UNC
SCHOOL OF MEDICINE

Kidney Disease Case Study

Georgette A. Dent, MD

Associate Professor, Department of Pathology & Laboratory Medicine

Medical Education and Student Professional Development Coach

Clinical History

TM is a 31 y/o male with a past medical history of Type 2 diabetes mellitus and hypertension that presented to UNC with a history of feeling poorly for the past several days, primarily with worsening fatigue, weakness, and generalized malaise. He complained that his mouth and hands felt dry, but he also noted that he had swelling in his face, hands, and legs. He reported that he had not been using his insulin consistently. He also noted that he was on 3 different blood pressure medications but has not been taking these either. He works in a profession where he is on his feet a lot and reports that when he takes the blood pressure medications it makes him dizzy. He has had no recent infectious symptoms, no fevers, chills, chest pain, dysuria, hematuria, diarrhea, or abdominal pain. He has been nauseated at times but has not been vomiting.

Clinical History

TM is a 31 y/o male with a past medical history of Type 2 diabetes mellitus and hypertension that presented to UNC with a history of feeling poorly for the past several days, primarily with worsening fatigue, weakness, and generalized malaise. He complained that his mouth and hands felt dry, but he also noted that he had swelling in his face, hands, and legs. He reported that he had not been using his insulin consistently. He also noted that he was on 3 different blood pressure medications but has not been taking these either. He works in a profession where he is on his feet a lot and reports that when he takes the blood pressure medications it makes him dizzy. He has had no recent infectious symptoms, no fevers, chills, chest pain, dysuria, hematuria, diarrhea, or abdominal pain. He has been nauseated at times but has not been vomiting.

Physical Examination

- **Physical Examination**
- Temp: 98.2 °F
- Heart Rate: 84
- Resp: 18
- BP: 190/139
- SpO2: 99 %
- General appearance - Normal, healthy, cooperative, in no acute distress, mild facial edema noted symmetrically
- Skin - Skin color, texture, turgor normal. No rashes or lesions.
- Eyes - Conjunctivae/corneas clear. PERRL*, EOM's* intact. No icterus.
- HEENT - Neck Supple. Oropharynx clear, no exudates. Mucous membranes dry.
- Lungs - Normal work of breathing. Lungs clear to auscultation.
- Heart - No murmurs, rubs, or gallops. Regular rate and rhythm.
- Abdomen - Abdomen soft, non-tender. Bowel sounds normal.
- Extremities - Extremities normal. Mild pitting edema to the shins bilaterally.
- *pupils are equal, round and reactive to light and accommodation
- *extraocular movement

Physical Examination

- **Physical Examination**
- Temp: 98.2 °F
- Heart Rate: 84
- Resp: 18
- BP: 190/139
- SpO2: 99 %
- General appearance - Normal, healthy, cooperative, in no acute distress, mild facial edema noted symmetrically
- Skin - Skin color, texture, turgor normal. No rashes or lesions.
- Eyes - Conjunctivae/corneas clear. PERRL*, EOM's* intact. No icterus.
- HEENT - Neck Supple. Oropharynx clear, no exudates. Mucous membranes dry.
- Lungs - Normal work of breathing. Lungs clear to auscultation.
- Heart - No murmurs, rubs, or gallops. Regular rate and rhythm.
- Abdomen - Abdomen soft, non-tender. Bowel sounds normal.
- Extremities - Extremities normal. Mild pitting edema to the shins bilaterally.
- *pupils are equal, round and reactive to light and accommodation
- *extraocular movement

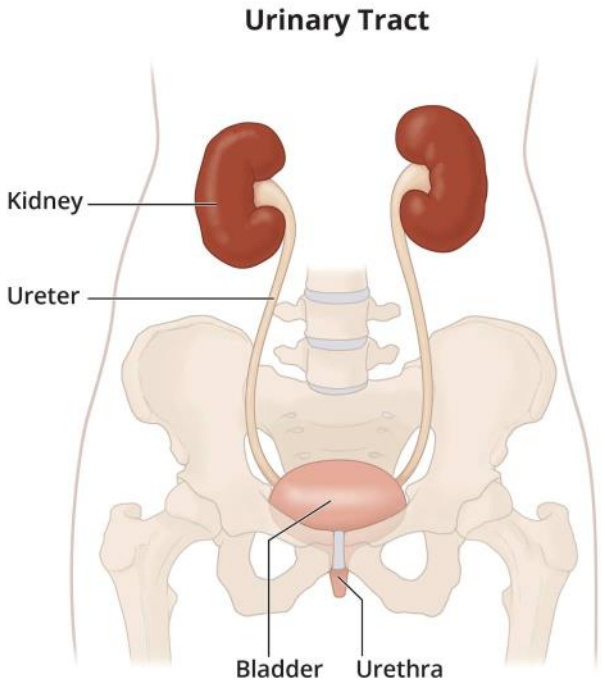
Physical Examination: Pitting edema

heartindia_59_14R1 AP done on 20150403

Laboratory Studies

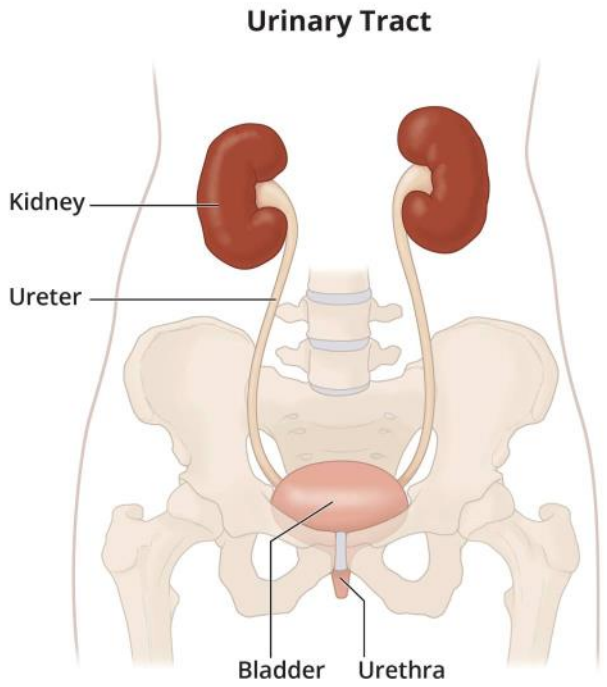
	Patient	Reference Range	
Sodium	121	135-145	mmol/L
Potassium	3.3	3.4-4.8	mmol/L
Glucose	>600	70-179	Mg/dL
BUN	37	9-23	mmol/L
Creatine	1.89	0.6-1.10	0.60 - 1.10 mg/dL
Hgb	10.5	12.9-16.5	12.9 - 16.5 g/dL

What do the kidneys do?



NIH: NIDDK

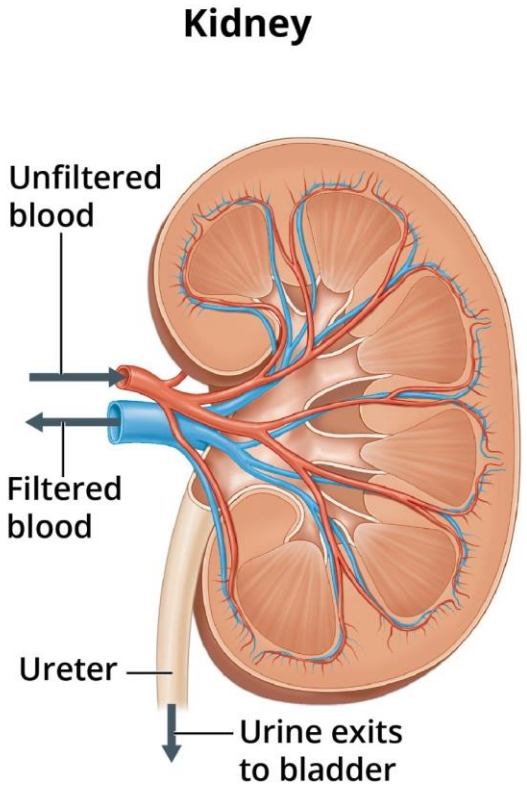
What do the kidneys do?



- Remove wastes and extra fluid from your body.
- Removes acid that is produced by the cells of your body and maintains a healthy balance of water, salts, and minerals—such as sodium, calcium, phosphorus, and potassium—in your blood.
- Without this balance, nerves, muscles, and other tissues in your body may not work normally.
- Helps control your blood pressure
- Produce a hormone called erythropoietin needed to support production of red blood cells
- Helps to keep bones strong and healthy

NIH: NIDDK

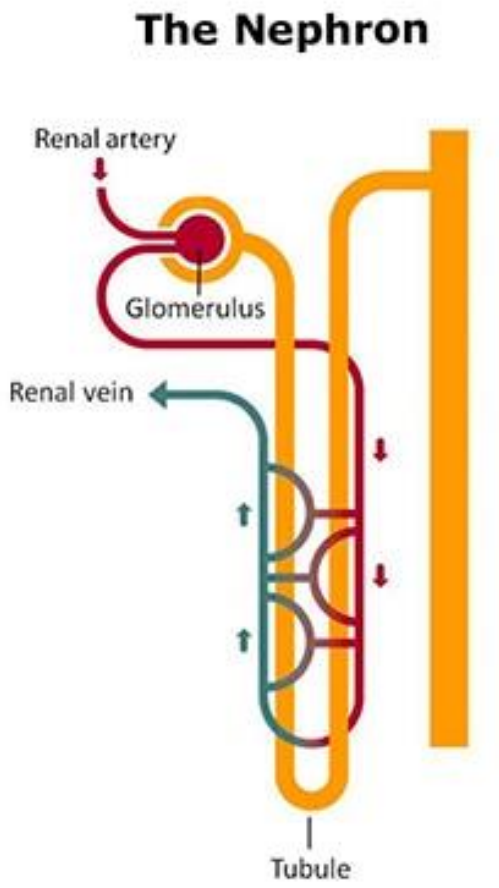
What do the kidneys do?



NIH: NIDDK

- Blood circulates through kidneys many times a day
- Unfiltered blood flows into the kidneys through the renal artery and filtered blood exits through the renal vein.
- Larger molecules such as proteins and red blood cells stay in the blood vessel.
- The tubules return needed substances to your blood and removes waste
- The ureter carries urine form the kidney to your bladder.

What do the kidneys do?



NIH: NIDDK

- Each nephron has a glomerulus to filter your blood and a tubule that returns needed substances to your blood and pulls out additional wastes.
- Wastes and extra water become urine.
- More than 7 gallons of blood pass through the kidneys' intricate filtration system every hour.
- Blood chemistries (or electrolytes e.g. potassium & sodium): abnormal levels may indicate abnormal kidney function
- Creatine: measures a waste product of muscles removed by the kidneys
- Blood urea nitrogen (BUN): another waste product (protein metabolism) that is eliminated by the kidneys
- Hypoalbuminemia: decreased albumin and proteins in blood leads to decreased osmotic pressure in vasculature and leakage of fluid into tissues causing generalized edema

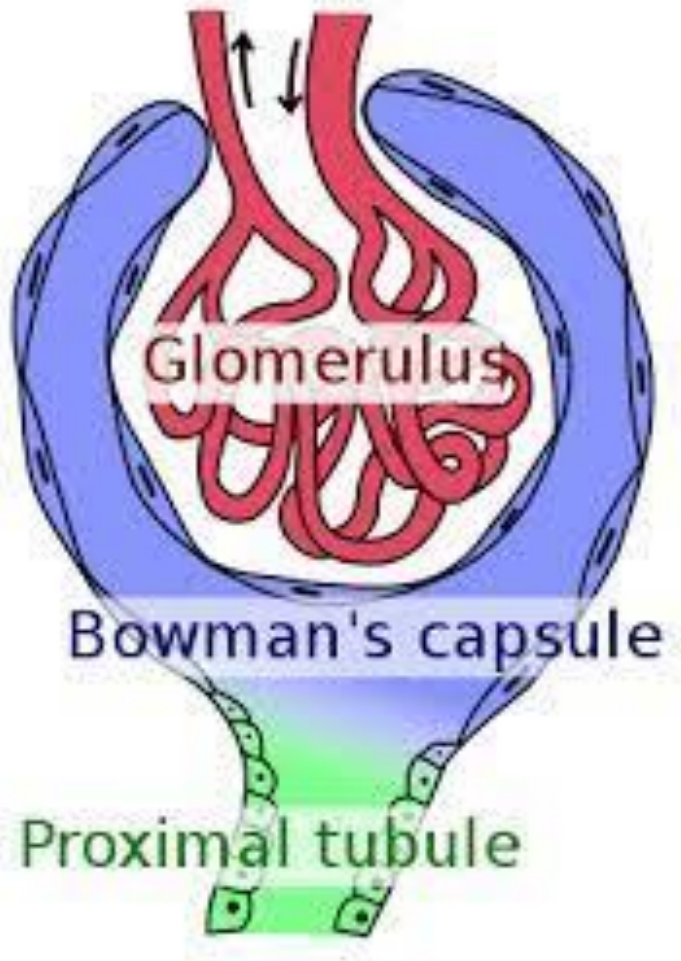
Laboratory Studies

	Patient	Reference Range	
Sodium	121	135-145	mmol/L
Potassium	3.3	3.4-4.8	mmol/L
Glucose	>600	70-179	Mg/dL
BUN	37	9-23	mmol/L
Creatine	1.89	0.6-1.10	0.60 - 1.10 mg/dL
Hgb	10.5	12.9-16.5	12.9 - 16.5 g/dL

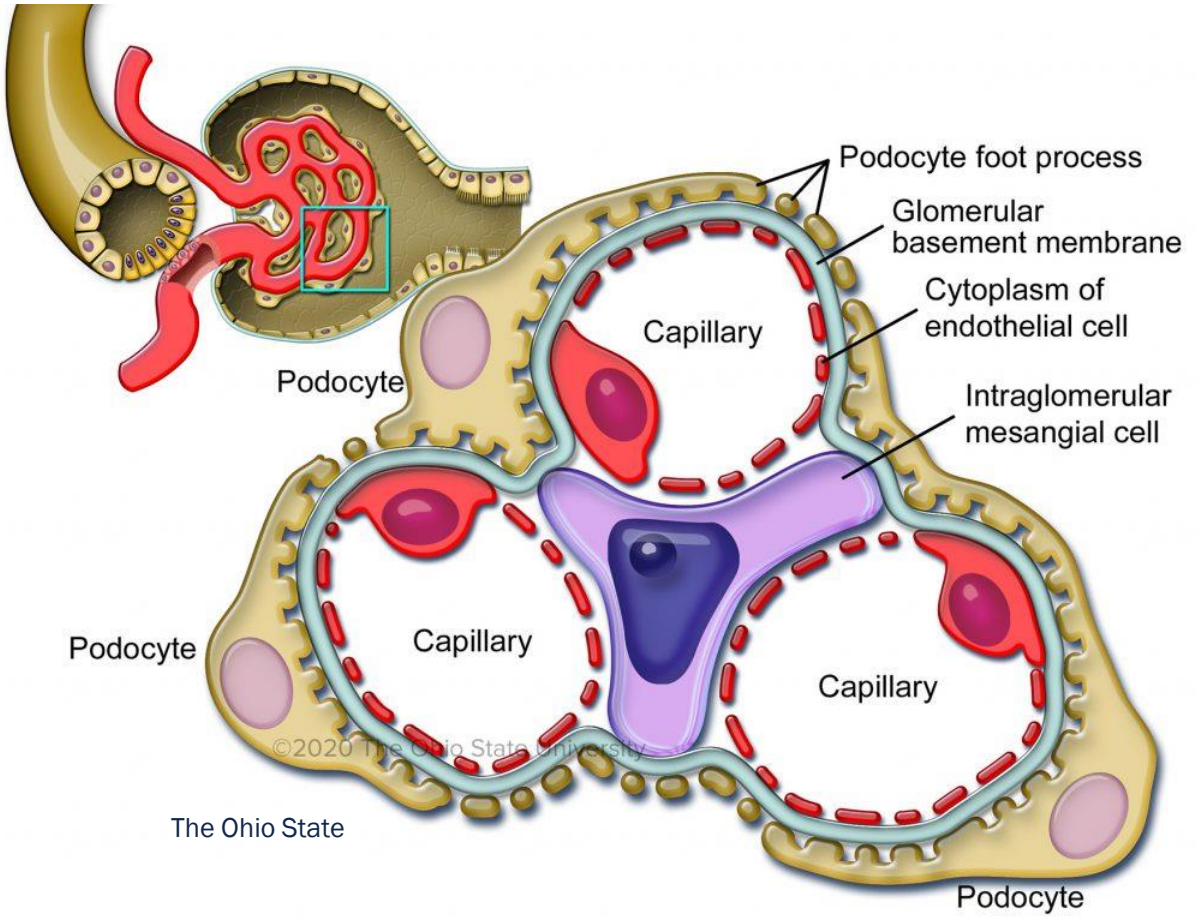
Laboratory Studies

	Patient	Reference Range	
Sodium	121 ↓	135-145	mmol/L
Potassium	3.3 ↓	3.4-4.8	mmol/L
Glucose	>600 ↑	70-179	Mg/dL
BUN	37 ↑	9-23	mmol/L
Creatine	1.89 ↑	0.6-1.10	0.60 - 1.10 mg/dL
Hgb	10.5 ↓	12.9-16.5	12.9 - 16.5 g/dL

What do the kidneys do?



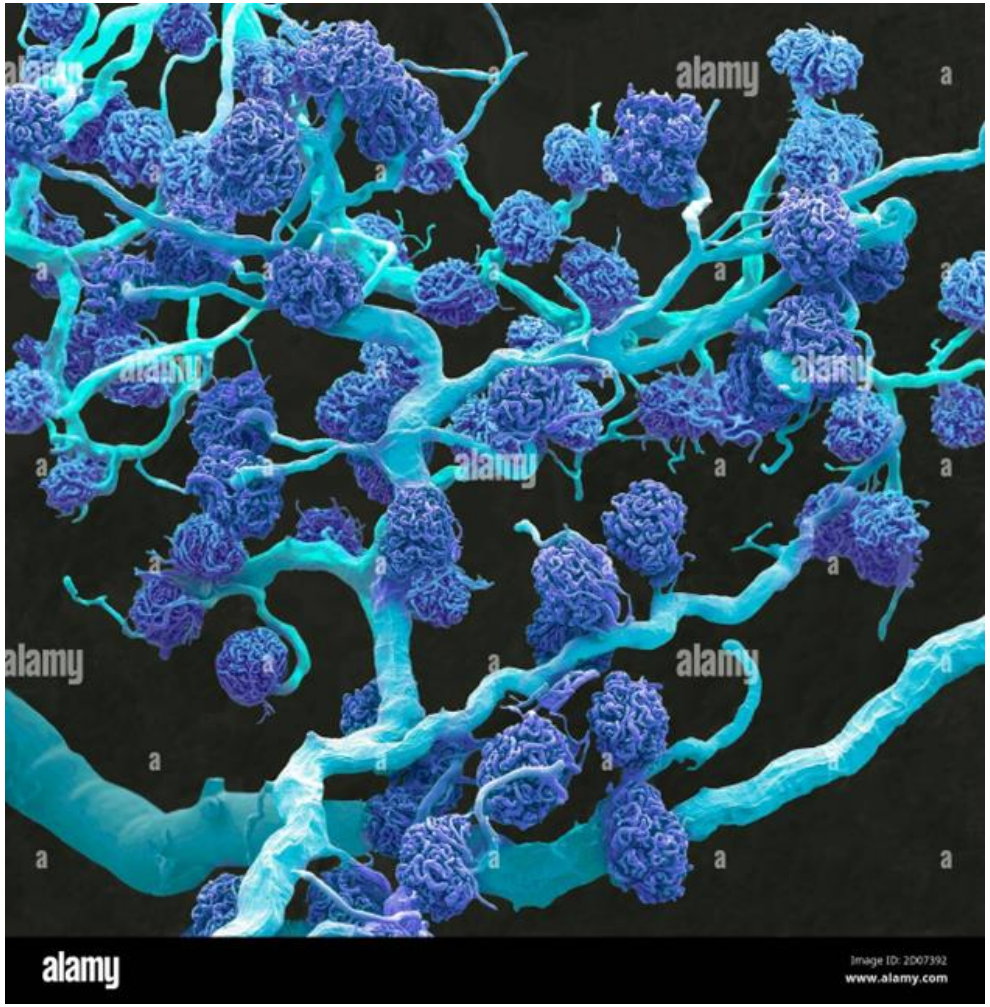
Wikipedia

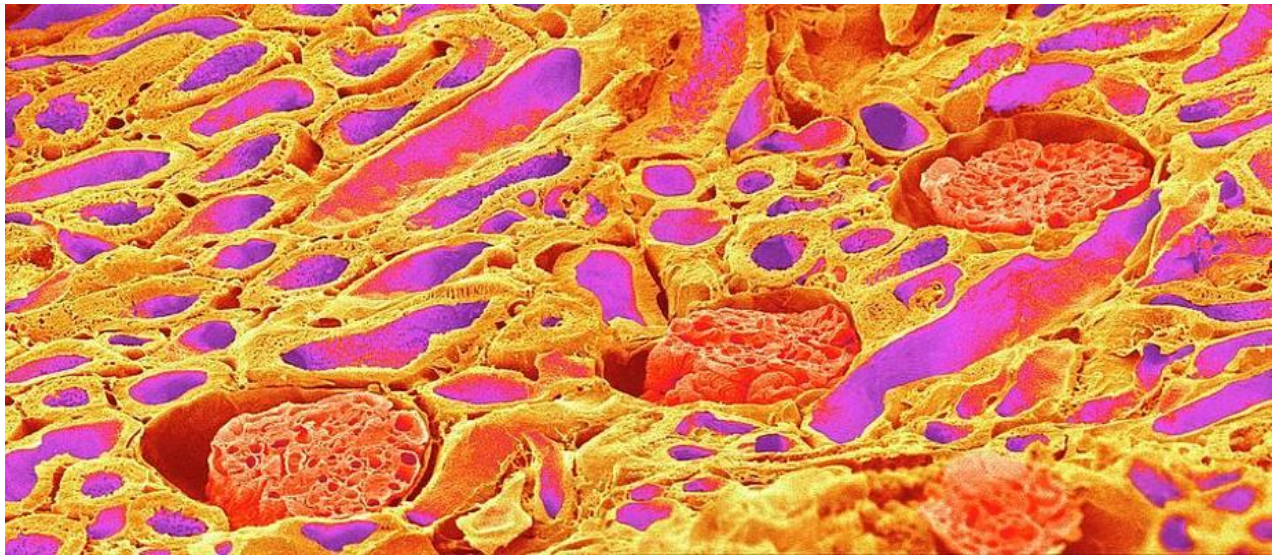


The Ohio State

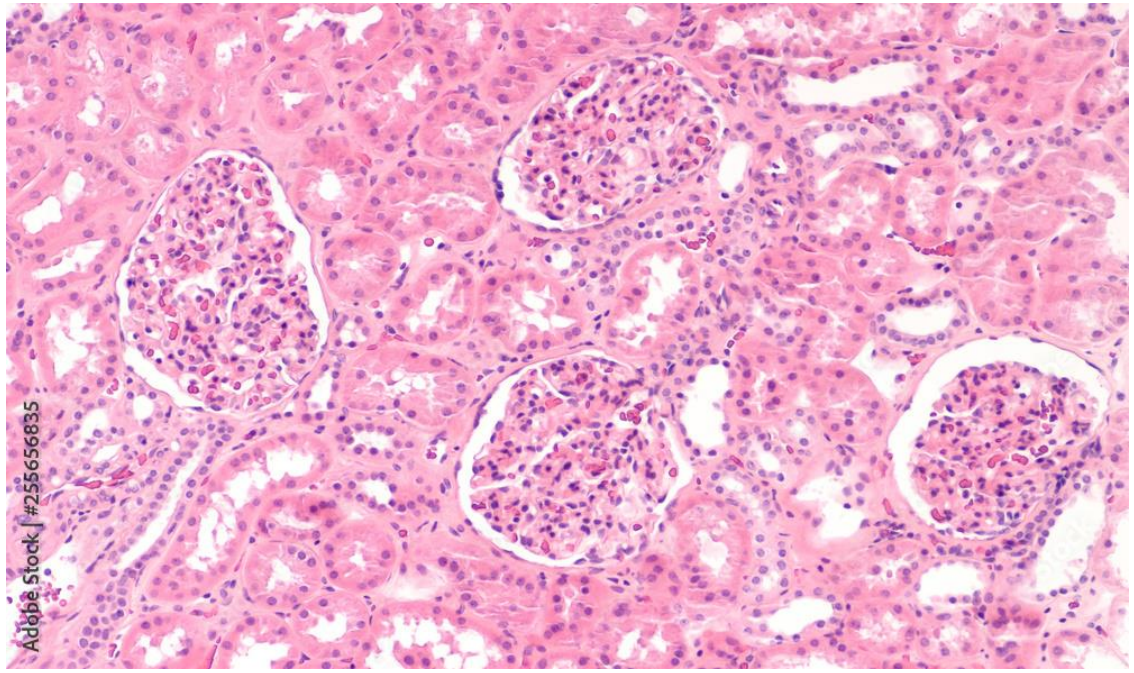
The basement membrane and mesangium can become abnormal in some disease processes

What do the kidneys do?

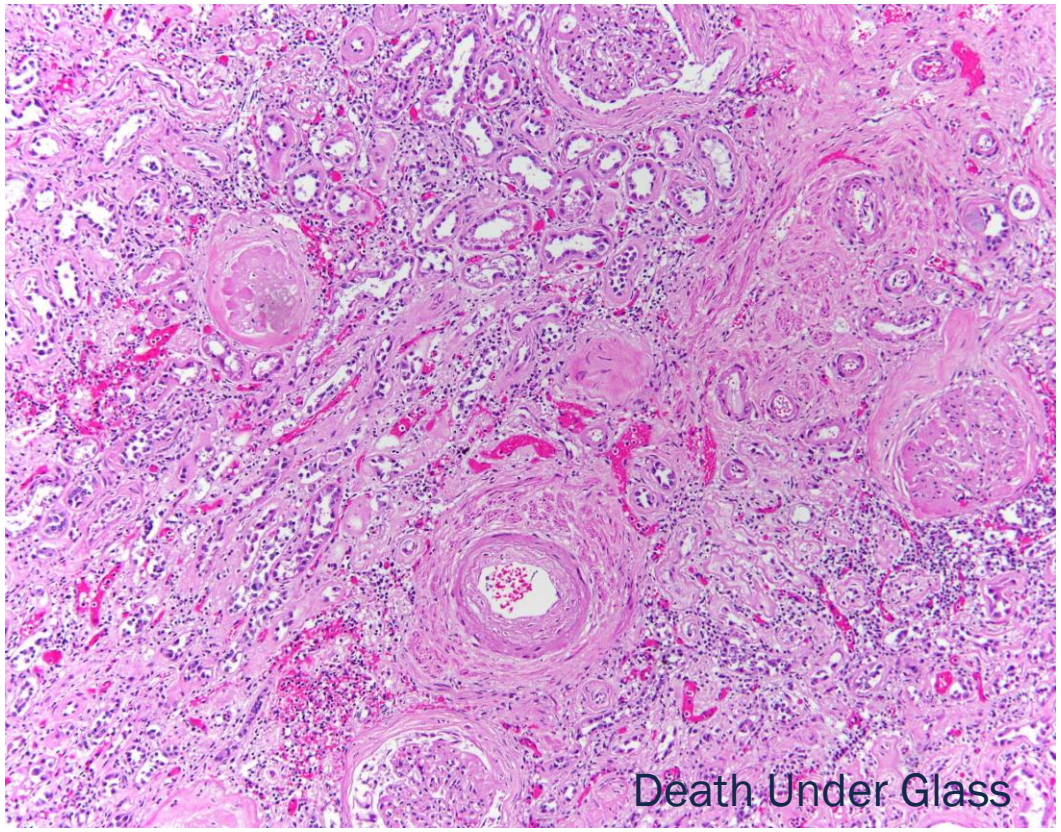




Kidney and hypertension

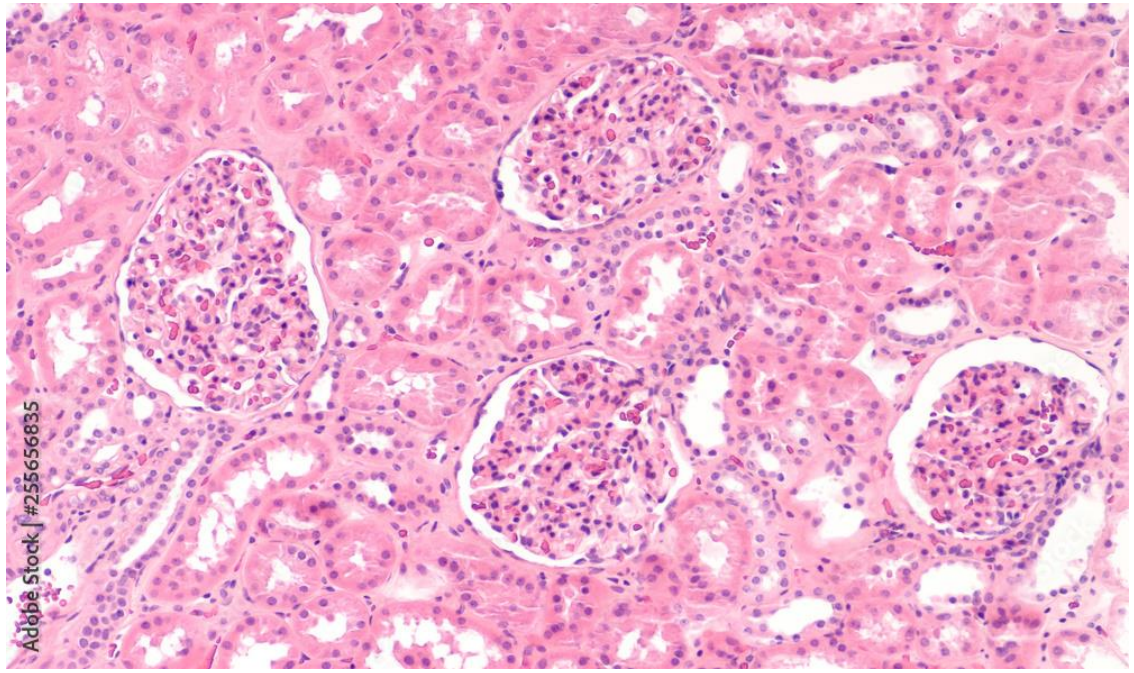


Normal Kidney

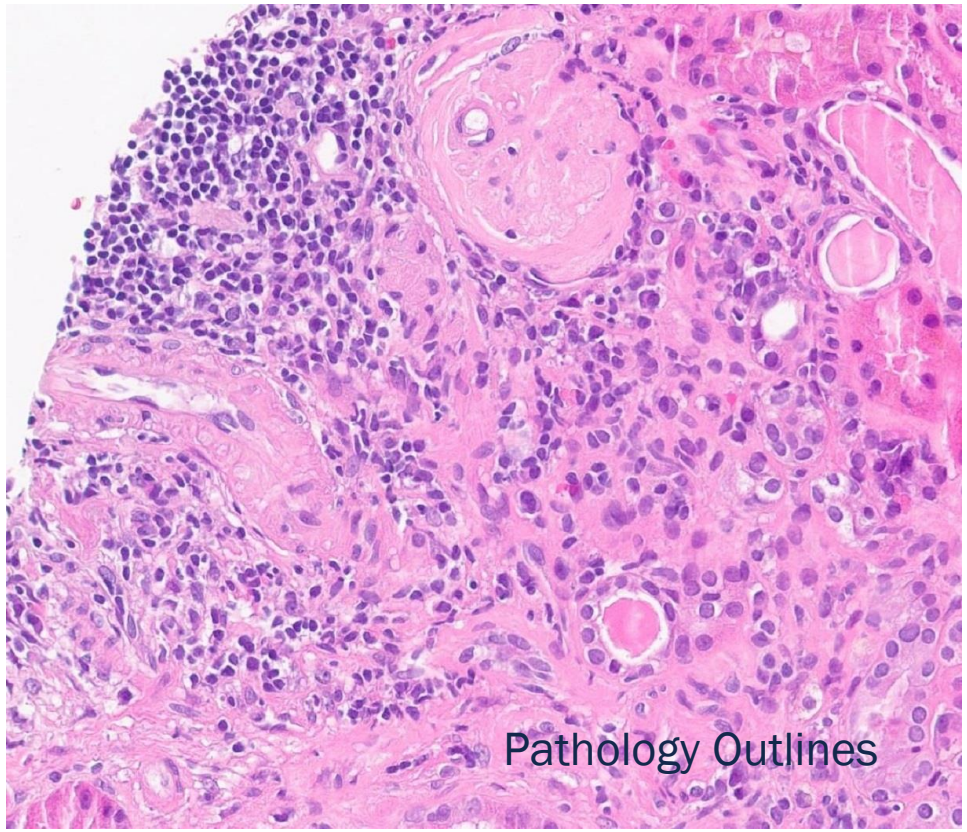


Hypertensive kidney

What does hypertension do to the kidneys?



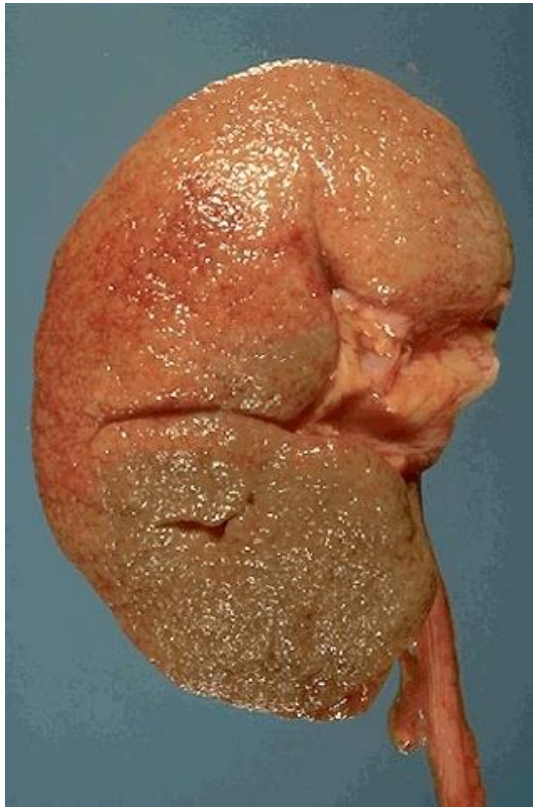
Normal Kidney



Hypertensive kidney

What does hypertension do to the kidneys?

http://h15.beauty/real-healthy-human-kidney

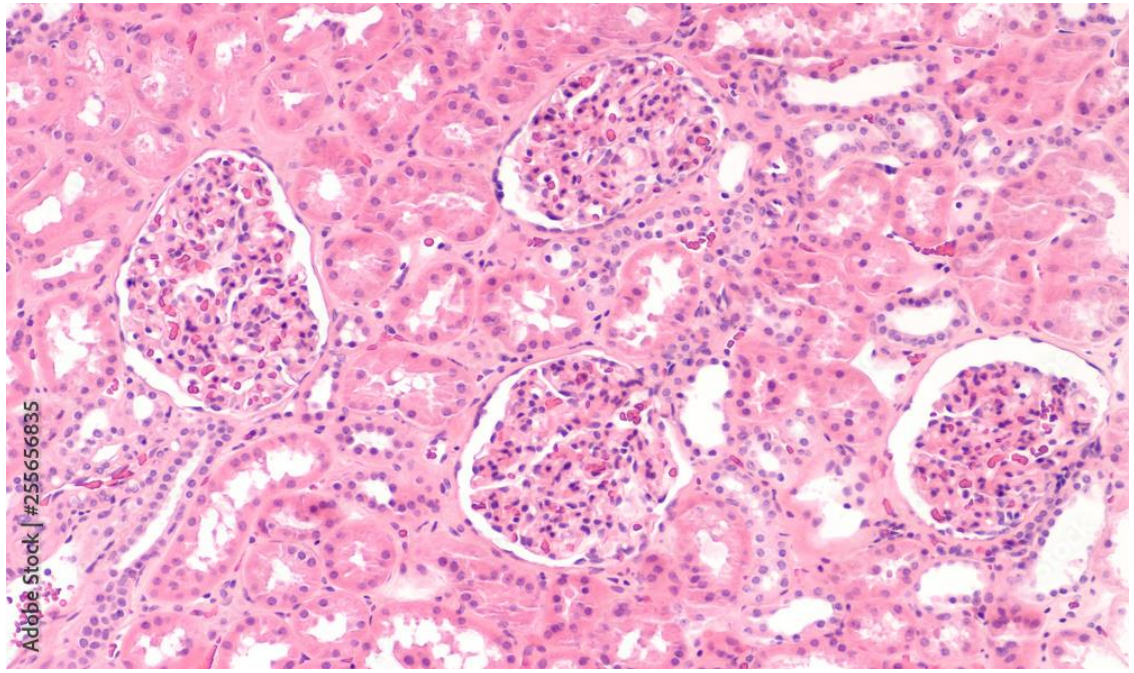


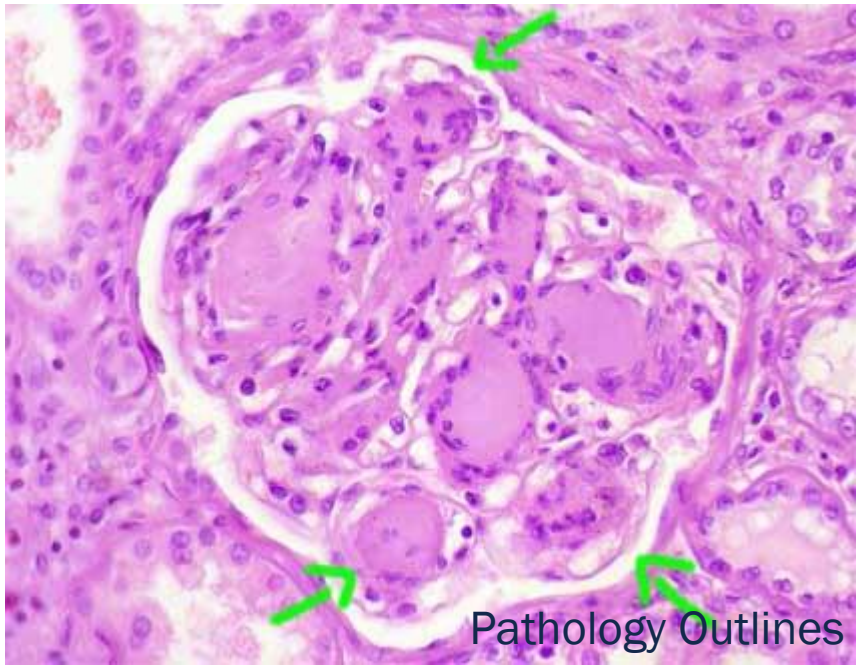
- https://webpath.med.utah.edu/RENAHTML/RENAL033.html

What does hypertension do to the kidneys?

- Kidneys become atrophic (smaller than normal)
- Granular surface
- Glomeruli show ischemic changes
- Glomeruli eventually become sclerotic (nephrosclerosis)
- Blood vessels become abnormal (hyaline arteriolosclerosis)

What does diabetes do to the kidneys?

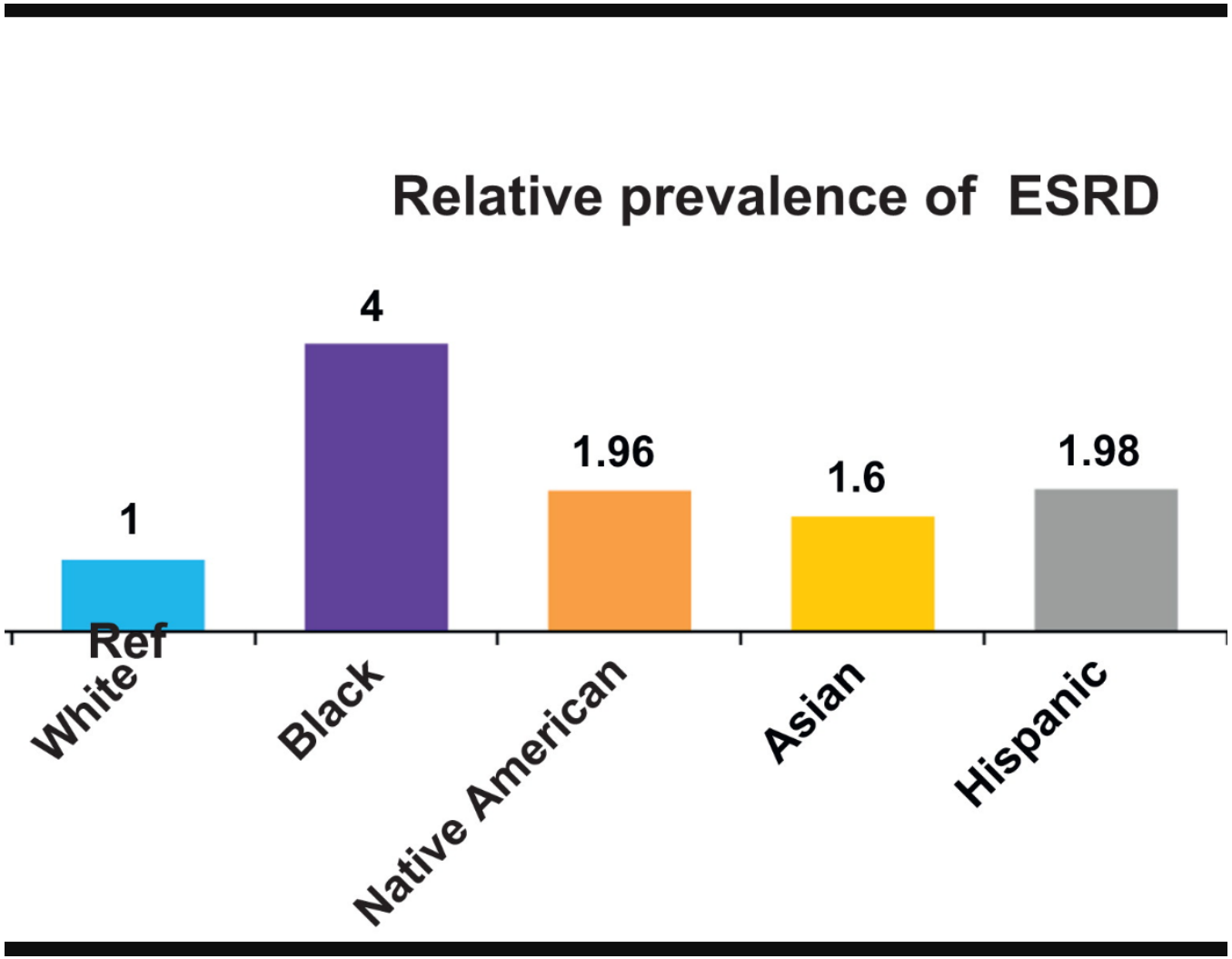




What Does Diabetes do to the kidney

- Thickening of the glomerular basement membrane
- Diffuse mesangial matrix expansion with nodular sclerotic lesions (Kimmelstiel-Wilson nodules)

Health Care Disparities



https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4291541/

Kidney Disease: Health Care Disparities

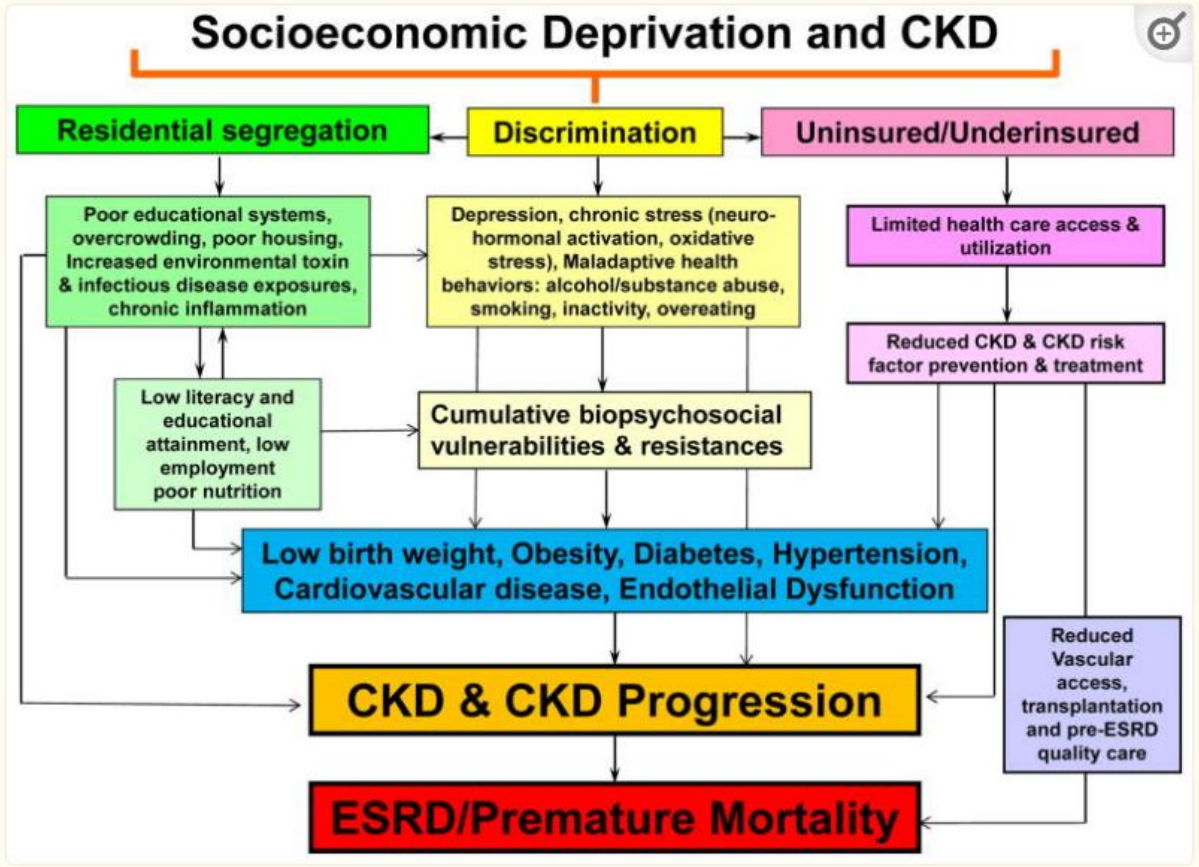


Figure 1

Conceptual model of the inter-relationship between socioeconomic deprivation and chronic kidney disease

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4291541/

Kidney Disease: Health Care Disparities

UNC Health and UNC School of Medicine

Newsroom

UNC HEALTH

News | Newsletters | Submit News/Event | News Team | For the Media | Events

Home / Diversity, Equity and Inclusion / UNC Hospitals Transplant, UNC Health Nephrologists, Health Equity Teams Reduce Disparities for Black Community

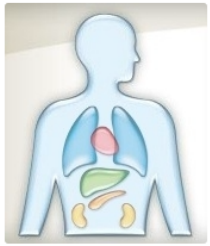
UNC Hospitals Transplant, UNC Health Nephrologists, Health Equity Teams Reduce Disparities for Black Community

April 1, 2024

April is Minority Health Month, a month to raise awareness about the need to reduce health disparities and improve the health of minority communities. The UNC Health Center for Transplant Care team and UNC Health nephrologists recently increased equitable access for the Black community by addressing and fixing a disparity among kidney transplant patients.

The UNC Health Center for Transplant Care team at the UNC Medical Center recently collaborated with UNC Health nephrologists to ensure Black patients received equitable access to kidney transplants.

Before the policy was implemented, the estimated Glomerular Filtration Rate (eGFR) – a tool used by kidney transplant programs to measure a patient's kidney function – included a race-based coefficient, which consistently assigned a higher



UNC Health News Team

Have a question? Need to reach the UNC Health News Team?

Call: (984) 974-1140

Keisha Gibson, MD, MPH, associate professor of medicine and pediatrics, chief of pediatric nephrology in the Division of Nephrology and Hypertension at the UNC School of Medicine

https://news.unchealthcare.org/2024/04/unc-hospitals-transplant-team-unc-health-nephrologists-and-equity-inclusion-department-reduce-disparities-for-black-community/

Summary: Kidneys

- Filter blood
- Help maintain proper balance of fluids and electrolytes
- Help maintain blood pressure
- Produce erythropoietin
- Help support healthy bones
- Can be damaged by a variety of systemic disorders including hypertension, diabetes, cardiovascular disease, and autoimmune diseases
- Significant health disparities exist in the incidence of kidney disease in the US

- No disparities stuff; well covered by Gibson
- Apol1 (genetic disposition)
- More pathology; especially mechanism of how HTN and T2DM hurt kidneys
- SGLT2 (Jardiane; Glifozins)