



Patient education: Peritoneal dialysis (Beyond the Basics)

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OVERVIEW

Peritoneal dialysis (PD) is a procedure that can be used by people whose kidneys are no longer working effectively. It does not cure or treat the underlying kidney disease. It is intended to replace as many functions of the failing kidneys as possible. The procedure is performed at home and primarily works to remove excess fluid and waste products from the blood.

This topic discusses peritoneal dialysis. Other treatments for chronic kidney disease are discussed separately. (See "Patient education: Dialysis or kidney transplantation — which is right for me? (Beyond the Basics)" and "Patient education: Hemodialysis (Beyond the Basics)" and "Patient education: Chronic kidney disease (Beyond the Basics)".)

WHEN WILL I NEED DIALYSIS?

As the kidneys lose their ability to function, fluid, electrolytes, minerals, and waste products that are normally removed from the body in the urine begin to build up in the blood. When these problems reach a critical stage, excess fluid and waste must be removed either by getting a kidney transplant or with kidney (renal) replacement therapy (also called dialysis). Although kidney transplantation is usually the best option for kidney failure, it is not feasible for everyone.

There are two types of dialysis: hemodialysis and peritoneal dialysis. The "best" type of dialysis depends upon your abilities, underlying medical illnesses, and personal needs. These issues are discussed separately. (See "Patient education: Dialysis or kidney transplantation — which is right for me? (Beyond the Basics)".)

It usually takes many months or years after kidney disease is first discovered before dialysis is necessary. However, some people have a rapid decline in kidney function, and, occasionally, require dialysis soon after diagnosis. (See "Patient education: Chronic kidney disease (Beyond the Basics)".)

You and your doctor will decide together if dialysis would be of benefit to you and when to begin dialysis after considering a number of factors, including your kidney function (as measured by blood and urine tests), symptoms, overall health, and personal preferences.

Advance planning — People with kidney disease should discuss the possible need for dialysis early in their treatment course. Advance planning allows the clinician to choose a therapy that will best meet the person's lifestyle and needs. During these discussions, the person should learn about all types of dialysis options available to them. Sometimes, the type of dialysis best suited for an individual can change, depending upon changes in their health and living situation over time; this may necessitate switching from one type of dialysis to another. The person should let the dialysis staff and their doctors know about their important life plans, goals, and wishes for the following years so that the type of dialysis recommended to them is best suited to those goals and wishes. Most people do not have a medical condition that would keep them from doing peritoneal dialysis. If the person and their clinician decide that peritoneal dialysis would be the most suitable option, then advance planning can allow the clinician time to plan for the placement of a peritoneal dialysis catheter in the abdomen.

After the catheter is placed, the person and their family will be trained by the staff at the home dialysis unit on how to set up the equipment and become familiar with the procedures used in peritoneal dialysis. During most of this "training," the person will actually be doing dialysis. The training enables you and/or your caregiver to perform dialysis at home independently. Most dialysis centers have staff on call who can be reached by phone or email to answer your questions in case of a problem during off hours.

PERITONEAL DIALYSIS CATHETER INSERTION

Before peritoneal dialysis can begin, a catheter (thin tube) must be inserted in the abdomen, which allows for transfer of fluid into and out of the abdominal cavity. The catheter is made of a

soft, flexible material (usually silicone) and has cuffs (which are like Velcro), which are placed under the skin. Skin tissue grows into them to hold the catheter in place. The end of the catheter inside the abdomen has multiple holes to allow fluid to flow in and out.

The site on the abdomen where the catheter comes out is called the "exit site." The catheter exit site is typically chosen to be on the left or right of the belly button, although, occasionally, it may be higher up on the abdominal wall or over the sternum (breastbone). Reasons to choose a particular exit site vary from person to person and should be discussed with the doctor. Before the insertion procedure, general or local anesthesia may be given. (See "Placement of the peritoneal dialysis catheter".)

Although the catheter can be used right away, if dialysis is not needed, it is best to wait 10 to 14 days after placement before dialysis is performed; this allows the catheter site to heal. In some cases, a small volume of fluid can be exchanged during this time (see 'How does peritoneal dialysis work?' below). Your health care provider will provide more detailed instructions.

PERITONEAL DIALYSIS CATHETER SITE CARE

Care of the catheter and the skin around the catheter (called the catheter exit site) is important to keep the catheter functioning and also to minimize the risk of developing an infection.

Care after insertion — After the catheter is inserted, the insertion site is usually covered with a gauze dressing and tape to prevent the catheter from moving and to keep the area clean. For the first 7 to 10 days after the catheter insertion, typically nothing needs to be done to the catheter exit site. The dressing is left alone and usually first changed at the dialysis home training center 7 to 10 days after placement. If a dressing change is needed before this time, it should be done by a specially trained peritoneal dialysis nurse using sterile techniques. While the exit site is healing, the catheter should not be moved or handled excessively because this can increase the risk of infection.

The area should be kept dry until it is well healed, usually for 10 to 14 days. This means that you should not take a shower or bath or go swimming during this time. A washcloth or sponge may be used to clean the body, although you should be careful to keep the catheter and dressing dry. While healing (two to three weeks), you will be asked to limit lifting and vigorous exercise.

The catheter may be flushed at a dialysis center to prevent blockage from residual blood clots. The flushing is usually performed on a weekly basis until dialysis is initiated; however, it may be done more frequently if blood persists in the drained fluid.

It is important to avoid becoming constipated after the catheter is inserted. Straining to move the bowels can increase the risk of developing a hernia (a weakness in the abdominal muscle). In addition, not moving the bowels regularly can lead to problems with catheter function (slow drain time or difficulty draining the abdomen completely). Your dialysis clinician will help prescribe medications to prevent or treat constipation, if needed.

To avoid constipation, your health care provider may recommend a diet that is high in fiber, as well as a stool softener or laxative. (See "Patient education: Constipation in adults (Beyond the Basics)" and "Patient education: High-fiber diet (Beyond the Basics)".)

Long-term care — After the catheter site has healed (approximately two weeks after insertion), your dialysis nurse will instruct you on catheter exit-site care. It will be important to keep the area clean to minimize the risk of skin infection, as well as infection inside the abdomen (called peritonitis). In addition, most centers will recommend that you "anchor" the catheter with tape or a special belt to stabilize the catheter and minimize the chance of movement causing some injury to the healed exit site.

The skin around the catheter site should be cleansed at least twice weekly and every time after a shower or vigorous exercise, including running, cycling, or swimming. An unscented antibacterial soap or an antiseptic (either povidone iodine or chlorhexidine) may be used as the cleansing agent. The soap should be stored in the original bottle (not poured into another container). Other types of cleansers, such as hydrogen peroxide or alcohol, should **not** be used unless directed by a health care provider.

- Before cleaning the area, wash your hands with soap and water and put on clean gloves.
- Hold the catheter still during cleaning, which helps prevent injury to the skin.
- Do not pick at or remove crusts or scabs at the site.
- Pat the skin around the site dry after cleaning. A clean cloth or towel is suggested.
- Apply a prescription antibiotic cream to the skin around the catheter with a cotton-tip swab every time the dressing is changed.
- A dressing cover over the exit site is not mandatory. However, if the exit site is covered, avoid using tapes or dressings that prevent air from reaching the skin. Use a sterile gauze dressing, which should be changed every time the site is cleaned.
- The catheter should be anchored to the skin with tape or a specially designed adhesive.

With appropriate catheter placement and exit-site care, most peritoneal dialysis catheters are problem free and work for many years. If the catheter no longer works or is needed, a minor surgical procedure is required to remove it.

Appearance — After the first two weeks, the skin around the catheter should not be red or painful. The skin should feel soft. There may be a small amount of thick, yellow mucus discharge around the catheter. A crust or scab may form every few days.

If the skin is reddened, painful, firm, or there is pus-like discharge around the catheter, there may be an infection. (See 'Peritoneal dialysis complications' below.)

Care after injury to the catheter site — If there is an injury to the catheter site, such as an accidental pull on the catheter, or if the catheter is moved excessively, a short course of oral antibiotics may be recommended to prevent infection from developing inside the abdomen (peritonitis). Most dialysis units recommend that you call if you injure the catheter site to determine if further evaluation or treatment is needed.

HOW DOES PERITONEAL DIALYSIS WORK?

In peritoneal dialysis, dialysis fluid (called dialysate) is infused into the abdominal cavity (called the peritoneal cavity) through the catheter. The fluid is held (dwells) within the abdomen for a prescribed period of time; this is called a "dwell." The lining of the abdomen (the peritoneum) acts as a membrane (filter) to allow excess fluids and waste products to pass from the bloodstream into the dialysate.

When the dwell is completed, the "used" dialysate can then be drained out of the abdomen (called an exchange) into a sterile container or into a shower or bathtub. This used fluid contains the excess fluid and waste that has been removed from the blood that was normally eliminated in the urine. The peritoneal cavity is then filled again with fresh dialysate, and the process starts again.

At times when the abdomen is full of dialysate, you may have a feeling of fullness or bloating, although you should not feel pain. However, most people have no abnormal sensations, and, despite the fluid in the abdomen, most people do not look or feel any different themselves or look different to other observers.

Types — Several different types of peritoneal dialysis schedules are possible. The "right" type of peritoneal dialysis depends upon an individual's situation. (See 'Which type is right for me?' below.)

- Continuous ambulatory peritoneal dialysis (CAPD), or manual peritoneal dialysis, is done by infusing the fluid into the abdomen and later allowing it to run out by gravity. It involves performing multiple exchanges during the day (usually three to five) with an overnight dwell. The process of connecting the bag of new dialysis fluid, emptying, and filling for each exchange takes 30 to 40 minutes when done manually. A machine is not needed, and the person can walk around while the fluid is in the abdomen. At bedtime, dialysate is infused and is drained upon awakening.
- Continuous cycler peritoneal dialysis (CCPD) is an automated form of peritoneal dialysis (APD) in which a machine performs exchanges automatically while the person sleeps. Because the catheter is already connected to the machine by a long tube, each exchange takes less time. The number of exchanges on the cycler is determined by the doctor. Once the person awakes, they disconnect the catheter from the machine. There may be a long daytime dwell and, occasionally, a manual daytime exchange. When awake, just as with CAPD, the person can walk around while the fluid is in the abdomen. In resource-rich countries such as the United States, CCPD is performed more commonly than CAPD.

Which type is right for me? — People are often allowed to choose between CAPD and CCPD or APD based upon lifestyle or personal issues. CCPD or APD allows significantly more uninterrupted daytime for work, family, and social activities than CAPD.

In some cases, a person is not able to do the dialysis exchanges themselves. Peritoneal dialysis could still be used, but the person would need a partner to do the exchanges. In these cases, APD works best so the partner is able to be free during the day.

There may be changes in treatment type, dwell time, number of exchanges, or type of dialysate after beginning treatment based upon how the body responds. Periodic blood and urine tests, as well as tests of the used dialysate, are used to fine tune peritoneal dialysis treatment. (See "Prescribing peritoneal dialysis".)

PERITONEAL DIALYSIS COMPLICATIONS

One of the most serious complications of peritoneal dialysis is infection, which can develop in the skin around the catheter or inside the abdominal cavity (called peritonitis). Another potential, but less serious, complication of peritoneal dialysis is the development of a hernia, a weakness in the abdominal muscle.

Catheter exit-site infection — The signs of a catheter exit-site infection include:

- Redness, firmness, or tenderness of the skin around the catheter
- Pus-like drainage from the area

Peritonitis — Peritonitis is a general term used to describe an infection of the abdominal cavity. People who use peritoneal dialysis are at risk of peritonitis because bacteria can enter the abdomen through or around the peritoneal dialysis catheter.

Peritonitis associated with peritoneal dialysis (PD peritonitis) is generally less severe compared with peritonitis resulting from other causes such as perforation of the bowel, appendicitis, or diverticulitis. PD peritonitis can usually be treated at home and usually resolves completely. (See "Clinical manifestations and diagnosis of peritonitis in peritoneal dialysis".)

However, if left untreated, peritonitis can become a life-threatening infection. Signs of peritonitis may include one or more of the following:

- Abdominal pain, which may be mild to severe
- Cloudy used dialysate fluid
- Fever (temperature greater than 100.4°F or 38°C)
- Nausea or diarrhea

Treatment of infection — If there are any signs of infection, you need to be seen by a health care provider and begin treatment as soon as possible. The type of treatment used depends upon the severity and location of the infection. Peritoneal dialysis is usually continued as the infection is being treated.

- Catheter exit-site infections are often treated with an antibiotic cream and/or oral antibiotics, as well as more frequent skin cleaning. Most mild infections resolve with treatment within one to two weeks. If the infection does not resolve, the catheter may need to be removed and replaced. (See "Peritoneal catheter exit-site and tunnel infections in peritoneal dialysis in adults".)
- Peritonitis usually resolves with treatment, and the person continues on their usual dialysis therapy. Treatment typically requires one or more antibiotics, which are commonly given through the person's catheter with the dialysis fluid (dialysate) (eg, intraperitoneal dosing). A change in the dwell time and/or dialysis prescription is sometimes needed temporarily. Less commonly, the peritoneal dialysis catheter must be removed to cure the peritonitis. In these cases, the person will be transitioned to hemodialysis and, once the infection resolves, if clinically indicated, often can have another catheter placed and return to peritoneal dialysis. (See "Microbiology and therapy of peritonitis in peritoneal dialysis".)

Hernia — Hernia is the medical term for a weakness in the abdominal muscle. People who use peritoneal dialysis are at risk of developing a hernia for several reasons, including the increased stress on the muscles of the abdomen (as a result of the weight of the dialysate) and the opening in the abdominal muscle created by the peritoneal dialysis catheter. Hernias can develop near the belly button (umbilical hernia), in the groin (inguinal hernia), or near the catheter site (incisional hernia).

Signs of a hernia include painless swelling or new lump in the groin or abdomen. If you develop signs of a hernia, contact your health care provider but continue to perform peritoneal dialysis regularly. Treatment of a hernia generally involves surgery. (See "Abdominal wall hernia and dialysate leak in peritoneal dialysis patients".)

LIVING WITH PERITONEAL DIALYSIS

Chronic kidney disease is a lifelong condition that requires lifelong treatment. Peritoneal dialysis is one option for lifelong treatment, with other options including hemodialysis and kidney transplantation. It is sometimes necessary to switch from one form of treatment to another as circumstances change.

- **Diet** – People who undergo dialysis, both hemodialysis and peritoneal dialysis, are often required to make changes to their diet. In general, people who use peritoneal dialysis have a less restricted diet compared with those who use standard in-center hemodialysis. Dietary changes help to ensure that the body has an adequate, but not excessive, amount of protein and certain minerals.

People who use peritoneal dialysis lose protein with every exchange, which usually means that they must eat an increased amount of protein in the diet. Protein is found in meat, milk, chicken, fish, and eggs; lower-quality protein is found in some vegetables and grains. A dietitian can provide specific recommendations about how much and what type of protein is needed.

- **Other changes in diet** may include reducing the amount of foods eaten that contain phosphorus (found in dairy products, cheese, dried beans, liver, nuts, and chocolate) and sodium and monitoring the amount of fluids consumed. (See "Patient education: Low-sodium diet (Beyond the Basics)".)
- **Weight gain** – Weight gain can be a problem for some people undergoing peritoneal dialysis because the dialysate contains a high concentration of dextrose, a type of sugar. The body absorbs some of this dextrose during the dwell, which can lead to weight gain. A dietitian can

provide guidance on how to minimize weight gain by monitoring the number of calories eaten.

- **Body image** – The abdomen may enlarge slightly and may cause you to feel bloated when it is filled with fluid, although most people do not look physically different to others. You may need a larger size of clothing and see a physical difference when dressed. Some people have a hard time accepting the change in their appearance. Patient support groups and websites can provide reassurance and tips for dressing. (See 'Where to get more information' below.)
- **Activities and peritoneal dialysis** – In general, when the peritoneal cavity is full (has a large-volume dwell), people should limit physical activities that are associated with high intra-abdominal pressure such as weightlifting, snow shoveling, and jumping. Peritoneal dialysis fluid should be drained prior to exercise in such cases. Activities that are not associated with a significantly higher intra-abdominal pressure, such as walking, hiking, and jogging, are safe and encouraged unless the fullness contributes to personal discomfort. You should discuss your activities with your health care team.
- **Time requirements** – Peritoneal dialysis requires time and dedication, potentially interfering with other activities. This is especially true with continuous ambulatory peritoneal dialysis (CAPD), which requires the person to perform several exchanges during the daytime. However, it is possible and desirable to continue to work and be active while using peritoneal dialysis, although it may be necessary sometimes to cut back on responsibilities.
- **Pets** – People on peritoneal dialysis should take extra precautions to prevent peritonitis if they have pets. Pets should not be allowed in the room where peritoneal dialysis exchanges take place, or where the dialysis tubing and equipment are stored.

It is important to perform every exchange and dwell exactly as recommended. Skipping a treatment or performing a dwell for shorter or longer than recommended may increase the risk of illness and the chances of being hospitalized and can even shorten the person's life.

If the demands of peritoneal dialysis feel overwhelming or if you are having trouble performing all the necessary treatments, talk to a health care provider.

WHERE TO GET MORE INFORMATION

Your health care provider is the best source of information for questions and concerns related to your medical problem.

This article will be updated as needed on our website (www.uptodate.com/patients). Related topics for patients, as well as selected articles written for health care professionals, are also available. Some of the most relevant are listed below.

Patient level information — UpToDate offers two types of patient education materials.

The Basics — The Basics patient education pieces answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials.

Patient education: Peritoneal dialysis (The Basics)

Patient education: Chronic kidney disease (The Basics)

Patient education: Choosing between dialysis and kidney transplant (The Basics)

Patient education: Dialysis and diet (The Basics)

Patient education: Kidney transplant (The Basics)

Patient education: Planning for a kidney transplant (The Basics)

Patient education: Acute kidney injury (The Basics)

Patient education: Glomerular disease (The Basics)

Patient education: End-stage kidney disease (kidney failure) (The Basics)

Patient education: 24-hour urine collection (The Basics)

Patient education: Peritoneal dialysis catheter placement (The Basics)

Patient education: How to care for a peritoneal dialysis catheter (The Basics)

Beyond the Basics — Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are best for patients who want in-depth information and are comfortable with some medical jargon.

Patient education: Dialysis or kidney transplantation — which is right for me? (Beyond the Basics)

Patient education: Hemodialysis (Beyond the Basics)

Patient education: Chronic kidney disease (Beyond the Basics)

Patient education: Constipation in adults (Beyond the Basics)

Patient education: High-fiber diet (Beyond the Basics)

Patient education: Low-sodium diet (Beyond the Basics)

Professional level information — Professional level articles are designed to keep doctors and other health professionals up-to-date on the latest medical findings. These articles are thorough, long, and complex, and they contain multiple references to the research on which they are based. Professional level articles are best for people who are comfortable with a lot of medical terminology and who want to read the same materials their doctors are reading.

Prescribing peritoneal dialysis

Evaluating patients for chronic peritoneal dialysis and selection of modality

Clinical manifestations and diagnosis of peritonitis in peritoneal dialysis

Fungal peritonitis in peritoneal dialysis

Indications for initiation of dialysis in chronic kidney disease

Medical management of the dialysis patient undergoing surgery

Microbiology and therapy of peritonitis in peritoneal dialysis

Modalities for the diagnosis of abdominal and thoracic cavity defects in patients on peritoneal dialysis

Noninfectious complications of continuous peritoneal dialysis

Noninfectious complications of peritoneal dialysis catheters

Risk factors and prevention of peritonitis in peritoneal dialysis

Placement of the peritoneal dialysis catheter

Inadequate solute clearance in peritoneal dialysis

Peritoneal catheter exit-site and tunnel infections in peritoneal dialysis in adults

Abdominal wall hernia and dialysate leak in peritoneal dialysis patients

The following organizations also provide reliable health information.

- National Library of Medicine

(www.nlm.nih.gov/medlineplus/healthtopics.html)

- National Institute of Diabetes and Digestive and Kidney Diseases

(www.niddk.nih.gov)

- National Kidney Foundation

(www.kidney.org)

- American Kidney Fund

(www.kidneyfund.org/)

- American Association of Kidney Patients

(www.aakp.org)

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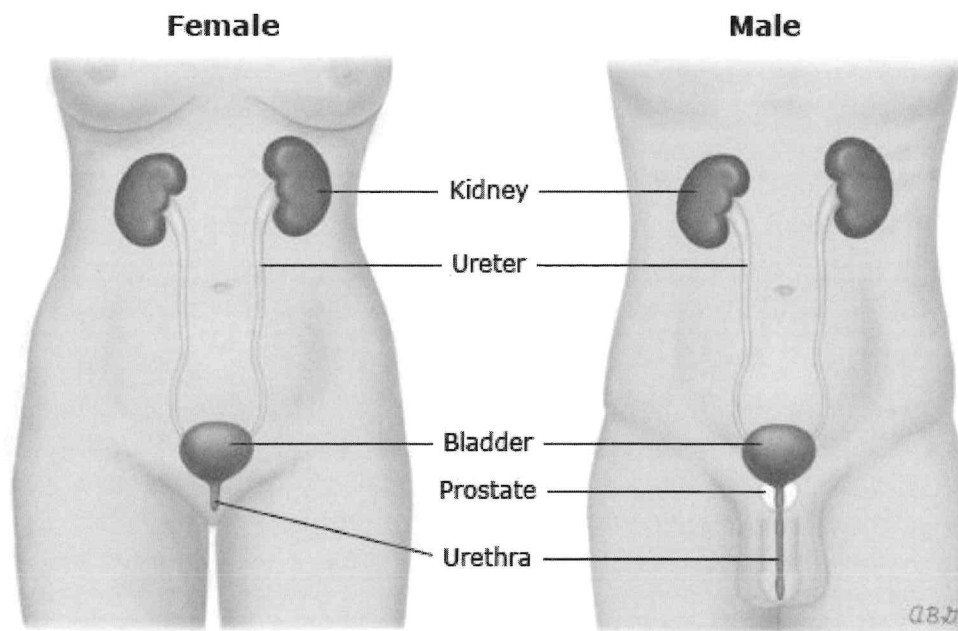
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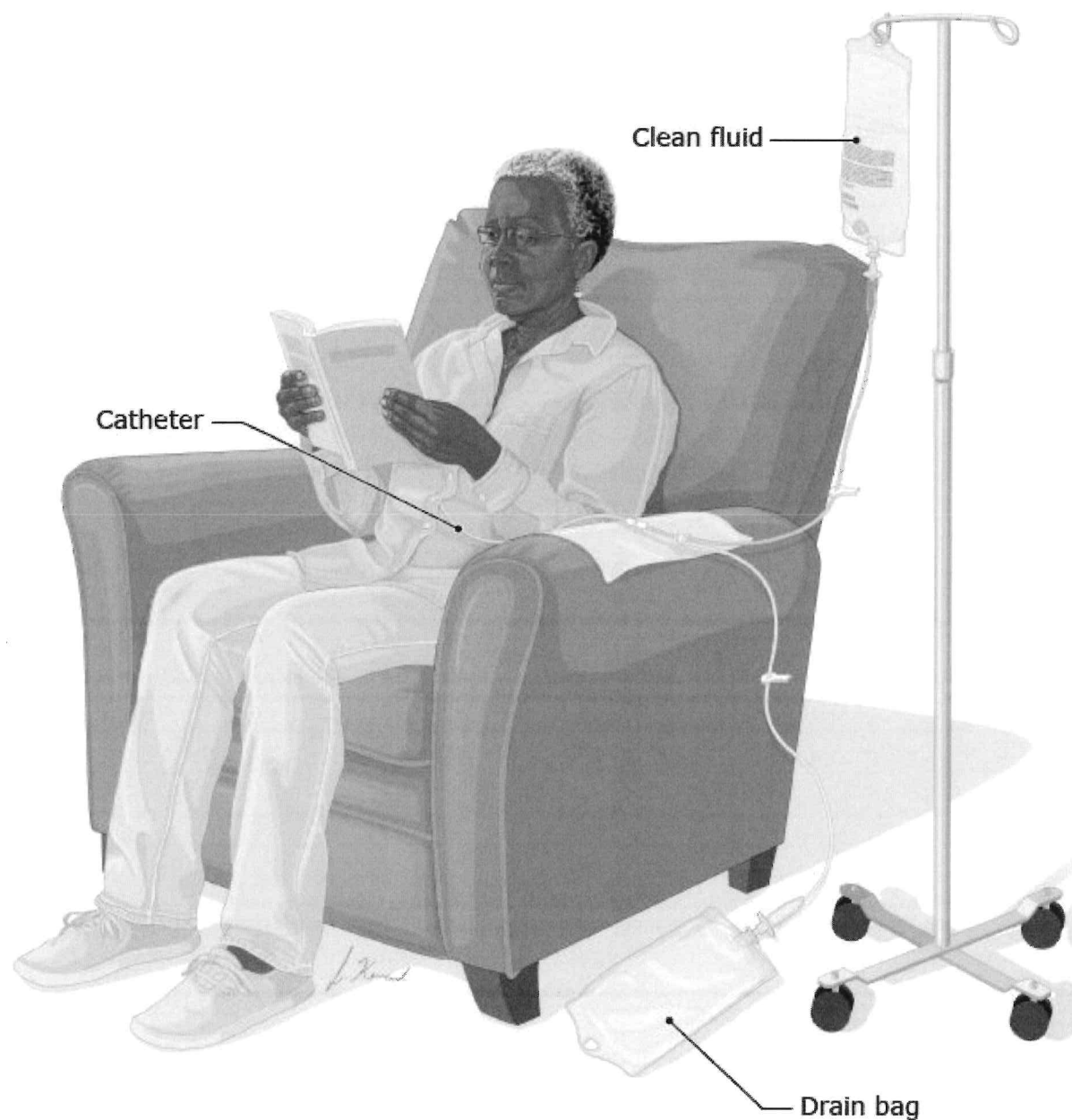
Anatomy of the urinary tract in adults



Urine is made by the kidneys. It passes from the kidneys into the bladder through 2 tubes called the "ureters." Then, it leaves the bladder through another tube called the "urethra."



Peritoneal dialysis



This drawing shows a person having peritoneal dialysis. The dialysis fluid (fresh dialysis solution) flows into the person's belly. It stays there for a certain amount of time, and then it drains out into the drain bag. The "transfer set" is the tubing that connects a thin tube (catheter) in the person's belly to the dialysis equipment.