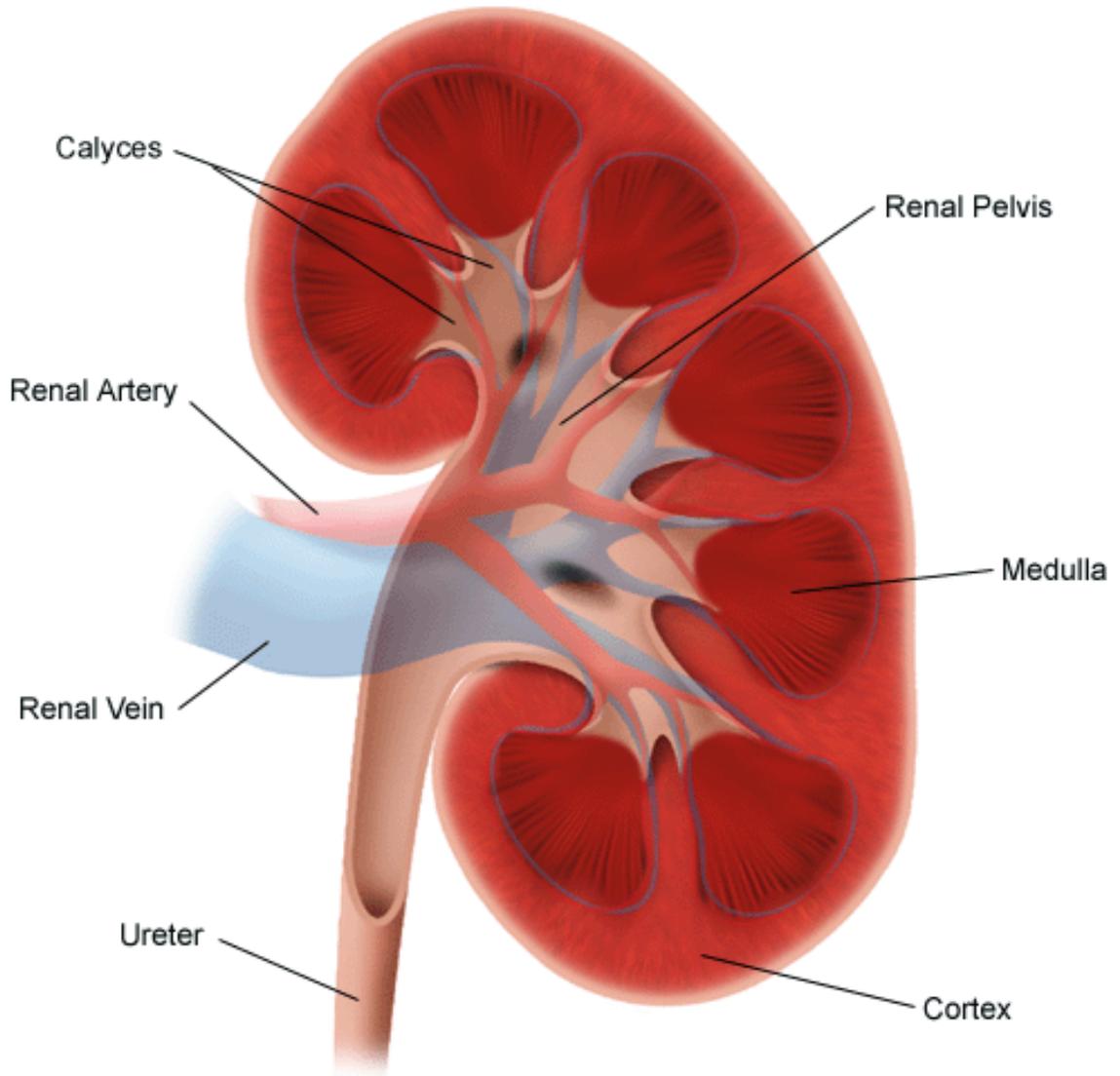


INTRODUCTION TO CHRONIC KIDNEY DISEASE

Anatomy of the Kidney



BY RENAL MEDICINE ASSOCIATES

Your Chronic Kidney Disease (CKD) Health Care Team:

Many People are involved in caring for you. But the CKD team is lead by you. We want you to feel that you are always informed about what is going on with your kidneys and understand the important things to help maintain your kidney function. And that is why the CKD program was developed. This program was designed to teach you about how to keep your kidneys as healthy as possible. The CKD health care team is lead by the Renal Medicine Associates (RMA) nephrologists:

Dr. Richard Cronin
Dr. Dale Erickson
Dr. Biju Cherian
Dr. Richard Goldman
Dr. Chudi Adi
Dr. Fidel Barrantes

Dr. Gustavo Espino
Dr. Kirby Gabrys
Dr. Sonam Kundeling
Dr. Jayant Kumar
Dr. Leonard Romero

The *nephrologists* are doctors who have had special training in kidney disease. After your kidney disease is diagnosed, the nephrologist will develop a plan to treat your CKD and will work with the nurse practitioners (NPs) to give you the best overall treatment and education.

The NPs are all highly skilled nurses who have completed at least their masters of Science degrees and are able to assess and help treat your CKD problems. In the CKD program, your CKD care and education will be routinely monitored and provided by the NPs. But the most important person in this team is you. We encourage you to bring family to each of your CKD program visits. The RMA Nephrology NPs are:

Alicia Bruno
Leslie Dork
Liza Lucero

Beth Evans
Chris Oberg

How to benefit from your CKD visit:

- Bring in your medications each visit or a current up to date list.
- Bring in your home blood pressure record.
- Bring in your home glucose record.
- Have your labs drawn one week prior to your visit, so you will learn about your present kidney function.
- Discuss with your NP any problem that you are having obtaining or taking any of your medications.
- Have family attend with you.
- Put together a question list prior to your visit.
- Be sure to take notes during the visit and never hesitate to ask for additional explanations if something is not clear.
- Request medication renewals (if needed) at each visit.

Be sure you know what all the kidney toxic medications are and avoid those medications *forever*. If unsure, check with your pharmacist.

Never take any of the following medications:

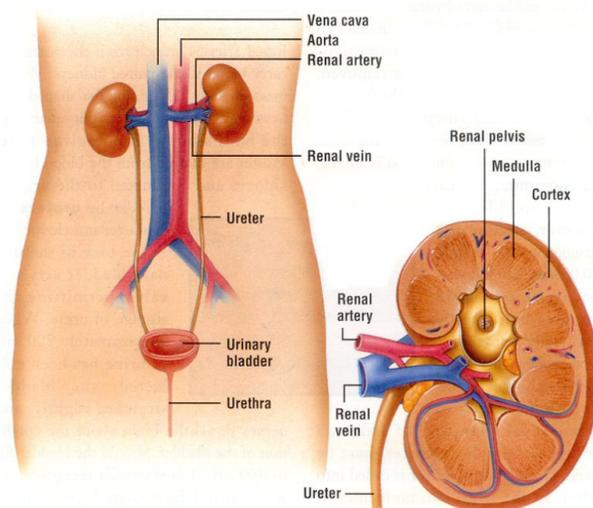
Generic Name	Trade Name	Generic Name	Trade Name
Celecoxib	Celebrex	Diclofenac	Voltaren
Etodolac	Lodine	Fenoprofen	Nalfon
Flurbiprofen	Ansaid	Ibuprofen	Motrin, Advil
Indomethacin	Indocin	Ketoprofen	Oruvail
Ketorolac	Toradol	Mefenamic Acid	Ponstel
Meloxicam	Mobic	Nabumetone	Relafen
Naproxen	Naprosen, Aleve	Oxaprozin	Daypro
Piroxicam	Feldene	Sulindac	Clinoril
Tometin	Tolectin	Rofecoxib	Vioxx

The Kidneys: What do they do?

Kidneys clean your blood 24 hours per day. Most of us are born with two kidneys. The kidneys are located below the rib cage in the middle of the back. Each kidney is about the size of a closed fist. The kidneys are attached to the bladder by tubes called ureters. The ureters carry the urine from the kidneys to the bladder. The kidneys filter your blood and make urine. The bladder holds the urine until you feel the urge to urinate. Each day the kidneys pump about two hundred quarts of blood through 140 miles of tubes and millions of filters. People can be born with just one kidney and live a normal life. People can also live a normal life with decreased kidney function due to CKD.

The kidneys have many jobs.

- **Removing waste from the blood.** As your body works, it builds up waste products that must be removed. The kidneys are the “garbage collectors” that removes this waste in the form of urine.
- **Adjust the levels of minerals.** Kidneys balance minerals and chemicals in our bodies-like sodium, potassium, calcium, and phosphorus.
- **Removing extra fluid.** Kidneys get rid of the extra water in the body.
- **Produce hormones.** Kidneys make hormones that help control blood pressure, and also make hormones that control our red blood cell count.



What is CKD and what causes it?

There are many different kind of kidney disease. Some are inherited and others develop as we grow older. It is not well understood the exact cause of many kidney diseases. The most common causes of CKD will be discussed.

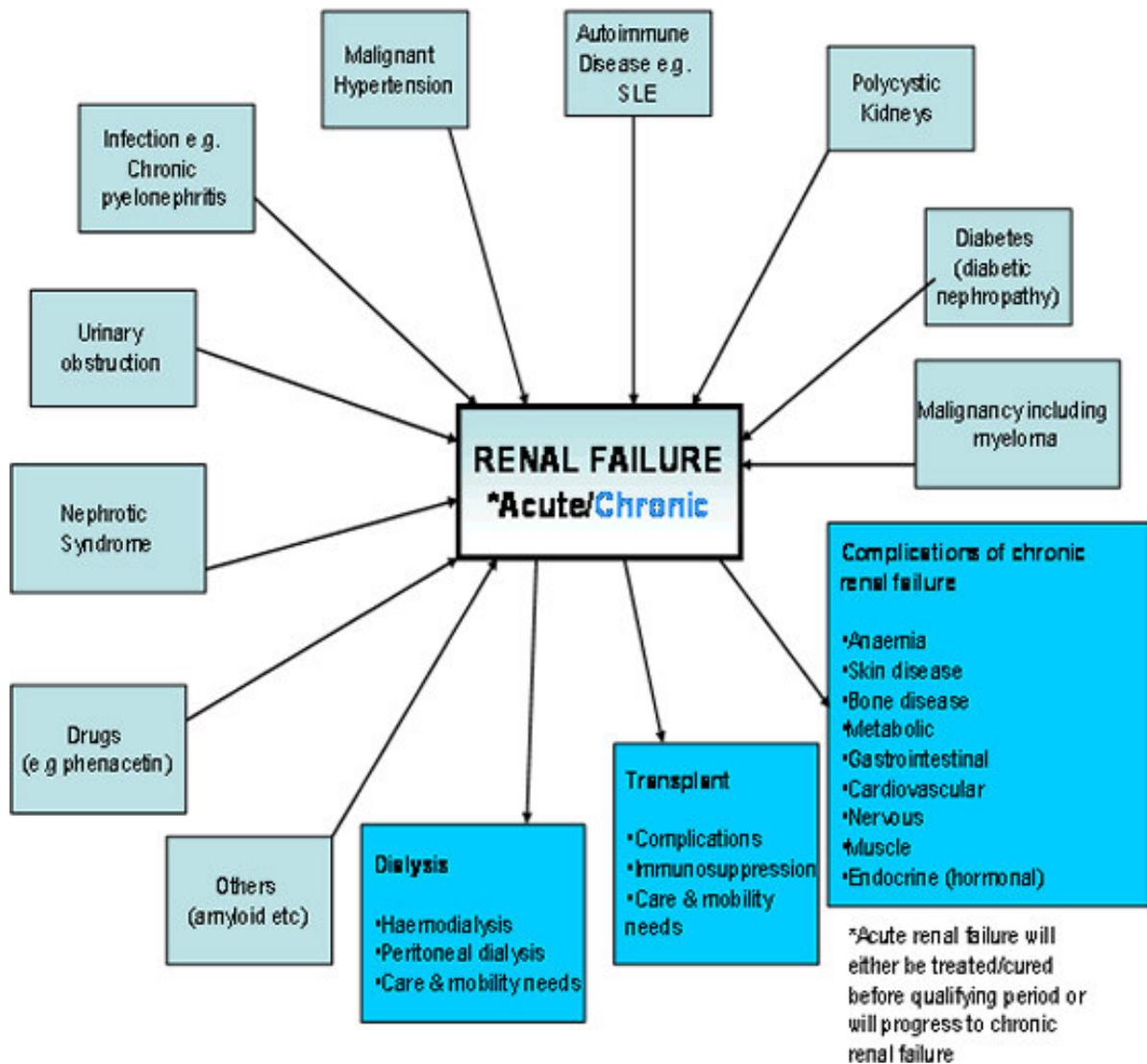
Chronic kidney disease (CKD) means the kidneys are not functioning at full capacity. We stage the kidney's function based on the *glomerular filtration rate* (GFR). The GFR is based on your serum creatinine (blood work), race, age and sex. The GFR is calculated and then your kidney function is stage. This estimates how well your kidney is filtering the toxins:

Stages of Chronic Kidney Disease of all Types		
Stage	Qualitative Description	Renal Function (mL/min/1.73 m ²)
1	Kidney damage-normal GFR	≥90
2	Kidney damage-mild ↓ GFR	60-89
3	Moderate ↓ GFR	30-59
4	Severe ↓ GFR	15-29
5	End-stage renal disease	<15 (or dialysis)

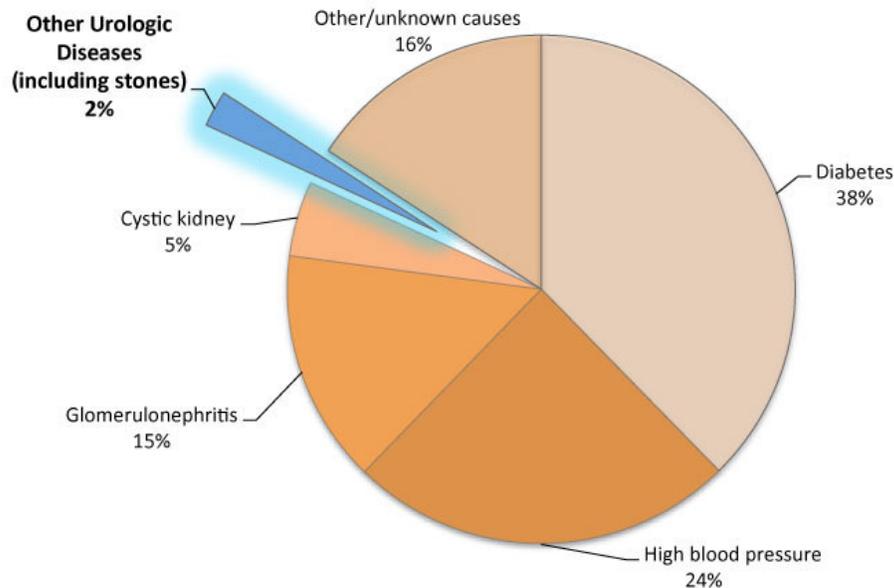
Usually CKD starts slowly and progresses over a number of years. At the early stages of CKD, the only treatment needed may be a change in diet, blood pressure and diabetes control. In the advanced stages (CKD 5), a renal replacement plan will need to be in place (dialysis, transplant, no treatment).

Sometimes kidneys can be hurt and require dialysis until the kidneys recover. This is called *acute kidney injury* and usually only occurs when people are hospitalized. Hopefully, the kidney function will return. Acute kidney injury is usually brought on by surgery, trauma or medication side effects.

End stage renal disease (ESRD) means minimal kidney function – usually less than 10% of normal kidney function. This does not mean the end of life. This is when renal replacement therapy is needed. The primary causes of kidney failure are outlined in the figure on page six.



Causes of Kidney Failure in the United States (2009)



Source: US Renal Data System, USRDS 2011 Annual Data Report.

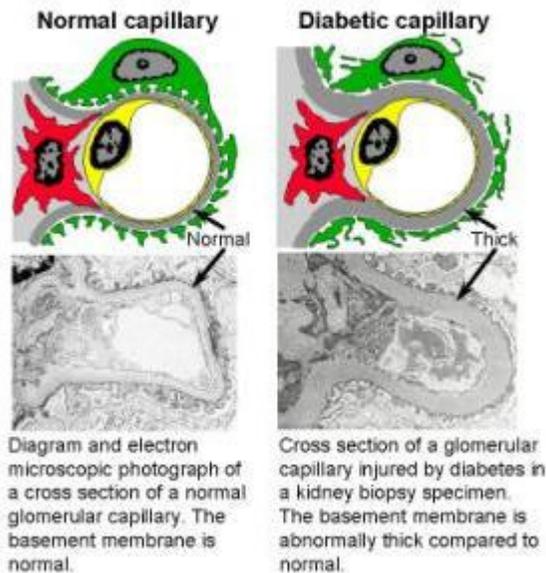
Diabetes: As you can see the largest cause of kidney failure is due to diabetes. Diabetes is either caused by a lack of insulin or the body's inability to properly use insulin. The hormone insulin is a very important chemical messenger which regulates the level of glucose (sugar) in the blood. The body must have insulin to function. Therefore, people with no insulin production must take insulin by injection. If the body does not use insulin properly – then medications are taken which help the body better use its insulin.

People with diabetes may develop complications, including kidney damage, vision loss, decreased sensation, etc. These can develop even before the person is diagnosed with diabetes. Progressive kidney damage is detected by checking urine for protein. As the disease worsens, the amount of protein often increases. The earlier this is diagnosed and treatment is begun, the kidney damage can be slowed.

The treatment includes:

- Tight diabetes control (HgbA1c less than 7mg/dL)

- Taking a certain blood pressure (BP) medication called an ACE Inhibitor (ACEi) or Angiotensin Receptor Blocker (ARB).
- Close follow up of kidney function, diabetes and screening your urine for protein levels.



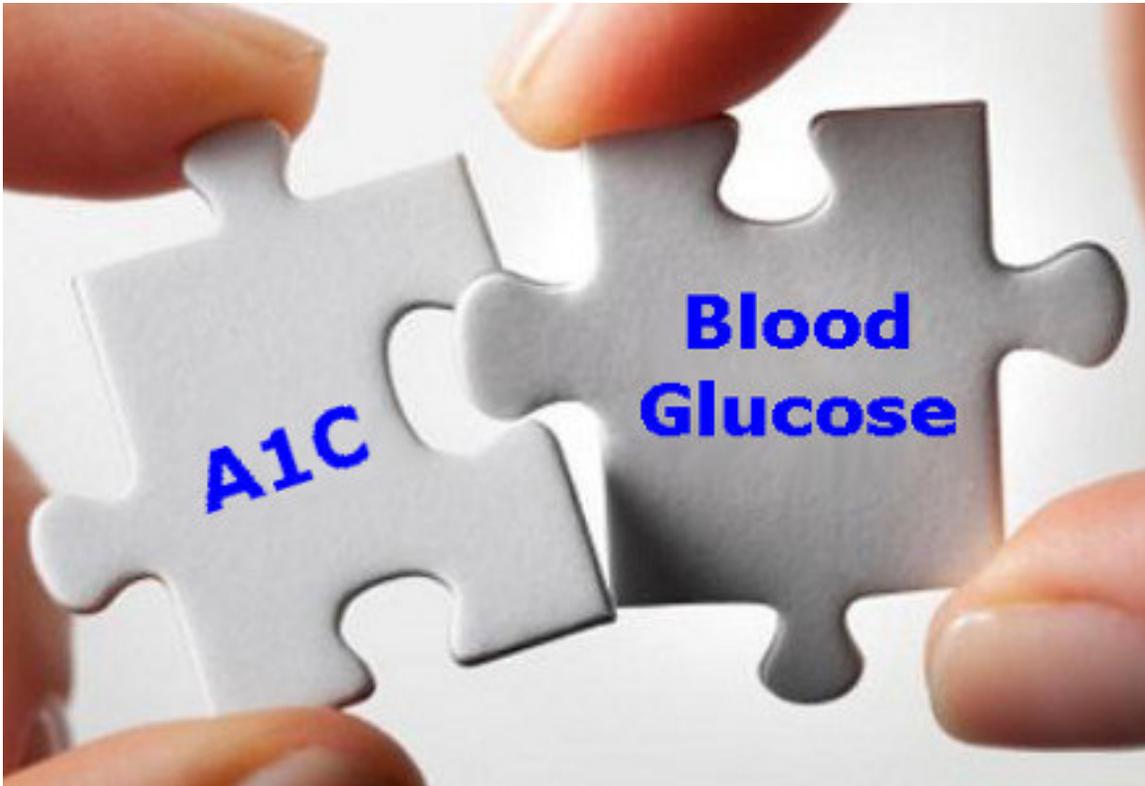
If you smoke it is recommended that you stop smoking. Smoking increases the risk of diabetes complications because it also damages the blood vessels. Diabetics also tend to have more difficulty fighting infections. Many infections if left untreated, especially bladder infections, can damage the kidneys. If you have diabetes you must take care to have infections treated immediately.

Diabetes and CKD: Too much Glucose (sugar) in the blood for a long time can cause diabetes problems. This high blood glucose can damage many parts of the body, such as the heart, eyes, blood vessels and kidneys. Heart and blood vessel disease can lead to strokes and heart attacks. You can do a lot to **prevent or slow down** diabetes problems. Keeping your blood glucose, blood pressure, cholesterol, weight management and exercising can prevent diabetes problems.

What should the blood glucose numbers be?

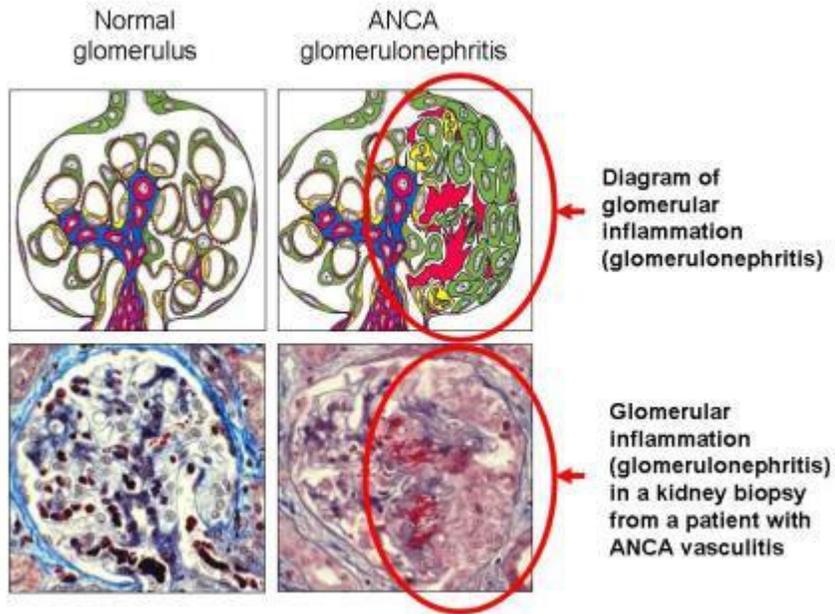
- Before meals 90-130
- 1-2 hours after eating less than 180

Keep track of your blood glucose levels. Always bring your record book to your CKD appointment – so it can be reviewed and medications adjusted as needed.



Glomerulonephritis: This is a condition in which the *glomeruli* (the tiny filters of the kidneys) are damaged. There are many types of glomerulonephritis. Some recover without medical treatment, some are treated with medications, but some cannot be successfully treated and progress to CKD.

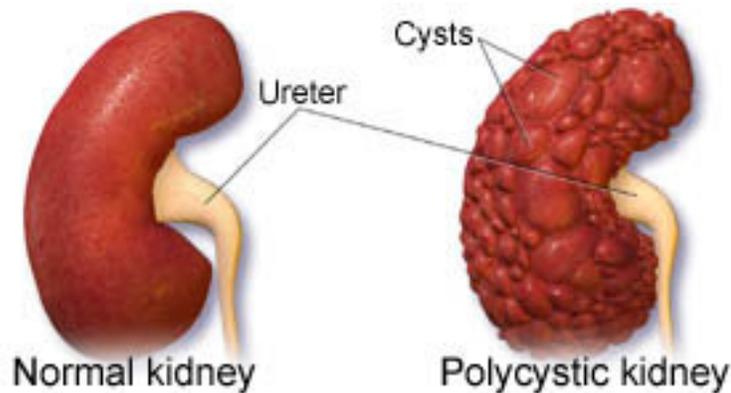
Many clues suggest that glomerulonephritis is caused by the body's immune system malfunctioning. The normal job of the immune system is to protect the body against invasion by viruses and bacteria. The immune system is a defense system made up of cells which recognize the foreign materials (called antigens), while making antibodies to fight them. The fighting process recruits other cells from the body's defense system. Usually the immune system wins, the bacteria is destroyed and the body returns to normal.



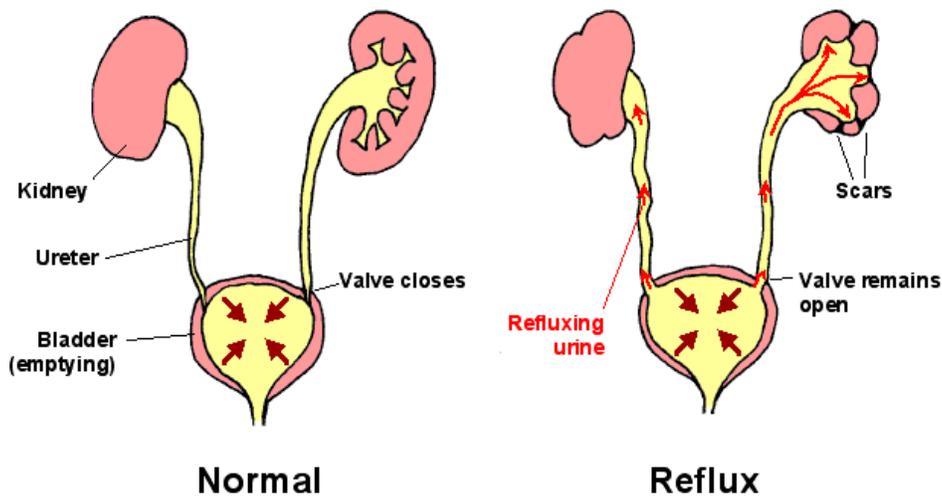
Unfortunately if the body’s defense system is not working properly – it can cause serious damage to the kidneys. One way this happens is when the immune system “mistakenly attacks” the kidney filters. The filters become inflamed, which is the meaning of the term “glomerulonephritis”. Another type of glomerulonephritis occurs when the antigen-antibody clump, leading to inflammation which damages the kidney’s filters. Systemic lupus erythematosus is due to this process. Lupus may affect many organs in the body, most often the joints and skin. This usually starts in young women age 20-30 years. Kidney damage is common in people with lupus. This disease is often treated with steroids and medications that suppress the immune system. If glomerulonephritis can not be treated, then the kidneys’ filters may slowly be destroyed and the kidneys will filter less and less.

High Blood Pressure: High BP may cause CKD and CKD may cause high BP. High BP damages the small blood vessels which deliver blood to the kidneys. Long-standing, untreated high BP will greatly reduce the flow of blood into the filters and may result in CKD. The kidneys also produce a hormone which is involved in the control of BP. When the kidneys fail, this hormone may be produced in increased amounts and cause high BP. In turn, this may lead to further kidney damage. ***It is important that high blood pressure is controlled to try and prevent long term kidney damage.***

Autosomal Dominant Polycystic Kidney Disease (AKPKD): This is the most common inherited disease of the kidneys. It will be passed to 50% of the children of an affected parent. Polycystic means “many cysts”. Polycystic kidneys become very large, have a bumpy surface and are made up of fluid-filled cysts. Pressure from the expanding cysts slowly damage the kidney tissue, which may lead to CKD. Since the disease is inherited, people with the disease should seek advice about informing and testing all family members who may be affected.



Urinary tract obstruction: The kidneys may be damaged if there is an obstruction (blockage) of the urinary outflow tract. Obstructions may occur in the ureters or at the outlet of the bladder. Birth defects can sometimes cause narrowing of the upper or lower ureters and this could lead to CKD in children. In adults, causes of urinary tract obstruction could be an enlarged prostate gland, kidney stones or tumors.



Reflux Nephropathy: The kidneys are “scarred” because of an abnormal flow of urine from the bladder into the kidney. This condition usually affects children who are born with an abnormality of the junction of the ureters and the bladder. If reflux nephropathy is not diagnosed early, or if the kidneys are badly scarred, the condition can cause CKD.

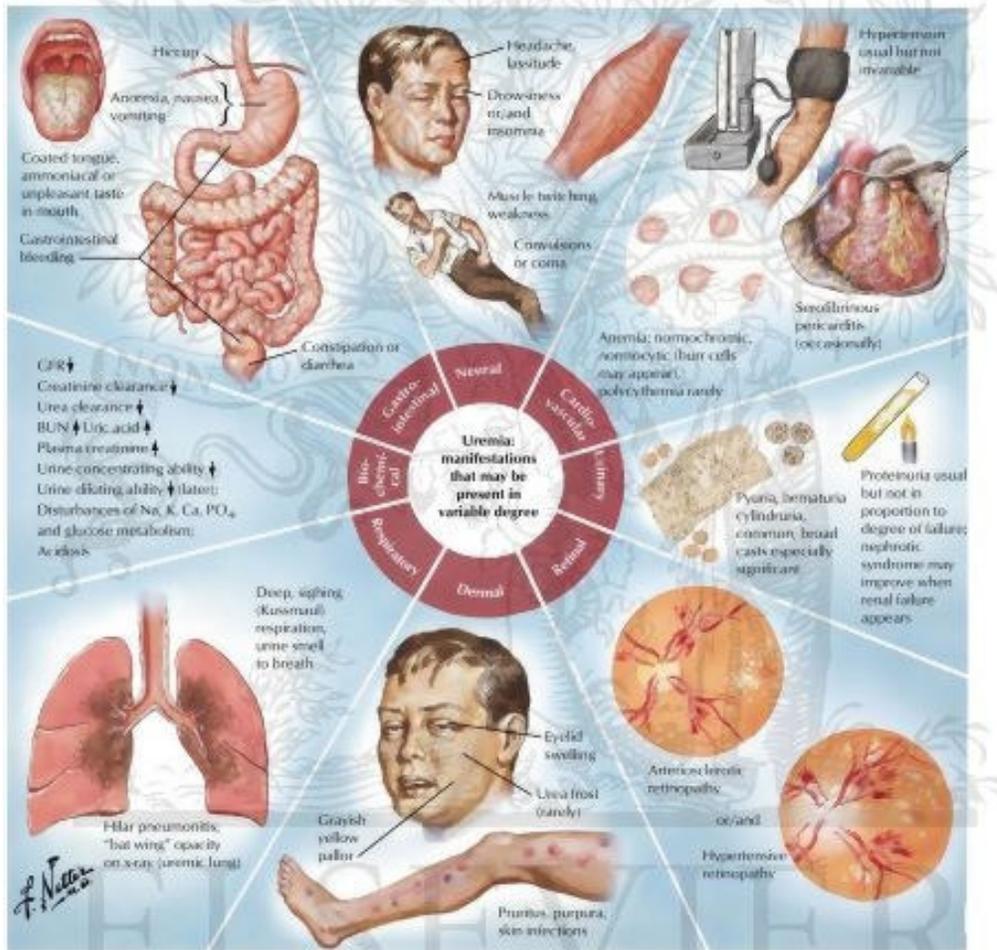
Drug-induced CKD: Abuse of drugs can cause kidney damage. The most common offenders are pain medications and anti-arthritis medications. Non-prescription pain killers, including aspirin, may damage the kidneys if used in large doses over a long period of time. The use of illegal drugs, such as heroin and cocaine, can also cause kidney damage. The special dyes given intravenously for special radiology examinations may also cause problems, and need to be monitored closely. Discuss herbal medications and OTC (over the counter) medications with your provider before taking.



What are the signs of CKD? The gradual loss of kidney function is called CKD and usually has not symptoms until the disease is more advanced stage (four or five). That is the reason that the disease may so undetected until the kidneys are severely damaged.

Simple laboratory tests such as urinalysis are useful in detecting CKD at an early stage this test will detect protein or blood in the urine which are both warning signals of potential kidney problems. A serum creatinine (blood

test) is often used to measure kidney function. It may show a decrease in kidney function long before there are other signs. Other blood tests, x-rays, kidney ultrasound and a kidney biopsy may be needed to diagnose the type of kidney disease so that proper treatment can be given. The goal of the CKD clinic is to manage and delay your CKD progression.



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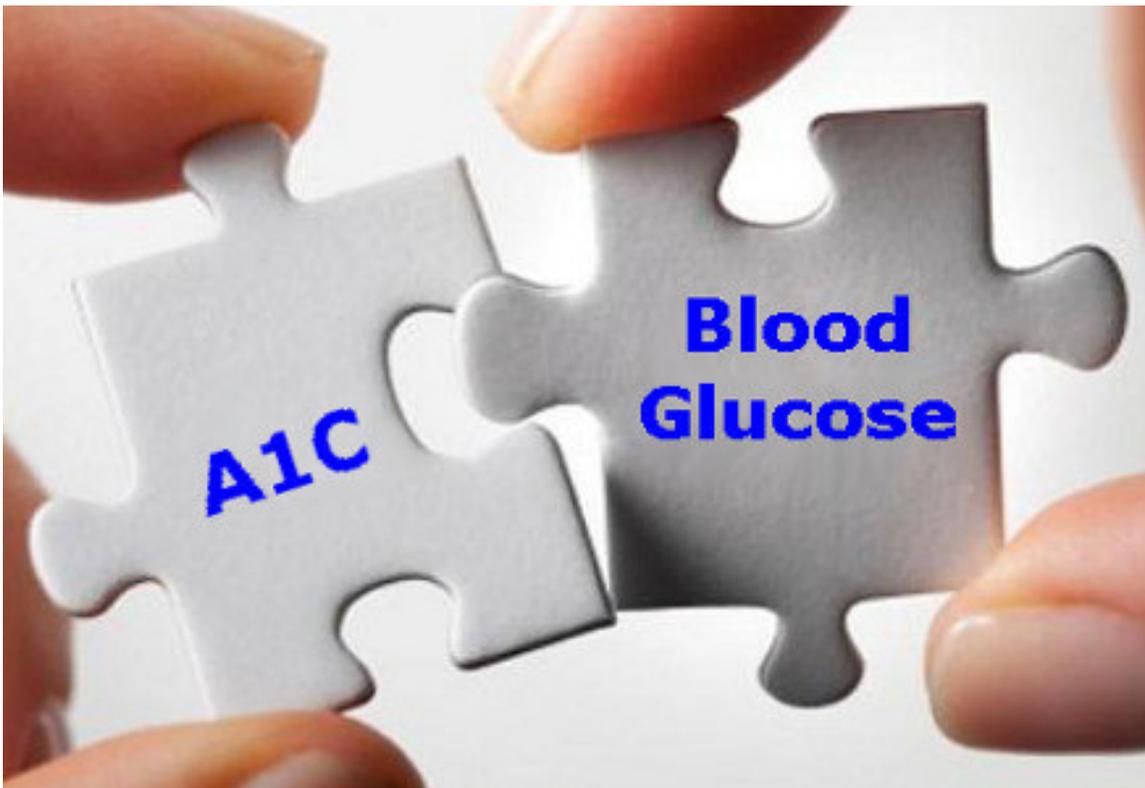
Uremia: This is a Greek word that means “urine in the blood”. Uremia develops as the kidneys fail and are unable to remove wastes from the body. There are many symptoms of uremia and they are shown in the above picture.

Diabetes and CKD: Too much Glucose (sugar) in the blood for a long time can cause diabetes problems. This high blood glucose can damage many parts of the body, such as the heart, eyes, blood vessels and kidneys. Heart and blood vessel disease can lead to strokes and heart attacks. You can do a lot to **prevent or slow down** diabetes problems. Keeping your blood glucose, blood pressure, cholesterol, weight management and exercising can prevent diabetes problems.

What should the blood glucose numbers be?

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Keep track of your blood glucose levels. Always bring your record book to your CKD appointment – so it can be reviewed and medications adjusted as needed.



What are your goals for your Chronic Kidney Disease Management?

1. Learn the cause of your CKD.
2. Learn how to delay the progression of CKD.
3. Understand what the labs mean.
4. Become the key member of your CKD team.
5. Understand your medications – what do they do, why you take them, what is the best time to take them, interactions and side effects.
6. Know who to contact if you have any problems with your CKD.
7. Involve your family and friends in your social network.
8. Follow the directions for management of your CKD.
9. Know the “kidney killers” to avoid.
10. Be more active.
11. Maintain a healthy weight, blood pressure and diabetes control.
12. Use stress management appropriately.
13. Stop smoking or avoid all cigarette smoke.
14. List my own goals:

