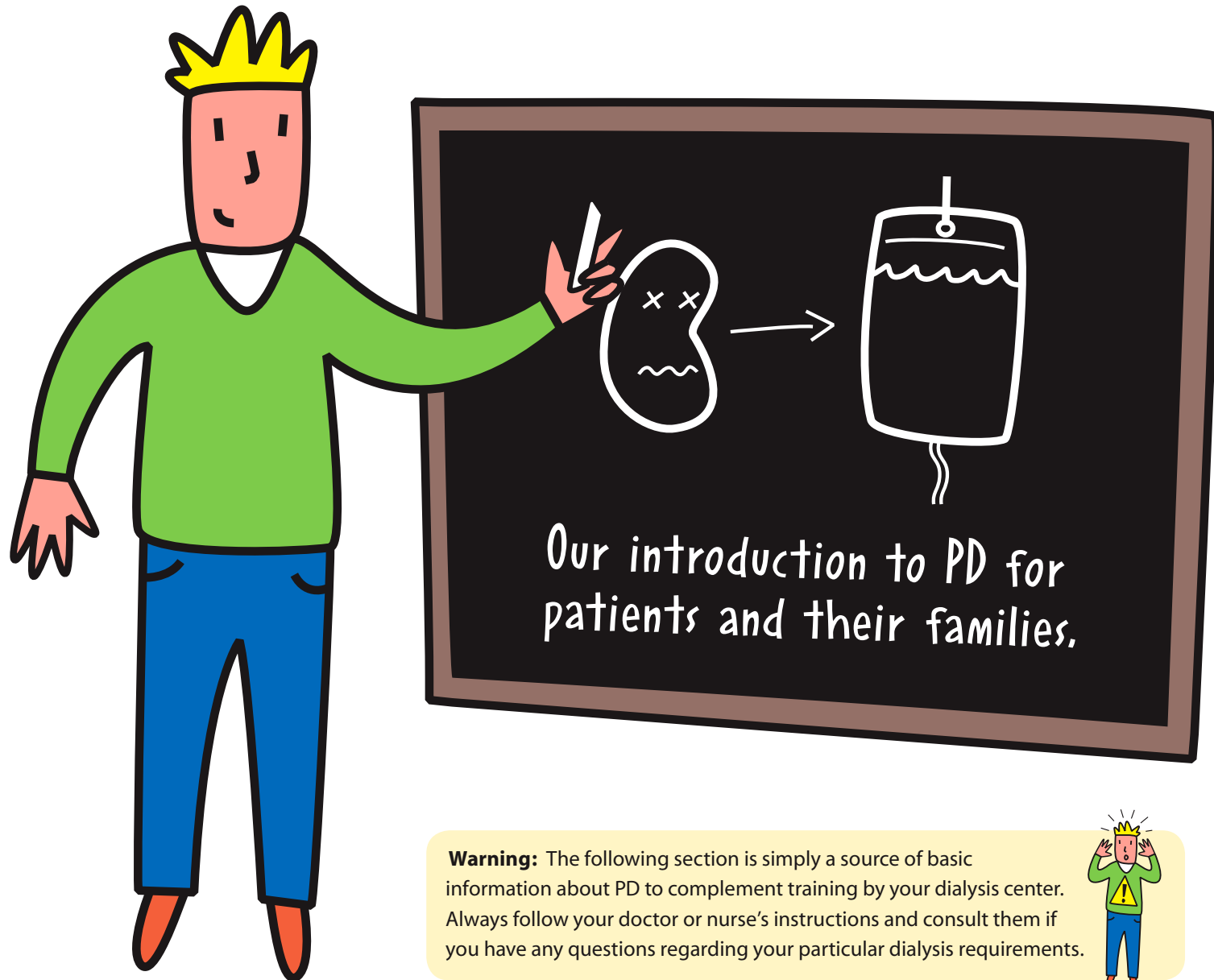


peritoneal dialysis 101



Warning: The following section is simply a source of basic information about PD to complement training by your dialysis center. Always follow your doctor or nurse's instructions and consult them if you have any questions regarding your particular dialysis requirements.



your kidneys

What are Kidneys?

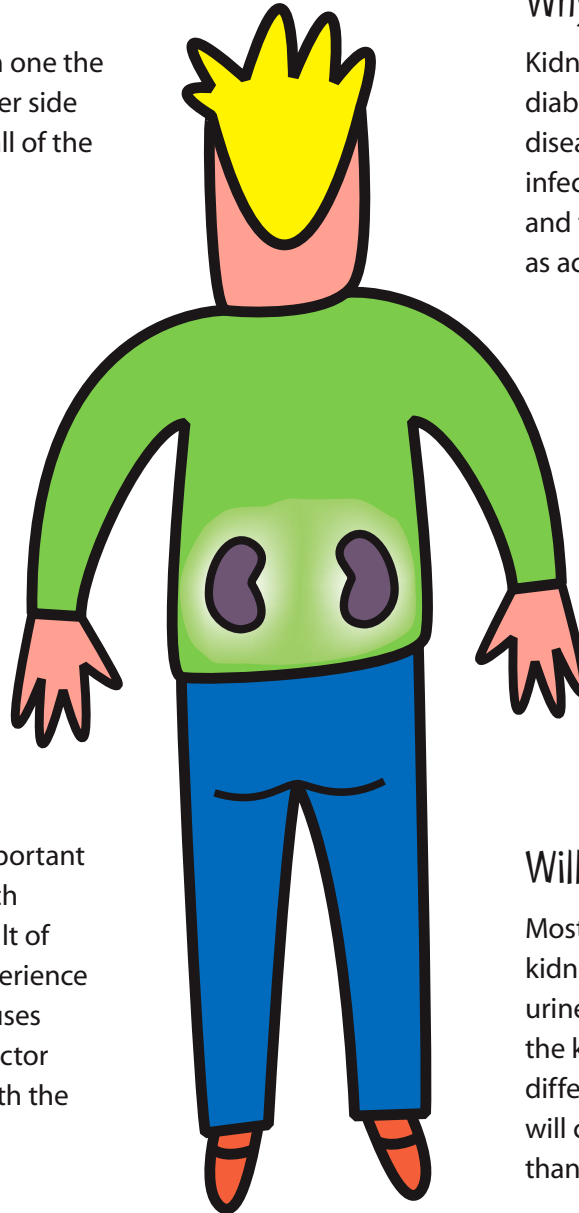
Most people have two kidneys, each one the size of a fist. They are located at either side of the backbone, just above the small of the back and level with the bottom rib.

What do they do?

Kidneys clean the blood by filtering out waste products and by balancing the body's water content. They do this by producing urine.

The kidneys also have other useful functions: they balance the amount of chemicals like potassium and sodium in the blood and they keep blood pressure under control.

Healthy kidneys also produce an important hormone called erythropoietin which helps build red blood cells. As a result of kidney failure, many people will experience a condition called anemia which causes fatigue and loss of appetite. Your doctor can prescribe medication to help with the symptoms of anemia.



Why do kidneys fail?

Kidneys fail for many reasons including diabetes, hypertension, hereditary kidney diseases such as polycystic kidney disease, infections such as glomerular nephritis, cancers and tumors, and sometimes from trauma such as accidents.

Diabetes and Kidney Failure

Diabetes is often confused with kidney disease but kidney disease does not cause diabetes. On the other hand, diabetes often causes kidney disease because diabetes narrows the blood vessels to the kidneys, starving them of blood. As a diabetic peritoneal dialysis patient, the calories in the PD solutions are taken into consideration.

Will I still pee?

Most likely yes, but expect a decrease as your kidneys lose more function. Just because urine is being produced does not mean that the kidneys are doing their job. Everyone is different, but generally speaking, PD patients will continue producing more urine for longer than patients on hemodialysis.



Good health before a transplant = better chances of success and quicker recovery, so eat well and don't miss exchanges!

peritoneal dialysis 101

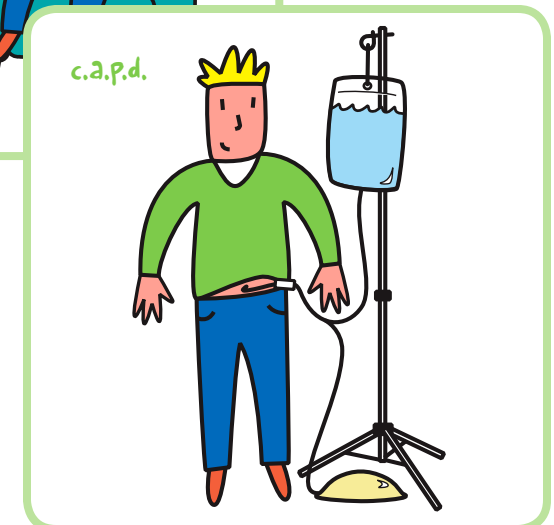
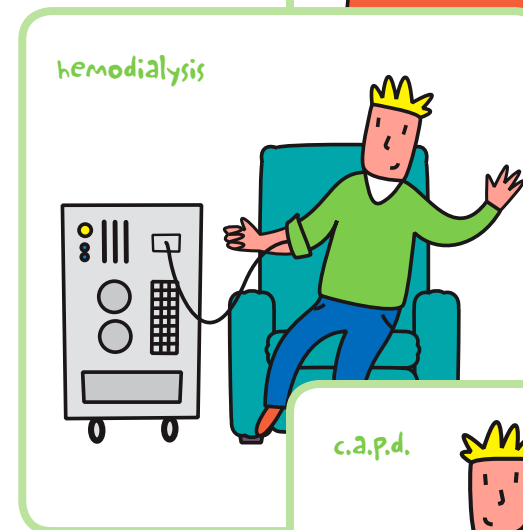
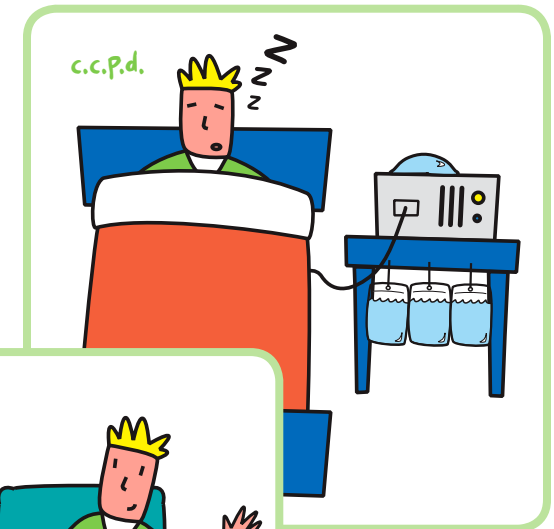
What is Dialysis?

Each day, healthy kidneys process 50 gallons of blood through 140 miles of tubes, and millions of filters called “nephrons”.

Dialysis is a medical treatment which replaces some of the functions of a healthy kidney. There are 2 types of dialysis: hemodialysis and peritoneal dialysis.

Hemodialysis is a treatment option which is usually performed at a hospital or clinic by a machine which is operated and monitored by the staff. Blood is removed from the patient’s body and passed through a specialized filter which removes waste and excess water. Before a person becomes a regular hemodialysis patient, surgery is required. This creates an access that allows for adequate blood flow to the machine via 2 large needles in the arm, or specialized tubes in the neck or chest. Hemodialysis is usually performed 3 times a week for 3 to 4 hours per treatment.

Unlike hemodialysis, blood never leaves the body during peritoneal dialysis (PD). Instead, PD makes use of the peritoneal membrane to act as the filter. Interestingly, this membrane’s designed function is simply to contain and protect the abdominal organs. In the early 1920’s, researchers discovered that when fluid was infused into the peritoneal cavity, the specialized cells of the membrane selectively allowed wastes and fluids to pass naturally from the bloodstream into the fluid.



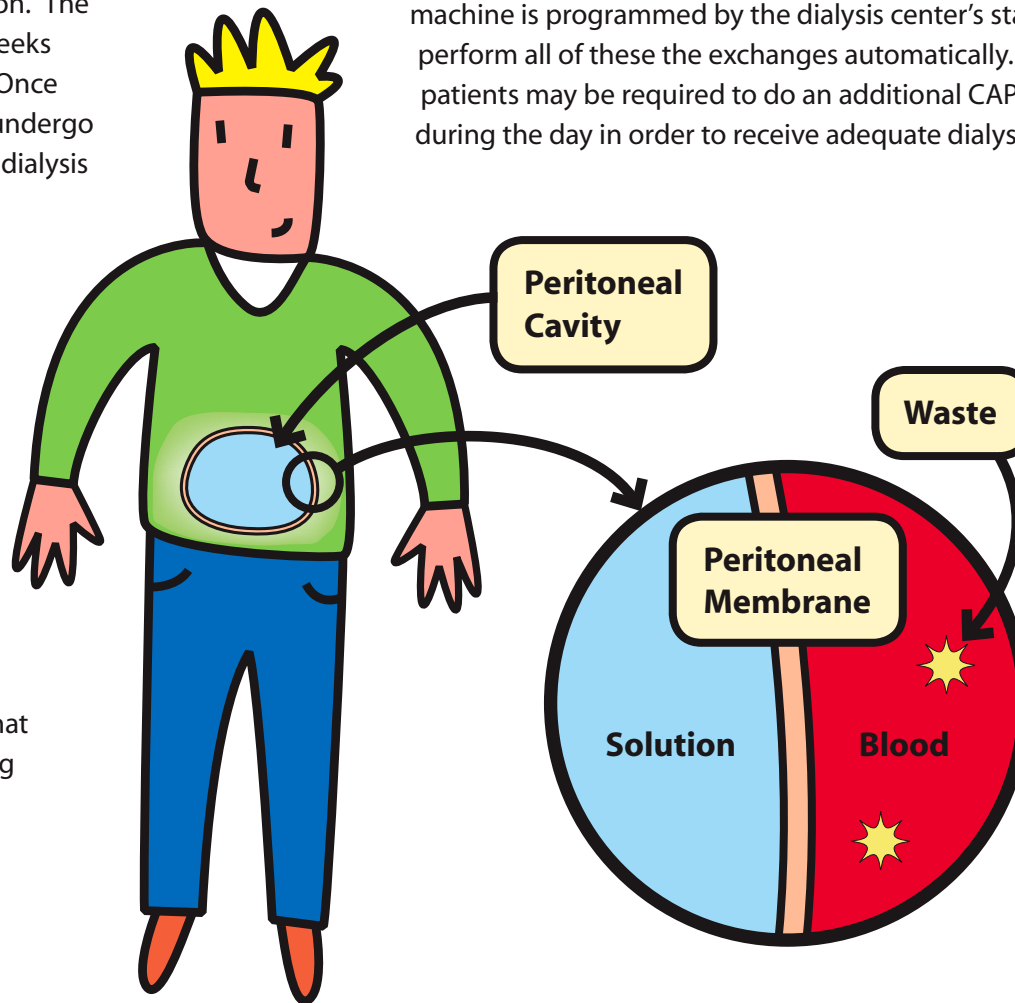
peritoneal dialysis 101

PD Basics

Before beginning PD, doctors must surgically place a soft flexible tube called a catheter into the peritoneal cavity. The place where the tube enters the skin is called the exit site, and is located a few inches from the belly button. The patient usually must wait about 3 to 6 weeks after this surgery before beginning PD. Once the exit site has healed, the patient will undergo a training program given by a nurse at a dialysis center. After the patient is trained, they are ready to do dialysis at home, on the road, or at work according to their own schedule (unlike hemodialysis!).

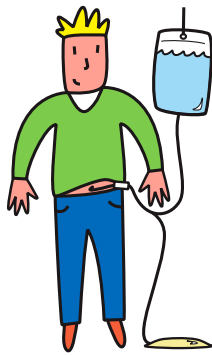
CAPD (Continuous ambulatory peritoneal dialysis) is one of 2 types of PD in which a person generally completes four to six exchanges every day. An exchange is the procedure that replaces old fluid for clean, fresh fluid. Page 25 illustrates the basic steps involved in CAPD. We've also tried to illustrate what happens at the membrane itself, showing waste particles and their movements.

CCPD (Continuous cycling peritoneal dialysis) uses a machine which the patient connects to during the night. Number of exchanges, dwell times and fill volumes are determined by the patient's doctor so that adequate dialysis is achieved. The machine is programmed by the dialysis center's staff to perform all of these the exchanges automatically. Some patients may be required to do an additional CAPD exchange during the day in order to receive adequate dialysis.



Discuss the option of CAPD vs. CCPD with your health professional to see what's best for you

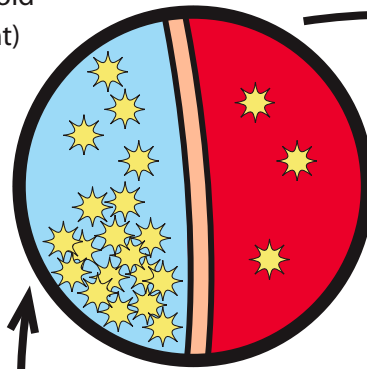
steps in c.a.p.d.



Drain

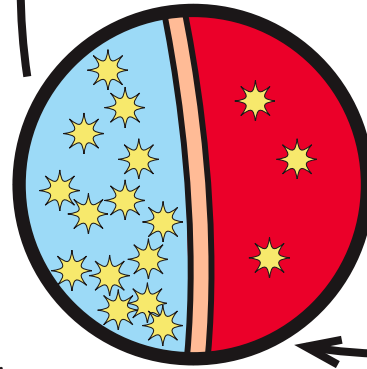
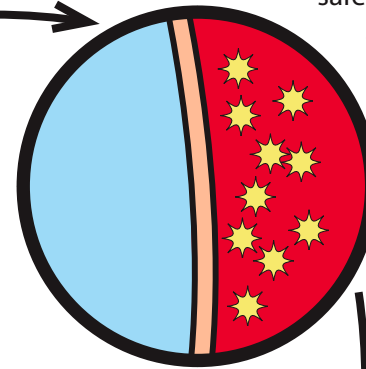
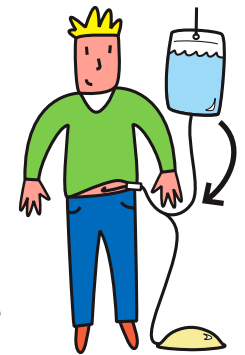
The patient connects the catheter to the double bag set and old fluid (effluent) flows into the drain bag by gravity.

The waste products leave the person's body with the effluent. This step takes about 10 to 15 minutes.



Fill

Fresh solution is allowed to flow into the peritoneum by snapping the safety seal in the tubing of the upper bag. It is very important to purge the air out of the fill line before allowing fluid to enter the peritoneum. Once the fill is completed, the patient disconnects from the double bag set and is free to carry on with his day. This step takes another 10 minutes.



Exchange Time

When the solution cannot absorb any more waste or water from the blood, it's time for an exchange.



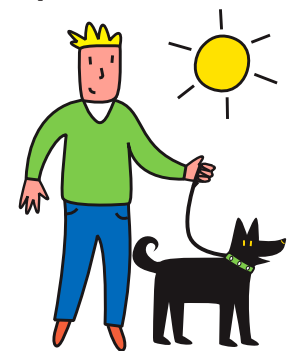
Sticking to your exchange time means you get optimal dialysis throughout the day and therefore better health!

Dwell

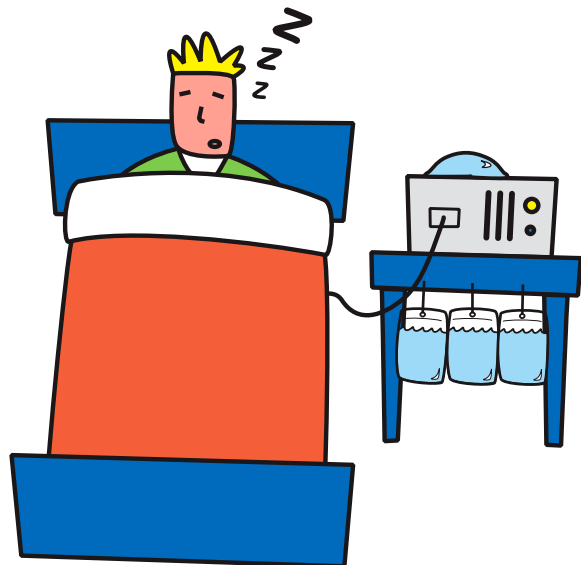
This is the time in between exchanges when the solution and peritoneal membrane do their work. **Waste products pass from the bloodstream into the fluid.**

This movement of particles is called diffusion.

Excess water also passes through the membrane the same way, this is called osmosis. The dwell time depends on the number of exchanges the person does per day.



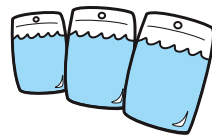
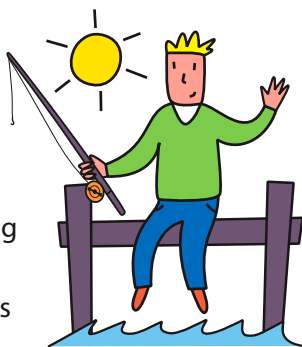
c.c.p.d.



CCPD

CCPD stands for Continuous Cycling Peritoneal Dialysis. It is sometimes referred to as APD or Automated Peritoneal Dialysis.

The cycler machine is programmed to perform several exchanges while you sleep, replacing some or all of the daytime exchanges required in CAPD.



...all about bags

Size

The size of a bag of solution is indicated in millilitres (mL). The volume of fluid will be prescribed to the patient depending on body size. The larger the body, the more fluid can fit inside. This is very convenient because a larger person also needs more dialysis because there is more blood to clean. CAPD bags generally come in sizes of 2000 mL, 2500 mL, and 3000 mL. There are also smaller sized for children and jumbo sized bags for CCPD. Each 1000 mL is equal to 1 litre, so for example, a 2000 mL bag is sometimes called a "2 litre bag". Oh, and 1 litre is just over a quart!

Concentration

Dialysis solutions come in different concentrations. These are indicated in percentages on the bags and boxes. The solutions are mostly water, but a certain percentage of it is glucose, dextrose, or other solute. These solutes draw water

from the bloodstream into the solution through the peritoneal membrane. The higher the solution's concentration, the more water it will remove with each exchange.

Why is water removal important? Well, remember that properly functioning kidneys would normally remove water from the blood, but now with little or no kidney function, the water would just keep building up in the blood. More water in the blood means more volume, which means more pressure... that's right: blood pressure... bad news for the heart as we all know! The last thing a kidney patient need is heart trouble! So that's why nurses teach (nag) patients to watch their fluid intake, weight (which tells you how much extra water you're carrying), and blood pressure. Your dialysis training nurse will teach you how to determine which bags to use, and how to monitor your weight and blood pressure.

Save your heart! Watch your salt and fluid intake!

cleanliness & infections

Peritoneal Infections

A peritoneal infection, also known as peritonitis, is caused by a bacterial or fungal invasion of the peritoneal membrane. Peritonitis is a problem often identified with PD, but is very preventable and treatable.

Causes: Peritoneal infections are caused by germs entering the peritoneum. The most common cause of peritonitis in PD patients occurs when the uncapped catheter touches an unclean surface during the connection stage of the exchange. Peritonitis can also occur from an untreated exit site infection which has made its way into the peritoneum. A less common route of infection can occur from the bloodstream or intestines.

Symptoms: Some of the more obvious symptoms are abdominal pain, fever, cloudy effluent, nausea and vomiting.

Prevention: Learn to make your connections accurately and quickly to minimize the chance of a touch infection. Follow your nurse's instructions in the event of a suspected touch contamination before continuing with that exchange. Follow the guidelines from dialysis training regarding cleanliness and hygiene.

Treatment: The environment inside the peritoneal fluid is perfect for germs to grow and spread, so getting yourself treated immediately is vital. Antibiotics are usually administered right into the peritoneum with fresh solution, making them very effective in their counter attack against the germs right at the peritoneal membrane. **So remember: time is your best weapon against peritonitis, so get treated fast!**

Exit Site Infections

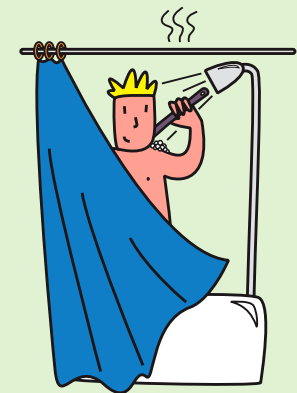
An exit site infection is an inflammation of the tissue in the area where the catheter comes out from the skin. This is more common during the early stages of PD while the exit site is healing, but can also happen anytime while a patient is on PD.

Symptoms: The early symptoms include redness and swelling at the exit site followed by pain and discharge from around the tube.

Causes and Prevention: The number one cause of this type of infection is improper maintenance of the exit site. To help prevent exit site infection, wash and dry your exit site thoroughly on a daily basis as you were trained to. Another cause of exit site infection is from tugging of the catheter with enough force which can damage the surrounding tissue or displace the tube. Always use care when handling the catheter to prevent this type of damage.

Treatment: Exit site infections are usually treated with daily dressing changes, antibiotic drugs and/or creams. In the most severe cases, the catheter is removed, and replaced in a different location. **Every patient should strive to have a nice, clean exit site, so follow your nurse's daily maintenance instructions religiously!**

Both types of infection should be taken very seriously, but they are preventable. They should not make you afraid of PD. Many patients go for years without any problems at all! Just follow your training for good exit site care and proper exchange technique to minimize your chances of any problems.



your nephro-team

PD Pit Crew

When you begin either type of dialysis, you'll be taken care of by a team of highly specialized professionals, each one essential to your well-being... but only if you make use of them. Take their advice seriously, and don't ever be afraid to ask questions or clarification on something you may not understand.



The **Nephrologist** is the doctor who specializes in kidneys. You will probably see him or her during your regular clinic visits. Your nephrologist will prescribe drugs and dialysate to you, monitor and interpret your blood test results, and if necessary, refer you to other specialists.



Your **PD Nurse** is the person you'll spend the most time with, particularly during the early training part of starting PD. He or she coordinates all aspects of your care.



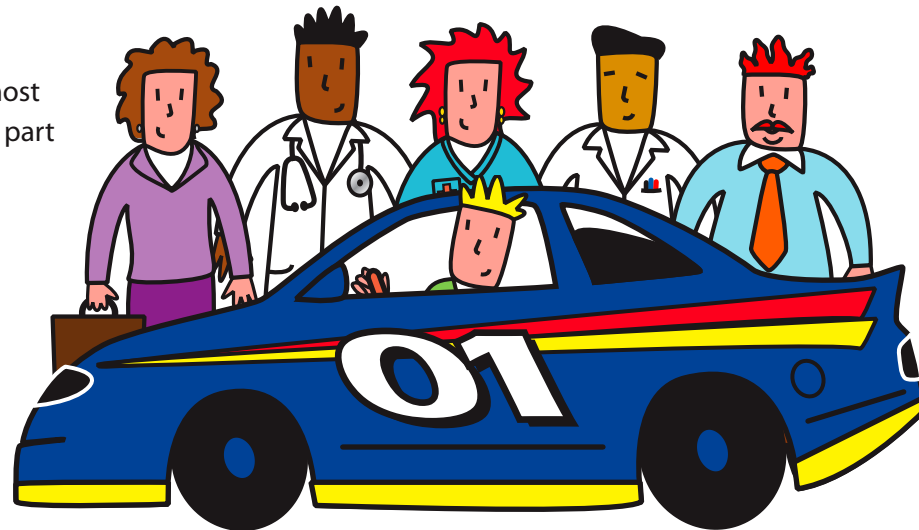
The **Pharmacist** is highly trained in the "chemistry" of the drugs you'll be taking and will guide you on how and when to take your medications. Many drugs interact with each other, so be sure to tell your pharmacist about all the other medications you take, including over the counter drugs, vitamins, supplements, and herbal remedies.



Eating the correct foods is as crucial as taking your medications and **Dieticians** are experts in food choices and preparation. They will help with meal planning, and they have helpful hints on making the right foods taste better.



Your **Social Worker** is often overlooked by patients, but offers a wealth of information and help with community resources, insurance, home health, travel needs, support groups, educational resources and just about any other personal needs other members of your Nephro-Team don't help with.



You chose PD over Hemodialysis and now **you** are the most important person in your health care. Use your nephro-team to help guide you through dialysis, diet, exercise, medication, and hygiene like a race car driver uses his pit crew to keep him fueled up and running strong.

Exercise regularly for a healthy heart and increased energy levels. Check with your doctor first.

4 important elements in the p.d. diet...

Sodium

Sodium is the most talked about element in every kidney diet because it has the most effect on the kidney patient. It works as simply as this: salt makes you thirsty, and when you quench that thirst you add water to your body. This isn't a problem in a healthy person, but to a person with bad kidneys, that water's got nowhere to go, and as we mentioned earlier, more water in your blood means more volume and more pressure.

If you have too much salt in your diet, and then drink too much, that extra water will show up as swelling in the ankles, give you high blood pressure and headaches. Ignore these symptoms and you'll soon damage your heart and increase your chances of a heart attack or stroke.

As a PD patient, do your best to avoid salty foods, especially fast food and highly processed foods like jerky or ready-to-eat meals which use salt as a preservative. Avoid adding salt to your food. We're not going to lie to you: Controlling salt and fluid intake is going to be the most difficult part of the PD diet, but it is also the most important part of making you feel better and live longer.



Potassium

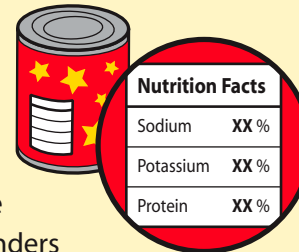
Potassium is vital to control muscle contractions and is most common in fruits and vegetables. In a person with healthy kidneys, excess potassium is passed in urine. In a kidney patient, it just builds up in the bloodstream.



The heart is a pretty important muscle, and needs to contract and relax constantly to keep you living, so needless to say, PD patients need to watch their potassium very carefully. High potassium levels in your blood will have serious consequences which usually come without warning: we're talking about sudden heart attacks!

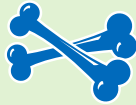
Be sure you understand where potassium is found in your diet, and do your best to control it.

The nutritional information labels on all store-bought foods have most of the information you need to help guide you when eating, shopping, and cooking. Do your best to keep an eye on the elements important to the PD diet and take your phosphate binders with all meals. Phosphorus is not on these labels, but is in all food anyways.



...and how they affect you!

Phosphorus



Phosphorus works to balance healthy calcium levels in your body. Optimal levels promote strong bones. In a kidney patient, elevated phosphorus levels cause calcium to be drawn out from your bones in your body's attempt to maintain this balance.

Losing control of your phosphorus and/or calcium will result in dry, itchy skin and eventually your bones will weaken, making them prone to breaks. The damage caused to bones from ignoring phosphorus levels is very difficult to reverse.

You'll be instructed by your Nephro-Team to take phosphate binders such as Tums, calcium carbonate pills, or prescription drugs such as Renagel. Phosphorus is in all foods, so they must be taken when you eat. This is vitally important because they work in your gut, bonding with the phosphorus in food and going right through you without being absorbed.

We've deliberately avoided lists of foods here telling you what to eat and not to eat. It's up to you to make use of your dietician who will educate you more specifically on different food choices.



Try making a list of what you currently like to eat and how you like it prepared. Your dietician will help you make adjustments to your diet to make it more PD-friendly while keeping you and your taste buds as happy as possible.

Protein



Protein is responsible for rebuilding muscle and tissue in your body and is most abundant in meats and fish. The jury is still out amongst renal experts regarding protein intake, particularly for PD patients who can lose large amounts of protein in their effluent, so follow your Nephro-Team's advice on what is best for you.

Too much protein in the PD patient shows up as elevated creatinine and urea levels, adding stress to your internal organs. This will make you tired and cloud your memory and thinking. In the long term, elevated creatinine and urea levels can damage your internal organs. These levels are checked with your regular bloodwork during your visits to the clinic or hospital.

If you have a problem with elevated creatinine and urea levels due to high protein intake, your nephrologist will suggest you lower the amount in your diet. Talk to your dietitian about ways to reduce the protein in your diet.

Not all "Renal Diets" are PD diets - be careful of what you read in books or on the internet!

glossary

Adequacy: A term that refers to how well your dialysis is working. To measure adequacy, tests are carried out to see if enough fluid and waste products are being removed from your blood.

Ambulatory: This is the “A” in CAPD. It means mobile!

Anemia: A condition that occurs when there are too few red blood cells in the blood. Red blood cells bring oxygen to cells in the body. A person who has anemia usually feels weak and tired all the time.

Blood Pressure: The pressure of the blood against the inner walls of the blood vessels. Blood pressure varies with health, age, and stress levels.

CAPD: Stands for “continuous ambulatory peritoneal dialysis”. Sometimes referred to as a manual exchange.

CCPD: Stands for “continuous cycling (cyclic) peritoneal dialysis.” A machine performs the peritoneal dialysis solution exchanges in regular cycles. Also known as Automated Peritoneal Dialysis (APD).

Catheter: A slender tube inserted into a body passage or blood vessel for passing or removing fluids.

Creatinine: Creatinine is a by-product of muscle activity. It is measured as part of a

patients lab work to determine the adequacy of dialysis or renal function.

Cycler: A machine that performs peritoneal dialysis solution exchanges in regular cycles in CCPD.

Diabetes: A chronic health condition where the body is unable to produce insulin and properly break down sugar in the blood.

Dialysate: Dialysis solution or fluid.

Dialysis: A way to partially replace the work of the kidneys. With dialysis, the blood is cleaned either by using a special solution and the tissues within the body (peritoneal dialysis) or with an artificial kidney machine (hemodialysis).

Dry Weight: A renal patient’s ideal weight. It’s used as a baseline to properly monitor and help control the amount of fluid a patient’s body is retaining.

Dwell: The time that the fluid stays in the peritoneum between exchanges.

Effluent: The drained waste fluid from a peritoneal dialysis exchange.

Hemodialysis: The word hemo means blood. During hemodialysis treatment blood is pumped outside the body through a dialyzer that acts like an artificial kidney. This device

removes the extra fluids and wastes and returns the clean blood to the body.

Hypertension: High blood pressure. Can be a major side effect in dialysis patients who don’t control their fluid levels. Will lead to many serious complications including heart problems.

Hypotension: Low blood pressure. Can also be a major problem in dialysis patients who have too much fluid loss. Symptoms include dizziness and thirst.

Nephrons: The small unit in the kidney, made up of small blood vessels (glomeruli) and tubules which produce urine.

Peritoneal Cavity: The peritoneum is a membrane that lines the abdomen. The peritoneal cavity is the space contained by this membrane.

Peritoneal Membrane: The lining of the abdominal cavity.

Peritonitis: Inflammation of the peritoneal membrane, usually caused by infection, is bad news for PD patients.

Ultrafiltration: Extra fluid gets pulled through the peritoneal membrane by using a solution with a higher concentration.