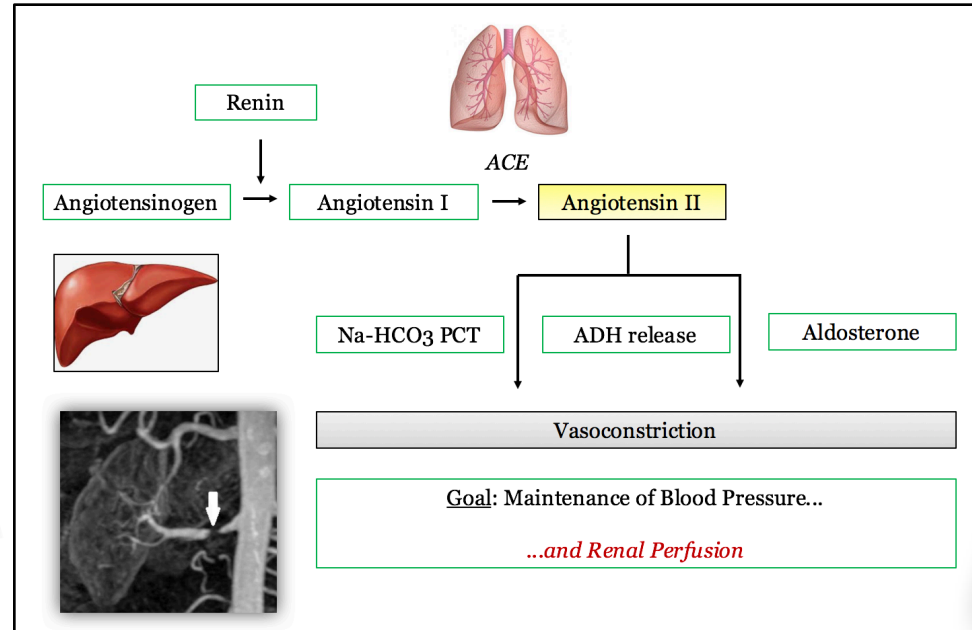


Blood Pressure (Dys)Regulation for the USMLE Step One Exam



Howard J. Sachs, MD
Associate Professor of Medicine
University of Massachusetts Medical School
www.12DaysinMarch.com; Season III
E-mail: Howard@12daysinmarch.com

Blood Pressure/HTN Series

- Regulation
- Renovascular HTN
- Endocrinopathies

Blood Pressure/HTN Series

- Blood Pressure Regulation
 - Autonomic nervous system (immediate: *seconds*)
 - ✓ Restore pressure
 - ✓ β -agonism: *stimulate renin*
 - Juxtaglomerular Apparatus [gradual: minutes (ATII) - days (aldosterone)]
 - ✓ Restore volume
 - ✓ ATII: *pressure*
- Renovascular HTN
 - Physiologic response
 - Pathology
 - Demographics
- Endocrinopathies
 - Mineralocorticoids (i.e. aldosterone, cortisol)
 - Catecholamines

Blood Pressure/HTN Series

- Blood Pressure Regulation
 - Autonomic nervous system
 - Juxtaglomerular apparatus
 - *Special Situations: BP Trivia (for USMLE)*
- Renovascular HTN
 - Physiologic response
 - Pathology
 - Demographics
- Endocrinopathies
 - Mineralocorticoids (i.e. aldosterone, cortisol)
 - Catecholamines

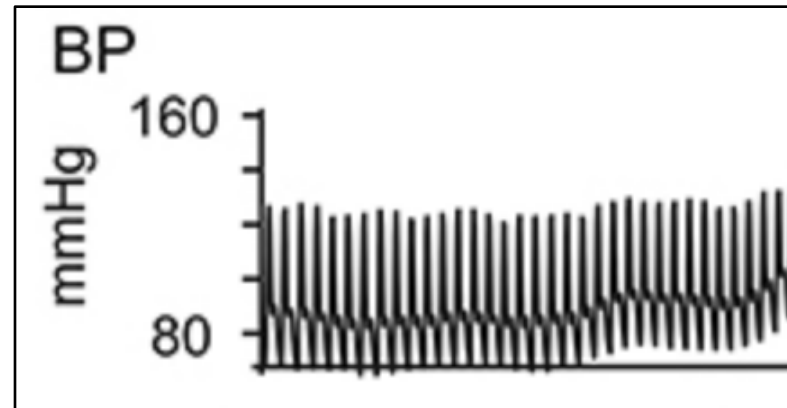


Oh Behave!

Blood Pressure Regulation: ANS

(‘First responders’ – seconds)

- Vasomotor tone (*sympathetic vasoconstrictor center*; medulla)
 - Maintain a partial state of *vasocontraction*
 - Norepinephrine is the neurotransmitter (*α -adrenergic receptors*)

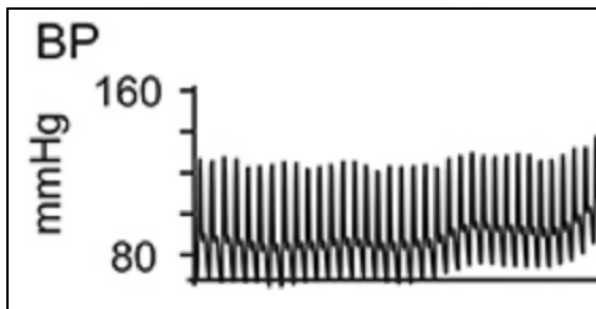


Mayer waves

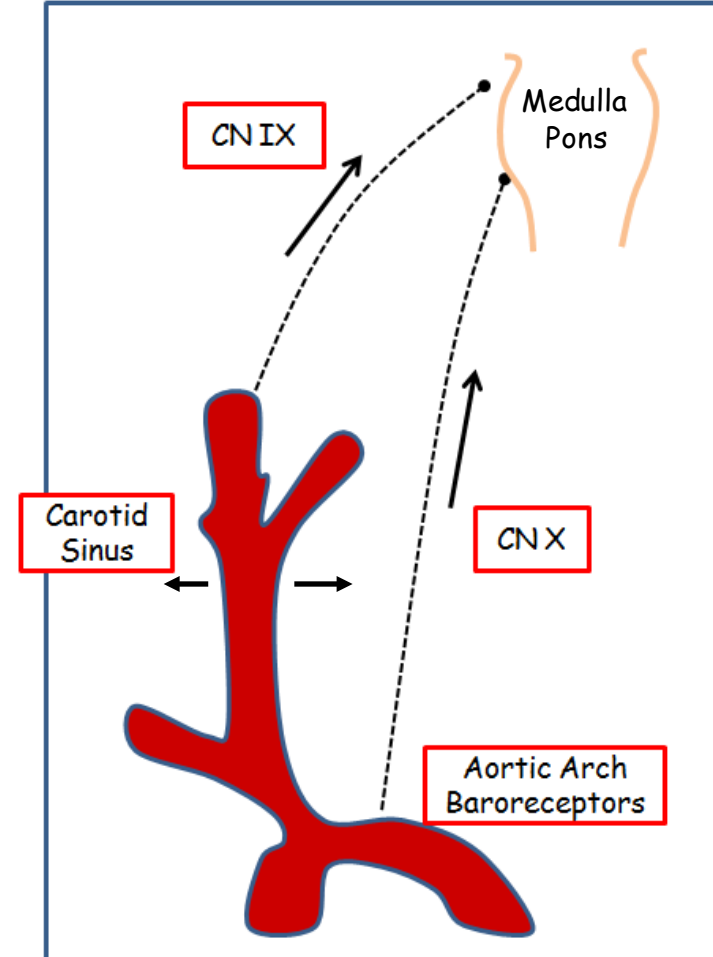
Blood Pressure Regulation: ANS

(*'First responders' – seconds*)

- Baro- (*mechano*) receptors respond to wall stretch
 - CN IX, *carotid body*; CN X, *aortic arch*
 - ✓ Parasympathetic impulses *inhibit sympathetic outflow*



Mayer waves

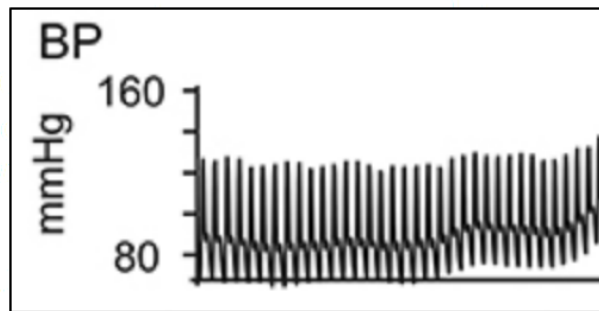


Blood Pressure Regulation: ANS

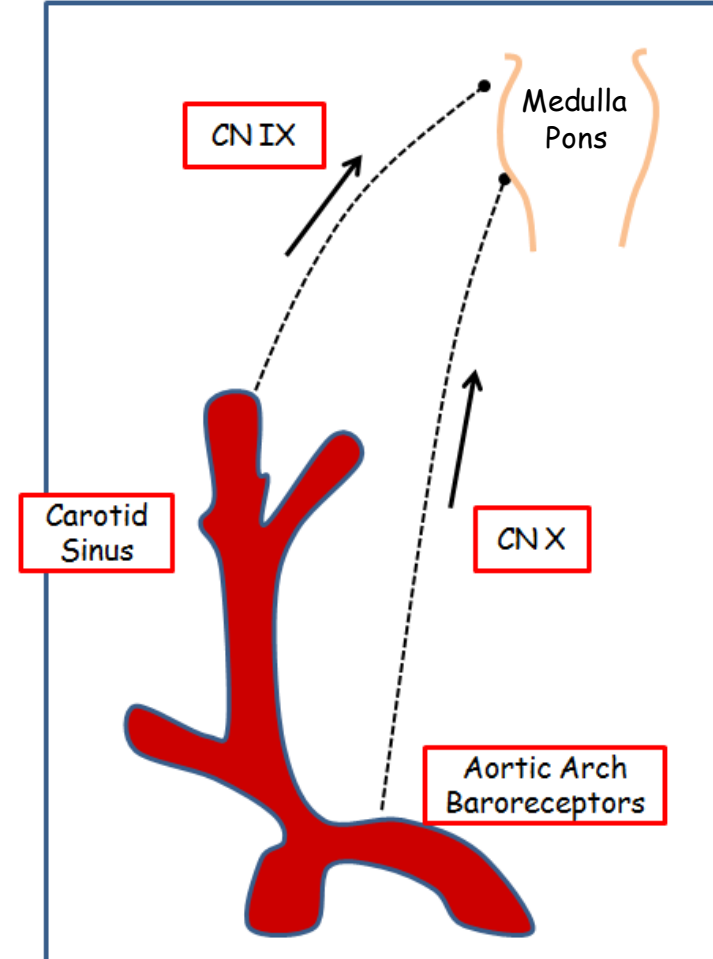
(*'First responders' – seconds*)

- Baro- (mechano) receptors respond to wall stretch

- CN IX, *carotid* body; CN X, *aortic* arch
 - ✓ Parasympathetic impulses *inhibit sympathetic outflow*
 - ✓ Sensitive to *'changes'* in BP rather than absolute values (*'reset'* after 1-2 d)



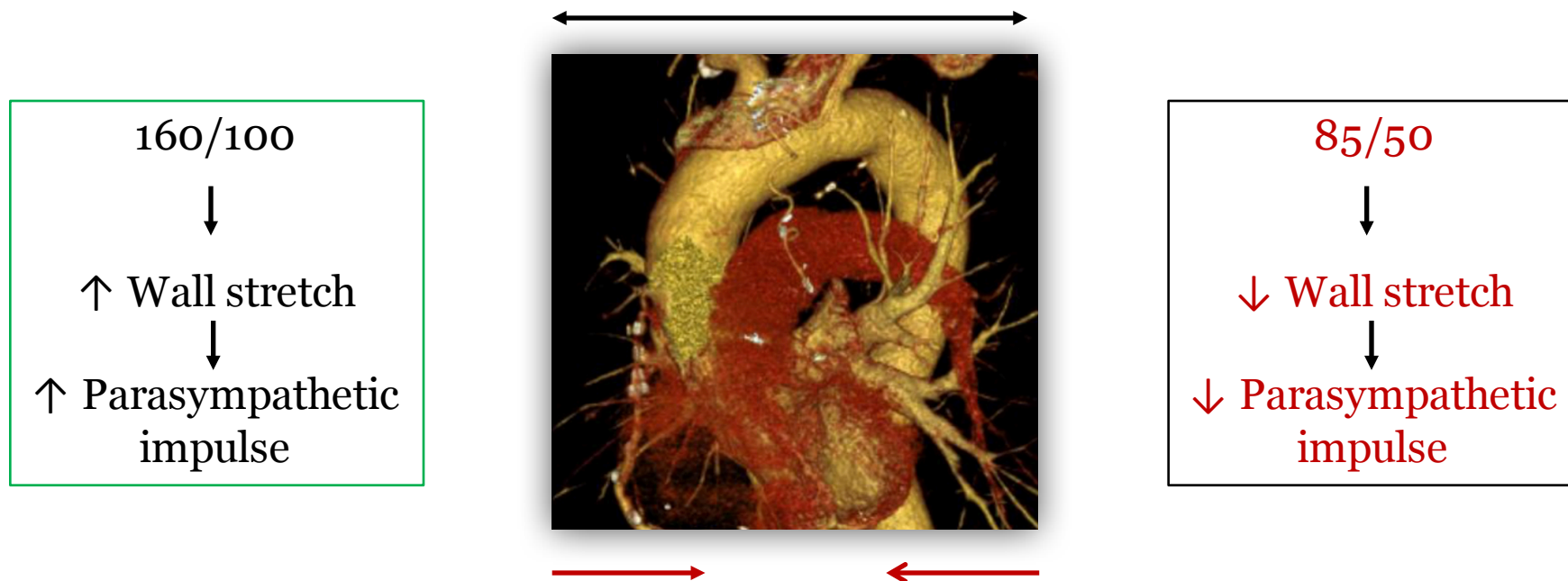
Mayer waves



Blood Pressure Regulation: ANS

(*'First responders' – seconds*)

- What if there is no wall stretch (as in *arterial hypoperfusion*)?
 - Decreased tonic parasympathetic tone → **↑ SNS efferent**
 - $(HR \times SV) \times TPR_{\Omega}$
 - $(\beta_1 \text{ chronotrope} \times \beta_1 \text{ inotrope/renin/VR}) \times \alpha_1$ [vaso-/veno-constrictor (*the heart pumps what it receives*)]



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α -1: small arteries, arterioles and veins; Φ capillaries

Blood Pressure Regulation: ANS

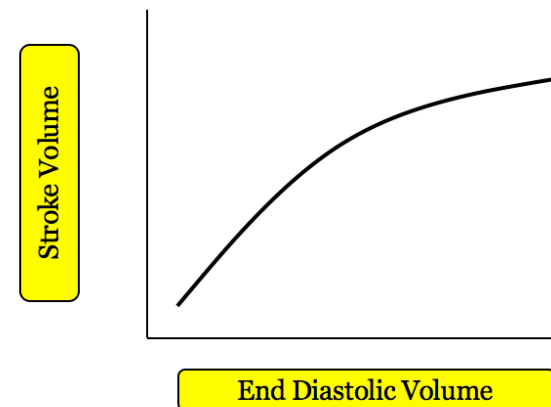
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α -1 agonist → TPR



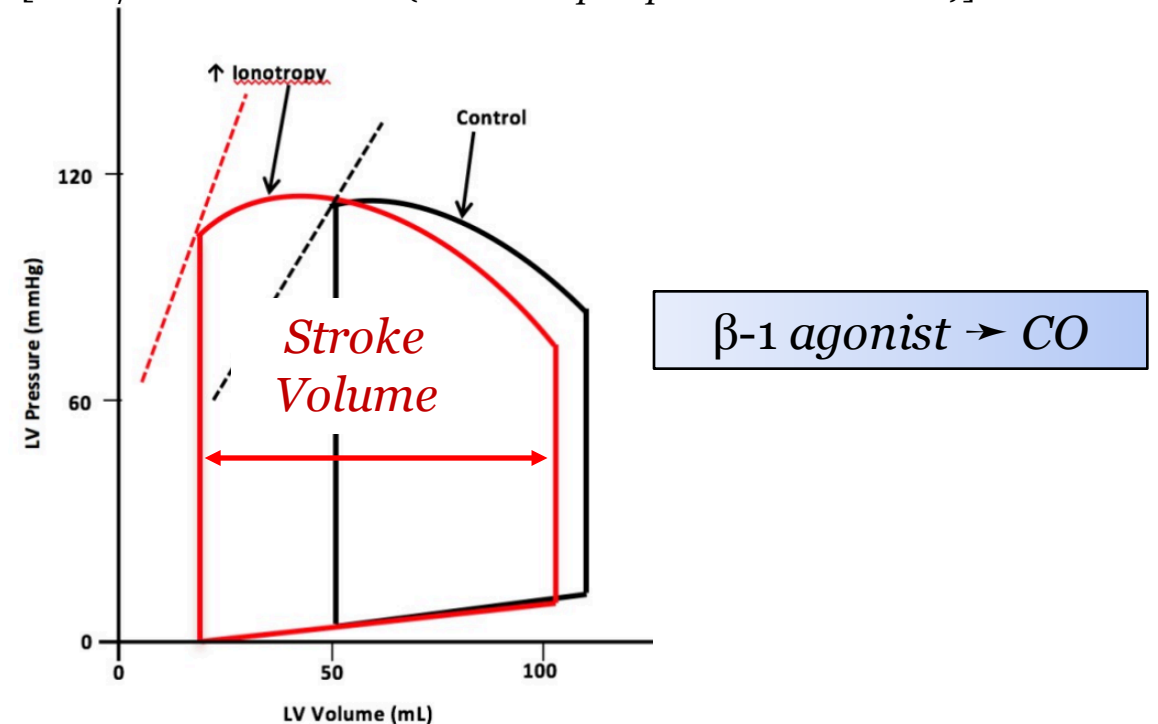
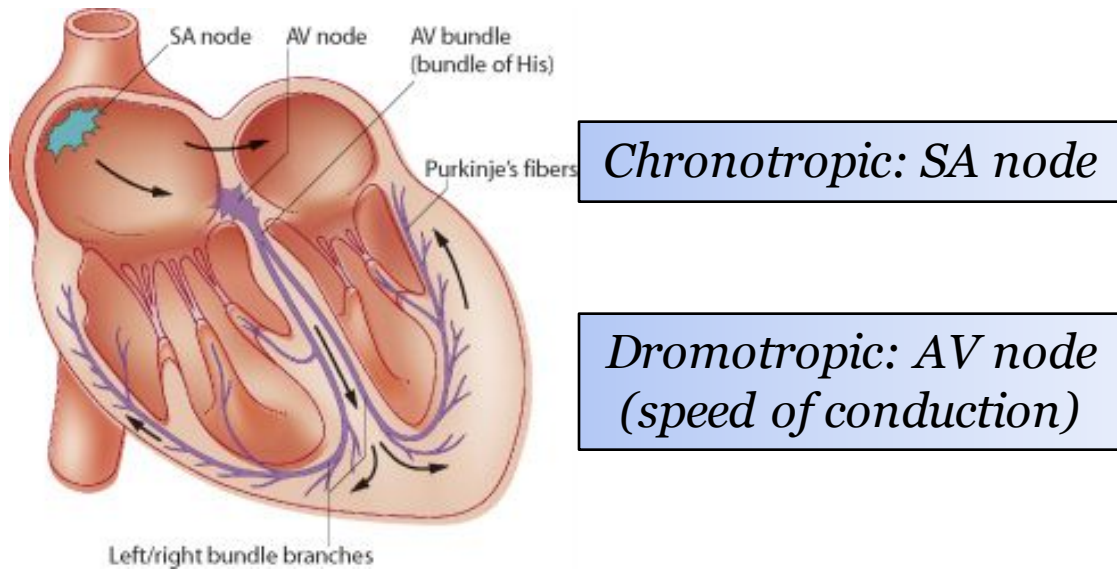
α -1 agonist → VR



Blood Pressure Regulation: ANS

(*'First responders' – seconds*)

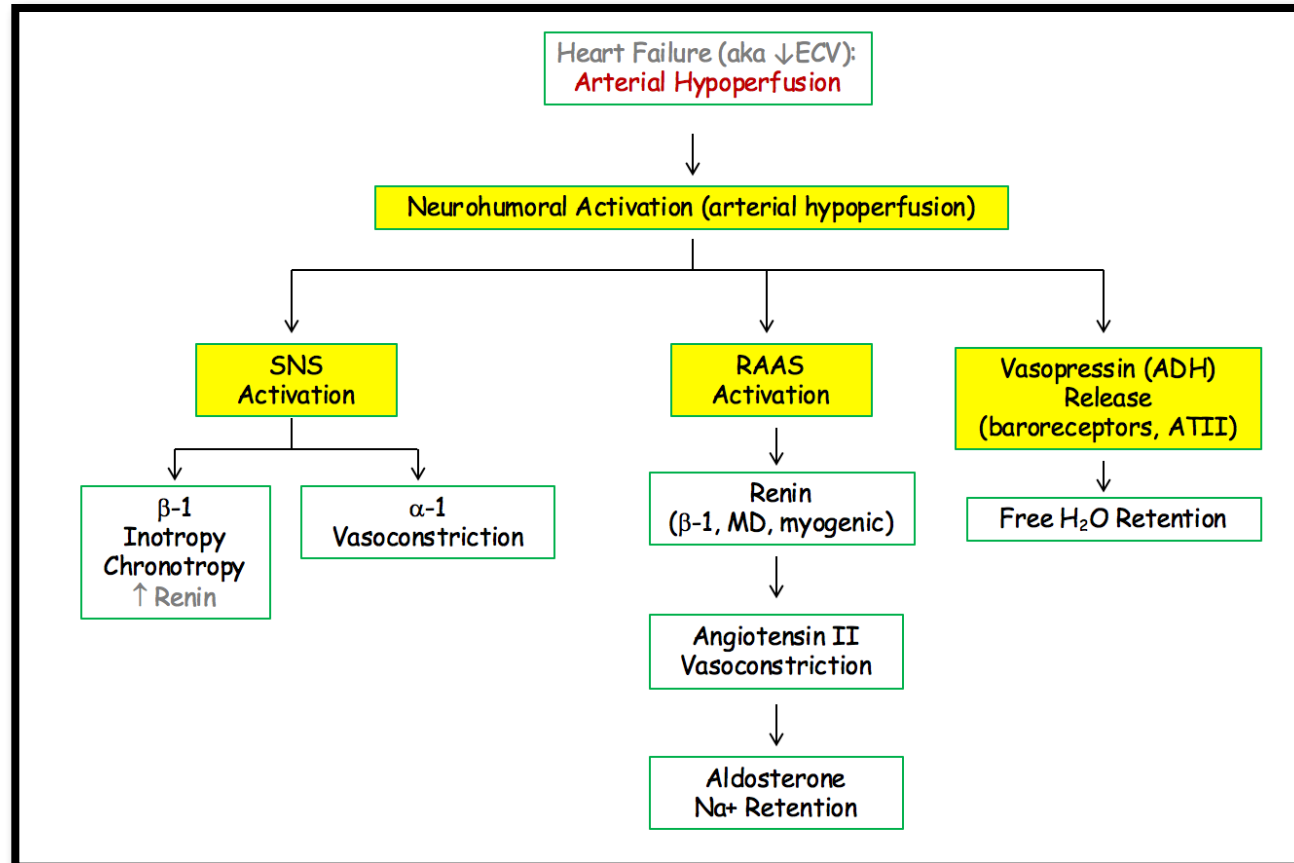
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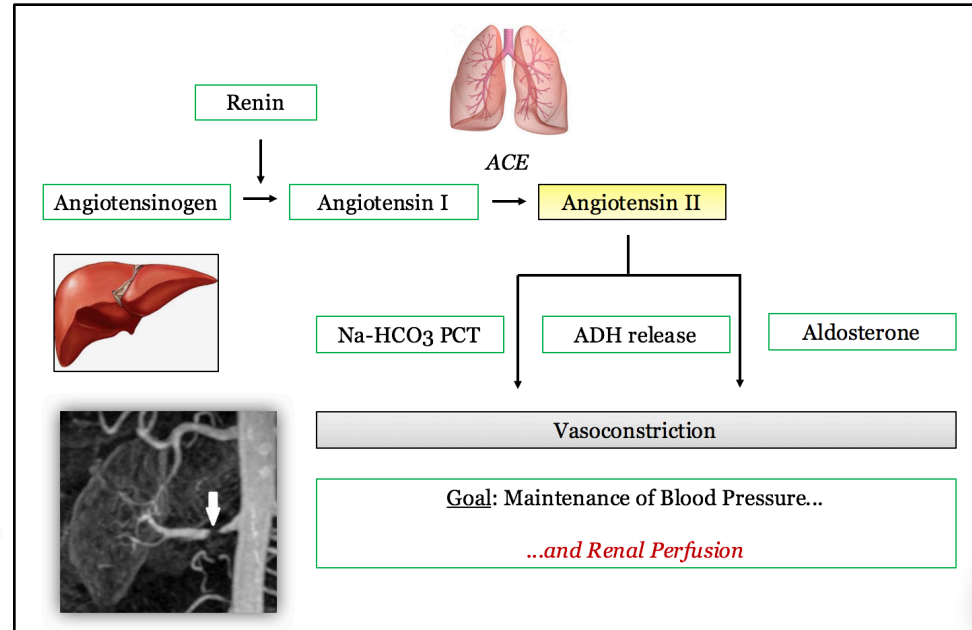
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