Outpatient Cases/Core Topic: Chronic Kidney Disease

Mrs. H is a 61 y/o female here for routine f/u visit with hx COPD, HTN, CKD stage 3, and tobacco use disorder. You haven't met her before so you briefly review her last office visit note, med list, and most recent labs. She's here for hypertension follow-up after meds were adjusted for worsening renal function. Her recent med changes included stopping HCTZ and starting furosemide. There was discussion at her last visit about possibly starting amlodipine if her blood pressure was still uncontrolled.

Her vitals today:

Vitals & Measurements
Temperature: 36.9
Respiration Rate: 16
Heart Rate: 67
Systolic BP Sitting: 174
Diastolic BP Sitting: 96
Oxygen Saturation: 96
Oxygen Therapy Delivery Method: Room air
Dosing Weight: 61.2 kg
Height: 167.5 cm
Body Mass Index: 21.83

Electrolytes Plus				
Sodium	136	(L) 127	(L) 133	136
Potassium	3.6	3.8	4.0	4.2
Chloride	105	(L) 94	99	102
Carbon Dioxide (lab)	26	27	27	(H) 31
Blood Urea Nitrogen	23	21	19	20
Creatinine	* (H) 1.58	* 1.23	* (H) 1.48	* 1.33
Glucose (lab)	81	85	91	88
Calcium	9.8	9.2	9.8	9.9
Phosphorus				
Magnesium				
Anion Gap	(L) <6	6	7	(L) <6
Liver Function Tests				
Total Protein				7.4
Albumin				3.7
Globulin				3.7
AST (SGOT)				28
ALT (SGPT)				28
Alkaline Phosphatase				81
Bilirubin, Total				0.6
Bilirubin, Direct				
Bilirubin, Indirect				
Lipids				
Cholesterol				169
Triglyceride				105
HDL Cholesterol				74
LDL Cholesterol				* 74
Other Routine Chemistry				
Uric Acid				
Est Glomerular Filtration Rate	* (L) 35	* (L) 47	* (L) 38	* (L) 43
Glucose Tolerance				

Symptoms

- none

Risk Factors:

- HTN, smoker

More history: none

Exam findings

- Urine alb/cr ratio was 79.8

~~Differential diagnoses?~~

CKD diagnostic criteria

- Abnormal kidney structure or function lasting >3 months w/associated health implications
- Indicators: albuminuria, urine sediment abnormalities, abnormal renal imaging findings, serum electrolyte or acid-base derangements, and GFR <60mL/min per 1.73m^2
- Also renal transplant = CKD regardless of GFR or no albuminuria

References:

- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6422950/pdf/40265_2019_Article_1064.pdf
- https://www.aafp.org/afp/2017/1215/p776.html
- https://kdigo.org/wp-content/uploads/2017/02/KDIGO_2012_CKD_GL.pdf

CKD is defined as abnormalities of kidney structure or function, present for >3 months, with implications for health.

Criteria for CKD: Either of the following present for > 3 months	
Markers of kidney damage (one or more)	• Albuminuria (ACR ≥ 30 mg/g) • Urine sediment abnormalities • Electrolyte and other abnormalities due to tubular disorders • Abnormalities detected by histology • Structural abnormalities detected by imaging • History of kidney transplantation
Decreased GFR	GFR <60 ml/min/1.73 m^2
Abbreviations: CKD, chronic kidney disease; GFR, glomerular filtration rate.	

https://www.kidney.org/professionals/kdoqi/gfr_calculator

CURRENT CHRONIC KIDNEY DISEASE (CKD) NOMENCLATURE USED BY KDIGO

CKD is _defined_ as abnormalities of kidney structure or function, present for >3 months, with implications for health and CKD is _classified_ based on cause, GFR category, and albuminuria category (CGA).

Prognosis of CKD by GFR and albuminuria category

				Persistent albuminuria categories Description and range		
Prognosis of CKD by GFR and Albuminuria Categories: KDIGO 2012				A1	A2	A3
				Normal to mildly increased	Moderately increased	Severely increased
				<30 mg/g <3 mg/mmol	30-300 mg/g 3-30 mg/mmol	>300 mg/g >30 mg/mmol
GFR categories (ml/min/ 1.73 m²) Description and range	G1	Normal or high	≥90	Green	Yellow	Orange
	G2	Mildly decreased	60-89	Green	Yellow	Orange
	G3a	Mildly to moderately decreased	45-59	Yellow	Orange	Red
	G3b	Moderately to severely decreased	30-44	Orange	Red	Red
	G4	Severely decreased	15-29	Red	Red	Red
	G5	Kidney failure	<15	Red	Red	Red

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

Epidemiology

- 14.8% of US adult population or 47 million persons
- 2014 – was 20% of all Medicare costs
- Slow disease progression to prevent long-term morbidity/mortality and decrease health care spending
- 2012 KDIGO (Kidney Disease: Improving Global Outcomes) work group w/updated guidelines on detection/evaluation/classification/mgmt of CKD
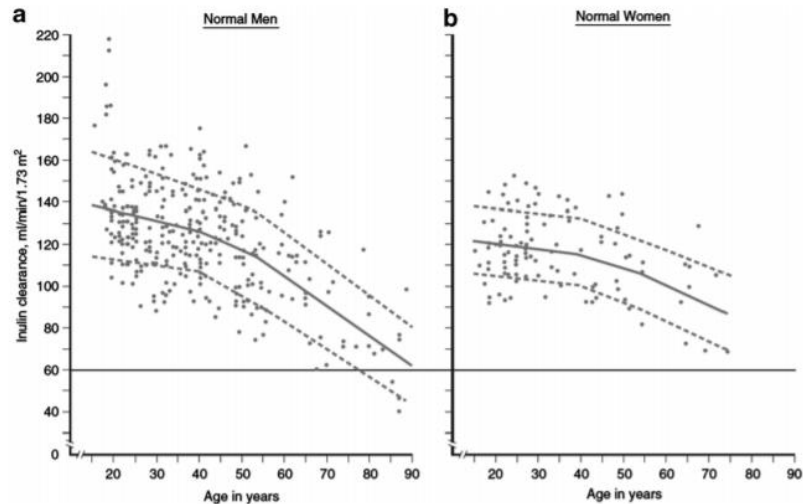

Figure 2 | Normal values for GFR by age. GFR is shown for men (Panel **a**) and women (Panel **b**) of various ages, with the GFR measured as the urinary clearance of inulin. The horizontal line indicates a GFR value of 60 ml/min/1.73 m², which is the threshold for the definition of CKD. Solid lines represent the mean value of GFR per decade of age, and dashed lines represent the value 1 SD from the mean value of GFR per decade of age. CKD, chronic kidney disease; GFR, glomerular filtration rate; SD, standard deviation. Adapted with permission from Wesson L.[20] Physiology of the Human Kidney. Grune & Stratton: New York, 1969.

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- Estimated GFR:
    - CKD Epidemiology Collaboration equation:
      https://www.kidney.org/professionals/kdoqi/gfr_calculator
    - Cockcroft-Gault equation is for med dosing adjustment calculation
    - Serum cystatin C is a filtration marker - most helpful if false-positive decreased eGFR suspected because lack of risk factors.
        - Not reliable in AKI, inflammatory states or thyroid dysfunction
        - Costly and not universally available
    - **When is eGFR less accurate?**
        - Not steady state (AKI), genetics/steroids/thyroid, other confounders
- Markers of Kidney Damage:
    - Total protein/creatinine ratio – less sensitive (includes other proteins: filtered albumin, tubular-secreted proteins – Tamm-Horsfall protein, other plasma proteins – multiple myeloma and infection)
    - Spot urine albumin/creatinine ratio – detects lower levels of proteinuria
    - Small amounts of albumin in urine have prognostic significance

- o **Confounders**: menstrual bleeding, urinary tract infection, exercise, etc.
- o Old terms: microalbuminuria vs. macroalbuminuria
  - ▪ New terms:
    - • Normal to mildly increased (alb/cr >30mg/g)
    - • Moderately increased (30-330mg/g)
    - • Severely increased (>300/g)
      - o *independent predictor for mortality and ESRD
  - ▪ Dipstick u/a not sensitive to small amounts of albumin (no longer recommended for screening or definitive diagnosis)
- o Abnormal urinalysis and ur microscopy
  - ▪ Hematuria, cellular casts, chronic pyuria, tubular concentrating defects, insufficient renal acidification (w/clinical context)

Morbidity/Mortality Risk

- • Progression to advanced renal failure, end-stage renal disease, or death
- • Early detection helps for starting timely therapeutic interventions, limiting nephrotoxin exposure, reducing further reduction in GFR, prep for renal replacement therapy
- • The more biomarkers you have, the all-cause higher mortality risk and ESRD (Cr, ACR, Cystatin C)
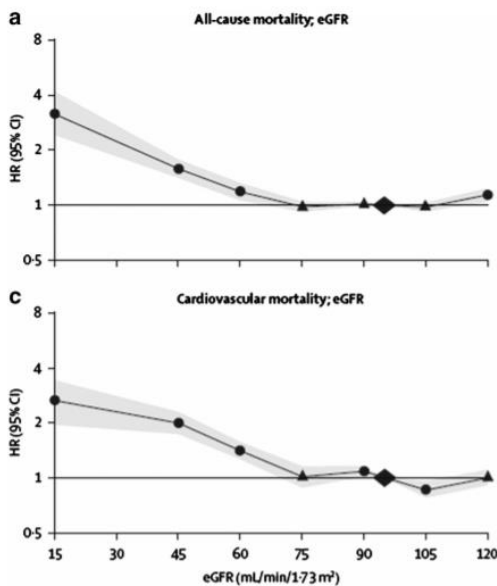

Figure 3 | Relationship of eGFR with mortality. HRs and 95% CIs for all-cause (**a**) and cardiovascular mortality (**c**) according to spline eGFR. HRs and 95% CIs (shaded areas) are adjusted for ACR, age, sex, ethnic origin, history of CVD, systolic BP, diabetes, smoking, and total cholesterol. The reference (diamond) was eGFR 95 ml/min/1.73 m² and ACR 5 mg/g (0.6 mg/mmol), respectively. Circles represent statistically significant and triangles represent not significant. ACR, albumin-to-creatinine ratio; BP, blood pressure; CI, confidence interval; CVD, cardiovascular disease; eGFR, estimated glomerular filtration rate; HR, hazard ratio. Reprinted from The Lancet, vol 375, Matshushita K, van de Velde M, Astor BC, et al.[4] Association of estimated glomerular filtration rate and albuminuria with all-cause and cardiovascular mortality in general population cohorts: a collaborative meta-analysis, p.
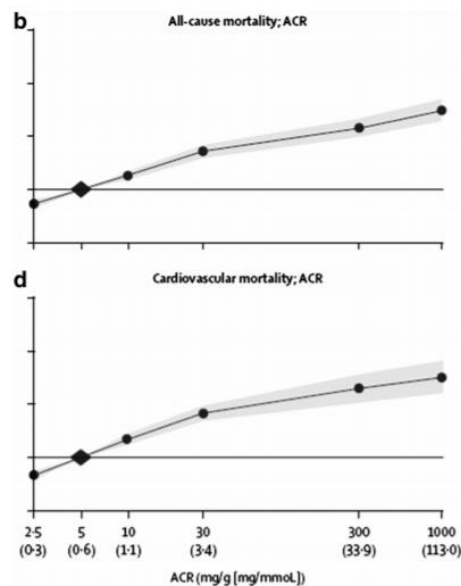
Figure 4 | Relationship of albuminuria with mortality. HRs and 95% CIs for all-cause (**b**) and cardiovascular mortality (**d**) according to ACR. HRs and 95% CIs (shaded areas) are adjusted for age, sex, ethnic origin, history of CVD, systolic BP, diabetes, smoking, and total cholesterol and spline eGFR. The reference (diamond) was ACR 5 mg/g (0.6 mg/mmol) and eGFR 95 ml/min/1.73 m², respectively. Circles represent statistically significant and triangles represent not significant. ACR plotted in mg/g. To convert ACR in mg/g to mg/mmol multiply by 0.113. Approximate conversions to mg/mmol are shown in parentheses. ACR, albumin-to-creatinine ratio; BP, blood pressure; CI, confidence interval; CVD, cardiovascular disease; eGFR, estimated glomerular filtration rate; HR, hazard ratio. Reprinted from The Lancet, vol 375, Matshushita K, van de Velde M, Astor BC, et al.[4] Association of

a

Age-Standardized Rate of Death from Any Cause (per 100 person-yr)

0.76 · 1.08 · 4.76 · 11.36 · 14.14

Estimated GFR (ml/min/1.73 m²): ≥60 · 45–59 · 30–44 · 15–29 · <15

No. of Events: 25,803 · 11,569 · 7802 · 4408 · 1842

b

Age-Standardized Rate of Cardiovascular Events (per 100 person-yr)

2.11 · 3.65 · 11.29 · 21.80 · 36.60

Estimated GFR (ml/min/1.73 m²): ≥60 · 45–59 · 30–44 · 15–29 · <15

No. of Events: 73,108 · 34,690 · 18,580 · 8809 · 3824

c

Age-Standardized Rate of Hospitalization (per 100 person-yr)

13.54 · 17.22 · 45.26 · 86.75 · 144.61

Estimated GFR (ml/min/1.73 m²): ≥60 · 45–59 · 30–44 · 15–29 · <15

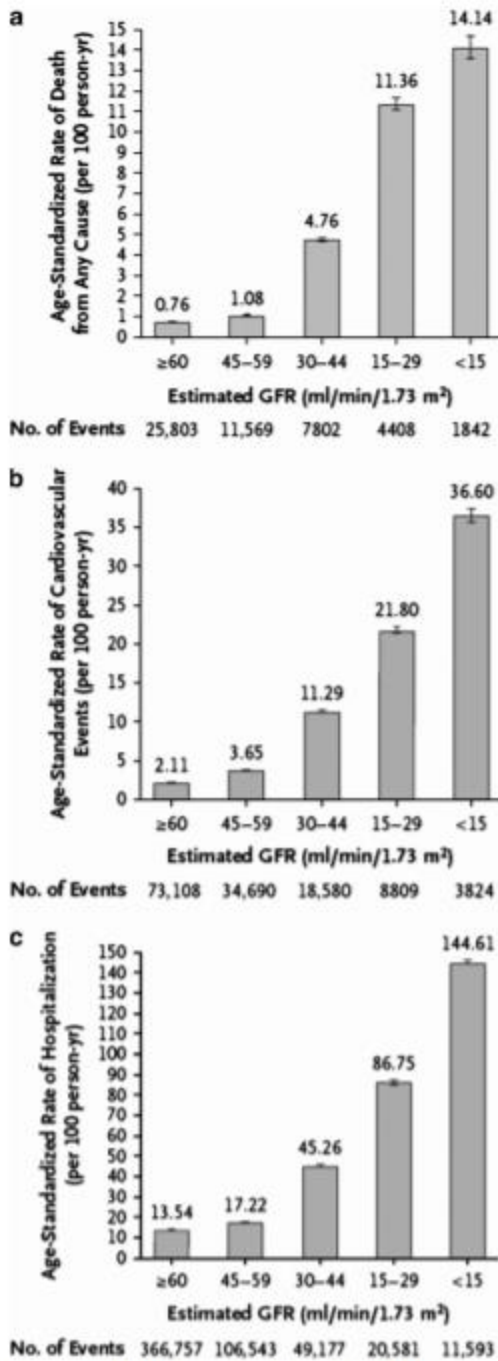No. of Events: 366,757 · 106,543 · 49,177 · 20,581 · 11,593

Figure 5 | Age-standardized rates of death from any cause (panel a), cardiovascular events (panel b), and hospitalization (panel c), according to the eGFR among 1,120,295 ambulatory adults. eGFR, estimated glomerular filtration rate. From N Engl J Med, Go AS, Chertow GM, Fan D, et al.[58] Chronic kidney disease and the risks of death, cardiovascular events, and hospitalization, 351: 1296-1305. Copyright © (2004) Massachusetts Medical Society. Reprinted with permission from Massachusetts Medical Society; accessed http://www.nejm.org/doi/pdf/10.1056/NEJMoa041031
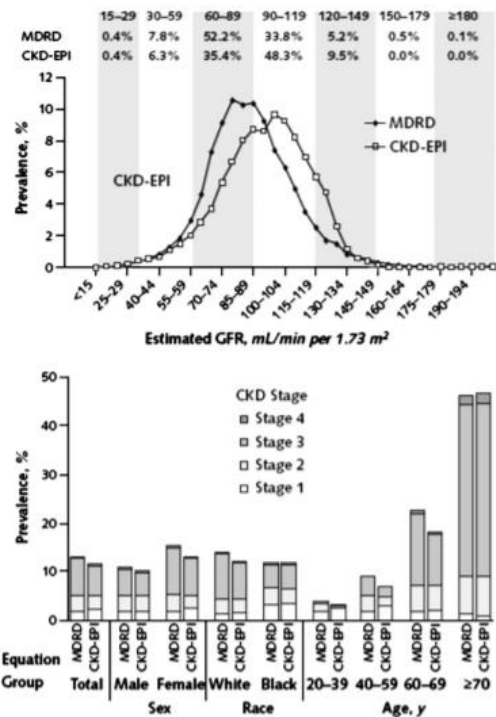
	15–29	30–59	60–89	90–119	120–149	150–179	≥180
MDRD	0.4%	7.8%	52.2%	33.8%	5.2%	0.5%	0.1%
CKD-EPI	0.4%	6.3%	35.4%	48.3%	9.5%	0.0%	0.0%

Prevalence, %

CKD-EPI

MDRD · CKD-EPI

Estimated GFR, mL/min per 1.73 m²: <15, 25–29, 40–44, 55–59, 70–74, 85–89, 100–104, 115–119, 130–134, 145–149, 160–164, 175–179, 190–194

Prevalence, %

CKD Stage
- Stage 4
- Stage 3
- Stage 2
- Stage 1

Equation Group: MDRD / CKD-EPI for Total; Male, Female (Sex); White, Black (Race); 20–39, 40–59, 60–69, ≥70 (Age, y)

Figure 12 | Comparison of distribution of GFR and CKD prevalence by age (NHANES 1999-2004). GFR was categorized on the basis of the classification system established by the NKF-KDOQI. Top. Distribution of estimated GFR, by 4-ml/min per 1.73 m² categories. Values are plotted at the midpoint. Bottom. Prevalence of CKD, by age. CKD, chronic kidney disease; GFR, glomerular filtration rate; NKF-KDOQI, National Kidney Foundation-Kidney Disease Outcomes Quality Initiative; NHANES, National Health and Nutrition Examination Survey. Reprinted with permission from Levey AS, Stevens LA, Schmid CH, et al.[87] A new equation to estimate glomerular filtration rate. Ann Intern Med 2009; 150(9): 604-612.

Table 9 | Prognosis of CKD: Relationship of outcomes and strength of relationship to Cause (C), GFR (G), Albuminuria (A) and other measures[*,67,68]

Outcomes	Kidney measures			Other measures
	Cause	GFR	Albuminuria	
Kidney outcomes				
GFR decline	+++	+	+++	High BP, male sex, black race, younger age
Albuminuria rise	+++	+	+++	High BP, diabetes
AKI	+	+++	+	Older age
Chronic kidney failure (GFR <15 ml/min/1.73 m²; category G5)	+++	+++	+	Younger age
Complications (current and future)				
Drug toxicity	+	+++	+	Drug exposure, liver disease
Endocrine and metabolic	+	+++	+	Various
CVD and mortality	++	+++	+++	Older age, history of CVD, CVD risk factors
Others (infection, cognitive impairment, frailty, etc)	++	++	++	Older age, comorbid conditions

Abbreviations: AKI, acute kidney injury; BP, blood pressure; CVD, cardiovascular disease; GFR, glomerular filtration rate.
Plus signs indicate the strength of the risk relationship between the CKD characteristic and the outcome: +, somewhat associated; ++, moderately associated; +++, strongly associated.
*Note that the + designations refer to strength of relationship not strength of evidence to support, and are based on consensus overview by the Work Group members.
Adapted with permission from Uhlig K, Levey AS.[68] Developing guidelines for chronic kidney disease: we should include all of the outcomes. Ann Intern Med 2012; 156(8): 599-601.

Table 1. Stages of Chronic Kidney Disease and Recommended Action Plan

Stage	Description	Estimated GFR (mL per minute per 1.73 m²)	Action plan
1	Kidney damage* with normal or increased GFR	≥ 90	Diagnose and treat chronic kidney disease and comorbid conditions, slow progression, reduce cardiovascular risk
2	Kidney damage* with mildly decreased GFR	60 to 89	Estimate progression
3a	Mildly to moderately decreased GFR	45 to 59	Evaluate and treat complications
3b	Moderately to severely decreased GFR	30 to 44	Evaluate and treat complications
4	Severely decreased GFR	15 to 29	Prepare for renal replacement therapy
5	Kidney failure	< 15 (or dialysis)	Renal replacement therapy if uremia present

GFR = glomerular filtration rate.
*—Markers of kidney damage are required for diagnosis of stage 1 or 2 chronic kidney disease.

Adapted with permission from National Kidney Foundation. K/DOQI clinical practice guidelines for chronic kidney disease: evaluation, classification, and stratification. Am J Kidney Dis. 2002;39(2 suppl 1):S216, with additional information from references 21 and 23.

**print pages 20-21 in KDIGO 2012 guidelines

**print page 32 (Table 8)

Complications:

- Anemia
- Metabolic bone disease –
  - **Get baseline levels if GFR <45:** Ca, phos, PTH, alk phos
  - Bone density – wait until GFR <45 for DEXA
  - High PTH – check phos, Ca and vit D first - (optimal PTH level not known)
  - Vit D – not routine supplement unless deficient
  - Bisphosphonates – not if GFR <30 unless strong rationale
- Acidosis – oral bicarbonate supplement if serum bicarb <22

- o Contraindications: alkalosis, hypernatremia, severe pulm edema, hypocalcemia, unknown abdominal pain (eg. Ascites?)
- CKD = Increased CV Risk
  - o CKD + HF = give appropriate HF care, monitor eGFR and serum K
  - o Interpretation of BNP/pro-BNP and troponins
  - o Monitor for peripheral arterial disease, routine DM foot care

Management guidelines

- CKD + DM > comprehensive eval to include HTN and CV risk mgmt.
- Individualize BP targets:
  - o 140/90 if DM or non-DM w/CKD and albuminuria <30mg/24hr
  - o 130/80 if DM or non-DM w/CKD and albuminuria >30mg/24hr
  - o ARB or ACE-I for DM pt w/albuminuria 30-300mg/24hr
  - o ARB or ACE-I for DM/non-DM w/CKD and albuminuria >300mg/24hr
  - o Not combine ARB+ACE-I
  - o Children w/CKD = BP mgmt if BP consistently >90%ile w/goal 50%ile or less (as tolerated) and w/ARB or ACE-I regardless of proteinuria
- Lower protein intake to 0.8 g/kg/day if GFR <30; avoid high protein intake if CKD at risk for progression
- A1c target 7.0 (looser if hypoglycemia or limited life expectancy)
- Salt intake <2g/day
- Healthy lifestyle for activity CV health and tolerance (target 30min, 5x/wk), target healthy weight (BMI 20-25, per country specifics) and stop smoking
- Dietician counseling if indicated tailored to severity of CKD (salt, phosphate, potassium, protein intake)
- Multiple approach – ACE/ARB, statin, antiplatelet (BP control, CV risk control)
- Pediatric Kidney survival 66.1% at 5yr f/u if SBP <90th %ile, 41% for non-achievers. Similar for DBP.

Monitoring recommendations

- DM + albuminuria > high risk of progression to ESRD as proteinuria worsens
- Assess GFR and albuminuria more often for pts at higher risk of progression
- Progression: decline in GFR category and eGFR 25% or more drop from baseline
  - o Rapid progression = sustained decline > 5mL/min/1.73 m^2/yr
  - o Small fluctuations are common and not = progression
- Risk factors for progression: cause of CKD, level of GFR, level of albuminuria, age, sex, race/ethnicity, elevated BP, hyperglycemia, dyslipidemia, smoking, obesity, hx CV disease, ongoing nephrotoxin exposure
- Frequency of follow-up:

Guide to Frequency of Monitoring (number of times per year) by GFR and Albuminuria Category				Persistent albuminuria categories Description and range		
				A1	**A2**	**A3**
				Normal to mildly increased	Moderately increased	Severely increased
				<30 mg/g <3 mg/mmol	30–300 mg/g 3–30 mg/mmol	>300 mg/g >30mg/mmol
GFR categories (ml/min/1.73 m²) Description and range	G1	Normal or high	≥90	1 if CKD	1	2
	G2	Mildly decreased	60–89	1 if CKD	1	2
	G3a	Mildly to moderately decreased	45–59	1	2	3
	G3b	Moderately to severely decreased	30–44	2	3	3
	G4	Severely decreased	15–29	3	3	4+
	G5	Kidney failure	<15	4+	4+	4+

GFR and albuminuria grid to reflect the risk of progression by intensity of coloring (green, yellow, orange, red, deep red). The numbers in the boxes are a guide to the frequency of monitoring (number of times per year).

Contraindicated meds, Renal-dosing or close monitoring of meds

- Low muscle mass – GFR might be unreliable
- Concurrent illness increasing AKI risk – hold RAAS blockers (ACE-I, ARB, aldosterone inhibitors, direct renin inhibitors), diuretics, NSAIDs, metformin, lithium, and digoxin
- Careful with OTC meds/protein supplements and avoid herbal remedies
- Metformin – caution GFR 30-45, stop GFR <30
- Nephrotoxic meds (lithium, calcineurin inhibitors – tacrolimus, cyclosporine, etc) = monitor lytes/GFR/drug levels
- Balance use of value of contrast with imaging w/AKI risk
- Avoid oral phosphate load w/bowel preps
- All CKD = at risk of AKI
- Limit for using NSAID? GFR <60?
- Chronic vs. acute concurrent illness ACE-I/ARB use

Screening recommendations

- Screening indicated: yearly for diabetes or hypertension
  - Other risk factors: cardiovascular disease, older age, hx low birth weight, obesity, family hx CKD
- Not indicated: asymptomatic adults without risk factors
- Measurement of serum creatinine, eGFR w/serum Cr equation, Urine albumin/creatinine ratio, and urinalysis
- Urinalysis w/high sensitivity for heavy proteinuria (>300mg/24hrs as estimated from spot Ur prot/Cr ratio) but not as good for clinically significant lower levels (30-300mg)
- Early morning sample recommended for initial proteinuria evaluation w/spot Ur alb/Cr ratio

- No longer timed 24-hour urine collection (inadequate collection, inconvenience to pts, lack of dx advantage over ur alb/cr ratio)

Indications for nephrology referral:

- AKI or abrupt sustained fall in GFR
- GFR <30
- Consistent albuminuria >300mg/g
- Progression of CKD
- Urine red cell casts (RBC>20 and not readily explained)
- CKD w/refractory HTN on treatment w/4 or more antihypertensives
- Persistent abnormal serum K+
- Recurrent or extensive nephrolithiasis
- Hereditary kidney disease

				Persistent albuminuria categories Description and range		
				A1	**A2**	**A3**
				Normal to mildly increased	Moderately increased	Severely increased
				<30 mg/g <3 mg/mmol	30–300 mg/g 3–30 mg/mmol	>300 mg/g >30 mg/mmol
GFR categories (ml/min/ 1.73 m^2) Description and range	**G1**	Normal or high	≥90		Monitor	Refer*
	G2	Mildly decreased	60–89		Monitor	Refer*
	G3a	Mildly to moderately decreased	45–59	Monitor	Monitor	Refer
	G3b	Moderately to severely decreased	30–44	Monitor	Monitor	Refer
	G4	Severely decreased	15–29	Refer*	Refer*	Refer
	G5	Kidney failure	<15	Refer	Refer	Refer

Referral decision making by GFR and albuminuria. *Referring clinicians may wish to discuss with their nephrology service depending on local arrangements regarding monitoring or referring.

Table 8 | CGA staging of CKD: examples of nomenclature and comments

Cause	GFR category	Albuminuria category	Criterion for CKD	Comment
Diabetic kidney disease	G5	A3	Decreased GFR, Albuminuria	Most common patient in the low clearance clinic
Idiopathic focal sclerosis	G2	A3	Albuminuria	Common cause of nephrotic syndrome in childhood
Kidney transplant recipient	G2	A1	History of kidney transplantation	Best outcome after kidney transplantation
Polycystic kidney disease	G2	A1	Imaging abnormality	Most common disease caused by a mutation in a single gene
Vesicoureteral reflex	G1	A1	Imaging abnormality	Common condition in children
Distal renal tubular acidosis	G1	A1	Electrolyte abnormalities	Rare genetic disorder
Hypertensive kidney disease	G4	A2	Decreased GFR and albuminuria	Usually due to long-standing poorly controlled hypertension, likely to include patients with genetic predisposition- more common in blacks- who should be referred to nephrologist because of severely decreased GFR
CKD presumed due to diabetes and hypertension	G4	A1	Decreased GFR	Should be referred to nephrologist because of severely decreased GFR
CKD presumed due to diabetes and hypertension	G2	A3	Albuminuria	Should be referred to nephrologist because of albuminuria
CKD presumed due to diabetes and hypertension	G3a	A1	Decreased GFR	Very common, may not require referral to nephrologist
CKD cause unknown	G3a	A1	Decreased GFR	May be the same patient as above

Abbreviations: CGA, Cause, GFR category and albuminuria category; CKD, chronic kidney disease; GFR, glomerular filtration rate.

Note: Patients above the thick horizontal line are likely to be encountered in nephrology practice. Patients below the thick horizontal line are likely to be encountered in primary care practice and in nephrology practice.

Other Recommendations:

- PPSV if adult eGFR <30 and offer re-vaccination q5 years
- Influenza yearly
- Hep B if progression risk and eGFR <30
- Live vaccination vs. inactivated = check pt's immunity status

Outpatient Cases/Core Topic: Chronic Kidney Disease

Mrs. H is a 61 y/o female here for routine f/u visit with hx COPD, HTN, CKD stage 3, and tobacco use disorder. You haven't met her before so you briefly review her last office visit note, med list, and most recent labs. She's here for hypertension follow-up after meds were adjusted for worsening renal function. Her recent med changes included stopping HCTZ and starting furosemide. There was discussion at her last visit about possibly starting amlodipine if her blood pressure was still uncontrolled.

Vitals & Measurements
Temperature: 36.9
Respiration Rate: 16
Heart Rate: 67
Systolic BP Sitting: 174
Diastolic BP Sitting: 96
Oxygen Saturation: 96
Oxygen Therapy Delivery Method: Room air
Dosing Weight: 61.2 kg
Height: 167.5 cm
Body Mass Index: 21.83

What else do you want to know?

- What was her urine albumin/creatinine ratio?
- Does she have CHF or edema?

What diagnostic criteria for Chronic Kidney Disease does this patient meet?
- GFR consistently 30s-40s for >3 months;
- CKD stage grade 3b, A2

What are her risk factors?
- Hypertension, smoking

What is her morbidity/mortality risk?
- See Figures 3, 4 and 5; Hazard ratio >2 for all-cause and cardiovascular mortality

How common is this condition?
- See Figures 2 and 12

What other complications is she at risk for?
- See Complications section

What are the management recommendations for this patient?
- Evaluate and treat complications

How often should you monitor this patient?
- At least 3 times per year (G3b, A2)

What types of meds should be avoided or adjusted for this patient?
- If no other indication for furosemide, this pt probably should not be on the loop diuretic
- Avoid NSAIDs; hold meds if acute concurrent illness (eg. Admitted inpatient) with AKI risk
- BP needs to be controlled, can use amlodipine (watch for edema risk)
- Stay on ACE-I or ARB due to albuminuria if no allergy

What are the screening recommendations for patients with regards to Chronic Kidney Disease?
- Don't screen asymptomatic
- Yearly screen if diabetes or hypertension

When would you refer this patient?
- If progression to A3 or GFR drops <30

Medlist:

Blood Pressure Cuffs Supply	Prescribed	1 each, Hypertension
calcitriol (calcitriol 0.25 mcg oral capsule)	Prescribed	0.25 mcg = 1 cap, By Mouth, Mon-Wed-Fri, # 36 cap, 5 Refill(s), Pharmacy: EXPRESS SCRIPTS HOME DELIVERY, 1 cap By Mouth Mon-Wed-Fri
carvedilol (carvedilol 25 mg oral tablet)	Prescribed	25 mg = 1 tab, By Mouth, BID, # 180 tab, 0 Refill(s), Pharmacy: EXPRESS SCRIPTS HOME DELIVERY, 1 tab By Mouth BID
furosemide (furosemide 20 mg oral tablet)	Prescribed	20 mg = 1 tab, By Mouth, once a day, # 90 tab, 1 Refill(s), Pharmacy: EXPRESS SCRIPTS HOME DELIVERY, 1 tab By Mouth once a day
lisinopril (lisinopril 40 mg oral tablet)	Prescribed	40 mg = 1 tab, By Mouth, once a day, # 90 tab, 1 Refill(s), Pharmacy: EXPRESS SCRIPTS HOME DELIVERY, 1 tab By Mouth once a day
omega-3 polyunsaturated fatty acids (Fish Oil oral capsule)	Documented	1 cap, By Mouth, once a day, # 100 cap, 0 Refill(s)
zoster vaccine live (Zostavax subcutaneous injection)	Prescribed	= 1 each, Subcutaneous, ONCE, # 1 each, 0 Refill(s)

Most recent labs:

Electrolytes Plus					
Sodium	136	(L) 127		(L) 133	136
Potassium	3.6	3.8		4.0	4.2
Chloride	105	(L) 94		99	102
Carbon Dioxide (lab)	26	27		27	(H) 31
Blood Urea Nitrogen	23	21		19	20
Creatinine	* (H) 1.58	* 1.23		* (H) 1.48	* 1.33
Glucose (lab)	81	85		91	88
Calcium	9.8	9.2		9.8	9.9
Phosphorus					
Magnesium					
Anion Gap	(L) <6	6		7	(L) <6
Liver Function Tests					
Total Protein					7.4
Albumin					3.7
Globulin					3.7
AST (SGOT)					28
ALT (SGPT)					28
Alkaline Phosphatase					81
Bilirubin, Total					0.6
Bilirubin, Direct					
Bilirubin, Indirect					
Lipids					
Cholesterol					169
Triglyceride					105
HDL Cholesterol					74
LDL Cholesterol					* 74
Other Routine Chemistry					
Uric Acid					
Est Glomerular Filtration Rate	* (L) 35	* (L) 47		* (L) 38	* (L) 43
Glucose Tolerance					