

Primary Care Approach to Management of CKD



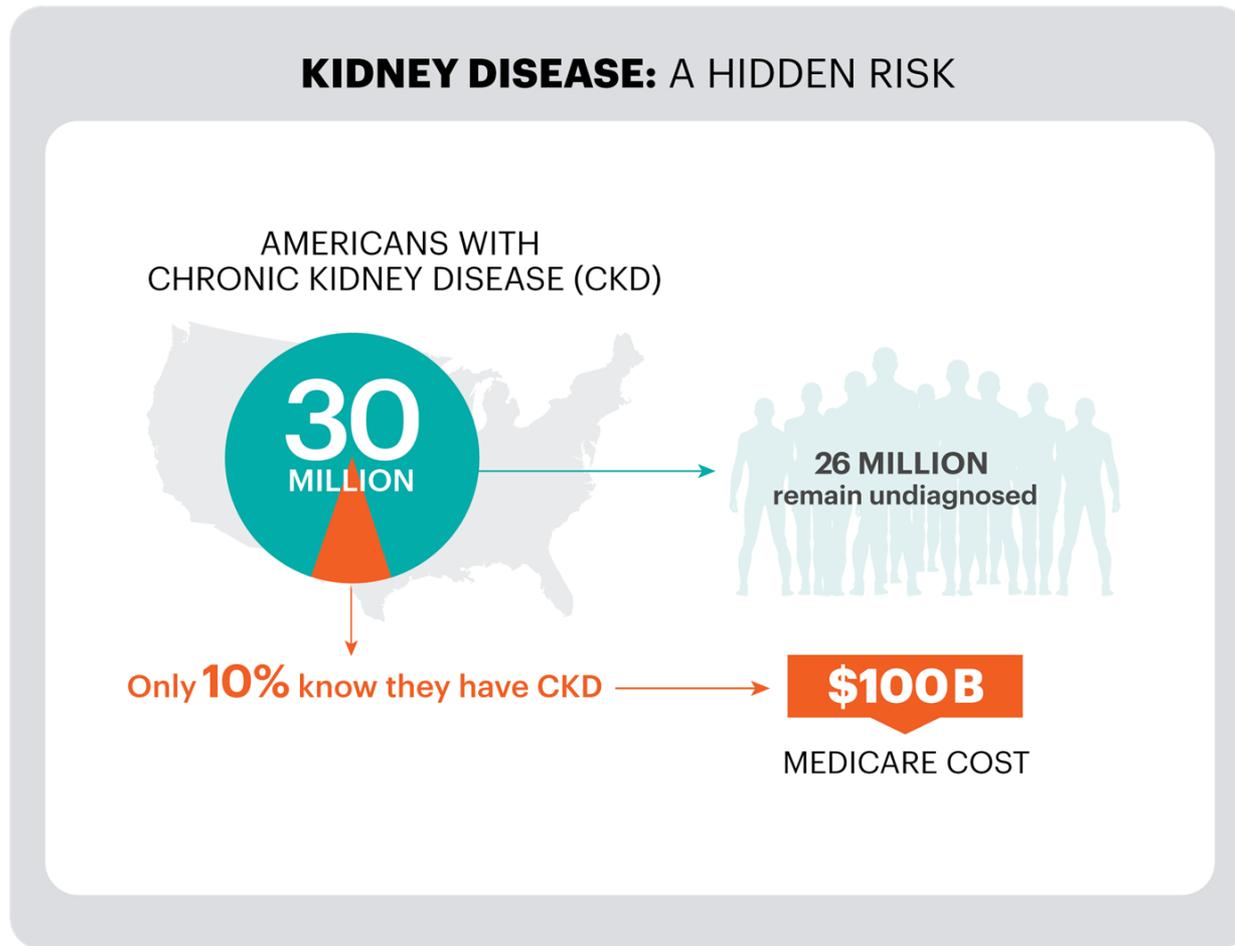
National Kidney Foundation®



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Low CKD recognition is a public health problem



The Role of CKD Recognition in Population Health

- Early recognition of CKD:
 - Offers opportunity to enhance kidney protective care by improving management of modifiable risk factors
 - Improves prediction of incident cardiovascular events beyond traditional risk factors¹
 - Encourages appropriate and timely referral to nephrology
 - Can limit patient safety risk associated with CKD

Matsushita, K., J. Coresh, et al. "Estimated glomerular filtration rate and albuminuria for prediction of cardiovascular outcomes: a collaborative meta-analysis of individual participant data." [The Lancet Diabetes & Endocrinology](#) 2015;**3**(7): 514-525.

Risk Factors for CKD

- **Modifiable**

- Diabetes
- Hypertension
- Frequent NSAID use
- History of acute kidney injury

- **Non-modifiable**

- Family history of kidney disease
- Age 60 or older
- Ethnicity: African American, Hispanic, Asian/Pacific Islander, American Indian

Improved CKD Diagnosis

- Studies demonstrate clinician behavior changes when CKD diagnosis improves.
 - Significant improvements realized in:
 - Increased urinary albumin testing
 - Increased appropriate use of ACEi or ARB
 - Avoidance of NSAIDs prescribing among patients with low eGFR
 - Appropriate referral and timely to nephrology

1. Wei L, et al. *Kidney Int.* 2013;84:174-178.
2. Chan M, et al. *Am J Med.* 2007;120:1063-1070.
3. Fink J, et al. *Am J Kidney Dis.* 2009;53:681-668.

CKD is diagnosed using two laboratory tests



- Estimated glomerular filtration rate (eGFR) provides insight regarding overall kidney function
- Albumin-creatinine ratio, urine (ACR) provides insight regarding the extent of kidney damage

Many laboratories offer these two tests as a **Kidney Profile** to streamline the ordering process.

Estimated Glomerular Filtration Rate (eGFR)

- Normal eGFR varies according to age, sex and body size
 - eGFR will decline with age
- The National Kidney Foundation recommends the CKD-EPI creatinine equation (2009) as the most accurate and least biased method to estimate eGFR

GFR CALCULATOR

Glomerular filtration rate (GFR) is the best overall index of kidney function. Normal GFR varies according to age, sex, and body size, and declines with age. The National Kidney Foundation recommends using the CKD-EPI Creatinine Equation (2009) to estimate GFR.

Serum Creatinine: mg/dL μ mol/L

Serum Cystatin C: mg/L

Age: Years

Gender: Male Female

Race: Black Other

Standardized Assays: Yes No Not Sure

Remove body surface adjustment: Yes No Not Sure

CALCULATE

The National Kidney Foundation provides an eGFR calculator at:
https://www.kidney.org/professionals/kdoqi/gfr_calculator

Summary of the MDRD Study and CKD-EPI Estimating Equations:

<https://www.kidney.org/sites/default/files/docs/mdrd-study-and-ckd-epi-gfr-estimating-equations-summary-ta.pdf>

Albumin-creatinine Ratio, Urine

- Urine albumin-creatinine ratio (ACR) is calculated by dividing albumin concentration in milligrams by creatinine concentration in grams
- The urine creatinine assists in adjusting albumin levels of varying urine concentrations, which allows for more accurate results versus albumin alone
- Spot urine albumin-creatinine ratio for quantification of proteinuria
 - New guidelines classify three levels of albuminuria as normal/mild, moderate or severe
- First morning void preferable – 24-hour urine test is rarely necessary to assess albuminuria or proteinuria

Diagnostic Criteria for CKD

- Abnormalities of kidney structure or function present for 3 or more months, with implications for health
- Either of the following must be present for ≥ 3 months:
 - eGFR: <60 mL/min/1.73m²
 - ACR: >30 mg/g
 - Markers of kidney damage (one or more*)

*Markers of kidney damage can include urinalysis abnormalities such as glomerular hematuria, kidney biopsy abnormalities or polycystic kidney disease on imaging studies.

Classification of CKD using eGFR and ACR

Prognosis of CKD by eGFR and Albuminuria Categories				Albuminuria categories		
				Description and range		
				A1	A2	A3
				Normal to mildly increased	Moderately increased	Severely increased
				<30mg/g <3 mg/mmol	30-299 mg/g 3-29 mg/mmol	≥300 mg/g ≥30mg/mmol
eGFR categories (ml/min/1.73m ²) Description and range	G1	Normal or High	≤ 90			
	G2	Mildly decreased	60-89			
	G3a	Mildly to moderately decreased	45-59			
	G3b	Moderately to severely decreased	30-44			
	G4	Severely decreased	15-29			
	G5	Kidney Failure	< 15			

Green: low risk (if no markers of kidney disease, no CKD); Yellow: moderately increased risk;
Orange: high risk; Red, very high risk

Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. *Kidney Int Suppl.* 2013;3:1-150.

CKD and Patient Safety

Medication Errors

- Toxicity (nephrologic or other)
- Improper dosing
- Inadequate monitoring

Electrolytes

- Hyperkalemia
- Hypoglycemia
- Hypermagnesemia
- Hyperphosphatemia

Miscellaneous

- Multidrug-resistant infections
- Arm preservation/dialysis access

Diagnostic tests

- Iodinated contrast media: AKI
- Gadolinium-based contrast: Nephrogenic systemic fibrosis (NSF)
- Sodium Phosphate bowel preparations: AKI, CKD

Cardiovascular Disease

- Missed diagnosis
- Improper management

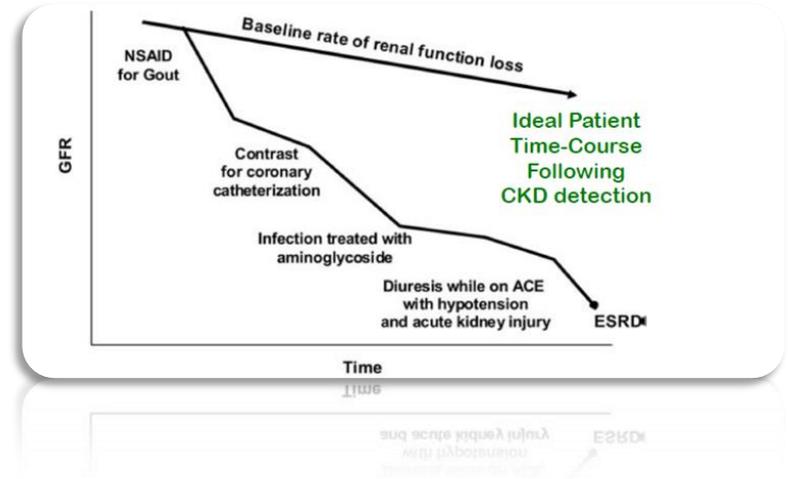
Fluid management

- Hypotension
- AKI
- CHF exacerbation

AKI = acute kidney injury; CHF = congestive heart disease
Fink et al. *Am J Kidney Dis.* 2009;53:681-668

CKD & Patient Safety Acute Kidney Injury Risks

- Remind CKD patients to avoid NSAIDs.
- Avoid Dual RAAS blockade.
- Any med with >30% renal clearance probably needs dose adjustment for CKD.
- No bisphosphonates for eGFR <30 mL/min/1.73m².
- Avoid gadolinium-based contrast for eGFR <30 mL/min/1.73m².



Fink et al. *Am J Kidney Dis.* 2009;53:681-668

CKD, Medications and Patient Safety

- CKD patients at high risk for drug-related adverse events.
- 50% of FDA approved drugs are cleared by the kidneys.
- Consider kidney function and current eGFR (not just SCr) when prescribing medications.
- Minimize pill burden as much as possible.

Indications for Nephrology Referral

- Acute kidney injury
- **eGFR <30 mL/min/1.73m² (eGFR categories G4-G5)**
- **Persistent albuminuria (ACR >300 mg/g)***
- Atypical Progression of CKD**
- Urinary red cell casts, RBC more than 20 per HPF sustained and not readily explained

*Significant albuminuria is defined as ACR 300 mg/g (30 mg/mmol) or AER 300 mg/24 hours, approximately equivalent to PCR 500 mg/g (50 mg/mmol) or PER 500 mg/24 hours

**Progression of CKD is defined as one or more of the following: 1) A decline in GFR category accompanied by a 25% or greater drop in eGFR from baseline; and/or 2) rapid progression of CKD defined as a sustained decline in eGFR of more than 5mL/min/1.73m²/year. KDOQI US Commentary on the 2012 KDIGO Evaluation and Management of CKD.

Indications for Nephrology Referral

- Hypertension refractory to treatment with 4 or more antihypertensive agents
- Persistent abnormalities of serum potassium
- Recurrent or extensive nephrolithiasis
- Hereditary kidney disease