Chapter: 3
Chronic Kidney Disease

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What is CKD?

- Presence of markers of kidney damage for three months, as defined by structural or functional abnormalities of the kidney with or without decreased GFR, manifest by either pathological abnormalities or other markers of kidney damage, including abnormalities in the composition of blood or urine, or abnormalities in imaging tests.

- The presence of GFR <60 mL/min/1.73 m² for three months, with or without other signs of kidney damage as described above.
Stages of CKD

- **Stage 1*: GFR >= 90 mL/min/1.73 m²
  - Normal or elevated GFR

- **Stage 2*: GFR 60-89 (mild)

- **Stage 3: GFR 30-59 (moderate)

- **Stage 4: GFR 15-29 (severe; pre-HD)

- **Stage 5: GFR < 15 (kidney failure)
Other etiologies

- Renovascular disease
- Glomerulonephritis
- Nephrotic syndrome
- Hypercalcemia
- Multiple myeloma
- Chronic UTI
Signs & Symptoms

- General
  - Fatigue & malaise
  - Edema
- Ophthalmologic
  - AV nicking
- Cardiac
  - HTN
  - Heart failure
  - Pericarditis
  - CAD
- GI
  - Anorexia
  - Nausea/vomiting
  - Dysgeusia
- Skin
  - Pruritis
  - Pallor
- Neurological
  - MS changes
  - Seizures
Hypertension

- **Target BP**
  - <130/80 mm Hg
  - <125/75 mm Hg
    - pts with proteinuria (> 1 g/d)

- Consider several anti-HTN medications with different mechanisms of activity
  - ACEs/ARBs
  - Diuretics
  - CCBs
  - HCTZ (less effective when GFR < 20)
Proteinuria

- Single best predictor of disease progression

- Normal albumin excretion
  - <30 mg/24 hours

- Microalbuminuria
  - 20-200 µg/min or 30-300 mg/24 hours

- Macroalbuminuria
  - >300 mg/24 hours

- Nephrotic range proteinuria
  - >3 g/24 hours
Evaluation for CKD

- **Blood**
  - CBC with diff
  - SMA-7 with Ca\(^{2+}\) and phosphorous
  - PTH
  - HBA\(_{1c}\)
  - LFTs and FLP
  - Uric acid and Fe\(^{2+}\) studies

- **Urine**
  - Urinalysis with microscopy
  - Spot urine for microalbumin
  - 24-urine collection for protein and creatinine

- **Ultrasound**
Metabolic changes with CKD

- Hemoglobin/hematocrit ↓
- Bicarbonate ↓
- Calcium ↓
- Phosphate ↑
- PTH ↑
- Triglycerides ↑
Anemia

- Common in CKD
- HD pts have increased rates of:
  - Hospital admission
  - CAD/LVH
  - Reduced quality of life
- Can improve energy levels, sleep, cognitive function, and quality of life in HD pts
Metabolic changes...

- Monitor and treat biochemical abnormalities
  - Anemia
  - Metabolic acidosis
  - Mineral metabolism
  - Dyslipidemia
  - Nutrition
Treating Anemia

- **Epoetin alfa (rHuEPO; Epogen/Procrit)**
  - HD: 50-100 U/kg IV/SC 3x/wk
  - Non-HD: 10,000 U qwk

- **Darbepoetin alfa (Aranesp)**
  - HD: 0.45 μg/kg IV/SC qwk
  - Non-HD: 60 μg SC q2wks
Metabolic acidosis

- Muscle catabolism
- Metabolic bone disease

- Sodium bicarbonate
  - Maintain serum bicarbonate > 22 meq/L
  - 0.5-1.0 meq/kg per day
  - Watch for sodium loading
    - Volume expansion
    - HTN
Mineral metabolism

- Calcium and phosphate metabolism abnormalities associated with:
  - Renal osteodystrophy
  - Calciphylaxis and vascular calcification

- 14 of 16 ESRD/HD pts (20-30 yrs) had calcification on CT scan
- 3 of 60 in the control group
Dyslipidemia

- Abnormalities in the lipid profile
  - Triglycerides
  - Total cholesterol
- NCEP recommends reducing lipid levels in high-risk populations
- Targets for lipid-lowering therapy considered the same as those for the secondary prevention of CV disease
Nutrition

- Think about uremia
  - Catabolic state
  - Anorexia
  - Decreased protein intake

- Consider assistance with a renal dietician
Management

- Identify and treat factors associated with progression of CKD
  - HTN
  - Proteinuria
  - Glucose control