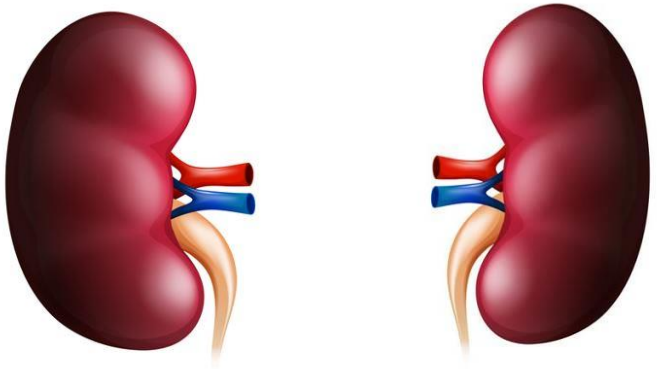
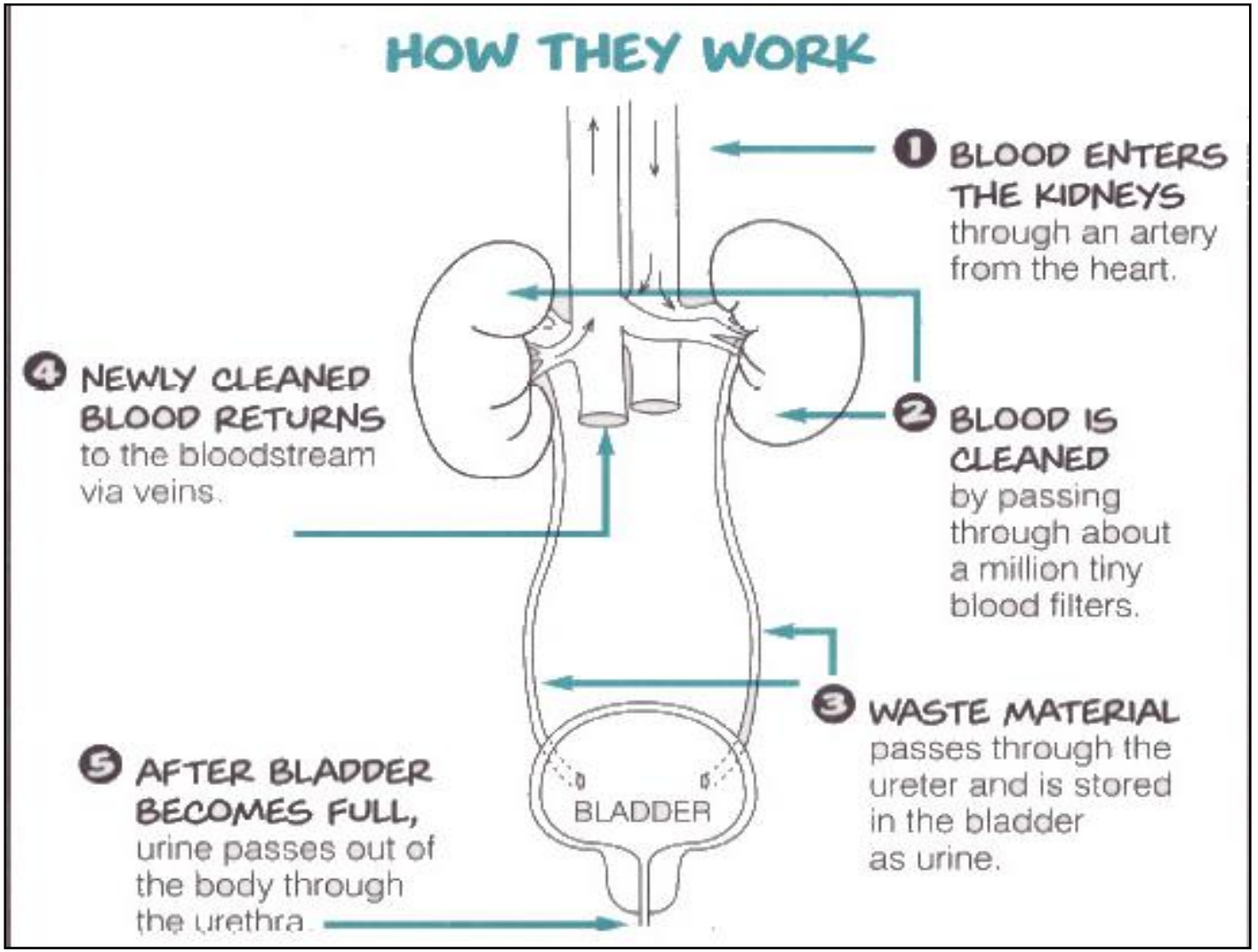
Inside the Kidneys: How They Work—and What Happens When They Don’t



How Do Kidneys Work?



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What Do Your Kidneys Do?

- Remove waste products
- Balance fluids
- Help control blood pressure
- Regulate hormones
- Keep bones healthy
- Balance minerals in the body
- Help make red blood cells

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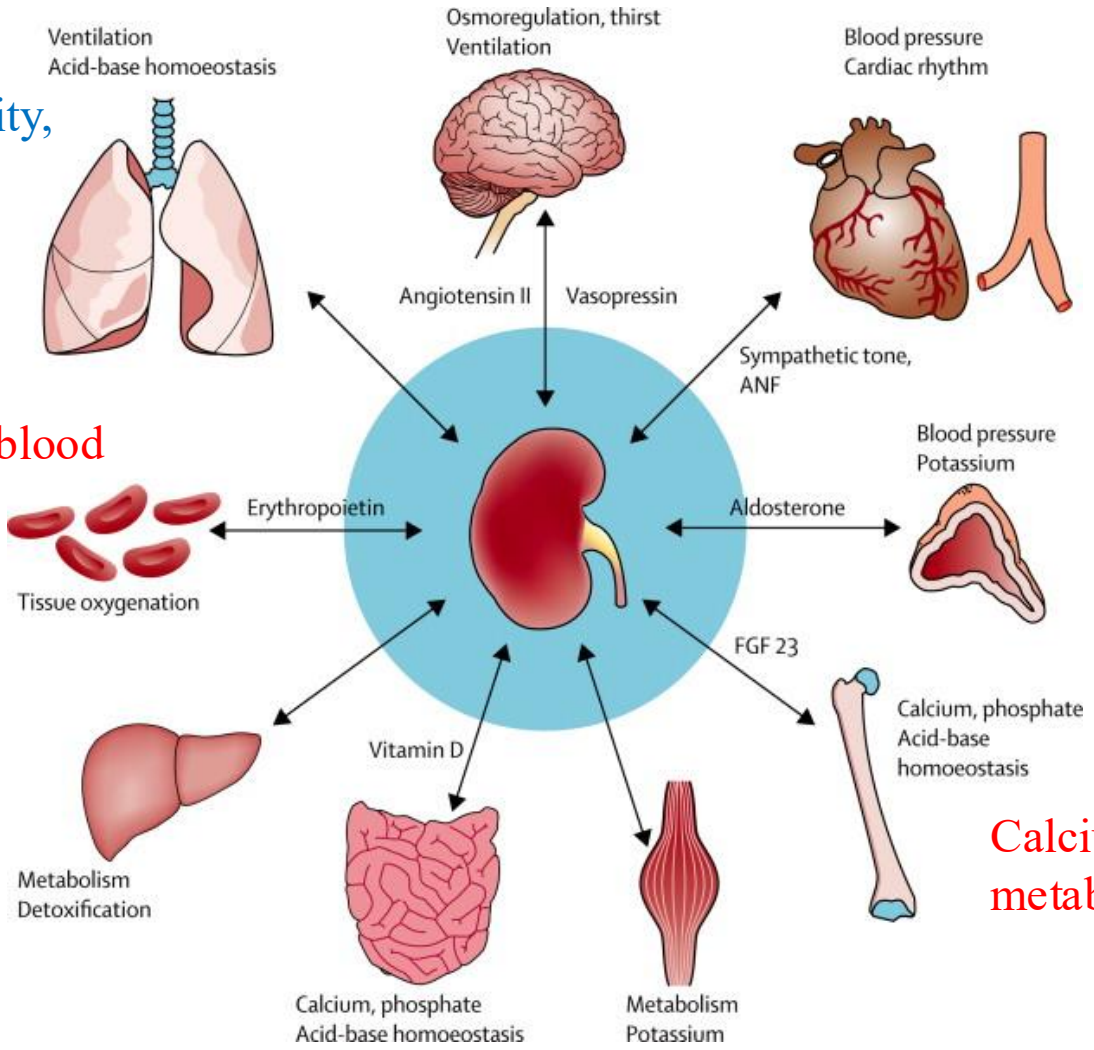
Kidney and multiple functions

Control of fluid, electrolytes, acidity, osmolality



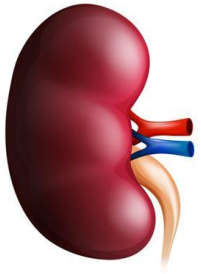
Blood pressure regulation

Erythropoietin: red blood cell production

Calcium, phosphorus and bone metabolism: Vit D

Remove waste products

Kidney trivia



- The kidney tissue is less than 1% of total body mass.
- Kidney blood flow is 1 L/min, or 20% of the cardiac output.
- A 154 lb person have about 42 L of body water, and the volume of water filtered each day is about 180 L (4.3x our total body water).
- 99% of water, 99.5% of sodium, 100% of glucose and amino acids are reabsorbed in the kidney.
- Each kidney has 1 million filtering units called nephron, where filtering and fine-tunning of what is going to be excreted is done.

What is Chronic Kidney Disease?

Your kidneys are losing their ability to filter blood or do their other jobs well enough to keep you healthy

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What Causes Kidney Disease?

- Diabetes & Hypertension
- Drugs: pain killers
- Inherited
- Autoimmune Diseases
- Congenital
- Glomerular Nephritis (GN)
- Other

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How is chronic kidney disease diagnosed?

- Most common:
  - Blood tests: serum creatinine
  - Urine tests: albumin
  - Ultrasound or other imaging tests
  - Kidney biopsy
- Other tests may be needed

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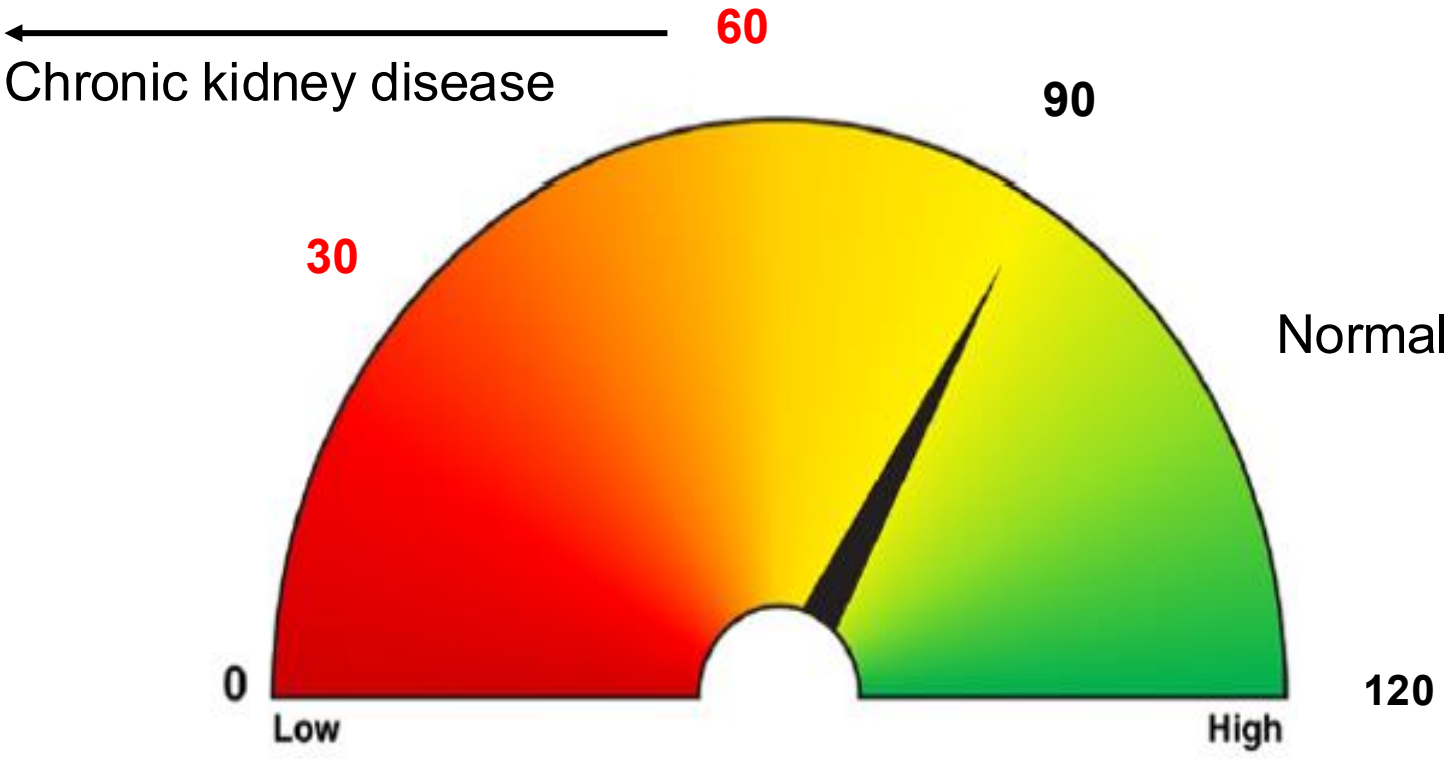
GFR (glomerular filtration rate)

- Calculated from serum creatinine, age and sex.
- Normal is 90 or higher
- Gets lower with age and when kidney disease gets worse
- Helps determine stage of kidney disease

https://www.kidney.org/professionals/gfr_calculator

GFR (glomerular filtration rate)



Chronic kidney disease stages

Two abnormal test separate by ≥3 months:

Reduced GFR (equations based on serum creatinine)

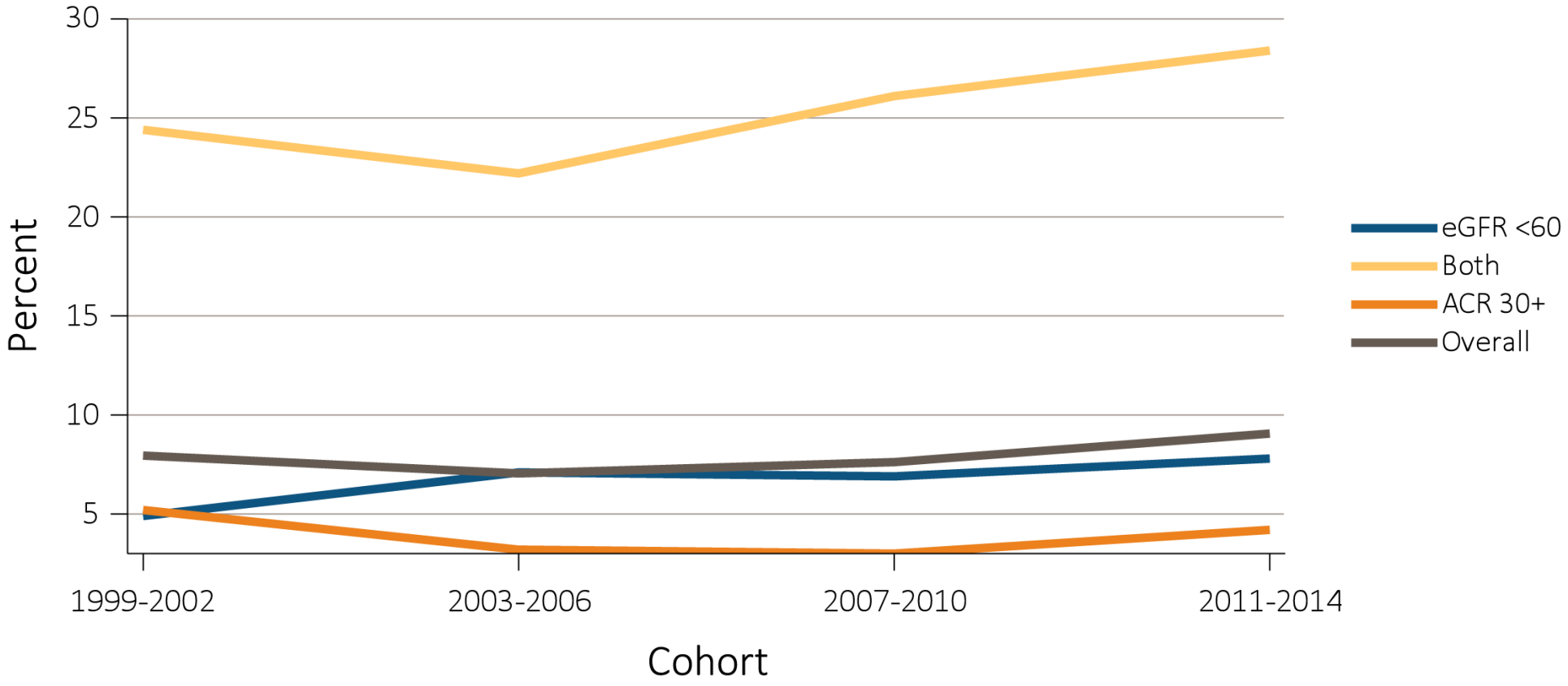
<60 ml/min/1.73 m^2

Kidney damage

- Urine albumin to creatinine ratio ≥30 mg/g

International guideline group Kidney Disease Improving Global Outcomes (KDIGO) in 2004

Awareness of chronic kidney disease (low GFR or increased albumin in urine)



NHANES 1999-2014

Kidney failure

- Despite the best treatment and your best efforts, kidneys can still fail
- This stage is called “kidney failure”
  - When 85 – 90% of kidney function is gone
  - GFR falls below 15ml/min
- Treatment Includes
  - Transplant, Peritoneal Dialysis, Hemodialysis and Palliative/Hospice
  - Dialysis is covered by Medicare.

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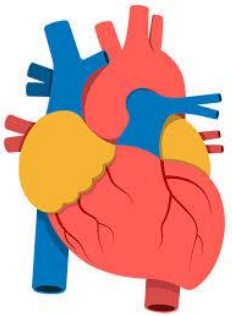
What are the symptoms of chronic kidney disease

- Nausea
- Trouble sleeping
- Poor appetite
- Tired
- Dry, itchy skin
- Urinary changes
- Weight loss
- Cramping
- Abnormal bleeding
- Swelling
- Skin color changes
- Trouble breathing
- Confusion

Kidney and Heart diseases

- Cardiovascular disease is a main cause of death in chronic kidney disease.
- Coronary heart disease, heart failure, atrial fibrillation



What are the treatments for chronic kidney disease?

- The treatment will depend on the disease that is causing chronic kidney disease.
- Your doctor may give you:
  - A blood pressure lowering medication: Renin-angiotensin blocker (RAS)(slow progression of CKD).
  - SGLT2 inhibitors, GLP-1 receptor agonists, and mineralocorticoid receptor antagonists.

How to avoid having kidney disease

- Control of diabetes: blood sugar, A1c
  - Weight loss, diet, physical activity
  - Medications
- Control of blood pressure:
  - Low salt diet
  - Physical activity
  - Medications
- Avoid medications toxic to kidneys
  - Anti-inflammatory pain drugs: ibuprofen and naproxen

Common Worries about Kidney Disease

- Can I travel?
- Can I work?
- Will it hurt?
- How will I know my kidneys are getting worse?
- What can I eat?

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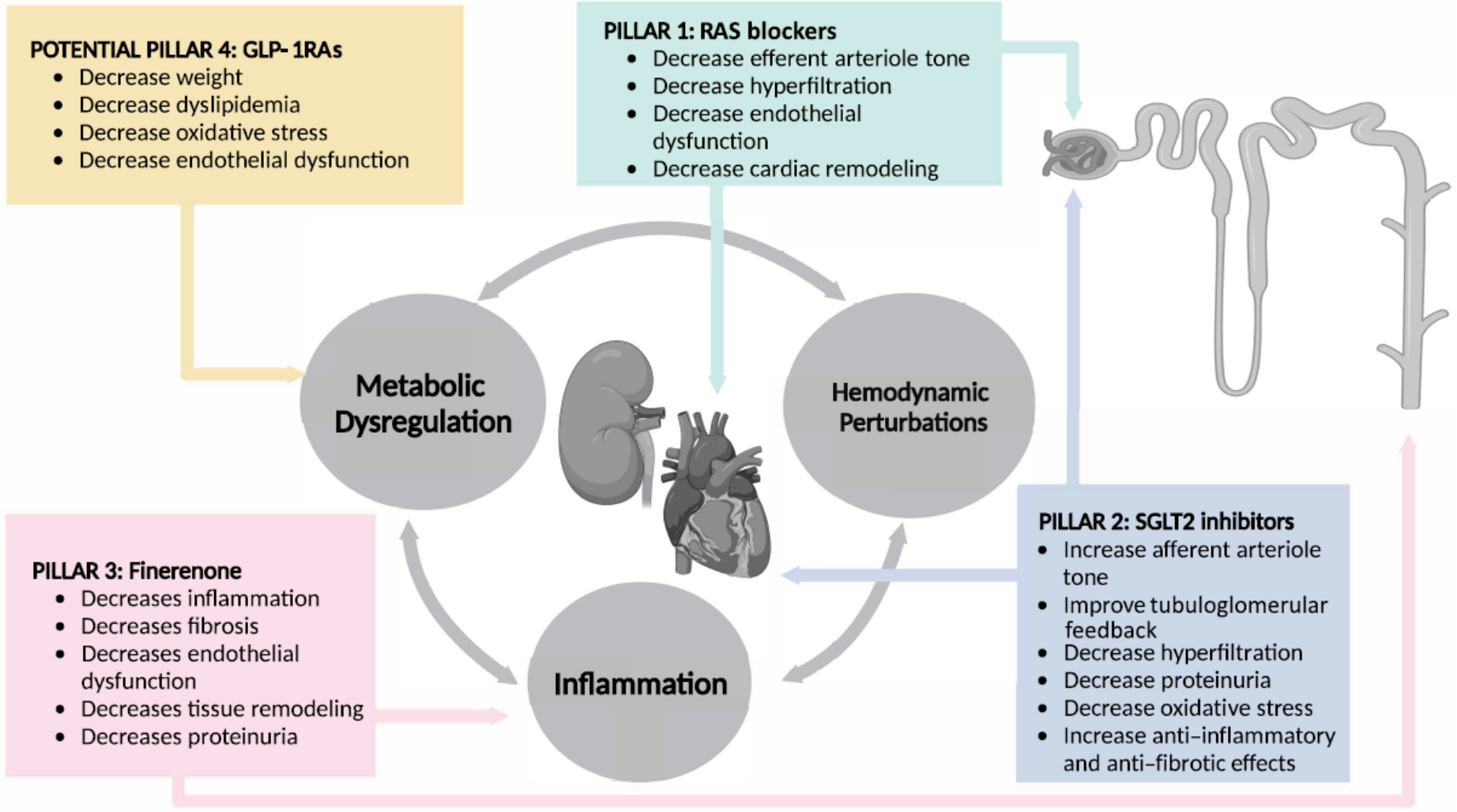
ADDITIONAL SLIDES

CVD and CKD: drug therapy and drug targets (diabetes)

Glucagon-like peptide 1 receptor agonist

Renin-angiotensin receptor blockers



Mineralocorticoid receptor antagonist

Sodium-glucose cotransporter 2 inhibitors

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