

Definition of CKD

- Kidney damage for > 3 months with or without decreased GFR (e.g. increased proteinuria)
- GFR < 60 mL/min/1.73 m² for > 3 months

What is Glomerular Filtration Rate (GFR)?

- GFR is equal to the sum of the filtration rates in all of the functioning nephrons
- Estimation of the GFR gives a rough measure of the number of functioning nephrons
- GFR cannot be measured directly

Equations to Predict or Estimate GFR

Cockcroft-Gault

$$C_{Cr} = \frac{(140 - \text{age}) \times \text{weight (kg)}}{72 \times S_{Cr}} \times 0.85 \text{ if female}$$

MDRD

$$\text{GFR} = 186 \times (S_{Cr})^{-1.154} \times (\text{age})^{-0.203} \times (0.742 \text{ if female}) \times (1.210 \text{ if African American})$$

Understanding a Normal GFR

- Cardiac output = 6 L/min
- X 20% of CO goes to kidneys = 1.2L/min
- X Plasma is 50% blood volume = 600 ml/min
- X Filtration Fraction of 20% = 120 ml/min

At What Level of Creatinine Does a 65-Year-Old Diabetic, Hypertensive White Woman Weighing 50 Kilograms Have CKD?

77% said:

- Creatinine > 1.5 mg / dl

GFR = 37 mL/min/ 1.73 m²

C_{creat} = 30 mL/min

- Correct response: Creatinine = 1.0 for GFR = 59 mL/min/1.73 m²

Assessment of Proteinuria

- "Spot" specimens should be used. 24-hour collections usually not necessary
- First morning specimens preferred but random is acceptable
- Dipstick is semi-quantitative only

Urine Albumin/Creatinine Ratio (UACR)

- The ratio of albumin to creatinine in a spot urine specimen correlates closely, in adults, to total albumin excretion:

Albumin (mg/dl) = Albumin excretion in mg/24 h Creatinine (g/dl)

- However, generally expressed as mg albumin/g creatinine:
 - Normoalbuminuria < 30 mg/g
 - Micro-albuminuria 30-300 mg/g
 - Macro-albuminuria >300 mg/g

Yearly Screening for Kidney Disease

- Yearly creatinine with GFR
- Yearly determination of UACR
 - if dipstick negative screens for MA
 - if dipstick positive or known albuminuric, monitors albuminuria, a reflection of response to therapy

Early Treatment Makes a Difference

Brenner, et al., 2001

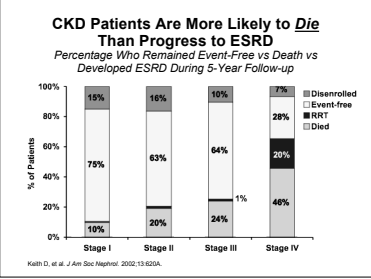
NKDEP **How to Treat for CKD**

- Maintain blood pressure less than 130/80 mmHg
- Use an ACE inhibitor or ARB
- More than one drug is usually required and a diuretic should be part of the regimen
- Continue best possible glycemc control in individuals with diabetes

NKDEP **How to Treat for CKD**

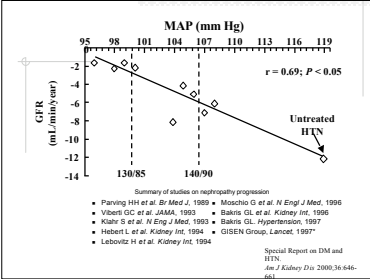
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- Refer to dietitian for a reduced protein diet
- Team with an interested health professional/nephrologist early
- If GFR<60, screen for anemia (Hgb), malnutrition (albumin), metabolic bone disease (Ca, Phos, PTH)
- Treat cardiovascular risk, especially smoking and hypercholesterolemia



NKDEP **Hypertension in CKD**

- Most (60-100%) of patients with CKD have HTN
- Prevalence of HTN is inversely related to renal function
- The relationship between HTN and CVD is well established. LVH is common in CKD
- Treatment of HTN preserves renal function



NKDEP **Benefit of Lowering Blood Pressure in Chronic Kidney Disease**

Blood Pressure	Loss of Kidney Function per Year	Years until Dialysis
160/100	12%	10 years
140/90	6%	20 years
130/85	3%	40 years