Boston Kidney Health Series 2014
Kidney Disease 101: Function, Causes, and Treatment

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Disclosures

• None to report
Introduction

• Kidney anatomy and function
• Chronic kidney disease – a public health problem
• Kidney disease recognition and diagnosis
• Kidney disease treatment and prevention
Kidneys 101: Anatomy

[Diagram of kidney anatomy with labels]

www.webmd.com
Kidneys 101: Anatomy

The basic unit of the kidney is a **NEPHRON**.
Kidneys 101: Anatomy

A nephron … simplified.
How do your kidneys work?

• Eliminate waste products from the body
• Eliminate drugs from the body
• Maintain body fluid, electrolyte, and acid balance
• Produce hormones that:
  – Regulate blood pressure
  – Promote bone health
  – Produce red blood cells
Types of Kidney Disease

• **Acute kidney injury (AKI)**
  – Sudden loss of kidney function occurring over hours to days
  – Can be reversible

• **Chronic kidney disease (CKD)**
  – Kidney damage or loss of kidney function lasting three months or longer

• **End stage renal disease (ESRD)**
  – Total and permanent kidney failure
  – Dialysis or transplant required for survival
What is chronic kidney disease (CKD)?

- Any condition that damages the kidneys and prevents them from keeping the body healthy (present for 3 months or longer)
- Kidneys lose the ability to get rid of waste products and regulate body fluid
- Associated with complications such as high blood pressure, anemia, bone disease, and poor nutrition
CKD: a major public health problem

- 26 million Americans are affected by kidney disease
  - As of 2012, 14% of Americans have CKD
  - Affects more than 35% of adults with diabetes
  - Affects more than 20% of adults with hypertension

- CKD costs Medicare $41 billion per year
  - 17% of Medicare expenditures
CKD is associated with cardiovascular disease

CKD: 2011
- CVA/TIA 26.7%
- CHF 42.9%
- AMI 15.1%
- None: 38.7%

No CKD: 2011
- CVA/TIA 20.3%
- CHF 18.5%
- AMI 6.4%
- None: 61.7%
CKD patients have higher hospitalization and death rates

**Hospitalization rates**
- No CKD: 315
- All CKD: 434
  - 38% higher

**Mortality rates**
- No CKD: 54
- All CKD: 77
  - 43% higher

USRDS 2012
ESRD patients have higher death rates

Deaths per 1,000 pt years

- ESRD
- Dialysis
- Transplant
- General Medicare

USRDS 2013
Less than $\frac{1}{3}^{rd}$ of CKD patients see a kidney doctor
How does my doctor know if I have CKD?

• Blood test for creatinine
  – A waste product from muscle breakdown
  – **Normal:** 0.7-1.2 mg/dL
  – Depends on muscle mass

• Determine your glomerular filtration rate (GFR)
  – A measure of your kidney function
  – **Normal:** 90-120 mL/min

• Urine test for protein
  – A sign of kidney damage, if persistent
  – **Normal:** <150 mg/day
## Stages of CKD

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
<th>GFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kidney damage with normal GFR</td>
<td>90 or above</td>
</tr>
<tr>
<td>2</td>
<td>Kidney damage with mild decrease in GFR</td>
<td>60-89</td>
</tr>
<tr>
<td>3</td>
<td>Moderate decrease in GFR</td>
<td>30-59</td>
</tr>
<tr>
<td>4</td>
<td>Severe reduction in GFR</td>
<td>15-29</td>
</tr>
<tr>
<td>5</td>
<td>Kidney failure</td>
<td>Less than 15</td>
</tr>
</tbody>
</table>
What causes CKD?

• Diabetes
• High blood pressure
• Other conditions
  – Glomerulonephritis
  – Inherited diseases
  – Congenital (birth) defects
  – Autoimmune disease (lupus)
  – Urinary obstruction
  – Repeated urinary tract infections
What are the symptoms of CKD?

Most patients have no symptoms until kidney disease is advanced.

Your tests reveal that you are retaining fluids!

I really feel that you should start dialysis immediately!

http://www.lightersideofdialysis.com
What are the symptoms of CKD?

- Fatigue and decreased energy
- Trouble concentrating
- Poor appetite
- Nausea/vomiting
- Swollen feet and ankles
- Itchiness
- Trouble sleeping
What will happen if I have CKD?

- Progression of CKD can lead to kidney failure and the need for dialysis or a kidney transplant.
- Early detection and treatment are important to prevent kidneys from getting worse.
Treatments for kidney failure (ESRD)

IN-CENTER HEMODIALYSIS

PERITONEAL DIALYSIS

HOME HEMODIALYSIS

http://trialx.com
http://www.lincolndocs.com
http://www.ninephrology.com/home_dialysis.htm
http://blogs.itb.ac.id/pahlev/2012/03/29/peritoneal-dialysis/
Can CKD be treated?

• Many kidney diseases can be treated successfully
  – Diabetes
  – High blood pressure
  – Glomerular diseases (immunosuppressants)

• Some causes of kidney disease are unknown and do not have specific treatments
  – More research is needed
8 steps to prevent and treat kidney disease

Step #1:

Visit your physician regularly
8 steps to prevent and treat kidney disease

Step #2:

Take control of your blood pressure
Take control of your blood pressure

• Measure your BP at home regularly

• Your BP goal:
  – < 140/90 if your doctor says you have no protein in your urine
  – < 130/80 if your doctor says you have protein in your urine

• You may benefit from taking an ACE inhibitor or angiotensin receptor blocker
8 steps to prevent and treat kidney disease

Step #3:

If you diabetic, take control of your blood sugar levels
Take control of your blood sugars

- Measure your blood glucose levels at home regularly
- Work with a dietitian or your doctor to create healthy diets that you can follow
- Take your diabetic medications as prescribed
- Alert your doctor if you notice your levels are frequently too high or too low
8 steps to prevent and treat kidney disease

Step #4:

Eat a healthy diet.

*Low salt
*Heart healthy
8 steps to prevent and treat kidney disease

Step #5: Take control of your weight.
8 steps to prevent and treat kidney disease

Step #6:

Stop smoking.
8 steps to prevent and treat kidney disease

Step #7: Take medications appropriately.
Take medications appropriately

• Make sure your doctor has dosed your medications appropriately for your level of kidney function
• Avoid medications and other agents that are potentially toxic to your kidneys
  – Non-steroidal anti-inflammatory drugs (NSAIDS) (e.g. ibuprofen)
  – Intravenous contrast dye (CT scans, angiograms)
  – Herbal remedies (e.g. aristolochic acid)
8 steps to prevent and treat kidney disease

Step #8:

• Learn about your kidneys
• Understand your disease

• Take an active partnership role in the care of your kidneys
  – Engage your doctor (ask questions, get clear answers)
  – Know and understand your treatment plan (e.g. medications, follow-up tests)
  – Recognize when things are not going well or when changes need to be made

• If your kidney disease is advanced, discuss the treatment options with your nephrologist early

• Early preparation is the key to a successful outcome
What your kidney doctor will do

• Try to determine the cause of your kidney disease and treat if reversible
• Manage the complications of CKD
  – Hypertension
  – Proteinuria (protein in your urine)
  – Anemia
  – Cardiovascular disease
  – Acidosis
  – Bone disease
  – Nutrition
• Educate you and prepare you for the need for dialysis or transplantation
Questions?