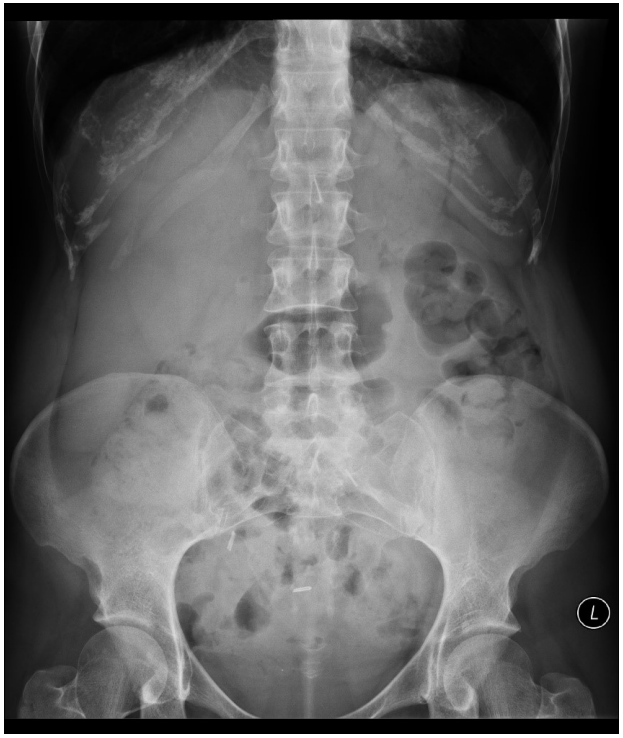
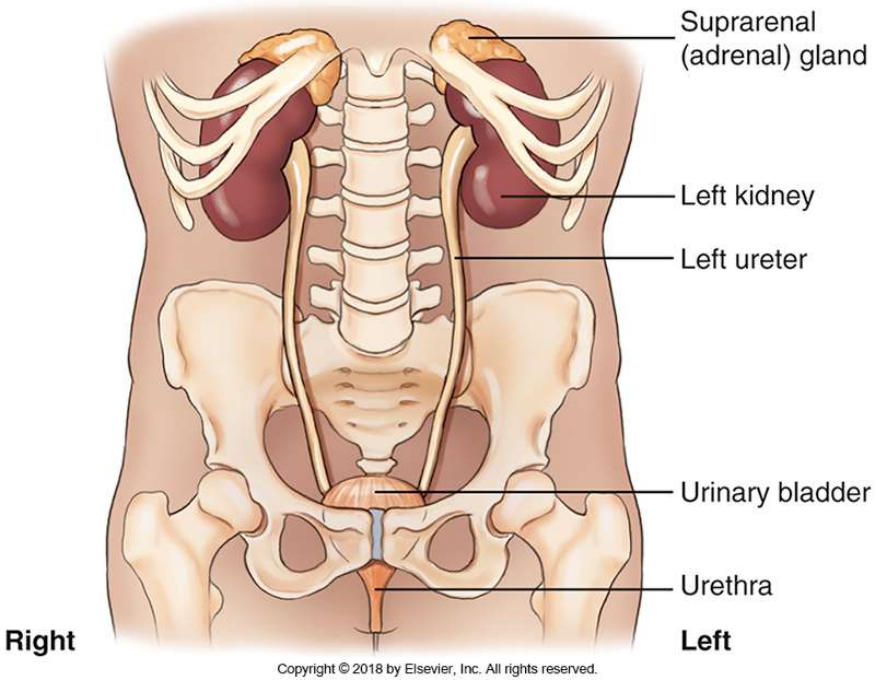
ANPH 252:

Urinary System Anatomy

KUB – Kidneys, Ureters, Bladder



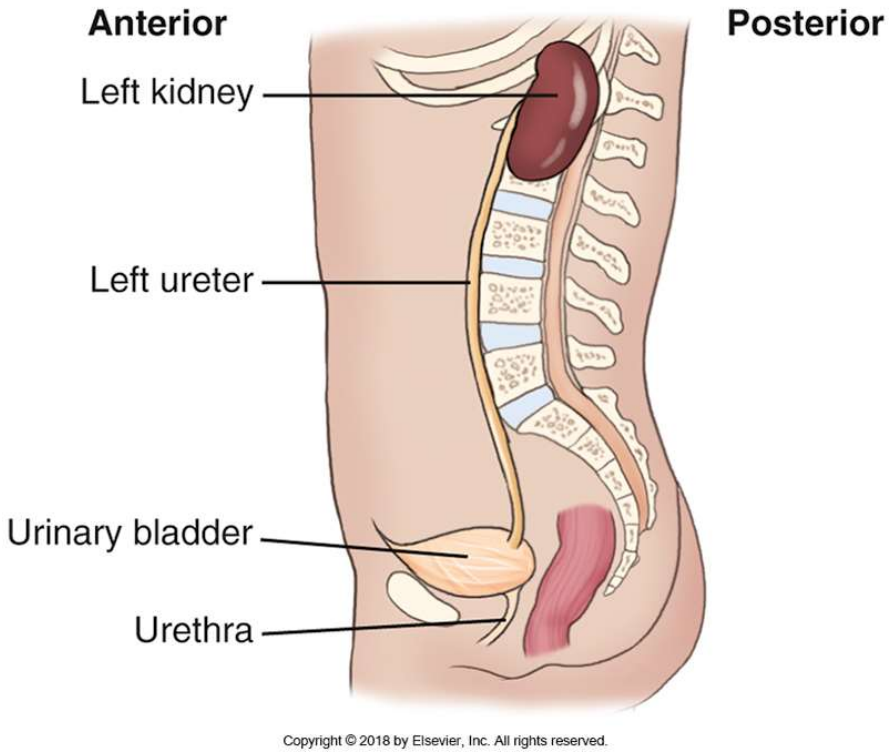


Copyright © 2018 by Elsevier, Inc. All rights reserved.

- Case courtesy of Dr Jeremy Jones, Radiopaedia.org, rID: 34067

Retroperitoneal location

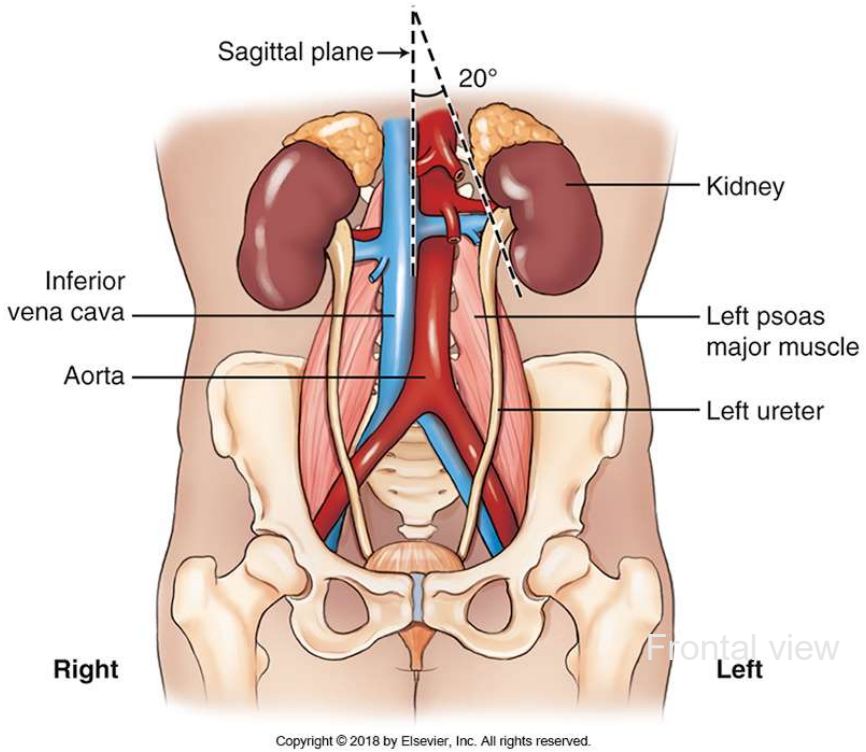
- Retroperitoneal structures: kidneys and proximal ureters
- Infraperitoneal structures: distal ureters, urinary bladder, urethra



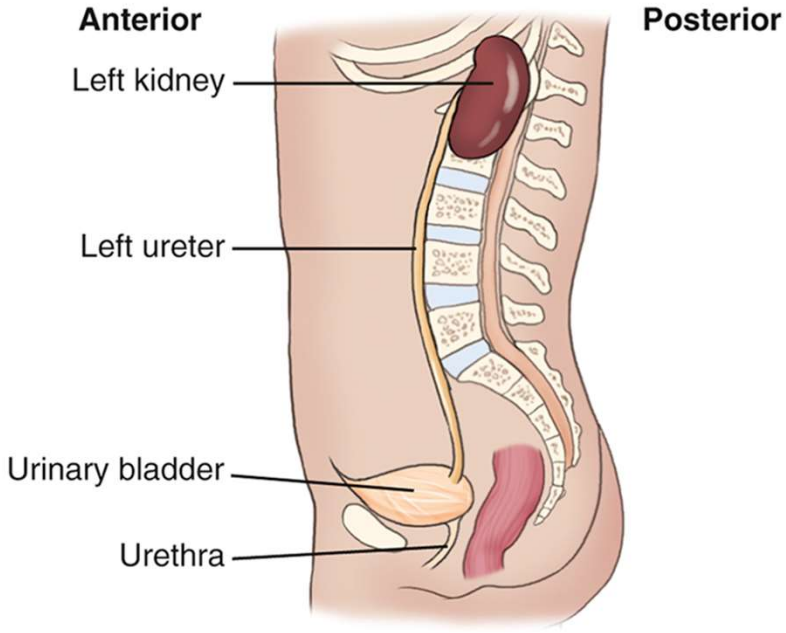
Copyright © 2018 by Elsevier, Inc. All rights reserved.

Copyright © 2014 by Mosby, an imprint of Elsevier Inc.

Kidney orientation



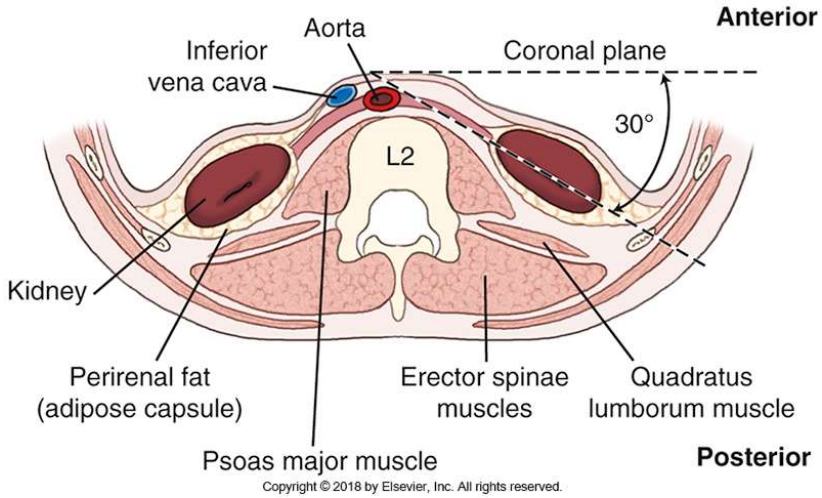
Copyright © 2018 by Elsevier, Inc. All rights reserved.



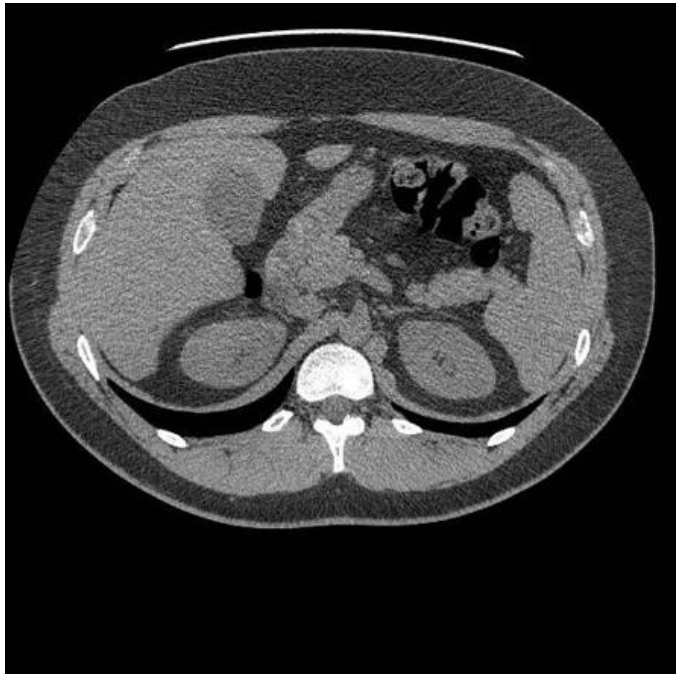
Copyright © 2018 by Elsevier, Inc. All rights reserved.

Copyright © 2014 by Mosby, an imprint of Elsevier Inc.

Kidney Orientation



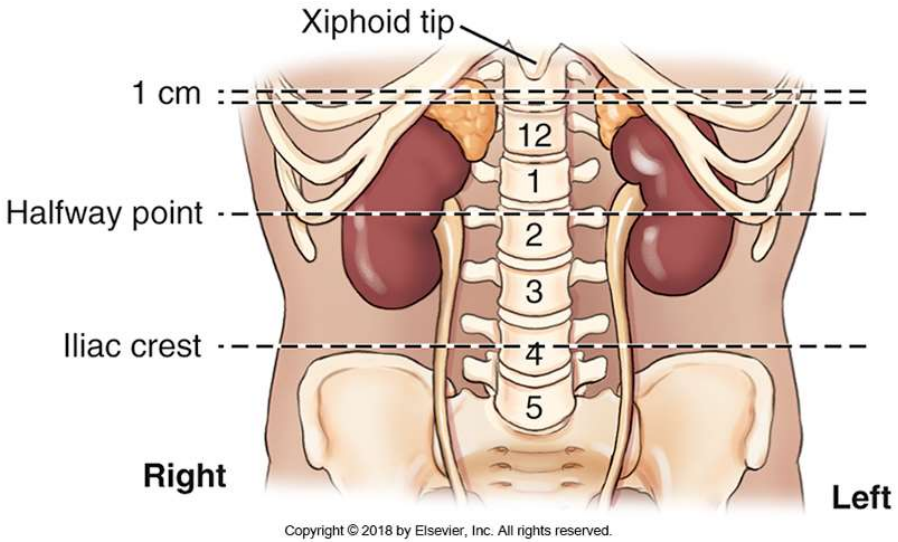
Copyright © 2018 by Elsevier, Inc. All rights reserved.



Case courtesy of Dr Jeremy Jones, Radiopaedia.org, rID: 13216

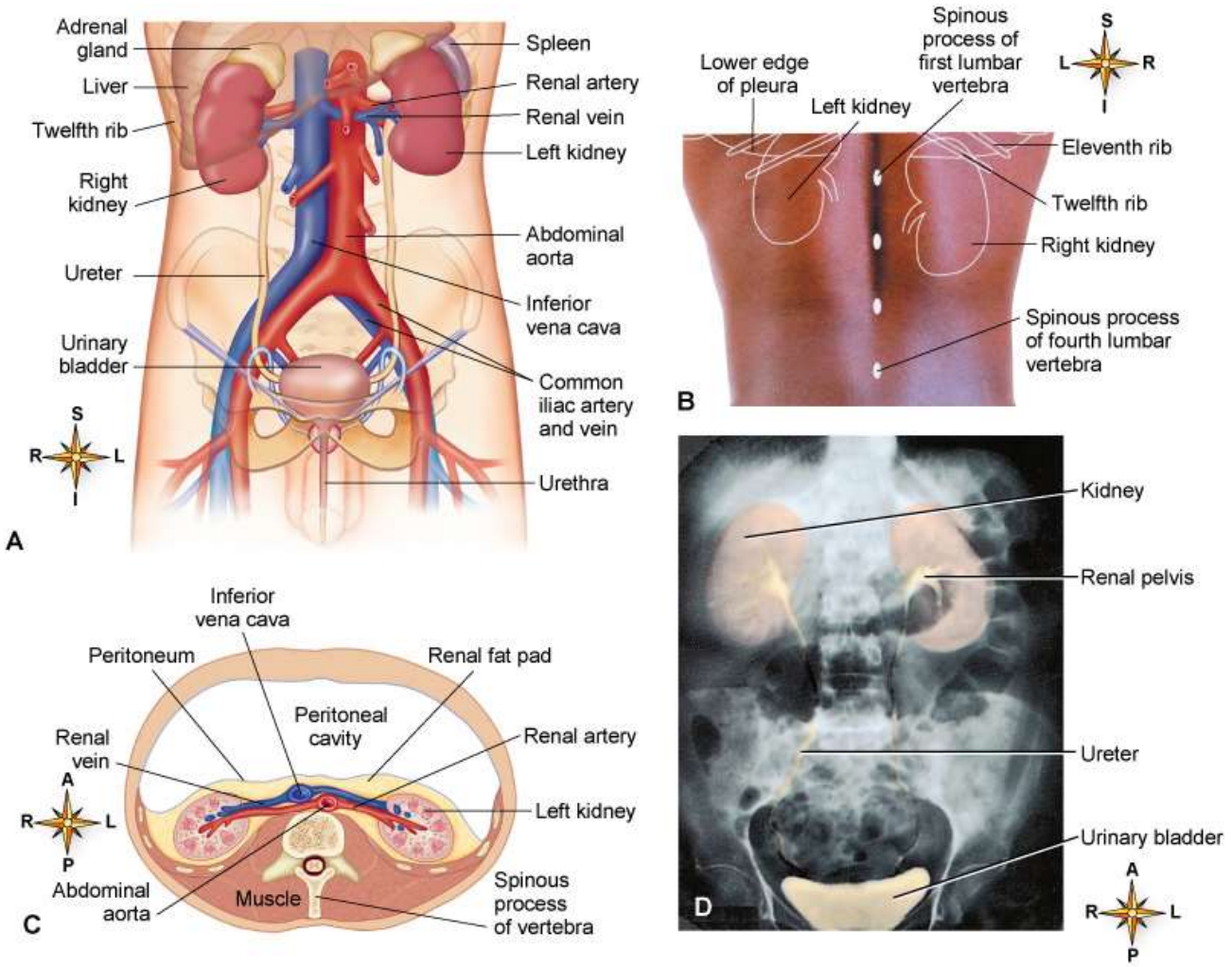
External landmarks for kidneys

- Halfway between xiphoid process and iliac crest
- Between T11/12 and L3
- The renal fat pad encasing each kidney, holds it in place and protects it



Copyright © 2018 by Elsevier, Inc. All rights reserved.

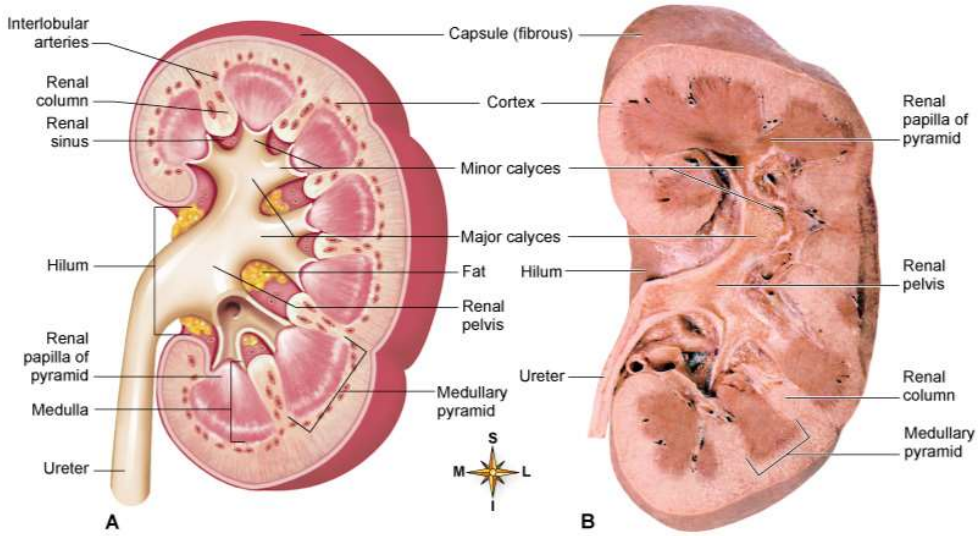
Copyright © 2014 by Mosby, an imprint of Elsevier Inc.



B, From Abrahams P, Hutchings RT, Marks SC: *McMinn's color atlas of human anatomy*, ed 5, St Louis, 2003, Mosby.

Patton and Thibodeau 20-1

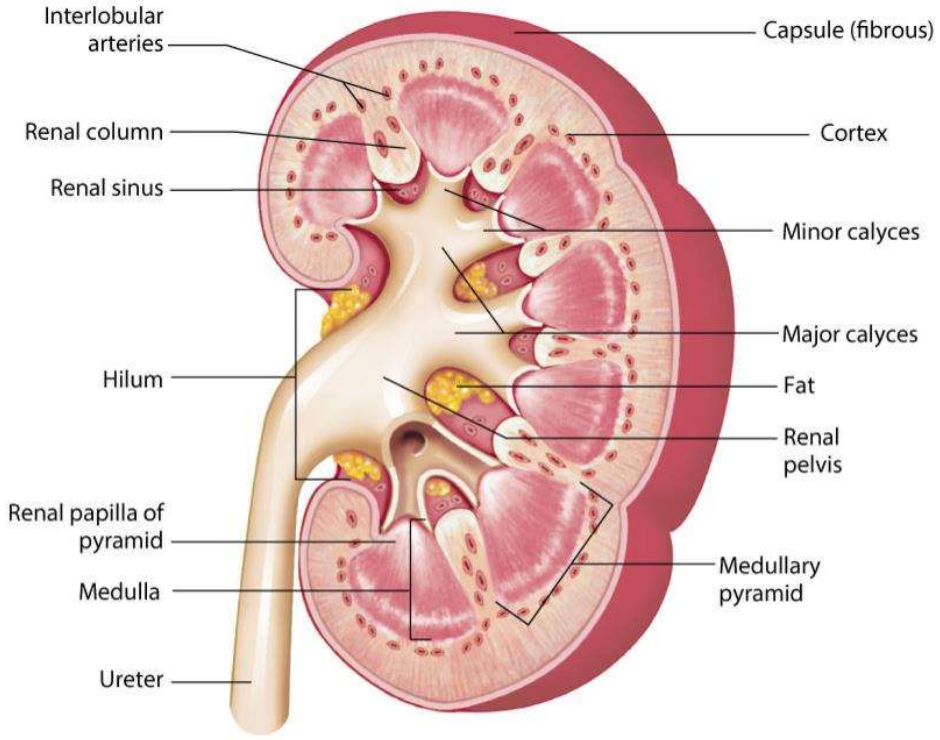
Kidney anatomy



B, From Abrahams P, Marks S, Hutchings R: *McMinn's color atlas of human anatomy*, ed 6, Philadelphia, 2008, Mosby.

- 20% of the total volume of blood is pumped through the kidneys each minute
- Normal blood pressure and a high rate of blood flow must be maintained for urine to be produced
- The average size of a kidney is 11 X 7 X 3cm
- Blood vessels, nerves, and the ureter, enter the kidney at the hilum

Kidney anatomy

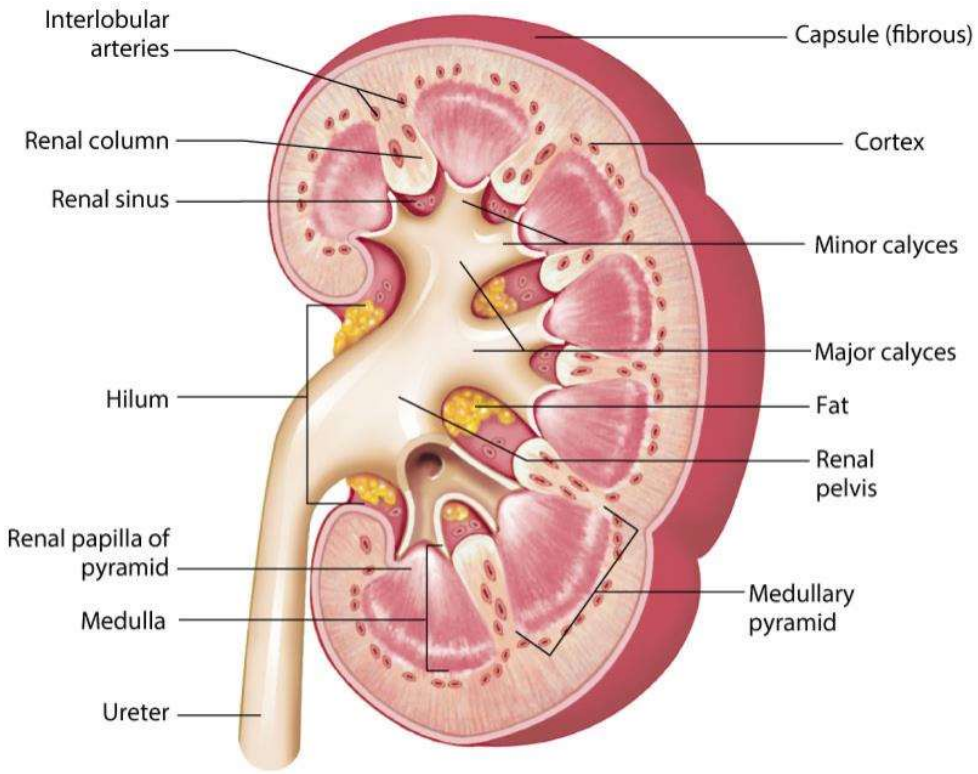


from Brundage DJ: *Renal disorders*, St. Louis, 1992, Mosby.

Kidney anatomy

Know the following anatomy:

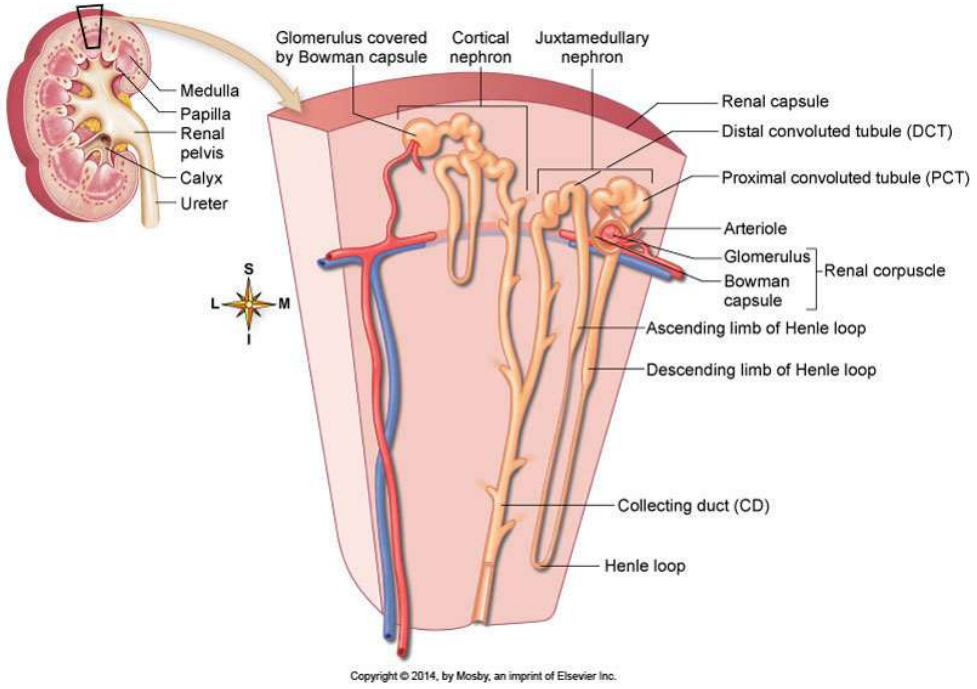
- Renal capsule
- Renal cortex
- Renal medulla
- Renal column
- Renal/medullary pyramids
- Nephron
- Major/Minor calyces
- Renal pelvis
- Renal hilum



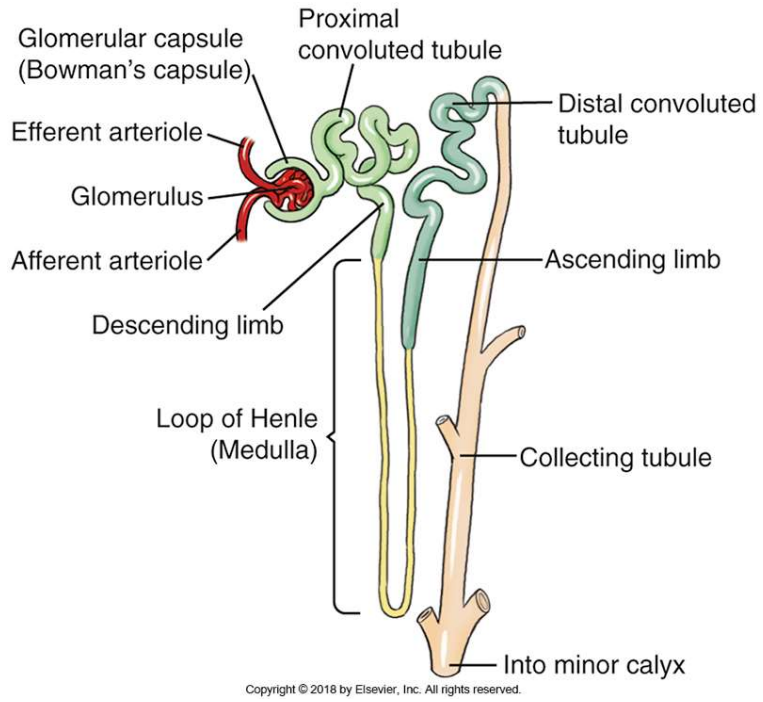
from Brundage DJ: *Renal disorders*, St. Louis, 1992, Mosby.

Nephrons: the microscopic filtering units

- Each kidney contains over a million nephrons
- 85% of nephrons are cortical nephrons
- 15% are juxtamedullary nephrons that help to concentrate urine
- Each nephron has a renal corpuscle and a renal tubule



Nephrons: the microscopic filtering units



Know the location and function of the following anatomical parts:

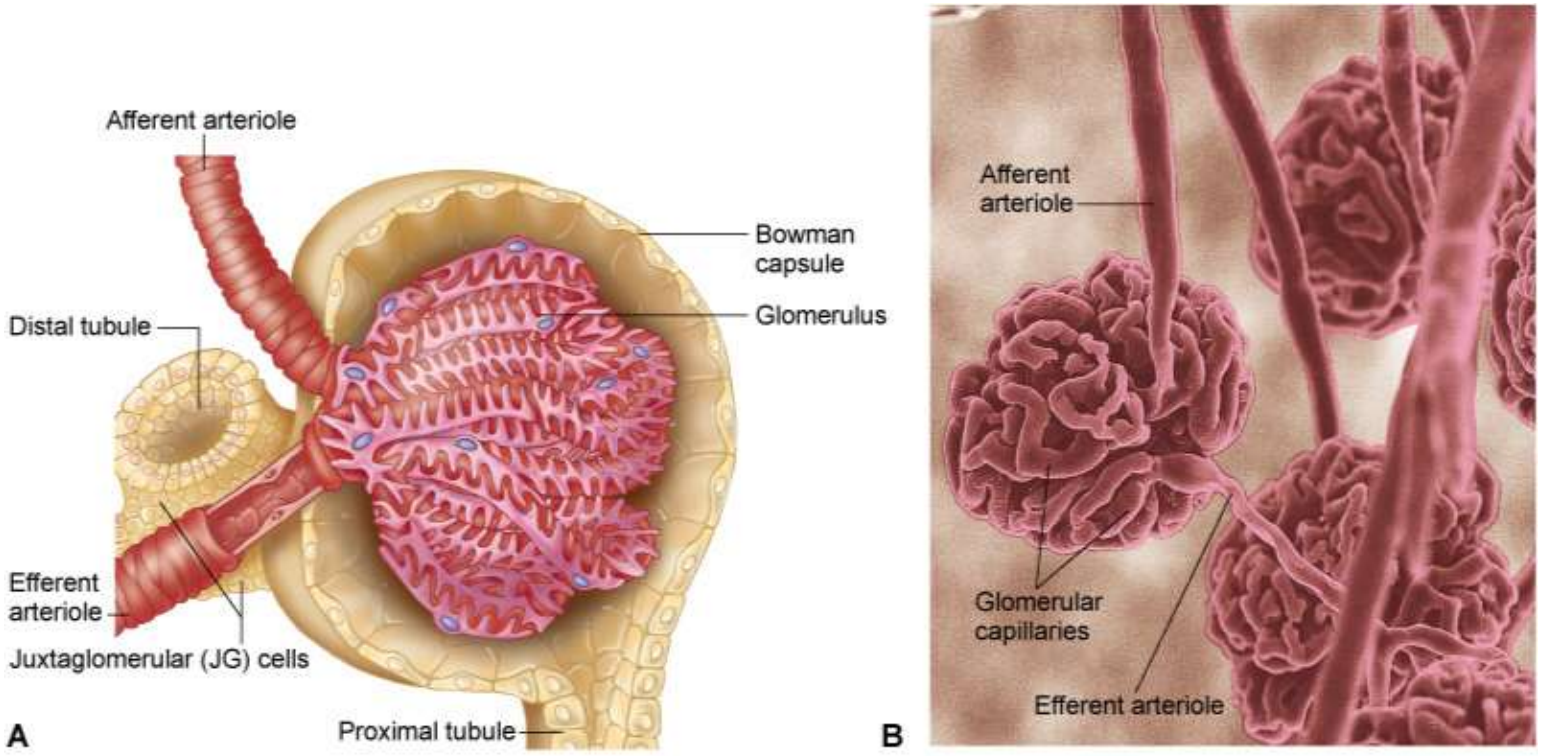
The renal corpuscle:

- Bowman's capsule
- Glomerulus

The renal tubule:

- Proximal convoluted tubule
- Loop of Henle
- Distal convoluted tubule
- Collecting duct/tubule

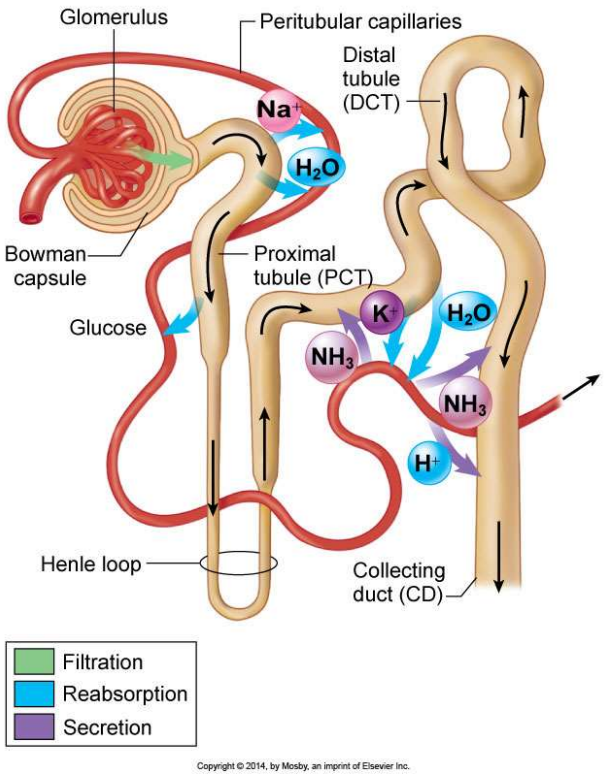
Glomerulus + Bowman's capsule = Renal corpuscle



Courtesy Andrew P. Evan, Indiana University School of Medicine.

Patton and Thibodeau 20-4

Urine formation

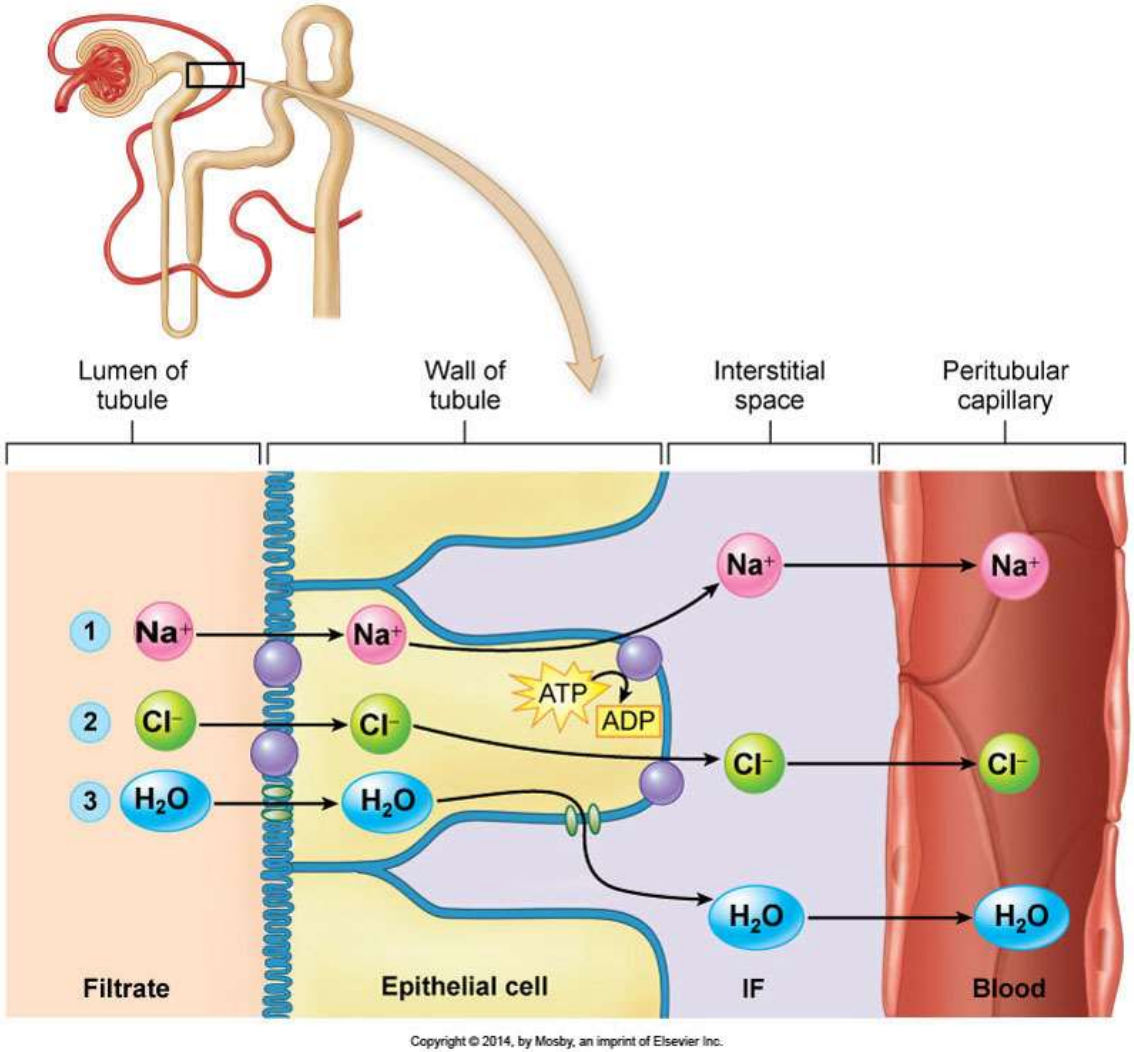


Copyright © 2014, by Mosby, an imprint of Elsevier Inc.

Kidneys maintain homeostatic blood chemistry by:

- removing waste products of cell metabolism
- regulating water and electrolyte levels
- regulating blood pressure and volume
- Releasing erythropoietin (EPO) hormone to stimulate RBC production

Patton and Thibodeau 20-8



Copyright © 2014, by Mosby, an imprint of Elsevier Inc.

Patton and Thibodeau 20-9

Urine formation

- Filtration: 50 gallons/180 liters/day
- Blood pressure in the glomerulus pushes water and blood solutes into Bowman's capsule. Therefore a drop in blood pressure can lead to kidney failure

- Reabsorption: 178 liters/day
- Water and nutrients such as glucose (100%) and important electrolytes like Na+ and Cl- (99%) are reabsorbed in the proximal tubule and loop of Henle.

- Excretion: Waste products are evacuated from the body.

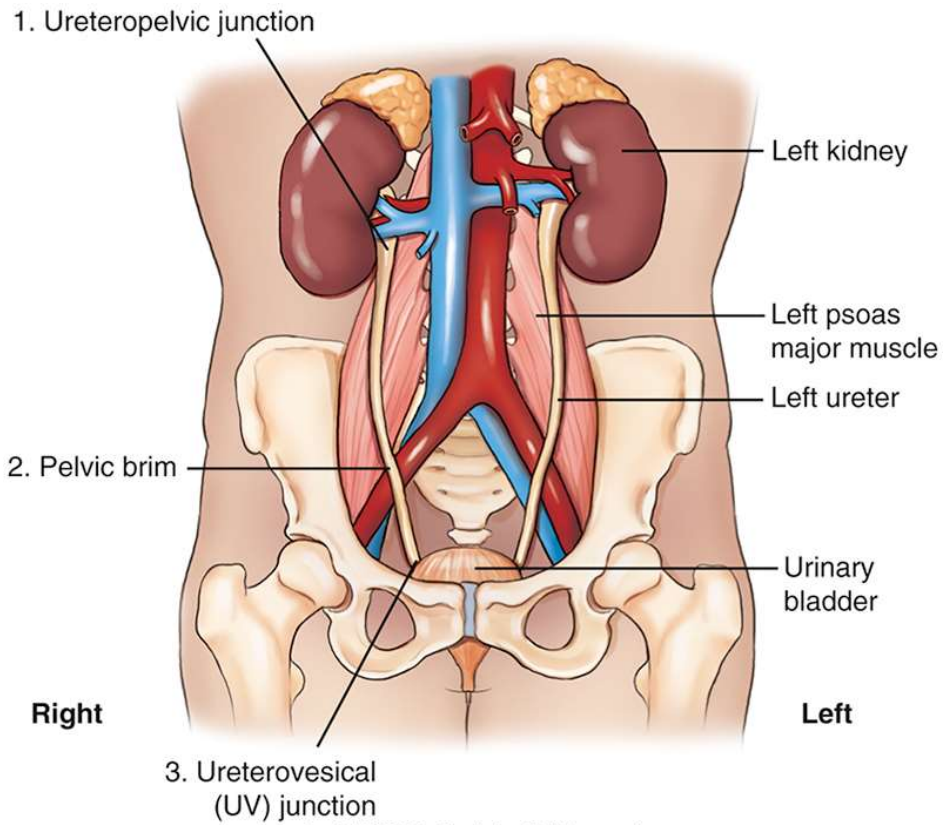
Urine Composition

- Urine is:
  - - 95% water
  - - 2.8% dissolved salts and other ions such as creatinine, ammonia, uric acid
  - - 2% urea

Ureters

- ~ 1ft. Long
- located on anterior side of psoas muscles
- enter posterolateral aspect of bladder

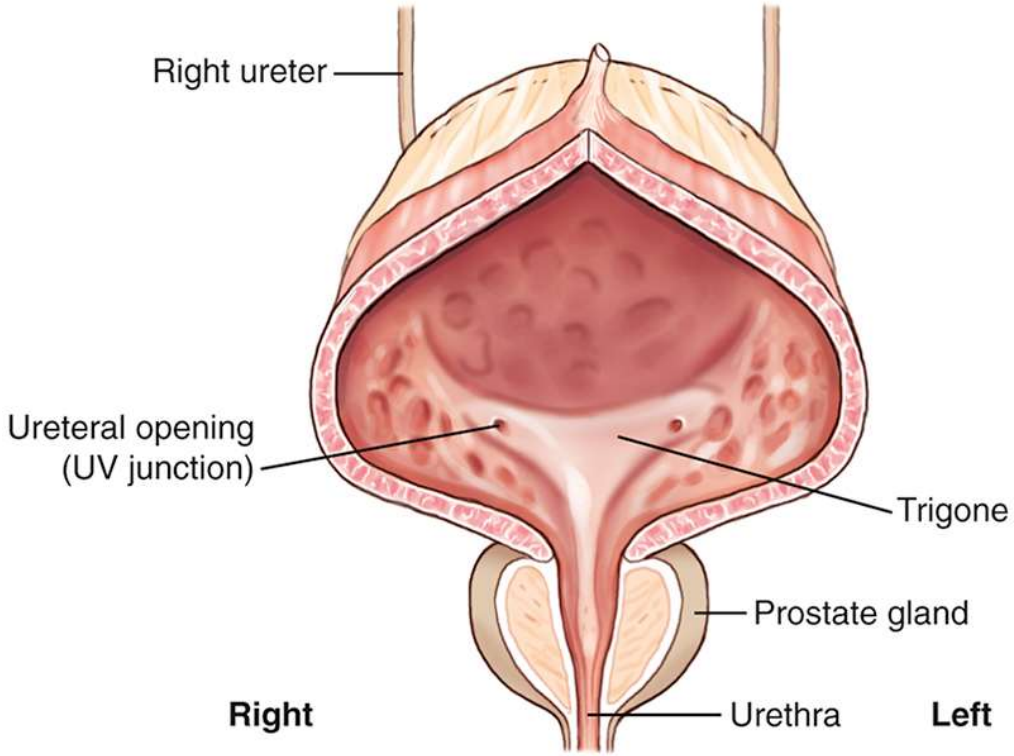
Note the constriction points of ureters are numbered 1,2, and 3 in diagram to the right



Copyright © 2018 by Elsevier, Inc. All rights reserved.

Copyright © 2014 by Mosby, an imprint of Elsevier Inc.

Urinary Bladder (male)



Copyright © 2018 by Elsevier, Inc. All rights reserved.

Copyright © 2014 by Mosby, an imprint of Elsevier Inc.

Micturition

- Also known as urination or voiding
- Emptying of the bladder
- Micturition includes 2 sphincters
  - Internal Urethral Sphincter (involuntary)
  - External Urethral Sphincter (voluntary)
- Both are sealed off when the bladder is being filled

Micturition

- **Emptying Reflex** – bladder wall stretches and send nerve impulses to 2nd-4th sacral segments of the spinal cord
- Makes the bladder muscles relax and the internal urethral sphincter relax
- External Urethral sphincter opens once you voluntary void

THANKS