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ELDER CARE
A Resource for Interprofessional Providers

Chronic Kidney Disease in Older Adults

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Chronic kidney disease (CKD) has multiple causes, all characterized by progressive loss of nephrons and kidney function, and frequently leading to end-stage renal disease (ESRD). The prevalence of CKD is 36.8% in people over age 65 compared with 14.4% in the overall US population. It is important not to confuse normal age-related reduction in kidney function with CKD. But, early recognition/ treatment of CKD can slow loss of renal function, reduce the risk of ESRD, reduce cardiovascular events and improve quality of life.

Estimating Kidney Function

Kidney function is measured in terms of blood filtration through the renal filtering system and is called "estimated glomerular filtration rate" or eGFR. The higher the eGFR, the better the kidneys are functioning. There are a number of eGFR calculators available, but it is unclear which are most accurate in older adults.

Classically, eGFR calculators relied on serum creatinine levels, but creatinine levels can be affected by the loss of muscle mass that often accompanies aging. More recently, blood cystatin C levels have been used to estimate eGFR and are more accurate as cystatin C is less affected by loss of muscle mass. If cystatin C is not available, current recommendations are to use the MDRD, CKD-EPI, or BIS equations (Table 1). However, renal dosing for many drugs, especially older ones, is based on the Cockroft-Gault equation. When prescribing for patients with CKD, check the drug manufacturer's prescribing information about which approach was used to determine renal dosing.

Finally, note that renal function cannot be reliably assessed with creatinine levels alone. Age, sex, and race are also important and are considered in the various equations.

The Aging Kidney

There is a natural decline in renal function (and measured eGFR) with age due to loss of renal mass and damaged kidney filtering mechanisms. Renal function steadily declines starting at about age 30, with the steepest decline occurring after age 75. Generally, however, reductions in renal function do not progress to the point of ESRD. The natural age-related decline in renal function can often be differentiated from CKD by the lack of proteinuria, lack of biochemical abnormalities, and lack of concomitant chronic illnesses associated with impaired renal function.

Causes of CKD

Major causes of CKD in older adults include hypertension, diabetes mellitus, ischemic nephropathy, and urinary tract obstruction. In addition, long-term use of proton-pump inhibitors has recently been linked to CKD.

Type-2 diabetes and systolic hypertension have the largest effect on progression of CKD in older adults. Fortunately, disease progression can be slowed by appropriately treating these conditions. Older adults with CKD are more susceptible to acute kidney injury (AKI) events, which in turn, may contribute to further progression of CKD.

Screening for CKD

The US Preventive Services Task Force states that there is insufficient evidence to assess the benefits and harms of screening for CKD in asymptomatic adults. However, it is common in practice for older adults to have an assessment of renal function as part of their annual medical evaluation.

Guidelines suggest diagnosing CKD and initiating further evaluation in any patient with an eGFR of <60ml/ min/1.73m^2 or other markers of kidney damage (e.g., proteinuria, hematuria) for more than 3 months. Recently, however, there have been proposals that a diagnosis of CKD in older adults should not be made in the absence of other indicators of CKD unless the eGFR is below 45ml/ min/1.73m^2 (see Glassock article on references and resource list).

Management of CKD

Management relies on modifying risk factors to slow the

TIPS ABOUT CHRONIC KIDNEY DISEASE IN OLDER ADULTS

- CKD is different than normal age-related reduction in kidney function.
- CKD should be suspected if estimated glomerular filtration (eGFR) is <60ml/min/1.73m2, if eGFR is trending downward, and if the patient has proteinuria or risks for CKD.
- When possible, calculate eGFR using a cystatin C-based equation (Table 1). If measurement of cystatin C is not available, use a standard creatinine-based equation.
- CKD increases risks for cardiovascular disease, malnutrition, physical disability, frailty, cognitive decline and dementia. As a result, care for patients with CKD should involve an interprofessional approach, which should be adopted early.

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Table 1. Formulas Used to Estimate Creatinine Clearance in Older Adults

Formula	*Significance*	*Online Calculator*
Modification of Diet in Renal Disease (MDRD) Equation	Less accurate at GFR >60 ml/min/1.73 m^2 and at older age	http://www.mdcalc.com/mdrd-gfr-equation/
Cockroft Gault Equation	Less accurate at lower levels of GFR Is the standard used for dosing most medications	http://www.mdcalc.com/creatinine-clearance-cockcroft-gault-equation/
Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) Creatinine Equation	Can overestimate GFR in older individuals	https://www.qxmd.com/calculate/calculator_251/egfr-using-ckd-epi
CKD-EPI Cystatin C Equation	More accurate for older individuals and those with sarcopenia	https://www.kidney.org/professionals/kdoqi/gfr_calculator
CKD-EPI Creatinine-cystatin C equation	Most accurate estimate of GFR in older individuals	
Berlin initiative study (BIS) equation	Reliable for use in older adults with stage 1–3 CKD	http://touchcalc.com/bis2.html

progression of CKD. Agents such as angiotensin-converting enzyme inhibitors (ACEIs) angiotensin receptor blockers (ARBs), or Sodium-glucose Cotransporter-2 (SGLT2) Inhibitor may be used to slow down progression of CKD, especially in presence of proteinuria. These drugs, however, may also predispose older patients to acute kidney injury by decreasing overall vascular perfusion of the kidneys or volume depletion; ACEI and ARB can also cause hyperkalemia. Renal function and potassium levels should be checked 1-2 weeks after starting or increasing the dose of ACEIs, ARBs and SGLT2 inhibitors.

Treatment also involves addressing known underlying risk factors, such as blood pressure and glycemic control. In addition, care should be taken to dose a patient's medications based on eGFR (Table 2), and medications known to damage kidneys should be avoided. Major culprits include non-steroidal anti-inflammatory drugs, radiocontrast agents, aminoglycosides, amphotericin B, calcineurin inhibitors, and others. Efforts to reduce the number and severity of acute kidney injury episodes is another important component of CKD management.

When is Specialty Care Needed?

Referral to a nephrologist should be considered when the eGFR is <45 ml/min/1.73m^2, when renal function is trending downward, when proteinuria is present, or when a medical condition is thought to be contributing to reduced eGFR.

Associated Disease Concerns

Older adults with CKD are at higher risk of developing cardiovascular disease, malnutrition, physical disability, frailty, and cognitive decline. A multidisciplinary care approach focusing on cardiovascular risk factor modification should be included in the goals of treatment for these patients. Clinicians caring for older adults with CKD should also incorporate preservation of functional status as a component of routine care.

It is important to identify CKD in older adults in its early stages so that necessary resources can be organized to provide appropriate care. Simplification of medication regimens, support from ancillary health care workers, emphasis on maintaining physical activity, and other principles of geriatric care are particularly applicable to older adults with CKD.

Table 2. Some Commonly Used Medications That Need Dosing Adjustment in Various Stages of CKD

Antivirals Acyclovir Famciclovir Valacyclovir	Allopurinol	Famotidine	Gabapentin	Metoclopramide	Spironolactone
	Amoxicillin	Fluconazole	Glyburide	Opioids (most preparations)	Statins (most preparations)
	Atenolol	Fluoroquinolones	Metformin	Ranitidine	Thiazide diuretics

References and Resources

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Interprofessional care improves the outcomes of older adults with complex health problems.

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