

Renal Failure

The kidneys are located in back portion of the upper abdomen and are approximately the size of a fist. When healthy, the kidneys cleanse the blood of waste products by creating urine. The kidneys also balance essential elements such as sodium and potassium while providing hormones necessary to regulate blood pressure and red blood cell production.

Kidney failure is a non-specific term for a decrease in renal function. Kidney failure is referred to under many different names:

- Kidney failure – acute
- Kidney failure – chronic
- Renal failure – chronic
- Chronic renal insufficiency
- CRF
- ESRD – end-stage renal disease

A definition of renal failure is:

Renal failure is a progressive loss of the ability of the kidneys to excrete waste, concentrate urine, and conserve electrolytes. This can occur suddenly (acute renal failure) or can occur slowly (chronic renal failure). It is also possible to have acute and chronic renal failure at the same time (acute on chronic renal failure).

Acute renal failure, although sudden, is quite often reversible with proper treatment. Symptoms for acute renal failure include:

- Fluid retention
- Internal bleeding
- Confusion
- Seizures
- Coma

Acute renal failure happens most often after complicated surgery or trauma and blood vessels to the kidneys become blocked, when there are toxins in the system, or urine flow becomes blocked. Generally normal to near normal renal function can return with proper medical treatment. Causes for acute renal failure can be broken in three classifications:

Pre-renal:

The most common pre-renal causes of acute renal failure include severe blood loss, dehydration, severe heart failure, excessive diuretic use, and severe infection.

Intra-renal:

This can arise from diseases of the small blood vessels, glomeruli, tubules, or interstitium of the kidney. Some medications, like penicillin, can also cause renal failure.

Post-renal:

Post-renal cause of acute renal failure is obstruction of urine flow beyond the kidney. This is most common in elderly males who cannot urinate properly due to an enlarged prostate. But, this can occur and any person where urine flow is obstructed. The result of this is stretching and bloating of the kidney. This can cause hydronephrosis, literally meaning “water in the kidney”. This can ultimately lead to destruction of the functioning kidney tissue.

Chronic renal failure slowly gets worse over time and is not reversible. Chronic renal failure results from any disease that can cause gradual loss of kidney function. These diseases slowly destroy the internal structures of the kidney. The patient may have mild dysfunction to severe renal failure. If the progression continues the patient may develop end-stage renal disease (ESRD). Chronic renal failure occurs over a period of several years and in the early stage there are usually no symptoms. The advancement of the disease process may be so gradual that the patient may not develop symptoms until renal function is less than 1/10 of normal.

Chronic renal failure and end-stage renal disease affect more than 2 out of 1000 people in the United States. The 2 most common causes for this are Diabetes and Hypertension. These causes account for about 2/3 of the cases of chronic renal failure and end-stage renal disease. Some of the other causes include:

Polycystic kidney disease:

Is an inherited kidney disorder that causes the kidneys to enlarge and interferes with their function because of multiple cysts in the kidneys.

Alport syndrome:

Is an inherited disorder involving damage to the kidneys, blood in the urine (hematuria), and in some cases loss of hearing. In some cases it may also cause eye defects.

Glomerulonephritis:

Is a type of kidney disease caused by inflammation of the internal kidney structures (glomeruli).

Reflux nephropathy:

Is a condition in which the kidneys are damaged by backflow of urine into the kidneys.

Obstructive uropathy:

It involves the blockage of the flow of the urine, causing it to backup and injure one or both of the kidneys.

Kidney stones:

Are a solid mass that consist of tiny crystals. There can be one or more stones present at the same time in the kidney or ureter.

Analgesic nephropathy:

It involves damage to one or both kidneys caused by overexposure to mixtures of medications, especially over-the-counter pain remedies (analgesics).

Chronic renal failure results in the buildup of fluids and waste products in the body causing azotemia (abnormal high level of nitrogen type waste in the blood stream) and uremia (the state of ill health resulting from renal failure). Nearly all the body systems are affected by renal failure and there can be many complications.

Generally there are no early symptoms of renal failure. Some of the first symptoms that the patient may develop are:

- Unintentional weight loss
- Nausea and vomiting
- Generalized illness
- Fatigue
- Headache
- Frequent hiccups
- Generalized itching (puritis)

Some of the later symptoms that may develop are:

- Increased or decreased urine output
- The need to urinate more at night
- Easy bleeding or bruising
- May have blood in vomit or stools
- Altered level of consciousness – drowsiness, somnolence, lethargy, confusion, delirium, or coma
- Muscle twitching or cramps
- Seizures
- Uremic frost (white crystal deposits in and on the skin)
- Neuropathy (decreased sensation in the hands, feet, or other areas)

The patient may also develop:

- Excessive nighttime urination
- Excessive thirst
- Abnormally light or dark skin
- Nail abnormalities
- Breath odor
- Hypertension
- Loss of appetite

Agitation

Some tests that are related to kidney failure that the patient may undergo include:

Cretinine levels:

Cretinine is a breakdown product of creatine, which is an important part of muscle. This test will measure how much cretinine is present in the blood. With renal failure these levels progressively increase. In normal renal function these levels should stay the same. Cretinine is excreted from the body entirely by the kidneys.

BUN levels:

Blood urea nitrogen is the measurement of urea nitrogen in the blood. A patient with impaired renal function will have increased BUN levels. Urea is ultimately eliminated through the kidneys.

Cretinine clearance test:

This test compares the level of cretinine in urine with the level in blood and is usually based on a 24 hour collection of urine and blood drawn at the end of the 24 hours. This test is used to estimate the glomerular filtration rate (GFR) – the standard by which kidney function is assessed.

Potassium levels:

Potassium is efficiently disposed of by the kidneys. An elevated potassium level could indicate decreased renal function.

Arterial blood gasses and blood chemistry:

These levels may show a metabolic acidosis due to decreased renal function.

The patient may have also undergone other studies that could possibly show renal failure by the size of the kidneys:

- Renal or abdominal x-rays
- Abdominal CT scan
- Abdominal MRI
- Abdominal ultrasound

Some other test that could indicate renal impairment include:

Urinary cast

Renal scans

PTH (Parathyroid hormone)

Serum magnesium

Erythropoietin (this is a hormone produced by specialized cells in the kidneys. Lower than normal levels can be seen in renal impairment)

The main focus in treatment is to control the symptoms, minimize complications, and slow the progression of the disease. Associated diseases that cause or result from chronic renal failure can include: Hypertension, congestive heart failure, urinary tract infections,

kidney stones, obstruction of the urinary tract, glomerulonephritis, and any other disorder need to be treated to slow the progression.

The patient may require blood transfusions to help control anemia. They may also require medications such as iron and erythropoietin supplements.

Fluid intake may be restricted depending on the severity of the renal failure. This is normally balanced at a volume equal to urine produced. Dietary protein may also be reduced to slow the buildup of waste in the blood stream. This may also help control symptoms like nausea and vomiting. Other items that may be restricted include salt, potassium, phosphorus, and other electrolytes.

As the disease progresses the patient may require renal dialysis.

There is no cure for chronic renal failure, but lifelong treatment may control the symptoms. If untreated it usually progresses to end-stage renal disease. Some other complications that can occur from this disease include:

Pericarditis

Cardiac tamponade

Congestive heart failure

Platelet dysfunction

GI bleeding

Ulcers

Hemorrhage

Anemia

Hepatitis B and C, liver failure

Decreased functioning white blood cells, decreased immune response, increased incidence of infection

Peripheral neuropathy

Seizures, encephalopathy, nerve damage, dementia

Weakening of the bones, fractures, joint disorders

Changes in glucose metabolism

Electrolyte abnormalities including hyperkalemia

Decreased libido, impotence, miscarriage, menstrual irregularities, infertility

Skin dryness, itching/scratching with resulting skin infections

Some of the medications that you may find associated with renal failure include:

Phosphate - lowering agents:

Calcium acetate (Calphron, PhosLo)

Calcium carbonate (Caltrate, Oysterical)

Calcitriol (Rocaltrol, Calcijex)

Doxercalciferol (Hectorol)

Lanthanum carbonate (Fosrenal)

Sevelamer (Renagel)
Paricalcitol (Zemlar)

Growth factors:

Epoetin alfa (Epogen, Procrit)

Iron salts:

Ferrous sulfate (Feosol, Feretab, Slow FE)

Iron dextran (DexFerrum, InFed)

Iron Sucrose (Venofer)

Ferric gluconate (Ferrlecit)

Recombinant human Erythropoietin:

Darbepoetin (Aranesp)

Calcimimetic agents:

Cinacalcet (Sensipar)

Treatment of the underlying disorders may help prevent or delay development of chronic renal failure. Diabetics should control blood sugars and blood pressure closely and should refrain from smoking.