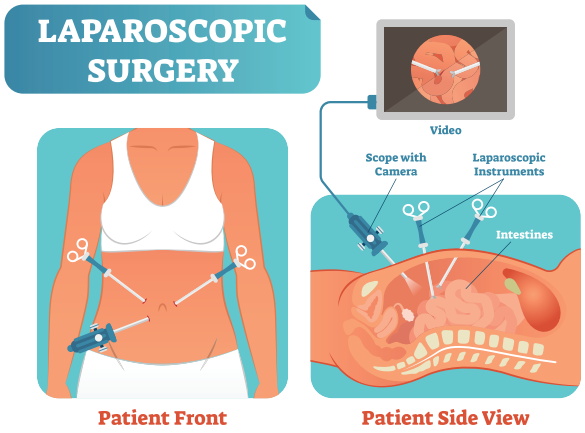
How is the PD catheter placed?

- PD catheters are usually placed by a surgeon
  - Your surgeon may place the catheter either using open or minimally invasive surgery
  - In open surgery, the surgeon makes an incision into your belly to place the catheter
  - In minimally invasive surgery (also called laparoscopic surgery), the surgeon uses 1-2 small incisions in your belly. These are used to insert tools and a camera to place the catheter.



  - Both procedures are performed in an operating room with anesthesia
- PD catheters can also be placed by some radiologists using X-rays to guide the catheter placement

Can I use the PD catheter right after it's placed?

- The PD catheter needs about two weeks for the surgical incisions to heal. Otherwise, fluid can leak out from the incisions.

How will I do daily activities with a PD catheter?

- There are accessories available to help hold your PD catheter securely in place. You may find these options more comfortable than using tape.

PD CATHETER BELT

- A PD catheter belt is worn around the abdomen and has an adjustable waistband that holds the PD catheter in place. It can be worn during all daily activities--sleeping, working, exercising, and especially during PD exchanges.

PD CATHETER NECKLACE

- A PD catheter necklace (also called a lanyard or transfer set holder) is a lightweight, adjustable strap worn around the neck to hold the catheter securely. It's suitable for most daily activities, including exercising and moving around, but cannot be used during PD exchanges.

Will I be able to do PD for as long as I need it?

- The PD catheter may become clogged. If this happens, the fluid may not be able to go in and out of the PD catheter. Sometimes, another procedure will need to be performed to either reposition or replace the catheter.
- An infection can start in the abdomen, called peritonitis. This is usually caused by bacteria. It can happen from fluid exchange or spread from an infection where the PD catheter exits the abdomen. Sometimes, the infection can be treated while the PD catheter is being used. Other times, the PD catheter will have to be removed.
- The patient may need to use HD briefly while working to resolve the problems with PD
- Over many years, the lining of the abdomen (peritoneum) may not work as well as a filter anymore. If this results in toxins and fluids building up, other methods of kidney replacement therapy will be necessary.

To hear about what patients have experienced with PD, visit:

Philip's Story: youtu.be/ujyqobjx0yU

Nichole's Story: youtu.be/3-p2JRIqfFA

Hemodialysis (also called HD)

What is hemodialysis?

- Hemodialysis (HD) cleans the blood using a machine with a special filter called a dialyzer

How does HD work?

- During HD, the patient's blood flows out of the patient and into the machine to be cleaned. The cleaned blood is then returned to the patient.

- Vascular access is required to perform HD. There are three main types of vascular access:
  - HD catheter (see page 20 for more information)
  - Arteriovenous fistula (see page 22 for more information)
  - Arteriovenous graft (see page 24 for more information)

Where would I do HD?

- HD is done in a dialysis facility (in-center HD) or at the patient's home (home HD)

When would I do HD?

- Most patients who do in-center HD have dialysis 3-4 times per week for 3-4 hours each time
- Most patients who do home HD have dialysis for about two hours each day 5-7 days per week
- Both in-center and home HD can be done at night (called nocturnal HD) while the patient sleeps
- Patients who do in-center HD at night go to the facility around 9PM and leave around 4AM. This is usually 3 times per week.
- Patients who do home HD at night have HD for about 8 hours 3-6 nights per week

Will I be able to do HD for as long as I need it?

- Patients can get HD as long as they have vascular access. There are a limited number of places on the body where a patient can have vascular access. Once they are used, it becomes difficult to create a new vascular access. (see pages 21, 23, and 25 for more information)

To hear about what patients have experienced with HD visit:

Jonathan and Melissa's Story: youtu.be/qVde-_Ms6ws

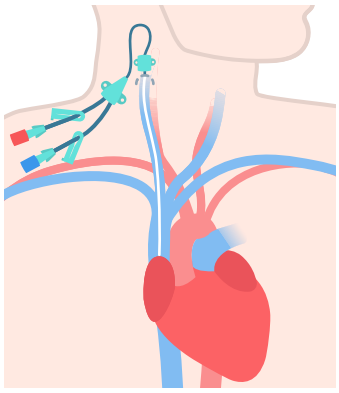
Duke and Susan's Story: youtu.be/W5iP5h8lnoY

Hemodialysis (HD) Catheter

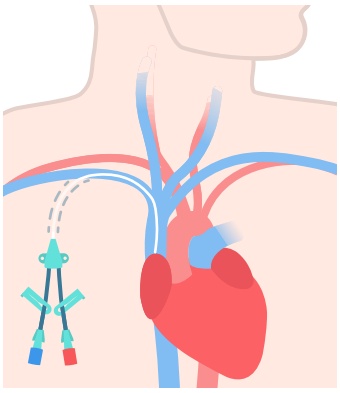
What is a HD catheter?

- HD catheters are plastic tubes that are placed into a large vein in the neck. Sometimes the catheter is placed in the leg.
- One end of the HD catheter hangs outside the patient's body, usually on the chest
- HD catheters for HD have two sides. One side carries blood from the patient to the dialysis machine to be cleaned. The other side carries the cleaned blood from the dialysis machine back into the patient.

What is the difference between a tunneled and a non-tunneled HD catheter?

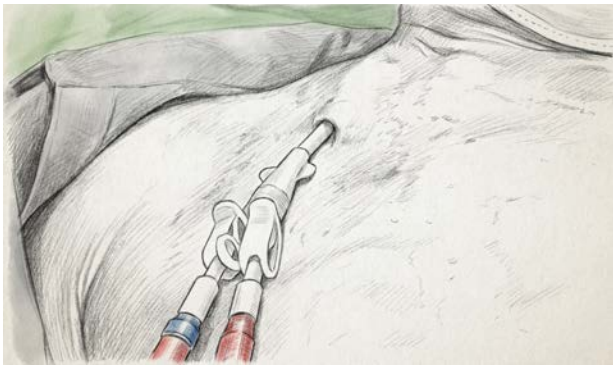


NON-TUNNELED



TUNNELED

- Non-tunneled HD catheters go directly into the skin and into the vein without running under the skin

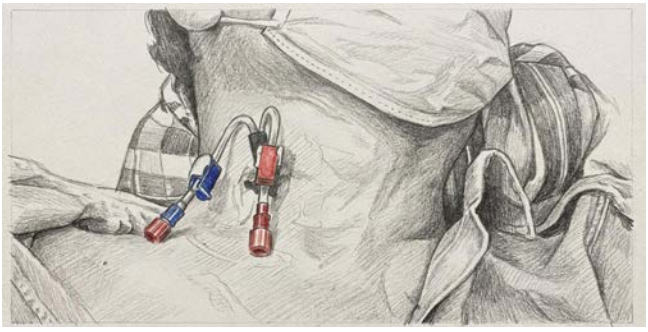


TUNNELED CATHETER

- Tunneled HD catheters run under the skin of the chest for a short length before going into the vein
- Tunneled HD catheters have a small fabric cuff that allows it to heal into the patient's body. This reduces the risk of infection and the risk that the catheter will fall out.

When are tunneled and non-tunneled HD catheters used?

- Non-tunneled HD catheters are temporary and only used while a patient is in the hospital
- Non-tunneled HD catheters are used when a patient needs dialysis and has no other vascular access



NON-TUNNELED CATHETER

- Tunneled HD catheters can be used for longer periods of time, up to years

How is the HD catheter placed?

- A doctor inserts the HD catheter with the help of ultrasound and X-rays
- The procedure usually takes about 30 minutes
- The patient gets numbing medicine injected at the location of the catheter. The patient may get some medicine injected through the veins to help relax and feel sleepy.

What are the risks of the HD catheter placement procedure?

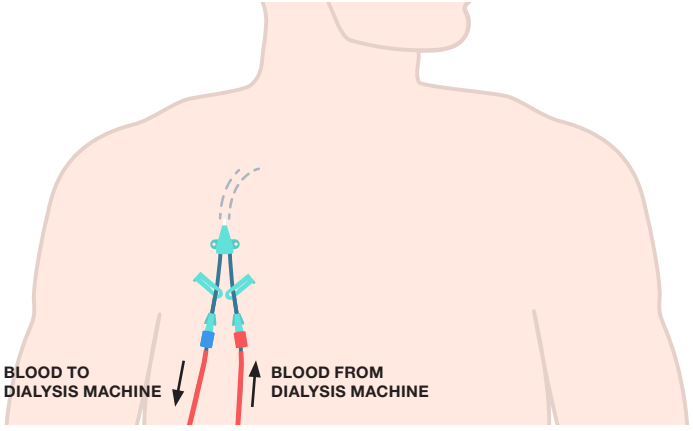
- There is a small risk of injury to other structures near where the HD catheter is being inserted. These structures include nerves, blood vessels, the lung, and the heart.

Can I use my HD catheter for dialysis right away?

- The HD catheter can be used shortly after it is placed

How does the HD catheter work for dialysis?

- The ends of the HD catheter connect to the tubes that go to the dialysis machine. There are no needles required.



How do I keep my HD catheter clean?

- To minimize the risk of infection, the catheter should not get wet
- Most patients do not take showers when they have a HD catheter. Instead, they do sponge baths.
- Patients with a HD catheter should not swim or soak in pools or hot tubs
- The staff at the dialysis facility will clean and change the dressing on the HD catheter at each dialysis session. The patient should not remove the dressing on their own.

What happens with the HD catheter over time?

- Over many months or years, the HD catheter could get infected, and could get clogged
- If the HD catheter gets clogged, medicines can be used to try to unclog it
- If the HD catheter gets infected, medicines can be used to try to clear the infection
- If the medications do not work to unclog the HD catheter or clear the infection, it has to be removed. A new HD catheter will need to be placed.

Arteriovenous Fistula (also called AV Fistula, Fistula or AVF)

What is an artery?

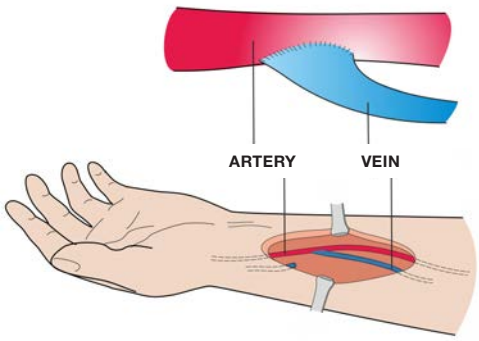
- Arteries are the blood vessels that carry blood and nutrients away from your heart to the rest of your body

What is a vein?

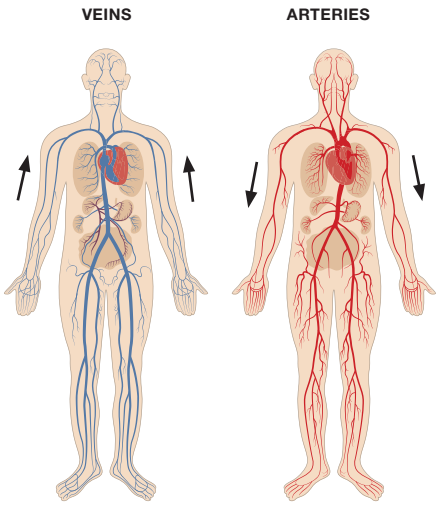
- Veins are the blood vessels that carry blood from your body back to your heart to get loaded up with nutrients again

What is a fistula?

- A fistula is a connection between an artery and a vein

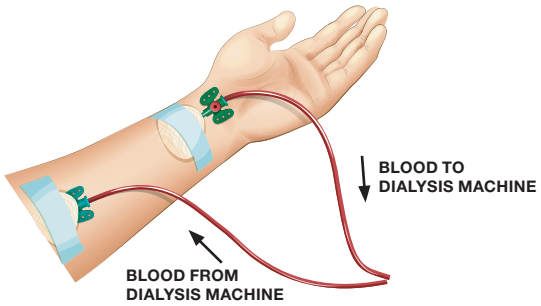


- The fistula is entirely under the skin
- The connection allows the vein to get bigger and have more blood flow. This allows it to be used for HD.



How does the fistula work for dialysis?

- Two needles are inserted into the fistula to carry blood between the patient and the dialysis machine



- The needles are inserted by a nurse or a technician. The patient can also learn how to insert the needles themselves (self-cannulation).

Can everyone get a fistula?

- To make a fistula, the patient must have a vein that is large enough
- An ultrasound (called vein mapping) is done to measure the size of all the veins in the arms

How is the fistula made?

- It is usually in the arm (but can be in the leg). The best location of the fistula is based on a number of factors. This will be discussed with you by your surgeon.
- Important factors include your hand dominance, previous surgeries or procedures, and vein mapping results
- There are two methods for creating a fistula: surgical and endovascular
  - The surgical method makes a cut in the skin in the wrist or the inside of the elbow
  - The endovascular method makes two small needle punctures in the upper arm
- The procedure takes 1-2 hours
- The patient usually goes home the same day after the procedure

Can I use the fistula for dialysis right away?

- It takes at least 6-8 weeks for the fistula to become usable for dialysis. The process of the fistula becoming usable is called "maturation."

Does the fistula always become usable?

- Sometimes the fistula does not become usable by itself. More procedures have to be done to make it usable.
- Sometimes even with those extra procedures the fistula still does not become usable. In this case, another access has to be made.

What are the risks of the fistula creation procedure?

- The procedure itself is usually very safe
- There is a small risk of bleeding and infection any time you have a procedure
- The biggest risk is that the fistula does not become usable (does not mature)
- Another risk is steal syndrome. This is when too much blood goes into the fistula and not enough blood goes into the hand. The hand may feel numb, weak, or even have sores on it. If this happens, the patient may need another operation to bring more blood to the hand.

What happens with the fistula over many years?

- If the fistula becomes usable, it is usually reliable for dialysis for at least 1-2 years
- It is possible that the fistula may develop problems after 1-2 years (see pages 27-31 for more information)

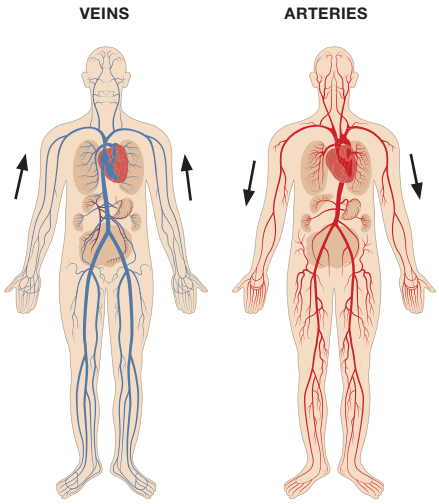
To hear about what patients have experienced with a fistula visit:

Duke and Susan's Story: youtu.be/W5iP5h8lnoY

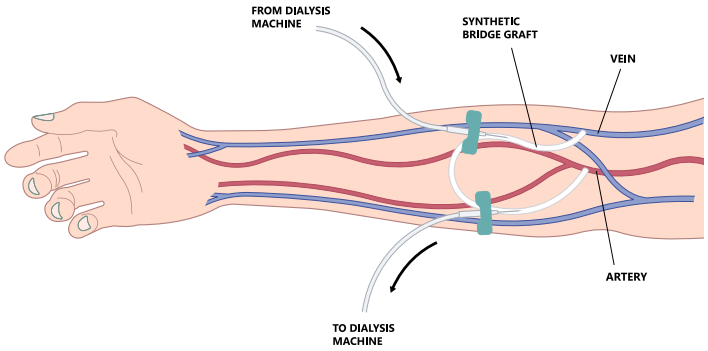
Arteriovenous graft (also called AV Graft, Graft or AVG)

What is an artery? What is a vein?

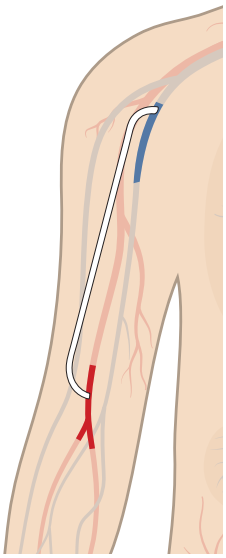
- Arteries are the blood vessels that carry blood and nutrients away from your heart to the rest of your body
- Veins are the blood vessels that carry blood from your body back to your heart to get loaded up with nutrients



What is a graft?



- A graft is a plastic tube that connects an artery and a vein. They are often in the forearm or the upper arm.



- The graft is entirely under the skin

How is the graft made?

- It is usually in the arm but can be in the leg. The best location of the graft is based on a number of factors. This will be discussed with you by your surgeon.
- Your surgeon will talk to you about whether you are right or left handed, if you have had previous operations or procedures, and the ultrasound of your veins
- Most commonly there is a cut in the skin inside the elbow. There is a second cut either near the hand or armpit, depending on where the graft will be placed.
- The procedure takes 1-2 hours
- The patient usually goes home the same day after the procedure

What are the risks of the graft creation procedure?

- The procedure itself is usually very safe
- There is a small risk of bleeding and infection any time you have a procedure
- Another risk is steal syndrome. This is when too much blood goes into the graft and not enough blood goes into the hand. The hand may feel numb, weak, or even have sores on it. If this happens, the patient may need another operation to bring more blood to the hand (see page 32 for more information)

Can everyone get a graft?

- Most patients can get a graft. The patient must have a vein that does not have any blockages on its path back to the heart.

Can I use the graft for dialysis right away?

- It takes at least 2 weeks for the graft to heal enough to become usable

How does the graft work for dialysis?

- Two needles are inserted into the graft to carry blood between the patient and the dialysis machine
- The needles are inserted by a nurse or a technician. The patient can also learn how to insert the needles themselves (self-cannulation).

Does the graft always become usable?

- The graft almost always becomes usable for dialysis

What happens with the graft over many years?

- Usually, the graft is reliable for dialysis for at least 1-2 years
- It is possible that the graft may develop problems after 1-2 years (see pages 28-31 for more information)

Vascular Access Complications

Non-maturation

What is non-maturation?

- Non-maturation can happen after a fistula creation
- Non-maturation means the vein did not become large enough to use for dialysis

Am I at risk for non-maturation?

- Non-maturation can happen up to 3-5 times out of every 10 times a fistula is created
- Sometimes people who are older, female, have diabetes or have a small vein can have a higher risk for non-maturation

How do I know if I have non-maturation?

- Your surgeon will check your fistula every few weeks after the operation
- Your surgeon may order an ultrasound to check your fistula
- If you have non-maturation, your surgeon will tell you that the fistula is not ready to be used for dialysis yet

If I have non-maturation, what happens next?

- Your doctor may recommend procedures to try to help the fistula to mature
- Your doctor may discuss a different location for a new fistula creation. This may be on the same arm or your other arm.
- If there are no other available places for a fistula, your doctor may discuss other access options such as a graft or a tunneled catheter

Infection

What kind of infection can happen with dialysis access?

- An infection can be mild, such as a skin infection
- An infection can be moderate, such as an infection of the fistula, or graft, or catheter
- Or an infection can be severe, where it spreads to the blood and can be life threatening

Am I at risk for infection?

- Infection can occur with any access type. The risk of infection is higher with catheters. Fistulas very rarely get infected. Grafts get infected a little more than fistulas.
- If you have other medical problems or take medications that weaken your immune system, you may have a higher risk for infection

How do I know if I have an infection?

- If the skin around your catheter, graft or fistula is red, or draining fluid or pus, you might have an infection
- If you have fever, chills or sweats, you might have an infection

If I have an infection, what happens next?

- It is important to contact your doctor as soon as possible
- Your doctor will determine how serious the infection is
- If the infection is mild, your doctor may be able to treat it with antibiotics
- If the infection is more severe, you may need surgery to clean out the infection or remove the infected catheter

Thrombosis

What is thrombosis?

- Thrombosis is when a blood clot (thrombus) blocks a blood vessel
- Thrombosis can happen to a fistula, a graft, or a catheter

Am I at risk for thrombosis?

- Grafts and catheters are a little more likely to have thrombosis than a fistula
- If you have other conditions that cause your blood pressure to be low, such as a weak heart, you may be more likely to have thrombosis

How do I know if I have thrombosis?

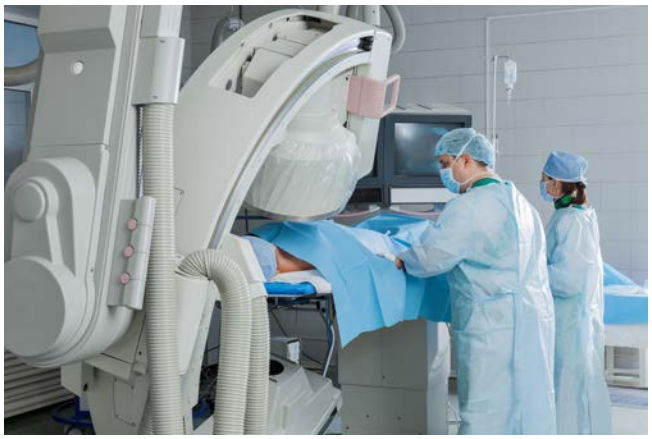
- Most commonly, people go to have dialysis and the dialysis technician is unable to use the access
- If you have a fistula or graft, you might be able to feel a buzzing sensation over it. If you stop being able to feel the buzzing, you may have thrombosis.

If I have thrombosis, what happens next?

- If you have a catheter that has thrombosis, the nurses at your dialysis facility may try to put medicine in the catheter to open it up. If that does not work, you will need a new catheter.
- If you have a fistula or graft, sometimes a procedure can be performed to re-open it. This is most commonly done with a fistulagram.
- Usually, your dialysis facility will tell you what steps to take next to treat the thrombosis

What is a fistulagram?

- In a fistulagram, a doctor inserts a catheter into your fistula or graft



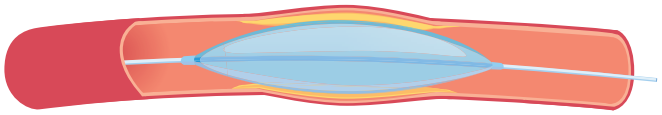
- The doctor injects contrast dye through the catheter and takes pictures with an X-ray machine
- The pictures show the doctor where the problem is

Do I go to sleep during a fistulagram?

- Most commonly, a fistulagram is done with only local anesthesia. The doctor injects numbing medicine into the area, like when you go to the dentist.
- Sometimes, you will get some medicine in your veins to help you relax if you need it

What else can happen during a fistulagram?

- If possible, the doctor will try to remove the blood clot. The doctor can use a strong medication that dissolves blood clots. The doctor can also use devices that can break up or suck out the blood clot.
- Sometimes, there can be a narrowing in the fistula or graft that caused the thrombosis. (The narrowing is sometimes called a stenosis.) The doctor can use a balloon to open up the narrowing. This is called angioplasty.



ANGIOPLASTY

Can I get thrombosis more than once?

- Thrombosis can happen many times
- There is no limit to the amount of times that thrombosis can happen

What if I have thrombosis many times?

- Your doctor will talk to you about your options
- You can continue to have procedures to open the fistula or graft as long as the doctor thinks it is reasonable
- Your other option is to create a new fistula or graft