

Chronic Kidney Disease Fact Sheet

Chronic Kidney Disease: What Is It?

Chronic kidney disease (CKD) is a slow progressive loss of kidney function because of structural or functional abnormalities for longer than 3 months or glomerular filtration rate (GFR) $< 60\text{mL}/\text{min}/1.73^2$ for less than 3 months irrespective of presence or absence of kidney damage (Vaidya & Aeddula, 2021). The Centers for Disease Control and Prevention (CDC) states 37 million people in the United States have CKD (CDC, 2021). Individuals diagnosed with CKD should be assigned a stage of disease based on level of kidney function, regardless of diagnosis, which are determined by GFR. Most patients with CKD are in stages 1 and 2, and not all patients progress to stage 5 (see Table 1). Common causes of CKD in the United States are diabetes mellitus and hypertension (National Institute of Diabetes and Digestive and Kidney Diseases, 2016). Advanced CKD can cause dangerous levels of fluid, electrolytes, and wastes to build up in the body. Kidney failure treated with dialysis, or a kidney transplant is called end-stage kidney disease (ESKD) (CDC, n.d.).

Table 1.
Stages of Chronic Kidney Disease

Stage	Description	GFR (ml/min/1.73m ²)
1	Kidney damage with normal or ↑ GFR	> 90
2	Kidney damage with mild ↓ GFR	60-89
3	Moderate ↓ GFR	30-59
4	Severe ↓ GFR	15-29
5	Kidney Failure	<15 (or dialysis)

(International Society of Nephrology, 2013)

Risk Factors for Chronic Kidney Disease

- Diabetes mellitus.
- Hypertension.
- Cardiovascular disease.
- Hyperlipidemia.
- Obesity.
- Older age.
- Family history of kidney disease.
- Low socioeconomic status.
- Ethnicity: African American, American Indian, Hispanic, Asian, or Pacific Islander.
- Frequent use of medications which can damage the kidneys.
- Genetic conditions of the kidney and urinary tract (Kazancıoğlu, 2013).

Etiology from a Variety of Diseases, Including but not Limited to:

- Diabetes mellitus.
- Vascular disease.
- Heredity disease.
- Hypertension.
- Obstructive disease.
- Chronic pyelonephritis.
- Glomerular disease.

Screening

Approximately nine out of 10 people with stage 3 CKD do not know they have the disease (CDC, 2021). Therefore, it is important for individuals with the following conditions to be screened:

- Diabetes mellitus.
- Hypertension.
- Cardiovascular disease.
- Metabolic syndrome.
- Family history of kidney disease.

Annual testing to assess albumin excretion in type 1 diabetes mellitus with a diabetes mellitus duration of longer than 5 years, and in all individuals with type 2 diabetes mellitus starting at diagnosis (Faselis et al., 2020).

Serum creatinine should be measured annually in all adults with diabetes mellitus regardless of the degree of urine albumin excretion. Serum creatinine should be used to estimate GFR and stage of CKD (American Diabetes Association, 2022).

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CKD Signs and Symptoms According to Stages

Signs, symptoms, and lab abnormalities vary based on the level of kidney dysfunction (see Table 2).

Table 2.
CKD Signs And Symptoms According To Stages

Stage	Signs and Symptoms
1	Normal or ↑ GFR Structural or functional abnormality of kidney based on markers of kidney disease (e.g., proteinuria, abnormalities of imaging tests, etc.) May have normal BP No serum lab abnormalities; there may be abnormalities in the composition of urine or imaging tests No symptoms GFR 60 to 89 mL/min/1.73m ²
2	Generally asymptomatic Hypertension usually develops at this stage Serum lab abnormalities are not present
3	GFR 30 to 59 mL/min/1.73m ² Serum lab abnormalities may be present indicating anemia, bone disease, and disorders of calcium, phosphorus, and parathyroid hormone levels Usually asymptomatic Hypertension usually present
4	GFR 15 to 29 mL/min/1.73m ² Serum lab abnormalities as above including metabolic acidosis Mild symptoms such as fatigue, anorexia, edema, impaired memory Hypertension Dyslipidemia
5	GFR <15 ml/min/1.73m ² Serum lab abnormalities as above More symptomatic due to uremia: malaise, weight loss/gain, neuropathy, trouble sleeping, anorexia, nausea, vomiting, taste changes, edema, muscle cramping, cognitive decline Hypertension Malnutrition due to anorexia or decreased protein intake and/or increasing proteinuria Dyslipidemia

Labs and Imaging Tests

Urine: Proteinuria can occur when there is damage to the kidney. The excretion of albumin is a sensitive marker for CKD due to diabetes mellitus, glomerular disease, or hypertension (Kidney Disease: Improving Global Outcomes, 2021).

Serum creatinine: Creatinine is a waste product which comes from muscle activity. Serum creatinine alone is not an accurate indicator for kidney dysfunction. Creatinine is used to estimate GFR (Kidney Disease: Improving Global Outcomes, 2021).

GFR: Identifies CKD stages and is used as a monitor of kidney function. GFR is a more sensitive measure to estimate kidney dysfunction. It can be estimated by obtaining a 24-hour creatinine clearance or by use of one of the formulas which have been developed to estimate the GFR using different variables (Kidney Disease: Improving Global Outcomes, 2021)

Hemoglobin: A protein in the red blood cells which carries oxygen from the lungs to the rest of the body. Hemoglobin measurement is the golden standard for assessment of the severity of anemia (International Society of Nephrology, 2012).

Transferrin saturation (TSAT): Measures the availability of iron. TSAT less than 20% indicate iron deficiency, while TSAT greater than 50% suggests iron overload (International Society of Nephrology, 2012).

Ultrasound: Shows kidneys and urinary tract; can identify stones, tumors, or structural problems.

Kidney biopsy: A small piece of kidney tissue is removed and looked at under a microscope to determine the exact cause of kidney dysfunction.

Intravenous pyelography (IVP): X-ray exam used to look at the kidneys and ureters. May be used to identify kidney asymmetry or abnormalities within the kidney, such as stones, tumors, or scars.

Computerized tomography (CT scan): The golden standard for detecting kidney stones but may also reveal kidney artery stenosis in addition to obstructions and tumors.

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Treatment

1. Initial treatment is aimed at treating the primary disease. For example, if the primary disease is diabetes mellitus, then strict glycemic control is very important. Hypertension management to optimally control blood pressure; recommended goal is 130/80 (Romagnani et al., 2017).
2. Cessation of medications which are damaging to the kidneys, such as NSAIDs (Bindu et al., 2020).
3. Reduction of proteinuria with appropriate medications, such as ace inhibitors or angiotensin receptor blockers (Cheung et al., 2021).
4. Monitor for signs and symptoms of anemia, metabolic bone disease, and disorders of calcium, phosphorus, and parathyroid gland function, such as secondary hyperparathyroidism. Abnormalities should be treated with appropriate medications and/or dietary measures.
5. Early referral to a nephrologist at stage 3 or 4 is important so treatments focusing on preventing the progression of CKD are initiated (Vassalotti et al., 2016). In addition, the individual should receive guidance in developing self-management strategies which promote health as well as treatment of complications and co-morbid conditions. It is important in stage 4 to begin timely discussions of kidney replacement therapy, such as hemodialysis, peritoneal dialysis, or transplantation, to enable the person to make an informed decision and initiate planning and implementation for appropriate access if indicated. Ongoing education about vein preservation of both peripheral and central vessels should be stressed, especially if hemodialysis is the choice.
6. Individuals diagnosed with CKD have an increased risk of death from cardiovascular disease. It is important to assess the risk factors for cardiovascular disease and implement appropriate interventions.
7. Adults with CKD at risk for atherosclerotic events should be offered treatment with antiplatelet agents unless there is an increased bleeding risk which needs to be balanced against the possible cardiovascular benefits.
8. It is important to monitor patients' nutritional health. Nutritional needs for patients with CKD often change based on the decline of kidney function. Tests can be done to monitor their nutritional health. It is important they are getting the right amount of protein and calories to maintain a healthy body weight. Their healthcare provider may refer them to a registered kidney dietician who will help them plan their meals, select the right foods and amounts, and assist in making changes in their diet based on their nutritional health and kidney function.
9. Lifestyle changes, such as weight reduction, exercise programs, avoiding salt intake, and cessation of smoking, should be included in the plan of care.
10. Individuals with CKD should undertake physical activity compatible with cardiovascular health and tolerance (aiming for at least 30 minutes five times per week), achieve a healthy weight (BMI 20 to 25) (Kidney Disease: Improving Global Outcomes, 2021).
11. The World Health Organization (WHO) recommends a reduction in salt to improve blood pressure. Lower intake to less than two grams per day of sodium.
12. Smoking cessation is of upmost importance in individuals with diabetes mellitus and CKD, as smoking increase kidney damage in those with diabetes.

Common Medications Used in CKD Treatment

Erythropoietic stimulating agents (ESA): Promotes red blood cell production by the bone marrow; can be given as a subcutaneous or intravenous injection. ESA treatment is normally started when the hemoglobin level is less than 10g/dL. There are currently three ESAs: epoetin alfa, epoetin beta, and darbepoetin (Kidney Disease: Improving Global Outcomes, 2021).

Iron preparations: Treats iron deficiency anemia. May be given orally but often has poor response due to decreased absorption; then it can be given intravenously. Iron should be started when serum TSAT \leq 20% or ferritin \leq 100ng/mL (Kidney Disease: Improving Global Outcomes, 2021).

Phosphate binders: Decrease the level of phosphorus in the body by binding with phosphorous from food before it is absorbed into the blood stream. They are to be taken with food and depending on the product, can be taken at the beginning or the end of the meal (Ketteler et al., 2017).

Vitamin D preparations: Treats and may prevent progression of metabolic bone disease and secondary hyperparathyroidism. Vitamin D supplementation prescribed in the form of cholecalciferol or ergocalciferol to correct 25(OH) D deficiency/insufficiency (Ketteler et al., 2017).

Calcimimetics: Mimics the action of calcium on the calcium sensing receptors in the body. Calcimimetics are used to treat secondary hyperparathyroidism in patients on dialysis. May be associated with hypocalcemia.

Antihypertensives: Treats hypertension but can be used to treat proteinuria with or without hypertension and cardiomyopathy without hypertension (Khalil & Zeltser, 2022).

Vitamin preparations: Patients with CKD should not take over the counter vitamins; there are several specific vitamins for individuals with CKD.

It is important to remember medication doses may need to be adjusted as kidney disease progresses. All medications, including over the counter medications and herbal supplements, should be reported to the patient's provider.

Reference

- American Diabetes Association. (2022). Introduction: Standards of medical care in diabetes-2022. *Diabetes Care*, 45(Suppl 1) S1-S2. <https://doi.org/10.2337/dc22-sint1>
- Bindu, S., Mazumder, S., & Bandyopadhyay, U. (2020). Non-steroidal anti-inflammatory drugs (NSAIDs) and organ damage: A current perspective. *Biochemical Pharmacology*, 180, 114147. <https://doi.org/10.1016/j.bcp.2020.114147>
- Centers for Disease Control and Prevention. (2021). *Chronic Kidney Disease in the United States, 2021*. <https://www.cdc.gov/kidneydisease/publications-resources/ckd-national-facts.html>
- Centers for Disease Control and Prevention. (n.d.) *Chronic kidney disease initiative*. <https://www.cdc.gov/kidneydisease/index.html>
- Cheung, A.K., Chang, T.I., Cushman, W.C., Furth, S.L., Hou, F.F., Ix, J.H., ... & Mann, J.F.E. (2021). Executive summary of the KDIGO 2021 clinical practice guideline for the management of blood pressure in chronic kidney disease. *Kidney International*, 99(3), 559-569. <https://doi.org/10.1016/j.kint.2020.10.026>
- Faselis, C., Katsimardou, A., Imprialos, K., Deligkaris, P., Kallistratos, M., & Dimitriadis, K. (2020). Microvascular complications of type 2 diabetes mellitus. *Current Vascular Pharmacology*, 18(2), 117-124. <http://dx.doi.org/10.2174/1570161117666190502103733>
- International Society of Nephrology. (2012). KDIGO clinical practice guideline for anemia in chronic kidney disease. *Kidney International Supplements*, 2(4), 279-335. <https://kdigo.org/wp-content/uploads/2016/10/KDIGO-2012-Anemia-Guideline-English.pdf>
- International Society of Nephrology. (2013). Chapter 1: Definition, and classification of CKD. *Kidney International Supplements*, 3(1), 27. https://kdigo.org/wp-content/uploads/2017/02/KDIGO_2012_CKD_GL.pdf
- Kazancıoğlu, R. (2013). Risk factors for chronic kidney disease: An update. *Kidney International Supplements*, 3(4), 368-371. <https://doi.org/10.1038/kisup.2013.79>
- Ketteler, M., Block, G.A., Evenepoel, P., Fukagawa, M., Herzog, C.A., McCann, L., ... & Leonard, M.B. (2017). Executive summary of the 2017 KDIGO Chronic Kidney Disease-Mineral and Bone Disorder (CKD-MBD) Guideline update: What's changed and why it matters. *Kidney International*, 92(1), 26-36. <https://doi.org/10.1016/j.kint.2017.04.006>
- Khalil, H., & Zeltser, R. (2022). Antihypertensive medications. *StatPearls Publishing*. <https://www.ncbi.nlm.nih.gov/books/NBK554579/?report=classic>
- Kidney Disease: Improving Global Outcomes. (2021). KDIGO 2021 clinical practice guideline for the management of blood pressure in chronic kidney disease. *Kidney International*, 99(3s), S1-S87. <https://doi.org/10.1016/j.kint.2020.11.003>
- National Institute of Diabetes and Digestive and Kidney Diseases. (2016) *Causes of chronic kidney disease*. <https://www.niddk.nih.gov/health-information/kidney-disease/chronic-kidney-disease-ckd/causes>
- Romagnani, P., Remuzzi, G., Glasscock, R., Levin, A., Jager, K.J., Tonelli, M., Massy, Z., Wanner, C., & Anders, H.J. (2017). Chronic kidney disease. *Nature Reviews Disease Primers*, 3(1), 1-24. <https://doi.org/10.1038/nrdp.2017.88>
- Vaidya, S.R., & Aeddula, N.R. (2021). *Chronic renal failure*. <https://www.ncbi.nlm.nih.gov/30571025>
- Vassalotti, J.A., Centor, R., Turner, B.J., Greer, R.C., Choi, M., & Sequist, T.D. (2016). Practical approach to detection and management of chronic kidney disease for the primary care clinician. *The American Journal of Medicine*, 129(2), 153-162. <https://doi.org/10.1016/j.amjmed.2015.08.025>

Additional Information

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ANNA Mission Statement

ANNA improves members' lives through education, advocacy, networking, and science.

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