Advancing Kidney Health
Through Optimal Medication Management

Clare Lyas, MD, MPH Assistant Professor
University of Alabama at Birmingham—Division of Nephrology

Chronic Kidney Disease and Management

Glossary of Terms

- **AER**=albumin excretion rate
- **ACR**=albumin to creatinine ratio
- **GFR**=glomerular filtration rate
- **ACEi**=angiotensin converting enzyme inhibitor
- **ARB**=angiotensin receptor blocker
- **SGLT2i**=sodium glucose co-transporter 2 inhibitor
- **CCB**=calcium channel blocker
- **GLP1**=glucagon-like peptide 1

Case

- 48 year old female with no known medical history
- Strong family history of hypertension and diabetes
- Initiates primary care
- Medications: over the counter multivitamin
- Height: 5’ 5’’ Weight: 200 lbs
- Current Labs: Serum creatinine 1.3mg/dl. GFR 60ml/min/1.73m2. Urine dipstick 1+ protein

Case Question

Which of the following best defines chronic kidney disease in this patient?

A. Serum creatinine 1.2mg/dL or higher

B. GFR <100ml/min/1.73m^2 and albuminuria

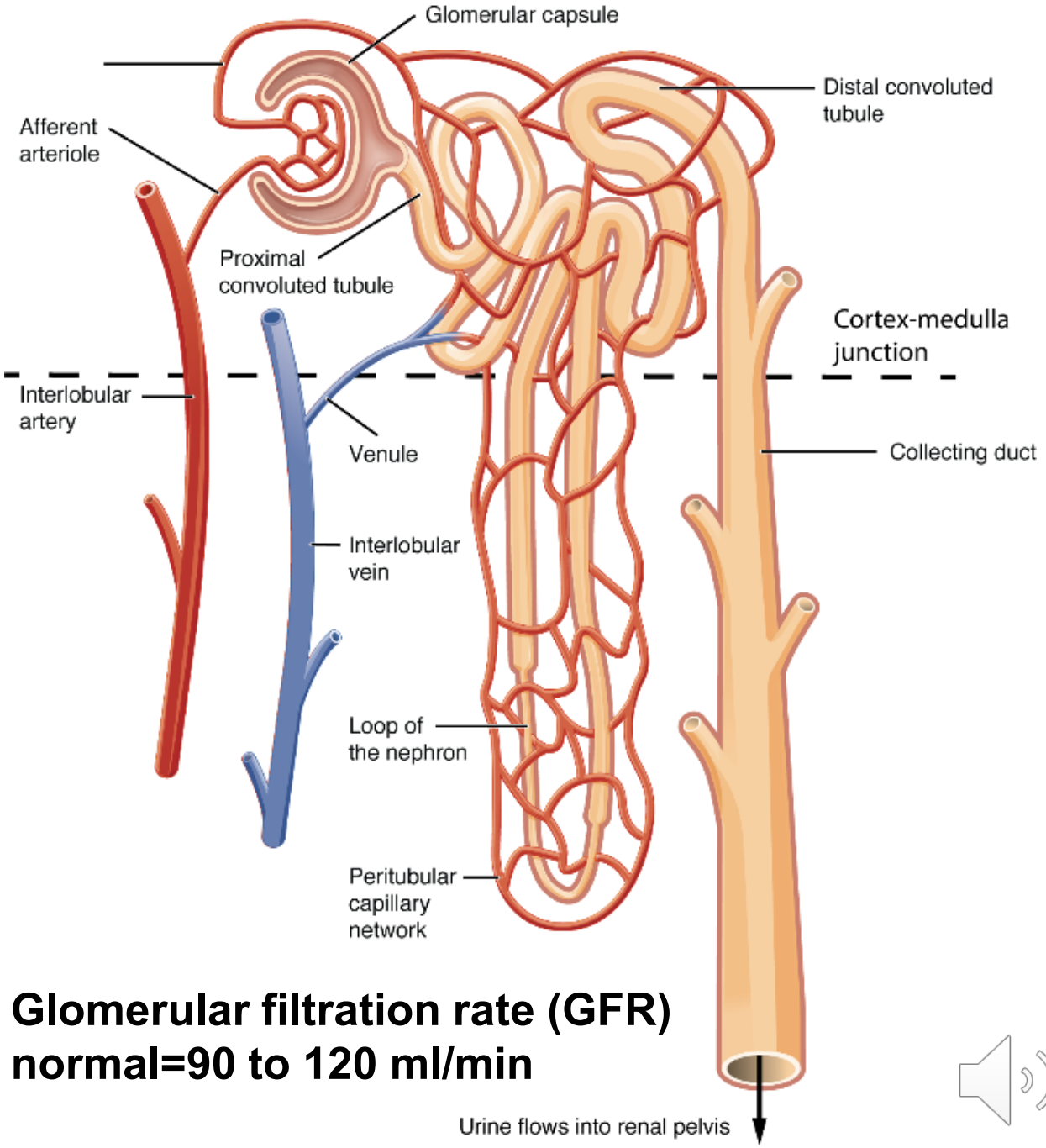
C. Trace proteinuria or higher on urinalysis

D. Serum creatinine >1.0mg/dL and albuminuria

E. GFR <60ml/min/1.73m^2 and presence of kidney damage

Assessment of Kidney Function

- Kidney Function is represented by glomerular filtration rate (GFR)
- Endogenous filtration markers, such as creatinine and cystatin c, along with age and gender have been used to estimate GFR



Glomerular filtration rate (GFR) normal=90 to 120 ml/min

Levey AS. Clinical Pharmacology and Therapeutics 2017;102:405-419

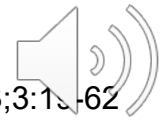
CKD Defined

Criteria for CKD Requires Presence for > 3 months

Markers of Kidney Damage (One or More)
Albuminuria (AER >30mg/24 hours; ACR >30mg/g [>3mg/mmol]
Urine sediment abnormalities
Electrolyte and other abnormalities due to tubular disorders
Abnormalities detected by histology
Structural abnormalities detected by imaging
History of Kidney Transplantation

OR

Decreased GFR
GFR <60ml/min/1.73m^2 (GFR categories G3a-G5)



Kidney International Supplements 2013;3:1-62

Prognosis of CKD

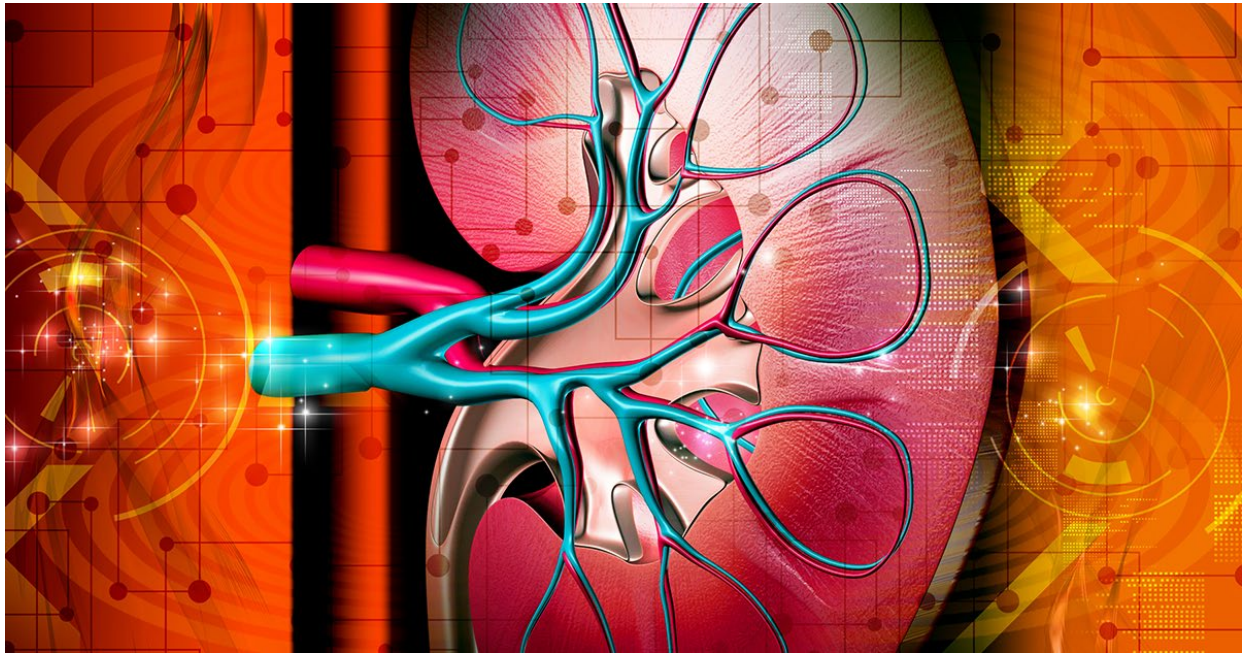
Prognosis of CKD by GFR and Albuminuria Categories: KDIGO 2012

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

Kidney International Supplements 2013;3:19-62

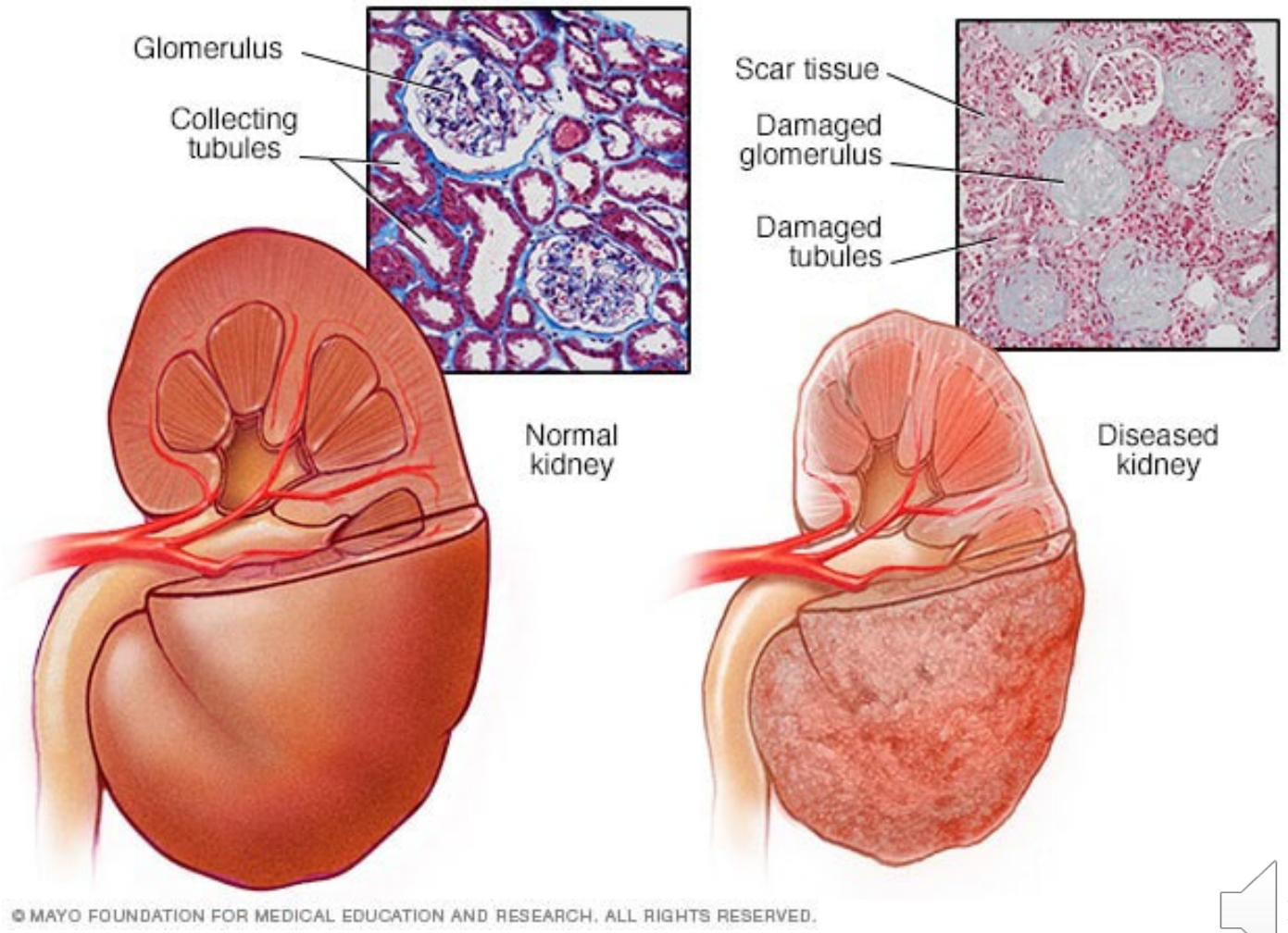
Common Causes of CKD

- Diabetes
- Systemic Autoimmune Disease
- Glomerular Diseases
- Genetic Diseases such as polycystic kidney disease
- Systemic infections



Pathophysiology of CKD

- Final common pathological manifestation of CKD is kidney fibrosis.
- Histologically evidenced by glomerulosclerosis, tubular atrophy and interstitial fibrosis

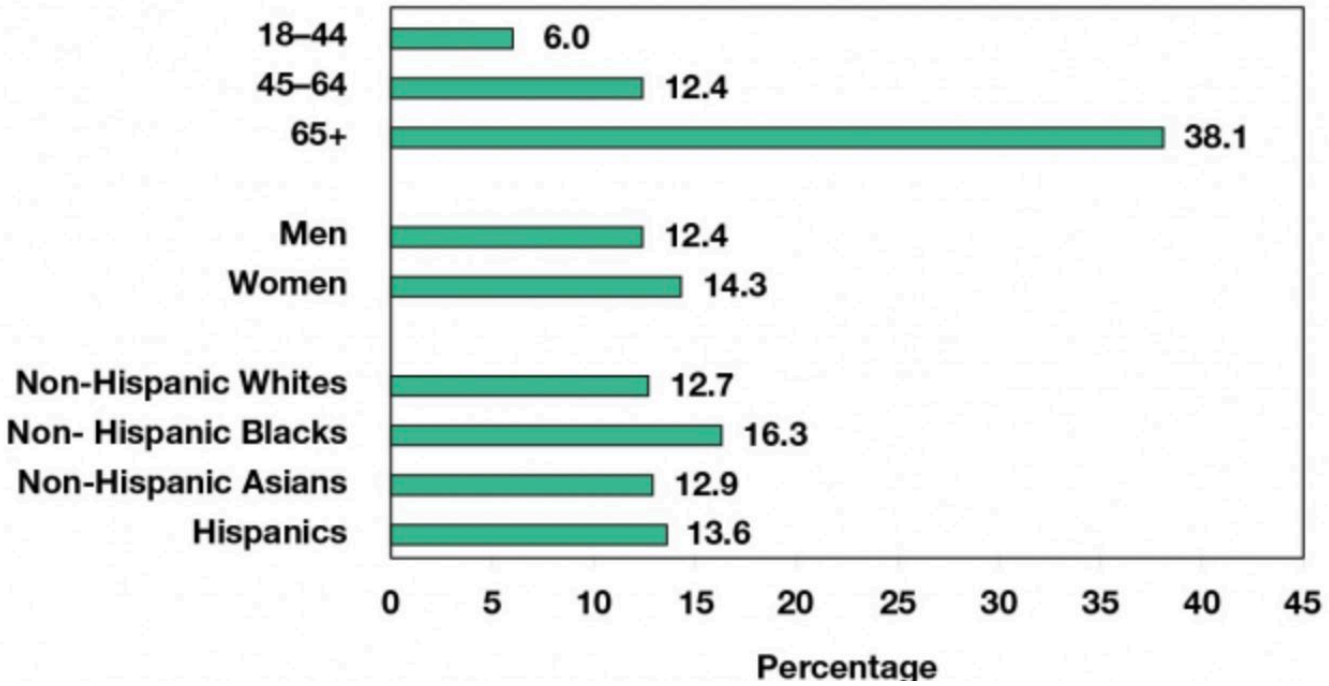


https://www.mayoclinic.org/diseases-conditions/chronic-kidney-disease/symptoms-causes/syc-20354521

CKD in the United States

CKD Is Common Among US Adults

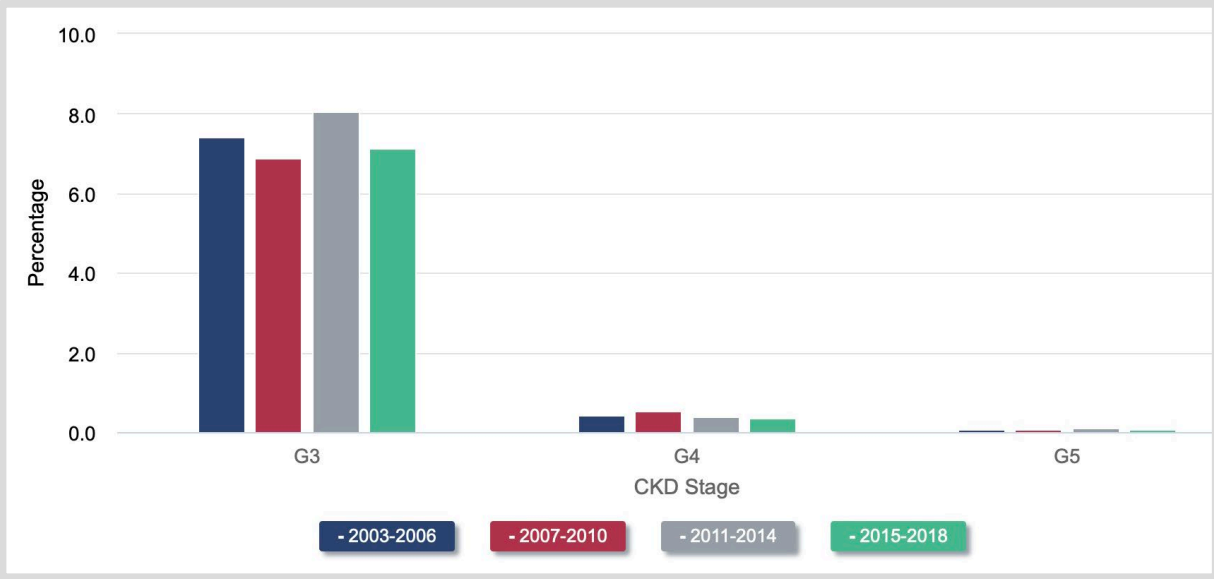
Percentage of US Adults Aged 18 Years or Older with CKD



Centers for Disease Control and Prevention. *Chronic Kidney Disease in the United States, 2021*. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention; 2021.

Disparities in CKD

White



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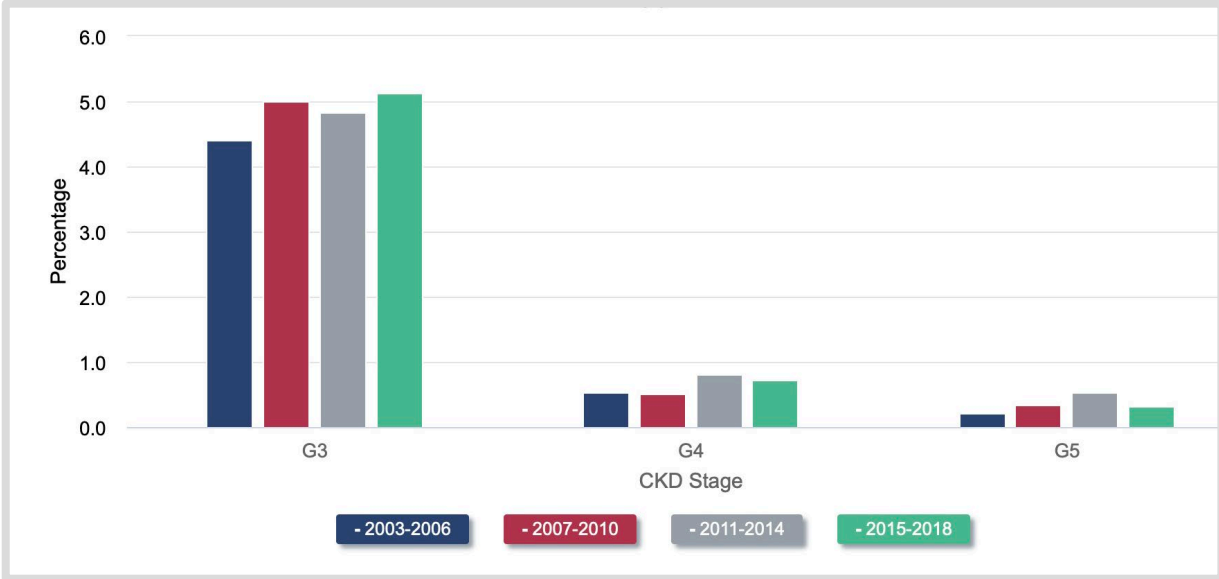
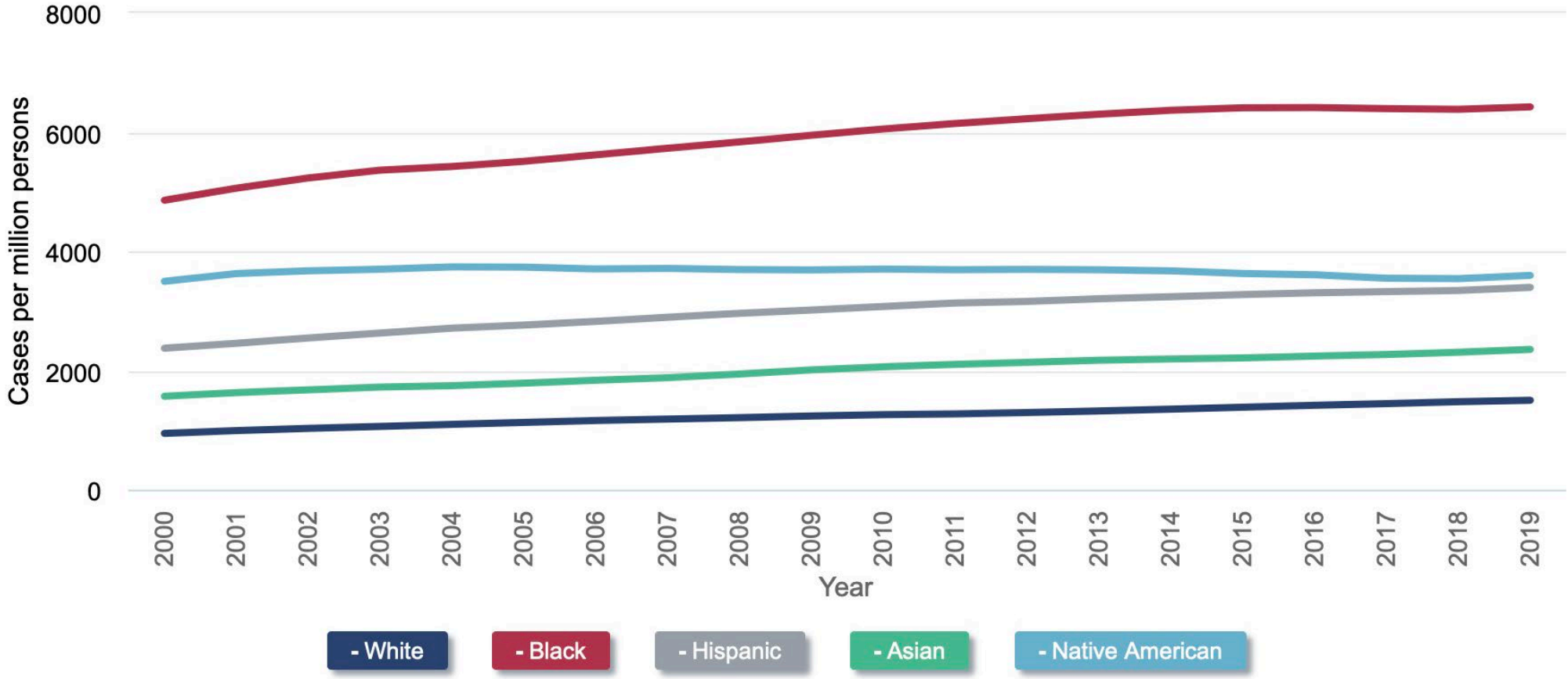


United States Renal Data System. 2021 *USRDS Annual Data Report: Epidemiology of kidney disease in the United States. National* Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, Bethesda, MD, 2021.

Disparities in End Stage Kidney Disease

Race/Ethnicity



United States Renal Data System. 2021 *USRDS Annual Data Report: Epidemiology of kidney disease in the United States.*National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, Bethesda, MD, 2021.

Socioeconomic Determinants of CKD

Housing

Challenges in overcrowding, pollution, lack of access to fresh/healthy foods, lack of parks/outdoor walkability

Education

Poor educational systems and low employment

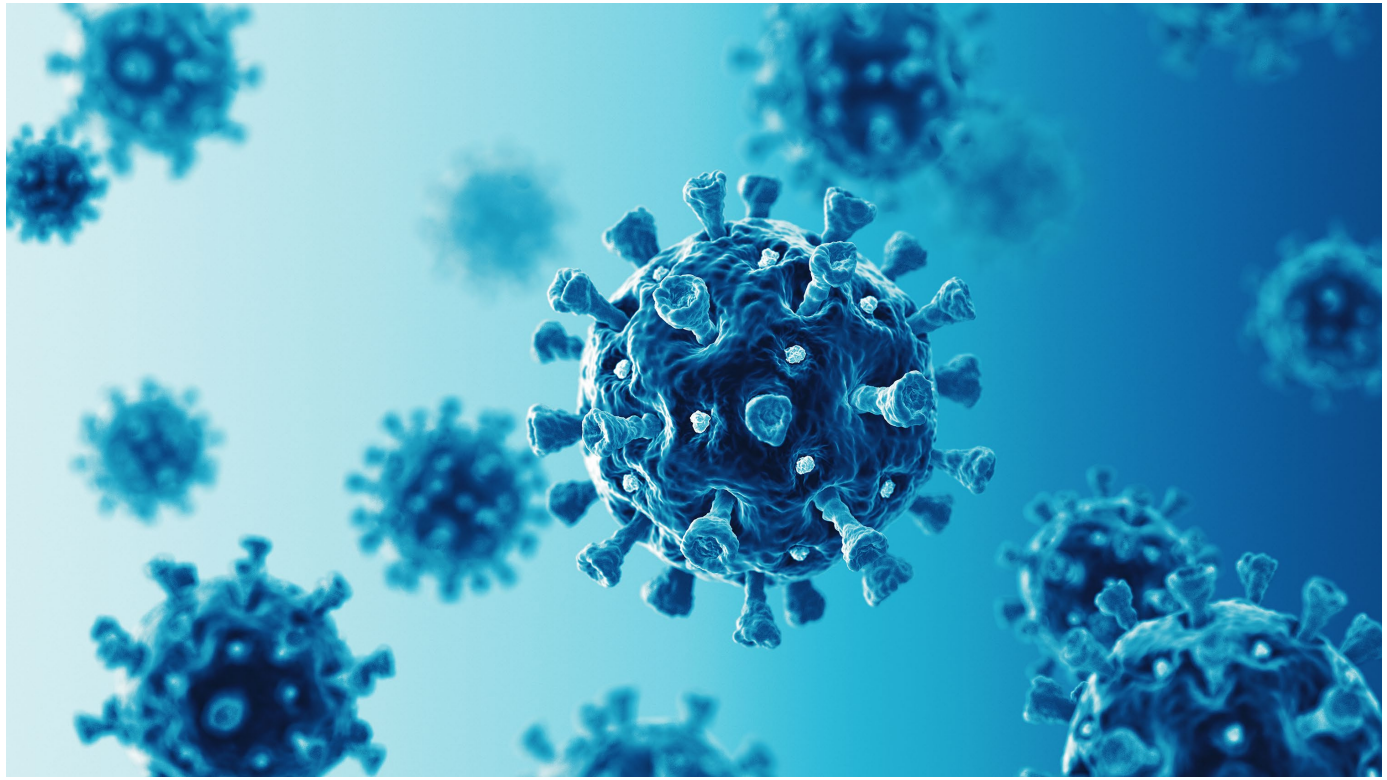
Healthcare

Limited health care access and utilization

Nicholas SB. Advances in Chronic Kidney Disease 2015; 22:[illegible]5

COVID and CKD

- Coronavirus disease 2019 (COVID-19) is associated with acute kidney injury in addition to lung disease and other end organ damage
- Patients with pre-existing kidney disease have an increased risk of in-hospital mortality

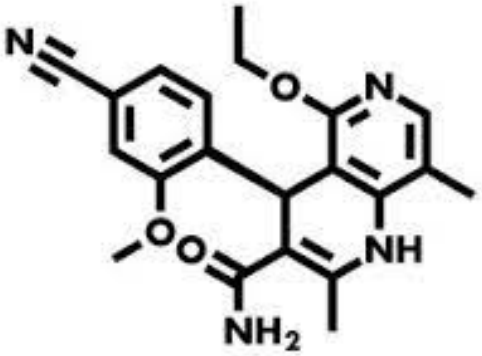


Management of CKD

- Control of Albuminuria
- Control of Blood Pressure
- Glycemic control in diabetes
- Lifestyle modification

Guidelines for Management of Albuminuria

- Maximally tolerated angiotensin converting enzyme (ACE) inhibitors or angiotensin receptor blockers (ARB)
- Sodium glucose co-transporter 2 inhibitors for persistent albuminuria despite ACEi or ARBs
- Mineralocortiocoid receptor antagonists in diabetes for ACR >30mg/g despite maximal ACEi or ARB and normal potassium



finerenone

Kidney International 2022; 102: Supplement, S1-S127

Guidelines for Management of Hypertension

- Blood pressure targets vary slightly based on cardiovascular risk, diabetes, albuminuria, and chronic kidney disease
- First line BP medication classes
  - ACEi or ARBs
  - Dihydropyridine calcium channel blockers (CCBs)
  - Thiazide diuretics

Cheung, A. et al. Kidney International (2021):99;559-569

Guidelines for Glycemic Control in Diabetes

- Individualized hemoglobin A1c target based on CKD severity, comorbidities, and risk of hypoglycemia
- Medication management in type 2 diabetes
  - Metformin for GFR >30ml/min/1.73m2
  - SGLT2 inhibitors for cardiovascular and kidney protection and individualized hemoglobin A1c targets
  - Glucagon-like peptide 1 (GLP1) receptor agonists for individuals with atherosclerotic cardiovascular disease or intolerant of SGLT2 inhibitors or metformin

Boer IH. Kidney International 2022;102: 974-989

Lifestyle modification in CKD

- Suggested healthy diet with higher intake of fruits, vegetables, whole grain, fibers and lower intake of sodium, red meat, and sugar
- Moderate physical activity at least 30 minutes per day, most days of the week, as tolerated
- Weight loss
- Smoking cessation

Advancing American Kidney Health Initiative

- Enacted in July 2019
- Three main policy goals
  - 25% decrease in kidney failure by 2030
  - Marked increase to 80% of individuals with end stage kidney disease (ESKD) treated with home dialysis or transplantation by 2025
  - Doubling of available kidneys for transplantation by 2030

Jain G Kidney 360 2021;2:1677-1683

Opportunities for Pharmacists

Clinical pharmacist increase physician prescribing patterns of medications known to slow kidney disease progression

Pharmacists reduce medication related problems, increase medication adherence, and improve patient outcomes

The Advancing Kidney Health through Optimal Medication Management (AKHOMM) initiative provides optimal medical management through team-based care

Clinical pharmacists with appropriate collaborative practice agreements can provide point-of-care testing for serum creatinine and albuminuria and educate about results

Wei ET. Journal of the American Pharmacists Association 2022; 62: 209-213
St. Peter WL. Current Opinion Nephrology Hypertension 2013; 22:656-662
Hudson JQ. Kidney Medicine 2022;4:100508

Case

- 58 year old male seen in primary care clinic with clinical pharmacist
- Past medical history of hypertension and diabetes
- Home medications of metformin and lisinopril
- BP 125/75, Heart Rate 72/min
- Labs: serum creatinine 1.5mg/dL, GFR 40ml/min/1.73m^2, hemoglobin A1c 7.5%, UACR 400mg/g, LDL 65mg/dL

Case Question

Which of the following medication classes is indicated to slow disease progression?

A. Dihydropyridine calcium channel blocker

B. Thiazide Diuretic

C. Sodium glucose co-transporter 2 inhibitor

D. Insulin

E. Loop diuretic

Summary

- Chronic kidney disease is common in the United States, and many individuals do not know they have it.
- The prevalence of CKD is increasing in the United States
- Socioeconomic factors contribute to disparities in CKD
- The most common cause of chronic kidney disease in the U.S. is diabetes
- Management of CKD includes control of albuminuria, hypertension, and glycemia in diabetes
- Pharmacists play a critical role in the management of CKD through optimal medication management

Advancing Kidney Health

Through Optimal Medication Management

Thank you!