

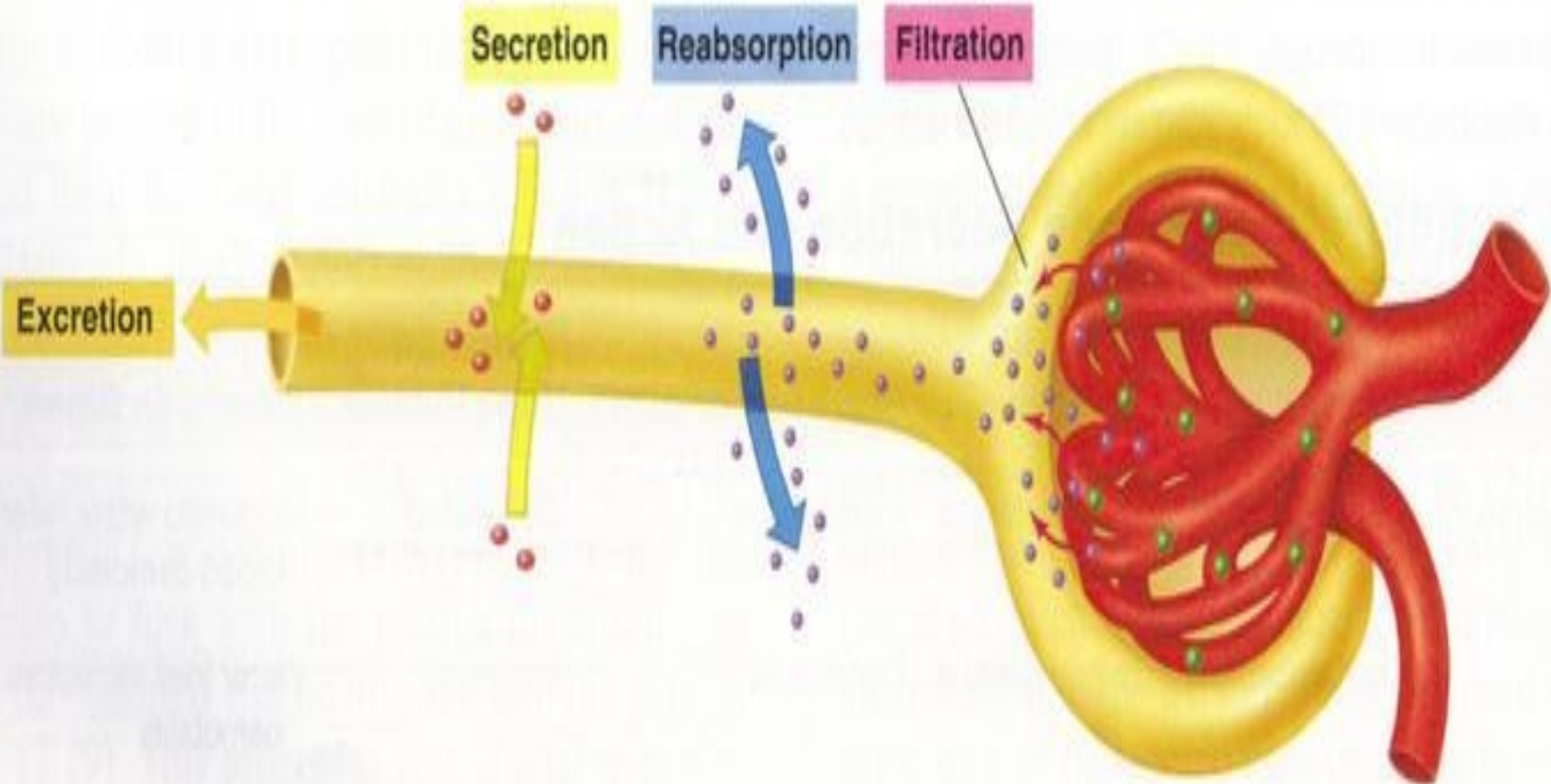


Renal Physiology: Filtration

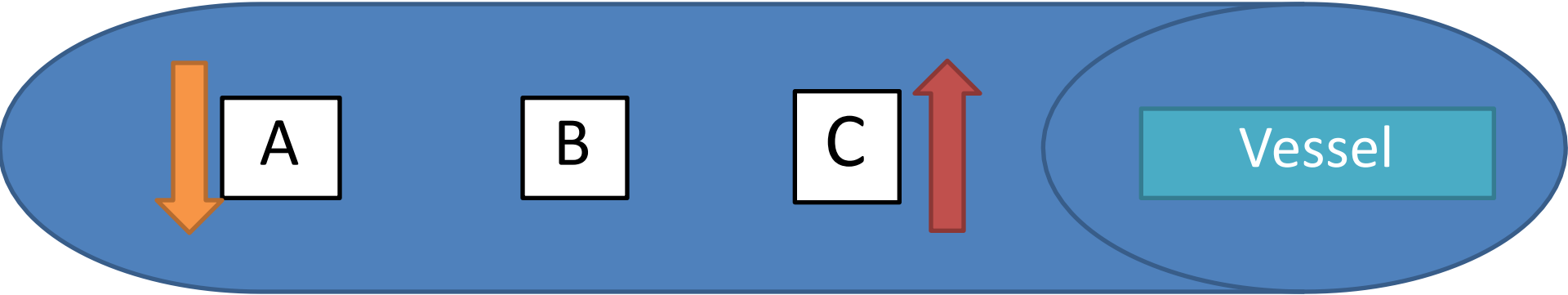
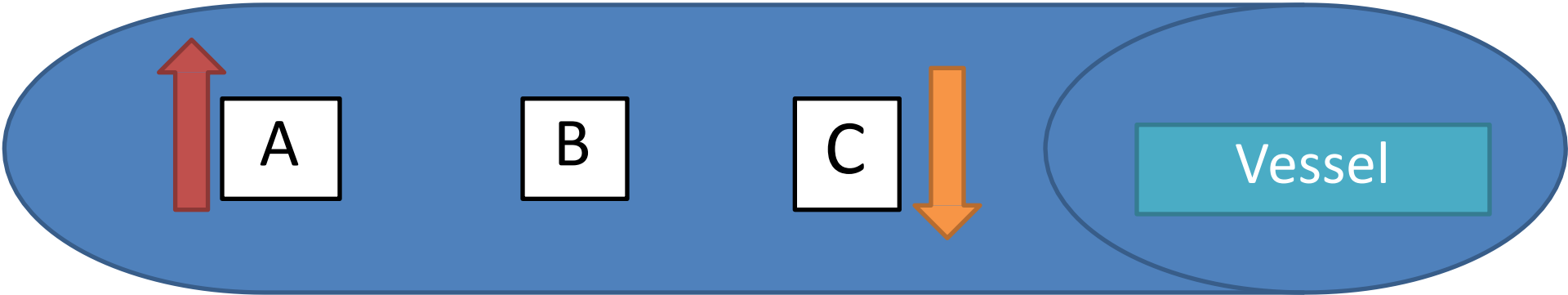
Abdullah Al-Asaad

KSAU-HS

Basics



Concept 1



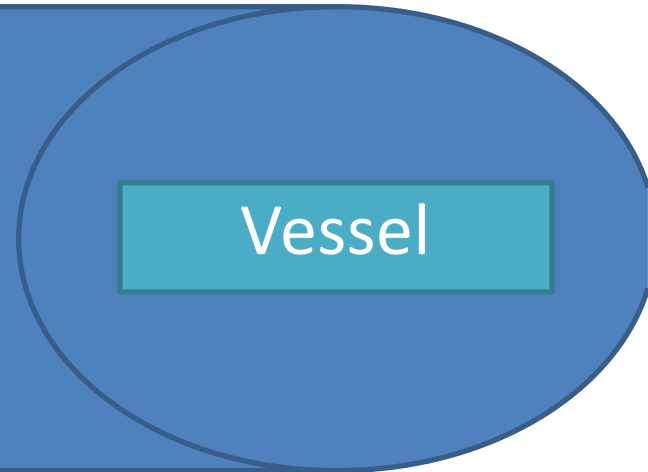
Concept 2



H_p



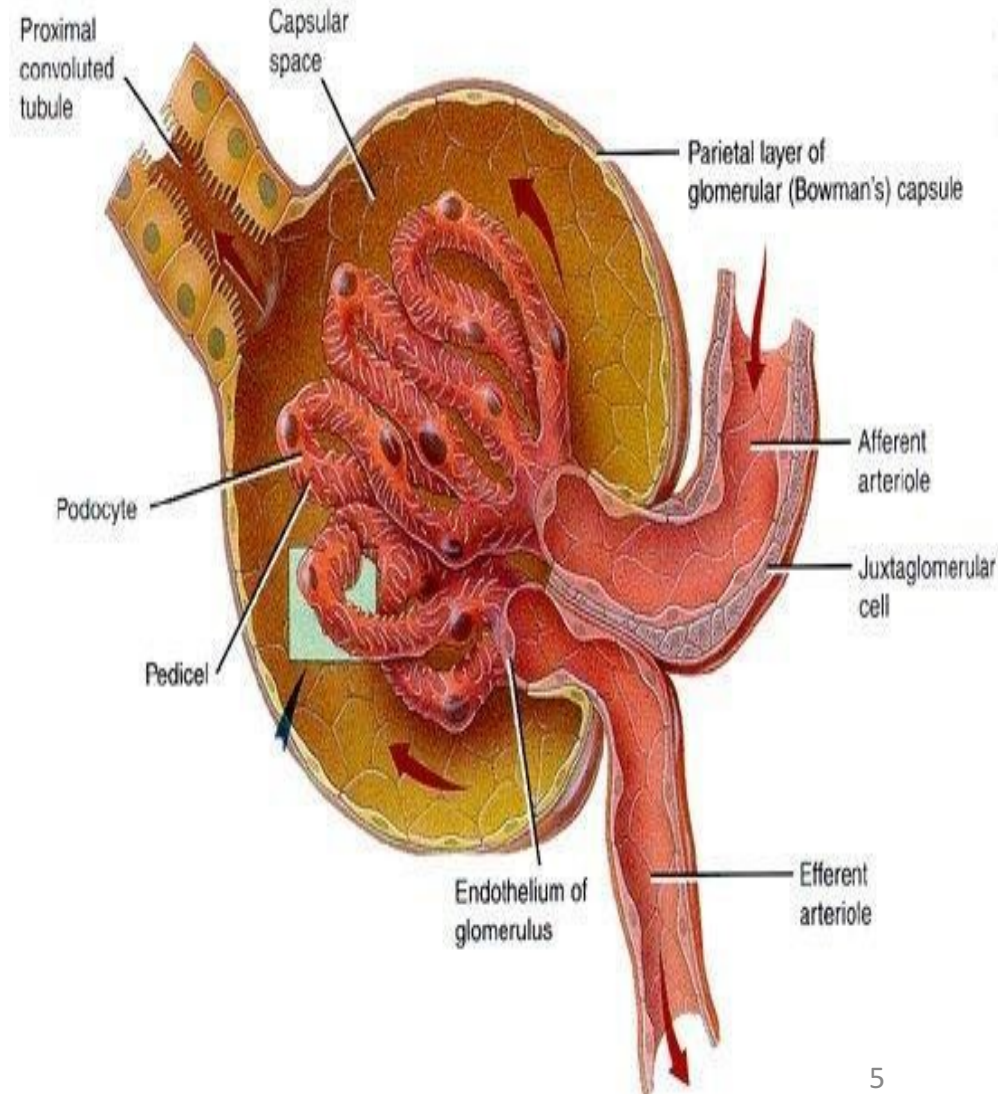
O_p



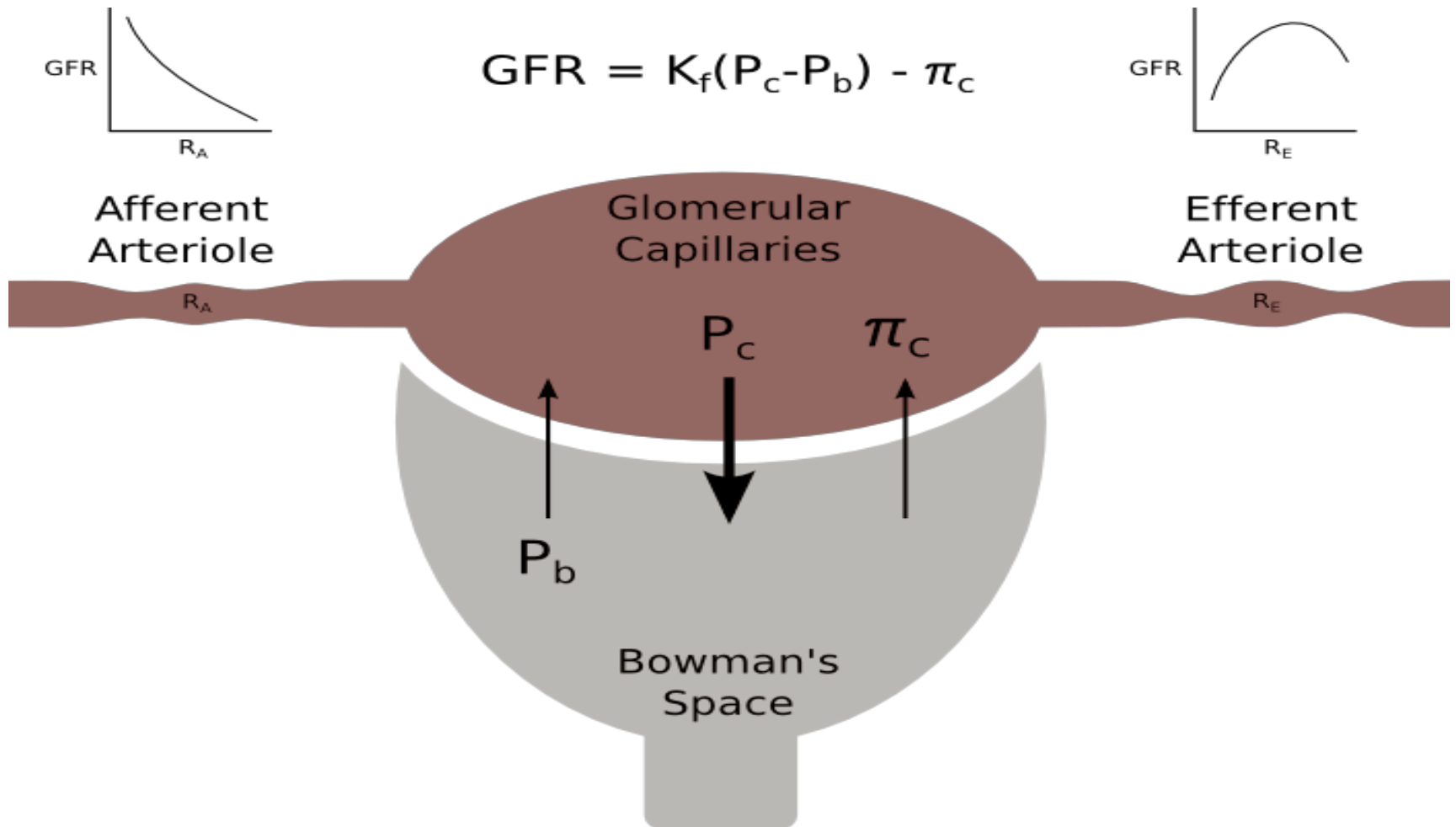
Glomerular Filtration Rate (GFR)



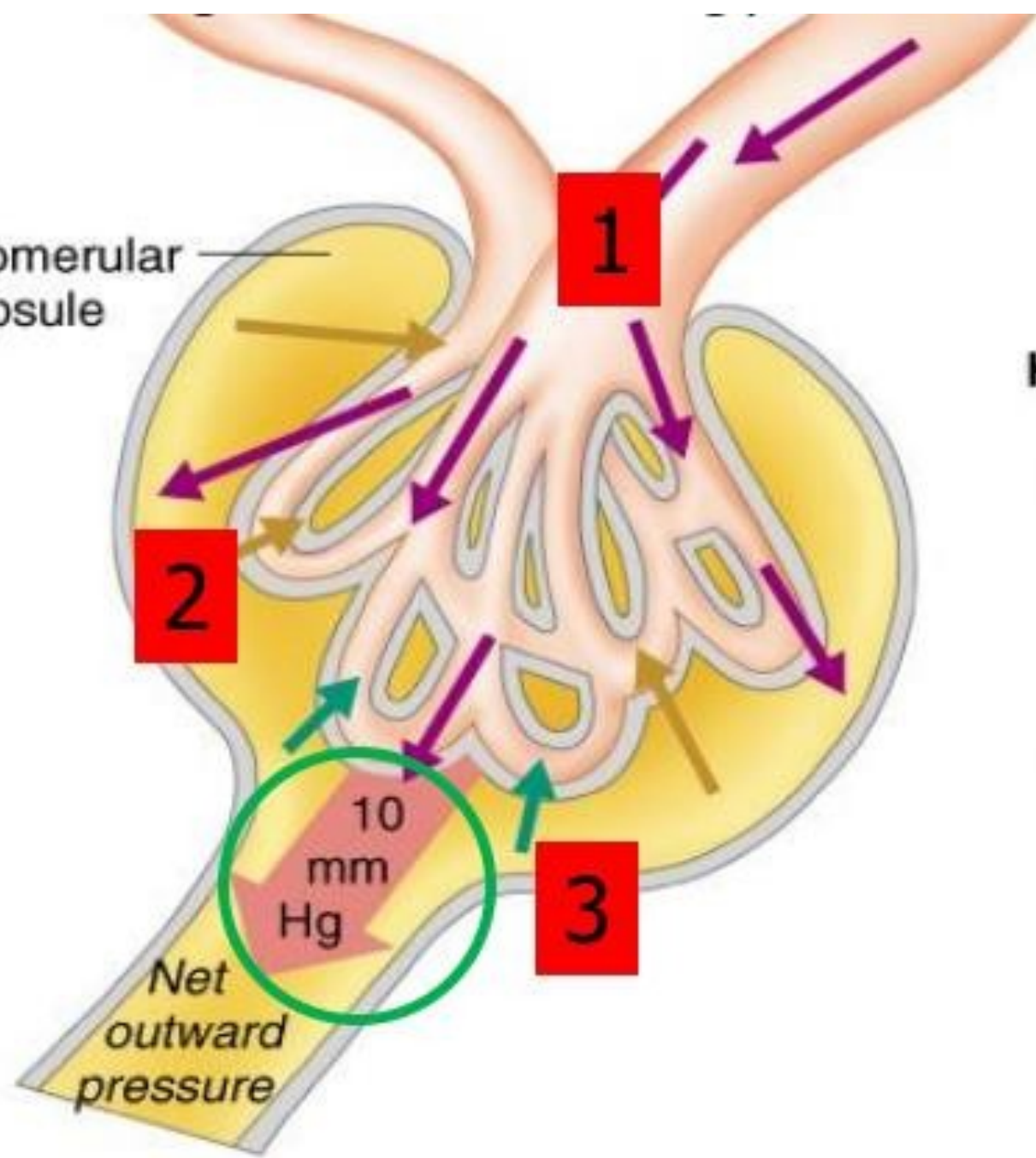
- Is the rate at which fluid is filtered into Bowman's Capsule
- Volume filtered per unit time e.g ml/min
- Normal is 125 ml/min or 180 L/day
- Note: if one kidney is removed → GFR??






The Four Factors



Glomerular
capsule



Key:

-  = Glomerular (blood) hydrostatic pressure (55 mm Hg)
-  = Blood colloid osmotic pressure (30 mm Hg)
-  = Capsular hydrostatic pressure (15 mm Hg)

Regulation

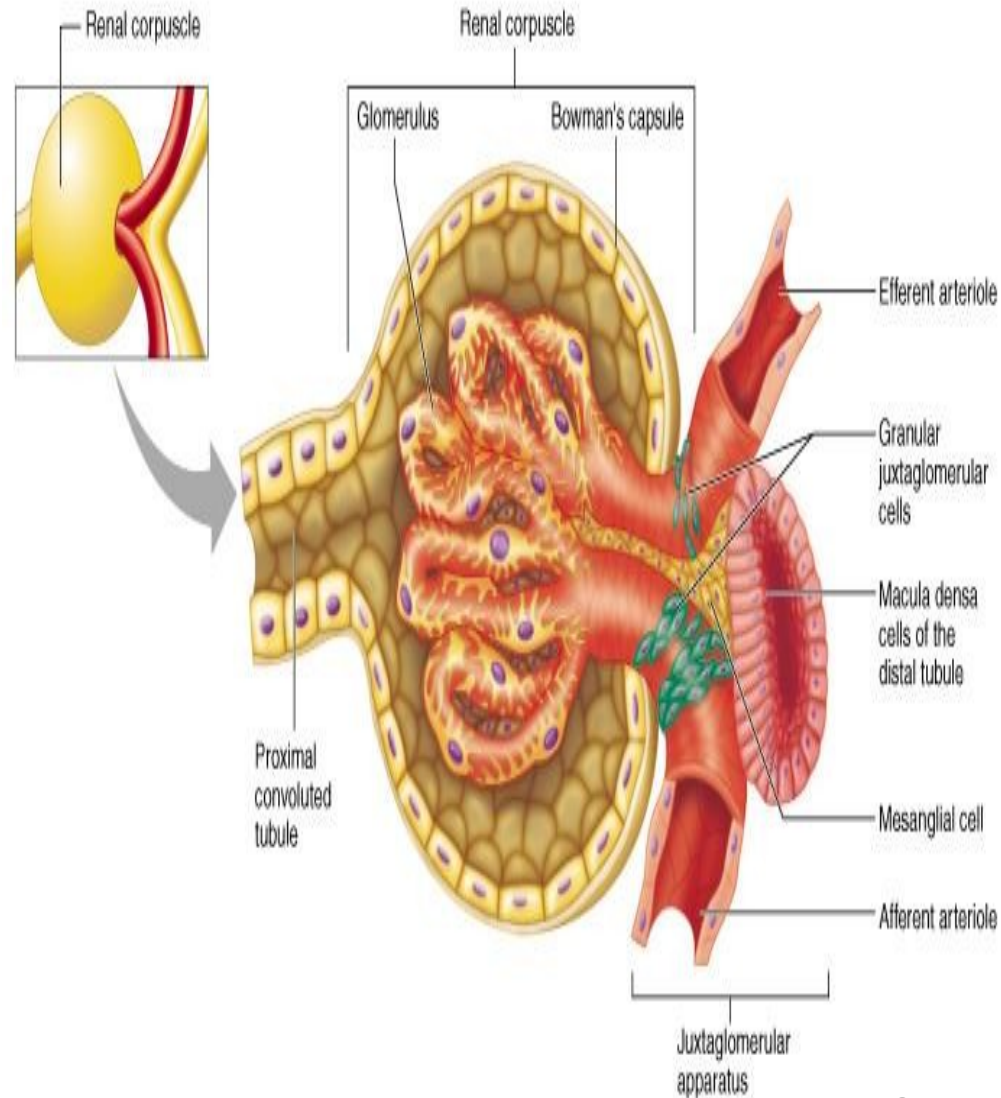
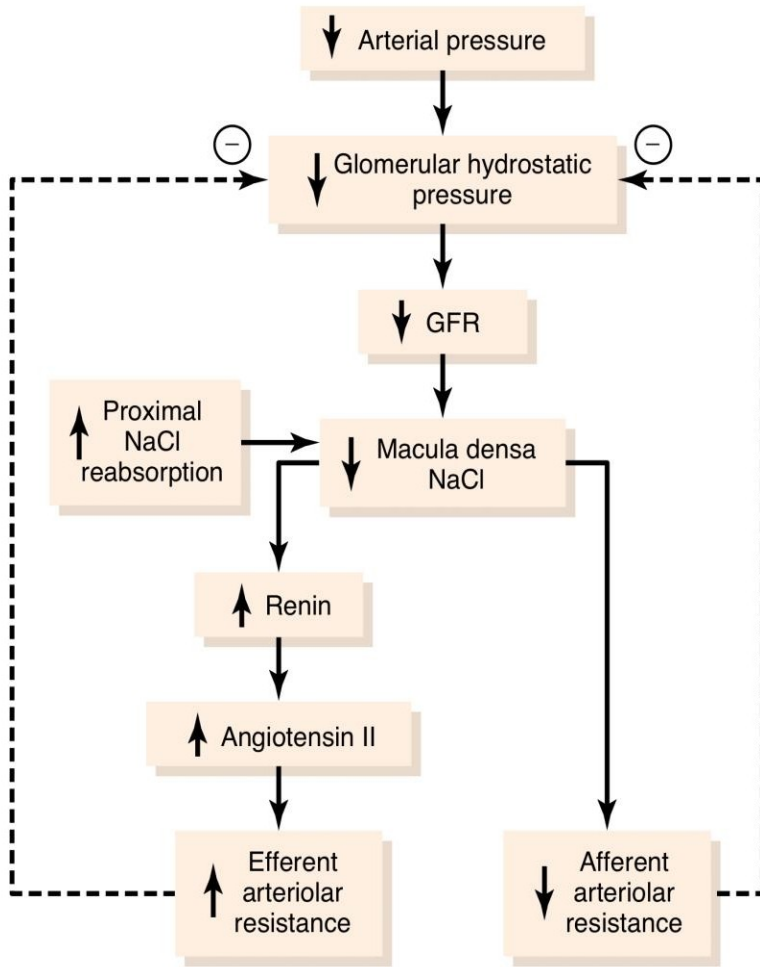
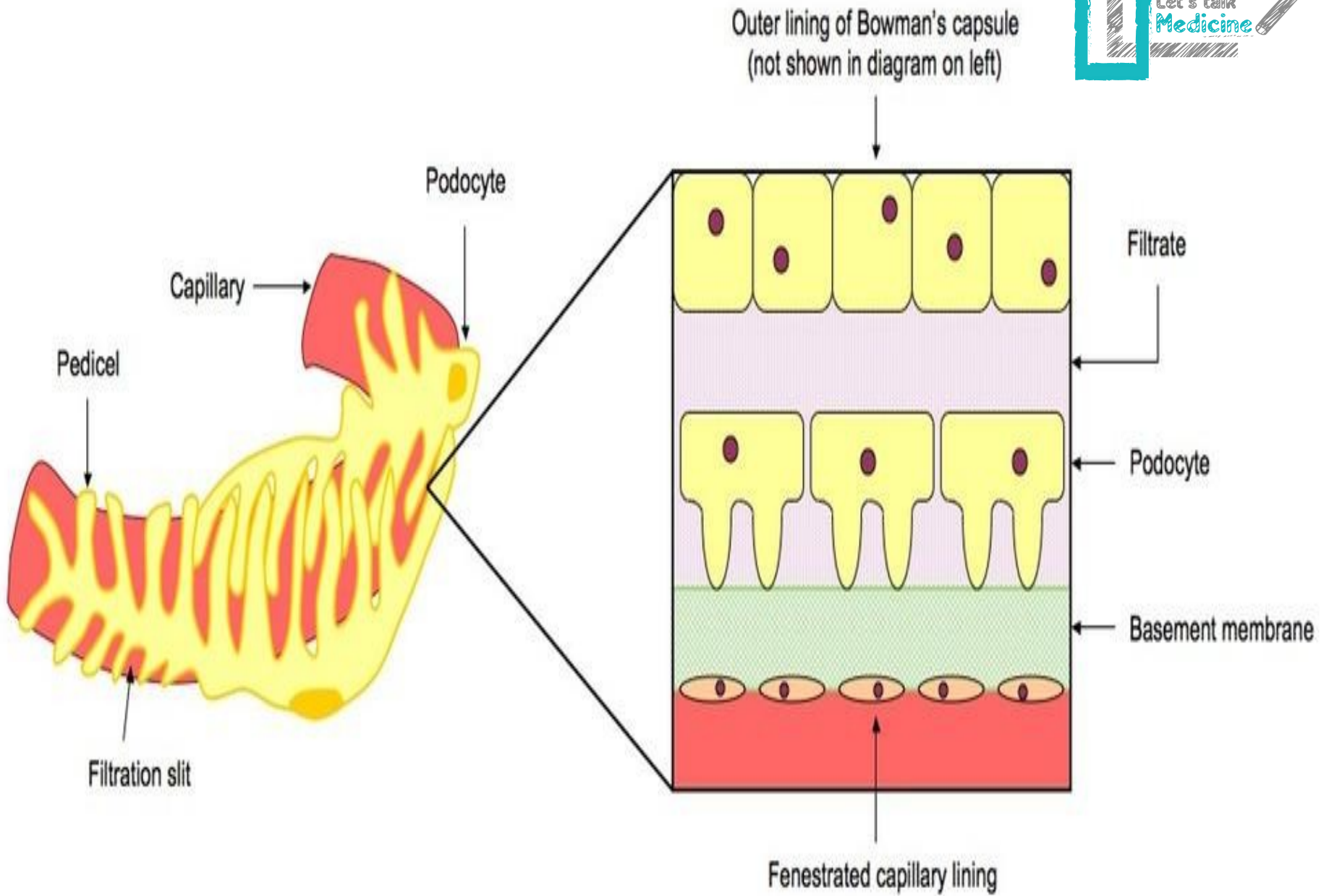


Figure 26-18

Macula densa feedback mechanism for autoregulation of glomerular hydrostatic pressure and glomerular filtration rate (GFR) during decreased renal arterial pressure.



- The Filtering Membrane of Glomerulus:
 1. Capillary endothelial wall with fenestrations
 2. Basement membrane
 3. Epithelial cell layer of podocytes



Material filtered



- Easily filtered:
 - ❖ Major electrolytes: Na, Cl, K
 - ❖ Metabolic waste: Urea, Creatinine
 - ❖ Metabolites: glucose, amino acid
 - ❖ Nonnatural substances: Inulin, PAH
 - ❖ Lower-Weight proteins and peptides: insulin, myoglobin

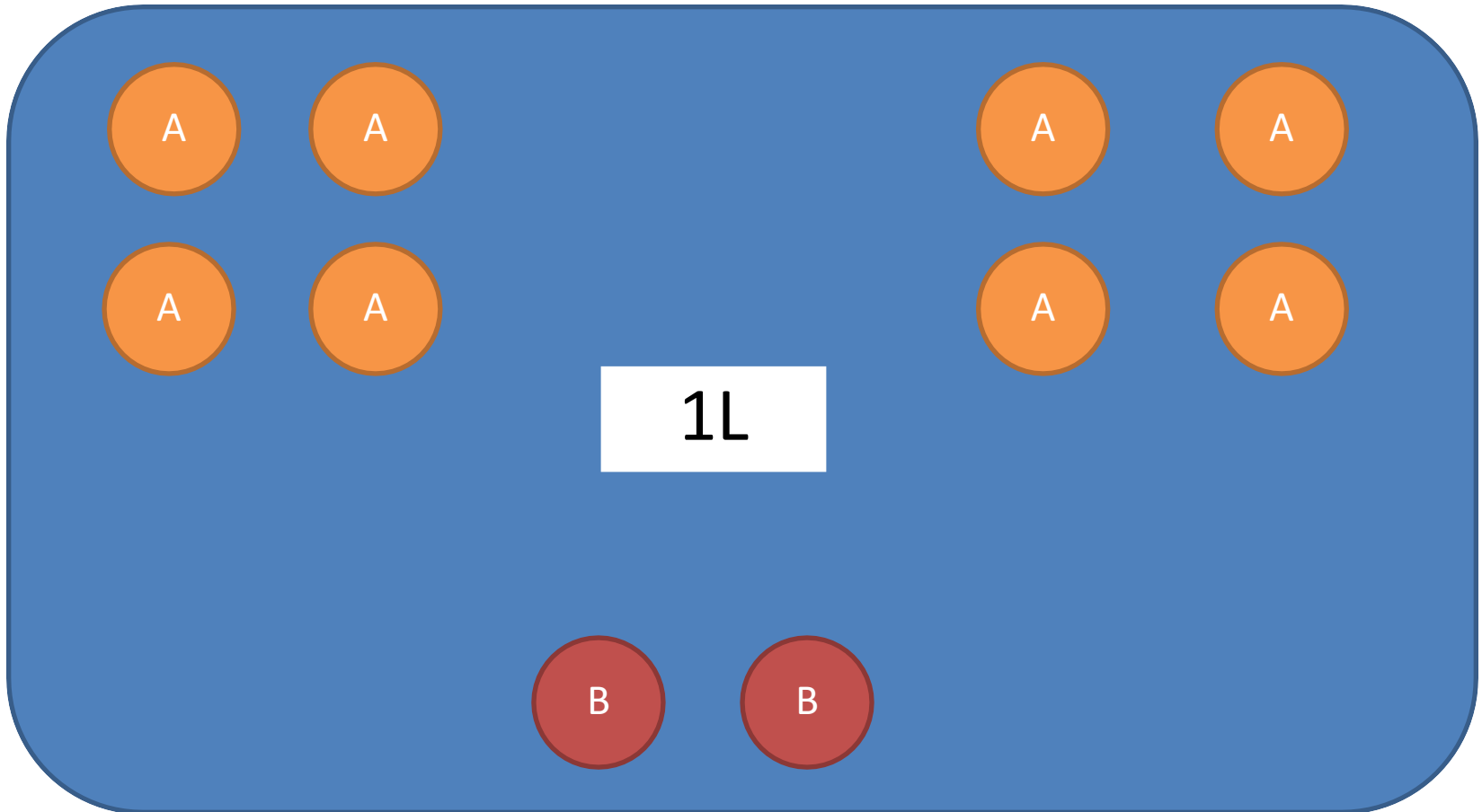
Filtration Fraction (FF)



- Fraction of the material entering the kidney that is filtered
- FF: $GFR/RPF \rightarrow 120/600 \rightarrow 0.20$ or 20%

	Afferent Constriction	Efferent Constriction
Glomerular Filtration pressure	Decrease	Increase
GFR	Decrease	Increase
RPF	Decrease	Decrease
FF	Not consistent	Increase

Clearance



Clearance



$$\text{clearance} = \frac{[x]_{\text{urine}} \times Vol_{\text{urine}}}{[x]_{\text{plasma}}}$$

- Unit is ml/min or L/day
- We use clearance to check for GFR function
- The Gold standard is Inulin but too expensive
- Clinical condition we use Creatinine



For any questions or comments
please contact us at:

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