Connection Between Kidney Disease and Heart Disease
Chronic Kidney Disease (CKD) as a Public Health Issue

- 26 million American affected
- Prevalence is 11-13% of adult population in the US
- 28% of Medicare budget in 2013, up from 6.9% in 1993
- $42 billion in 2013
- Increases risk for all-cause mortality, cardiovascular mortality, kidney failure (ESRD), and other adverse outcomes
- 6-fold increase in mortality rate with diabetes+ CKD
- Disproportionately affects African Americans and Hispanics

ESRD, end stage renal disease
The global burden of CKD is greatest in developing countries and in the poor

Territories are sized in proportion to the absolute number of people who die of CKD each year.

Even within countries, burden of CKD is concentrated among the poorest.

Renal replacement is available only to a wealthy few.

White et al, WHO Bull 2008; Nugent et al, NCP 2011
ESRD is increasingly common worldwide

Frequency of ESRD

1990: 426,000
2000: 1,490,000
2010: 2,500,000

Lysaght, J Am Soc Nephrol, 2002
Most people affected by CKD are unaware

- NHANES 1988-94 and 1999-2000 surveys in the US general population (19,589); Adults aged 20 years and older;
- China National Survey of Chronic Kidney Disease; Adults aged 18 years and older;
- Self-reported awareness of CKD
- Awareness of CKD is even lower in developing countries

Detecting CKD is cheap and efficient

• Kidney function (eGFR) estimated using simple equations applied to results of blood test (serum creatinine; $0.75)

• Albuminuria detected using semi-quantitative urine dipstick ($0.02) or quantitative urine albumin:creatinine ratio ($2.50)

• Consistent presence of low eGFR or abnormal albuminuria indicates presence of CKD

NKF-K/DOQI, 2002
The people to test are those at greatest risk

- Diabetes mellitus
- Hypertension
- Cardiovascular disease
- Family members of patients with ESRD

Note on pediatric patients:
- CKD may start with childhood obesity
- No recommendations for routine testing
CKD is less common in children but there are risk factors

- Family history of polycystic kidney disease or other genetic kidney disease
- Renal dysplasia or hypoplasia
- Urologic disorders—especially obstructive uropathies

Hogg, et al., 2003
Chronic Kidney Disease (CKD) Risk Factors

Changeable
- Diabetes
- Hypertension
- History of acute kidney injury
- Frequent NSAID use (pain relief drugs, like aspirin or Aleve)
- Smoking

Not changeable
- Family history of kidney disease, diabetes, or hypertension
- Age 60 or older (GFR declines normally with age)
- Race/U.S. ethnic minority status
Cardiovascular Disease (CVD) Risk Factors

Changeable
- Diabetes
- Hypertension
- Smoking
- Elevated cholesterol
- Obesity
- CKD

Not changeable
- Family history of heart disease
- Age
- Gender (male>female)
- CKD

*Partial list
AKI, acute kidney injury
**Many patients with heart disease also have CKD**
In addition to ESRD, CKD leads to CVD

Adjusted* hazard ratio for CVD events

Go, et al., 2004
And many patients with CKD also have heart disease
As CKD gets worse, your risk of developing heart failure increases.
Patients with CKD and congestive heart failure (CHF) die sooner
For patients with both CKD and heart disease, as the kidney disease gets worse, you die sooner.
How Does CKD Lead to Congestive Heart Failure (CHF)?

• High blood pressure and fluid overload strains the heart (leads to heart failure)
• Endothelial dysfunction (blood vessel cells)
• Inflammation
• Dyslipidemia (bad cholesterol elevated)
• Elevated phosphate levels
• Low vitamin D levels
Preventing CKD and CVD

“An Ounce of Prevention is Worth a Pound of Cure”

• Diet and exercise to maintain a healthy weight
• Smoking cessation
• Control diabetes
• Control blood pressure
• Control cholesterol
• Avoid excess over the counter pain medications (ibuprofen, Motrin, Aleve, etc.)
• Consider Vitamin D supplement
• Regular check up with your Primary Care Physician
American Heart Association Recommendations for Diet and Exercise

For Overall Cardiovascular Health:
At least 30 minutes of moderate-intensity aerobic activity at least 5 days per week for a total of 150
OR
At least 25 minutes of vigorous aerobic activity at least 3 days per week for a total of 75 minutes; or a combination of moderate- and vigorous-intensity aerobic activity
AND
Moderate- to high-intensity muscle-strengthening activity at least 2 days per week for additional health benefits.

For Lowering Blood Pressure and Cholesterol:
An average 40 minutes of moderate- to vigorous-intensity aerobic activity 3 or 4 times per week
Inexpensive treatments for CKD improve CV and renal outcomes

• Control of hypertension
• ACEI or ARB use
• Statin use
• Control of blood sugar (in diabetic patients)
• Smoking cessation
• Prevention of obesity
Diabetes Control

29 million people with diabetes and 89 million people with pre-diabetes in the US (2012)

- Diet and exercise to maintain healthy weight
- Medications if necessary to control blood sugars
- Medications to control cholesterol
- Target HbA1c < 7.0%

Regular visits with your doctor
CKD-CVD-Diabetes Link: CKD is a Disease Multiplier
Hypertension (High Blood Pressure) Control

78 million people with hypertension (1 in 3 adults) in the US (2013)

• Diet and exercise to maintain healthy weight
• Limit sodium in diet
• Smoking cessation
• Medications if necessary
  – Adults age <60: <140/90
  – Adults > 60 yrs: <150/90
  – All ages, diabetes and/or CKD: <140/90

Regular visits with your doctor
We can have an impact on progression of CKD

- Intensive glycemic control lessens progression from microalbuminuria in Type 1 diabetes—goal in Type 2 is less clear
  - DCCT, 1993
  - ACCORD, 2008

- Antihypertensive therapy with ACE Inhibitors or ARBs lessens proteinuria and progression
  - Giatras, et al., 1997
  - Psait, et al., 2000
  - Jafar, et al., 2001

- Blood pressure below 130/80 is beneficial
  - Sarnak, et al., 2005
Cholesterol Control and CKD

Indications for medications (“Statins”)

- Adults > 50 years & CKD (any stage)
- Adults 18 – 49, any stage CKD, AND
  - Known coronary artery disease (CAD)
  - Diabetes
  - Prior stroke
  - Estimated 10 year incidence of heart attack >10%
- Adults with CKD on Dialysis – No Rx
Complications of CKD can Affect Heart Disease

- **Anemia** (low blood counts) can trigger chest pain (angina) and even heart attacks in patients with heart disease.
- **High blood pressure** causes a strain on the heart and can lead to congestive heart failure.
- **High calcium** and **phosphorus** levels can lead to hardening of the arteries.
What do people with CKD die from?
Cardiovascular disease is a major cause

USRDS, 2010 ADR
National Vital Statistics Report, CDC 2010
Key Take Away Messages

- CKD, CVD, diabetes and hypertension are all very common and related
- Lifestyle (diet, exercise, tobacco abuse) is the biggest risk factor, and the main treatment
- Prevention is key
- Regular visits with your primary care physician is important to screen for and manage these diseases
Thank You!

Questions?