TRAIN FOR SUCCESS INC.
CARING FOR PATIENTS RECEIVING HEMODIALYSIS 15Hr

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Purpose:

This course was designed to provide the health care professionals; LPN, RN, ARNP, students, Certified Nursing Assistants (CNA), Home Health Aids (HHA), and other professionals/ individuals with the opportunity to review the Hemodialysis procedure, various disorders affecting the kidneys such as: Renal papillary necrosis, Kidney cancer, acute renal failure, chronic renal failure, End Stage Renal Disease (ESRD), Infection prevention procedures while working with the Hemodialysis patient, caring for patients receiving Hemodialysis, some nursing care plans with interventions and rationales.

Objectives/ Goals:

After successful completion of this course the students will be able to:

1. Describe the anatomy and physiology of the Renal system,

2. Discuss disorders and disease of the kidneys/ renal system such: Renal papillary necrosis, Kidney cancer, acute renal failure, chronic renal failure, End Stage Renal Disease (ESRD).

3. Describe the purpose of hemodialysis

4. Describe Infection prevention procedures while working with the hemodialysis patient

5. Discuss dietary modification and restrictions for hemodialysis patients

6. Discuss the Graft, fistula and catheter access used for hemodialysis

7. Describe effects of hemodialysis on the patient's body and interventions

8. Discuss Renal Osteodystrophy

9. Discuss Sleep Disorders patients frequently experience

10. Discuss Anemia and Erythropoietin (EPO) treatment

INTRODUCTION

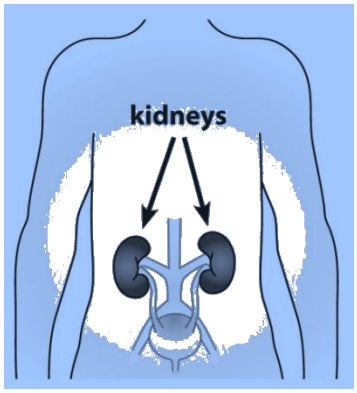
Hemodialysis:

Healthy kidneys clean the blood and remove extra fluid in the form of urine. The kidneys also make hormones the body needs for various vital functions. The kidneys balance electrolytes, control the blood pressure, maintains acid-base balance and other functions that will be reviewed later. When the kidney fails, treatment is needed to replace some of the important functions. The treatments for kidney failure are:

- Hemodialysis,
- Peritoneal dialysis and
- Kidney transplant.

THE KIDNEYS

The kidneys are two bean-shaped organs (each about size of a fist).
They are located just below the rib cage, one on each side.
The kidneys filter blood to produce urine (composed of waste & extra fluid).
Each kidney is about 4 or 5 inches long.

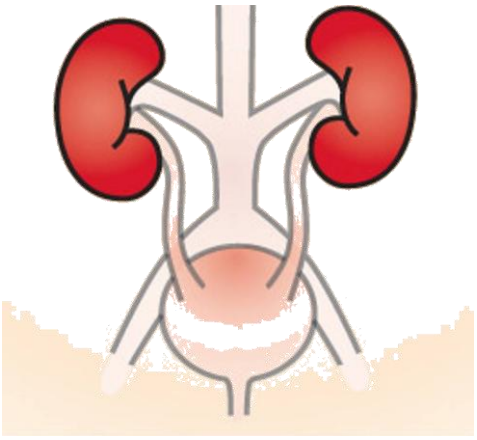


THE KIDNEYS ARE LOCATED IN THE:

Retroperitoneum at the costovertebral angle.
Upper Border (T12)
Lower Border (L3)
SIZE: 4-6 Oz. (120-170g) each.

The Renal System

Kidneys – collect the body's waste products etc (several functions are listed later.)



The Ureters – Muscular tubes that transport urine from each kidney to the bladder. The ureters collects filtrate and urine from renal pelvis and takes it to the bladder for urination.

Urinary Bladder – A sac that collects and holds urine that comes from the ureters.

Urethra – a narrow passageway where urine passes from the bladder to the outside of the body (urination).

Renal Capsule – outer membrane that surrounds the kidney; it is thin (tough, fibrous)

Renal Pelvis – basin-like area that collects urine from the nephrons, it narrows into the upper end of the ureter.

Calyx – extension of the renal pelvis; they channel urine from the pyramids to the renal pelvis

Cortex – the outer region of the kidney; extensions of the cortical tissue, contains about one million blood filtering nephrons.

Nephron – these are the filtration units within the kidneys.

Medulla – inner region of the kidney contains 8-12 renal pyramids. The pyramids empty into the calyx.

Medullary pyramids – formed by the collecting ducts, inner part of the kidney.

Renal Artery – branches off of the aorta bringing blood filled with waste, into the kidney for filtering in the nephrons; the renal artery then further divides into several branches within the kidneys.

Renal Vein – removes the filtered blood from the kidneys to the inferior vena cava.

Kidney Function

The kidneys have several functions:

Maintain homeostasis (balance of the various body functions) in the body and help control blood pressure.

They maintain balance in electrolytes, acid-base, and fluid in the blood.

The kidneys remove nitrogenous waste from the body (creatinine, urea, ammonia) and keep essential substances the body needs to function as it should.

The kidneys produce the hormone erythropoietin that stimulates the production of red blood cells and enzymes.

Malfunction of the kidney or kidneys:

When the kidneys are not working effectively, there is a disturbance of homeostasis which can cause death if this is not corrected.

Kidney Function Profile (laboratory blood test) is used to:

- - monitor the kidneys,
- - detect kidney abnormalities
- - make a diagnosis.

Nephron Anatomy

Renal Artery – brings blood from the aorta to the kidney for filtering in the nephron.

Glomerulus – each glomerulus is a cluster of blood capillaries surrounded by a Bowman's capsule.

Proximal convoluted tubule (PCT)
Thin descending limb of the loop of Henle
Thin Ascending limb of the loop of Henle
Thick Ascending limb of the loop of Henle
Distal convoluted tubule

Proximal convoluted tubule (PCT); the section of the nephron that is located between Bowman's capsule and the loop of Henle in the vertebrate kidney. Reabsorption of water, salt, glucose, etc from the glomerular filtrate occurs in this tubule, also certain substances, such as drug metabolites, and uric acid are actively transferred from the blood capillaries into the tubule.

Renal Vein; when filtration is complete, blood leaves the nephron to join the renal vein, which removes the filtered blood from the kidney.

Arterioles; blood is brought to and carried away from the glomerular capillaries by 2

small blood vessels (afferent and efferent arterioles).

Nephron Function

Bowman's Capsule, Surrounds the glomerulus
Glomerulus consist of a the cluster of capillaries

Proximal Convoluted Tubule, near the glomerulus, have permeable cell membranes that reabsorb glucose, amino acids, metabolites and electrolytes into nearby capillaries and allow for circulation of water.

Loop of Henle – has an ascending and descending portion, these loops and their blood vessels and collecting tubes form the pyramids in the medulla. The filtrate contains high levels of salts /sodium. As the filtrate moves further through the loop, more water is removed and continues to concentrate the filtrate even more.

Distal Convoluted Tubule – further away from the glomerulus;
helps with potassium excretion.

Collecting Duct – collecting the filtrates

Individual nephrons are microscopic.

The nephron is the basic structural and functional unit of the kidney.
Each kidney has about 1 million nephrons.

The walls of the nephron are made of a single layer of epithelial cells.
Blood containing urea and metabolic waste products enters the kidney from the liver.

The blood is filtered to remove;
- fluids,
- wastes,
- electrolytes,
- acids
- bases

into the tubular system while leaving blood cells, proteins in the bloodstream.

The nephrons also reabsorb and secrete;

- ions that control the fluids and electrolyte balance.

The blood enters the kidney and goes to the glomerulus.
Pressure forces fluid out of the blood through membrane filtration slits creating a cell-free fluid (plasma) of water and small molecules that enters into the renal tubule. Large cells and proteins stay in the blood. This plasma is taken to the nearest (proximal) convoluted tubule. This goes down into the medulla to the loop of Henle, then back to the distal (farthest), convoluted tubule to join with other tubules.

In the distal tubule most of the salts are reabsorbed. Whatever remains is further modified until it becomes concentrated urine which has urea and other waste at the end of the collecting duct.

The kidneys collect and get rid of waste from the body in 3 steps:

Glomerular filtration
Filtrate is made as the blood is filtered through a collection of capillaries in the nephron (called glomeruli).

Tubular reabsorption
The tubules in the nephrons reabsorb the filtered blood in blood vessels that are close by.

Tubular secretion
The filtrates pass through the tubules to the collecting ducts and then taken to the bladder.

The glomerular filtration rate (GFR) is the rate at which the glomeruli filter the blood. The normal GFR is 120 ml/minute.

Most accurate measure of the GFR is done by measuring creatinine clearance. Clearance is the complete removal of a substance from the blood.
Creatinine is a good measure; it is filtered by the blood but not reabsorbed by the tubules.

Urine

Urine is made of:
- water,
-urea,
-electrolytes, and
-other waste products.

The exact contents of urine vary depending on;

- How much fluid intake
- How much salt intake,
- the environment
- the patient's health
- Medications /drugs (some are excreted in the urine and can be detected in the urine.

How much urine is made and how does the content of the urine change in order to maintain homeostasis (keep the body in balance). This balance is done;
- in the kidneys

The kidneys work to keep the balance by filtering the blood several times through out the day.

DEHYDRATION
When the body is dehydrated, the kidneys put less water in the urine.

ACIDIC
When the body is too acid, the kidneys remove more acid into the urine.

ELEVATED POTASSIUM
When the potassium levels are too high, the kidneys remove more potassium into the urine.

Urine is formed in the nephrons in three process:

- Glomerlular filtration,
- Tubular reabsorbtion and
- Tubular secretion.

The amount of urine varies based on the fluid intake and other factors as mentioned earlier, such as the environment (climate).

Condition of the kidneys (Problems /Disease)

• Pyelonephritis (infection of kidney pelvis):

Bacteria can infect the kidneys, the patients may experience back pain, fever. Bacteria often travels from a bladder infection and lead to pyelonephritis.

• **Glomerulonephritis (**inflammation of the glomeruli in the kidneys)

An overactive immune system or a group of diseases may attack the kidney, causing inflammation of the glomeruli. Patient with glomerulonephritis will often have blood and protein in the urine. This can also lead to kidney failure.

• Nephrolithiasis (Kidney stones):

Minerals in urine can form stones /crystals, which can get large and larger which may result in blockage of the flow of urine. It is one of the **most painful** conditions. sometimes kidney stones can pass out through the urine without any interventions however some may be too large to pass through and the patient will need to be treated.

• Nephrotic syndrome:

Damage to the kidneys can causes the kidneys to spill very large amounts of protein into the urine. Patients often experience edema (Leg swelling etc).

• **Polycystic kidney disease: (**genetic condition)

Is an inherited disorder; clusters of cysts develop in the kidneys.
large cysts in both kidneys that impair the function.

• **Acute renal failure (kidney failure):**

Sudden worsening in kidney function;
- Dehydration,
- Blockage in the urinary tract,
- kidney damage

can all cause acute renal failure, which **may be reversible**.

• **Chronic renal failure:**
A permanent loss of kidney function (partial loss)

Most common causes;
- Diabetes and
- Hypertension (high blood pressure).

End stage renal disease (ESRD): complete loss

Kidney function is completely loss; often due to chronic kidney disease. Patients with End Stage Renal Disease (ESRD) require regular dialysis to survive.

• Papillary necrosis:

A disorder of the kidneys in which all or part of the renal papillae dies (necrosis). Severe damage to kidneys can cause parts of kidney tissue to break off and block the kidneys. If this is not treated, the damage may lead to total kidney failure. The renal papillae are the areas where the openings of the collecting ducts enter the kidney and where the urine flows into the ureters.

Causes

Renal papillary necrosis may occur due to various conditions such as:

•Diabetic nephropathy
. Analgesic nephropathy
•Kidney infection (pyelonephritis)
•Kidney transplant rejection
•Sickle cell anemia
•Urinary tract blockage
Sickle cell anemia is a common cause of renal papillary necrosis in children.

Symptoms

Tissue death (necrosis) of the renal papillae may make the kidney unable to concentrate the urine. Symptoms may include:
•Back pain or flank pain
•Bloody urine
•Cloudy urine
•Dark, rust-colored, or brown urine
•Tissue pieces in the urine

Other symptoms that may occur with this disease:
•Chills
•Fever
•Painful urination
•Urinary frequency or urgency
•Urinary hesitancy
•Urinary incontinence
•Urinating large amounts
•Urinating often at night

Examinations

The area over the affected kidney (in the flank area) may feel tender during an examination. There may be a history of urinary tract infections. There may be signs of obstructive uropathy or kidney failure.

A urinalysis may reveal infection or dead tissue in the urine.

An intravenous pyelogram (IVP) may show a blockage or tissue in the renal pelvis or ureter.

How well a patient does depends on what is causing the condition. If the cause can be controlled, the condition may go away on its own. In some cases, individuals with this condition develop kidney failure and will need dialysis or a kidney transplant.

Treatment

There is no specific treatment for renal papillary necrosis. Treatment depends on the cause. For example, if a medication is the cause, the physician will recommend that the patient stop taking the medication that is causing it. This may allow the kidney to heal over time.

Possible Complications

•Acute kidney failure
•Acute bilateral obstructive uropathy
•Acute unilateral obstructive uropathy
•Chronic bilateral obstructive uropathy
•Chronic kidney disease
•Chronic or recurrent urinary tract infection (UTI)
•Chronic unilateral obstructive uropathy
•Hyperkalemia
•Hypovolemia
•Metabolic acidosis

Patient teaching

Instruct patients to contact a Medical Professional if;

• Have blood in the urine
• Develop other symptoms of renal papillary necrosis, especially after taking over-the-counter pain medications

Prevention

Controlling diabetes or sickle cell anemia may reduce the risk. To prevent renal papillary necrosis from analgesic nephropathy, be careful when using medications, including over-the-counter pain relievers.

Diabetic nephropathy:

High blood sugar (Hyperglycemia) from diabetes damages the kidneys; this progresses and leads to chronic kidney disease. In the urine protein may be noted (nephrotic syndrome).

• Hypertensive nephropathy:

This is kidney damage that is caused by hypertension (high blood pressure). As this progresses, chronic renal failure may result.

• Kidney cancer:

Is a disease in which the kidney cells become cancerous (malignant) and forms a tumor (grows out of control).
Renal cell carcinoma (the most common cancer affecting the kidneys).
Smoking - one of the most common cause of kidney cancer.

Kidney cancer

Kidney cancer: Renal cell carcinoma is the most common cancer affecting the kidney. Smoking is the most common cause of kidney cancer.

Kidney cancer (also called renal cancer) is a disease in which kidney cells become malignant (cancerous) and grow out of control, forming a tumor. Almost all kidney cancers first appear in the lining of the tiny tubes (tubules) in the kidney.

This type of kidney cancer is called renal cell carcinoma. These tumors can grow to be very large before they are detected.

Physicians and researchers are not sure what causes the kidney cancer. But some

factors appear to increase the risk of getting kidney cancer. For example, kidney cancer occurs most often in individuals who are older than age 40.

These are some other risk factors for kidney cancer such as:

•Smoking
When the individual smoke cigarettes, he /she is at risk for kidney cancer (twice that of nonsmokers). Smoking cigars may also increase the risk.

•Being male.
Men are about twice as likely as women to get kidney cancer.

•Being obese.
Extra weight may cause changes to hormones that increase the risk.

•Using some pain medications for a long period of time. This includes over-the-counter medications as well as prescription drugs.

•Having advanced kidney disease or being on long-term dialysis.

•Having certain genetic conditions, such as von Hippel-Lindau (VHL) disease or inherited papillary renal cell carcinoma.

•Having a family history of kidney cancer. The risk is especially high in siblings.

•Being exposed to some chemicals, such as asbestos, benzene, cadmium, organic solvents, or certain herbicides.

•Having high blood pressure.

Physicians and researchers are not sure whether high blood pressure or the medications used to treat it is the source of the increased risk.

•Being black.
The risk in blacks is slightly higher than in whites. No one knows why.

•Having lymphoma. For an unknown reason, there is an increased risk of kidney cancer in patients with lymphoma.

However having these risk factors, does not mean that the individual will get kidney cancer. And the individual may have none of them and still get the disease.

Symptoms of Kidney Cancer

In many cases, the individual may have no early symptoms of kidney cancer. As the tumor grows larger, symptoms may appear. The individual may experience one or more of these kidney cancer symptoms:
•Blood in the urine
•A lump in the side or abdomen
•A loss of appetite
•A pain in the side that does not go away
•Weight loss that occurs for no known reason
•Fever that lasts for weeks and is not caused by a cold or other infection
•Extreme fatigue
•Anemia
•Swelling in the ankles or legs.

Kidney cancer that spreads to other parts of the body may cause other symptoms, such as:
•Shortness of breath
•Coughing up blood
•Bone pain

Patient teaching

To confirm a diagnosis of kidney cancer, the patient will need a thorough physical exam, health history, and laboratory tests such as:

•Urine tests check for blood in the urine or other signs of problems.
•Blood tests show how well the kidneys are functioning.

•Intravenous pyelogram (IVP) involves X-raying the kidneys after the injection a dye that travels to the urinary tract, highlighting any tumors.

•Ultrasound uses sound waves to create a picture of the kidneys. It can help tell if a tumor is solid or fluid-filled.

•A CT scan uses X-rays and a computer to create a series of detailed pictures of the kidneys. This may also require an injection of dye.

•Magnetic resonance imaging (MRI) uses strong magnets and radio waves to create detailed images of soft tissues in the body. An injection of a contrast agent may be used to create better pictures.

•Renal arteriogram. This test is used to evaluate the blood supply to the tumor. It is not given frequently, but may help diagnose small tumors (also used for other reasons).

Sometimes, a biopsy may be done to confirm the diagnosis.

The physician may use a needle biopsy to remove a sample of tissue, which is then examined under a microscope for cancer cells. The biopsy may also tell the grade of the cancer. Often the surgeon will remove the entire tumor and then have a sample of tissue examined.

When the physician makes a diagnosis of kidney cancer, the patient may need other tests to tell if the cancer has spread within the kidney, to the other kidney, or to other parts of the body. When cancer spreads from the place where it first started, it has metastasized.

The patient may need a CT scan or MRI.
A chest X-ray can show whether the cancer has spread to the lungs.
A bone scan can see if it is in the bones.

These tests will help the physician determine the stage of kidney cancer.

Stages of Kidney Cancer

the patient's prognosis depends on his/her general health, and also the grade and stage of the kidney cancer.
These are the stages of kidney cancer. The higher the stage, the more advanced the cancer.

Stage I
•A tumor 7 centimeters or smaller that is only in the kidney

Stage II
•A tumor larger than 7 centimeters that is only in the kidney

Stage III
•A tumor that is in the kidney and in at least one nearby lymph node
•A tumor that is in the kidney's main blood vessel and may also be in nearby lymph node
•A tumor that is in the fatty tissue around the kidney and may also involve nearby lymph nodes
•A tumor that extends into major veins or perinephric tissues, but not into the ipsilateral adrenal gland and not beyond Gerota's fascia

Stage IV
•Cancer has spread beyond the fatty layer of tissue around the kidney, and it may also be in nearby lymph nodes
•Cancer may have spread to other organs, such as the bowel, pancreas, or lungs
•Cancer has spread beyond Gerota's fascia (including contiguous extension into the adrenal gland)

TREATMENT

Treatment may involve a urologist, a medical or radiation oncologist, or a surgeon. Kidney cancer is one of the more common cancers to undergo spontaneous remission. However, the incidence is quite low (approximately 0.5%).

There are several standard types of treatment for kidney cancer. In most cases, surgery is the first step. Even if surgery removes the entire tumor, though, the physician may suggest an extra treatment to kill any remaining cancer cells that cannot be seen.

Surgery for kidney cancer

The type of surgery the patient has depends on how advanced the cancer is.

•Radical nephrectomy

This procedure removes the kidney, the adrenal gland, and surrounding tissue. It also often removes lymph nodes that are close by. It is the most common surgery for kidney cancer and can be performed through a small incision with a laparoscope.

•**Simple nephrectomy** removes the kidney only.

•Partial nephrectomy

This procedure removes the cancer in the kidney and also some tissue around it. This procedure may be used when the tumor is smaller (less than 4 cm) or in those patients in which a radical nephrectomy might hurt the other kidney. An individual can survive with just a part of one kidney as long as it is still functioning.

DIALYSIS or kidney transplant

If the surgeon has to remove both kidneys or if both kidneys are not functioning, the patient will need a machine to clean the blood (dialysis) or a new kidney (kidney transplant). A transplant is possible if the cancer was found only in the kidney and a donated kidney is available.

If surgery cannot remove the kidney cancer, the physician may suggest another option to help destroy the tumor.

Cryotherapy uses extreme cold to kill the tumor.

Radiofrequency ablation uses high-energy radio waves to cook the tumor.

Arterial embolization involves inserting material into an artery that leads to the kidney. This blocks blood flow to the tumor. This procedure may be performed to help to shrink the tumor prior to surgery.

Biologic therapy for kidney cancer

This therapy uses the patient's immune system to fight cancer by boosting, directing, or restoring the body's natural defenses. Substances for biologic therapy are made by the patient's body or in a lab.

Biologic therapies for metastatic kidney cancer include:
Interferon alpha or interleukin-2.
There are many new immunotherapies being studied for kidney cancer.

Targeted therapy for kidney cancer

This therapy uses medications or other substances to find and target cancer cells with less toxicity to normal cells. Targeted therapy such as anti-angiogenic agents; these keep blood vessels from feeding the tumor, causing it to shrink or to stop growing.

Another type of targeted agent is known as multikinase inhibitors or tyrosine kinase inhibitors. These are oral medications that block an enzyme pathway which allows cancer cells to grow.

Another type of targeted therapy is known as m-TOR inhibitors (available PO or by IV). They block a pathway which allows blood vessels to help tumor cells grow.

Radiation therapy for kidney cancer

Radiation therapy is frequently used to help with symptoms of kidney cancer or in patients who cannot have surgery. Radiation therapy treatment uses high-energy X-rays or other types of radiation to kill cancer cells, or to stop their growth.

External radiation therapy sends radiation to the cancer from a machine outside the body.

Chemotherapy for kidney cancer

Chemotherapy uses drugs/medications to kill the cancer cells or stop them from multiplying. Less effective for kidney cancer than for other types of cancer, chemotherapy is mainly used for a certain type of kidney cancer in which there spindle cells (sarcomatoid variant).

Lower risk for Kidney Cancer

Because physicians and researchers do not know the causes of kidney cancer, it is not clear how to prevent the disease but there are various factors that are linked to kidney cancer, so the individual can take certain steps to lower the risk, such as:

- quit smoking,
- maintain a healthy weight,
- manage the blood pressure, and
- avoid exposure to harmful chemicals.

• Interstitial nephritis:

Inflammation of connective tissue within the kidneys, often leading to acute renal failure. Medication side effects and allergic reactions are common causes.

• Minimal change disease:

This as form of nephrotic syndrome - kidney cells seems almost normal when assessed under the microscope. This disease may cause significant edema (leg swelling). Steroids are used in the treatment of minimal change disease.

• Nephrogenic diabetes insipidus:

The kidneys lose their ability to concentrate urine, often due to drug/medication reaction. Diabetes insipidus causes frequent urination and thirst.

• Renal cyst:

Renal Cysts are round pouches of fluid that develop on or within the kidneys. Isolated kidney cysts occur in many normal individuals, they can be associated with serious disorders that may impair kidney function. However renal cysts are often noncancerous cysts that rarely cause complications.

Acute renal failure (kidney failure)

Acute renal failure (kidney failure):

The rapid (less than 2 days) loss of the kidneys' ability to remove waste and help balance fluids and electrolytes in the body.

There is a sudden worsening in kidney function.

Dehydration, a blockage in the urinary tract, or kidney damage can cause acute renal failure, which may be reversible.

There are many possible causes of kidney damage. They include:
•Acute tubular necrosis (ATN)
•Autoimmune kidney disease
•Blood clot from cholesterol (cholesterol emboli)
•Decreased blood flow due to very low blood pressure, which can result from burns, dehydration, hemorrhage, injury, septic shock, serious illness, or surgery
•Disorders that cause clotting within the kidney blood vessels
•Infections that directly injure the kidney, such as acute pyelonephritis or septicemia
•Pregnancy complications, including placenta abruption or placenta previa
•Urinary tract blockage

Symptoms

Symptoms of acute kidney failure may include any of the following:
•Bloody stools
•Breath odor and metallic taste in the mouth
•Bruising easily
•Changes in mental status or mood
•Decreased appetite
•Decreased sensation, especially in the hands or feet
•Fatigue
•Flank pain (between the ribs and hips)
•Hand tremor
•High blood pressure
•Nausea or vomiting, may last for days
•Nosebleeds

•Persistent hiccups
•Prolonged bleeding
•Seizures
•Shortness of breath
•Slow, sluggish movements
•Swelling due to the body keeping in fluid (may be seen in the legs, ankles, and feet)
•Urination changes, such as little or no urine, excessive urination at night, or urination that stops completely

Examination

The nurse or physician will examine the patient. Many patients with kidney disease have fluid retention which causes swelling in the body. On assessment the healthcare practitioner may hear a heart murmur, crackles in the lungs, or other abnormal sounds when listening to the heart and lungs with a stethoscope.

The results of laboratory tests may change suddenly (within a few days to 2 weeks). Such tests may include:

•BUN
•Creatinine clearance
•Serum creatinine
•Serum potassium
•Urinalysis

A kidney or abdominal ultrasound is the preferred test for diagnosing a blockage in the urinary tract.

¬X-ray,
¬CT scan, or
¬MRI of the abdomen can also tell if there is a blockage.

Blood tests may help reveal the underlying cause of kidney failure. Arterial blood gas

and blood chemistries may show metabolic acidosis.

Treatment

When the cause is found, the goal of treatment is to help the kidneys work again and prevent fluid and waste from building up in the body while they heal. Usually, the patient will have to stay overnight in the hospital for treatment.

The amount of liquid /fluid intake will be limited to the amount of urine the patient can produce. The patient will be told what the patients may and may not eat to reduce the buildup of toxins that the kidneys would normally remove.

The diet may need to be high in carbohydrates and low in protein, salt, and potassium.

The patient may need antibiotics to treat or prevent infection.

Diuretics may be used to help remove fluid from the body.

Medications will be given to help control the blood potassium level.

The patient may need dialysis (treatment that does what healthy kidneys normally do) to rid the body of harmful wastes, excess salt, and water.

Dialysis can save the patient's life if the potassium levels are dangerously high.

Dialysis will also be used if:

•The patient has mental status changes

•The patient stops urinating

•Develops pericarditis

• Patient is retaining too much fluid

•Patient is not able to remove nitrogen waste products from the body

With acute renal failure, dialysis will most often be short term. In rare cases, the kidney damage is so great that dialysis is needed permanently.

Chronic renal failure

Chronic renal failure: A permanent partial loss of kidney function. Diabetes and high blood pressure are the most common causes.

Chronic kidney disease is the slow loss of kidney function over time. The main job of the kidneys is to remove wastes and excess water from the body.

Causes

Chronic kidney disease (CKD) slowly gets worse over months or years. The patient may not notice any symptoms for some time. The loss of function may be so slow that the patient does not have symptoms until the kidneys have almost stopped working.

The final stage of chronic kidney disease is called end-stage renal disease (ESRD). At this stage, the kidneys are no longer able to remove enough wastes and excess fluids from the body. At this point, the patient would need dialysis or a kidney transplant. Diabetes and high blood pressure are the two most common causes and account for most cases.

Many other diseases and conditions can damage the kidneys, including:

•Autoimmune disorders (such as systemic lupus erythematosus and scleroderma)
•Birth defects of the kidneys (such as polycystic kidney disease)
•Some toxic chemicals
•Injury to the kidney
•Kidney stones and infection
•Problems with the arteries feeding the kidneys
•Some medicines, such as pain and cancer drugs

•Backward flow of urine into the kidneys (reflux nephropathy)

•Other kidney diseases

Chronic kidney disease leads to a buildup of fluid and waste products in the body. This condition affects most body systems and functions, including:

•High blood pressure

•Low blood cell count

•Vitamin D and bone health

Symptoms

The early symptoms of chronic kidney disease are the same as for many other illnesses. These symptoms may be the only sign of a problem in the early stages. Symptoms may include:

•Appetite loss

•General ill feeling and fatigue

•Headaches

•Itching (pruritus) and dry skin

•Nausea

•Weight loss without trying to lose weight

Symptoms that may occur when kidney function has gotten worse include:

•Abnormally dark or light skin

•Bone pain

•Drowsiness or problems concentrating or thinking

•Numbness or swelling in the hands and feet

•Muscle twitching or cramps

•Breath odor

•Easy bruising, or blood in the stool

•Excessive thirst

•Frequent hiccups

•Problems with sexual function

•Menstrual periods stop (amenorrhea)

•Shortness of breath

•Sleep problems

•Vomiting, often in the morning

Examination
Most individuals will have hypertension (high blood pressure) at all stages of chronic kidney disease. During an examination, the physician/ health care provider may also hear abnormal heart or lung sounds in the chest. The patient may have signs of nerve damage during a nervous system examination.

Urinalysis

A urinalysis may show protein or other changes in the urine. These changes may appear 6 months to 10 years or more before symptoms appear.

Tests that check how well the kidneys are working include:
•Creatinine clearance
•Creatinine levels
• Blood urea nitrogen (BUN)

Chronic kidney disease changes the results of several other tests. The patient will need to have the following tests as often as every 2 - 3 months when kidney disease gets worse:

•Albumin
•Calcium
•Cholesterol
•Complete blood count (CBC)
•Electrolytes
•Magnesium
•Phosphorous
•Potassium
•Sodium

Other tests that may be done to check for the cause or type of kidney disease include:
•CT scan of the abdomen
•MRI of the abdomen
•Ultrasound of the abdomen
•Kidney biopsy
•Kidney scan
•Kidney ultrasound

This disease may also change the results of the following tests:
•Erythropoietin
•PTH
•Bone density test
•Vitamin D level

Treatment

Controlling blood pressure will slow further kidney damage.
•Angiotensin-converting enzyme (ACE) inhibitors or angiotensin receptor blockers (ARBs) are used most often.
•The goal is to keep blood pressure below 130/80 mmHg.

Lifestyle changes

Making lifestyle changes can help protect the kidneys, and prevent heart disease and stroke, such as:

•Do not smoke.
•Eat meals that are low in fat and cholesterol.
•Get regular exercise (instruct patients to speak with nurse or physician before starting to exercise).
•Take medications to lower the cholesterol, if needed.
•Keep the blood sugar under control.
•Avoid eating too much salt and potassium.

Instruct patients;

- To always contact the kidney doctor prior to taking any over-the-counter medications; including vitamins and minerals, herbs and all supplements.
- To inform all of the healthcare practitioners involved in their care that he /she has chronic kidney disease.

Other treatments may include:
•Medications called phosphate binders, to help prevent high phosphorous levels
•Extra iron in the diet, iron pills, iron given through a vein (intravenous iron) special shots of a medication called erythropoietin, and blood transfusions to treat anemia
•Extra calcium and vitamin D
the physician may prescribe a special diet for chronic kidney disease.
•Limiting fluids
•Eating less protein
•Restricting salt, potassium, phosphorous, and other electrolytes
•Getting enough calories to prevent weight loss

The patients will go to dialysis when they have only 10 - 15% of the kidney function left. Even individuals who are waiting for a kidney transplant will need dialysis while waiting.

Possible Complications:

•Anemia
•Bleeding from the stomach or bleeding from the intestines
•Bone, joint, and muscle pain
•Change in blood sugar
•Damage to nerves of the legs and the arms - peripheral neuropathy
• Pleural effusion (fluid build up around the lungs)
•Complications of the heart and blood vessels
•Congestive heart failure
•Coronary artery disease
•High blood pressure
•Pericarditis
•Stroke
•High phosphorous levels
•High potassium levels
•Hyperparathyroidism
•Increase risk of infections
•Liver damage or failure
•Malnutrition
•Miscarriage and infertility
•Seizure
•Swelling (edema)
•Weakening of the bones and increased risk of fractures.

End-stage kidney disease

End-stage kidney disease is the last stage of chronic kidney disease. This is when the kidneys can no longer support the body's needs and the kidneys are not removing waste and excess water from the body as they should. End-stage kidney disease is also called end-stage renal disease (ESRD).

Causes of ESRD

End-stage renal disease (ESRD) occurs when the kidneys are no longer able to work at a level needed for day-to-day life. The most common causes of ESRD in the U.S. are diabetes and hypertension (high blood pressure). These conditions can affect the kidneys.

ESRD almost always comes after chronic kidney disease. The kidneys may slowly stop working over 10 to 20 years before end-stage disease results.

Some common symptoms may include:

•General ill feeling and fatigue

•Itching (pruritus) and dry skin

•Headaches

•Weight loss without trying

•Loss of appetite

•Nausea

Other symptoms may include:

•Abnormally dark or light skin

•Nail changes

•Bone pain

•Drowsiness and confusion
•Problems concentrating or thinking
•Numbness in the hands, feet, or other areas
•Muscle twitching or cramps
•Breath odor
•Easy bruising, nosebleeds, or blood in the stool
•Excessive thirst
•Frequent hiccups
•Problems with sexual function
•Menstrual periods stop (amenorrhea)
•Sleep problems
•Swelling of the feet and hands (edema)
•Vomiting, often in the morning

Examinations

The health care provider will perform a physical exam and order blood tests. Most people with this condition have high blood pressure.

Patients with ESRD will make much less urine, or their kidneys no longer make urine. ESRD changes the results of many tests.

Patients who are receiving dialysis will need these tests as well as other tests to be completed frequently:

•Potassium
•Sodium
•Albumin
•Phosphorous
•Calcium

•Cholesterol

•Magnesium

•Complete blood count (CBC)

•Electrolytes

This disease may also change the results of the following tests:

•Erythropoietin

•PTH

•Bone density test

Treatment

Treatment for ESRD may involve dialysis or kidney transplant. The patient may need to stay on a special diet or take medications to help the body work well.

DIALYSIS

As mentioned earlier, dialysis does some of the job of the kidneys when they stop working well.

Dialysis can:

•Remove extra salt, water, and waste products so they do not build up in the body

•Keep safe levels of minerals and vitamins in the body

•Help control blood pressure

•Help produce red blood cells

Dialysis removes waste from the blood when the kidneys can no longer do their job.

•Usually, dialysis is started when the patients have only 10 to 15% of their kidney function left.

•Even patients who are waiting for a kidney transplant may need dialysis while waiting.

Two different methods are used to perform dialysis:

- **Hemodialysis and Peritoneal dialysis.**
- During hemodialysis, the blood passes through a tube into an artificial kidney, or filter.
- During peritoneal dialysis, a special solution is passed into the belly though a catheter tube. The solution remains within the abdomen for period of time and it then removed. This method can be done at home, at work, or while traveling.

KIDNEY TRANSPLANT

A kidney transplant is surgery to place a healthy kidney into a patient with kidney failure. The physician will refer patients to a transplant center. There, they will be seen and evaluated by the transplant team. They will want to make sure that the patients are good candidates for kidney transplant.

SPECIAL DIET

Patients may need to continue following a special diet for chronic kidney disease. The diet may include:

•Eating foods low in protein
•Getting enough calories if losing weight.
•Limiting fluids.
•Limiting salt, potassium, phosphorous, and other electrolytes.

OTHER TREATMENTS

Other treatments depend on the symptoms but may include:

•Extra calcium and vitamin D

•Medications called phosphate binders, to help prevent phosphorous levels from increasing too high

•Treatment for anemia, such as extra iron in the diet, iron pills or injections, injection of a medication called erythropoietin, and blood transfusions.

•Medications to control the blood pressure.

End-stage kidney disease leads to death if the patient does not have dialysis or a kidney transplant. Both of these treatments have risks. The outcome is different for each patient.

Possible Complications may include:

•Anemia

•Bleeding from the stomach or intestines

•Bone, joint, and muscle pain

•Changes in blood sugar (glucose)

•Damage to nerves of the legs and arms

•Fluid buildup around the lungs

•High blood pressure, heart attack, and heart failure

•High potassium levels

•Increased risk of infection

•Liver damage or failure

•Malnutrition

•Miscarriages or infertility

•Restless legs syndrome

•Stroke, seizures, and dementia

•Swelling and edema

•Weakening of the bones and fractures related to high phosphorous and low calcium levels

STARTING DIALYSIS TREATMENT

The patient needs to start treatment when the patient has stage 5 chronic kidney disease (CKD), or kidney failure.

The physician will be able to determine the stage of chronic kidney disease (CKD) by checking the glomerular filtration rate (GFR).

- The Glomerular filtration rate (GFR) can be estimated from the results of creatinine blood test (a waste product from muscle activity).
- If the Glomerular filtration rate (GFR) falls below 15, the patient is diagnosed with kidney failure; CKD stage 5, and needs to have treatment to replace the function of the kidneys.
- If the Glomerular filtration rate (GFR) is less than 30, the physician will discuss with the patient; the different treatments for kidney failure.

LABORATORY TEST

eGFR

eGFR is used to:

- Screen for early kidney damage
- Detect early kidney damage
- To monitor kidney status

eGFR is performed by ordering a creatinine test and calculating the estimated glomerular filtration rate. The National Kidney Foundation has recommended that it be calculated automatically each time a creatinine test is completed.

A creatinine test and eGFR may be ordered when the physician / health practitioner wants to evaluate a patient's kidney function as part of the health checkup or if kidney disease is suspected.

An eGFR may be ordered periodically when the patient has a chronic kidney disease (CKD) or a condition for example diabetes or hypertension that is associated with kidney damage.

The National Kidney Foundation state normal values as 90-120 mL/min.

An eGFR below 60 mL/min suggests that some kidney damage has occurred.

HEMODIALYSIS

Hemodialysis function to:

- Remove waste, urea, salt and extra water to prevent them from building up in the blood,
- Restore the proper balance of electrolytes in the blood.
- Help to regulate the blood pressure.

A special dialysis prescription will be developed for the patient. This prescription helps ensure that the patient gets the right amount of treatment. Also the dialysis center / team monitor the treatment with lab tests, to measure the amount of dialysis the patient receives (delivered dose of dialysis).

Hemodialysis Procedure

The hemodialysis machine has a special filter (a dialyzer or artificial kidney), to clean the blood.
To get the blood into the dialyzer, the physician has to make an access into the blood vessels. This is done with minor surgery, usually to the arm.

There are 3 different types of access that can be made:

- Fistula,
- Graft or
- Catheter.

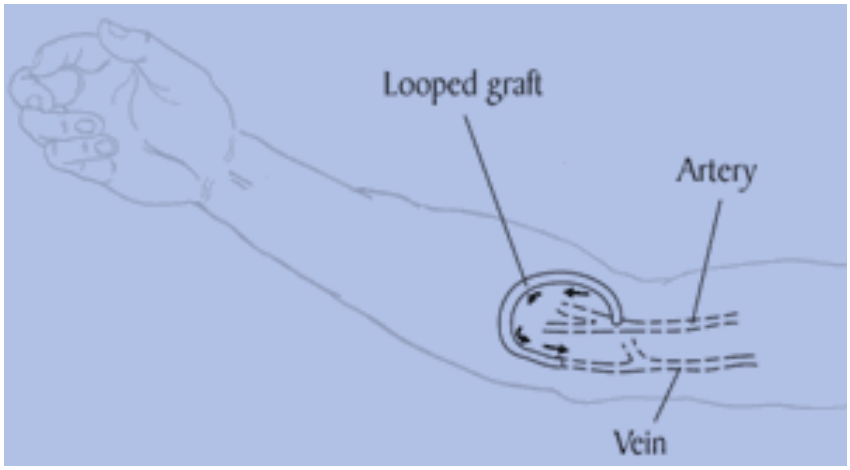
Fistula

A fistula is the first choice for an access. It is made by joining an artery to a nearby vein under the skin to make a larger blood vessel. This type of access is preferred because it has fewer problems and lasts longer. The patient is evaluated by a vascular surgeon (preferably at least 6 months before they will need to start dialysis). A fistula should be placed early (several months before starting dialysis) so it has plenty of time to heal and be ready by the time the patients need treatment.

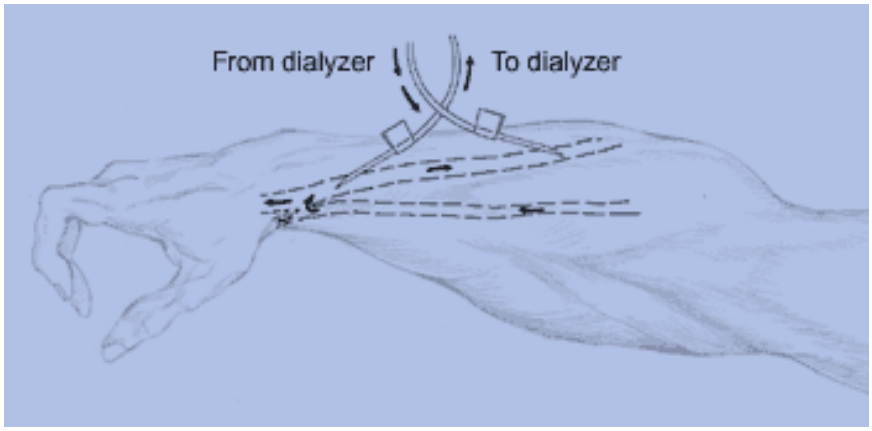
Graft

If the blood vessels are not suitable for the fistula, a graft may be used. The graft involves joining an artery and nearby vein with a small, soft tube made of synthetic material and placed under the skin.

After the fistula or graft has healed and dialysis is started, two needles will be placed; one in the artery side and one in the vein side of the access- each time the patient goes for treatment.



The needles are connected to the plastic tubes. One tube will carry the blood to the dialyzer where it is cleaned and the other tube returns the cleaned blood back to the patient.



Arterial and venous needles

Catheter

The 3rd type of access (a catheter), is inserted into a large vein located in the neck or chest. This type of access is generally used when the patients need dialysis for a short period of time.
Catheters may be used as a PERMANENT access - only when a fistula or a graft cannot be placed. Catheters can be connected directly to the dialysis tubes and needles are not used.

A large bore double lumen non-tunneled catheter is most often used when there is an immediate need for hemodialysis; such as with acute kidney injury, thrombosed hemodialysis access or poisoning.

If dialysis is needed for more than one week, a cuffed- tunneled catheter should be used instead. Cuffed - tunneled catheters can also be placed for a patient with chronic kidney disease who needs dialysis, but does not have a functional permanent vascular access.

Whenever permanent dialysis access is needed;

- an arteriovenous hemodialysis fistula is created or
- a prosthetic arteriovenous graft is placed.

When the fistula or graft can be used reliably, then the catheter is removed.

Dialysis catheters usually have at least two lumens attached to two ports (blue and red color).

- The RED port identifies the arterial lumen that draws blood from the body; proximal/side opening.

- The BLUE port identifies the venous lumen for return of blood from the dialysis machine to the patient the distal opening.

CATHETER PLACEMENT

Internal jugular catheters

- Internal jugular catheters are inserted into the jugular vein on the side of the neck.

Subclavian catheters

- Subclavian catheters are placed into the subclavian vein under the collarbone on the chest.

Femoral catheters

- Femoral catheters are placed in the large femoral vein in the leg near the groin.

After the catheter has been placed, needle insertion is not needed to receive hemodialysis treatment.

Catheters have an exit site, which is covered with bandages or other types of dressing. These dressings need to be changed and kept clean and dry at all times.

The nurse will twist the hemodialysis tubing ends onto the catheter ends.
The red end (arterial) takes the blood to the dialyzer. The blue end (venous) will bring the blood back to the patient. Once the tubing is connected, the nurse will open the clamps and start the treatment.

CARE OF THE CATHETERS

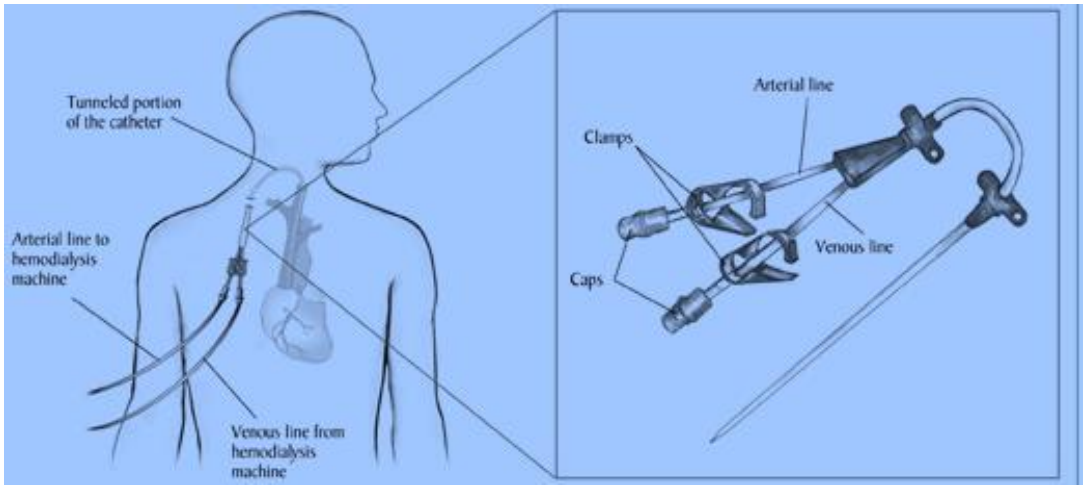
The catheter exit site should be cleaned with each dialysis treatment and clean dry gauze applied (sterile procedure). The patient and dialysis nurse must wear a mask for the dressing change, on and off procedures for dialysis or any time the dialysis catheter is to be accessed for use.

Non-cuffed catheters

For non-cuffed catheters, the sutures must remain in place for as long as the patient have the catheter.

Tunneled cuffed catheters

For tunneled cuffed catheters, the sutures should be removed when the catheter is healed into place to prevent infection from the sutures.



Tunneled Venous catheter

INSTRUCT PATIENTS …

Catheter caps

The catheter caps must be kept on the catheter and only removed by the dialysis staff. The clamps must remain closed at all times. The dialysis catheter must only be used by the dialysis staff.

If the clamp comes undone, close the clamp immediately. If a catheter cap becomes loose and falls off, make sure the catheter remains clamped and report to the dialysis center or emergency room due to the risk for air entering the bloodstream and /or an infection and the need for urgent care.

CATHETER SEPARATION

If any portion of the catheter develops a leak, hole or part separation, then the catheter has to be clamped off above the problem site. The catheter clamp may be movable and can be slid up on the body of the catheter to close off the catheter, or the patient may need to kink the catheter with the fingers to occlude the catheter and then **call 911**. If blood is leaking out, air can also enter the blood vessel and cause an air embolism.

Some important steps to take- Instruct the patients:

- Keep the catheter dressings intact, clean and dry.
- Make sure the area of the insertion site is clean and the nurse changes the dressing at each dialysis session.
- Always keep an emergency dressing kit at home, in case they need to change the dressing between treatments (patients need to be taught this procedure – if there is an emergency- they need to react quickly and effectively.
- Never remove the cap on the end of the catheter. Air must not enter the catheter.
- Do not shower or swim; may take baths... DO NOT wet the catheter site or catheter dressing. Moisture may cause infection. Taking a bath is safe if patients do not allow the catheter or catheter dressing to get become wet.

- Wear a mask over the mouth and nose whenever the catheter is opened to prevent bacteria from entering the catheter and enter the bloodstream. Nurses/ professionals who are changing the dressing should also wear mask and gloves.
- The clamps and caps of the catheter should be kept closed when not in use for dialysis. Only the nurse/ healthcare professionals should use the dialysis catheter to administer medications and fluids or to draw blood.
- Instruct patients to report s/s of infection; to report to the dialysis center/physician immediately, if the area around the catheter has redness, pus, or feeling of tenderness.
- Instruct patients to know the Kt/V and urea reduction ratio (URR). Kt/V and URR are numbers that tell how much dialysis the patient is getting. The National Kidney Foundation (NKF) recommends using Kt/V.

Kt/V is a way of measuring dialysis adequacy. In this measurement,

- **K** means - the dialyzer clearance, the rate at which blood passes through the dialyzer, expressed in milliliters per minute (mL/min)
- **t** stands for time
- **Kt**, the top part of the fraction, is clearance multiplied by time, represents the volume of fluid that is completely cleared of urea during a single treatment
- **V** is the bottom part of the fraction (the volume of water the patient's body contains).

URR - Urea Reduction Ratio

URR means urea reduction ratio;

- URR means the reduction in urea as a result of dialysis.
- The URR is one measure of how effectively a dialysis treatment removes waste products from the body and is usually expressed as a %.

The urea reduction ratio (URR) is often measured once every 12 to 14 treatments (once a month).

When the patient is receiving enough dialysis;

- The Kt/V should be at least 1.2.
- If urea reduction ratio (URR) is used, it should be 65 % or more.

If the numbers are too low, one possible cause may be that the access is not working well and needs to be assessed.

INSTRUCT THE PATIENTS HOW TO CARE FOR AND HOW TO PROTECT THE VASCULAR ACCESS

Patients needs to:

- Check for thrill in the access every day. The thrill is rhythmic vibration that you can feel over the vascular access.
- Be careful not to bump or cut the access.
- Watch for and report signs of infection such as redness, tenderness, or pus.
- Not allow anyone put a blood pressure cuff on the access arm.
- Not wear tight clothes or jewelry over the access site.
- Avoid sleeping with the access arm under the head or body.
- Avoid lifting heavy objects
- Avoid putting pressure on the access arm.

Blockage of catheter

Interventions for blockage of the catheter involve the administration of a clot busting medication such as tissue plasminogen activator (tPA)**.** Most dialysis centers administer the medication while the patients are in the dialysis chair, therefore hospitalization is prevented.

If the clot is not treated when the signs and symptoms of an early clot are noted, the catheter can progress to be fully clotted. The healthcare provider injects the medication directly into the catheter opening. The medicine needs to remain inside the catheter for thirty minutes to break down the clot; after thirty minutes if enough blood flow is not restored, the physician can repeat the process.

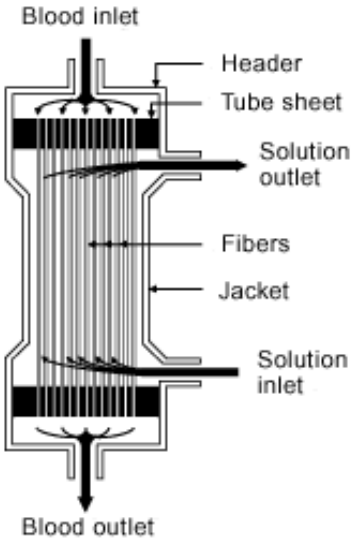
The patient may then be required to visit the vascular laboratory or the hospital to have the catheter checked and/or exchanged for a new catheter.

THE DIALYZER

The dialyzer (filter) has 2 parts;

- one part for the blood, and
- the other part for the dialysate (washing fluid).

There is a thin membrane that separates the two sides. Blood cells, protein and other substances remain in the blood because they are too large to pass through the membrane. However the smaller waste products for example creatinine, urea and extra fluids pass through the membrane and therefore removed. Changes in the dialysate fluid (cleansing fluid) can be made according to the patients needs. The machine continually pumps fresh dialysate through the dialyzer, removes the used solution and the waste it contains.



Structure of typical hollow fiber dialyzer.

TYPES OF HEMODIALYSIS MEMBRANES

Some types of membranes currently used to manufacture dialyzers include:

- Cellulose, called cuprophan (cuprophane), is a polysaccharide-based membrane that is obtained from pressed cotton. Cellulose is made up of chains of glucosan rings with abundant free hydroxyl groups.

- Substituted cellulose membranes are obtained by chemical bonding of a material to free hydroxyl groups at surface of cellulose polymer. The most common type is cellulose acetate.

- Cellulosynthetic membranes are modified by adding synthetic material to liquefied cellulose during its formation.

Duration of Hemodialysis treatment

Hemodialysis treatments are usually done 3 times a week. Each treatment usually lasts about 4 hours, but the patient may need more time to make sure that enough waste and fluid are removed.

The amount of dialysis the patient needs depends on different factors such as:

How much the kidneys are working

How much waste the patient has in the blood

The patient's weight

How much fluid weight gain the patient has between treatments

The type of artificial kidney used at the dialysis center

The size of artificial kidney the dialysis center uses.

The dialysis center /healthcare team checks and make sure that:

The patient's access is working well,

Blood samples are taken correctly

The dialyzer is functioning well

The flow rate of the dialysate fluid (cleansing fluid) and the blood flow are not too slow during dialysis.

Hemodialysis at home

Hemodialysis treatments may be completed at home. If the patient and the physician decide that home treatment is a good choice, the patient and a dialysis care partner, will be trained how to do the hemodialysis at home. A dialysis care partner may be a family member or friend or a caregiver hired to assist the patient.

Home hemodialysis allows patients to schedule treatments to fit the patient's routine. However the patient's home needs to have enough space for the hemodialysis machine/ equipment and have adequate water drainage and electrical power to operate the machine and water purification unit.

Some methods of home hemodialysis such as short daily home hemodialysis and nocturnal home hemodialysis, involve either;

- Shorter and more frequent treatments or
- Long and slow treatments during sleep (nocturnal).

Protecting the remaining kidney function

- If the patients have high blood pressure, the physicians /healthcare practitioners may order blood pressure pills called angiotensin-converting enzyme inhibitors (ACEIs) or angiotensin receptor blockers (ARBs). These medications help to protect kidney function.

- Avoiding medications that can harm the patient's kidneys, such as pain reliever such as medications called nonsteroidal anti- inflammatory drugs (NSAIDs) and some antibiotics.

- The physicians /healthcare practitioners may order diuretics (water pills) to help remove salt and water from the patient's blood.

- Protect the remaining kidney functions by also making sure conditions such as diabetes and hypertension (high blood pressure) are well controlled.

Special diet

The patient's diet will be different from the one they followed before starting dialysis. Certain foods may be limited, but it is important to get the right amount of calories and protein to maintain good health.

Sodium and fluid restrictions must be maintained to make sure that patient will not build up too much fluid in their body between dialysis treatments. Fluid buildup may lead to the need for (ultrafiltration) some fluid removal, during patient's dialysis treatment. Ultrafiltration may cause some discomfort during the patient's treatment.

When excess fluid buildup, this can also increase the patient's blood pressure. To help prevent fluid buildup between treatments, patient's daily diet should not include more than 2 grams of sodium.

Patient teaching

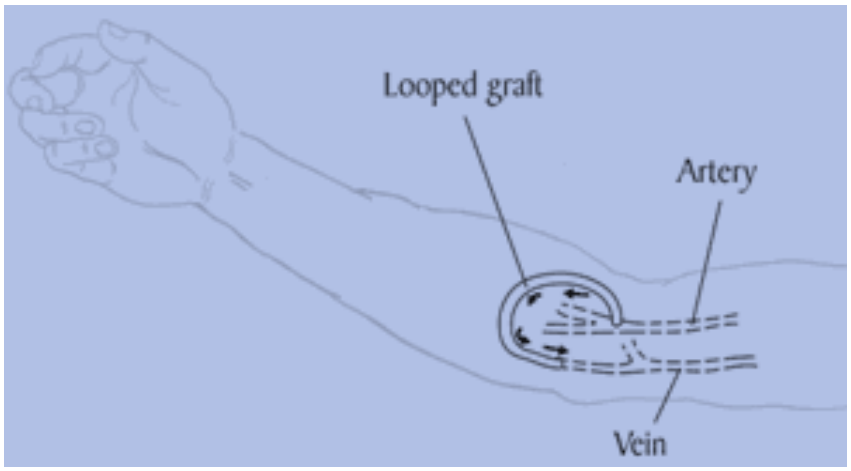
Keep sodium under control

To limit the amount of sodium in patient's diet and help prevent too much fluid buildup, try the following:

- Limit use of processed, canned and frozen foods
- Read all food labels and choose foods items that are low in sodium
- Avoid salt substitutes and low-sodium foods that are made with salt substitutes; these are high in potassium
- Cook meals with herbs and spices instead of salt

- When dining out, encourage patients to order fish or meat without salt.
- Avoid gravy or ask for sauce or gravy “on the side” because these may contain large amounts of sodium (salt) and should be used in very small amounts.

NURSING CARE PLANS



THE NURSE IS CARING FOR A HEMODIALYSIS PATIENT WHO HAS A NURSING DIAGNOSIS OF: Risk for Injury

Nursing Diagnosis

Risk for injury -loss of vascular access

Risk factors may include
•Clotting
•Hemorrhage related to accidental disconnection
•Infection

Desired Outcomes

•Maintain patent vascular access
•Be free of infection

Nursing Interventions and Rationale

Monitor internal AV shunt patency at frequent intervals:

Palpate for distal thrill:
Thrill is caused by turbulence of high-pressure arterial blood flow entering low-pressure venous system and should be palpable **above venous exit site**.

Auscultate for a bruit.
Bruit is the sound caused by the turbulence of arterial blood entering venous system and should be audible by stethoscope (may be very faint).

Note color of blood or obvious separation of cells and serum.
Change of color from uniform medium red to dark purplish red suggests sluggish blood flow and/or early clotting.

Separation in tubing is indicative of clotting.
Very dark reddish-black blood next to clear yellow fluid indicates full clot formation.

Palpate skin around shunt for warmth.
Diminished blood flow results in coolness of the shunt.

Notify physician and/or initiate declotting procedure if there is evidence of loss of shunt patency.
Rapid intervention may save access; however, **declotting must be done by those who are trained /**experienced .

Evaluate reports of :
pain,
numbness
tingling
note extremity swelling distal to access
May indicate inadequate blood supply.

Avoid trauma to shunt;
Handle tubing gently,
maintain cannula alignment
Limit activity of extremity
Avoid taking BP or drawing blood samples in shunt extremity.

Teach patient not to sleep on side with shunt or carry packages, books, purse on affected extremity -Decreases risk of clotting and disconnection.

Attach two cannula clamps to shunt dressing.
Have tourniquet available.
If cannulas separate, clamp the arterial cannula first, then the venous.

If tubing comes out of vessel, clamp cannula that is still in place and apply direct pressure to bleeding site.

Place tourniquet above site or inflate BP cuff to pressure just above patient's systolic BP.-- Prevents massive blood loss while awaiting medical assistance if cannula separates or shunt is dislodged.

Assess skin around vascular access, note;
redness,
swelling,
local warmth,
exudate,
tenderness
Signs of local infection, which can progress to sepsis if untreated.

Avoid contamination of access site.
Use aseptic technique and masks when;
giving shunt care,
applying or changing dressings, and
when starting or completing dialysis process -
Prevents introduction of organisms that can cause infection.

Monitor temperature.
Note presence of fever, chills, hypotension-
Signs of infection or sepsis requires prompt medical intervention.

Culture the site and obtain blood samples as indicated.
Determines presence of pathogens.

Monitor PT, activated partial thromboplastin time (aPTT) as appropriate.
Provides information about coagulation status, identifies treatment needs, and evaluates effectiveness.

Administer medications as indicated:

Heparin (low-dose) Infused on arterial side of filter : prevent clotting in the filter without systemic side effects.

Antibiotics (topical or systemic): treatment of infection may save access, prevent sepsis.

THE NURSE IS CARING FOR A HEMODIALYSIS PATIENT WHO HAS A NURSING DIAGNOSIS OF: Deficient Fluid Volume

Nursing Diagnosis

Risk for deficient fluid volume

Risk factors may include:

•Fluid restrictions
• Ultrafiltration
•Actual blood loss (disconnection of the shunt or systemic heparinization)

What are the Desired Outcomes?

Maintain fluid balance as evidenced by:

• appropriate weight (stable weight)
• appropriate vital signs,
• good skin turgor,
• moist mucous membranes,
• absence of bleeding.

Nursing Interventions and Rationale

Measure all sources of I&. (patient needs to keep a log /diary)-
This help in evaluating fluid status, especially when compared with weight.

ALERT!!

Urine output is an inaccurate evaluation of renal function in dialysis patients. Some individuals have water output with little renal clearance of toxins, while others have oliguria or anuria.

Weigh patient daily before and after dialysis-
Weight loss over specific measured time is a:

• measure of ultrafiltration and
• fluid removal.

Monitor vital signs: BP, pulse, and hemodynamic pressures (if available during dialysis).

IF PATIENT HAS VOLUME DEPLETION there will be:

- Hypotension,
- tachycardia,
- falling hemodynamic pressures

MONITOR FOR whether the diuretics and antihypertensives medications are to be withheld.

Dialysis potentiates hypotensive effects if these drugs have been administered.

Verify continuity of shunt and/or access catheter.
Disconnected shunt or open access permits exsanguination.

Apply external shunt dressing.
Permit no puncture of shunt.
Minimizes stress on the cannula insertion site to reduce dislodgement and bleeding from site.

Place patient in a supine or Trendelenburg's position as needed.
If hypotension occurs, these positions can maximize venous return.

Assess for frank bleeding or oozing at:
- access site or
- mucous membranes,
- incisions or
- wounds.

Hematest and/or guaiac stools, gastric drainage.
Systemic heparinization during dialysis increase clotting times; places patient at risk for bleeding, especially during the first 4 hr after procedure.

Monitor laboratory studies as indicated:

- Hb/Hct - May be reduced because of anemia, hemodilution, or actual blood loss.
- Serum electrolytes and pH - Imbalances may require changes in the dialysate solution or supplemental replacement to achieve balance.

- Clotting times: PT/aPTT, and platelet count - Use of heparin to prevent clotting in blood lines and hemofilter alters coagulation and increases the risk of active bleeding.

Administer IV solutions (normal saline, volume expanders (such as albumin) during dialysis as indicated

Saline and/or dextrose solutions, electrolytes, and NaHCO3 may be infused in the venous side of continuous arteriovenous (CAV) hemofilter when high ultrafiltration rates are used for removal of extracellular fluid and toxic solutes.

Volume expanders may be needed during or after hemoodialysis if sudden or marked drop in blood pressure (hypotension) occurs.

Blood / Packed Red Blood Cells (PRCs) if needed.

Destruction of RBCs (hemolysis) by mechanical dialysis, hemorrhagic losses, decreased RBC production may result in profound or progressive anemia requiring corrective action.

Reduce rate of ultrafiltration during dialysis as indicated -
Reduces the amount of water being removed and may correct hypotension or hypovolemia.

Administer protamine sulfate as appropriate -
May be needed to return clotting times to normal or if heparin rebound occurs (up to 16 hr after hemodialysis).

THE NURSE IS CARING FOR A HEMODIALYSIS PATIENT WHO HAS A NURSING DIAGNOSIS OF: Risk for Excess Fluid Volume

What will you plan to do for this patient?

Risk factors may include:

• Excessive or rapid fluid intake:
IV; blood, saline, plasma expanders administered to support Blood Pressure during dialysis.

What will be some Desired Outcomes?

• Free of edema
• Maintain dry weight within the patient's normal range
• clear breath sounds

• serum sodium levels within normal limits.

Nursing Interventions

Weigh patient routinely
Measure all sources of I&O -

This assist in evaluating fluid status, especially when compared with weight. Weight gain between treatments should **not exceed 0.5 kg/day.**

Monitor BP and heart rate (pulse) -

Hypertension and tachycardia between hemodialysis may result from;
fluid overload and/or Heart Failure.

Note presence of peripheral edema
Note presence of sacral edema,
respiratory rales,
dyspnea,
orthopnea,
distended neck veins,
ECG changes (indicative of ventricular hypertrophy).

Fluid volume excess due to
Inefficient dialysis or

repeated hypervolemia between dialysis treatments may cause or exacerbate Heart Failure, as indicated by signs and symptoms of respiratory congestion and systemic venous congestion.

Note changes in mentation;

Fluid overload or hypervolemia may potentiate cerebral edema (disequilibrium syndrome).

Monitor serum sodium levels.
Restrict sodium intake as indicated.

High sodium levels are associated with:
1. fluid overload,
2. edema,
3. Hypertension,
4. cardiac complications etc.

Restrict PO fluids as indicated
Restrict IV fluid intake as indicated (space allowed fluids throughout a 24-hr period).

WHY?

The intermittent nature of hemodialysis results in fluid retention and potential overload between procedures and may require fluid restriction.

Spacing fluids allows fluid throughout the 24 hour period and helps to reduce thirst.

Infection control Standards

Patients who undergo hemodialysis have a higher risk of infection due to:

- Weakened immune system,
- Frequent use of the catheter or needle insertion to access the blood stream
- Frequent hospitalization and /or surgery.

Patients can get infections from dialysis therefore appropriate infection control practices are mandatory.

INFECTION CONTROL

Infection control refers to guidelines / regulations that are designed for educating, reporting, monitoring, managing and isolating healthcare related and/or community acquired infections. Therefore, infection control measures are important to control, eliminate or minimize employee exposure to bloodborne pathogens and communicable diseases.

Infection

The invasion, multiplication and growth of microorganisms such as Viruses, bacteria and parasites that are not normally present in the body. Microorganisms that live

naturally within the body are not considered infections such as bacteria that normally live in the mouth or intestine are not infections.

An infection may remain localized (in a specific body part) or it may spread throughout the entire body; spread to the blood and /or lymphatic vessels and become systemic. An infection may not cause symptoms and remain subclinical, or it may lead to symptoms such as fatigue, fever, pain, tenderness, rash, loss of appetite, nausea, vomiting, diarrhea, redness, swelling of parts of the body, and drainage or discharge from the infected area.

During dialysis, infections can spread by contact transmission; most frequently by the hands of healthcare workers (CDC 2012).

Wear personal protective equipment (PPE); gloves, gowns and face protection as needed:

- During the initiation of dialysis
- When cleaning dialyzers
- When handling laboratory samples
- During the termination of dialysis

Healthcare workers should dedicate SUPPLIES to a single patient.

- Any items taken to a patient's dialysis station could become CONTAMINATED.

- Items taken to the dialysis station should be disposed of or cleaned and disinfected before taken to a common clean area or use for another patient.

Unused supplies or medications SUCH AS Syringes, alcohol swabs, medication vials; taken to the patient's dialysis station should not be returned to the common clean area. (CDC 2012).

Prepare all individual patient doses in a clean area away from dialysis station,

Do not carry any medications from station to station,

Do not prepare any medications at patient's station,

Prepare dose close to time of use,

Do not carry medications and/ or supplies in your pockets

Do not use the same medication cart to deliver medications to multiple patients,

CDC recommends that dialysis facilities use SINGLE –DOSE vials as much as possible and dispose of them immediately after use (CDC 2012).

DISINFECTING THE DIALYSIS STATION

All surfaces and equipments are considered contaminated after each dialysis session and must be disinfected,

After the patient leaves the station, disinfect the dialysis station including the chairs, countertops, trays and machine,

Clean all surface areas; clean with disinfectants and let it air dry

All the control panels on the dialysis machine should be cleaned also,

Empty and disinfect all the surfaces of prime waste containers.

DIALYZERS AND BLOOD TUBINGS

Before removing and /or transporting used dialyzers and blood tubing, cap dialyzer ports and clamp tubing,

Place all used dialyzers and tubing in leak-proof containers for transport from station to reprocessing or for disposal area.

If dialyzers are reused follow the published methods for example Association for the Advancement of Medical Instrumentation (AAMI) standards for reprocessing.(CDC 2012).

The Process of Infection

For an infection to develop there has to be a source. The source is a pathogen that is capable of causing a disease. The pathogen needs a reservoir where it is able to grow and multiply. Humans and animals are reservoirs for pathogens (microbes). When the individual does have signs and symptoms of the infection, he /she is referred to as a carrier. Carriers are capable of passing the pathogen to others. The pathogen has to be able to leave the reservoir, it leaves through an exit. The exits within the human body include breaks in the skin and in the blood, the gastrointestinal, respiratory, urinary and reproductive tracts. When the pathogen leaves the reservoir it may be transmitted to another individual or host.

Methods of transmission

Methods of transmission include:

- Air
- direct contact,
- food,
- water,
- animals, and
- Insects.

Microbes may also be transmitted by equipment for personal care, hygiene, dressings etc. The pathogen then has to enter the body through a portal of entry. The portals of entry within the human body include breaks in the skin and in the blood, the gastrointestinal, respiratory, urinary and reproductive tracts.

TIPS

- Avoid patient contact when you have open skin wounds and/or lesions.
- Always wash your hands after contact with the patient.
- Wash immediately if hands and other body parts make contact with blood or body fluids.
- When providing assistance with personal care try to avoid cuts or nicks when shaving a patient.
- When using sharp objects, take caution to avoid injuring yourself or the patient.

- Always use resuscitation devices when you need to perform mouth-to-mouth resuscitation.

Susceptibility of the host

The growth of the pathogen and its ability to multiply within the host, depends on the susceptibility of the host. Human beings have the natural ability and are able to protect itself from infections, but the ability to resist an infection may be related to various factors including but not limited to:

- general health condition,
- age of the individual,
- presence of other illnesses,
- absence of other illnesses,
- sex of the individual,
- fatigue,
- nutritional status, and
- Medications.

Regulations

Infection control standards and policies published by Occupational Safety and Health Administration (OSHA), the Centers for Disease Control and Prevention (CDC) the Association for Professionals in Infection Control and Epidemiology (APIC) and National Institute of Occupational Safety and Health (NIOSH) have made recommendations. These guidelines are designed to reduce the transmission of bloodborne and other pathogens and apply to every patient regardless of their diagnosis. These guidelines reinforce the idea that body substances such as oral and body secretions; blood, breast milk, urine, feces, airborne spray from coughing or droplet, vomits, tissue, wound, or any other drainage; can be a source of infection. These guidelines also explain that the environment can also be a source of infection.

Some of the functions of Occupational Safety and Health Administration (OSHA) include:

- Writing the regulations or standards for workplace safety,
- conducting reviews to ensure compliance, and

- Prosecute Violations of standards.

National Institute of Occupational Safety and Health (NIOSH) is responsible for research into best practices for workplace safety and making recommendations regarding proper procedures and equipment.

The need for Occupational Safety and Health Administration (OSHA) in the healthcare environment came to light with the emergence of the Human Immunodeficiency Virus (HIV) and concerns regarding the possibility of healthcare workers acquiring the virus through patient contact.

Healthcare workers are occupationally exposed to a several types of infectious diseases while they are on the job performing their duties. During the process of delivering healthcare services, there are a wide variety of workers involve, such as:

- Physicians,
- Nurses,
- CNA/HHA,
- Therapist (Physical, Occupational and Speech)
- Technicians,
- Transporters
- clinical laboratory workers,
- First responders; EMS, Fire Department, Police Officers,
- building maintenance personnel,
- security staff and administrative personnel,
- social workers,
- food service,
- volunteers
- housekeeping,
- Mortuary personnel and so much more.

Several of the healthcare workers can also be found in a variety of workplace environment such as,

- Hospitals,
- nursing care facilities,
- outpatient clinics (medical office, dental offices, and occupational health clinics),
- ambulatory care centers,
- Home Health Care and
- Emergency response settings.

Primary routes of infectious disease transmission in the United States healthcare settings include:

- Contact,
- Droplet, and
- Airborne.

Contact transmission

Contact transmission (sub-divided into direct and indirect contact).

Direct contact transmission

Direct contact transmission involves the transfer of infectious agents to the susceptible individual through physical contact with an infected individual such as, direct skin-to-skin contact.

Indirect contact transmission

Indirect contact transmission occurs whenever infectious agents are transferred to the susceptible individual when the individual makes physical contact with the contaminated items and surfaces such as:

- Contaminated blood draw equipment,
- Door knobs,
- patient-care instruments or equipment,

- bed rails,
- Examination table, etc.

Examples of contact transmissible infectious agents include:

- Methicillin-Resistant *Staphylococcus Aureus* (MRSA) and
- Vancomycin-Resistant Enterococcus (VRE).

Droplets

Droplets containing infectious agents are generated when:

- When an infected individual talks,
- When an infected individual sneezes,
- When an infected individual coughs,
- During certain medical procedures, for example suctioning or while performing an endotracheal intubation.

Transmission occurs when the droplets generated as mentioned above; come into direct contact with the healthcare worker or other individuals' (a susceptible individual) mucosal surfaces of the nose, mouth or eyes. Droplets are too large to be airborne for a long period of time; therefore droplet transmission does not occur through the air over long distances.

Examples of droplet transmissible infectious agents are the:

- Influenza virus which causes the seasonal flu and
- *Bordetella Pertussis* which causes Pertussis (whooping cough).

Airborne transmission

Airborne transmission occurs through very small droplet nuclei or small particles that contain infectious agents and can remain suspended in air for extended periods of time. When the infectious droplet nuclei or small particles are inhaled by the susceptible individual, they enter the respiratory tract and can cause infection. Because air currents can disperse these droplet nuclei or particles over long distances; airborne transmission does not require face-to-face contact with the infected individual.

Airborne transmission only occurs with an infectious agent that is capable of surviving and retaining infectivity for relatively long periods of time in droplet nuclei or airborne particles.

There are a limited number of diseases that are transmissible via the airborne route. Two examples of airborne transmissible agents include:

- *Mycobacterium tuberculosis* which causes tuberculosis (TB) and
- Rubella virus which causes measles.

There are several OSHA standards and directives that are directly applicable to protecting workers against transmission of infectious agents. These include:

- OSHA's Bloodborne Pathogens standard which provides protection of workers from exposures to blood and body fluids that may contain bloodborne infectious agents;
- OSHA's Personal Protective Equipment standard and Respiratory Protection standard which provide protection for workers when exposed to contact, droplet and airborne transmissible infectious agents and
- OSHA's TB compliance directive which protects workers against exposure to TB through enforcement of existing applicable OSHA standards and the General Duty Clause of the OSH Act.

Employers

It is mandatory for employers to implement an Exposure Control Plan that makes Universal Precautions mandatory and treats all body fluids and blood as infectious with the exception of sweat. This plan focuses on hand hygiene and the use of Personal Protective Equipment (PPE) as protection against blood and body fluid infection. PPE includes gowns, gloves, masks, goggles and resuscitation bags. These materials must be available to the employee at no charge. Hypoallergenic gloves, powderless gloves glove liners, or other alternatives must be provided for the employee who is allergic to the gloves that are usually provided. The employer must also launder, clean or dispose of PPE at no cost to the employee. A review of available Personal Protective Equipment should be completed periodically for example annually, due to new product developments and other improvements.

Under the General Duty Clause, Section 5(a)(1) of the Occupational Safety and Health Act (OSHA) of 1970, employers are required to provide their employees with a place of employment that "is free from recognizable hazards that are causing or likely to cause death or serious harm to employees." The courts have interpreted OSHA's general duty clause to mean that an employer has a legal obligation to provide a workplace free of conditions or activities that either the employer or industry recognizes as hazardous and that cause, or are likely to cause, death or serious physical harm to employees when there is a feasible method to abate the hazard.

Each employer shall:

- Shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees;
- shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees; shall comply with occupational safety and health standards promulgated under this Act.
- Each employee shall comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to this Act which are applicable to his own actions and conduct.

An employer can be found to be in violation of the general duty clause if it can be shown that:

- A hazard exist
- Workers / staff were exposed to the hazard
- The hazard is likely to cause death or serious physical harm.
- Employer had knowledge of the hazard or should have had knowledge because the hazard had been recognized by the employer, the industry, or common sense.
- The hazard was foreseeable.

Universal Precaution

Universal Precaution is an infection control principle that treats all human blood and other potentially infectious materials (OPIM) as infectious (29 CFR1910.1030(d)(1). OSHA regulation for preventing any exposure to HBV, HIV, and HCV in the workplace and requires the proper use of Personal protective equipment (PPE).

Standard Precautions

Standard Precautions: recommendations from the Centers for Disease Control and Prevention (CDC) which focuses on all body fluids; whether or not blood is present. Body fluids from excretion, secretion (except sweat), and contact with non-intact skin or mucus membranes.

Hand Hygiene

Hand hygiene procedures include the use of alcohol-based hand rubs (containing 60-95% alcohol) and handwashing with soap and water. Alcohol-based hand rub is the preferred method for decontaminating hands, except when hands are visibly soiled for example with dirt, blood, body fluids, or after caring for patients with known or suspected infectious diarrhea such as with Clostridium difficile and norovirus, in such case soap and water should be used. Hand hygiene stations should be placed to ensure there is easy access.

Washing the hands with liquid soap and water

The components of good hand washing include:

Using adequate amount of soap
Rubbing the hands together to create some friction and
Rinsing under running water

The mechanical action of washing and drying removes most of the transient bacteria that is present. Washing hands thoroughly between patient contacts and after contact with body fluids, blood, excretion, secretion, articles or equipment contaminated by them is an important component of infection control and isolation precautions.

Some institutions recommend use adequate soap, make lather and continue rubbing for *15-20 seconds*. To wash for the correct time, sing “Happy Birthday to You ” twice.
If soap and water are not available, you can use an alcohol based hand rub to clean

your hands. These foam gels significantly reduce the number of germs on the skin and are fast acting. Follow your institutions' policy and procedure.

Using Alcohol-based Hand Rub (always follow manufacturer's directions):

- Dispense the recommended volume of product
- Apply product to the palm of one hand
- Rub hands together, covering all surfaces of hands and fingers until they are dry (no rinsing is required)

Indications for Hand Hygiene

Always perform hand hygiene in the following situations:

- Wash hands or perform hand hygiene before touching the patient, even if gloves will be worn
- Wash hands or perform hand hygiene before exiting the patient's care area after touching the patient or the patient's immediate environment
- Wash hands or perform hand hygiene after contact with blood, body fluids or excretions, or wound dressings
- Wash hands before performing an aseptic task such as accessing a port or preparing an injection.
- Wash hands or perform hand hygiene if hands will be moving from a contaminated-body site to a clean-body site during patient care
- Wash hands or perform hand hygiene after glove removal

Personal protective equipment (**PPE)**

Personal protective equipment (PPE) are protective wear, materials, specialized equipment or clothing used to protect the healthcare worker from any splashes or body exposures to blood, body fluids or other contaminates or infectious materials. PPE are equipments such as gloves, scrubs, lab coat, face mask, goggles, gowns, surgical shoe covers, aprons, caps etc. Disposable face masks are to be worn whenever there is a reasonable expectation that droplet transmission may occur. The selection of personal protective equipment is based on the nature of the patient interaction,

potential for exposure to body fluids, blood or infectious agents. For personal protective equipment used for the preparation and handling of antineoplastic and hazardous drugs, follow the recommendations determined in accordance with OSHA and NIOSH.

Appropriate use of PPE is required by the Bloodborne Pathogens standard, if exposure to blood is anticipated.

Gloves

Gloves act as a barrier between the healthcare worker and the patient. They protect the healthcare worker from pathogens that may be present in the patient's body fluids, blood, and body substances. Do not allow the gloves to touch the skin on the wrists or arms. Patients will also be protected from microorganisms that may be present on the healthcare worker's hand.

Wear gloves when the possibility of contact transmission may occur, for example:

- When touching blood,
- when touching body fluids,
- when touching body substances,
- when touching mucous membranes,
- During venipuncture procedures where hand contact with blood is anticipated, or when handling items that are contaminated,
- when there are breaks, cuts, or openings in the skin
- when there is a possibility there will be contact with feces, urine, vomitus, wound drainage, dressings, soiled clothing or soiled linen.

Change gloves between each patient procedure.

- Do not wear the same pair of gloves for the care of more than one patient
- Do not wash gloves TO BE ABLE TO REUSE THEM
- Perform hand hygiene before and immediately after removing gloves

Masks, goggles and face shields

Wear Masks, goggles, or face shield when splashing of body fluids or blood is possible so that your eyes and the mucous membranes of your mouth will be protected.

Facemasks (Procedure or Surgical Masks)
Wear a facemask:

- When there is potential contact with respiratory secretions and sprays of blood or body fluids (as defined in Standard Precautions and/or Droplet Precautions)
    - May be used in combination with goggles or face shield to protect the mouth, nose and eyes
- When placing a catheter or injecting material into the spinal canal or subdural space (to protect patients from exposure to infectious agents carried in the mouth or nose of healthcare personnel)
    - Wear a facemask to perform intrathecal chemotherapy

Goggles, Face Shields
Wear eye protection for potential splash or spray of blood, respiratory secretions, or other body fluids.

- Personal eyeglasses and contact lenses are not considered adequate eye protection
- May use goggles with facemasks, or face shield alone, to protect the mouth, nose and eyes

Respirators

If available wear N95-or higher respirators for potential exposure to infectious agents transmitted via the airborne route for example tuberculosis.

- All healthcare personnel that use N95-or higher respirator are fit tested at least annually and according to OSHA requirements

N95 disposable respirator

- The N95 respirator is the most common of the seven types of particulate filtering facepiece respirators. This product filters at least 95% of airborne particles but is not resistant to oil.
-
- Occupational Safety and Health Administration (OSHA) allows for the use of the N95 disposable respirator for employees for protection against Tuberculosis in the health care environment.
- The N95 disposable respirator has to be fit tested. A fit test is a test protocol conducted to verify that a respirator is both comfortable and correctly fits the user. Fit testing uses a test agent, either qualitatively detected by the user's sense of smell, taste or involuntary cough (irritant smoke) or quantitatively measured by an instrument, to verify the respirator's fit.
- Fit testing each model of respirator the employee is to use in workplace tasks before their use is important to assure the expected level of protection is provided by minimizing the total amount of contaminant leakage into the face piece. The benefits of this testing include better protection for the employee and verification that the employee is wearing a correctly-fitting model and size of respirator. Higher than expected exposures to a contaminate may occur if users have poor face seals with the respirator, which can result in excessive leakage.

Gowns or aprons

Gowns or aprons are worn when soiling, splashing or smearing from blood and /or body fluids is possible.

- Do not wear the same gown for the care of more than one patient
- Remove gown and perform hand hygiene before leaving the patient's environment for example the exam room.

NEEDLE SAFETY

HANDLING SHARP DEVICES

Any worker handling sharp devices or equipment such as scalpels, sutures, hypodermic needles, blood collection devices, or phlebotomy devices is at risk. Nursing staff are most frequently injured. Exposure Prevention Information Network (EPINET) data shows that needle stick injuries occur most frequently in the operating room and in patient rooms.

Place sharp objects and needles in a Sharps container (puncture-proof). A needle should not be bent or replaced in the sheath or guard, or removed from the syringe after use. Do not recap used needles; high risk for injury and infection.

For accidents/ injuries, report all incidents to the supervisor follow your facility guidelines regarding treatment and necessary the follow up.

According to National Institute of Occupational Safety and Health (NIOSH):

If you experience a needlestick or sharps injury or are exposed to the blood or other body fluid of a patient during the course of your work, immediately follow these steps:

- Wash needlesticks and cuts with soap and water.
- Flush splashes to the nose, mouth, or skin with water.
- Irrigate eyes with clean water, saline, or sterile irrigants.
- Report the incident to your supervisor.
- Immediately seek medical treatment.

The cost of sharps injury may be one of the reasons to utilize safer sharps practices, because sharps injury can cause considerable costs for the healthcare institution, including:

- Expense from laboratory testing (testing for bloodborne pathogens may last for several months)
- Costly treatments for affected employee
- Costly to replace employee
- Loss of employee time from work
- Stress on the infected employee and family
- Cost to investigate the incident /injury
- feelings of distress and anxiety for the infected employee

The Centers for Disease Control and Prevention (CDC), estimates that about 385,000 sharps-related injuries occur yearly among health care workers within hospitals. More recent data from the Exposure Prevention Information Network (EPINet) suggest these injuries can be reduced, because sharps related injuries in nonsurgical hospital settings decreased 31.6% during 2001–2006 after the Needlestick Safety and Prevention Act of 2000. However, injuries in the surgical settings increased 6.5% in the same period, where the use of safety devices was limited in comparison to nonsurgical settings. It has also been estimated that about half or more of sharps injuries are not reported. Most reported sharps injuries involve nursing staff, but other employees are also injured such as, physicians, laboratory employees, housekeepers, and other health care workers.

SOME SAFETY TIPS

- Always observe the universal /standard safety precautions; Observe all applicable isolation procedures.
- Wash hands in warm, running water, the chlorhexidine gluconate hand washing product or your facility approved agent.
  hand wash product before and after each patient collection.
- Personal protective equipment should be worn at all times.
- A lab coat or gown should be worn during blood collection procedures.
- Always wear Gloves during all phlebotomy procedures, and changed them and wash hands between patient collections.
- Discard Gloves in the appropriate container immediately after the phlebotomy procedure.
- All Personal protective equipment has to be removed before the health care worker leaves the immediate work area.
- Needles and hubs are single use ONLY, dispose of needles and hubs in an appropriate sharps container – do not separate – dispose as one unit.
- DO NOT RECAP Needles; never bend or break them; if needles must be recapped, use the one-handed scoop technique
- Sharps containers are required to be leak proof, rigid and puncture resistant at the bottom and around the sides.
- The Sharps containers must be placed in areas close to where the devices are to be used, must be kept in an upright position and not to be overly full (full when it is filled to ¾ of its capacity).
- All other items used for the procedure must be disposed of according to proper biohazardous waste disposal policy.
- Contaminated work surfaces must be cleaned as soon as possible after the procedure is completed.
- All equipment has to be cleaned after use with an approved disinfectant (follow your facility's policy) after contact with blood or body fluids.
- Do not pick up broken glass with your hands, use a dust pan and brush or other approved method that is approved by your facility's policy and procedure; and dispose of broken glass in a puncture proof container.

- In the case of an accidental needlestick, immediately wash the area with an antibacterial soap, contact your supervisor and immediately seek medical attention.

OSHA can answer questions and concerns from workers and employers.
To reach area OSHA office, go to OSHA's Regional & Area Offices web site or call 1-800-321-OSHA (6742).

Post Exposure

The Centers for Disease control (CDC) has Emergency Needlestick information available and provides immediate access to treatment protocols following blood exposures involving HIV,HBV, HCV INCLUDING the clinicians' **Post Exposure Prophylaxis Hotline** (PEPline) at 1-888-448-4911.

HEPATITIS

Hepatitis means inflammation of the liver. Some drugs /medications, toxins, some diseases, heavy alcohol intake, and viral and bacterial infections can all cause hepatitis.

Hepatitis C Virus (HCV)

Hepatitis C (HCV) is a liver disease caused by the Hepatitis C virus (HCV). HCV infection sometimes results in an acute illness, but most often becomes a chronic condition that can lead to cirrhosis of the liver and liver cancer. There is no vaccine for Hepatitis C.

According to the CDC, based on limited studies, the estimated risk for infection after a needlestick or cut exposure to HCV-infected blood is approximately 1.8%. The risk following a blood splash is unknown but is believed to be very small; however, HCV infection from such an exposure has been reported.

Hepatitis C is a contagious liver disease that ranges in severity from a mild illness lasting a few weeks to a serious, lifelong illness that attacks the liver. It results from infection with the Hepatitis C virus (HCV), which is spread primarily through contact with the blood of an infected person. Hepatitis C can be either "acute" or "chronic."

Acute Hepatitis C virus infection is a short-term illness that occurs within the first 6 months after someone is exposed to the Hepatitis C virus. For most people, acute infection leads to chronic infection.

Chronic Hepatitis C virus infection is a long-term illness that occurs when the Hepatitis C virus remains in a person's body. Hepatitis C virus infection can last a lifetime and lead to serious liver problems, including cirrhosis (scarring of the liver) or liver cancer.

Hepatitis C is usually spread when blood from a person infected with the Hepatitis C virus enters the body of someone who is not infected. Today, most individuals become infected with the Hepatitis C virus by sharing needles or other equipment to inject drugs. Before 1992, when widespread screening of the blood supply began in the United States, Hepatitis C was also commonly spread through blood transfusions and organ transplants.

People can become infected with the Hepatitis C virus during such activities as

- Sharing needles, syringes, or other equipment to inject drugs
- Needlestick injuries in health care settings
- Being born to a mother who has Hepatitis C

Less commonly, a person can also get Hepatitis C virus infection through

- Sharing personal care items that may have come in contact with another person's blood, such as razors or toothbrushes
- Having sexual contact with a person infected with the Hepatitis C virus

The Hepatitis C virus can survive outside the body at room temperature, on environmental surfaces, for up to 3 weeks.(CDC 2015)

Some people are at increased risk for Hepatitis C, including

- Current injection drug users (currently the most common way Hepatitis C virus is spread in the United States)
- Past injection drug users, including those who injected only one time or many years ago
- Recipients of donated blood, blood products, and organs (once a common means of transmission but now rare in the United States since blood screening became available in 1992)
- People who received a blood product for clotting problems made before 1987
- Hemodialysis patients or persons who spent many years on dialysis for kidney failure
- People who received body piercing or tattoos done with non-sterile instruments

- People with known exposures to the Hepatitis C virus, such as
  - Health care workers injured by needlesticks
  - Recipients of blood or organs from a donor who tested positive for the Hepatitis C virus
- HIV-infected persons
- Children born to mothers infected with the Hepatitis C virus

Less common risks include:

- Having sexual contact with a person who is infected with the Hepatitis C virus
- Sharing personal care items, such as razors or toothbrushes, that may have come in contact with the blood of an infected person

Hepatitis B Virus (HBV)

Hepatitis B virus (HBV) is a pathogenic microorganism that can cause potentially life threatening disease in humans. HBV infection is transmitted through exposure to blood and other potentially infectious materials (OPIM), as defined in the OSHA Bloodborne Pathogens standard, 29 CFR 1910.1030. HBV is found in highest concentrations in blood and in lower concentrations in other body fluids (e.g., semen, vaginal secretions and wound exudates) The HBV vaccine is very effective.

The CDC states that health care workers who have received hepatitis B vaccine and have developed immunity to the virus are at virtually no risk for infection. For an unvaccinated person, the risk from a single needlestick or a cut exposure to HBV-infected blood ranges from 6%–30% and depends on the hepatitis B e antigen (HBeAg) status of the source individual. Individuals who are both hepatitis B surface antigen (HBsAg) positive and HBeAg positive have more viruses in their blood and are more likely to transmit HBV.

PATIENTS WITH HEPATITIS B (HBsAg+)

For patients with HEPATITIS B (HBsAg+) Hepatitis B surface antigen;

- Dialyze patient with HEPATITIS B (HBsAg+) in a separate room, use separate machine, supplies, equipments and instruments.

- Use a separate gown,

- Staff who are caring for the patient with HEPATITIS B (HBsAg+) should not care for the patient who is HBV susceptible at the same time such as during the same shift or during patient change over (CDC 2012).

PREVENTING THE SPREAD OF BACTERIAL INFECTIONS

Hemodialysis patients who might be at increased risk for spreading an infection to others include patients with:

Fecal incontinence

Uncontrolled diarrhea

Infected wound (not covered with dressing)

Draining infected wound.

PATIENTS WITH RESPIRATORY ILLNESS AND FEVER are at risk of spreading virus or bacterial infections to other patients; these patients need to be dialyzed at least 6 feet away from other patient station (CDC 2012).

Some Conditions Related to Kidney Failure and The Treatments

When the kidneys stop working, the patients may have problems with anemia and conditions that affect the nerves, bones and skin.

Some of the more common conditions caused by kidney failure are:

- Extreme tiredness,
- Bone problems,
- Joint problems,
- Itching,
- Restless legs.

Restless legs may keep the patients awake as they feel the jumping and twitching.

Itching (Pruritus)

Many patients treated with hemodialysis have complains of itchy skin (pruritus), which is often worse during or just after treatment. Itching can be made worse by wastes in the bloodstream that the current dialyzer membranes cannot remove from the blood.

The problem may also be related to increased levels of parathyroid hormone (PTH).

Some individuals have found relief after having their parathyroid glands removed. The parathyroid glands help to control the levels of phosphorus and calcium in the blood.

Phosphate binders seem to be helpful for some patients; these medications bind phosphorus while in the stomach.

Some patients report improvement after receiving erythropoietin (EPO).

A few antihistamines have been found to be helpful such as

- Benadryl,
- Atarax,
- Vistaril

Capsaicin cream applied to the skin may also relieve itching and pain.

Encourage patients to take care of dry skin; applying creams with camphor or lanolin may be helpful.

Anemia and Erythropoietin (EPO)

- Anemia is a condition in which the volume of red blood cells is low.
- Red blood cells (RBC) carry oxygen to cells through the body. Without the oxygen, the cells cannot use the energy from food, so the person with anemia may tire easily and look pale.
- Anemia can also contribute to heart problems.

Anemia is common in patients with kidney disease because the kidneys produce the hormone erythropoietin (EPO), which stimulates the bone marrow to produce red blood cells.

Patients with kidney disease often do not make enough erythropoietin (EPO), and so the bone marrow makes fewer red blood cells. Erythropoietin (EPO) is often given to patients on dialysis.

Renal Osteodystrophy

Renal osteodystrophy; bone disease of kidney failure, affects 90 % of dialysis patients. It causes bones to become weak and thin or the bones formed incorrectly and can affect adults as well as children. Symptoms can be seen in growing children with kidney disease even before dialysis is started.

Amyloidosis

Dialysis related amyloidosis (DRA) is common in patients who have been on dialysis for more than 5 years. Dialysis related amyloidosis develops when proteins in the blood deposit on tendons and joints, causing pain, fluids and stiffness in the joints. The normal functioning kidneys will filter out these proteins, but dialysis filters are not as effective.

Sleep Disorders

Patients on dialysis often experience insomnia. Some individuals experience sleep apnea syndrome (often signal by snoring and breaks in snoring). Episodes of sleep apnea are breaks in breathing during sleep. Apnea may be related to the effects of advanced kidney failure on the control of breathing.

Some treatments that work with individuals who have sleep apnea include:

- Changing sleeping positions,
- losing weight,
- Wear a mask that pumps air continuously into the nose- nasal continuous positive airway pressure; CPAP).

Many people on dialysis have trouble sleeping at night because of:

Aching, restless legs.

The causes of restless legs may include chemical imbalances or nerve damage.

Moderate exercise during the day maybe helpful,

Patients with restless leg syndrome should avoid or reduce caffeine, tobacco and alcohol; some patients also find relief with warm baths or massages.

Medications such as benzodiazepines, often used to treat anxiety or insomnia, may also be helpful.

Sleep disorders can impair the patient's quality of life.

INSTRUCT PATIENTS

Never take vitamins from the store because they may contain vitamins or minerals that are harmful to them.

SOME COMMONLY USED TERMS, ABBREVIATIONS & ACRONYMS

Terms:

Albumin and normalized protein nitrogen appearance (nPNA) – measures of the patient's nutritional health. It tells whether the patient is getting enough protein and calories from dietary intake.

Average daily weight gain – is the amount of weight the patient gain each day between dialysis treatments. If the patients do not follow their fluid and salt restrictions (limits) between treatments, they may gain too much fluid weight.

Calcium and phosphorus – are 2 minerals that are vital for bone health. When these minerals are out of balance, the parathyroid glands start making more PTH, which can lead to loss of calcium from bones.

Kt/V and URR – measures of the delivered dose of dialysis; tells whether the patient is receiving the right amount of dialysis.

Glomerular filtration rate (GFR) – an estimate of how well the kidneys are working, the Glomerular Filtration Rate (GFR) can be measured from the results of patient's blood creatinine test, patient's gender, age.

Hemoglobin - is the part of red blood cells that carries the oxygen to the patient's tissues. If patient's level is decreased or too low, the patient has anemia and will need to take medication to raise red blood cell production in the body.

Parathyroid hormone (PTH) – is made by 4 small glands that are located in the neck. When these glands overwork and make too much parathyroid hormone, it may lose calcium from the bones. Over a period of time, this can weaken the bones and cause them to fracture easily.

Potassium – is a mineral that is very important to the heart. Too little as well as too much potassium in the blood may be harmful to the heart.

Pre-dialysis and post-dialysis BP /blood pressure – should be taken each time the patient receive dialysis. The patient's blood pressure goes down when excess salt and fluid are removed from the blood by the dialysis treatment.

Target weight (dry weight) – is how much the patient should weigh after dialysis removes excess fluid from the body.

Transferring saturation (TSAT); Iron is important to patient's body's ability to make red blood cells.
Transferring saturation (TSAT) and serum ferritin are measures of the iron stores in the body. The patient needs extra iron if he /she has anemia.

Some common abbreviations and acronyms include:

Abbreviation	Stands for	More information
ABG	Arterial blood gas	an ABG test to detect and manage patient's respiratory and metabolic disturbances .
ACE	Angiotensin converting enzyme	Medications called ACE inhibitors - used to treat patient with heart failure, high blood pressure (HTN), kidney diseases.
AFIB	Atrial fibrillation	A disturbance of the rhythm of the heart
AIDS	Acquired immunodeficiency syndrome	Infection caused by human immunodeficiency virus
ALP	Alkaline phosphatase	blood test for ALP to detect liver or bone disease.
ALT	Alanine aminotransferase	blood test for ALT to detect liver disease.
AMI	Acute myocardial infarction	Heart attack
AST	Aspartate aminotransferase	blood test for AST to detect liver damage /disease.
BMI	Body mass index	A measure of how much you should weigh based on your height
BP	Blood pressure	The force of blood pushing against the walls of the arteries
BUN	Blood urea nitrogen	blood test for BUN to detect kidney disease problems.
CA	Cancer OR Calcium	

CA-125	Cancer antigen 125	blood test for CA-125 A to measure cancer activity.
CBC	Complete blood count	blood test that measures various properties of the cells in the blood
CHD	Congenital heart disease	Born with Heart disease
CHF	Congestive heart failure	A condition in which the heart is not pumping blood as it should throughout the body. Also called heart failure.
CMV	Cytomegalovirus	A common herpes virus infection
CNS	Central nervous system	brain and spinal cord
COPD	Chronic obstructive pulmonary disease	lung disease that makes it difficult to breathe
CPK	Creatine phosphokinase	blood test for CPK to see if experienced a heart attack.
CRP	C-reactive protein	blood test for CRP to check if there is heart problems or inflammation.
DJD	Degenerative joint disease	Another name for arthritis
DM	Diabetes mellitus	a complex disorder of carbohydrate, protein and fat metabolism which is characterized by hyperglycemia
DVT	Deep-vein thrombosis	blood clot
DX	Diagnosis	
ECG, EKG	Electrocardiogram	Test that measures electrical

		impulses of the heart
ECHO	Echocardiogram	test that uses sound waves to look at the heart
EEG	Electroencephalogram	test that measures electrical impulses of the brain
EMG	Electromyography	test that measures electrical impulses of muscles
ENT	Ear, nose and throat	
ERCP	Endoscopic retrograde cholangiopancreatography	A way to diagnose problems in the liver, gallbladder, bile ducts and pancreas
ESR	Erythrocyte sedimentation rate	A blood test for inflammation
ESRD	End-stage renal (kidney) disease	
FSH	Follicle stimulating hormone	Test done for women; blood test for FSH to evaluate fertility.
GI	Gastrointestinal	Another term for the digestive system
GFR	Glomerular filtration rate	Test of kidney damage
GU	Genitourinary	The urinary and sex organs
HAV	Hepatitis A virus	virus that causes one type of liver disease
HBV	Hepatitis B virus	A virus that causes one type of liver disease
HCV	Hepatitis C virus	A virus that causes one type of liver disease
		blood test measurement

HCT	Hematocrit	
HDL	High density lipoprotein	A type of cholesterol, also known as good cholesterol
HGB	Hemoglobin	blood test measurement
HIV	Human immunodeficiency virus	The virus that causes AIDS
HTN	Hypertension	High blood pressure
IDDM	Insulin-dependent diabetes mellitus	Type 1 diabetes
LDL	Low density lipoprotein	A type of cholesterol, also known as bad cholesterol
LFT	Liver function tests	Tests that assess liver function
MRSA	Methicillin-resistant Staphylococcus aureus	A type of infection caused by a strain of staph bacteria; contagious and antibiotic resistant
MS	Multiple sclerosis	A disease of the nervous system
NG	Nasogastric	NG tube goes to stomach; empty the contents of the stomach or place feeding or medications
NIDDM	Non-insulin dependent diabetes mellitus	Type 2 diabetes
NKDA	No known drug allergies	
PAT	Paroxysmal atrial tachycardia	A disturbance of the rhythm of the heart

PSA	Prostate specific antigen	blood test for PSA to detect prostate disease.
PT	Prothrombin time	A measure of blood clotting
PTH	Parathyroid hormone	blood test for PTH to detect parathyroid disease.
PTT	Partial thromboplastin time	A measure of blood clotting
RA	Rheumatoid arthritis	A type of joint disease
RBC	Red blood cell	A type of blood cell
RSV	Respiratory syncytial virus	A virus that causes infections in the respiratory track. Very common in children.
SOB	Shortness of Breath	
STD	Sexually transmitted disease	
T3	Triiodothyronine	blood test for T3 thyroid hormone to detect thyroid disease.
T4	Thyroxine	blood test for T4 to detect thyroid disease.
TB	Tuberculosis	An infection of the lungs
TIA	Transient ischemic attack	A small stroke
TIBC	Total iron binding capacity	A test that measures the amount of iron in the blood
TID	Three times a day	Your doctor may write this on your prescription.
TORCH	Stands for a group of infections that may cause birth defects	A newborn will have this test to check for infections. Sometimes the mother also needs the test.

TSH	Thyroid stimulating hormone	blood test for TSH to detect thyroid disease.
UTI	Urinary tract infection	Infection of the bladder and kidneys
WBC	White blood cell	A type of blood cell

TAKE EXAM

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