Geriatric Nephrology: Managing CKD and AKI in Elderly Patients

Andrew Bland, MD, FACP, FAAP

March 2026

Geriatric Nephrology: Managing CKD and AKI in Elderly Patients

Learning Objectives

By the end of this session, students will be able to: - Understand physiologic changes in renal function with aging - Interpret eGFR and creatinine appropriately in elderly patients - Apply age-specific drug dosing adjustments in CKD - Assess frailty and functional status in geriatric CKD patients - Recognize and manage polypharmacy in elderly with kidney disease - Diagnose and treat AKI with age-specific considerations - Make evidence-based CKD progression decisions in elderly populations

---

I. Normal Kidney Aging and eGFR Decline

Physiologic Changes with Aging

The kidney undergoes predictable structural and functional changes with advancing age:

Parameter	Age 20–40	Age 65–75	Age 80+	Clinical Significance
GFR (mL/min/1.73m²)	95–105	55–75	30–55	Progressive decline
Nephron loss	1 million/kidney	Loss of 30–50%	Loss of 40–60%	Loss of reserve capacity
Tubular function	Normal	☐ Reabsorption, ☐ secretion	Significant decline	Impaired drug clearance
Renal blood flow	600 mL/min	400 mL/min	300 mL/min	Reduced perfusion
Creatinine production	Normal	☐ 20–30%	☐ 30–50%	Masked renal dysfunction
Serum creatinine	0.8–1.0	0.9–1.2	1.0–1.3	May appear “normal”

The Critical Concept: Creatinine ≠ GFR in Elderly

Key Point: A "normal" serum creatinine of 1.0 mg/dL in an 85-year-old represents **significant renal impairment** because: - Elderly patients produce less creatinine (reduced muscle mass, lower metabolism) - The KDIGO CKDEPI equation accounts for age, accounting for lower muscle mass - An 85-year-old with Cr 1.0 mg/dL may have GFR ~30–40 mL/min/1.73m², not 100

Clinical Pearl: Never assume "normal creatinine" = "normal kidneys" in elderly patients. Always calculate eGFR using the CKD-EPI equation, which is preferred over Cockcroft-Gault in all populations.

Expected vs. Pathologic GFR Decline

- **Expected:** 1 mL/min/1.73m² per year after age 40
- **Pathologic:** Decline >3–4 mL/min/1.73m² per year indicates progressive kidney disease
- **Recommendation:** Classify elderly patients with GFR 45–59 as CKD stage 3b, but recognize that many live well without further intervention if stable

---

II. eGFR Interpretation in Elderly: When NOT to Refer

Risk-Benefit Analysis of Nephrology Referral in Elderly

Referral to nephrology is **not always indicated** simply based on low eGFR. Consider:

Patients Who NEED Nephrology Referral:

1. **Rapidly declining GFR** (>4 mL/min/year or acute change)
2. **Significant proteinuria** (UACR >300 mg/g or nephrotic-range proteinuria)
3. **Hematuria with cellular casts** (glomerulonephritis)
4. **Resistant hypertension** despite 3+ agents
5. **CKD G4 or G5** with expected lifespan >5 years
6. **Symptoms** (uremia, volume overload, hyperkalemia)
7. **Consideration of dialysis** or transplant

Patients Who MAY NOT Need Referral:

- Stable CKD G3a–G3b (eGFR 45–59) in patients >75 years with expected lifespan <5 years
- Asymptomatic, normotensive CKD G3b without proteinuria
- Incidental low eGFR found on routine labs with no other indicators of kidney disease
- Very elderly (>85) with stable, slowly declining eGFR and multiple comorbidities

Age-Based Screening Recommendations

- **Screen annually:** Patients 65–75 with diabetes or hypertension
- **Selective screening:** Patients >75 only if presenting with symptoms or acute change
- **Consider benefits:** Early CKD diagnosis in very elderly may lead to unnecessary testing and anxiety without clear benefit

---

III. Geriatric Drug Dosing in CKD

Age-Related Pharmacokinetic Changes

Elderly patients have altered drug metabolism and clearance:

Factor	Effect	Clinical Consequence
☐ **Renal blood flow**	☐ Drug clearance	Accumulation
☐ **GFR**	☐ Glomerular filtration	Prolonged half-life
☐ **Tubular secretion**	☐ Active drug elimination	Higher drug levels
☐ **Hepatic metabolism**	☐ First-pass metabolism	Increased bioavailability
☐ **Body fat**	☐ Lipophilic drug volume of distribution	Prolonged effects
☐ **Plasma protein binding**	☐ Free drug fraction	Increased pharmacologic activity
Polypharmacy	☐ Drug interactions	Unpredictable effects

Drug Dosing Adjustments by eGFR in Elderly CKD

Common Medications Requiring Adjustment: ACE Inhibitors/ARBs: - eGFR <30: May require dose adjustment; monitor K+ carefully - Avoid dose escalation; lower target doses often sufficient - Ramipril 1.25–5 mg daily (vs. up to 10 mg in younger patients)

Beta-Blockers: - eGFR <30: Atenolol, nadolol require 50% dose reduction - Prefer metoprolol or carvedilol (hepatically metabolized) - Start low, titrate slowly

Thiazide/Thiazide-Like Diuretics: - eGFR <30: Less effective; switch to loop diuretics if needed - Chlorthalidone more potent than HCTZ; use caution in elderly

NSAIDs: - **Avoid entirely** in CKD G3b and worse; extremely high risk of acute deterioration - Consider selective COX-2 inhibitors (celecoxib) if absolutely necessary, with gastroprotection and renal monitoring

Anticoagulation: - **Warfarin:** eGFR >30 no adjustment; <30 may require closer INR monitoring - **DOACs:** Reduced dosing commonly needed in elderly with CKD: - Apixaban: 2.5 mg BID if age ≥60 + weight ≤60 kg + Cr ≥1.5 mg/dL - Rivaroxaban: 15 mg daily (not 20 mg) if eGFR 15–60 - Dabigatran: Avoid if eGFR <30; 75 mg BID if 30–60 - Edoxaban: 30 mg daily if eGFR 15–50

Diabetes Medications: - **Metformin:** Avoid if eGFR <30; reduce if 30–45 - **GLP-1 agonists:** Can continue but monitor for GI effects - **SGLT2i:** Continue for heart/kidney protection even in G3b–G4 - **Sulfonylureas:** Avoid (hypoglycemia risk); prefer GLP-1 or DPP-4 - **DPP-4i (Sitagliptin):** 25 mg daily if eGFR 30–50; 25 mg every 2 days if <30

Antibiotics: - **Aminoglycosides:** Avoid or use extended-interval dosing (25 mg/kg once daily) with levels - **Fluoroquinolones:** 50% dose reduction if eGFR <30 - **Trimethoprim-SMX:**

Avoid if eGFR <15 (hyperkalemia risk) - **Vancomycin:** Goal trough 15–20; check levels; may dose q24–48h in G4–G5

IV. Frailty Assessment in CKD Patients

Why Frailty Matters in Elderly CKD

Frailty predicts mortality, disability, and poor outcomes independent of eGFR. Elderly CKD patients with frailty have markedly higher risk of: - Accelerated GFR decline - Acute illness and hospitalization - Falls and fractures - Progression to ESKD requiring dialysis - Death (within 1–2 years if severe frailty)

Frailty Screening Tools

Simple Clinical Frailty Scale (CFS) — Grades 1–9

Grade	Description	Clinical Context
1–2	Very fit / Well	Robust; pursue standard interventions
3–4	Managing well / Vulnerable	Mild impairment; watch for decline
5–6	Mildly frail / Moderately frail	ADL/IADL limitations; discuss goals
7–8	Severely frail / Very severely frail	Significant limitations; focus on comfort
9	Terminally ill	Palliative approach

FRAIL Scale (Fried Risk Assessment of Instability for the Elderly) — 5 items

- **F:** Fatigue (self-reported weariness)
- **R:** Resistance (inability to walk up one flight of stairs)
- **A:** Ambulation (inability to walk one block)
- **I:** Illness (self-reported health = fair/poor)
- **L:** Loss of weight (>5% unintentional weight loss)

Score ≥3/5 = frail; 1–2 = pre-frail; 0 = robust

Integration into CKD Management

Robust/Well elderly (CFS 1–2) with CKD: - Pursue CV risk reduction, CKD progression prevention - Tight BP control, statin therapy, SGLT2i - Nephrology referral if CKD G4–G5 or rapid decline

Vulnerable/Mildly frail (CFS 3–4) with CKD: - Individualize treatment goals - Avoid aggressive BP targets; allow SBP 130–160 if tolerated - Annual functional and cognitive assessments - Simplify drug regimens - Consider late referral to nephrology (near ESKD) if dialysis planned

Severely frail (CFS 6–8) with CKD: - Goals-of-care discussions are **mandatory** - Avoid aggressive interventions - Focus on symptom management and quality of life - Conservative (non-dialysis) management often preferred

---

V. Polypharmacy and Deprescribing in Elderly CKD

The Polypharmacy Burden in Elderly CKD

- Average elderly patient takes 5–7 medications
- Average CKD patient takes 8–10 medications
- Elderly with CKD takes 10–15 medications (and higher risk of adverse effects)

Explicit Criteria for Medication Deprescribing

Medications Commonly Deprescribed in Elderly CKD:

Drug	Reason for Deprescribing	Alternative/Action
NSAIDs	☐ AKI, GI bleed risk; no benefit in CKD	Acetaminophen, topical NSAIDs, physical therapy
Statins (if age >75, frail)	No CV benefit in primary prevention; ☐ myalgia	Continue only if secondary prevention or very robust
Beta-blockers (no CAD/HF)	No benefit if rate-controlled AFib; ☐ BP excessively	Taper; may improve functional capacity
ACE-I/ARB (if eGFR drop >30% in 1 month)	Acute renal injury; hemodynamic changes	Discontinue; address underlying cause
Loop diuretics (chronic use, no edema/dyspnea)	Risk of dehydration, AKI, electrolyte abnormalities	D/C if euvolemic; switch to PRN dosing
Anticholinergics (diphenhydramine, oxybutynin)	Delirium, falls, urinary retention, ☐ cognition	Non-pharm alternatives; avoid
PPI (>1 year continuous)	☐ AKI, fractures, C. difficile; no data for long-term use	Taper and D/C if GERD controlled
Sulfonylureas	Hypoglycemia, worsening cognition	Switch to GLP-1, DPP-4i, or basal insulin only
Benzodiazepines	Falls, delirium, respiratory depression	Taper; non-pharm sleep/anxiety interventions

Deprescribing Strategy in Elderly CKD

1. **Audit current medications** monthly in vulnerable/frail elderly
2. **Ask "Why?"** for each medication: Is it still needed? Is dose appropriate?
3. **Involve patient/family:** Frame as "cleaning up" medications to reduce side effects
4. **Taper, don't stop:** Most deprescribing requires slow taper to avoid rebound
5. **Monitor after change:** Watch for rebound symptoms or new issues
6. **Simplify:** Consolidate to once-daily or twice-daily dosing if possible

---

VI. Acute Kidney Injury in Elderly

Epidemiology and Risk Factors

- **Incidence:** 50% higher in patients >65; 70% higher in patients >75
- **Mortality:** 2–3-fold higher in elderly with AKI (community-acquired) vs. younger patients
- **ICU AKI in elderly:** 30-day mortality 40–60% vs. 20–30% in younger

Age-Specific Risk Factors:

- Polypharmacy (NSAIDs, ACE-I, diuretics in combination)
- Baseline CKD (even mild; loss of renal reserve)
- Dehydration (reduced thirst sensation, frailty)
- Acute illness (infection, cardiac event) with reduced compensation
- Medications causing AKI (ACE-I with NSAIDs, contrast, aminoglycosides)
- Falls and rhabdomyolysis
- Urinary retention and obstructive uropathy

Atypical Presentation of AKI in Elderly

Classic AKI presentation (**oliguria, dark urine, flank pain**) is often **absent** in elderly. Instead:

Atypical Presentation	Classic Sign Usually Absent
Non-oliguric AKI (urine output 0.5–1 L/day)	Oliguria; GFR may be severely reduced
Hypercreatininemia without oliguria	Urine output >1 L/day despite rising Cr
Slowly rising creatinine	Acute change may take 48–72 hours to manifest
Confusion, weakness, falls	Abdominal symptoms; may be mistaken for delirium
Hyperkalemia without cardiac signs	No peaked T-waves on EKG despite K >6
Metabolic acidosis	No GI symptoms; found incidentally on labs

Clinical Pearl: Suspect AKI in any elderly patient with acute mental status change, weakness, or unexplained fall. Check creatinine, BUN, K+, and calculate FeNa or FEUrea.

AKI Staging and Prognosis in Elderly

KDIGO Stage	Cr Rise	Urine Output	30-Day Mortality (Elderly)	Management Focus
1	1.5–1.9× baseline or +0.3	<0.5 mL/kg/h × 6–12h	5–10%	Identify cause; reverse causative agents
2	2–2.9× baseline	<0.5 mL/kg/h × ≥12h	20–30%	Close monitoring; consider nephrology referral
3	≥3× baseline or Cr ≥4 + acute rise ≥0.3	<0.3 mL/kg/h × ≥24h or anuria	40–60%	RRT if indicated; aggressive management of complications

Management Principles in Elderly AKI

1. **Volume assessment:** Use clinical exam (JVP, lung sounds, edema), not just labs
   - Avoid aggressive diuresis if hypovolemic (common in elderly)
   - Judicious fluid resuscitation if dehydrated (target MAP >65 in sepsis)
2. **Medication review:**
   - Hold ACE-I/ARB if hyperkalemia or rapid Cr rise
   - Avoid NSAIDs, contrast, aminoglycosides if possible
   - Continue SGLT2i if euvolemic (cardio-protective; no evidence of harm)
3. **Target nutritional support:**
   - Elderly with AKI have ☐ protein catabolism
   - Provide 0.8–1.0 g/kg/day protein (not restriction)
   - Manage hyperkalemia aggressively (avoid K+ supplementation)
4. **Dialysis decisions in elderly:**
   - Indication: K >6.5 with EKG changes, metabolic acidosis pH <7.15, severe uremia, volume overload
   - Discuss goals and outcomes; some elderly prefer conservative management
   - Intermittent hemodialysis, CRRT, or SCUF each have role depending on hemodynamic stability and goals

---

VII. CKD Progression Decisions in Elderly

Key Question: Should We Slow CKD Progression in Elderly?

The answer depends on life expectancy, functional status, and patient goals.

Evidence for CKD Slowing Interventions in Elderly: SGLT2 Inhibitors: - Benefit in elderly with CKD even without diabetes - Dapagliflozin (DAPA-CKD): 39% ☐ in GFR decline/ESRD/death in CKD; median age 61, 19% >75 years - Empagliflozin (EMPA-KIDNEY):

Similar benefit; ~23% were age >75 - **Recommendation:** Continue SGLT2i in elderly CKD if tolerated and eGFR >20

ACE-I/ARB: - Proven to slow progression in CKD + proteinuria - Less clear benefit in CKD without proteinuria - Benefit in elderly with hypertension and CKD - Risk: Hyperkalemia, acute decline in first 1 month (expected; usually stabilizes) - **Recommendation:** Continue if baseline UACR >30 mg/g and K+ <5.5

GLP-1 Agonists (in CKD + diabetes): - SGLT2i > GLP-1 for renal protection, but GLP-1 also protective - Weight loss benefit helps CV disease in elderly diabetics - **Recommendation:** Use if tolerated; good CV/renal benefit

Blood Pressure Targets: - SPRINT trial (mostly age 50–75) showed CV benefit of SBP <120 mm Hg, but increased AKI risk - In frail elderly >75, target SBP 130–150 mm Hg is safer - Avoid rapid BP lowering (risk of stroke, syncope, falls)

When CKD Progression Doesn't Matter (Conservative Approach Preferred):

- **Life expectancy <5 years** (frailty, advanced cancer, other terminal illness)
- **eGFR 15–30** with stable or slow decline (avoid unnecessary testing, specialist visits)
- **Very elderly (>85) with multiple comorbidities** and declining functional status
- **Patient preference:** Some elderly choose to avoid medications and accept progression

Individualized Decision-Making Framework:

Life Expectancy	eGFR	Proteinuria	Approach
>10 years	>30	+ (UACR >30)	Optimize SGLT2i, ACEI/ARB, BP target SBP 130–140
5–10 years	20–30	±	Selective use of SGLT2i; allow higher BP targets
<5 years	<20	Any	Conservative management; focus on symptoms/goals
Very frail, any	Any	Any	Goals-of-care discussion; likely conservative

VIII. Special Topics

Anemia in Elderly CKD

- Higher hemoglobin targets may increase CV risk in elderly
- Target Hgb 10–11 g/dL is often safer than 11–12

- ESA dosing often lower needed due to reduced response; monitor for thromboembolic events

Bone Disease in Elderly CKD

- Osteoporosis + CKD-MBD = very high fracture risk
- DEXA screening warranted if expected lifespan >5 years
- Phosphate binders often unnecessary unless P >5.5 mg/dL
- Avoid calcium-based binders if possible (cardiovascular risk)

Cognitive Decline and CKD Progression

- Uremia, electrolyte abnormalities, anemia all contribute to delirium/cognitive decline
- Screen with MMSE or MoCA at CKD diagnosis; repeat annually
- May be reversible with medication adjustment or dialysis initiation

---

Practice Questions

1. **An 78-year-old woman presents for routine visit. Labs show:** Serum Cr 1.2 mg/dL (baseline), eGFR 38 mL/min (CKD-EPI), no proteinuria, no hematuria. She is on lisinopril 10 mg daily, HCTZ 25 mg daily, and atorvastatin. No symptoms. Should you refer to nephrology?

    - A) Yes, she has CKD G3b
    - B) No, referral not indicated unless eGFR drops >4 mL/min/year, develops proteinuria, or has symptoms
    - C) Yes, all CKD G3b patients should see a nephrologist
    - D) Yes, she is elderly and needs palliative care planning

    Answer: B. Stable CKD G3b without proteinuria or symptoms in an elderly patient does not require referral. Continue monitoring eGFR (annual labs) and optimize BP/CV risk factors. Referral only needed if: eGFR drops >4 mL/min/year, UACR develops/worsens, or she develops symptoms or resistant hypertension.

2. **An 82-year-old man with CKD G4 (eGFR 22) and diabetes on lisinopril, metformin 1000 mg daily, and ibuprofen PRN for arthritis presents acutely with Cr rise from 3.5 to 4.8 mg/dL over 3 days, K+ 6.1 mEq/L, and confusion. You suspect AKI. First step?

    - A) Start dialysis immediately
    - B) Continue all home medications; increase monitoring
    - C) Stop lisinopril, metformin, NSAIDs; check orthostatic vitals and IV fluid status; obtain EKG for hyperkalemia
    - D) Refer to ICU for mechanical ventilation

    Answer: C. This elderly patient has AKI (likely NSAID + ACE-I + possible dehydration) with hyperkalemia. Immediate actions: (1) Discontinue ACE-I, metformin, NSAIDs; (2) assess volume status and renal perfusion; (3) obtain EKG (peaked T-waves risk); (4) treat hyperkalemia (calcium gluconate if EKG changes, insulin/glucose, kayexalate or SGLT2i if available). Confusion may improve with Cr stabilization.

3. **You are deprescribing medications in a 79-year-old frail woman (CFS 7) with CKD G3b, stable CAD, and GERD. She is on:** aspirin 81 mg, atorvastatin 40 mg, omeprazole 20 mg daily, metoprolol 50 mg daily, lisinopril 5 mg daily. Which medication is the BEST candidate for deprescribing?

   - A) Aspirin (secondary prevention of MI)
   - B) Atorvastatin (for primary CV prevention; no recent MI)
   - C) Omeprazole (continuous >1 year; ☐ AKI risk in CKD)
   - D) Metoprolol (rate control if AFib present)

   Answer: C. In a severely frail elderly patient with CKD, omeprazole is the best candidate for deprescribing because: (1) Evidence for long-term PPI use is weak; (2) PPIs increase AKI risk and bone loss in CKD; (3) If GERD is controlled, PPI can be tapered off. Taper over 2–4 weeks and monitor for rebound heartburn. Continue aspirin (secondary prevention), statin (secondary prevention), and BP meds (kidney protection).

Clinical Pearls Summary

- **Creatinine 1.0 in an 85-year-old ≠ normal GFR.** Always use CKD-EPI equation.
- **Elderly CKD without proteinuria, anemia, or symptoms may never need dialysis.** Stable observation is appropriate.
- **Frailty (not age alone) drives dialysis decision-making.** Use CFS or FRAIL scale.
- **AKI in elderly often presents atypically:** mental status change, weakness, falls. Suspect AKI first.
- **Deprescribe aggressively in frail elderly:** NSAIDs, long-term PPIs, statins (primary prevention), benzodiazepines.
- **SGLT2 inhibitors benefit elderly CKD** regardless of diabetes status; continue even in G4.
- **Conservative CKD management** (no slowing interventions) is appropriate if life expectancy <5 years.

References

1. Kidney Disease: Improving Global Outcomes (KDIGO). KDIGO Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. *Kidney Int Suppl.* 2021;11:S1–S166.
2. Levin A, Warnock DG, Mehta RL, et al. Improving Outcomes for CKD Patients on the Path to Kidney Failure: A Comprehensive Update of the KDIGO Clinical Practice Guideline. *Kidney Int.* 2020;100(4 Suppl 4):S1–S27.
3. SPRINT Research Group. A Randomized Trial of Intensive versus Standard Blood-Pressure Control. *N Engl J Med.* 2015;373(22):2103–2116.
4. Pippias M, Kramer A, Akgun B, et al. The European Renal Association–European Dialysis and Transplant Association Registry Annual Report 2017: a summary. *Clin Kidney J.* 2020;13(5):693–709.

5. Kidney Disease: Improving Global Outcomes (KDIGO). KDIGO Clinical Practice Guideline for Acute Kidney Injury. *Kidney Int Suppl.* 2012;2(1):1–141.
6. American Geriatrics Society Beers Criteria Update Expert Panel. American Geriatrics Society 2023 Updated AGS Beers Criteria® for Potentially Inappropriate Medication Use in Older Adults. *J Am Geriatr Soc.* 2023;71(9):2815–2860.
7. Inker LA, Eneanya ND, Coresh J, et al. New Creatinine- and Cystatin C-Based Equations to Estimate GFR without Race. *N Engl J Med.* 2021;385(19):1737–1749.
8. Rockwood K, Song X, MacKnight C, et al. A Global Clinical Measure of Fitness and Frailty in Elderly People. *Can Med Assoc J.* 2005;173(5):489–495.
9. Morley JE, Vellas B, van Kan GA, et al. Frailty Consensus: A Call to Action. *J Am Med Dir Assoc.* 2013;14(6):392–397.
10. Deprescribing Network. Deprescribing Guidelines: Benzodiazepines, PPIs, NSAIDs, Statins in Older Adults. www.deprescribing.org (Accessed 2026).

Created for PA and medical student education. Consult clinical guidelines and supervising physician for patient care decisions.

Clinical Resources

- Clinical Review: Geriatric Nephrology Overview — Comprehensive clinical review with PubMed references