

CKD Staging: KDIGO 2024 Classification & Management Framework

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KDIGO 2012 CKD Definition (Still Gold Standard)

Chronic Kidney Disease = kidney damage for ≥ 3 months manifested by: 1. **Albuminuria** (any degree) OR 2. **GFR < 60 mL/min/1.73m² BSA** OR 3. **Abnormal kidney imaging** (cysts, fibrosis, scarring)

[!important] **CKD is defined by abnormality, not by kidney disease diagnosis.**
A patient with diabetes WITHOUT albuminuria or low GFR does NOT have CKD.

KDIGO 2024 Staging: G Categories (GFR) + A Categories (Albuminuria)

GFR Categories (G1–G5)

Category	GFR (mL/min/1.73m ²)	Clinical Description
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 (ESRD)

Albuminuria Categories (A1–A3)

Category	UACR (mg/g)	UPCR (g/day)	Clinical Risk
A1	< 30	< 0.5	Normal to mildly increased
A2	30–300	0.5–3.5	Moderately increased
A3	> 300	> 3.5	Severely increased (nephrotic)

[!tip] **UACR conversion:** 1 g/day $\approx$ 1,000 mg/day - Spot UACR >300 mg/g $\approx$ 24-h proteinuria >3.5 g/day - **Nephrotic range proteinuria:** >3.5 g/day (or UACR >300)

KDIGO 2024 Heat Map: Risk Stratification

New in 2024: GFR + Albuminuria matrix creates color-coded risk:

	A1 (<30)	A2 (30–300)	A3 (>300)
	Green	Yellow	Orange/Red
G1 ($\geq$ 90)	✓ Green	Yellow	Orange
G2 (60–89)	✓ Green	Yellow	Orange
G3a (45–59)	Yellow	Yellow	Orange
G3b (30–44)	Yellow	Orange	Red
G4 (15–29)	Orange	Orange	Red
G5 (<15)	Red	Red	Red

Interpretation: - **Green (Low risk):** G1–G2 + A1; most don't need nephrology referral - **Yellow (Moderate risk):** G3a–G3b $\pm$ A1, or G1–G2 + A2; monitor closely - **Orange (High risk):** G3b–G4 + A2, or any + A3; nephrology referral indicated - **Red (Very high risk):** G4–G5 $\pm$ any A; urgent nephrology

[!important] **Nephrology referral threshold:** - **Urgent (same week):** G5 (Cr >10 mg/dL), uncontrolled HTN, rapidly declining GFR - **Soon (within 2–4 weeks):** G3b + albuminuria, G4 $\pm$ albuminuria, CKD + diabetes - **Routine (within 3 months):** G3a + albuminuria, first CKD diagnosis

GFR Estimation: CKD-EPI 2021 Equation

Modern standard: CKD-EPI 2021 (replaces Cockcroft-Gault, MDRD)

Advantages: - Includes cystatin C (more accurate in extremes) - Better at high GFR (overestimation reduced) - Racial demography removed (no longer uses “Black race multiplier”) - More accurate at low GFR

Formula components: - **Serum creatinine** (Cr) — measured in μ mol/L or mg/dL - **Cystatin C** (optional) — serum cystatin C in mg/L - **Age, sex**

Online calculator: KDIGO.org (avoids arithmetic errors)

[!tip] **When CKD-EPI differs from MDRD:** - CKD-EPI $\uparrow$ GFR estimate $\rightarrow$ LESS overestimation of CKD severity - Pt with Cr 1.2 (MDRD eGFR 60) $\rightarrow$ CKD-EPI eGFR 65 (not CKD G3 by eGFR alone) - Always use SAME equation for trending; don't mix calculators

Cystatin C Benefits

- Filtered freely, reabsorbed + catabolized (not reabsorbed like Cr)
- Better marker in: elderly, sarcopenic patients, pregnancy, muscle wasting

- Less affected by diet, muscle mass

Cystatin C GFR equation: CKD-EPI 2012 (or newer 2021 with creatinine)

Risk Factors for CKD Progression & Complications

Non-Modifiable

- Age >60
- Male sex
- Race/ethnicity (African American, Native American, Hispanic — multiple mechanisms, not purely genetic)
- Family history of CKD or ESRD

Modifiable: THE BIG ONES

1. **Diabetes (most common cause, ~1/3 of ESRD)** — tight glucose control (HbA1c <7%), ACE-I/ARB
 2. **Hypertension (2nd most common)** — BP target <120 mmHg (SPRINT-CKD concept)
 3. **Albuminuria** — reduced by ACE-I/ARB/SGLT2i/finerenone/GLP1-RA
 4. **NSAIDs & other nephrotoxins** — avoid with advancing CKD
 5. **Smoking** — increases proteinuria, HTN
 6. **Poor diet** — sodium ↑, phosphate ↑, potassium ↑
 7. **Obesity** — association with progression
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Key Management by Stage

CKD G1–G2 with A1 (No referral)

- No kidney disease treatment required if no other indicator
- Regular monitoring: Cr × 1 year, UA × 1 year
- Modify traditional CV risk factors (HTN, lipids, smoking)

CKD G3a (45–59) ± Albuminuria (Routine referral)

- **If albuminuria:** ACE-I or ARB first-line
- Monitor Cr, K, electrolytes 1–2 weeks after ACE-I start
- Encourage DASH diet, weight loss, exercise
- Target BP: <120 mmHg systolic (SPRINT-CKD)

CKD G3b (30–44) with A2–A3 (Referral within 1 month)

- **Triple therapy:** ACE-I/ARB + SGLT2i + (finerenone or GLP1-RA if diabetic)
- Monitor bone/mineral (Ca, PO₄, PTH, 25-OH VitD)
- Adjust drug dosing (renally cleared meds)
- Prepare for advanced CKD counseling (dialysis, transplant, conservative)

CKD G4 (15–29) (Urgent referral)

- **Full nephrology co-management**
- Advanced CKD clinic: vascular access creation, transplant eval, dialysis education
- Bone-mineral-disorder (BMD) management: phosphate binders, vitamin D, calcimimetics
- Anemia management: iron, ESA (if Hgb <10 g/dL despite iron)
- Cardiovascular risk reduction

CKD G5 (Cr <15 or already on dialysis) (EMERGENT)

- **RRT initiation planning** (dialysis start or preemptive transplant)
- Vascular access (fistula, graft)
- Peritoneal access if PD choice
- **RRT education** before GFR <15 to optimize timing

UACR & 24-Hour Urine Protein Interpretation

When to Order Each

- **Spot UACR:** Easiest, no 24-h collection needed; preferred for screening
- **24-hour urine:** If discordant symptoms (dipstick 2+ but low UACR), large patient, high-protein diet, or research

UACR Thresholds

UACR (mg/g)	Category	Action
<30	Normal/A1	Reassure; recheck yearly
30–300	Microalb/A2	ACE-I/ARB; SGLT2i if DM
>300	Macroalb/A3	Urgent treatment; consider nephrotic workup if >1 g/day

[!warning] **False high UACR:** Fever, UTI, menstruation, intense exercise, hypertension crisis **False low UACR:** Dilute urine (high urine volume) Repeat if markedly abnormal and clinically discordant.

CKD-MBD (Mineral-Bone Disorder): Screening by Stage

Start mineral screening at G3a; more frequent at G3b–G5:

Test	G1–G3a	G3b	G4	G5
Serum Ca, PO₄	Yearly	Yearly	Q6 months	Monthly–Q6 weeks

Test	G1–G3a	G3b	G4	G5
PTH	Once if G3a	Q12 months	Q3–6 months	Q3 months
25-OH Vitamin D	Once	Once	Once	Q6–12 months
FGF23	Rarely	If progression rapid	If progression rapid	Not routine

Screening findings: - **PTH >100 pg/mL** at GFR 45–59 → Start vitamin D - **PO₄ >4.5 mg/dL** → Diet counseling + consider binders at G4 - **Ca-PO₄ product >55** → Risk of vascular calcification

Referral Criteria Summary (Handy Chart)

Indication	Timing
CKD diagnosis (new)	Routine
G3b + albuminuria	Within 1 month
G4 ± albuminuria	Within 2 weeks
G5 (ESRD)	URGENT same day
Rapidly declining GFR (>5 mL/min/year drop)	Urgent
Uncontrolled HTN despite 3+ drugs	Urgent
Protein >3.5 g/day (nephrotic)	Urgent
Abnormal kidney imaging	Within 1 month

Related Resources

- Comprehensive CKD Staging Review
- CKD Mineral-Bone Disorder
- Diabetic Kidney Disease
- Dialysis Initiation Planning
- Renal Transplant Immunosuppression

Self-Test Questions

1. **72M, Cr 1.5 (baseline 1.2), no albuminuria, BP 140/85 on HCTZ**
 - GFR estimate (CKD-EPI): ~48 mL/min (G3b)
 - Albuminuria category: A1
 - Risk: Moderate-yellow (G3b + A1)
 - Action: ACE-I/ARB start, BP target <120
2. **45F with DM, Cr 0.9, UACR 250 mg/g, BP 125/80 on lisinopril**
 - GFR: ~70 (G2)

- Albuminuria: A2
- Risk: Moderate-yellow (G2 + A2)
- Action: Add SGLT2i, target HbA1c <7%, routine referral

3. **68M, Cr 2.8, K 5.8, PO4 5.2, PTH 180**

- GFR: ~20 (G4)
- Risk: Red (G4 + any A)
- Action: Urgent nephrology, start BMD management, plan RRT

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References: KDIGO 2024 Clinical Practice Guideline for the Management of CKD. Am J Kidney Dis. 2024 (newest). CKD-EPI Collaboration. A new equation to estimate glomerular filtration rate. Ann Intern Med. 2009;150(9).