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Subject: Re: PKD-PLD CAPD and CCPD dialysis
Date: October 14, 2006 3:56:28 PM HST
To: pkd@topica.com



The usual schedule is 5 to 7 nights a week for 6 to 8 hours at a time for peritoneal dialysis (home dialysis). Most patients take one night off a week. Who qualifies for nightly home dialysis?

There are actually very few restrictions on who can enter an NHD program. People who would benefit from it specifically include (in no particular order):

- Patients who have problems with low blood pressure on hemodialysis, or very high weight gains: because NHD is performed over a longer period, lower blood flows and lower rates of fluid removal can be used. This is a much more gentle approach, and blood pressure is generally well maintained throughout the night, even if large weight gains occur.
- Large patients who do not get enough dialysis on a three times weekly schedule: some people can't get enough dialysis this way, and remain quite sick, with symptoms of kidney disease despite dialysis. Because more dialysis is delivered by NHD, these symptoms can then improve.
- People who live far from a dialysis unit: not everyone lives close to a hospital that can provide hemodialysis. NHD may offer a viable option for them.
- People unlikely to be transplanted in the near future.

Please note that this list is not a checklist of criteria to qualify for NHD, but merely examples of individuals who may benefit from the program in a specific way.

What are the benefits of NHD?

There are many. More dialysis is delivered on a more frequent basis, so that the situation is much closer to having better kidney function.

- Better blood pressure control- most patients with high blood pressure take less or no blood pressure pills on NHD.
- Unrestricted diet: People on NHD eat a normal diet with no fluid restriction. The main exception is diabetic patients- a low sugar diet should still be followed. If you are on Hemo you are on a strict diet of low low fluid,phos and low potassium which is hard to keep normal
- Quality of life: NHD patients report more energy, thinking more clearly, improved sexual function. Many even can return to work. Despite what one might think, a recent study has shown that sleep actually improves on NHD.
- Less medication: blood pressure pills, calcium pills and erythropoietin (prevents anemia) are reduced in dose or discontinued.

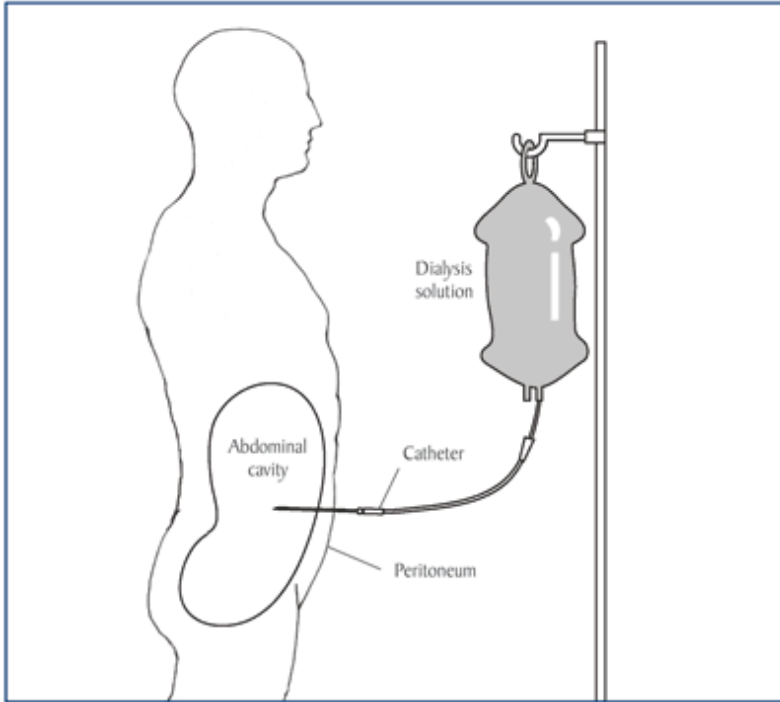
Is this dangerous?

To prevent accidental disconnection of the dialysis tubing during the night, the connections are reinforced with safety valves and locking boxes. Also, the dialysis run is monitored via the internet by a trained observer at the hospital. In seven years of experience in Toronto there have been no complications of accidental disconnection.

After an initial assessment by the NHD team regarding suitability for the program, patient training, with or without a partner, will commence. Training takes approximately six weeks. Some modifications to plumbing and electrical supply in the home are required, and internet connection will be established. After the patient returns home, clinic visits to monitor progress occur once monthly.

In PD, a soft tube called a catheter is used to fill your abdomen with a cleansing liquid called dialysis solution. The walls of your abdominal cavity are lined with a membrane called the peritoneum, which allows waste products and extra fluid to pass from your blood into the dialysis solution. The solution contains a sugar called dextrose that will pull wastes and extra fluid into the abdominal cavity. These wastes and fluid then leave your body when the dialysis solution is drained. The used solution, containing wastes and extra fluid, is then thrown away. The process of draining and filling is called an exchange and takes about 30 to 40 minutes. The period the dialysis solution is in your abdomen is called the dwell time. A typical schedule calls for four exchanges a day, each with a dwell time of 4 to 6 hours. Different types of PD have different schedules of daily exchanges.

One form of PD, continuous ambulatory peritoneal dialysis (CAPD), doesn't require a machine. As the word ambulatory suggests, you can walk around with the dialysis solution in your abdomen. Another form of PD, continuous cycler-assisted peritoneal dialysis (CCPD), requires a machine called a cycler to fill and drain your abdomen, usually while you sleep. CCPD is also sometimes called automated peritoneal dialysis (APD).



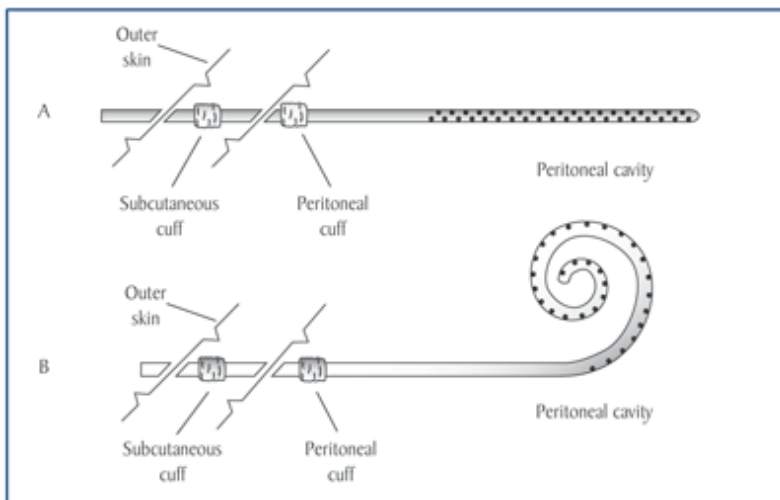
Peritoneal dialysis.

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Getting Ready for PD

Whether you choose an ambulatory or automated form of PD, you'll need to have a soft catheter placed in your abdomen. The catheter is the tube that carries the dialysis solution into and out of your abdomen. If your doctor uses open surgery to insert your catheter, you will be placed under general anesthesia. Another technique requires only local anesthetic. Your doctor will make a small cut, often below and a little to the side of your navel (belly button), and then guide the catheter through the slit into the peritoneal cavity. As soon as the catheter is in place, you can start to receive solution through it, although you probably won't begin a full schedule of exchanges for 2 to 3 weeks. This break-in period lets you build up scar tissue that will hold the catheter in place.

The standard catheter for PD is made of soft tubing for comfort. It has cuffs made of a polyester material, called Dacron, that merge with your scar tissue to keep it in place. The end of the tubing that is inside your abdomen has many holes to allow the free flow of solution in and out.



Two double-cuff Tenckhoff peritoneal catheters: standard (A), curled (B).

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Types of PD

The type of PD you choose will depend on the schedule of exchanges you would like to follow, as well as other factors. You may start with one type of PD and switch to another, or you may find that a combination of automated and non-automated exchanges suits you best. Work with your health care team to find the best schedule and techniques to meet your lifestyle and health needs.

Continuous Ambulatory Peritoneal Dialysis (CAPD)

If you choose CAPD, you'll drain a fresh bag of dialysis solution into your abdomen. After 4 to 6 or more hours of dwell time, you'll drain the solution, which now contains wastes, into the bag. You then repeat the cycle with a fresh bag of solution. You don't need a machine for CAPD; all you need is gravity to fill and empty your abdomen. Your doctor will prescribe the number of exchanges you'll need, typically three or four exchanges during the day and one evening exchange with a long overnight dwell time while you sleep.

Continuous Cycler-Assisted Peritoneal Dialysis (CCPD)

CCPD uses an automated cycler to perform three to five exchanges during the night while you sleep. In the morning, you begin one exchange with a dwell time that lasts the entire day.

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Customizing Your PD

If you've chosen CAPD, you may have a problem with the long overnight dwell time. It's normal for some of the dextrose in the solution to cross into your body and become glucose. The absorbed dextrose doesn't create a problem during short dwell times. But overnight, some people absorb so much dextrose that it starts to draw fluid from the peritoneal cavity back into the body, reducing the efficiency of the exchange. If you have this problem, you may be able to use a minicycler (a small version of a machine that automatically fills and drains your abdomen) to exchange your solution once or several times overnight while you sleep. These additional, shorter exchanges will minimize solution absorption and give you added clearance of wastes and excess fluid.

If you've chosen CCPD, you may have a solution absorption problem with the daytime exchange, which has a long dwell time. You may find you need an additional exchange in the mid-afternoon to increase the amount of waste removed and to prevent excessive absorption of solution.

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Preventing Problems

Infection is the most common problem for people on PD. Your health care team will show you how to keep your catheter bacteria-free to avoid peritonitis, which is an infection of the peritoneum. Improved catheter designs protect against the spread of bacteria, but peritonitis is still a common problem that sometimes makes continuing PD impossible. You should follow your health care team's instructions carefully, but here are some general rules:

- Store supplies in a cool, clean, dry place.
- Inspect each bag of solution for signs of contamination before you use it.
- Find a clean, dry, well-lit space to perform your exchanges.
- Wash your hands every time you need to handle your catheter.
- Clean the exit site with antiseptic every day.
- Wear a surgical mask when performing exchanges.

Keep a close watch for any signs of infection and report them so they can be treated promptly. Here are some signs to watch for:

- Fever
- Nausea or vomiting
- Redness or pain around the catheter
- Unusual color or cloudiness in used dialysis solution
- A catheter cuff that has been pushed out

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Equipment and Supplies for PD

Transfer Set

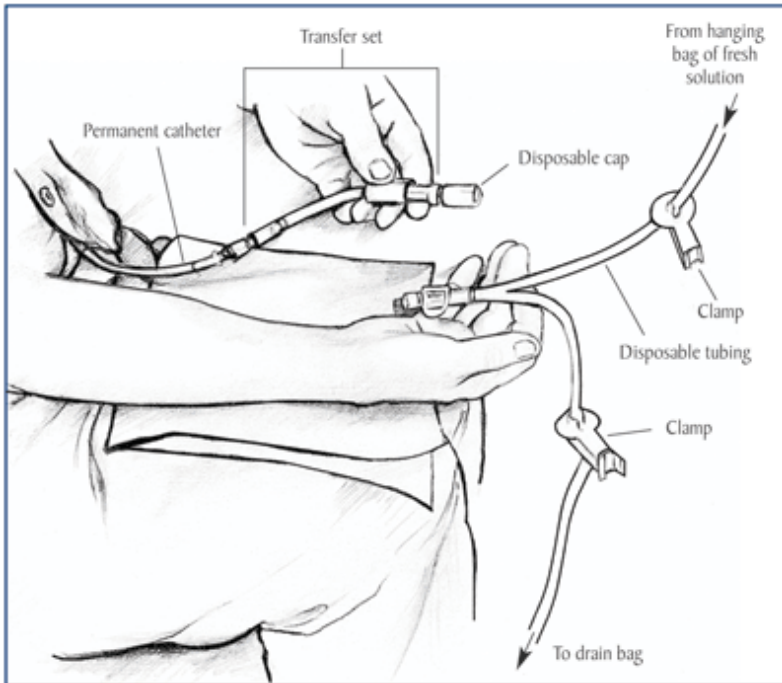
A transfer set is tubing that connects the bag of dialysis solution to the catheter. When your catheter is first placed, the exposed end of the tube will be securely capped to prevent infection. Under the cap is a universal connector.

When you start dialysis training, your dialysis nurse will provide a transfer set. The type of transfer set you receive depends on the company that supplies your dialysis solution. Different companies have different systems for connecting to your catheter.

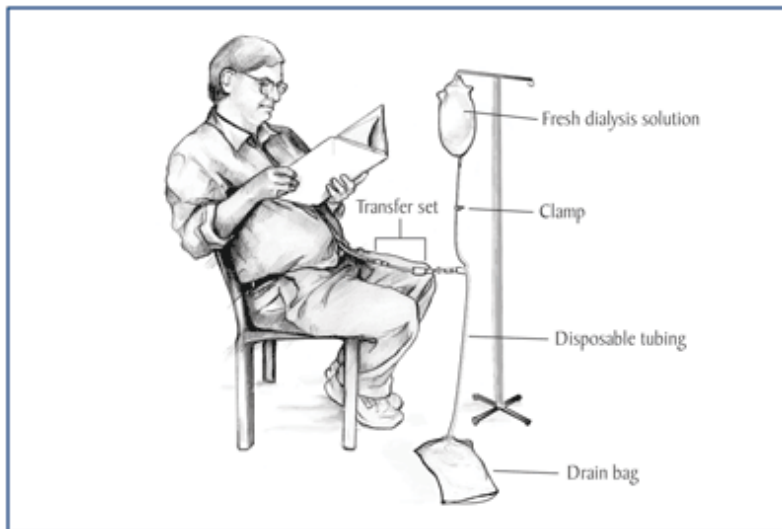
Connecting the transfer set requires sterile technique. You and your nurse will wear surgical masks. Your nurse will soak the transfer set and the end of

your catheter in an antiseptic solution for 5 minutes before making the connection. The nurse will wear rubber gloves while making the connection.

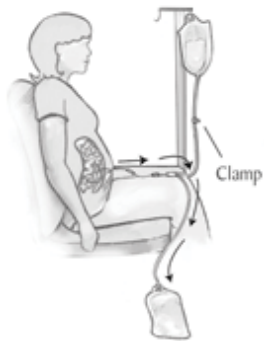
Depending on the company that supplies your solution, your transfer set may require a new cap each time you disconnect from the bag after an exchange. With a different system, the tubing that connects to the transfer set includes a piece that can be clamped at the end of an exchange and then broken off from the tubing so that it stays on the transfer set as a cap until it is removed for the next exchange. Your dialysis nurse will train you in the aseptic (germ-free) technique for connecting at the beginning of an exchange and disconnecting at the end. Follow instructions carefully to avoid infection.



Transfer set. Between exchanges, you can keep your catheter and transfer set hidden inside your clothing. At the beginning of an exchange, you will remove the disposable cap from the transfer set and connect it to a Y-tube. The branches of the Y-tube connect to the drain bag and the bag of fresh dialysis solution. Always wash your hands before handling your catheter and transfer set, and wear a surgical mask whenever you connect or disconnect.



During an exchange, you can read, talk, watch television, or sleep.



The first step of an exchange is to drain the used dialysis solution from the peritoneal cavity into the drain bag. Near the end of the drain, you may feel a mild “tugging” sensation that tells you most of your fluid is gone.



After the used solution is removed from your abdomen, you will close or clamp the transfer set and let some of the fresh solution flow directly into the drain bag. This flushing step removes air from the tubes.



The final step of the exchange is to refill the peritoneal cavity with fresh dialysis solution from the hanging bag.

Dialysis Solution

Dialysis solution comes in 1.5-, 2-, 2.5-, or 3-liter bags. A liter is slightly more than 1 quart. The dialysis dose can be increased by using a larger bag, but only within the limit of the amount your abdomen can hold. The solution contains a sugar called dextrose, which pulls extra fluid from your blood. Your doctor will prescribe a formula that fits your needs.

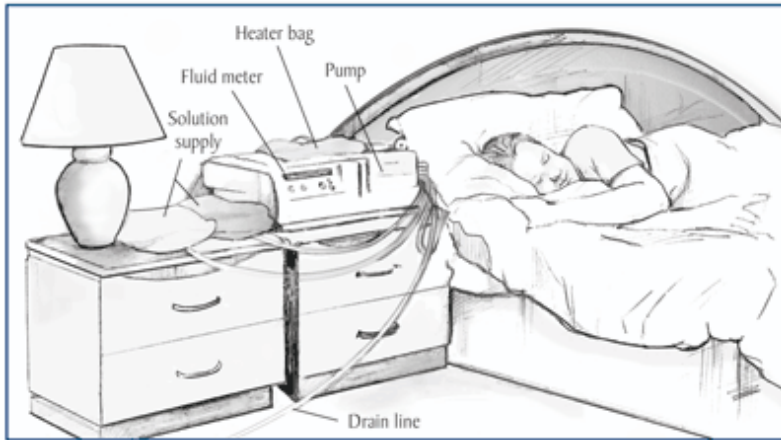
You'll need a clean space to store your bags of solution and other supplies. You may also need a special heating device to warm each bag of solution to body temperature before use. Most solution bags come in a protective outer wrapper that allows for microwave heating. Do not microwave a bag of solution after it has been removed from its wrapper because microwaving can change the chemical makeup of the solution.

Cycler

The cycler—which automatically fills and drains your abdomen, usually at night while you sleep—can be programmed to deliver specified volumes of dialysis solution on a specified schedule. Most systems include the following components:

- **Solution storage.** At the beginning of the session, you connect bags of dialysis solution to tubing that feeds the cycler. Most systems include a separate tube for the last bag because this solution may have a higher dextrose content so that it can work for a day-long dwell time.

- **Pump.** The pump sends the solution from the storage bags to the heater bag before it enters the body and then sends it to the disposal container or drain line after it's been used. The pump doesn't fill and drain your abdomen; gravity performs that job more safely.
- **Heater bag.** Before the solution enters your abdomen, a measured dose is warmed to body temperature. Once the solution is the right temperature and the previous exchange has been drained, a clamp is released to allow the warmed solution to flow into your abdomen.
- **Fluid meter.** The cycler's timer releases a clamp to let the used dialysis solution drain from your abdomen into a disposal container or drain line. As the solution flows through the tube, a fluid meter in the cycler measures and records how much solution has been removed. Some systems compare the amount of solution inserted with the amount drained and display the net difference between the two volumes. This lets you know whether the treatment is removing enough fluid from your body.
- **Disposal container or drain line.** After the used solution is weighed, it's pumped to a disposal container that you can throw away in the morning. With some systems, you can dispose of the used fluid directly by stringing a long drain line from the cycler to a toilet or bathtub.
- **Alarms.** Sensors will trigger an alarm and shut off the machine if there's a problem with inflow or outflow.



Cycler. A cycler performs four or five exchanges overnight, while you sleep.

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Testing the Effectiveness of Your Dialysis

To see if the exchanges are removing enough waste products, such as urea, your health care team must perform several tests. These tests are especially important during the first weeks of dialysis to determine whether you're receiving an adequate amount, or dose, of dialysis.

The peritoneal equilibration test (often called the PET) measures how much sugar has been absorbed from a bag of infused dialysis solution and how much urea and creatinine have entered into the solution during a 4-hour exchange. The peritoneal transport rate varies from person to person. If you have a high rate of transport, you absorb sugar from the dialysis solution quickly and should avoid exchanges with a very long dwell time because you're likely to absorb too much solution from such exchanges.

In the clearance test, samples of used solution drained over a 24-hour period are collected, and a blood sample is obtained during the day when the used solution is collected. The amount of urea in the used solution is compared with the amount in the blood to see how effective the PD schedule is in removing urea from the blood. For the first months or even years of PD treatment, you may still produce small amounts of urine. If your urine output is more than several hundred milliliters per day, urine is also collected during this period to measure its urea concentration.

From the used solution, urine, and blood measurements, your health care team can compute a urea clearance, called Kt/V , and a creatinine clearance rate (adjusted to body surface area). The residual clearance of the kidneys is also considered. These measurements will show whether the PD prescription is adequate.

If the laboratory results show that the dialysis schedule is not removing enough urea and creatinine, the doctor may change the prescription by

- increasing the number of exchanges per day for patients treated with CAPD or per night for patients treated with CCPD
- increasing the volume of each exchange (amount of solution in the bag) in CAPD
- adding an extra, automated middle-of-the-night exchange to the CAPD schedule
- adding an extra middle-of-the-day exchange to the CCPD schedule

Compliance

One of the big problems with PD is that patients sometimes don't perform all of the exchanges prescribed by their medical team. They either skip exchanges or sometimes skip entire treatment days when using CCPD. Skipping PD treatments has been shown to increase the risk of hospitalization and death.

Itching (Pruritus)

Many people treated with peritoneal dialysis complain of itchy skin. Itching is common even in people who don't have kidney disease; with kidney failure, however, itching can be made worse by uremic toxins in the blood that dialysis doesn't adequately remove. The problem can also be related to high levels of parathyroid hormone (PTH). Some people have found dramatic relief after having their parathyroid glands removed. But a cure that works for everyone has not been found. Phosphate binders seem to help some people; others find relief after exposure to ultraviolet light. Still others improve with EPO shots. A few antihistamines (Benadryl, Atarax, Vistaril) have been found to help; also, capsaicin cream applied to the skin may relieve itching by deadening nerve impulses. In any case, taking care of dry skin is important. Applying creams with lanolin or camphor may help.

Sleep Disorders

Patients on dialysis often have insomnia, and some people have a specific problem called sleep apnea syndrome. Episodes of apnea are breaks in breathing during sleep. Over time, these sleep disturbances can lead to "day-night reversal" (insomnia at night, sleepiness during the day), headache, depression, and decreased alertness. The apnea may be related to the effects of advanced kidney failure on the control of breathing. Treatments that work with people who have sleep apnea, whether they have kidney failure or not, include losing weight, changing sleeping position, and wearing a mask that gently pumps air continuously into the nose, called nasal continuous positive airway pressure (CPAP).

Many people on dialysis have trouble sleeping at night because of aching, uncomfortable, jittery, or restless legs. You may feel a strong impulse to kick or thrash your legs. Kicking may occur during sleep and disturb a bed partner throughout the night. Theories about the causes of this syndrome include nerve damage and chemical imbalances.

Moderate exercise during the day may help, but exercising a few hours before bedtime can make it worse. People with restless leg syndrome should reduce or avoid caffeine, alcohol, and tobacco; some people also find relief with massages or warm baths. A class of drugs called benzodiazepines, often used to treat insomnia or anxiety, may help as well. These prescription drugs include Klonopin, Librium, Valium, and Halcion. A newer and sometimes more effective therapy is levodopa (Sinemet), a drug used to treat Parkinson's disease.

Sleep disorders may seem unimportant, but they can impair your quality of life. Don't hesitate to raise these problems with your nurse, doctor, or social worker.

Amyloidosis

Dialysis-related amyloidosis (DRA) is common in people who have been on dialysis for more than 5 years. DRA develops when proteins in the blood deposit on joints and tendons, causing pain, stiffness, and fluid in the joints, as is the case with arthritis. Working kidneys filter out these proteins, but dialysis is not as effective.

Adjusting to Changes

You can do your exchanges in any clean space, and you can take part in many activities with solution in your abdomen. Even though PD gives you more flexibility and freedom than hemodialysis, which requires being connected to a machine for 3 to 5 hours three times a week, you must still stick to a strict schedule of exchanges and keep track of supplies. You may have to cut back on some responsibilities at work or in your home life. Accepting this new reality can be very hard on you and your family. A counselor or social worker can help you cope.

The only way to tell how one does on dialysis is when they do it everyone handles it differently. One thing for me was I controlled my own treatments, which means I told them how much fluid to take off and I was on hemo. At the beginning they were taking me to low and the result was low BP, very nausea, light headed, sometimes unable to walk and lethargic, BUT once I found out I could control my own dialysis I did. The staff performed it but I said how much, after that I was able to drive myself and do what I wanted even shopping. One can drink while on dialysis. I never did. It seemed to me it defeated the purpose of hemo dialysis. I also only ate ice all the time; no drinking of any fluid ever, while going to dialysis to keep fluid intake at a minimum so a majority of times I just had to have my blood cleaned no fluid removed and that's even better. You will get epogen before getting off which is for anemia and heparin a blood thinner. Both are given when they return some fluid to flush out the tubing. It is injected into the tubing. You should always be in control of your dialysis. One thing too with peritoneal dialysis you don't need a fistula which is great!! I had a catheter and as I said before it calcified and I still have it in my neck permanently.