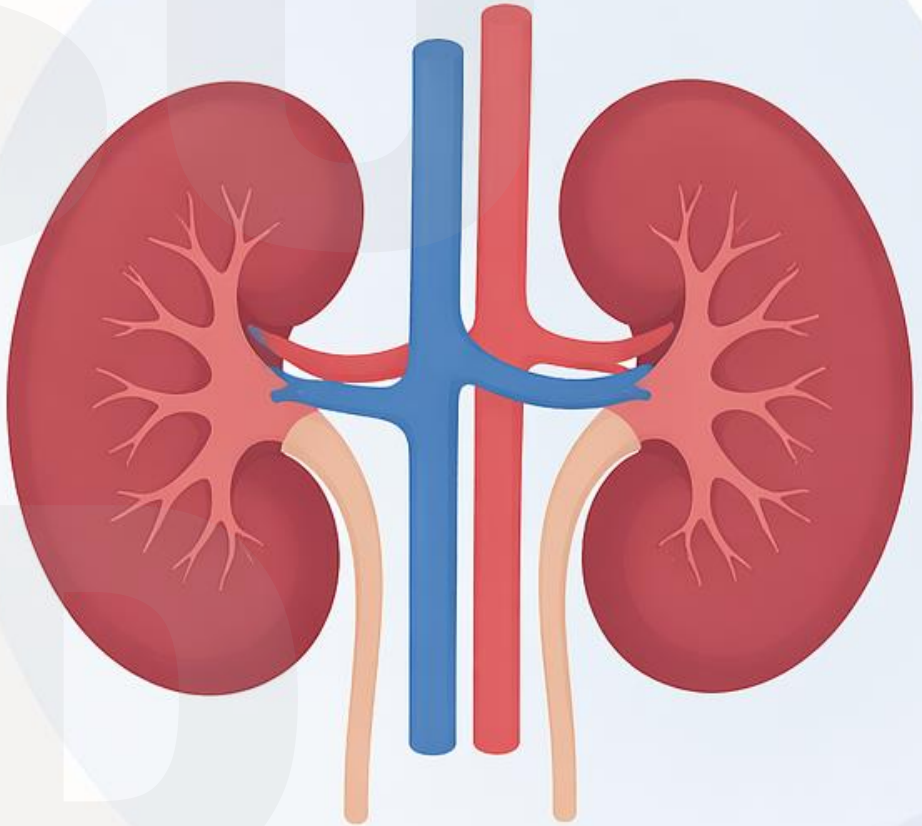
Chronic kidney disease

for the general internist



Amy Li, MD

Assistant Professor of Nephrology, OHSU

5/14/2026

GOALS / AGENDA

We're going to follow a patient's journey from PCP to my office, including a brief view into how I conduct an initial consult in the clinic.

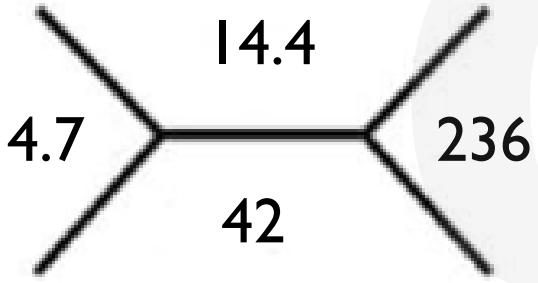
**Please note, how I practice may differ from other nephrologists*

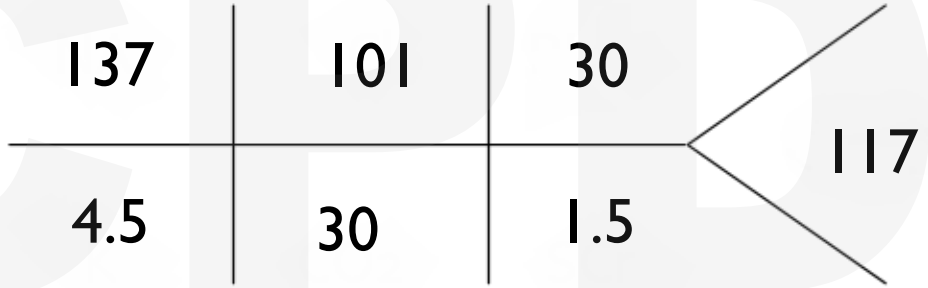
- Diagnostic criteria and staging of CKD
- When to refer to Nephrology
- Initial workup and differential diagnosis for the PCP
- Key points in CKD management

Harold is a 79-year-old man recently moved to PDX to be closer to family, here for an annual Medicare exam.

https://share.google/9YmBPZ4Ke4HZE4LMU

- History of DMT2 x15 years, HTN, CAD s/p 3v CABG
- Meds: ASA 81mg QD, carvedilol 12.5 mg BID, metformin 500 mg daily, rosuvastatin 40 mg daily
- BP 127/65, HR 80, physical exam is unremarkable





eGFR 48

A1c 6.5%

LDL 83
TC 177

CKD is defined as ANY abnormalities of kidney structure OR function, present for a minimum of 3 months
(with implications for health)

Table 1 | Criteria for chronic kidney disease (either of the following present for a minimum of 3 months)

Markers of kidney damage (1 or more)	Albuminuria (ACR ≥30 mg/g [≥3 mg/mmol])
	Urine sediment abnormalities
	Persistent hematuria
	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 per 1.73 m^2 (GFR categories G3a–G5)

ACR, albumin-to-creatinine ratio; GFR, glomerular filtration rate.

CKD heat map by KDIGO 2024

CKD is classified based on:
- **Cause (C)**
- **GFR (G)**
- **Albuminuria (A)**

GFR categories (ml/min/1.73 m^2) Description and range				Albuminuria categories Description and range: A1	A2	A3
				Normal to mildly increased	Moderately increased	Severely increased
				<30 mg/g <3 mg/mmol	30–299 mg/g 3–29 mg/mmol	≥300 mg/g ≥30 mg/mmol
	G1	Normal or high	≥90	Screen 1	Treat 1	Treat 3
	G2	Mildly decreased	60–89	Screen 1	Treat 1	Treat 3
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	G5	Kidney failure	<15	Treat 4+	Treat 4+	Treat 4+

Low risk (if no other markers of kidney disease, no CKD)
Moderately increased risk
High risk
Very high risk

KDIGO 2024 CKD Guidelines

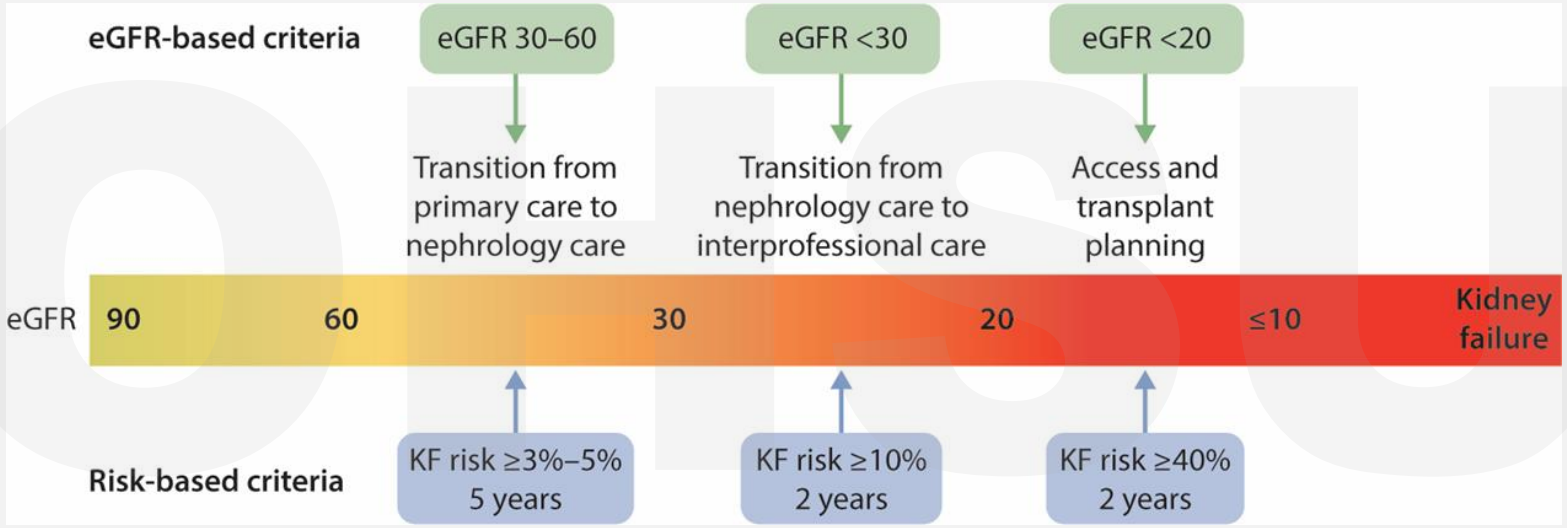
The eGFR cutoff/definition of CKD is controversial, especially for sex and age BUT…

Regardless of the presence of albuminuria, eGFR <60 meaningfully increases risk of mortality and morbidity

" Kidney function of 60% or greater is considered 'normal' or '*good enough*' "

Age 65+	ACR, mg/g				ACR, mg/g			
eGFRcr-cys	<10	10–29	30–299	300+	<10	10–29	30–299	300+
	All-cause mortality				Myocardial infarction			
105+	1.2	1.4	1.9	3.5	0.97	1.4	2.0	19
90–104	ref	1.2	1.4	2.0	ref	1.2	1.1	1.9
60–89	1.2	1.5	1.8	2.3	1.1	1.4	1.5	1.9
45–59	1.6	2.0	2.4	2.9	1.6	1.9	2.3	3.4
30–44	2.0	2.4	3.2	4.1	2.1	2.6	3.1	3.8
<30	3.4	4.1	5.1	6.5	4.9	3.0	5.1	5.0
	Cardiovascular mortality				Stroke			
105+	1.1	1.5	2.0	12	1.2	1.3	1.5	3.3
90–104	ref	1.4	1.4	3.4	ref	1.3	1.3	2.8
60–89	1.2	1.7	2.2	3.1	1.1	1.4	1.8	2.5
45–59	1.7	2.4	3.0	4.3	1.5	1.7	2.0	2.3
30–44	2.4	3.1	4.5	5.8	1.5	2.0	2.1	2.3
<30	5.7	5.2	5.1	7.8	1.7	2.0	2.4	4.8
	Kidney failure replacement therapy				Heart failure			
105+	2.0	1.0	2.1		0.99	1.5	1.7	7.0
90–104	ref	1.9	4.7	10	ref	1.3	1.5	2.2
60–89	1.4	2.6	6.2	19	1.2	1.5	2.0	3.2
45–59	3.7	7.9	16	42	1.6	2.0	2.9	4.1
30–44	14	14	46	137	2.3	2.9	3.5	6.1
<30	87	364	241	406	4.4	4.1	5.5	7.2
	Acute kidney injury				Atrial fibrillation			
105+	0.91	1.1	1.3	1.9	0.95	1.1	1.0	3.7
90–104	ref	1.3	1.4	3.9	ref	1.2	1.3	2.4
60–89	1.5	2.1	2.7	4.7	1.1	1.2	1.5	2.0
45–59	3.6	4.3	5.1	7.3	1.2	1.4	1.7	1.9
30–44	5.7	5.9	7.2	9.8	1.5	1.8	2.0	2.2
<30	10	11	11	22	1.8	1.8	2.2	3.2
	Hospitalization				Peripheral artery disease			
105+	1.0	1.1	1.2	2.2	1.1	2.3	2.9	4.9
90–104	ref	1.1	1.3	1.4	ref	1.3	2.0	4.8
60–89	1.1	1.2	1.3	1.5	1.3	1.6	2.0	3.2
45–59	1.2	1.2	1.4	1.6	2.0	2.8	3.1	3.1
30–44	1.5	1.4	1.6	2.0	3.5	2.8	3.8	5.9
<30	1.9	1.9	2.0	2.6	8.4	4.1	5.9	10

KDIGO 2024 CKD Guidelines



eGFR ≤60 is a decent rule of thumb for CKD referral to nephrology with some exceptions…

- Proteinuria, especially nephrotic range (3.5g or greater)
- ADPKD
- Any glomerulonephritis

What's the cause?
What's driving the CKD?

Because saying that one has CKD isn't sufficient.

Treatment is tailored to the specific cause(s) of CKD.

Practical approach to the differential diagnosis of CKD in an outpatient setting

MEDICAL

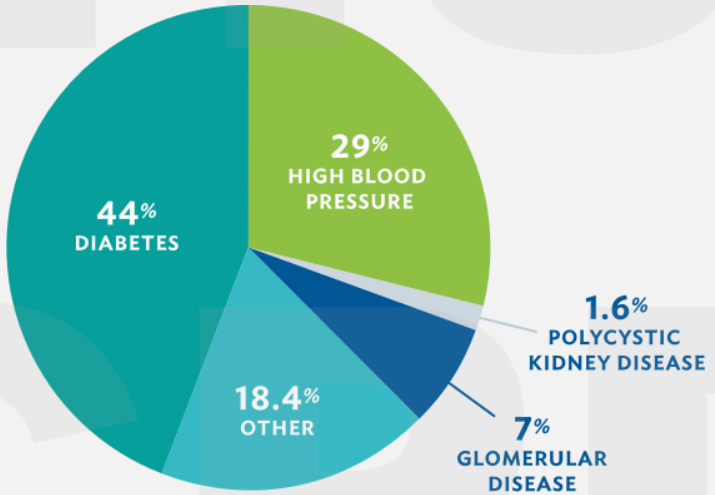
Proteinuric or nonproteinuric?

Proteinuric

- DMT2
- Hyperfiltration (HTN, obesity)
  - Leads to secondary FSGS

Nonproteinuric CKD is less common

- Often multifactorial; age can be a big factor*



SURGICAL / STRUCTURAL

Operative or nonoperative?

- Incidental (congenital) solitary kidney
  - If normal eGFR with no proteinuria, doesn't need to see a nephrologist
- Acquired/functionally solitary kidney
- Hydronephrosis / obstruction
  - Malignant (cancer) or nonmalignant (usually BPH or stone)
- Neurogenic bladder
  - Diabetes is an underappreciated cause
- Polycystic kidney disease (eg ADPKD)
  - Most common genetic kidney disease

*We'll come back to this later

When to refer to Nephrology

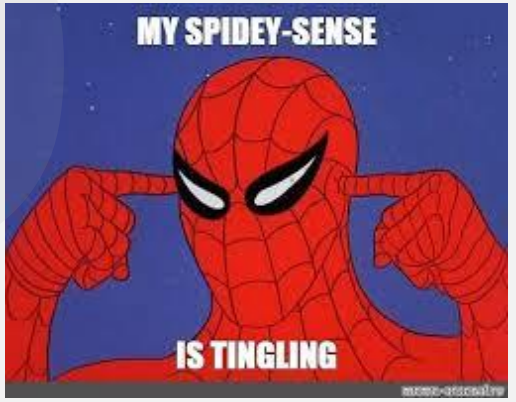
CKD

- ANY glomerulonephritis or concern thereof
- ANY progressive renal disease (acute or chronic)
- Significant proteinuria (or proteinuria that makes you uncomfortable)
- If you don't know if it's AKI or CKD
- AKI with slow or nonrecovery
- Your interventions aren't working
- ADPKD or >10 renal cysts in total
- Kidney transplant

NON-CKD

- Truly resistant hypertension
  - Not at goal w/ 3 meds at max tolerated dose
  - At goal on 4 meds
- Electrolyte abnormalities (Na, K, Mg, Ca, Phos)
- Metabolic acid/base disorders
- Recurrent nephrolithiasis

Never underestimate the power of the gut feeling



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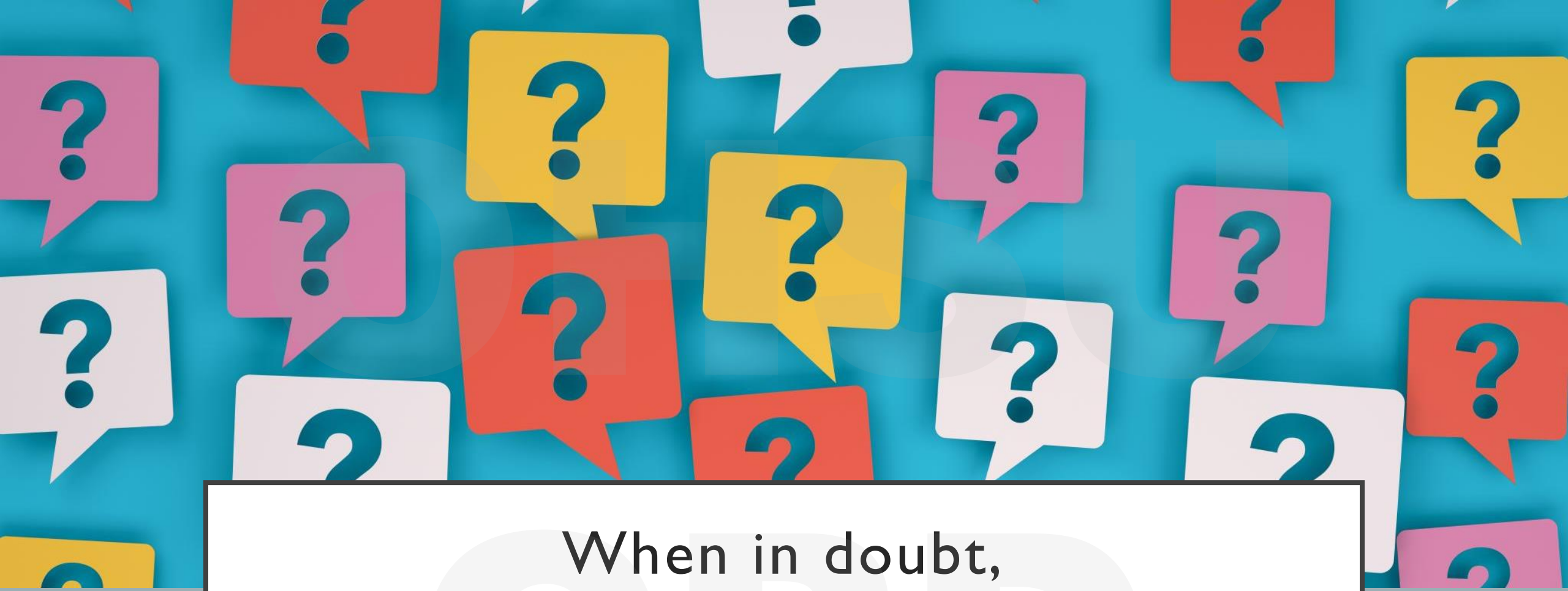

When in doubt,
feel free to refer or call us ☺

or e-consult

https://share.google/9YmBPZ4Ke4HZE4LMU

Back to Harold's evaluation.

MEDICAL EVALUATION

BARE MINIMUM

- ❑ Basic metabolic panel
- ❑ Urinalysis (dipstick)
- ❑ Urine microscopy
- ❑ Urine albumin/creatinine → BIG protein = seen on dipstick
- ❑ Urine protein/creatinine → All inclusive of big and small proteins (that wouldn't be detected on dipstick)

STRUCTURAL/ANATOMIC EVALUATION

- ❑ Renal ultrasound with PVR

https://www.instagram.com/p/DP7-M4jDYyJ/

Harold's urine studies return

- **Dipstick UA**: 1+ GLUC, 3+ PROT, negative LEUK EST, negative NITR
- **Microscopy**: 1 WBC, 2 RBC, no casts
- **UACR**: 1.24 g/g = 1240 mg/g
- **UPC**: 2.56 g/g
- **Renal US:** 10 cm bilat, no hydro, no mass, PVR 30

Now we know that Harold has CKD stage 3A / A3, specifically with non-nephrotic range proteinuria

→ refer to nephrology

CKD is classified based on: • Cause (C) • GFR (G) • Albuminuria (A)				Albuminuria categories Description and range		
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Low risk (if no other markers of kidney disease, no CKD)
Moderately increased risk
High risk
Very high risk

As a PCP, there are 2 valid approaches to the evaluation of CKD

LESS

- No further evaluation from here
- Refer to nephrology and let the nephrologist order their workup

MORE

- Start the serologic workup for the nephrologist
- Have patient review with nephrologist
- Nephrologist can order any additional workup

Honestly, I personally think either approach is fine – it's a style thing, so whatever you're most comfortable with.

My general approach for initial evaluation of CKD

FOR ALL REFERRALS

- ❑ Basic metabolic panel
- ❑ Urinalysis (dipstick)
- ❑ Urine microscopy
- ❑ Urine albumin/creatinine
- ❑ Urine protein/creatinine
- ❑ HIV screen
- ❑ HBV (Surface Ab, Ag, and Core Ab)
- ❑ HCV screen
- ❑ A1c if not already +DMT2
- ❑ Renal ultrasound with PVR

+PROTEINURIA

- ❑ SPEP
- ❑ Serum FLC

2 separate orders

- ❑ Anti-PLA2R
- ❑ Syphilis screen (if +risk factors)

+HEMATURIA

- ❑ ANA with reflex panel +/- dsDNA
- ❑ C3, C4
- ❑ ANCA
- ❑ MPO and PR3

Also 2 separate orders

- ❑ Anti-GBM (sometimes)

There is a pathophysiologic reason for this extensive workup, but it is beyond the scope of this talk

I have an order set in Epic so I just click boxes

Harold comes to kidney clinic.

"What is your understanding of your kidney health?"

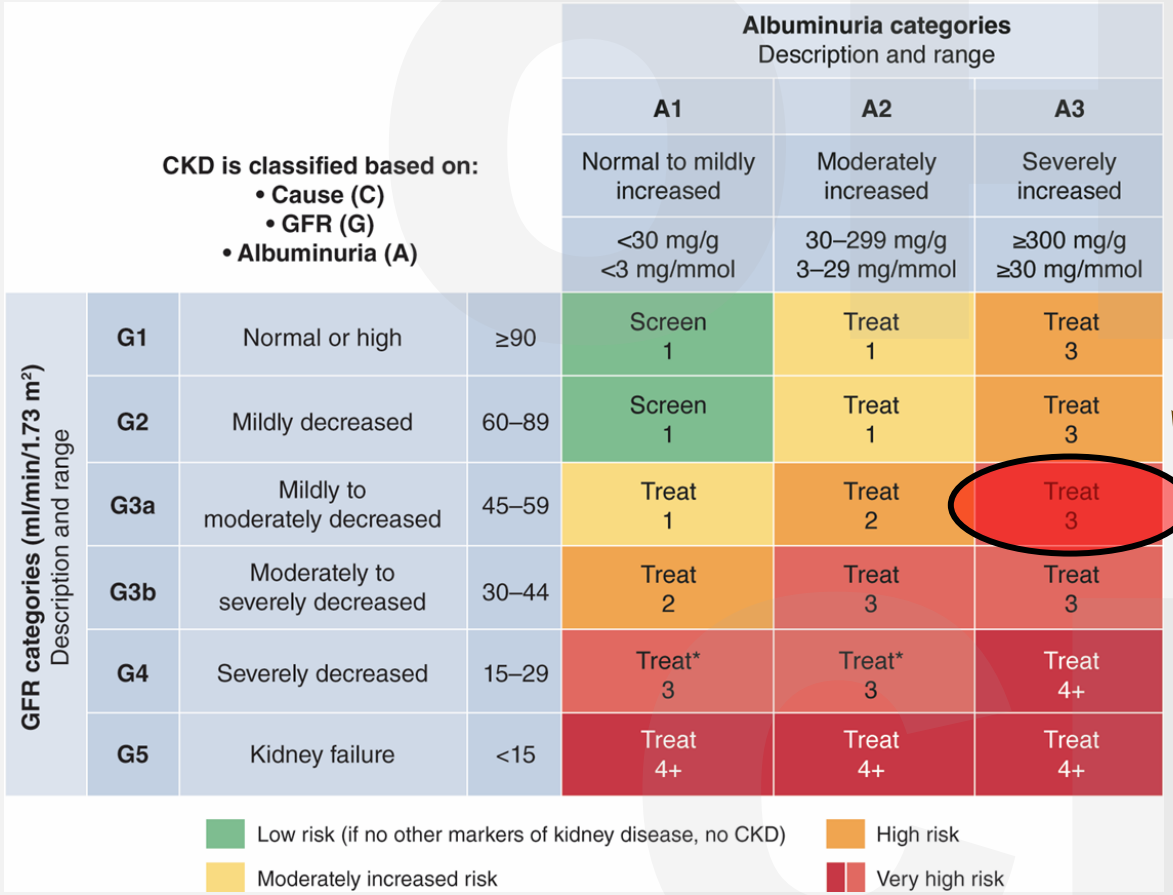
Common answers:

"I'm don't know, I was just told to come here"

"I thought they were pretty good until someone checked my labs and, apparently they're not good"

"I was told they're not normal, but I'm worried I'm going to need dialysis"

Most common in response from people who have friends/family on dialysis



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Low risk (if no other markers of kidney disease, no CKD)
Moderately increased risk
High risk
Very high risk

Harold comes to my renal clinic…
as a nephrologist, I have 3 main goals

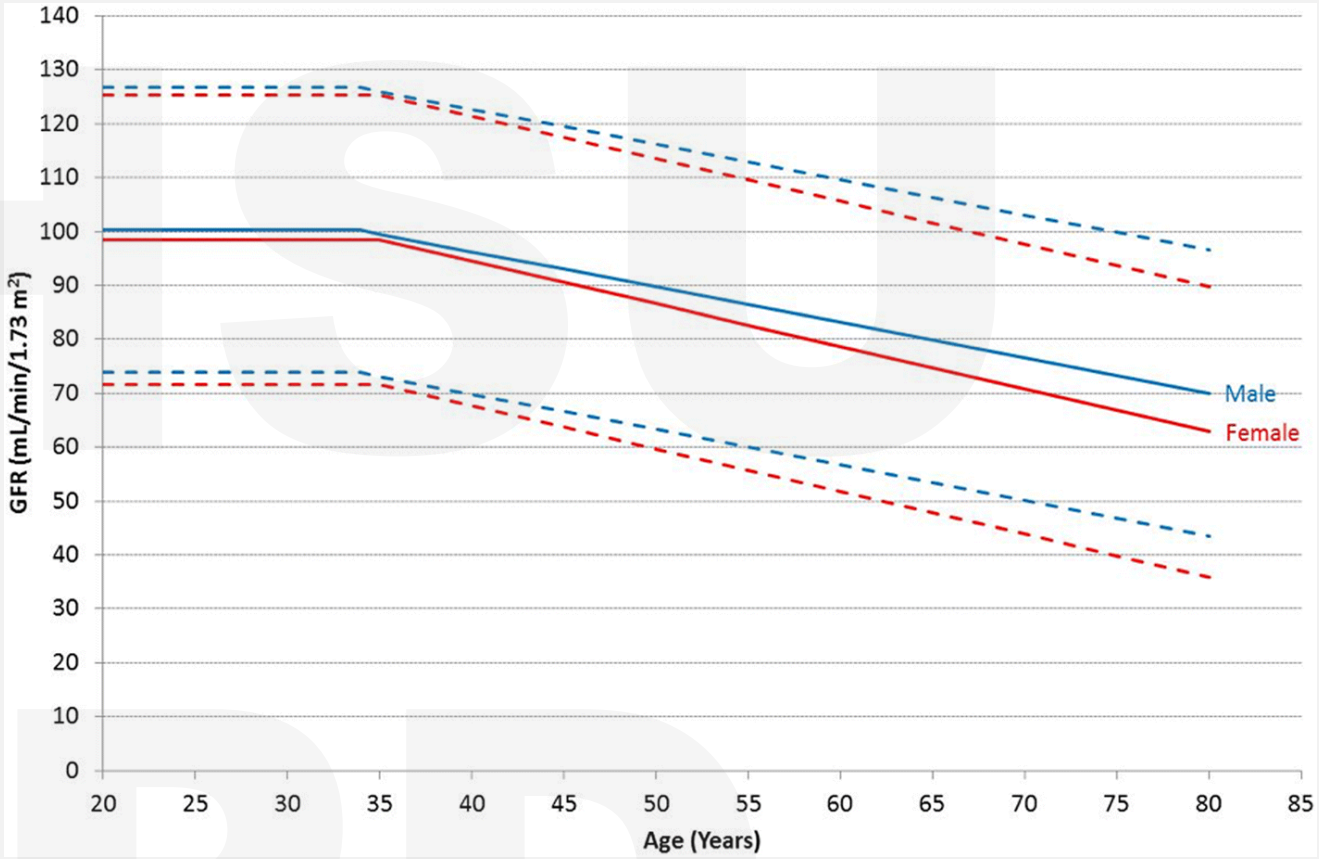
1. What's the **cause** of CKD?
2. What is the patient's **risk** for progressive kidney disease?
3. How do keep Harold's kidneys happy and healthy for as long as possible? (**longevity**)

1. What is the etiology of Harold's CKD?

- Recall:
  - Known history of DMT2, HTN, CAD s/p 3v CABG.
  - Cr 1.5 (eGFR 48). UACR 1.2 g/g.
  - Renal ultrasound unremarkable, PVR normal.
- Serologic workup comes back negative.

- CKD is primarily due to **DMT2, HTN**, and probably some renovascular disease. Your currently estimated % kidney function is **around 50%** on a scale of 0-100.

Age- and gender-specific GFR reference ranges based on measured GFRs from 2974 prospective living kidney donors



Fenton A, et al., BMC Nephrology 2018

"But, even on your best day, your best expected % kidney function is approximately 60% based on age alone because after age 40, we naturally lose about 1% of our kidney function every year. Since you are nearly 80, normal kidney function for you would be expected to be ~60%."

2. What is Harold's risk of progressive kidney disease?

- Technical answer: Kidney Failure Risk Equation (KFRE)
  https://www.kidneyfailurerisk.com/

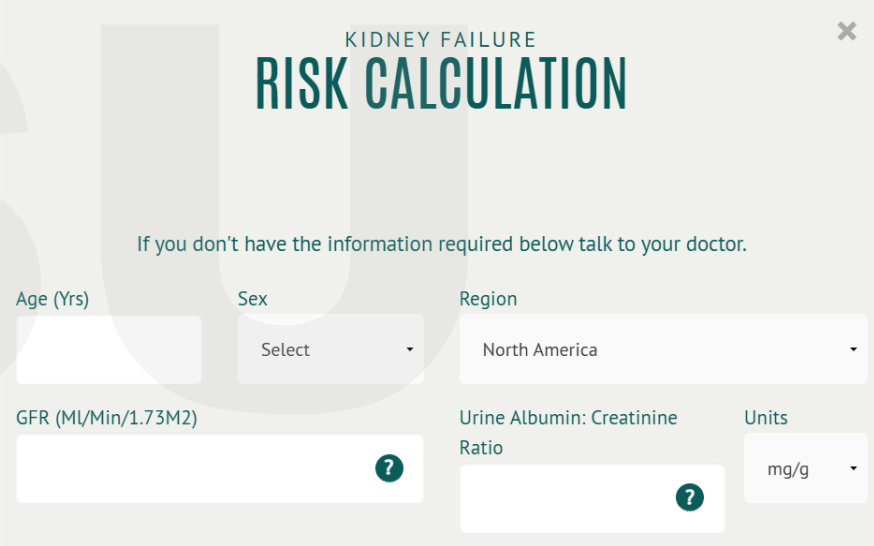
  Data needed: age, sex, eGFR, UACR (mg/g)
- The simpler answer:

the higher the proteinuria, the greater the risk of progression

- It is also worth knowing specific to ***diabetic*** kidney disease:

  It's not a question of *IF* but *WHEN* will dialysis be needed

Kidney Failure Risk Equation (KFRE)
https://www.kidneyfailurerisk.com/



Can be useful in helping you decide if you should refer to nephrology (e.g., if KFR=5% at 5 years)

For me, I don't routinely use it (anymore). I use it mostly to provide education for interested patients.

3. How to maximize kidney health for as long as possible?

- Harold is 79 years old with Cr 1.5. What is the likelihood that he will need dialysis in the next 5 years?
- Harold is far more likely to die of cardiovascular disease than ESRD

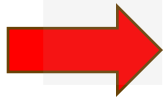
What keeps you heart-healthy keeps you kidney-healthy.

- Good BP control, good glycemic control, healthy diet, mild-moderate exercise, avoid tobacco, alcohol in moderation, avoid other substances, etc.

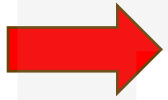
THE CKD MANAGEMENT CHECKLIST

FYI, Routine CKD labs:

- ❑ Complete blood count (CBC) +/- iron studies with ferritin
- ❑ Basic metabolic panel
- ❑ Serum magnesium + phosphorus
- ❑ 25-OH vitamin D + PTH
- ❑ Urinalysis (dipstick)
- ❑ Urine microscopy
- ❑ Urine albumin/creatinine
- ❑ Urine protein/creatinine



- ❑ **Etiology**:
- ❑ **Baseline Cr**:
- ❑ **UPC**:
- ❑ **UACR**:
- ❑ **Imaging**: usually ultrasound; CT ok
- ❑ **BP/Volume**: BP goal ≤130/80s, EDW, volume status
- ❑ **Anemia**: Hgb goal 10-12
- ❑ **Acid/base**: bicarb goal 22+
- ❑ **Electrolytes**: Na, K, Mg
- ❑ **MBD**: Ca, Phos goal 3.5-5.5, VitD goal 30+, PTH goal is controversial in pre-dialysis



- ❑ **CV risk**: high intensity statin
- ❑ **Dialysis access planning**:
- ❑ **Transplant**: refer when eGFR 25 or less

ANTI-PROTEINURICS

Amy's checklist in order of priority:

- ACEi/ARB
- SGLT2i
- MRA
- GLP1a
- Thiazide

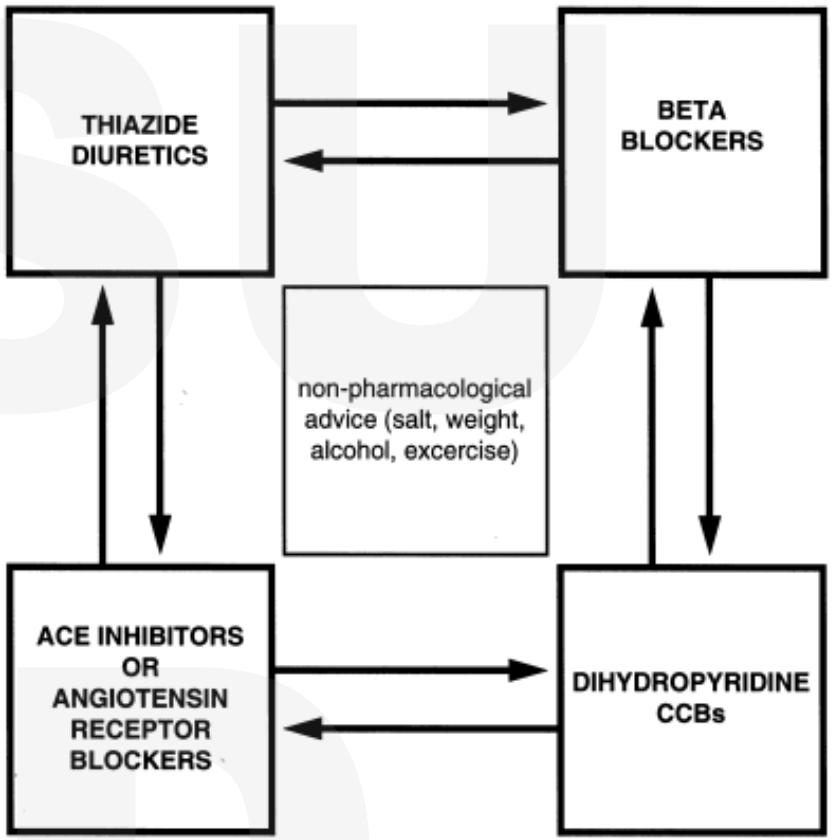


Figure 1 The 'Birmingham Hypertension Square' for the optimal choice of add-in drugs in the management of resistant hypertension.

ANTI-HYPERTENSIVES

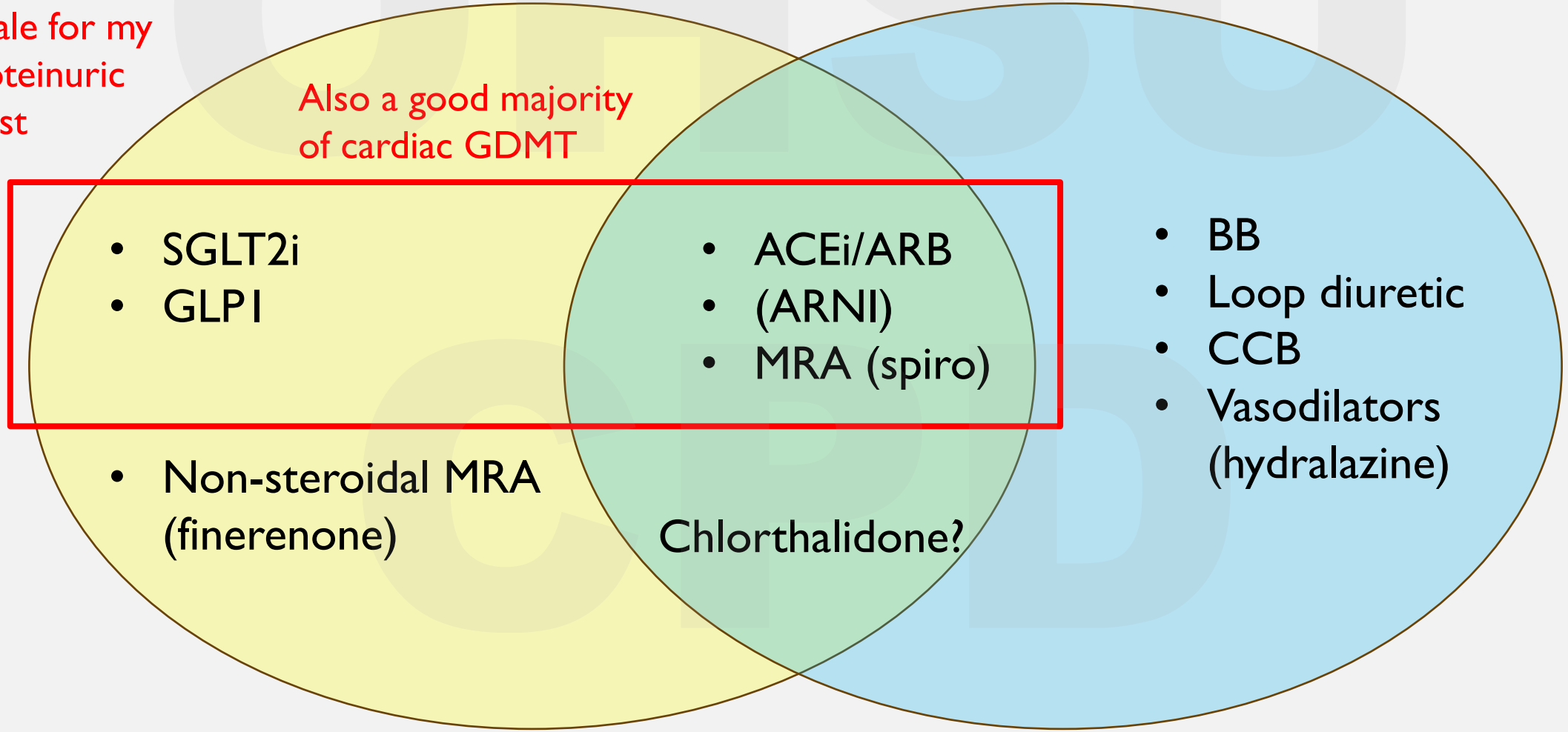
Anti-proteinurics and anti-hypertensives in CKD

ANTIPROTEINURICS

ANTIHYPERTENSIVES

Rationale for my antiproteinuric checklist

Also a good majority of cardiac GDMT



Key takeaways for management of the CKD patient for the PCP

Glycemic control	BP control	Cardiovascular risk
• SGLT2i • GLP1a	• ACEi/ARB • MRA	• High intensity statin

How would a nephrologist optimize Harold's current medications?

- History of DMT2 x15 years, HTN, CAD s/p 3v CABG

Current meds:

- 👍 ASA 81mg daily
- metformin 500 mg daily
- carvedilol 12.5 mg BID
- 👍 rosuvastatin 40 mg daily

Glycemic control

- SGLT2i
- GLP1a

BP control

- ACEi/ARB
- MRA

Cardiovascular risk

- 👍 High intensity statin

Switch metformin to SGLT2i (or GLP1a)

Switch carvedilol to ACEi/ARB

https://share.google/glpbWhvJMSYmv9C5c

SUMMARY

In the form of a cheat sheet

CKD is ANY abnormality of kidney structure OR function present for 3+ months

(with implications for health)

CKD is classified based on: • Cause (C) • GFR (G) • Albuminuria (A)				Albuminuria categories Description and range		
				A1	A2	A3
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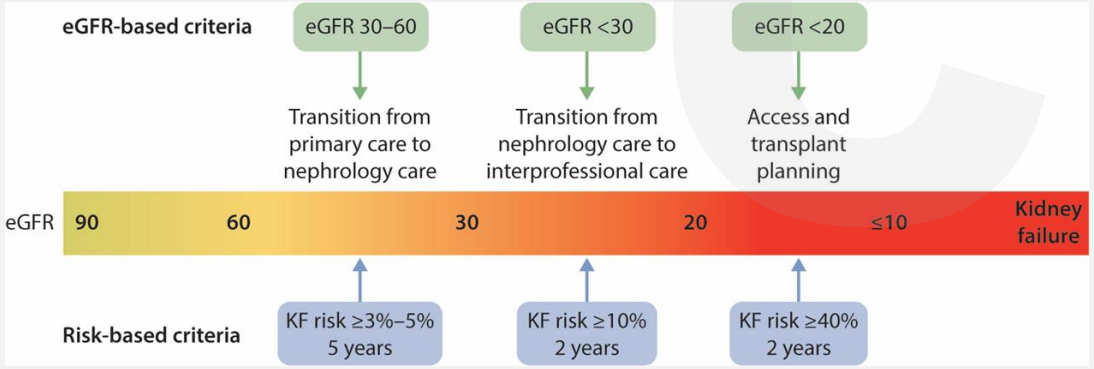

Evaluation of CKD

FOR ALL REFERRALS

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- ❑ A1c if not already +DMT2
- ❑ Renal ultrasound with PVR

+PROTEINURIA

- ❑ SPEP
- ❑ Serum FLC
- ❑ Anti-PLA2R
- ❑ Syphilis screen (if +risk factors)

+HEMATURIA

- ❑ ANA with reflex panel +/- dsDNA
- ❑ C3, C4
- ❑ ANCA
- ❑ MPO and PR3
- ❑ Anti-GBM (sometimes)

What keeps you heart-healthy keeps you kidney-healthy.

<u>Reduction of proteinuria</u> is the name of the game

Glycemic control	BP control	Cardiovascular risk
• SGLT2i • GLP1a	• ACEi/ARB • MRA	• High intensity statin

THANK YOU!

Suggested resources:

1. **KDIGO 2024 CKD Guidelines:**
    1. Levin, A., Ahmed, S. B., Carrero, J. J., Foster, B., Francis, A., Hall, R. K., ... & Stevens, P. E. (2024). Executive summary of the KDIGO 2024 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease: known knowns and known unknowns. *Kidney international*, *105*(4), 684-701.
2. **KDIGO 2022 Diabetes in CKD:**
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Questions?

Anything you may have heard differently elsewhere?

Common teaching points I share with patients

- **Essentially all kidney diseases are asymptomatic until it's "too late"**
  - Few exceptions: kidney stones and UTIs
- **Because kidney diseases usually do not come with symptoms, we heavily rely on labs** from blood and urine to understand your kidney health, which is why it's so important for you to get labs.
- **Past predicts future**
  - Rate of observed loss of kidney function gives me some idea of what to expect in the future
- **Essentially all kidney diseases are progressive**. There is NO cure for any kidney disease.
  - If not because of the natural history of the disease process, then because of sheer natural aging of the kidneys

OTHER HELPFUL TIDBITS

- If the patient has a history of dialysis-dependent AKI (or severe AKI not requiring dialysis), they will assuredly have residual CKD after recovery.
- They may recover to their prior normal baseline Cr, but histologically, there will be more interstitial fibrosis and tubular atrophy (IFTA) and/or glomerulosclerosis post-AKI vs pre-AKI.
  - Why? The healthy nephrons/areas of the kidneys are compensating for the loss of the scarred areas.
- "We get wounds on our skin, it scabs over, then it forms a scar and that scar tissue will never be like normal skin anymore. Same thing happens in the kidneys. After an injury, the kidneys form scar tissue after healing and that because of that scarring, the kidneys just won't work the same."

How I commonly describe dialysis

- Dialysis does 2 things to try to mimic what the kidneys do. Just like your laundry machine, there's a cleaning cycle and a drying cycle. Dialysis cleans the blood and removes the extra water your body doesn't need, which is basically what is in urine – trash and water your body doesn't need.
- Dialysis comes in many different flavors.
  - For outpatient: you can do dialysis through the blood (hemodialysis, HD) or through the belly (peritoneal dialysis, PD).
  - For inpatient: there are two flavors of dialysis – slow dialysis (CRRT) and fast dialysis (iHD). What we pick depends on how sick you are.
- HD can be exhausting because you are squeezing the work that kidneys would do over 48 hours into a 4-hour dialysis sessions.

THE DIALYSIS PLANNING PROCESS IS LONG

- **Dialysis education** (usually a 1–2-hour class)
- **Access planning**: vascular access vs peritoneal catheter
  - Meet with a surgeon for pre-operative evaluation
  - Imaging → operative planning → schedule OR time
  - Depending on the access, a 2nd stage surgery may be required
- Wait for access **maturation**
  - Depends on type of access and the surgeon but expect *minimum* 6 weeks
- For in-center HD: send **referrals** to dialysis clinics (usually ≤1 month)
  - For home dialysis options: the clinic will train the patient (and often a caregiver), which takes minimum 2 weeks.
- All told, preparing for dialysis takes ***at least 6 months***
  - "Better to have it and not need it, then to need it and not have it"