



A Primary Care Approach to CKD Management

Dr. Krishna Baradhi MD,FACP,FASN,FNKF
Associate Professor, Department Of Internal Medicine,
Associate Program Director For Nephrology Fellowship Program
University of Oklahoma ,Tulsa
Certified Hypertension Specialist



1

Learning Objectives

- Identify timely testing and intervention strategies in patients at-risk for chronic kidney disease (CKD).
- Discuss appropriate clinical measures to manage risk, and increase patient safety in CKD.
- Recognize co-management and referral of patients to nephrology, when appropriate, in order to improve outcomes in CKD.



2

Case Question 1

A 50-year-old Hispanic female was diagnosed with type 2 diabetes at age 30. She has taken medications as prescribed since diagnosis. The fact that she has confirmed diabetes puts this patient at:

- A. Higher risk for kidney failure and CVD
- B. Higher risk for kidney failure only
- C. Higher risk for CVD only
- D. None of the above



3

Case Question 2

A 42-year-old African American man with diabetic nephropathy and hypertension has a stable eGFR of 25 mL/min/1.73m². Observational studies of early as compared to late nephrology referral have demonstrated which of the following?

- A. Reduced 1-year Mortality
- B. Increase in Mean Hospital Days
- C. No change in serum albumin at the initiation of dialysis or kidney transplantation
- D. Decrease in hematocrit at the initiation of dialysis or kidney transplantation
- E. Delayed referral for kidney transplantation



4

Primary Care Practitioners – First Line of Defense Against CKD

- As many as 9 out of 10 people who have CKD are not aware they have the disease.
- Primary care professionals can play a significant role in early diagnosis, treatment, and patient education.
- A greater emphasis on early diagnosis and management , can improve patient outcomes.

CKD is Part of Primary Care



5

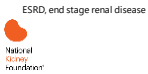
The Public Burden of CKD



6

CKD : Public Health Issue

- 37 million American adults affected.
- 1 in 7 US adults are affected
- Prevalence is 14.2 % of adult population in the US.
- Estimated global prevalence is 9.1 % of adults.
- Nearly 1 in 3 people with diabetes and 1 in 5 people with hypertension have CKD.
- 2 in 1,000 Americans are living with end-stage kidney disease (ESKD) on dialysis.



1. Coresh et al. JAMA. 2007. 298:2038-2047.
 2. NKF Fact Sheets. <http://www.kidney.org/news/newsroom/factsheets/FactFacts>
 3. USRDS. www.usrds.org

7

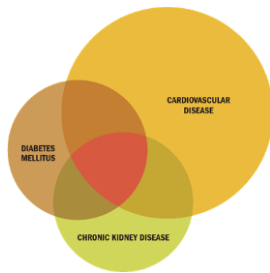
Epidemiology

- Increases risk for all-cause mortality, CV mortality, kidney failure (ESRD), and other adverse outcomes.
- 6 fold increase in mortality rate with DM + CKD.
- Disproportionately affects African Americans, Hispanics, Asians/Pacific Islander, American Indians.
- For every white person who develops ESKD, 3 Black people develop ESKD.
- CKD is most common among people ages 65 or older (38%)
- Slightly more common in women (14%) than men (12%)



8

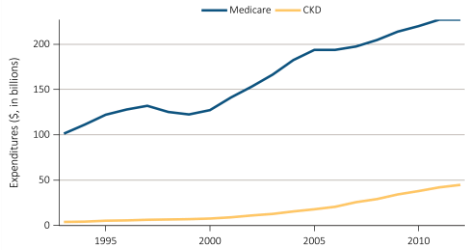
CKD-CVD-Diabetes Link: CKD is a Disease Multiplier



9

CKD- BURDEN

Overall expenditures on Parts A and B services for the Medicare population age 65+ and for those with CKD, by year, 1993-2012



Data source: Medicare 5 percent sample. Non-dialysis. Abbreviations: CKD, chronic kidney disease. USRDS ADR 2014.

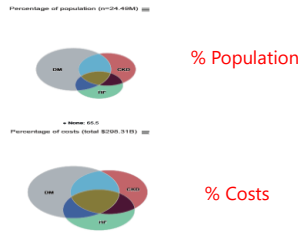


10



Distribution of prevalence and annual spending among older adults with CKD (excluding ESRD), Diabetes, and Heart failure, 2020

Figure 6.1 Distribution of prevalence and annual spending among older adults with CKD (excluding ESRD), diabetes, and heart failure, 2020



Notes: Percentages represent the unweighted prevalence of CKD (excluding ESRD), diabetes, and heart failure by age in the Medicare 5 percent sample. Point prevalence individuals aged 65 years and older on January 1, 2020 with Medicare Parts A and B coverage in 2020. Costs represent the Medicare paid costs for ages 65 and older.

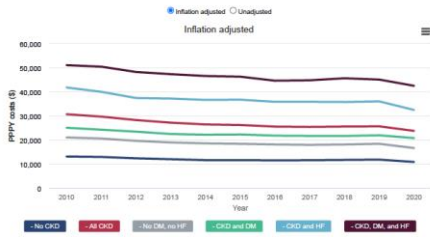


11



Per person per year spending among older adults with CKD (ESRD excluded), by presence of diabetes and heart failure, 2010-

Figure 6.6 Per person per year spending among older adults with CKD (ESRD excluded), by presence of diabetes and heart failure, 2010-



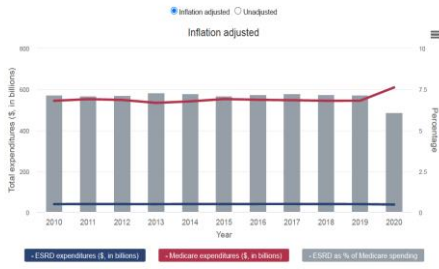
Data Source: Medicare 5% FFS sample. Point prevalent individuals aged 65 years on January 1, 2010-2020, with Medicare Parts A and B coverage in the prior year. Medicare PPSY paid costs include Parts A, B, and D.



12



Figure 9.3 Total and ESRD spending in Medicare fee-for-service, and ESRD spending as a percentage of total Medicare spending, 2010-2020

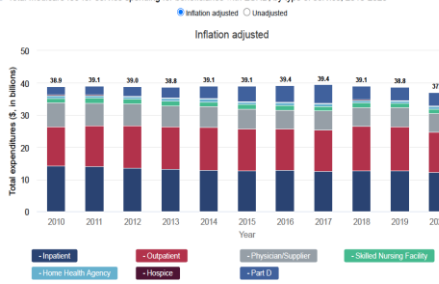


Data Source: USRDS ESRD database. Period: prevalent ESRD patients with at least one Medicare claim in a year, 2010-2020. Medicare FFS spending obtained from CMS Trainers Report.



13

Figure 9.5 Total Medicare fee-for-service spending for beneficiaries with ESRD, by type of service, 2010-2020



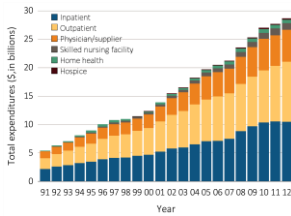
Data Source: USRDS ESRD database. Period: prevalent ESRD patients with at least one Medicare claim in a year, 2010-2020.



14

Total Medicare dollars spent on ESRD, by type of service

Preventing progression of CKD will help hold down costs, as the treatment of kidney failure is expensive. ESRD requires some type of replacement therapy to maintain life.



USRDS ESRD Database. Total Medicare costs from claims data; includes all Medicare as primary payer claims as well as amounts paid by Medicare as secondary payer. USRDS ADR, 2014.



15

BOTTOM LINE

Medicare spending for beneficiaries with CKD (not including ESKD) ages 66 or older exceeded **\$70 billion** in 2018, representing 23.8% of Medicare spending in this age group.

Medicare-related spending for beneficiaries with ESKD totaled **\$49.2 billion** in 2018.



16

CKD Risk Factors*

Modifiable

- Diabetes
- Hypertension
- History of AKI
- Frequent NSAID use
- Obesity
- Smoking
- Hyperlipidemia

Non-Modifiable

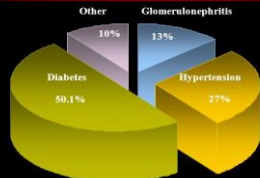
- Family history of kidney disease, diabetes, or hypertension
- Age 60 or older (GFR declines normally with age)
- Race/U.S. ethnic minority status



*Partial list
AKI, acute kidney injury

17

The Two Most Common Causes of CKD

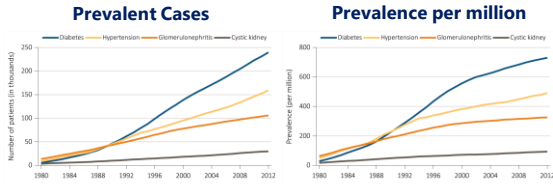


Primary Diagnosis for Patients Who Start on Dialysis



18

Diabetes and Hypertension are leading causes of kidney failure



Trends in (a) prevalent ESRD cases and (b) adjusted* prevalence of ESRD, per million, by primary cause of ESRD, in the U.S. population, 1980-2012.



*Point prevalence on December 31 of each year; Adjusted for age, sex, and race. The standard population was the U.S. population in 2011 ESRD patients. ESRD, end stage renal disease. USRDS ADR, 2013.

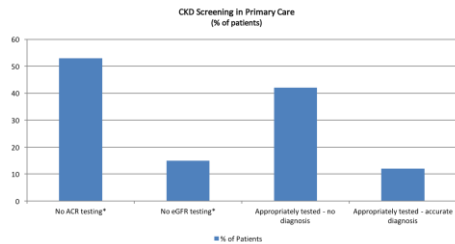
19

CKD Screening and Evaluation



20

Gaps in CKD Diagnosis



*Based on the 15-month retrospective review for approximately 10 thousand adults with type-2 diabetes in the primary care setting. Annual ACR and eGFR testing for type-2 diabetes is recommended by NKF KDOQI and ADA.



Szczech LA, et al. "Primary Care Detection of Chronic Kidney Disease in Adults with Type-2 Diabetes: The ADD-CKD Study (Awareness, Detection and Drug Therapy in Type-2 Diabetes and Chronic Kidney Disease)." *PLoS One*. 2014;9:e110535.

21

Improved Diagnosis...

Studies demonstrate that clinician behavior changes when CKD diagnosis improves. Significant improvements realized in:¹⁻³

- Increased urinary albumin testing
- Increased appropriate use of ACEi or ARB
- Avoidance of NSAIDs prescribing among patients with low eGFR
- Appropriate nephrology consultation



1. Wei L, et al. *Kidney Int.* 2013;84:174-178.
 2. Chan M, et al. *Am J Med.* 2007;120:1063-1070.
 3. Fink J, et al. *Am J Kidney Dis.* 2009;53:681-688.

22

Screening Tools: eGFR

- Considered the best overall index of kidney function.
- Normal GFR varies according to age, sex, and body size, and declines with age.
- The NKF recommends using the CKD-EPI Creatinine Equation (2009) to estimate GFR. Other useful calculators related to kidney disease include **MDRD** and Cockcroft-Gault.
- For GFR calculators search: [GFR calculator – The National Kidney Foundation](#).



Summary of the MDRD Study and CKD-EPI Estimating Equations:
<https://www.kidney.org/sites/default/files/docs/mdrd-study-and-ckd-epi-gfr-estimating-equations-summary-ta.pdf>

23

Screening Tools: ACR

- Urinary albumin-to-creatinine ratio (ACR) is calculated by dividing urinary albumin concentration in milligrams by creatinine concentration in grams.
- Creatinine assists in adjusting albumin levels for varying urine concentrations, which allows for more accurate results versus albumin alone.
- Spot urine albumin-to-creatinine ratio for quantification of proteinuria.
 - New guidelines classify albuminuria as mild, moderately or severely increased.
- First morning void preferable.



24

Criteria for CKD

Definition :

- Abnormalities of kidney structure or function, present for >3 months, with implications for health.
- Either of the following must be present for >3 months:
 - ACR >30 mg/g
 - Markers of kidney damage (one or more*)
 - GFR <60 mL/min/1.73 m²

*Markers of kidney damage can include nephrotic syndrome, nephritic syndrome, tubular syndromes, urinary tract symptoms, asymptomatic urinalysis abnormalities, asymptomatic radiologic abnormalities, hypertension due to kidney disease.



25

Old Classification of CKD as Defined by Kidney Disease Outcomes Quality Initiative (KDOQI) Modified and Endorsed by KDIGO

Stage	Description	Classification by Severity	Classification by Treatment
1	Kidney damage with normal or increased GFR	GFR ≥90	T if kidney transplant recipient D if dialysis
2	Kidney damage with mild decrease in GFR	GFR of 60-89	
3	Moderate decrease in GFR	GFR of 30-59	
4	Severe decrease in GFR	GFR of 15-29	
5	Kidney failure	GFR <15	

Note: GFR is given in mL/min/1.73²



National Kidney Foundation. KDOQI Clinical Practice Guidelines for Chronic Kidney Disease: Evaluation, Classification, and Stratification. Am J Kidney Dis. 2002;39(suppl 1):S1-S266

KDIGO. Kidney Disease: Improving Global Outcomes

26

Classification of CKD Based on GFR and Albuminuria Categories: "Heat Map"

Prognosis of CKD by GFR and Albuminuria Categories			Albuminuria categories description and range						
			A1	A2	A3				
GFR categories (mL/min/1.73 m ²) description and range	G1	Normal or high	≥90	Normal to mildly increased	<30 mg/g <3 mg/mmol	Moderately increased	30-299 mg/g 3-29 mg/mmol	Severely increased	>300 mg/g >30 mg/mmol
	G2	Mildly decreased	60-89	Green	Yellow	Orange	Red	Dark Red	
	G3a	Mildly to moderately decreased	45-59	Yellow	Orange	Red	Dark Red	Very Dark Red	
	G3b	Moderately to severely decreased	30-44	Orange	Red	Dark Red	Very Dark Red	Black	
	G4	Severely decreased	15-29	Red	Dark Red	Very Dark Red	Black	Black	
G5	Kidney failure	<15	Dark Red	Very Dark Red	Black	Black	Black	Black	

Green: low risk (if no other markers of kidney disease, no CKD); Yellow: moderately increased risk; Orange: high risk; Red, very high risk. KDIGO 2012



Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. Kidney Int Suppl 2013;11-150.

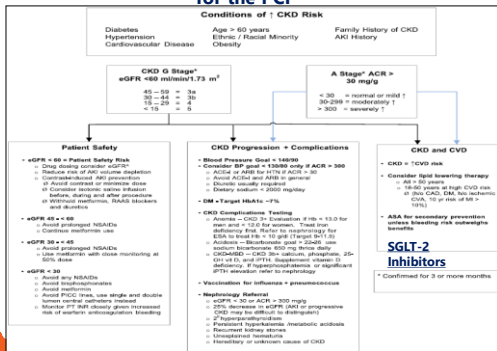
27

CKD PCP Management



28

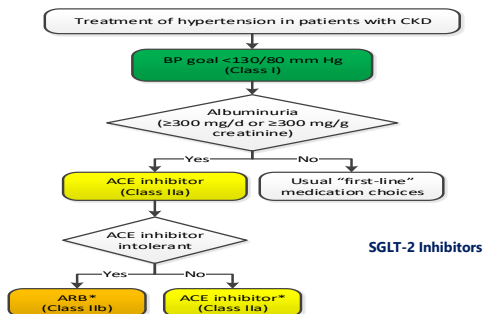
Practical Approach to the Detection and Management of CKD for the PCP



Vassilotti J, et al. National Kidney Foundation Kidney Disease Outcome Quality Initiative (NKF-KDOQI). Practical Approach to Detection and Management of Chronic Kidney Disease for the Primary Care Clinician. *Am J Med.* 2016;129:153-162. <http://www.ama-assn.org/donors/ckid/ckid15080831.asp>

29

Management of Hypertension in Patients With CKD



*Colors correspond to Class of Recommendation in Table 1.
 *CKD stage 3 or higher or stage 1 or 2 with albuminuria ≥300 mg/d or ≥300 mg/g creatinine.
 *ACE indicates angiotensin-converting enzyme; ARB, angiotensin receptor blocker; BP, blood pressure; and CKD, chronic kidney disease.

30

Slowing CKD Progression: ACEi or ARB

Attenuating Proteinuria

- Risk/benefit should be carefully assessed in the elderly and medically fragile.
- Check labs 2 weeks after initiation.
 - If less than 25% SCr increase, continue and monitor.
 - If more than 25% SCr increase, stop ACEi and evaluate for RAS and volume contraction.
- Proteinuria suppression augmented with low Na diet and diuretics.
- Avoid volume depletion.
- **Avoid ACEi and ARB in combination.**^{1,2}
 - Risk of adverse events (impaired kidney function, hyperkalemia).



1) Kunz R, et al. *Ann Intern Med.* 2008;148:30-48.
 2) Mann J, et al. ONTARGET study. *Lancet.* 2008;372:547-553.

31

Goals of Care in CKD: Glucose Control

- Target HbA1c ~7.0%.
- Can be extended above 7.0% with comorbidities or limited life expectancy, and risk of hypoglycemia.
- Risk of hypoglycemia increases as kidney function becomes impaired.
- Declining kidney function may necessitate changes to diabetes medications that are renally excreted.



NKF KDQOL Diabetes and CKD. 2012 Update. *Am J Kidney Dis.* 2012;60:850-856.

32

SGLT2 inhibitors

- Act by blocking reabsorption of glucose in the proximal tubule and leads to substantial glycosuria.
- Blocking the SGLT2 cotransporter, they reduce sodium reabsorption. The resulting natriuresis reduces intravascular volume and blood pressure,
- Increased sodium delivery to the macula densa normalizes tubulo-glomerular feedback and thereby reduces intraglomerular pressure (ie, reduces glomerular hyperfiltration) through constriction of the abnormally dilated afferent arteriole
- DM-2
- HTN
- CAD/CHF-Mortality
- Proteinuria ,CKD
- **Note -gfr >25 ml/min.**



33

Modification of Other CVD Risk Factors in CKD

- Smoking cessation
- Exercise
- Weight reduction to optimal targets.
- Lipid lowering therapy.(Statins/Ezetimibe)
- Aspirin is indicated for secondary, but not primary prevention.



Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. *Kidney Int Suppl.* 2013;3:1-150.

34

Detect and Manage CKD Complications



35

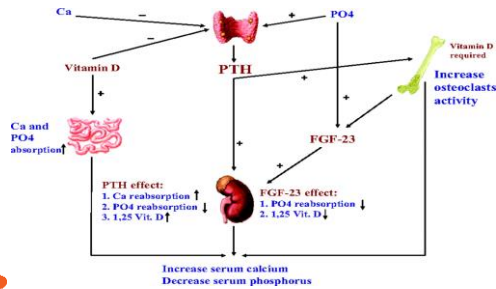
Anemia of CKD

- Predominantly in CKD-4/5/ESRD patients
- Initiate iron therapy if TSAT \leq 30% and ferritin \leq 500 ng/mL (IV iron for dialysis, oral for non-dialysis CKD).
- **Individualize erythropoiesis stimulating agent (ESA) therapy:**
 - **1.** Start ESA if Hb <10 g/dl, and maintain Hb <11.5 g/dl.
 - 2.Ensure adequate Fe stores.
 - 3.Ensure no contraindications: malignancy uncontrolled hypertension, acute thrombosis, CVA,MI,DVT etc...



36

CKD-Mineral and Bone Disorder (CKD-MBD)



37

CKD-Mineral and Bone Disorder (CKD-MBD)

- o Treat with D3 as indicated to achieve normal serum levels.
- o 2000 IU po daily is cheaper and better absorbed than 50,000 IU monthly dose.
- o Limit phosphorus in diet (CKD stage 3/5), with emphasis on decreasing packaged products
- o May need phosphate binders, if hyperphosphatemia persists with dietary restriction.



38

Metabolic Acidosis & Hyperkalemia

- Metabolic acidosis
 - o Usually occurs later in CKD.
 - o Serum bicarbonate >22mEq/L.
 - o Correction of metabolic acidosis may slow CKD progression and improve patients functional status.^{1,2}
- Hyperkalemia
 - o Reduce dietary potassium.
 - o Stop NSAIDs, COX-2 inhibitors.
 - o Stop or reduce dose of beta blockers.
 - o Avoid salt substitutes that contain potassium.
 - o Novel therapies available now.(patiomer, ZS-9)



1) Mahajan, et al. *Kidney Int.* 2010;78:303-309.
 2) de Brito-Ashurst L, et al. *J Am Soc Nephrol.* 2009;20:2075-2084.

39

A Balanced Approach to Nutrition in CKD:
Macronutrient Composition and Mineral Content*

Nutrient	Stage of CKD		
	1-2	1-4	3-4
Sodium (g/d)		<2.3	
Total fat (% of calories)		<30	
Saturated fat (% of calories)		<10	
Cholesterol (mg/d)		<200	
Carbohydrate (% of calories)		50-60	
Protein (g/kg/d, % of calories)			
No diabetes	1.4 (-18)		0.6-0.8 (-8-10)
Diabetes	0.8 (-10)		0.6-0.8 (-8-10)
Phosphorus (g/d)	1.7		0.8-1.0
Potassium (g/d)	>4		2.4

Adapted from DASH (dietary approaches to stop hypertension) diet.
*Adjust so total calories from protein, fat, and carbohydrate are 100%. Emphasize such whole-food sources as fresh vegetables, whole grains, nuts, legumes, low-fat or nonfat dairy products, canola oil, olive oil, cold-water fish, and poultry.

Whole Plant based protein



¹(CKD Stages 1-4)
NKF KDOQI. *Am J Kidney Dis.* 2007;49(suppl 2):S1-S179.

40

What Can Primary Care Practitioners
Do?

- Recognize and test at-risk patients.
- Educate patients about CKD and treatment.
- Manage blood pressure and diabetes.
- Address other CVD risk factors.
- Monitor eGFR and ACR



41

What Can Primary Care Practitioners
Do?

- Consult, refer or team with a nephrologist (co-management).
- Co-manage anemia, malnutrition, CKD-MBD, and other complications in at-risk patients with the Nephrologist.
- Refer to dietitian for nutritional guidance.
- Consider patient safety issues in CKD.



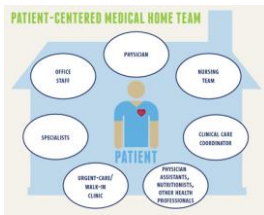
42

Co-Management, Patient Safety, and Nephrology Referral



43

Co-Management Model

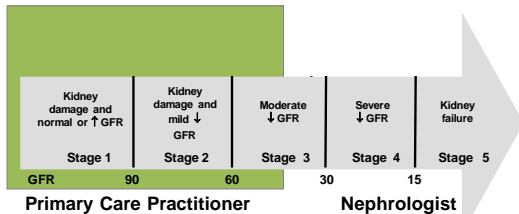


- Collaborative care
 - Formal arrangement
 - Curbside consult
- Care coordination
- Clinical decision support
- Population health
 - Development of treatment protocols



44

Who Should be Involved in the Patient Safety Approach to CKD?

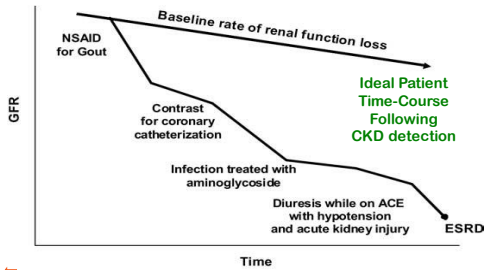


Patient safety
The Patient (always)
and other subspecialists (as needed)



45

Impact of Primary Care CKD Detection with a Patient Safety Approach



Improved diagnosis creates opportunity for strategic preservation of kidney function. Fink et al. *Am J Kidney Dis*. 2009;53:681-668

46

CKD Patient Safety Issues

- **Medication errors**
 - Toxicity (nephrologic or other)
 - Improper dosing
 - Inadequate monitoring
 - NSAID's
- **Electrolytes**
 - Hyperkalemia
 - Hypoglycemia
 - Hypermagnesemia
 - Hyperphosphatemia
- **Miscellaneous**
 - Arm preservation/dialysis access
 - AVOID PICC lines in advanced CKD & ESRD.



Fink JC, Brown J, Hsu, VD, et al. *Am J Kidney Dis* 2009;53:681-668.

47

CKD Patient Safety Issues

- **Diagnostic tests**
 - Iodinated contrast media: AKI
 - Gadolinium-based contrast: Nephrogenic systemic fibrosis (NSF)
 - Sodium Phosphate bowel preparations: AKI, CKD
- **CVD**
 - Missed diagnosis
 - Improper management
- **Fluid management**
 - Hypotension
 - AKI
 - CHF exacerbation



AKI = acute kidney injury; CHF = congestive heart failure; NSF = nephrogenic systemic fibrosis. Fink JC, Brown J, Hsu, VD, et al. *Am J Kidney Dis* 2009;53:681-668.

48

Common Medications Requiring Dose Reduction in CKD

- Allopurinol
- Gabapentin
 - CKD 4- Max dose 300mg qd
 - CKD 5- Max dose 300mg qod
- Reglan
 - Reduce 50% for eGFR < 40
 - Can cause irreversible EPS with chronic use
- Narcotics
 - Methadone and fentanyl best for ESRD patients
 - Lowest risk of toxic metabolites
- Renally cleared beta blockers
 - Atenolol, bisoprolol, nadolol
- Digoxin
- Some Statins & Fibrates
 - Lovastatin, pravastatin, simvastatin, Fluvastatin, rosuvastatin
- Antimicrobials
 - Antifungals, aminoglycosides, Bactrim, Macrobid
- Enoxaparin
- Methotrexate
- Colchicine



49

Key Points on Medications in CKD

- CKD patients at high risk for drug-related adverse events.
- Several classes of drugs renally eliminated.
- Consider kidney function and current eGFR (not just SCr) when prescribing meds.
- Remind CKD patients to avoid NSAIDs.
- Avoid bisphosphonates for eGFR < 30 mL/min/1.73m².
- Avoid GADOLINIUM for eGFR < 30 mL/min/1.73m².



50

Indications for Referral to Specialist Kidney Care Services for People with CKD

- Acute kidney injury or abrupt sustained fall in GFR
- GFR < 30 mL/min/1.73m² (GFR categories G4-G5) (**recommend referral < 60 mL/min GFR though**)
- Persistent albuminuria (ACR ≥ 300 mg/g)*
- Atypical Progression of CKD
- Urinary red cell casts, RBC more than 20 per HPF sustained and not readily explained. (**Gross hematuria –Urology referral first**)
- Hypertension refractory to treatment with 3 or more antihypertensive agents
- Persistent abnormalities of serum potassium
- Recurrent or extensive nephrolithiasis. (**Renal masses –Urology Referral**)
- Hereditary kidney disease



*Significant albuminuria is defined as ACR ≥ 300 mg/g (≥ 30 mg/mmol) or AER ≥ 300 mg/24 hours, approximately equivalent to PCR ≥ 300 mg/g (≥ 30 mg/mmol) or ER = 300 mg/24 hours
 **Progression of CKD is defined as one or more of the following: 1) A decline in GFR category accompanied by a 25% or greater drop in eGFR from baseline; and/or 2) rapid progression of CKD defined as a sustained decline in eGFR of more than 5mL/min/1.73m²/year.
 †KDIGO US Commentary on the 2012 KDIGO Evaluation and Management of CKD.

51

Observational Studies of Early vs. Late Nephrology Consultation

Table 36 | Outcomes of early versus late referral

Variable	Early referral mean (SD)	Late referral mean (SD)	P value
Overall mortality, %	11 (3)	23 (4)	<0.0001
1-year mortality, %	13 (4)	29 (5)	0.028
Hospital length of stay, days	13.5 (2.2)	25.3 (3.8)	0.0007
Serum albumin at RRT start, g/dL (g/l)	3.62 (0.05) [36.2 (0.5)]	3.40 (0.03) [34.0 (0.3)]	0.001
Hematocrit at RRT start, %	30.54 (0.18)	29.71 (0.10)	0.013

Abbreviation: RRT, renal replacement therapy.
 Adapted from Am J Med. Chan MR, Dahl AT, Fletcher RE, et al¹⁷ Outcomes in patients with chronic kidney disease referred late to nephrologists: a meta-analysis. 120:1063-1070, 2007, with permission from Elsevier; accessed <http://download.journals.elsevierhealth.com/pdf/journals/0002-9343/P15500293430710664x.pdf>



Chan M, et al. *Am J Med.* 2007;120:1063-1070.
<http://download.journals.elsevierhealth.com/pdf/journals/0002-9343/P15500293430710664x.pdf>
 KDIGO CKD Work Group. *Kidney Int Suppl.* 2013;3:1-150.

52

Take Home Points

- Primary care providers play an important role.
- Identify risk factors.
- Know patient's GFR using appropriate screening tools.
- Help your patient adjust medication.
- Modify diet.
- Partner and refer to nephrologist.



53

Thank You

Questions ?

- **Additional Online Resources for CKD Learning**
- National Kidney Foundation: www.kidney.org
- United States Renal Data Service: www.usrds.org
- CDC's CKD Surveillance Project: <http://nccd.cdc.gov/ckd>
- National Kidney Disease Education Program (NKDEP): <http://nkdep.nih.gov>



54

Case Question 1

A 50-year-old Hispanic female was diagnosed with type 2 diabetes at age 30. She has taken medications as prescribed since diagnosis. The fact that she has confirmed diabetes puts this patient at:

- A. Higher risk for kidney failure and CVD
- B. Higher risk for kidney failure only
- C. Higher risk for CVD only
- D. None of the above



55

Case Question 2

A 42-year-old African American man with diabetic nephropathy and hypertension has a stable eGFR of 25 mL/min/1.73m². Observational studies of early as compared to late nephrology referral have demonstrated which of the following?

- A. Reduced 1-year Mortality
- B. Increase in Mean Hospital Days
- C. No change in serum albumin at the initiation of dialysis or kidney transplantation
- D. Decrease in hematocrit at the initiation of dialysis or kidney transplantation
- E. Delayed referral for kidney transplantation



56



END



57