NATIONAL KIDNEY FOUNDATION®

How to Manage CKD

Conditions of ↑ CKD Risk

Diabetes
Hypertension
Cardiovascular Disease
Age >60 years
Obesity
Family History of CKD
AKI History

Yes

Screen for CKD

- "Spot" urine for albumin-to creatine ratio (uACR) to detect albuminuria
- Serum creatinine to estimate glomerular filtration rate (eGFR)

Is either of the following present for 3 months or more?

- eGFR <60 ml/min/1.73 m2
- uACR >30 mg/g

No → Periodically repeat evaluation

Yes

Classify CKD stage

Assign GFR Category

45 – 59 = G3a
30 – 44 = G3b
15 – 29 = G4
<15 = G5

Identify and treat specific cause of CKD *

Assign Albuminuria Category

<30 = A1 (normal or mildly ↑)
30-299 = A2 (moderately ↑)
>/= 300 = A3 (severely ↑)

Patient Safety

eGFR <60
- Consider eGFR in drug dosing
- Reduce risk of AKI volume depletion

eGFR 45 to <60
- Avoid prolonged NSAIDs
- Hold metformin for iodinated contrast imaging procedures

eGFR 30 to <45
- Avoid prolonged NSAIDs
- Use metformin with close monitoring at 50% dose
- Adjust DOAC dose based on FDA prescribing guides
- Consider avoid PICC lines to preserve future veinous access; consider nephrology consult or use single or double lumen central catheters instead
- Consider iodinated contrast-induced AKI prevention in high-risk circumstances
  - Avoid iodinated contrast or minimize dose
  - Consider isotonic saline infusion before, during, and after procedure
  - Hold metformin at time of or before procedure
  - Consider withhold other nonessential potentially nephrotoxic agents

eGFR <30
- Annual comprehensive medication review for dosing and other safety concerns
- Avoid any NSAIDs, bisphosphonates, and metformin
- Continue SGLT-2i until dialysis (if tolerated); Refer to FDA prescribing guides for guidance on initiating SGLT-2i in G4 CKD
- Avoid PICC lines; use single and double lumen central catheters instead
- Monitor PT/INR closely if on warfarin (increased bleed risk)
- Adjust DOAC dose or avoid depending on FDA prescribing guides
- Iodinated contrast-induced AKI prevention recommended
  - Avoid iodinated contrast or minimize dose
  - Consider isotonic saline infusion before, during and after procedure
  - Withhold nonessential potentially nephrotoxic agents
- Gadolinium contrast = risk of nephrogenic systemic fibrosis; consult radiology & nephrology, macrocyclic agent preferred and minimize dose

CKD Progression + Complications (for patients not on dialysis)

BP Goals
- No DM:
  - SBP <120 (when tolerated) using standardized office BP measurment
  - SBP <130 reasonable, especially if no access to standardized BP measurement
- With DM:
  - SBP <130 using standardized office BP measurement
- Balance risk for AKI and polypharmacy, especially if very low kidney function
- Consider less intensive therapy if limited life expectancy or symptomatic postural hypotension

BP Treatment
- ACE-I or ARB 1st line if DM or uACR >30 (A2/A3), titrated to highest tolerated/approved dose
- Thiazide, CCB, or ACE-I/ARB 1st line if uACR < 30 (A1)
- Avoid any combination of ACE-I, ARB, and DRI therapy
- Diuretic usually required
- Dietary sodium <2000 mg/day

DM Goals:
- Individualized A1C goal ranging from <6.5% to < 8%, depending on:
  - CKD severity, macrovascular complications, comorbidities, life expectancy, hypoglycemia awareness, resources for hypoglycemia management, and propensity for hypoglycemia
- CGM time in range (TIR) > 70% (either 70-180 mg/dL or patient-specific range)

T2DM Treatment
- Prioritize SGLT-2i, metformin, and/or GLP-1 RA

Vaccination for influenza, pneumococcus, and full COVID-19 series

CKD Complications Screening
- Acidosis – Bicarbonate goal: 22-26; treat <22 with oral bicarbonate supplements and promote base-producing diet
- Anemia – CKD G3a+; Evaluate if Hb <13 g/dL (men) or <12 g/dL (women). Treat iron deficiency first. Consider ESA to treat Hb <10 g/dL if favorable risk/benefit (Target 9-11.5 g/dL) or refer to nephrology.
- CKD-MBD – CKD G3a+; evaluate calcium, phosphate, 25-OH vitamin D, and iPTH. Supplement vitamin D deficiency. Refer to nephrology if hyper phosphatemia or significant iPTH elevation. Consider BMD testing if results will impact treatment decisions.

Nephrology Referral
- eGFR <30 (G4/G5) or uACR >300 (A3)
- >25% decrease in eGFR (AKI or progressive CKD may be difficult to distinguish)
- Sustained decline in eGFR >5 mL/min/1.73m2/year
- 2^0 hyperparathyroidism
- CKD and HTN refractory to treatment with >4 antihypertensive agents
- Persistent hyperkalemia / metabolic acidosis
- Recurrent or extensive kidney stones
- Persistent unexplained hematuria
- Hereditary or unknown cause of CKD

CKD and CVD (for patients not on dialysis)

CKD = ↑CVD risk

Consider statin therapy
- All >/= 50 years
- 18-49 years at high CVD risk (history of ASCVD, DM, 10-yr ASCVD risk >10%)
- Additional lipid-lowering treatment may be warranted for higher risk individuals

Consider SGLT-2i (independent of T2DM) if eGFR within FDA prescribing guidelines, especially if uACR > 30 (A2+)

Consider NS-MRA after max tolerated ACE-I/ARB if:
- T2DM, uACR > 30 (A2+), eGFR >25, AND K <5

Low-dose aspirin for secondary ASCVD prevention unless bleeding risk outweighs benefits

* **Cause of CKD** is classified based on presence or absence of systemic disease and the location within the kidney of observed or presumed pathologic-anotomic findings.

How to Evaluate for Chronic Kidney Disease

Know the criteria for CKD

- Abnormalities of kidney structure or function, present for >3 months, with implications for health
- Either of the following must be present for >3 months:
  - Markers of kidney damage (one or more)
  - eGFR <60 ml/min/1.73 m^2

Screen for CKD with two simple tests.

- "Spot" urine for albumin-to-creatinine ratio (uACR) to detect albuminuria
- Serum creatinine to estimate glomerular filtration rate (eGFR)

What if CKD is detected?

- Classify CKD based on cause, GFR category, and albuminuria category
- Implement a clinical action plan based on patient's CKD classification (See flip side)
  - Consider co-management with a nephrologist if the clinical action plan cannot be carried out
  - Refer to a nephrologist when eGFR <30 mL/min/1.73 m^2 or uACR >300 mg/g
- Learn more at **kidney.org/professionals**

Why should you classify CKD?

- To have a more precise picture of each patient's condition
- To guide decisions for testing and treatment
- To evaluate patient's risk of progression and complications
- Because neither the category of GFR nor the category of albuminuria alone can fully capture prognosis of CKD

References

Anemia: Am J Kidney Dis. 2013;62(5):849-859. **BP:** Am J Kidney Dis. 2022;79(3):311-327. & Kidney Int. 2021;99(3S):S1-S87. **CKD Management:** Am J Kidney Dis. 2014;63(5):713-735. & Kidney Inter, Suppl. 2013;3:1-150. **CKD-MBD:** Am J Kidney Dis. 2017;70(6):737-751. & Kidney Int, Suppl. 2017;7(1):1-59. **DM:** Kidney Int. 2022;102(5S):S1-S127. & Diabetes Care. 2022;45(12):3075-3090. **Gadolinium-based contrast media:** Kidney Med. 2020;3(1):142-150. **Iodinated contrast media:** Kidney Med. 2020;2(1):85-93. **Lipid management:** Am J Kidney Dis. 2015;65(3):354-366. **Metabolic acidosis:** Am J Kidney Dis. 2019;74(2):263-275. **Vascular access:** Am J Kidney Dis. 2020;75 (4 Suppl 2):S1-S164.

How do you classify CKD?

- Identify cause of CKD*
- Assign GFR category
- Assign albuminuria category

*Cause of CKD is classified based on presence or absence of systemic disease and the location within the kidney of observed or presumed pathologic-anotomic findings.

GFR categories in CKD

Category	GFR (ml/min/1.73 m^2)	Terms
G1 †	≥90	Normal or high
G2 †	60-89	Mildly decreased*
G3a	45-59	Mildly to moderately decreased
G3b	30-44	Moderately to severely decreased
G4	15-29	Severely decreased
G5	<15	Kidney failure

*Relative to young adult level.
† In the absence of evidence of kidney damage, neither GFR category G1 nor G2 fulfill the criteria for CKD.

Albuminuria categories in CKD

Category	uACR (mg/g)	Terms
A1	<30	Normal to mildly increased
A2	30–299	Moderately increased*
A3	≥300	Severely increased†

*Relative to young adult level.
†Including nephrotic syndrome (uACR >2220 mg/g)
uACR >30 for >3 months indicates CKD.

Abbreviations

25-OH Vitamin D, 25-hydroxy vitamin D; **A Stage**, albuminuria category; **ACE-I**, angiotensin-converting-enzyme inhibitor; **AKI**, acute kidney injury; **ARB**, angiotensin receptor blocker; **ASCVD**, atherosclerotic cardiovascular disease; **BMD**, bone mineral density; **BP**, blood pressure; **CCB**, calcium-channel blocker; **CKD**, chronic kidney disease; **CGM**, continuous glucose monitoring; **CKD-MBD**, chronic kidney disease mineral and bone disorder; **COVID-19**, coronavirus disease 2019; **CVD**, cardiovascular disease; **DM**, diabetes mellitus; **DOAC**, direct-acting oral anticoagulant; **DRI**, direct renin inhibitor; **eGFR**, estimated glomerular filtration rate; **ESA**, erythropoietin-stimulating agent; **FDA**, Food & Drug Administration; **G Stage**, GFR category; **GLP-1 RA,** glucagon-like peptide 1 receptor agonist; **Hb**, hemoglobin; **HTN**, hypertension; **iPTH**, intact-parathyroid hormone; **NS-MRA**, non-steroidal mineralocorticoid receptor antagonist; **NSAIDs**, nonsteroidal anti-inflammatory drugs; **PICC**, peripherally inserted central catheter; **PT/INR**, prothrombin time/international normalized ratio; **SBP**, systolic blood pressure; **SGLT-2i**, sodium-glucose cotransporter-2 inhibitor; **T2DM**, type 2 diabetes mellitus; **uACR**, urine albumin-to-creatinine ratio.

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