Awareness of Chronic Kidney Disease:
An Introductory Program for
Community Health Care Professionals

Nephrology Pharmacy Associates, Inc.
Outline

• Introduction
• Epidemiology and costs associated with CKD
• CKD screening and early referral
• National Kidney Foundation (NKF) Kidney Disease Outcomes Quality Interactive (KDOQI) clinical practice guidelines
• Risk factors and primary indicators for CKD
• Strategies for slowing the progression of CKD
• Common complications and comorbidities of CKD
• Medication-related problems, medication errors, and reduction of polypharmacy
• Role of the health care professional in Medication Therapy Management (MTM) programs
The Role of Healthcare Professionals in CKD

A Community Pharmacist’s Perspective
Provided by:
Susan Sutter, RPh
Marshland Pharmacies, Inc.
Burnett, WI
Community Pharmacists and CKD: The Next Opportunity for Improving Patient Care

- Pharmacists are an untapped public health resource
  - Frequency with which they see patients
  - Most accessible of health care providers
- Medications are central to the treatment and potential problems for patients with CKD
- Pharmacists have proven their value in helping to manage other related diseases such as diabetes, lipids, asthma

The Asheville Project, North Carolina Association of Pharmacists
http://www.ncpharmacists.org/displaycommon.cfm?an=1&subarticlenbr=41#Anchor-Asheville-35882
Community Health Care Professionals: Their Role in CKD

• Screen for patients, with the use of the medication profile, for patients at risk
• Suggest dosage adjustments in prescribed medications based on patient’s renal function
• Monitor compliance with medication therapies to delay progression
• Help achieve clinical outcome goals through MTM programs
• Educate to increase awareness of CKD
Multidisciplinary Care Teams Save Lives

- MDC = nephrologist, nurse educator, nutritionist and pharmacist.
- Standard care = nephrologist and multi-disciplinary nurses.

Curtis BM et al. NDT 2005; 20: 147-54.
Epidemiology and Costs Associated with CKD
Definition of CKD

- Kidney damage for ≥3 months, as defined by structural or functional abnormalities of the kidney, with or without decreased glomerular filtration rate (GFR), manifest by either:
  - Pathological abnormalities
  - Markers of kidney damage, including abnormalities in the composition of the blood or urine, or abnormalities in imaging tests
- GFR <60 mL/min/1.73m² for ≥3 months, with or without kidney damage

GFR = glomerular filtration rate

Epidemiology of CKD

<table>
<thead>
<tr>
<th>Stage</th>
<th>GFR (ml/min/1.73m²)</th>
<th>ESRD</th>
<th>ICD-9 codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>&lt;15 or dialysis</td>
<td></td>
<td>585.5 or 585.6</td>
</tr>
<tr>
<td>4</td>
<td>15-29</td>
<td></td>
<td>585.4</td>
</tr>
<tr>
<td>3</td>
<td>30-59</td>
<td></td>
<td>585.3</td>
</tr>
<tr>
<td>2</td>
<td>60-89</td>
<td></td>
<td>585.2</td>
</tr>
<tr>
<td>1</td>
<td>≥90</td>
<td></td>
<td>585.1</td>
</tr>
</tbody>
</table>

CKD is a Major Public Health Issue

<table>
<thead>
<tr>
<th>Stage</th>
<th>GFR (ml/min/1.73m²)</th>
<th>Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>&lt;15 or dialysis</td>
<td>400,000 pts</td>
</tr>
<tr>
<td>4</td>
<td>15-29</td>
<td>400,000 pts</td>
</tr>
<tr>
<td>3</td>
<td>30-59</td>
<td>7,600,000 pts</td>
</tr>
<tr>
<td>2</td>
<td>60-89</td>
<td>5,300,000 pts</td>
</tr>
<tr>
<td>1</td>
<td>≥90</td>
<td>5,900,000 pts</td>
</tr>
</tbody>
</table>

Total = 20 million pts

Epidemiology of Stage 5 CKD

- Prevalence of new dialysis patients is growing by 6-10% per year

- Diabetes 50%
- Hypertension 27%
- GN 12%
- Other 10%

USRDS ADR 2005
Per person per year costs of ESRD

EGHP = employer group health plan
USRDS ADR 2005

EGHP ($72,450)
Medicare ($54,904)
Patient costs for diseases versus CKD & ESRD

CKD Screening and Early Referral
Kidney Early Evaluation Program

- Free screening program offered by National Kidney Foundation (NKF) for people at increased risk of developing CKD:
  - Diabetes
  - High blood pressure
  - Parent, grandparent, brother or sister with diabetes, hypertension or CKD
- Goals:
  - Raise awareness about CKD especially among “high risk” people
  - Provide free testing for people at increased risk
  - Encourage people “at risk” to visit a doctor and follow a treatment plan
  - Provide education so that “at risk” people can prevent or delay CKD
  - Provide doctor referrals for follow-up care
  - Provide ongoing information and support
What Happens at a KEEP Screening?

• Blood pressure and weight measurements
• Blood and urine tests for signs of diabetes and CKD, including
  – Blood glucose
  – Hemoglobin
  – Urine dipstick test for microalbumin
  – Urine dipstick test for hematuria
  – Albumin to creatinine ratio
  – Serum creatinine
  – Estimated GFR
KEEP Process

KEEP screening

Test results

Referral to PCP

Follow-up forms to NKF

52% of KEEP participants have CKD, with 35% stage 1-2, 17% stage > 3

KEEP n=22,846, with total CKD n=11,835 after excluding participants with missing values for CKD stage.
NHANES III n=15,853, NHANES 1999-2000 n=4,568
KEEP 2004 ADR
Community screening for CKD is important

- Traditionally isolated SCr values were used:
  - However, SCr has a nonlinear correlation with kidney function
- Estimations of GFR are more convenient than measurements
  - MDRD recommended for staging of CKD and monitoring progression or response to therapy
  - Cockcroft-Gault recommended for calculation of drug dosing
- Screening vital for individuals at “high risk”. Those with…
  - Diabetes
  - High blood pressure
  - Parent, grandparent, brother or sister with diabetes, hypertension or CKD
Mission of KDOQI

• Define “best practices” to enable health professionals to intervene early, at a time when their efforts will have the greatest outcomes for improving the survival and quality of life of individuals with CKD.
• Develop nationally (and internationally) accepted clinical practice guidelines for nephrology.
Risk Factors and Primary Indicators for CKD
Risk Factors for CKD

- **Susceptibility factors**
  - Advanced age
  - Racial/ethnic minority
  - Family history
  - Low income or education

- **Initiators**
  - Diabetes
  - Hypertension
  - Glomerular Diseases

- **Progression factors**
  - Hyperglycemia
  - Hypertension
  - Proteinuria
  - Smoking
# Individuals at Increased Risk for CKD

<table>
<thead>
<tr>
<th>Disease or condition</th>
<th>Prevalence (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes mellitus</td>
<td></td>
</tr>
<tr>
<td>Diagnosed in adults ≥ 20 yrs</td>
<td>10.2</td>
</tr>
<tr>
<td>Undiagnosed in adults ≥ 20 yrs</td>
<td>5.4</td>
</tr>
<tr>
<td>Hypertension in adults ≥ 20 yrs</td>
<td>43.1</td>
</tr>
<tr>
<td>Functioning kidney graft</td>
<td>0.09</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
</tr>
<tr>
<td>African-American</td>
<td>34.7</td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>35.3</td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>60–70 yrs</td>
<td>20.3</td>
</tr>
<tr>
<td>≥ 70 yrs</td>
<td>25.5</td>
</tr>
</tbody>
</table>

KDOQI. Am J Kidney Dis 2002; 39: S1-S266
Strategies for Slowing the Progression of CKD
Delaying Progression of CKD

• Early detection delays progression
  – Screening high risk patients imperative
• Early treatment reduces associated complications and adverse outcomes
• Delay progression by:
  – Glucose control
  – Blood pressure control
  – Reduction of proteinuria
  – Correction of anemia
  – Lipid-lowering therapy
Complications and Comorbidities of CKD
Complications of CKD Start Early and Tend to Progress

**Complications**
- CVD, HTN, DM, Dyslipidemia, CV calcification
- Anemia, Decreased QOL
- Abnormal bone and mineral metabolism

Complications and Comorbidities of CKD

Cardiovascular Disease
Cardiovascular Mortality in the General Population & Dialysis Patients

Cardiovascular Disease is Multifactorial

- Hypertension
- Diabetes
- Acute Inflammation
- Dyslipidemia
- Age
- Homocysteine
- Advanced Glycation End-products
- Vascular calcification
- Abnormal Mineral Metabolism
- Anemia

Hypertension Develops Early and Progresses…

Recommended BP targets in CKD
- < 125/75 mm Hg if proteinuria > 1 g/d*
- < 130/85 mm Hg if proteinuria < 1 g/d

*Including diabetic nephropathy

…Yet, BP is Poorly Controlled

CKD patients receiving ACE inhibitors/ARBs, age 60 years and older

NHANES III 1988–1994 & NHANES 1999–2002 patients age 60 & older; patients with eGFRs of less than 15 ml/min/1.73 m² are excluded. *Sample size less than 30, or coefficient of variation is not less than 30 percent.

USRDS 2005 ADR
Patients with diabetes who receive glucose-lowering agents, age 60 years and older

NHANES III 1988–1994 & NHANES 1999–2002 patients age 60 & older; patients with eGFRs of less than 15 ml/min/1.73 m² are excluded. *Sample size less than 30, or coefficient of variation is not less than 30 percent.

USRDS 2005 ADR
Relationship between Blood Pressure and Decline in GFR

Summary of studies on nephropathy progression used in figure
- Viberti GC et al. JAMA, 1993
- Bakris GL. Hypertension, 1997
- GISEN Group, Lancet, 1997*

Question: Why is 130/80 mmHg better than 140 mmHg in CKD?

• Compared to BP control of 140/90, does this level of BP control slow progressive renal disease…
  A. 25%
  B. 40%
  C. 50%
  D. 65%
So What Does a 65% Reduction Mean?

• A 35 yo female with CKD and a serum creatinine of 1.5 mg/dl (CrCl = 60 ml/min).

Approximately, when will she require dialysis?

<table>
<thead>
<tr>
<th>Blood Pressure</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>130/80</td>
<td>25 years</td>
</tr>
<tr>
<td>140/90</td>
<td>8 - 9 years</td>
</tr>
<tr>
<td>150/100</td>
<td>5 years</td>
</tr>
</tbody>
</table>

• Time to dialysis depends on how well BP is controlled! It can be delayed by tight control.
### Preferred HTN Agents in CKD

<table>
<thead>
<tr>
<th>Type of Kidney Disease</th>
<th>Preferred Agent, with or without HTN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetic</td>
<td>ACE Inhibitor or ARB</td>
</tr>
<tr>
<td>Non-Diabetic</td>
<td></td>
</tr>
<tr>
<td>• High protein excretion</td>
<td>ACE Inhibitor or ARB</td>
</tr>
<tr>
<td>• Low protein excretion</td>
<td>None preferred</td>
</tr>
<tr>
<td>Transplant</td>
<td>None preferred</td>
</tr>
</tbody>
</table>

### Compelling Indications for HTN Agents

<table>
<thead>
<tr>
<th>CVD Type</th>
<th>Thiazide or Loop Diuretics</th>
<th>ACEI or ARB</th>
<th>Beta-Blocker</th>
<th>CCB</th>
<th>Aldosterone Antagonist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Failure with Systolic Dysfunction</td>
<td>X</td>
<td>X</td>
<td>$X^a$</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Post MI with Systolic Dysfunction</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Post MI</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chronic Stable Angina</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>High Risk CAD</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Recurrent Stroke Prevention</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supraventricular Tachycardia</td>
<td></td>
<td></td>
<td>X</td>
<td>$X^b$</td>
<td></td>
</tr>
</tbody>
</table>

$X^a$ = carvedilol, bisoprolol, metoprolol succinate  
$X^b$ = non-dihydropyridine CCB

Smoking and CKD

- Dose dependent risk
- Diabetic women at particular risk
- 20 year smoking history
  - Men have 2.4 times CKD risk
  - Women have 2.9 times CKD risk

Complications and Comorbidities

Diabetes
Progression of CKD and Diabetes

GFR (mL/min/1.73 m²) vs Years

Hyperfiltration
Clinical nephropathy
Clinical nephropathy
Renal replacement therapy
Microalbuminuria

Urinary Albumin (g/d)

0 3 6 9 12 15 18 21 24 27

• Early and routine screening for protein in the urine is important

Diabetes Outcomes

• Cardiovascular
  – DM Type 1
    HR = 1.15 for every 1% increase in A1C
  – DM Type 2
    HR = 1.18 for every 1% increase in A1C

“Three-fourths of patients with diabetes die from cardiovascular causes, as opposed to one-third of the general population.”

HR = hazard ratio

Steno-2 Study

160 Type 2 DM Subjects With Microalbuminuria

- HbA1c <6.5%
- TC <175 mg/dL
- TG <150 mg/dL
- SBP <130 mm Hg
- DBP <80 mm Hg

Intensive Rx vs. Conventional Rx

Percent

From the Steno Diabetes Center, Copenhagen

Steno-2 Study: Reduction in CV and Microvascular Disease

Relative Risk Reductions After 7.8 Years of Intensive vs Conventional Rx

- Cardiovascular disease: -50
- Nephropathy:
- Retinopathy: -40
- Autonomic neuropathy: -30

Complications and Comorbidities

Bone and Mineral Metabolism Abnormalities
Bone and Mineral Metabolism Abnormalities Starts Early and Progresses

### KDOQI Targets for Bone Disease Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Target CKD Stage 3-4</th>
<th>Target CKD Stage 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum P (mg/dl)</td>
<td>2.7-4.6</td>
<td>3.5-5.5</td>
</tr>
<tr>
<td>Corrected serum Calcium (mg/dl)</td>
<td>Normal range for laboratory used</td>
<td>8.4-9.5</td>
</tr>
<tr>
<td>Ca x P product (mg²/dl²)</td>
<td>&lt;55</td>
<td>&lt;55</td>
</tr>
<tr>
<td>Intact PTH (pg/ml)</td>
<td>Stage 3: 35-70</td>
<td>150-300</td>
</tr>
<tr>
<td></td>
<td>Stage 4: 70-110</td>
<td></td>
</tr>
</tbody>
</table>
Bone & Mineral Metabolism Abnormalities

- Clinical Findings:
  - Bone pain and fractures
  - Pain and swelling in and around joints
  - Muscle weakness
  - Soft tissue calcification
  - Pruritis
  - Left ventricular hypertrophy
  - Anemia

# Phosphate Binder Comparison

<table>
<thead>
<tr>
<th>Binder</th>
<th>Place in therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium carbonate</td>
<td>Those NOT at risk of hypercalcemia, or those with Ca$$^++$$ ≤ 9.5 mg/dL</td>
</tr>
<tr>
<td>Calcium acetate</td>
<td></td>
</tr>
<tr>
<td>Aluminum</td>
<td>Short term use &lt; 4 weeks for PO$_4$ &gt; 7mg/dL due to adverse effects</td>
</tr>
<tr>
<td>Lanthanum</td>
<td>Unknown??</td>
</tr>
<tr>
<td></td>
<td>In place of Al$$^{+++}$$??</td>
</tr>
<tr>
<td>Sevelamer</td>
<td>Used in patients at risk for vascular calcification, or iPTH &lt; 150 pg/mL</td>
</tr>
</tbody>
</table>
# Vitamin D Analogs and Cinacalcet

<table>
<thead>
<tr>
<th>Agent</th>
<th>Place in therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcitriol (vitamin D₃)</td>
<td>CKD stage 3-4 = oral</td>
</tr>
<tr>
<td></td>
<td>CKD stage 5 = intravenous</td>
</tr>
<tr>
<td></td>
<td>Concerns: Hypercalcemia</td>
</tr>
<tr>
<td>Paricalcitol (vitamin D₂ analogue)</td>
<td>Hyperphosphatemia</td>
</tr>
<tr>
<td>Doxercalciferol (vitamin D₂ analogue)</td>
<td>Elevated Ca x PO₄ product</td>
</tr>
<tr>
<td>Cinacalcet (calcimimetic agent)</td>
<td>Elevated PTH (&gt; 150 pg/mL)</td>
</tr>
<tr>
<td></td>
<td>Concerns: hypocalcemia (&lt; 8.4 mg/dL)</td>
</tr>
<tr>
<td></td>
<td>seizure disorder</td>
</tr>
<tr>
<td></td>
<td>drug interactions</td>
</tr>
</tbody>
</table>
Complications and Comorbidities

Anemia
Anemia is very prevalent in CKD… ...and in ESRD is associated with poor outcomes.

Overall RR mortality: 0.95 per 1g/dL Hgb increase (p=0.003)
Overall RR hosp.: 0.94 per 1g/dL Hgb increase (p=0.0001)

*Keane WF. Kidney Int. 2003; 63:1499-1507 (Hgb < 12)
**USRDS 2003 ADR (Hgb < 11)
Anemia Consequences in CKD

• Left ventricular hypertrophy (LVH)
• Precipitating factor for CHF
• Exacerbation of angina
• Reductions in
  – Aerobic capacity
  – Overall well being
  – Sexual function
  – Cognition

<table>
<thead>
<tr>
<th>Agent</th>
<th>Place in therapy</th>
</tr>
</thead>
</table>
| **Erythropoiesis Stimulating Agents (ESAs)**  
  Epoetin alfa (rHuEPO)  
  Darbepoetin alfa | Hemoglobin < 11 g/dL  
  Concerns:  
  iron depletion  
  hypertension |
| **Iron Therapy**  
  **IV Iron**  
  Sodium ferric gluconate complex (SFGC)  
  Iron Sucrose  
  Iron Dextran | Hemodialysis  
  TSAT > 20% or CHr > 29 pg/cell  
  Ferritin > 200 ng/ml  
  CKD and Peritoneal Dialysis  
  TSAT > 20%  
  Ferritin > 100 ng/ml  
  Concerns:  
  Adverse side effects |
| **Oral Iron**  
  Various | |

Anemia Therapy

- **Erythropoiesis Stimulating Agents (ESAs)**
  - Epoetin alfa (rHuEPO)
    - Epogen™
    - Procrit™
  - Darbepoetin alfa
    - Aranesp™

- **Iron Therapy**
  - IV Iron
    - Sodium Ferric Gluconate Complex (Ferrlecit®)
    - Iron Sucrose (Venofer®)
    - Iron Dextran (InFed®, Dexferrum®)
  - Oral Iron
    - Various
    - 200 mg elemental Fe per day
## KDOQI Anemia Parameter Targets

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>hemoglobin (g/dl)</td>
<td>11-13</td>
</tr>
<tr>
<td>Serum ferritin (SF, ng/ml), transferrin saturation (Tsat, %) and reticulocyte hemoglobin content (CHr, pg/cell)</td>
<td>Hemodialysis: SF &gt; 200 and [Tsat &gt; 20 or CHr &gt;29] Peritoneal dialysis and CKD: SF &gt; 100 and Tsat &gt;20</td>
</tr>
</tbody>
</table>
Medication Related Problems (MRPs), Medication Errors, and Reduction in Polypharmacy
Medication Related Problem

Definition

“any aspect of a patient’s drug therapy that is interfering with a desired, positive patient outcome.”

MRP Categories

- Medical indication without drug treatment
- Failure to receive drug
- Under-dose
- Over-dose
- Inappropriate laboratory follow up
- Drug use without medical indication
- Adverse Drug Reaction
- Drug interaction
- Wrong drug

Factors Associated with MRP: CKD

- ≥ 3 concurrent disease states
- Medication regimen changes ≥ 4 times/year
- ≥ 5 medications in regimen
- ≥ 12 medication doses/day
- History of noncompliance
- Presence of drugs requiring therapeutic monitoring
- Diabetes
- Inaccurate records
Identification of CKD Using the Rx Profile

Role of the Health Care Professional in MTM Programs
MMA 2003

“… prescription drug plans [PDPs] and Medicare Advantage plans will be required to have continuous quality improvement programs such as MTM programs to optimize use of prescription drugs, improve outcomes and reduce adverse drug interactions”

MTM According to CMS

- Directed at patients who:
  - Have multiple chronic conditions (such as asthma, DM, HTN, high cholesterol and CHF)
  - Are taking multiple medications
  - Are likely to have high drug expenses
  
  “…should be coordinated with other chronic care management and disease management programs and developed in cooperation with pharmacists and physicians using a multidisciplinary approach.”

- Requirements for Qualifying for MTM
  - Targeted beneficiaries are enrollees in the sponsor’s Part D plan who:
    - Have multiple chronic diseases AND
    - Are taking multiple Part D drugs AND
    - Are likely to incur annual costs of > $4000 for all covered Part D drugs

What MTM is…

• Patient assessment and intervention

• Goal:
  To optimize the response to medications or to manage treatment-related medication interactions or complications

• Includes the following elements:
  – review of the pertinent patient history
  – medication profile review (prescription and OTC)
  – recommendations for improving outcomes and compliance
  – NOT to be used to describe the provision of product-specific information at the point of dispensing or any other routine dispensing-related activities
Role of the Health Care Professional

• Identify patients at risk
  – Medication review
    • Consider ACE inhibitor/ARBs
    • Consider appropriate diabetic medications
  – Number of medications
    • CKD 3-4: 6-8 medications
    • CKD 5: 10-12 medications
  – Common medications
    • Anemia (ESA and iron therapy)
    • Hypertension (2-4 medication classes)
    • Hyperlipidemia
    • Bone disease (phosphate binder, oral Vit D, cinacalcet)
  – Screen for “must avoid” medications
## 29 Drugs to Avoid in ESRD

<table>
<thead>
<tr>
<th>Category</th>
<th>Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analgesics</td>
<td>meperidine; ketorolac; choline + magnesium; baclofen</td>
</tr>
<tr>
<td>Antibacterials</td>
<td>Tetracyclines (demeclocycline; oxytetracycline; tetracycline) nitrofurantoin; methanamine</td>
</tr>
<tr>
<td>Antiviral</td>
<td>combination HIV meds (dosing); ribavirin</td>
</tr>
<tr>
<td>Blood Modifiers</td>
<td>anisidione; LMWHs</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>dofetilide; nicardipine IR</td>
</tr>
<tr>
<td>Diabetic Meds</td>
<td>metformin; 1&lt;sup&gt;st&lt;/sup&gt; generation sulfonylureas (acetohexamide, chlorpropamide; tolazimide; tolbutamide)</td>
</tr>
<tr>
<td>Diuretics</td>
<td>acetozolamide; amiloride; Thiazides as sole diuretic</td>
</tr>
<tr>
<td>Lipid lowering</td>
<td>fenofibrate</td>
</tr>
<tr>
<td>Other</td>
<td>acamprosate; sulcralfate; gallium; probenecid</td>
</tr>
</tbody>
</table>

ESRD Outpatient Medications Project

Issues to be considered during patient medication review

1. What medications are being taken?
2. What are the indications for the medications?
3. Does every indication have a medication, if appropriate?
4. Was the right medication prescribed?
5. Is the patient on the right medication dose?
6. Is the patient taking the medication?
7. Is there appropriate monitoring?
8. Are there any adverse drug events?
How to recognize a potential patient with CKD

• If you have no lab values
  – Hypertension
  – Diabetes
  – Family history of CKD
  – Recurrent urinary tract infections

• If you do have labs
  – Elevated SCr
  – Low GFR
  – Low hemoglobin (Hb)
  – Elevated BP
  – Low serum albumin
  – Elevated Hb A1C
  – Significant proteinuria, albuminuria
Useful websites for information

- American Association of Kidney Patients (AAKP)  
  http://www.aakp.org
- American Diabetes Association (ADA)  
  http://www.diabetes.org/home.jsp
- ESRD Outpatient Medications Project  
- Kidney Disease Outcomes Quality Initiative practice guidelines (KDOQI)  
  http://www.kidneydrugcoverage.org
- Kidney Drug Coverage  
  http://www.kidneydrugcoverage.org
- Kidney Early Evaluation Program (KEEP)  
- National Health and Nutrition Examination Survey  
  http://www.cdc.gov/nchs/nhanes.htm
- MDRD calculator  
  http://www.nkdep.nih.gov/professionals/gfr_calculators/mdrd.htm
- National kidney Foundation (NKF)  
  http://www.kidney.org
- National Kidney Disease Education Program (NKDEP)  
  http://www.nkdep.nih.gov
- Nephrology Pharmacy Associates, Inc. (NPA)  
  http://nephrologypharmacy.com
- United States Renal Data System (USRDS)  
  http://www.usrds.org
Summary

• CKD is common, under recognized and under treated.
• Appropriate screening can identify patients at risk and facilitate early treatment.
• KDOQI CPGs recommend optimal management strategies.
• Complications are common, start early, and progress as CKD progresses.
• CKD patients at high risk for MRPs.
• Health care professions can identify CKD patients by risk factors and medication profiles.
Thank you for participating in this program. Please return to the Main Menu to access the Post-Test.