

Hemodialysis Fact Sheet

Chronic Kidney Disease: What is it?

Chronic kidney disease (CKD) is defined as abnormalities of the kidney structure or function present for greater than 3 months with health implications. It is classified based on cause, glomerular filtration rate category, and albuminuria category (Brown & Gilliland, 2020). CKD may become a progressive loss of renal function leading to, but not always requiring, renal replacement therapy. The etiology of end stage renal disease can be from a variety of diseases, most notably:

- Diabetes mellitus.
- Glomerular disease.
- Chronic pyelonephritis.
- Obstructive disorders.
- Hypertension.
- Interstitial nephritis.
- Cystic/hereditary/congenital diseases.
- Drugs/toxins.

Regardless of the etiology, many body systems depend upon an environment in which normal kidney function exists. CKD affects virtually every system in the body. These alterations may include:

- Cardiovascular disease.
- Bone and mineral imbalances and disorders.
- Chronic inflammatory state.

Manifestations of these alterations include:

- Decreased or no urine output.
- Fluid retention/edema (hands, feet, face).
- Nausea/vomiting.
- Thirst.
- Anemia.
- Hypertension.
- Shortness of breath.
- Sleep interruption.
- Restlessness ('restless legs syndrome').
- Decreased appetite.

While CKD is highly prevalent, most people are unaware they have it and remain undiagnosed (Brown & Gilliland, 2020); therefore, knowing the risk factors associated with CKD are important. CKD risk factors include:

- Older age.
- Family history of CKD.
- Obesity.
- Hyperlipidemia.
- NSAIDs usage.
- Contrast media. (Brown & Gilliland, 2020)

Renal replacement therapy can take several forms: Kidney transplantation, peritoneal dialysis, and hemodialysis.

Hemodialysis

Hemodialysis is the most common therapy for patients with CKD. Benefits of hemodialysis therapy:

- Removes waste products and excess fluid directly from the vascular system by filtering the blood through the artificial kidney (or dialyzer).
- Performed 3-5 hours three times per week in-center; nocturnally up to 6 hours; or done in short, daily increments if a patient is at home.
- Corrects the pH, electrolyte, and chemical levels of the blood.

The dialysis process:

- Blood is separated from the *dialysate* (the fluid that passes through the dialyzer and causes the removal of toxins) by a thin semipermeable membrane.
- Uremic toxins and excess levels of chemicals like potassium are removed from the artificial kidney through diffusion.
- Pressure in the dialyzer is used to remove excess fluid. The blood and the dialysate do not come in direct contact with each other.
- Hemodialysis is made possible through the principles of diffusion, osmosis, ultrafiltration, and convection.
- The hemodialysis procedure replaces only the filtration function of natural kidneys. It does not replace the hormonal functions of a kidney. (Arslanian et al., 2020).

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Vascular Access for Hemodialysis:

The Patient's Lifeline

- There are three types of vascular access used for hemodialysis: Arteriovenous fistula (AVF), arteriovenous graft (AVG), and central venous catheter.
- Two types of internal accesses (AVF and AVG) require cannulation with two large bore fistula needles for every dialysis session. One needle will pull the blood into the tubing and dialyzer, while the other is used to return the blood. The needles are removed after the treatment is completed.

Arteriovenous Fistula*:

- Created by surgically connecting an artery to a vein.
- The standardly preferred access.
- Should not be used until it is determined to be ready for use – usually 6-12 weeks after its creation.
- Lowest risk for infection.

Arteriovenous Graft*:

- Created by attaching a special synthetic tubing to an artery at one end and a vein at the other.
- Ready for use in 2-3 weeks after surgical site is healed and the swelling has gone down.

Central Vein Catheter*:

- An external access that may be used for hemodialysis immediately.
- Placed in a large vein through the neck or upper chest.
- The ports to access the catheter remain outside the body.
- Does not require cannulation.
- Connects directly to the blood tubing of the dialysis machine.

NOTE: *DO NOT USE any of these forms of vascular access for anything other than hemodialysis.

Nutritional Management

Typical Recommendations

- **Protein:** 1-1.2 g/kg/day 50% high biologic value protein.
- **Potassium:** 40-70 mEq/day (1,500-2,500 mg) (avoid high potassium foods and salt substitute that is potassium chloride).
- **Sodium:** 750-1,000 mg/day (avoid high sodium foods and do not use added salt).
- **Phosphorus:** 600-1,200 mg/day (limit dairy products).
- **Calories:** > 35 kcal/kg/day, less for patients with obesity (25-30 kcal/kg), and more with stress or malnutrition (40-45 kcal/day).
- **Fluids:** Limited to 1-1.5 liters plus urine output per day.

Special Recommendations

For patients with diabetes mellitus, use the same meal plan as above but limit concentrated sweets.

Typical Medications

- **Multivitamins without minerals or vitamin D** to replace excess loss during hemodialysis (folic acid 1 mg/day).
- **Phosphate binders** to limit gastrointestinal absorption of phosphorous and prevent renal bone disease or hyperparathyroidism (e.g., Phoslo[®], Renvela[®], Fosrenol[®]).
- **Erythropoietin** for anemia (Aranesp[®], Epogen[®], PROCRIT[®]).
- **Iron** for anemia management (oral or IV – e.g., Ferrlecit[®], iron dextran, Venofer[®] or Feraheme[®]).
- **Vitamin D** (1,25 vitamin D₃) to prevent/treat renal bone disease (Hectorol[®], Rocaltrol, ZEMPLAR[®]).
- **Antihypertensives** for blood pressure management (ACE inhibitors, angiotensin receptor blockers, beta blockers, calcium channel blockers, central alpha-2 agonist, alpha-1 blockers, vasodilators, and – especially for CKD – diuretics).

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Activity and Limitations: Exercise Benefits for Dialysis Patients

- Increased strength and energy.
- Improved muscle strength and stronger bones.
- Better blood pressure control.
- Better sleep.
- Better control of body weight.
- Lowered level of blood fats (cholesterol and triglycerides).

Guidelines for Exercise

Advise patients to:

- Check with their health care professional.
- Follow the treatment plan.
- Take any appropriate medications.
- Follow their diet.
- Emphasize individual health, fitness level, interest, and available time will vary.

Types of Exercise

- Recommend continuous exercises that will move large muscle groups, such as walking, swimming, bicycling, skiing, and aerobic dancing.
- Recommend low level strength exercises, such as low weights and high repetitions.
- Emphasize there is to be no heavy lifting, and a slow, relaxed pace of exercise can still yield positive benefits.

Times to Exercise

- Recommend a minimum of 3 days per week of exercise.
- Advise patients to work toward exercising 30 minutes per session.
- Emphasize that a patient's endurance will be better on non-dialysis days.

Partnering With the Health Care Team

- Patients can be confident health care professionals will listen and offer education, continuity of care, and encouragement, as well as information on support groups and rehabilitation.
- Patients who are active participants in their care may have a greater sense of control of their disease.

- Health care professionals (doctors, nurses, social workers, dieticians, and case managers) are invaluable resources to patients.
- The Web is also available and offers numerous informative sites sponsored by nationally recognized kidney organizations – but beware of misinformation.
- Patients can be confident support is available for lifestyle changes.
- Hemodialysis can be offered as a home therapy when appropriate and if desired by the patient.
- **Remember: Health Care Team + Patient = The Winning Team!**

Advanced Practice Nursing Care (Gomez, 2011)

In addition to the items outlined above:

- Order and interpret laboratory results and diagnostic tests (i.e., kinetics, renal function, electrolytes, blood volume monitoring, echocardiograms, X-rays). Order appropriate follow-up and refer to physician as needed.
- Monitor patient's treatment plan, dialysis prescription, and target weight. Adjust as warranted based on patient's response.
- Monitor for any signs of infection. Order diagnostic studies or laboratories (i.e., exit site cultures, blood cultures) as warranted and treat as appropriate in collaboration with physician.
- Monitor patient's response to medications (i.e., ESA, iron, bone disease medications, antihypertensives). Adjust as warranted.
- Monitor patient's response to diet in collaboration with a registered dietitian. Adjust as needed in response to patient's treatment plan.
- Monitor patient's access (see separate Vascular Access Fact Sheet).

References

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- Brown, J.S., & Gilliland, M. (2020). Chronic kidney disease. In C.S. Counts (Ed.), *Core curriculum for nephrology nursing* (7th ed., Vol. 1, pp. 287-350). American Nephrology Nurses Association.
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Additional Information:

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