check medication port on venous chamber clamped
3. Remove white cap from medication port on venous chamber, save the cap
4. Remove the wet hydrophobic filter from pressure port
5. Attach white cap to wet hydrophobic filter and place line in holder
6. Luer lock the new pressure line to the medication port on venous chamber
7. Attach new hydrophobic filter to the venous pressure port
8. Open the white clamp on medication port
9. Press “*Problem corrected confirm*”
10. Assess levels in venous chamber and adjust level is necessary

CHECKING FOR RESIDUAL DISINFECTANT

5008s CorDiax Procedure

Expected Outcome

Machine will be free of residual disinfectant.

Alert

Strict adherence to checking for absence of residual disinfectant.

Equipment

- Fresenius 5008s CorDiax machine
- Residual chlorine test strips

Procedure

1. After **Degreasing / Cold Disinfection** (chlorine disinfectant) the machine will provide a prompt to check for residual disinfection
2. Screen message indicates “Check for residual disinfectant” after bleach disinfection is completed, or press Cleaning menu to retrieve message
3. Press Start
4. Screen message indicates “Check now for the absence of residual disinfectant – Start” press OK
5. Wet indicator strip with fluid from dialysate coupling or obtain a sample from the dialysate sample port
6. Screen message indicates - “Has the absence of residual disinfectant been confirmed?” – Yes – No
    - Press **Yes** if the indicator strip shows that there is no residual disinfectant – **0**ppm
    - Press **No** if there is still some residual disinfectant – **0.1**ppm or greater
        - Start the rinse program to eliminate any residual disinfectant
        - The check for the absence of residual disinfectant must be repeated after rinse

Two disinfections have been programmed to occur automatically on a weekly basis:

1. Degreasing / Cold Disinfection – Every Saturday at 1:00pm, duration 45minutes
2. Interface Cleaning – Every Sunday at 1:00pm, duration 1½ hours

Emergency Button – Red Cross

5008s CorDiax Procedure

Alert

When the Emergency (**RED CROSS**) Button is activated, the light on the top of the machine turns amber and flashes until the button is pressed again to deactivate. There is no audible alert signal while the Emergency button is activated.

Equipment

Fresenius 5008s CorDiax

Procedure

If the patient experiences a hypotensive episode (low blood pressure) and requires intervention, the emergency button activates several different functions, depending on the default settings.

1. Press EMERGENCY (**RED CROSS**) button on the screen
    - UF stopped
    - Treatment clock stopped
    - Blood pump speed reduced to 200ml/min
    - Venous pressure limits open
    - NOTE: If the machine is programmed for **ONLINE*plus***, the automatic bolus function is available
2. If normal saline bolus is required:
    - Administer normal saline bolus
    - Manage alarms – arterial and venous pressure alarms
    - Respond to blood not detected alarm – Press *Continue Treatment*
    - Check blood pressure
    - Consider lowering UF goal
3. Deactivate Emergency button to resume treatment and UF – Press Red Cross on the screen
4. Treatment and UF resumes
5. Screen message *"Blood flow reduced. Increase blood flow rate!"* – Press *Confirm*
6. Increase blood pump speed to desired rate

Emergency (RED CROSS) – Remote Control

1. Press Emergency button on the remote control
    - UF stopped
    - Treatment clock stopped
    - Blood pump speed reduced to 200ml/min
    - Venous pressure limits open
    - NOTE: If the machine is programmed for **ONLINE*plus***,, the automatic bolus function is available
2. Using the remote control respond to screen message *"Emergency key on remote control pressed. Start emergency mode?" No – Yes*
3. Using the remote control press OK for *Yes*
4. If normal saline bolus is required:
    - Administer normal saline bolus
    - Manage alarms – arterial and venous pressure alarms
    - Respond to blood not detected alarm – Press *Continue Treatment*
    - Check blood pressure
    - Consider lowering UF goal
5. Screen message *"Emergency mode active." Stop*
6. Deactivate (Stop) Emergency button – Press OK on the remote control
7. Treatment and UF resumes
8. Screen message *"Blood flow reduced. Increase blood flow rate!"* – Press OK on the remote control to *Confirm*
9. Using the remote control increase blood pump speed to desired rate

ENTERING DIALYSIS PARAMETERS

5008s CorDiax Procedure

Procedure

Press DIALYSATE MENU button

1. For each change press **OK** to confirm changes in data
2. Verify concentrate code
3. Verify prescription of **Na+** (sodium) 138mmol/L and **Bic** (bicarbonate) 35mmol/L
   - Na^+ and Bic may change depending on your lab results, your nurse will update you with the programming changes
4. Verify dialysate temperature (36.5^{0}C)
5. Verify dialysate flow, do this after dialysis started
   - During preparation, EcoFlow is activated – 100ml/min

Press UF MENU button

1. For each change press **OK** to confirm the data
2. Enter UF time – _____h
3. Enter UF goal – _____ml

Press HEPARIN MENU button

1. For each change press **OK** to confirm the data
2. Enter stop time – _____h:min
3. Select Heparin start – **Automatic**
4. Enter Heparin rate – _____ml/h
5. Select Auto bolus – **Yes**
6. Enter Heparin bolus – _____ml
7. Heparin I/O – YELLOW (not yet active), this key will turn green once therapy initiated
   Note, for heparin free dialysis press Heparin I/O key to switch off heparin, Heparin I/O – GREY (not active)

Press **PREPARATION** key to return to the preparation screen

Heparin Preparation

5008s CorDiax Procedure

HEPARIN SYRINGE PREPARATION

Indication:

1. Anticoagulation - inhibiting the clotting of the blood
2. To prevent blood clotting during dialysis

Equipment

- 2 – 10ml Vials Heparin 1:1000units/ml
- 1 – 20ml syringe
- 1 – Blunt Fill Needle 18G x 1½
- 1 – Antiseptic wipes

Procedure to prepare the medication

1. Wash hands
2. Check expiry date on vials
3. Attach blunt fill needle to 20ml syringe
4. Remove the cap on the vial and wipe the rubber stopper with antiseptic swab
5. Draw up air in the syringe equal to the volume of medication required
6. Insert the needle with syringe containing air into the rubber stopper on the heparin vial
7. Gently inject air into the vial
8. Invert the heparin vial, slowly withdraw the entire volume of heparin
9. Ensure the needle tip is positioned below the pocket of air
10. Withdraw the medication
11. Remove the needle from the vial
12. Flick or tap the syringe to remove air bubbles
13. Safely recap the needle on the syringe containing the heparin to maintain sterility

INSTALL HEPARIN SYRINGE

Expected Outcome

Heparin Syringe correctly loaded for delivery of anticoagulant during hemodialysis

Alert

Ensure correct syringe is used – 20ml syringe

Equipment

- Fresenius 5008s CorDiax
- 20ml syringe
- Heparin as per physician's orders

Procedure

1. Connect and secure the heparin line from arterial blood line tubing on to the syringe
2. Depress the clamping brackets and move the grip handle all the way out
3. Insert syringe prepared with heparin into the barrel holder and ensure wings are between the barrel holder and the metal bracket
4. Depress the clamping brackets and slide the grip handle toward the syringe and secure it onto the bottom of the syringe plunger
5. Confirm the connection on the monitor screen

Set/check parameters

1. Select Heparin menu
2. For each change press **OK** to confirm the data
3. Enter stop time – _____h:min
4. Select Heparin start – **Automatic**
5. Enter Heparin rate – _____ml/h
6. Select Auto bolus – **Yes**
7. Enter Heparin bolus – _____ml
8. Heparin I/O – YELLOW (Not yet active), this key will turn green once therapy initiated

IV Iron Administration

Indication:

1. Require IV iron supplementation
2. Maintain hemoglobin

Equipment

- 1 – Iron medication vial
- 1 – 10ml syringe with 21G x 1½ needle
- 2 – Antiseptic wipe

Procedure to prepare the medication

1. Wash hands
2. Check expiry date on the vial
3. Remove the cap from medication vial; wipe the rubber stopper with antiseptic swab
4. Draw up air in the syringe equal to the volume of medication required
5. Insert the needle into the medication vial
6. Gently inject air into the vial
7. Ensure the needle tip remains below the pocket of air
8. Invert the vial, slowly withdraw the required dose of medication
9. Remove needle from the vial
10. Flick or tap the syringe to remove air bubbles
11. Safely recap the needle on the syringe containing the medication to maintain sterility

Procedure to administer the medication

1. Initiate dialysis therapy as per protocol
2. Wipe arterial sample port with antiseptic swab
3. Uncap the needle on syringe prepared with iron medication
4. Pierce the needle into arterial sample port
5. Inject 1ml of iron every minute until the prescribed dose is administered
6. Dispose of needle and syringe into the sharps container

POTENTIAL ADVERSE REACTION: If an adverse reaction is experienced, stop the administration of Venofer and seek emergency assistance. Administer EpiPen. Call 911.

Low molecular weight Heparin (LMWH)

Low-molecular-weight heparin is derived from standard heparin but requires less monitoring and is longer acting.

Indication

1. LMWH is an anticoagulant medication, also called a blood thinner.
2. LMWH is a medication given to prevent or reduce clotting (coagulation) of blood during dialysis.

Special Instructions and Precautions

1. Store LMWH at room temperature. Do not refrigerate. Do not leave syringes in direct sunlight.
2. You should not use this medication if you have allergies to LMHH.
3. You should not use this medication if have active bleeding or a history of low platelet counts after receiving heparin.
4. Avoid using other drugs that can affect blood clotting such as non-steroidal anti-inflammatory medication (ibuprofen, Advil, Aleve, and others).
5. Do not use LMWH if requiring an invasive procedure within 12 hours of a dialysis session.

Equipment

- Pre-loaded single-dose syringes (dose to be determined by your doctor)
- Antiseptic wipes

Procedure to administer medication

1. Initiate dialysis therapy as per protocol
2. Administer the medication within 30 minutes after the start of dialysis treatment
3. Wipe the arterial sample port with an antiseptic swab
4. Inject LMWH as a bolus dose
5. Dispose of needle/syringe as per protocol

POTENTIAL ADVERSE REACTION: If an adverse reaction is experienced, call 911.

Manual Reinfusion

In the event of:

1. Screen Failure – No screen reaction
2. Multiple Microbubble alarms
3. Battery failure

Procedure – Option 1: Arterial Blood line Connected to Normal Saline (NaCl)

1. Ensure the blood pump has stopped
2. Clamp arterial access and arterial blood line
3. Attach saline syringe to arterial access and flush the access
4. Attach arterial blood line to medication injection connector on IV line
5. Open roller clamp on IV line and open clamp on arterial bloodline
6. Open the doors
7. Check for air
8. Do not continue if air is present below the venous bubble catcher, discard the blood circuit; otherwise, continue with step 9
9. Remove ARTERIAL and VENOUS blood lines from occlusion clamps
10. Pull out the handle from pump rotor
11. Rotate handle clockwise until the blood lines are clear of blood
12. Clamp venous blood line, venous access and IV line
13. Select Blood System menu
14. Select Remove blood lines
15. Select Dialysate menu
16. Select Empty the bags – the Bi*B*ag will empty
17. Proceed with the end of treatment procedures and disinfection

Procedure – Option 2: Return Arterial Blood via Gravity

1. Ensure the blood pump has stopped
2. Clamp arterial access and arterial blood line
3. Open white clamp on arterial injection port
4. Open IV roller clamp
5. Open the doors
6. Check for air
7. Do not continue if air is present below the venous bubble catcher, discard the blood circuit; otherwise, continue with step 8
8. Remove ARTERIAL and VENOUS blood lines from occlusion clamps
9. Pull out the handle from pump rotor
10. Rotate handle clockwise until the venous blood line is clear of blood
11. Clamp venous blood line and venous access
12. Open arterial blood line clamp, allow saline to return the blood via gravity
13. When arterial blood line clear, clamp the arterial blood line and arterial access
14. Close the IV roller clamp
15. Select Blood System menu
16. Select Remove all blood lines
17. Select Dialysate menu
18. Select Empty the bags – the Bi*B*ag will empty
19. Proceed with the end of treatment procedures and disinfection

Micro Bubbles

Alarm

Message "*Micro bubbles detected below venous bubble detector! If necessary, disconnect patient, connect arterial and venous blood lines to a bag of NaCl!"*

First Micro Bubble Alarm:

1. Mute alarm
2. Check all connections
3. If no air or micro bubble visible press *Treatment – Continue*
4. If air or micro bubbles visible, check for the source of air
5. **If the source of air is coming from the heparin line connection, proceed with treatment and switch off the heparin function, continue treatment with heparin off as follows:**

TREATMENT CONTINUE with HEPARIN OFF

1. Check the venous bubble catcher air free
2. Open doors
3. Clamp heparin line
4. Press HEPARIN menu
5. Press HEPARIN I/O, green indicator light will turn GREY
6. Close doors
7. Manage alarms, blood pump restarts
8. Raise level in bubble catcher if necessary; Press BLOOD SYSTEM; Press LEVEL SET ARROW UP

INJECT HEPARIN VIA ARTERIAL BLOOD LINE

Equipment

- 1 – 10ml syringe with 21g x 1½ needle attached
- 2 – Antiseptic wipes
- 1 – Vial of heparin 1:1000units

ADMINISTER THE HEPARIN

1. Prepare **10ml** syringe with heparin 1:100units as per protocol
2. Wipe RED ARTERIAL sample port with antiseptic swab
3. Inject 1ml of heparin for every hour remaining in therapy in the RED ARTERIAL sample port; for example, if there are 3 hours of treatment remaining, inject 3ml of heparin
4. Dispose of syringe and needle as per protocol
5. Continue dialysis

Second Micro Bubble Alarm:

If a second micro bubble alarm occurs, **stop therapy**

A. If air or micro bubbles visible in the blood line and bubble catcher, discard the blood, stop therapy
B. If blood line and venous bubble catcher air free, reinfuse the blood
C. Alarm message can be parked for 2 minutes, up to 2 times

Reinfusion

1. Press Reinfusion
2. Press Reinfusion I/O key to start infusion
3. Proceed with reinfusion protocol
4. Abort therapy

Third Micro Bubble Alarm:

If hemodialysis treatment is not terminated after the second micro bubble alarm, there is risk of a third reoccurrence of the alarm.

If the alarm appears for a third time, the machine will display a new alarm message: Message indicates "*Air Detected below the venous bubble catcher. Disconnect the patient, connect the arterial and venous blood line to the NaCl solution!*" ***Disconnect the patient; connect the arterial and venous blood lines to the recirculator connector! Open clamps.***

Manual Reinfusion

1. Check blood lines and bubble catcher air free
2. Do NOT reinfuse, if air or microbubbles visible, discard circuit, abort therapy
3. If blood line and bubble catcher air free, **MANUALLY** reinfuse the blood as per protocol
4. Abort therapy

Normal Saline Bolus / Flush

In the event of:

1. Low blood pressure
2. Flush / rinse the blood circuit to assess for clots

Procedure

Start Normal Saline Infusion

1. Open roller clamp on IV line
2. Open white clamp on arterial injection port
3. Close the red arterial clamp
4. Allow normal saline to infuse until **BLOOD NOT DETECTED** alarm occurs (approximately 200ml of normal saline administered)
5. Manage alarms – arterial, venous, blood not detected
6. Low Blood Pressure:
    - If bolus is administered to manage low blood pressure, press UF TIMER **I/0** key or Emergency key to stop ultrafiltration (UF) and the treatment clock; indicator light turns grey
7. Clotting:
    - If normal saline is administered to assess the circuit for clots, do not select UF Timer I/O key
    - If the dialyzer is clotting and/or there are clots in the bubble catcher, consider ending the treatment

Procedure

Stop Normal Saline Infusion

1. Open red arterial line clamp
2. Close white clamp on arterial injection port
3. Close roller clamp on IV line
4. Low Blood Pressure:
    - Take blood pressure
    - Consider adjusting the UF Goal for the management of low blood pressure —
        - Press UF Goal
        - Reduce the UF Goal
        - Press OK
5. If blood pressure stable and you are symptom-free, press UF TIMER I/O; indicator light turns green, UF and the treatment clock
6. Consider increasing your target weight
7. Clotting:
    - Consider an increase in the dose of anticoagulant
8. Report event(s) to your nurse – low blood pressure, clotting blood lines and dialyzer, loss of blood

Power Failure during Treatment

5008s CorDiax Procedure

Expected Outcome

- The integrity of the blood circuit is maintained by battery operated blood pump and blood alarms.
- All current dialysis parameters will be retained until power supply is re-established

Alert

Blood within the circuit must be returned to the patient if the power supply is not re-established within a 10-minute period.

Equipment

Fresenius 5008s CorDiax

Procedure

1. In a power failure situation the alarm sounds
2. Press Mute
3. Screen message indicates, “Power failure – System is battery-operated”
4. Press Confirm
5. “Battery Operation” is displayed of the screen highlighted in orange
6. Hemodialysis ceases
7. The blood pump and heparin pump continue, and all data is retained
8. Treatment time does not count down during battery operation
9. If power supply does not return within 10minutes, return blood to patient by selecting REINFUSION menu and proceed with reinfusion protocol
10. Remove the bloodlines then switch off the 5008s monitor
11. Disinfect equipment when power supply is re-established

Single-Needle Single-Pump (Click-Clack)

Alert

Needle is connected to Y connector

Equipment

- Y adaptor for single needle treatment, ensure the Y adaptor is primed with normal saline

Procedure

1. Reduce pump speed to 150ml/min
2. Press Blood Pump I/O, blood pump stops
3. Clamp arterial and venous blood lines and priming bag
4. Clamp white clamp on arterial injection port on the arterial blood line
5. Connect arterial and venous lines to the patient's access Y adaptor for single needle
6. Open clamps on Y adaptor and needle
7. Open clamps on arterial and venous blood lines
8. Press Options menu
9. Press Single Needle
10. Press Click-Clack I/O
11. Message indicates "*Connect both the arterial and the venous patient line to the same vascular access.*"
12. Press Single-Needle START, increase blood pump speed slowly
13. When the upper switching pressure is reached the blood **return phase** starts (Upper SN pressure 400mmHg)
14. When the lower switch pressure is reached the blood **removal phase** starts again (Lower SN pressure 50mmgh)
15. Note the effective blood flow (ml/min)
16. The blood removal and return phase is time controlled

17. Once optical detector senses blood, alarm sounds, blood pump stops
18. Message indicates "*blood detected*" – Treatment Start
19. Press START
20. System automatically changes to the TREATMENT screen
21. Adjust pump speed to tolerated rate
22. Observe the Upper and Low switching pressures

Troubleshooting

Cycle alarm

1. The pressure does not rise in the set time frame of 15 seconds
2. Usually, due to access issues, either a flow/ return problem or the pressure differences are set too high in relation to the blood flow rate

Manage Cycle alarm

1. If the access is problematic, desired pump speed may not be achieved
    - Reduce blood pump speed
2. If the access is problematic, upper switching pressures (SN) may not be achieved
    - Reduce the upper switching pressure; once the upper switching pressure is achieved blood **return phase** will start
    - Note upper switching pressure is defaulted to **400mmHg**
3. If the access is problematic, the lower switching pressures may not be achieved
    - Increase the lower switching pressure; once the lower switching pressure is achieved the blood **removal phase** will start
    - Note lower the lower switching pressure is defaulted to **50mmgh**
4. Administer normal saline flush to observe for circuit clotting
5. Consider termination of treatment
6. Report to medical team

End of Treatment Reinfusion for Single-Needle Single-Pump (Click Clack)

Expected Outcome

Patient disconnected from machine using normal saline (NaCl 0.9%)

Alert

Ensure an adequate amount of normal saline is available

Procedure

End of treatment

1. Audible alarm sounds and message indicates "*Treatment goal achieved*" – Continue – Reinfusion Start"
2. Press Start
3. Blood pump stops
4. The system switches automatically to the REINFUSION screen
5. Screen message indicates "*Connect a bag of NaCl*" – Start Reinfusion – OK – Treatment
6. Close the **arterial** blood line clamp
7. Close the **arterial** segment of the **Y** adaptor
8. Disconnect **arterial** blood line from the **Y** adaptor
9. Connect arterial blood line to the NaCl IV line medication port
10. Open roller clamp on saline line
11. Press OK
12. Blood pump starts at pre-set rate, 200ml/min
13. When optical detector senses clear fluid, alarm sounds, pump stops
14. Screen message indicated "*Blood reinfused*" – Reinfusion Continue – Machine Remove lines
15. If further rinse is required, press Continue

16. Stop reinfusion when venous blood line completely clear
17. Close venous Y adaptor on patient access
18. Close venous blood line
19. Close saline line roller clamp
20. Take blood pressure
21. Disconnect venous blood line (BLUE) from access
22. Remove hydrophobic filter, attach filter to venous blood line (BLUE)
23. Close doors
24. Press remove blood lines
25. Follow info prompts from left to right, open the doors last
26. If using patient card message save data to card: Message – "*Saving data to card*"
27. Message – "*Saving modified treatment parameter on to card*? No – Yes
28. Press Yes
29. Treatment parameter screen – press OK, lower right corner
30. Pull out PatientCard from card slot
31. Select INFO Message – "*Please insert dialyzer coupling into shunt interlock to empty dialyzer*"
32. Open shunt
33. Place blue dialysate coupling onto blue shunt and close door
34. Message indicates "*The dialyzer is now empty. Insert dialysate coupling into the shunt interlock*"
35. Cap the blue end of dialyzer
36. Open shunt door a second time, insert red dialysate coupling onto red shunt and close door
37. Cap the red end of dialyzer
38. *Bibag* will empty automatically
39. Message indicates "*Bibag is empty and can be removed*"
40. Remove *Bibag* close cover
41. Place acid concentrate wand into holder close cover
42. Open the doors, remove the lines
43. Close the doors
44. Select cleaning menu
45. Select Heat Disinfection START
46. Clean the exterior of machine

5008s CorDiax ONLINE*plus* System

1

5008/5008S CorDiax
ONLINE*plus* – Setup

- Turn machine on
- Verify last disinfection
- Check for residual disinfectant, if required
- 9 minute rinse, then complete water checks
- Press Treatment or Start T1 Test
- Connect acid and bi*b*ag concentrates
- Insert PatientCard
  - » Accept name
  - » Accept download, OK
  - » Accept parameters

Preparation Menu

- Install dialyzer
- Install arterial line and close injection port clamp
- Connect arterial line to dialyzer
- Leave dialyzer arterial end (RED) up
- Install heparin syringe and do the 4 checks
- Install venous line and clamp the 2 injection ports
- Connect venous line to dialyzer
- Install ONLINE*plus* – SafeLine
- Connect SafeLine to patient end of arterial line
- Connect rinse port connector to patient end of venous line
- T1 test complete, check PatientCard inserted
- Connect substituate connector on SafeLine to the ONLINE*plus* substituate port
- Connect rinse connector on venous line to rinse port
- Connect dialysate couplings
- Press Start Priming/Rinsing
- Turn dialyzer arterial end (RED) down when both pumps start turning
- Program:
  - » Dialysate menu – Na 138, Bicarb 35
  - » UF menu
  - » Heparin infusion and stop time
  - » Blood pressure interval (optional)

Prepare the Vascular Access

- Prepare access as per protocol
- Collect blood – use discard vial, then sample(s)
- Centrifuge appropriate blood sample(s)

2

5008/5008S CorDiax
ONLINE*plus* – Start and End Treatment

Start Treatment

- Press Blood pump I/O to stop pump
- Message: *Priming/Rinsing – Continue – Exit*
- Press Exit
- Clamp and disconnect arterial line from SafeLine and connect to patient's arterial access
- Discard recirculator and connect SafeLine **PRE** or post dialyzer
- Clamp and remove rinse connector from rinse port
- Discard rinse connector and connect venous line to patient's venous access
- Close rinse port
- Open 4 clamps and start blood pump
- Message – *Blood Detected* – Press START
- Increase blood flow
- Take blood pressure

End treatment

- Start **Reinfusion** – pump stops
- Clamp arterial line
- Clamp arterial patient access
- Disconnect patient arterial line and attach to recirculating adapter
- Disconnect the SafeLine from the blood line and attach to the other end of the recirculating adapter
- Unclamp arterial line
- Message – *Online reinfusion* – Press OK
- When reinfusion complete, clamp patient access and venous line
- Take blood pressure
- Disconnect venous line from patient
- Disconnect venous transducer (hydrophobic filter)
- Press Remove Lines
- Empty dialyzer, return blue coupling to shunt
- Close shunt
- Message – *The dialyzer is emptied* – return red coupling to shunt, close shunt
- Remove substituate connector, bi*b*ag and return acid wand
- Remove the blood lines
- Perform a disinfection
- Remove PatientCard

ONLINE Machine Preparation

5008 CorDiax ONLINE*plus* Procedure

Expected Outcome

- T1 test completed and passed
- Machine will be set up, extracorporeal circuit primed, rinsed and ready for HD/HDF treatment

Alert

- T1 test must be performed before priming and dialysis can proceed
- Strict adherence to aseptic technique is required due to the risk of bacterial contamination

Equipment

- Fresenius 5008 CorDiax
- Fresenius 5008 CorDiax blood line set
- Dialyzer
- Acid and bi*b*ag® concentrates
- Residual disinfectant test strips, if required

Procedure

Machine startup

1. Turn machine on by pressing on/off button
2. Select rinse,
3. Select auto off – NO
4. Verify last disinfection
5. Verify absence of disinfectant if required
6. After rinse, complete the water system checks and document results
7. Start T1 Test
8. Connect acid and bi*b*ag concentrates
9. Insert PatientCard into card slot and confirm the information

   Arterial and venous lines can be placed onto machine during test.

10. Wash hands
11. Place dialyzer into dialyzer holder
12. Open blood line set and tighten all connectors (connections may have loosened during sterilization process)
13. Open outer doors
14. Insert line guide (alpha clip) into blood pump until signal sounds
15. Insert arterial blood line into line holders
16. Connect arterial blood line to dialyzer, leave arterial end up
17. Insert arterial pressure dome into pressure measurement unit
18. Insert arterial line into arterial clamp
19. Optional: Insert arterial blood line through arterial BTM and close cover
20. Place patient end of arterial blood line into line holder on dialyzer holder

21. Attach heparin syringe, confirm placement of syringe
22. Close **white** clamp on arterial injection port
23. Insert venous bubble catcher into level detector
24. Insert venous line into optical detector/bubble detector
25. Insert venous blood line into venous clamp
26. Optional: Insert venous blood line through venous BTM and close cover
27. Place patient end of venous blood line into line holder on dialyzer holder
28. Insert venous blood line into line holder
29. Connect venous blood line to dialyzer
30. Attach venous transducer (hydrophobic filter) to the venous pressure transducer port
31. Close **2 white** clamps on venous injection ports
32. Attach rinse connector (**remove blue cap**) on the end of venous bloodline
33. Insert SafeLine™ line guide to the substitute pump until a signal sounds
34. Insert SafeLine into line holder
35. Connect arterial blood line to circulator adaptor located on SafeLine
36. Close outer doors

PRIMING

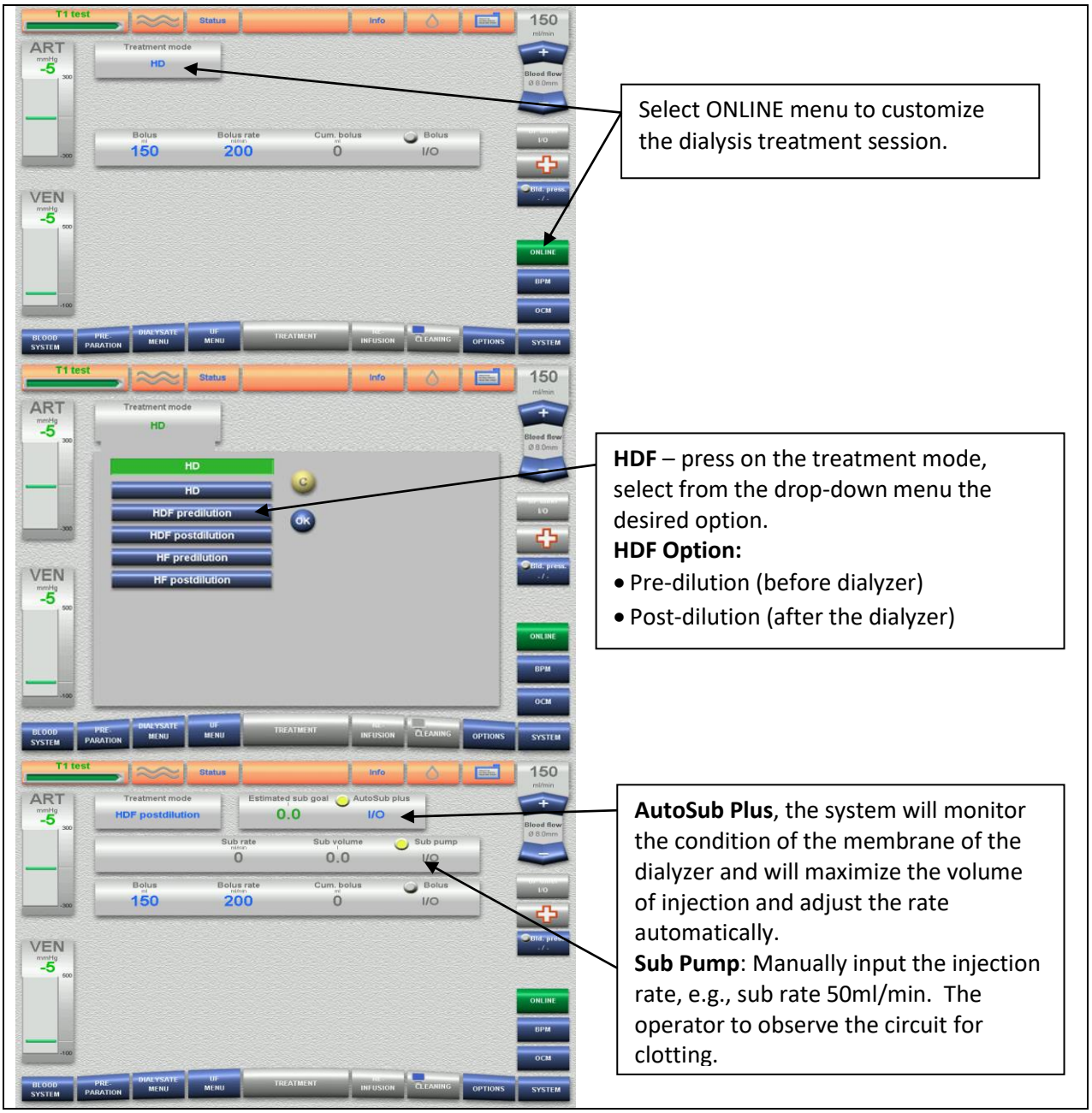
Once T1 test is completed, priming/rinsing can begin:

37. Screen message indicates "*If necessary, connect substitute and rinse connector! Connect dialyzer couplings!*"
38. Open left outer door
39. Connect **substitute connector** on **SafeLine** to substitute port and close substitute port catch (**blue**)
40. Connect **rinse connector** with venous blood line to rinse port and close rinse port catch (**grey**)
41. Close left outer door
42. Connect dialyzer couplings
43. When screen message indicates "*Priming/Rinsing*", press START
44. Allow dialyzer to fill
45. Turn arterial end of dialyzer down once the blood pump and substitute pump start turning
46. System automatically switches to the PREPARATION screen
47. Rinse volume preset at 500ml, Pump speed preset at 150 ml, ONLINE UF 200ml; Blood flow will increase to 400ml once substitute detected in venous chamber
48. Endless rinse (blood flow decreases to 50ml) will start when the ONLINE rinse volume has been reached
49. Program dialysis parameters
    - Dialysate: Na 138mmol/L, bicarbonate 35mmol/L, temperature 36.5ºC
    - Check code on acid concentrate corresponds to the programmed code
    - Check dialyzer type corresponds to the programmed dialyzer

- UF: UF goal and treatment time
- Heparin: Hourly rate, bolus and stop time if required

50. Note if programming HDF - Substituate Rate
    - Go to **OPTIONS**
    - Select **ONLINE**
    - Check to ensure **SUB PUMP** I/O key is on
    - Set rate as per nursing instructions, e.g. 50ml/min

HEMODIAFILTRATION (HDF): Treatment combines diffusive and convective transport of solutes. In addition, HDF utilized when considering heparin free dialysis.



ONLINE Patient Connection

5008 CorDiax ONLINE*plus* Procedure

Expected Outcome

Patient connected in an aseptic manner to ensure safe delivery of substitution fluid.

Alert

- Machine must be internally and externally disinfected prior to preparation
- Strict adherence to aseptic technique required due to risk of bacterial contamination

Equipment

Fresenius 5008 CorDiax in Precirculation mode - status bar grey and blood flow at 50ml/min

Procedure

Ensure machine preparation is complete as per ONLINE Machine Preparation procedure.

1. Press Preparation
2. Press Blood Pump **I/O**
3. **Blood pump stops** and screen message indicates "*Priming/Rinsing"* - Continue - Exit
4. Press **Exit** and follow prompts on screen. **Clamp** arterial and venous blood lines.
    a. Disconnect arterial blood line from the SafeLine, leave recirculator on SafeLine
    b. Connect arterial blood line to patient
    c. Remove recirculator and connect **SafeLine** before the dialyzer
    d. Remove **rinse connector** and connect venous blood line to patient
    e. Close rinse port
5. Screen message indicates "*Start blood pump"*, press Confirm
6. Once optical detector senses blood, alarm sounds, blood pump stops, clamps close, mute LED flashes.
7. Screen message indicates "*Blood detected*" - Dialysis Start
8. Press Start
9. System automatically changes to the **TREATMENT** screen
10. Ultrafiltration automatically starts
11. Heparin infusion starts automatically and heparin bolus is administered
12. Set the blood flow to the desired rate
13. Alarm limits will automatically set
14. Take blood pressure
15. Verify TREATMENT parameters are correct
16. Complete documentation

ONLINE Reinfusion

5008 CorDiax ONLINE*plus* Procedure

Expected Outcome

Patient disconnected from machine utilizing the ONLINE*plus* system (saline free).

Alert

Normal saline may be used if conductivity alarm, screen failure, power failure or water deficiency.

Equipment

Fresenius 5008 CorDiax

Procedure

End of treatment

1. Audible alarm sounds once and screen message indicates "*Treatment goal achieved" - Dialysis Continue - Reinfusion* Start
2. Press Start
3. Blood pump stops
4. Clamp **arterial blood line** and **arterial access**
5. Disconnect patient's arterial access from arterial bloodline
6. Attach **arterial blood line** to the **recirculation adapter**
7. Disconnect **SafeLine** from blood line and attach to **recirculation adapter**
8. Screen message indicates "*Connect SafeLine to arterial bloodline"* - OK - Reinfusion NaCl - Treatment
9. Open clamp on **arterial blood line** - Press **OK**
10. Blood pump commences at preset rate of 200ml/min
11. When optical detector senses clear fluid, alarm sounds, pumps stop
12. Screen message indicates "*Blood reinfused"* Reinfusion Continue - Machine Remove lines
13. If further reinfusion is required, press Continue
14. Stop reinfusion when the blood circuit is clear of blood
15. Clamp the venous blood line and venous access
16. Disconnect the hydrophobic filter, press Remove Lines
17. Screen message indicates "Please open the doors to continue"
18. Follow the **info prompts** on the screen from **right to left** to continue with teardown of blood lines
    - Do not open the doors, follow the other prompts on the screen

PatientCard

19. If using a PatientCard:
    - Screen indicates "Saving data to card. Leave card inserted"
    - Screen indicates "Save modified treatment prescription onto PatientCard?" - No – Yes

- Press Yes
- Treatment parameters screen - Press OK on lower right corner
- Screen indicates “Saving data to card. Leave card inserted”
- Remove card after message disappears

Emptying the dialyzer

20. Screen message indicates “*Please insert the inlet dialyzer coupling into the shunt interlock to empty the dialyze*r”
21. Open the shunt door, place the blue dialysate coupling onto the shunt and close door
22. Drain program is in progress
23. Screen message indicates “The dialyzer is being emptied”
24. Once the dialyzer is completely drained, screen message indicates, “*The dialyzer is now empty. Please insert both dialysate couplings into the shunt interlock*”
25. Cap the blue end of the dialyzer
26. Open the shunt door and place the **red** dialysate coupling onto the shunt and close door
27. **Cap** the **red** end of the dialyzer
28. Open the doors and remove the blood lines
29. Select disinfection mode
30. Perform external cleaning as per external cleaning procedure

ONLINE Bolus

5008 CorDiax ONLINE*plus* Procedure

Expected Outcome

Bolus can be given ONLINE.

Alert

ONLINE bolus **not** permissible in the following situations:

- **Power failure**
- **Water deficiency**
- **Concentrate supply low (Conductivity alarm)**
- **Screen failure**
- **Flow or blood alarms**
- **During an active Pressure Holding Test**

Equipment

- Fresenius 5008 CorDiax

Procedure

1. Press ONLINE
    - Bolus 210ml, bolus flow rate 50 ml/min and blood flow rate will be 50 ml/min
2. Press Bolus I/O
3. Bolus will run until total amount reached unless stopped by user or alarm
4. If another bolus is required or needs to be continued, press Bolus I\O again
5. Once bolus administered, increase blood pump speed to desired rate

Emergency Key:

1. Emergency  : UF Timer OFF, automatic administration of normal saline bolus
2. Press OK
    - Bolus will run until total amount reached unless stopped by user or alarm
3. Once bolus administered, increase blood pump speed to desired rate

NOTE: If bolus is not permissible, terminate treatment using normal saline and IV spike method

ONLINE Recirculation during Treatment after Blood Return

5008 CorDiax ONLINE*plus* Procedure

Expected Outcome

Extracorporeal circuit recirculated during treatment (e.g. to resite needle).

Alert

Blood within extracorporeal circuit (blood in the lines) can only be recirculated for 60minutes.

Equipment

- Fresenius 5008 CorDiax
- 2 – 10ml preloaded normal saline syringes
- 1 – Sterile recirculation adaptor

Procedure

1. Administer bolus prior to circulation, press **ONLINE**
2. Administer bolus 210ml, bolus flow rate 50 ml/min and blood flow rate will be 50 ml/min
3. When **blood flow drops to 50** ml/min, **decrease to 0**
4. Allow bolus to run until it stops
5. If screen message "*Continue – Treatment – Remove Blood lines* " appears, press **Treatment**
6. Press **Options**
7. Press **Circulation**
8. Press **Circulation Start**
    - Note press **green hard key**, if the recirculating adaptor message does not appear
9. Screen message indicates, "*Use recirculating adaptor to join the arterial and venous patient connectors!*" - Circulation - Treatment Continue
10. Clamp arterial and venous blood lines and patient access
11. Connect the arterial and venous blood line together with a recirculation adapter
12. Open blood line clamps, press **Circulation**
13. Blood flow commences at 200ml/min
14. Flush patient access with 10ml normal saline filled syringes
15. Screen message indicates, "*Stop circulation?*"
16. When patient is ready to be reconnected, press **OK,** blood pump stops
17. Screen message indicates, "*Has the patient been reconnected?* - Circulation - Treatment Continue
18. Clamp arterial and venous blood lines
19. Reconnect the patient to the blood lines; unclamp blood lines and patient access
20. Press **Continue**
21. Gradually increase the blood flow rate as desired

ONLINE Bolus - Visualize Dialyzer

5008 CorDiax ONLINE*plus* Procedure

Expected Outcome

Dialyzer visualized with heparin free treatment.

Alert

Strict adherence to aseptic technique required if switching SafeLine™ from post infusion to pre infusion port.

Equipment

Fresenius 5008 CorDiax

Procedure

1. Press ONLINE
    - Bolus 210ml, bolus flow rate 50 ml/min and blood flow rate 50 ml/min
2. Press Bolus I/O
3. When blood flow drops to 50 ml/min, decrease flow to 0ml/min
4. Allow bolus to run until it stops on its own or until visual verification of dialyzer is sufficient
5. If further rinse is required, press Bolus I/O again
6. Gradually increase blood flow rate as prescribed

ONLINE REINFUSION – NORMAL SALINE & SPIKE

5008 CorDiax ONLINE*plus* Procedure

Expected Outcome

Reinfuse blood using Normal Saline and Spike in the event of the following:

- **Power failure**
- **Water deficiency**
- **Concentrate supply low (Conductivity alarm)**
- **Screen failure**
- **Flow or blood alarms**
- **During an active Pressure Holding Test**

Alert

Strict adherence to aseptic technique required to connect arterial blood line to IV spike.

Strict adherence to aseptic technique required to insert IV spike into normal saline bag.

Equipment

- Fresenius 5008 CorDiax
- IV spike
- 1L Normal saline bag

Procedure

1. Select Reinfusion menu
2. Message ONLINE reinfusion: Connect SafeLine to arterial bloodline! **OK** – **NaCl** – **Treatment**
3. Press **NaCl**
4. Clamp patient **arterial access**, clamp **arterial bloodline**; disconnect arterial blood line
5. Remove IV spike cap, **connect arterial blood line to IV spike**
6. Remove cover on IV spike, insert IV spike with arterial blood line into 1L normal saline bag
7. Open arterial blood line clamp
8. Message NaCl: Connect arterial blood line with NaCl solution! Start reinfusion! **OK**
9. Blood pump commences at preset rate 200ml/min
10. When optical detector senses clear fluid, alarm sound, pump stops, clamps close and mute LED flashes
11. Screen message indicates "*blood reinfused*" **Reinfusion Continue** – **Remove blood lines**
12. If further reinfusion is required, press Reinfusion **Continue**
13. Stop reinfusion when blood lines clear
14. Camp the arterial bloodline
15. Clamp the venous blood line and patient venous access
16. Disconnect the hydrophobic filter, press **Remove Lines**
17. Screen message indicates "*Please open the doors to continue*"

18. Follow the **info prompts** on the screen from **right to left** to continue with teardown of blood lines
    - Do not open the doors, follow the other prompts on the screen

PatientCard

19. If using a PatientCard:
    - Screen indicates “Saving data to card. Leave card inserted”
    - Screen indicates “Save modified treatment prescription onto PatientCard?” - No – Yes
    - Press Yes
    - Treatment parameters screen - Press OK on lower right corner
    - Screen indicates “Saving data to card. Leave card inserted”
    - Remove card after message disappears

Emptying the dialyzer

20. Screen message indicates “*Please insert the inlet dialyzer coupling into the shunt interlock to empty the dialyzer*”
21. Open the shunt door, place the **blue** dialysate coupling onto the shunt and close door
22. Drain program is in progress
23. Screen message indicates “*The dialyzer is being emptied*”
24. Once the dialyzer is completely drained, screen message indicates, “*The dialyzer is now empty. Please insert both dialysate couplings into the shunt interlock.*”
25. Cap the blue end of the dialyzer
26. Open the shunt door and place the **red** dialysate coupling onto the shunt and close door
27. **Cap** the **red** end of the dialyzer
28. Open the doors and remove the blood lines
29. Select disinfection mode
30. Perform external cleaning as per external cleaning procedure

Taking blood samples from CENTRAL VENOUS CATHETER (CVC) – Pre and Post Hemodialysis

Pre-dialysis

Equipment

- Vacutainer needle – Luer-Lok Access Device
- Discard-Vial – BD Vacutainer Vial – No Additive
- Blood collection vials
- Antiseptic wipes
- Centrifuge

Procedure

1. Wash hands
2. Proceed with cleaning one of the CVC ports as per protocol
3. Attach 10m syringe to the clean CVC port
4. Open clamp
5. Aspirate 3 – 5ml of blood
6. Close clamp
7. Attach the vacutainer to CVC port
8. Insert the discard-vial into vacutainer
9. Open port clamp
10. Allow discard-vial to fill
11. Remove discard-vial
12. Insert blood vial(s), collect sample(s)
13. Close port clamp
14. Remove vacutainer
15. Attach 10my syringe with normal saline to port and proceed with protocol for accessing CVC
16. Label the samples:
    - **Pre Dialysis**
    - **Your full Name**
    - **OHIP**
    - **Date of Birth**
17. Centrifuge the vials containing gel for 15 minutes
18. Place all vials in refrigerator or on an ice pack until you are able to deliver the blood specimens to the lab or home dialysis unit

Post-dialysis

Equipment

- Vacutainer needle – Luer-Lok Access Device
- Discard-Vial – BD Vacutainer Vial – No Additive
- Blood collection vials
- Antiseptic wipes
- Centrifuge

Procedure

1. Hand sanitize
2. Message – **Treatment goal achieved**
3. Proceed with reinfusion protocol
4. Cleans one of the CVC ports as per protocol
5. Attach 10m syringe to the clean CVC port
6. Open clamp
7. Aspirate 3 – 5ml of blood
8. Close clamp
9. Attach the vacutainer to the CVC port
10. Insert the discard-vial into vacutainer
11. Open port clamp
12. Allow discard-vial to fill
13. Remove discard-vial
14. Insert blood vial(s), collect sample(s)
15. Close port clamp
16. Remove vacutainer
17. Attach 10my syringe with normal saline to port and proceed with protocol to lock the CVC
    - **Post Dialysis**
    - **Your full Name**
    - **OHIP**
    - **Date of Birth**
18. Centrifuge the vials containing gel for 15 minutes
19. Place all vials in refrigerator or on an ice pack until you are able to deliver the blood specimens to lab or home dialysis unit

Taking blood samples from ARTERIOVENOUS FISTULA OR GRAFT (AVF or AVG) – Pre and Post Hemodialysis

Pre-dialysis

Equipment

- Vacutainer needle – Luer-Lok Access Device
- Blood collection vials
- Centrifuge

Procedure

1. Wash hands
2. Cannulate arterial needle as per protocol
   - Do not flush the needle
3. Clamp arterial needle
   - Note clamping may not be necessary, if needle has a hemostatic valve
4. Attach the vacutainer to the arterial needle
5. Open arterial needle clamp
6. Insert blood vial(s), collect sample(s)
7. Clamp arterial needle
8. Remove vacutainer
9. Attach 10my syringe with normal saline
10. Flush arterial needle
11. Clamp arterial needle
12. Proceed to cannulate the venous needle as per protocol
13. Label the samples:
    - **Pre Dialysis**
    - **Your full Name**
    - **OHIP**
    - **Date of Birth**
14. Centrifuge the vials containing gel for 15 minutes
15. Place all vials in refrigerator or on an ice pack until you are able to deliver the blood specimens to the lab or home dialysis unit

Post-dialysis

Equipment

- Vacutainer needle – Luer-Lok Access Device
- Discard-Vial – BD Vacutainer Vial – No Additive
- Blood collection vials
- Centrifuge

Procedure

1. Hand sanitize
2. Message – **Treatment goal achieved**
3. Reinfuse blood as per protocol
4. Clamp arterial needle
   - Note clamping may not be necessary, if needle has a hemostatic valve
5. Attach the vacutainer to the arterial needle
6. Insert the discard-vial into vacutainer
7. Open arterial needle
8. Allow discard-vial to fill
9. Clamp arterial needle
10. Remove discard-vial
11. Insert blood vial(s), collect sample(s)
12. Clamp arterial needle
13. Remove vacutainer
14. Attach 10my syringe with normal saline
15. Flush arterial needle
16. Clamp arterial needle
17. Proceed to remove the arterial and venous needles as per protocol
18. Label the samples:
    - **Post Dialysis**
    - **Your full Name**
    - **OHIP**
    - **Date of Birth**
19. Centrifuge the vials containing gel for 15 minutes
20. Place all vials in refrigerator or on an ice pack until you are able to deliver the blood specimens to lab or home dialysis unit