

**Kidney Disease 101:
How do your kidneys function,
what causes kidney disease?**

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Boston Kidney Health Series 2012

DISCLOSURES

- None to report

OUTLINE

- Kidney disease as a public health burden
- Importance of kidney disease awareness
- Structure and function of kidneys
- Kidney disease recognition and diagnosis
- Kidney disease treatment and prevention

Definitions

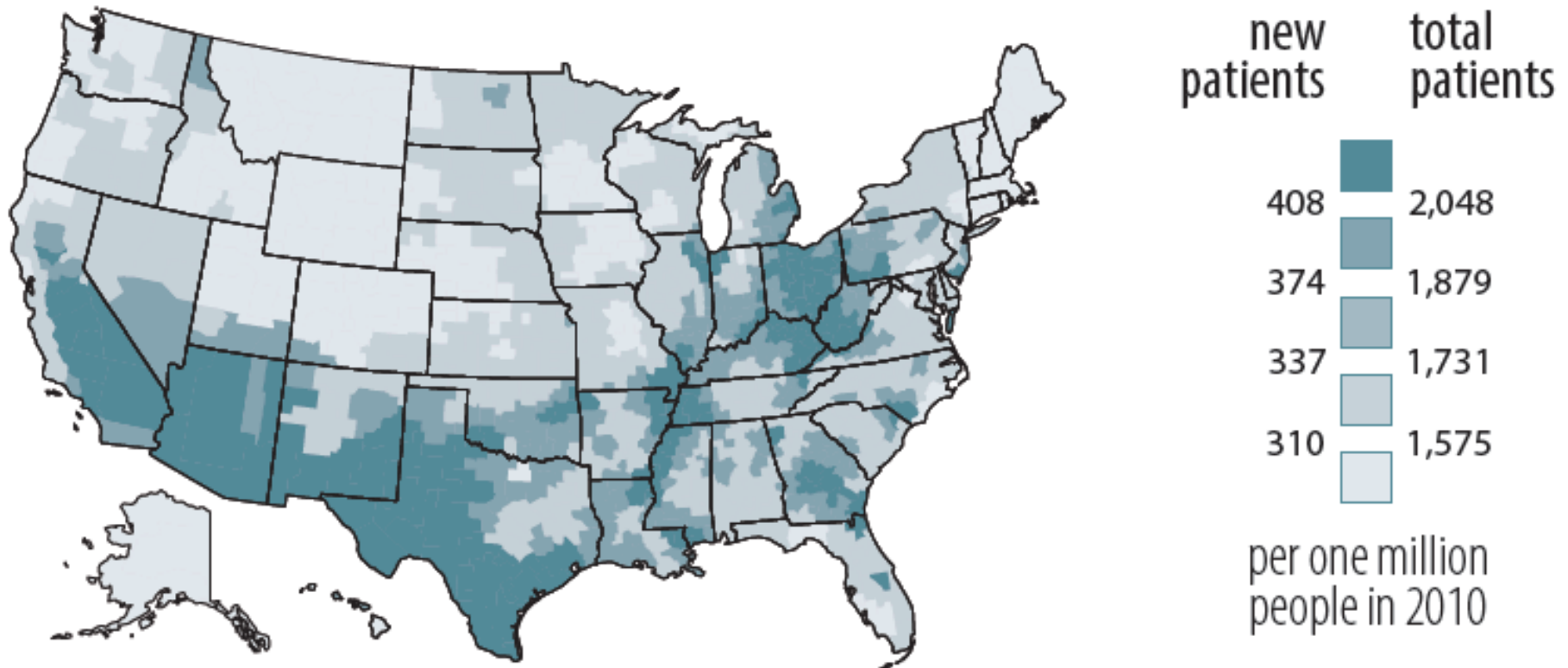
- Acute kidney injury (AKI)
 - Sudden loss of kidney function
 - May be reversible
- Chronic kidney disease (CKD)
 - Gradual loss of kidney function
- End-stage renal disease (ESRD)
 - Total and permanent kidney failure
 - Dialysis or transplant needed for survival

Chronic kidney disease is a major public health problem

- As of 2012, 14% of US population has CKD
- CKD accounts for \$41 billion in Medicare costs
 - 17% of Medicare expenditures
- End-stage renal disease accounts for 7.5% of Medicare costs
 - 1.3% of Medicare patients have ESRD

ESRD is increasing in the US

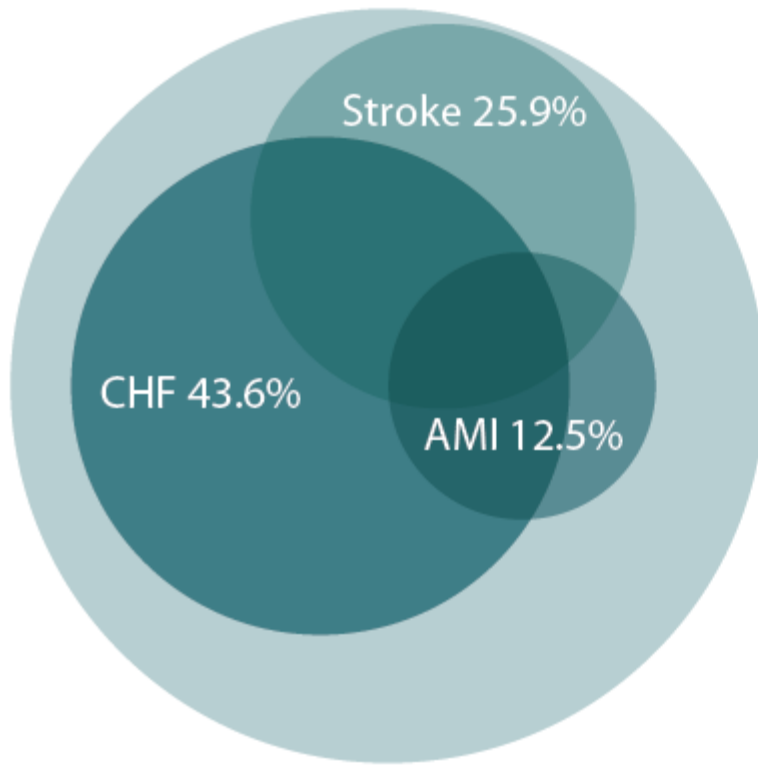
1 in 11,600 in 1980 -> 1 in 2900 as of 2010



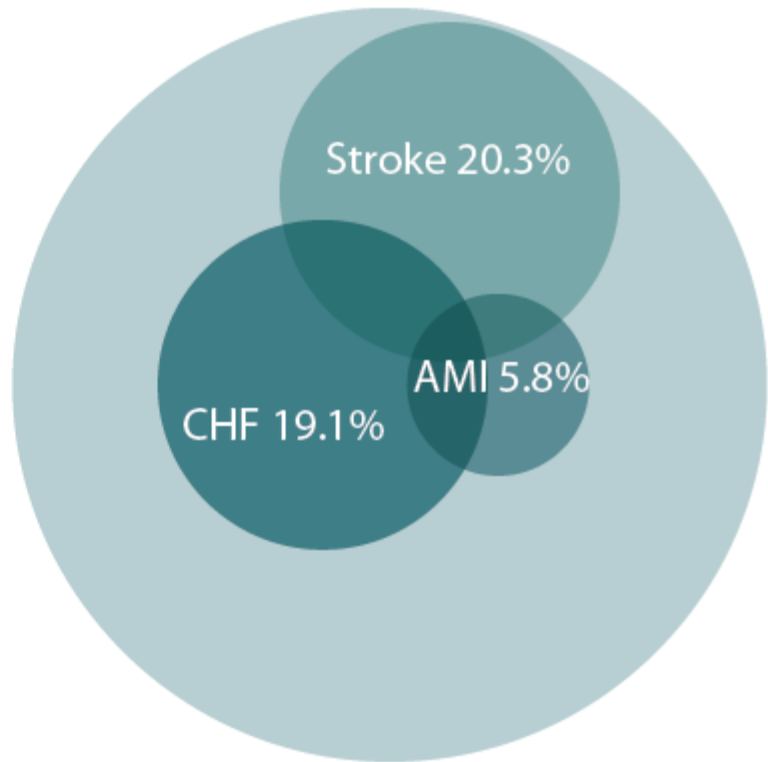
Why is this important?

CKD is associated with heart disease and stroke

CKD: 2010

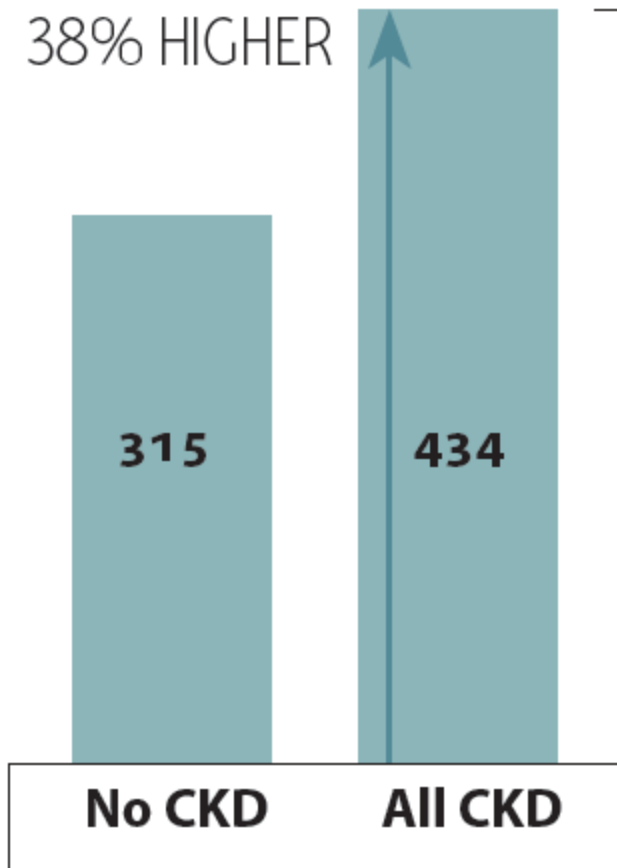


No CKD: 2010

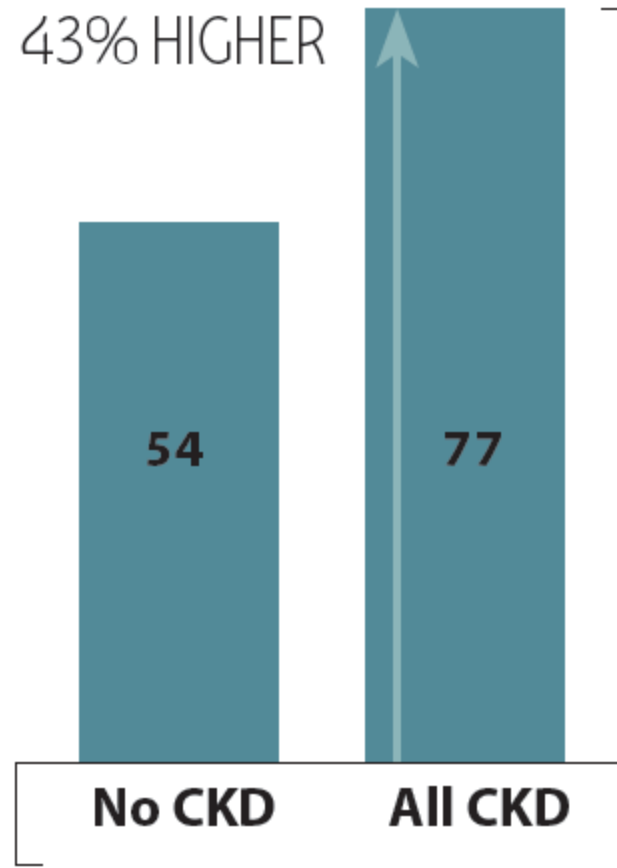


CKD patients have higher hospitalization and death rates

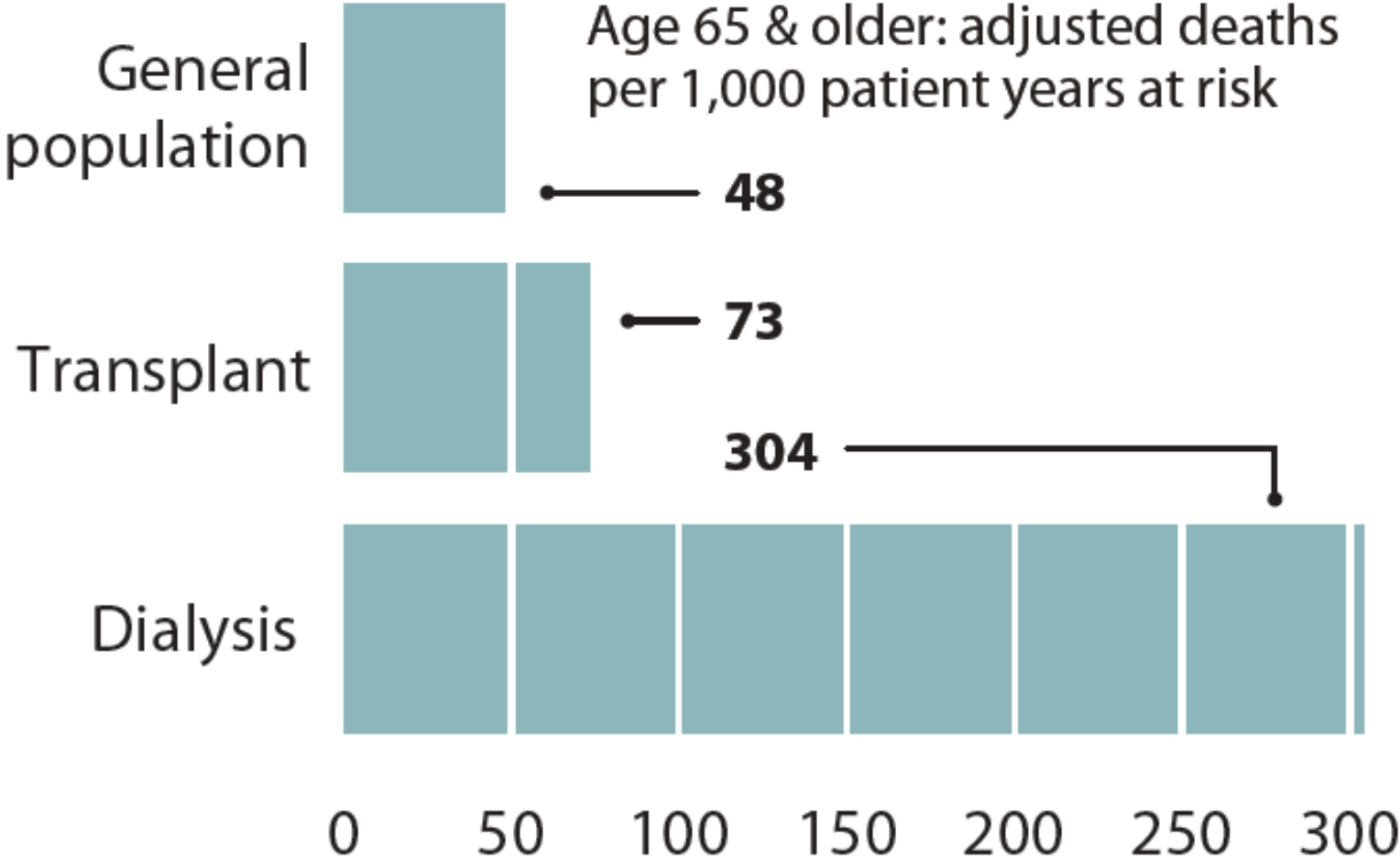
Hospitalization rates



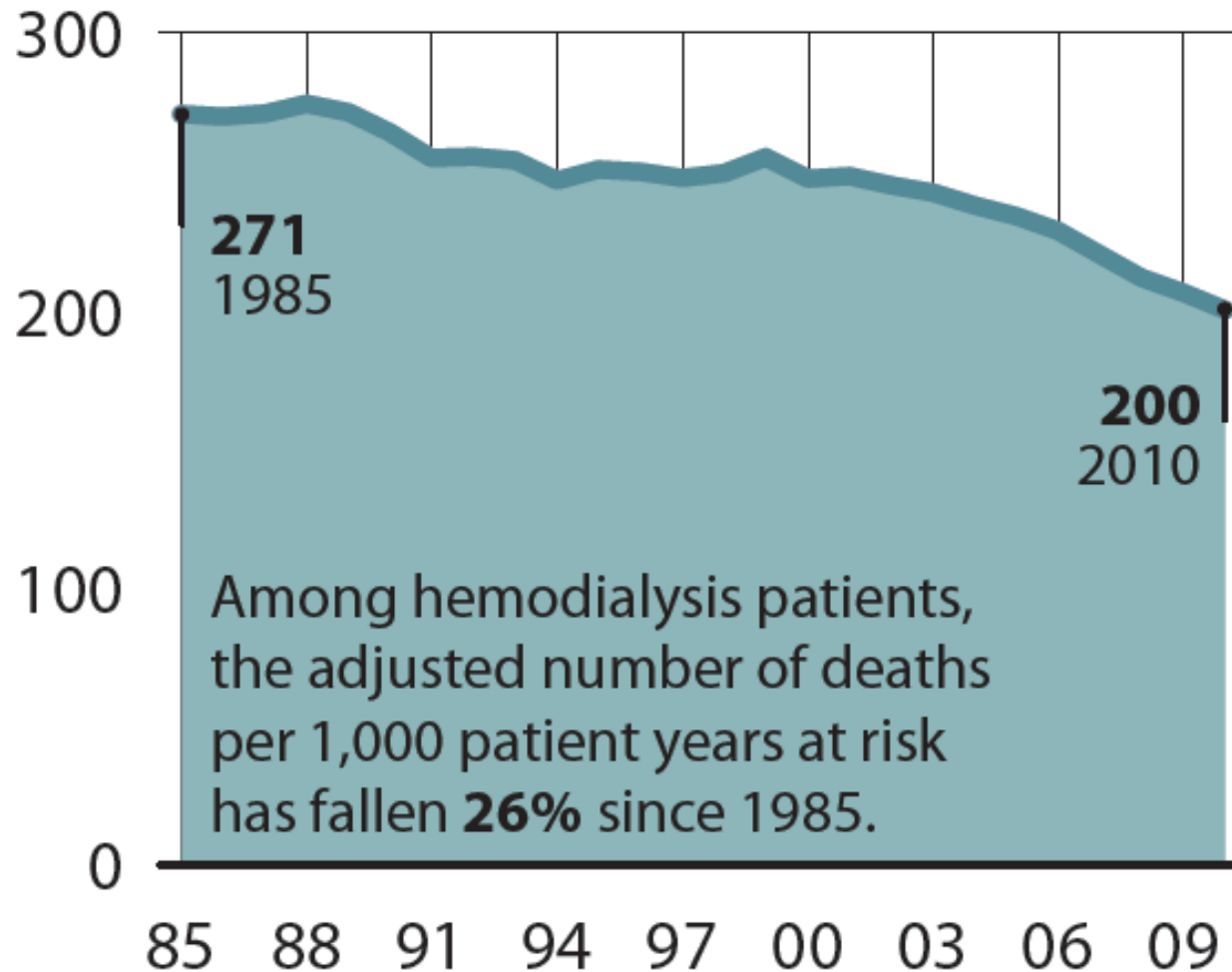
Mortality rates



ESRD patients have higher death rates

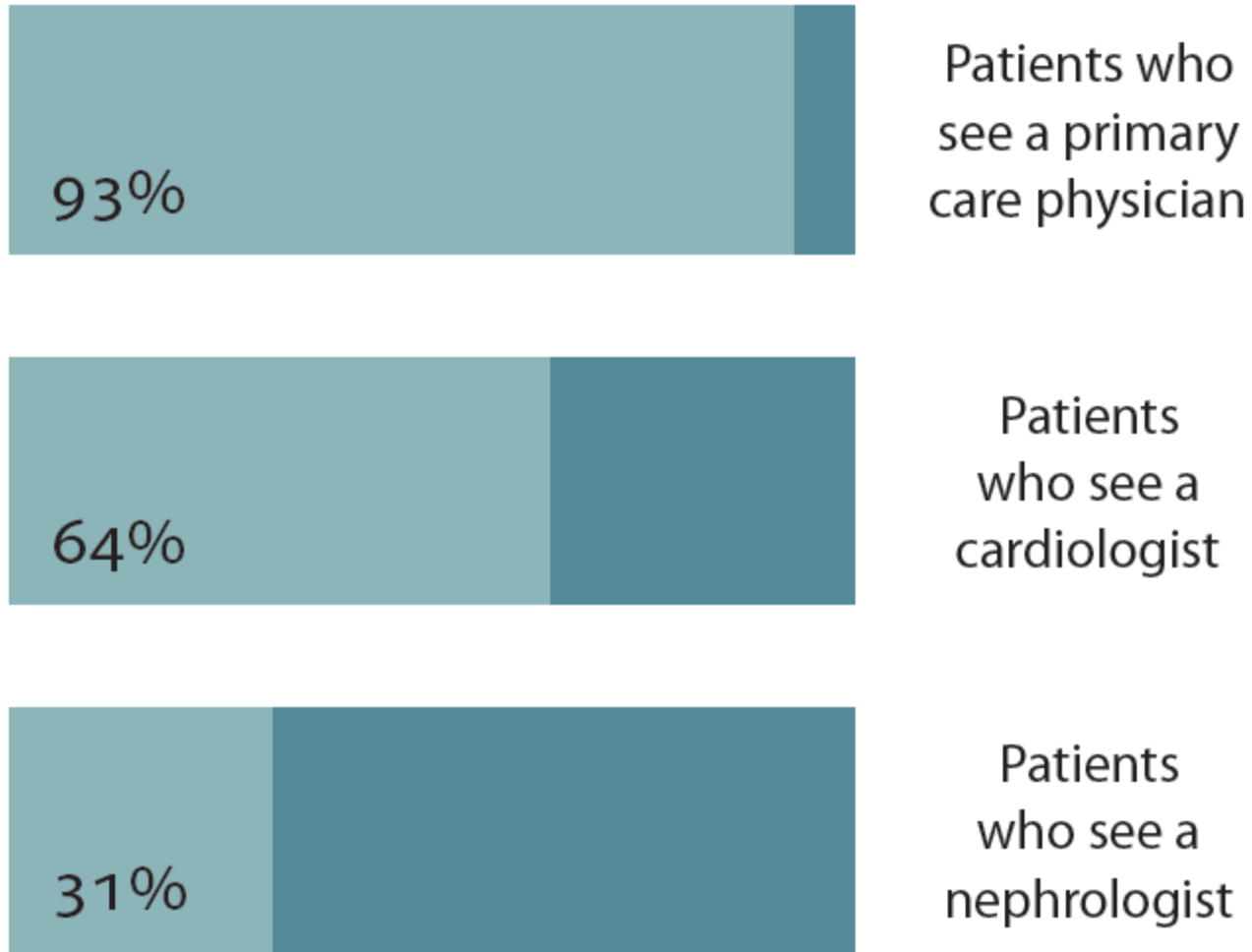


ESRD patients are surviving longer



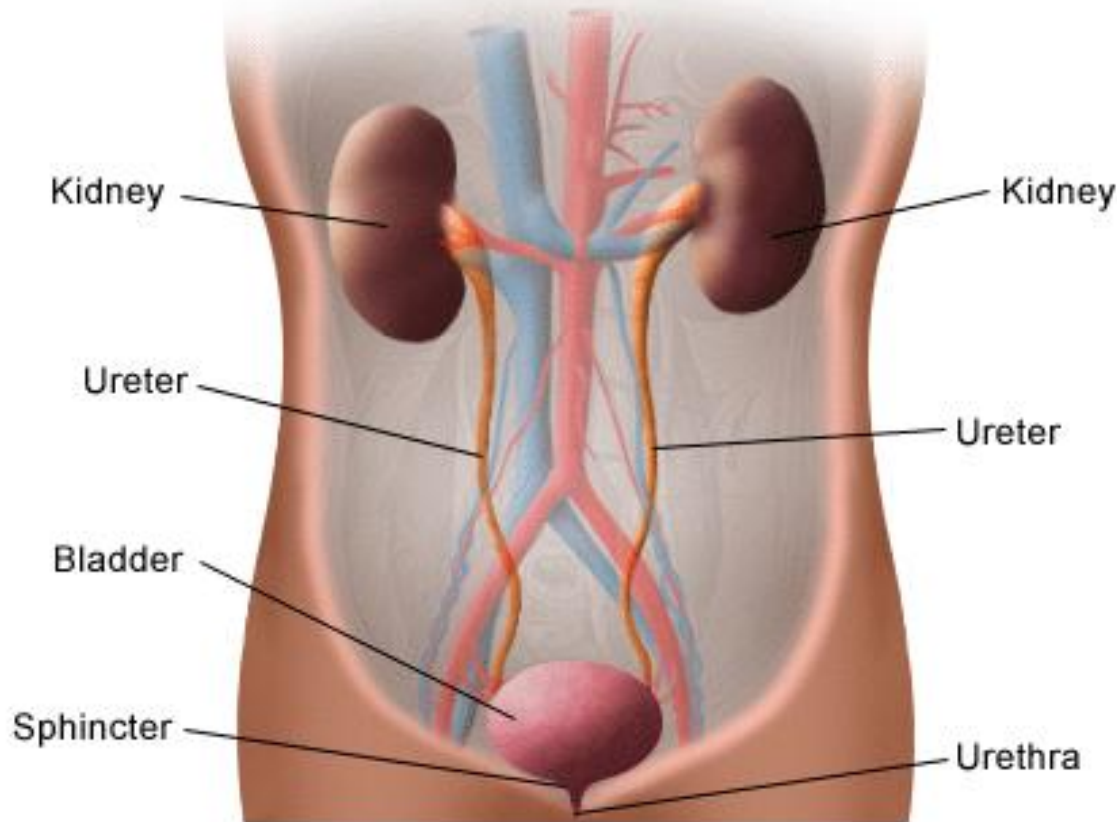
Many people with CKD are not aware
of their disease

Less than 1/3rd of CKD patients see a kidney doctor



What are the kidneys'
structure and function?

Kidney anatomy



2 bean-shaped organs in back of abdominal cavity

– 11-14cm long

– 6cm wide, 4cm thick

– 125-170g males

– 115-155g females

Kidneys perform many functions

- Highly efficient “filtering machines”
 - Process 180L of blood/day
- Removes wastes and extra water -> urine
- Retains important substances (proteins)
- Maintains acid-base and electrolyte balance in blood and urine
- Makes important hormones
 - EPO -> makes RBC's
 - Renin -> regulates blood pressure
 - Calcitriol -> maintains bone health

What causes kidney damage?

Normal loss of kidney function as we age

Common causes of kidney damage

- Diabetes
 - ↑ blood sugar damages kidneys
 - Prevalence ***
- High blood pressure (hypertension)
 - ↑ blood pressure damages small blood vessels in kidneys
 - “Silent” disease
 - Prevalence ***

Other causes of kidney damage

- Toxins
 - NSAIDs
 - AKI
 - Minimal change, membranous, interstitial nephritis, papillary necrosis, etc
 - Bowel preps
 - Herbal medicines
 - NOT regulated by the FDA
 - Aristolochic acid
 - Heavy metal contamination



http://www.springerimages.com/Images/Chemistry/1-10.1007_s00216-007-1310-3-0

<http://drpinna.com>

Other causes of kidney damage

- Obesity
 - Diabetes, hypertension, hyperfiltration, sleep apnea
- Glomerulonephritis
 - Lupus, IgA
- Inherited
 - Polycystic kidney disease
- Urinary tract obstruction
 - Kidney stones, enlarged prostate
- Other factors still being studied

How is kidney disease detected?

Diagnostic methods

- Blood test
 - ↑ blood creatinine
 - ↓ estimated glomerular filtration rate
 - “Filter Function”
- Urine test
 - Urine protein, albumin, creatinine levels
- NKF also recommends blood pressure measurement
 - Can cause or be a sign of kidney disease
 - Goal 130/80
- Additional tests may be needed

Symptoms of CKD

- Oftentimes there are no signs, especially in early stages
- May have...
 - Back pain
 - High blood pressure
 - Swelling/edema
 - Blood in urine “hematuria”
 - Frothy urine from protein “proteinuria”
 - Change in urinary frequency: ↑ or ↓

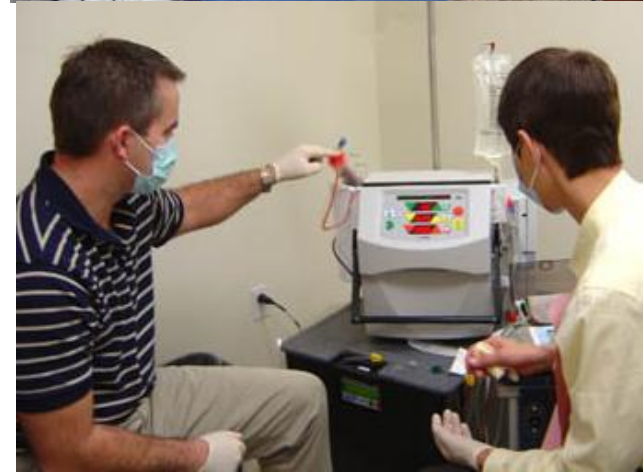
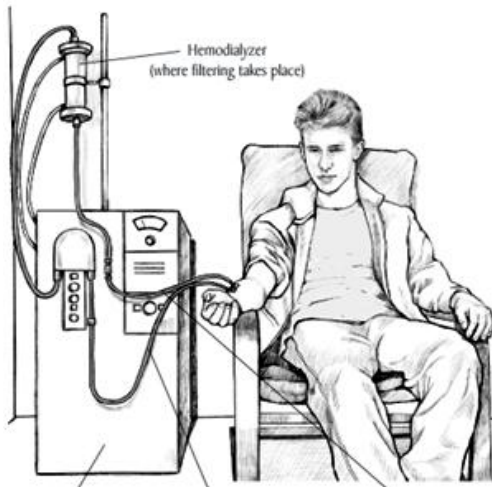
Symptoms of advanced CKD

- Fatigue
- Decreased appetite
- Nausea/vomiting
- Itchiness
- Problems concentration
- Darkening skin
- Muscle cramps

Stages of kidney disease

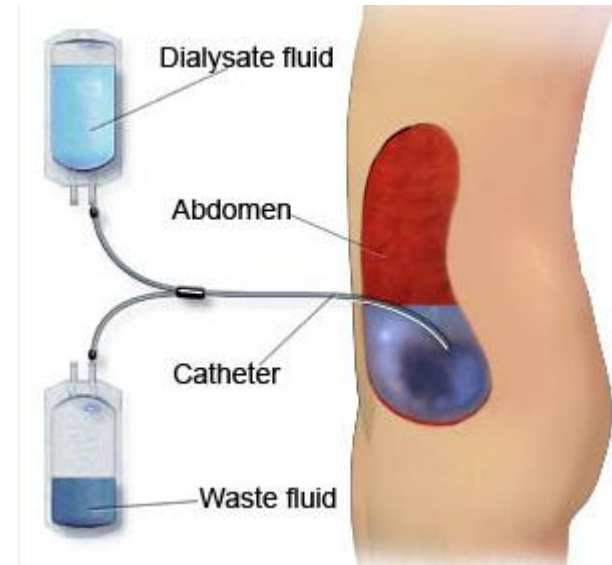
STAGE	DESCRIPTION
1	Normal kidney function but abnormal urine or imaging tests
2	Mild ↓ function but abnormal urine or imaging tests
3	Moderate ↓ function with or without abnormal urine or imaging tests
4	Severe ↓ function with or without abnormal urine or imaging tests
5	Kidney failure

Treatments if kidneys fail



**IN-CENTER
HEMODIALYSIS**

**HOME
HEMODIALYSIS**



**PERITONEAL
DIALYSIS**

<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/>

What can be done to treat and prevent
kidney disease?

Kidney disease treatment and prevention

#1 Important to see your physician regularly

#2 Blood pressure control

- *Goal <130/80 for kidney disease

- *Patients with protein in their urine will benefit from an ACE inhibitor or ARB

Kidney disease treatment and prevention

#3 Blood sugar control

*Watch for both \uparrow and \downarrow blood glucose levels

#4 Dietary changes

*Low salt

*“Heart-healthy diet”

#5 Weight control

Kidney disease treatment and prevention

#6 Smoking cessation

- *Smoking can cause kidney disease and increase rate of progression

#7 Appropriate use of medications

- *Important to go over medications with physician

- *Kidney involved in metabolism, excretion of many meds -> may need dose adjustment

- *Avoidance of kidney toxins

Kidney disease treatment and prevention

#8 Kidney disease education and preparation

- *“Kidney team:” Meeting with dietitians, social workers, kidney nurses in addition to physicians

- *As kidney disease progresses, learn about dialysis and transplant options

- *Open communication between you and your kidney team

QUESTIONS