RRM Ch 20: Cardiovascular System and Circulation

*See Fig. 20.16 on pp. 806 and 807 as well as the Chapter Summary

1. **********Please be sure to use the videos accompanying LAB this chapter, especially in terms of how to draw out, visualize and learn the vessels. http://www.humanbodyhelp.com/uncategorized/easy-way-to-learn-the-arteries/ (or search the words in the url.

   Have colored pencils and computer printer paper nearby. *I will ask you to hand in your draft drawings. Please use* Figs 20.22 (there are several), 23, 24,25,26,27 and 20.28 to confirm and assist your learning.

   Did you turn this assignment in yet? Yes or no? Thank you!

2. **Section 20.1**

   See T 20.1. For each comparison, using your knowledge of the difference between the role of arteries and veins, suggest WHY the difference or similarity might exist for each type of vessel.

   Characteristic Your suggestion WHY?

Lumen	Artery: Constrict blood flow to ensure O2 delivery. Vein: A less restricted system
Thickness	Artery: More pressure is required to deliver the blood. Vein: A more passive system that is driven by blood being driven into it after gas exchange/
Cross-section shape	Artery: More connective tissue in order to preserve the shape. Vein: Less need to maintain the shape.
Tunic	Arteries: Thicker Veins: Thinner
Fibers	Artery: More Veins: Fewer
Valves	Arteries: None Veins: Present in most
BP Range	Arteries: Around 100 mmHG in larger, around 40 in smaller Veins: <20 mmHG in most
Flow	Arteries: Blood is transported away from the heart. Veins: Blood is transported to the heart
Oxygen levels	Arteries: Systemic (High in O2) Pulmonic (Low in O2) Veins: Systemic (Low in O2) Pulmonic (High in O2)

The differences between arteries and veins largely comes down to the payload, namely O2. Because the arteries are responsible for transporting oxygenated blood to the tissues, there is a need to have stiffer walls that can hold up to the pressure on the system. In the case of veins, the system relies more heavily on the flow of deoxygenated blood out of the capillaries.

3. What is the role of a fenustrated capillary?
   To allow for the passage of smaller plasma proteins into the tissues to deliver nutrients and building blocks.

4. My Dad has 24 stents….and has since he was 65. He is now 78….true. What is the role of a stent in treating his atherosclerosis?
   The role of a stent is to clear the plaques that are blocking the flow of blood within the arteries.

This is a common condition in older individuals, and can in emergency or severe circumstances, be treated with bypass surgery.

5. Please write out the term associated with vessels as they decrease in diameter and come together in a capillary bed. Think of the larger vessels such as arteries and veins.
   Arterioles and Venules

   Artery_____capillaries_____, _____

   For 20.5 #5: 100 mmHg 40 mmHg

   Uncertain as to the nature of whether the above was or was not a question.

Section 20.2

This section talks about velocity as it is related to cross sectional area in each major vessel type. (Capillaries, veins, arteries). What is the analogy the authors use to show this relationship? And what is the relationship? (Direct? Inverse?)

The relationship between blood flow velocity and cross sectional are in blood vessel types, while not linked 1:1, is connected. The cross sectional area is at its largest when the blood flow velocity is at its lowest in order to allow for the exchange of gasses and other nutrients with the tissues. The relationship is more or less inverse, as the speed is lowest when the area is the highest, and vice versa.

Section 20.3

1. This section is very important, and you know a lot about it in your study of chapter 2, active and passive transport. **Hydrostatic pressure** and (**colloid) osmotic pressure** are specific in terms of blood flow.

   Please see **Figure 20.10**. Define each of the bold terms and also NFP in your own words, *and* re-word the caption under this Figure.

   Hydrostatic Pressure: The amount of pressure going into the system from the pressure of the heartbeat.

   Colloid Osmotic Pressure: the pressure created from the plasma proteins that draw fluid into the capillary.

Section 20.4

You and your friends are camping in Ludington State Park. Your friend Trent endured a compound fracture during some beach volleyball. You ice the region as soon as possible.

Why? Use a term from 20.4, please.

Because bone is highly vascularized, there is a high danger of the patient suffering from internal bleeding as a direct result of the fracture.

Meanwhile, Trent is releasing leukotrienes and thromboxanes. What are they and what do they do?

They cause vasoconstriction as an endogenous means of controlling blood loss.

Trent's body is likely sending other hormones. What do Angiotensin II and ADH do for Trent?

To induce vasoconstriction in order to reduce blood loss

Section 20.5

1. What is systolic BP? When the artery is maximally stretched.

What is diastolic BP ? When the vessels recoil no further.

Your patient, Alyssa has a BP of 112/70. She is 26 and you know her from CrossFit. Is this healthy?

Taking age and activity into consideration, most likely. The numbers are on the lower side. But this is but one of many values that need to be accounted for. (This is a personal approach to medicine)

2. Your floor supervisor asks you to take her "pulse pressure". Why and how is "pulse pressure" calculated?

   By subtracting Diastolic Pressure from Systolic (Sys - Dias = PP)

   Please calculate it for Alyssa.

   (112-70): 32

3. Oops….you double check the order and it actually asks you to take "MAP". What is it and why take this data? Please calculate for Alyssa.

(Dias + 1/3 PP) or (((Sys - Dias) * 1/3) + Dias)

For Alyssa (72 +11): 83

4. Where (list three spots you might palpate on Alyssa) can you find her pulse? That is the same thing as BP, right? Please explain.

   Most Common are:

   1. Radial artery

   2. Common carotid artery

   3. Brachial artery

Pulse and BP are not the same, as BP is determined by multiple factors including systemic pressure, hydration/blood levels, etc. Pulse is simply determined by heart rate. *But* if you're attempting to determine if someone is still alive, a pulse is far *easier* to go off of.

5. Pulse pressure disappears in the capillaries. Going back to 20.1 #4, please add in the blood pressure in its appropriate location (blanks below the names of vessels.

   Why should capillary pressure be relatively high, but not too high?

   It should be high enough to push blood through the capillaries, but low enough to allow time for gas and substance exchanges within the capillaries.

6. Learning Strategy 20.2 is so helpful. Please tell me what happens to blood flow when Alyssa is very dehydrated.

   Use terms please. Because her blood is more _____ resistance _____and flow _____

   Her blood flow rate decreases because there is more resistance to the flow. The analogy would not be unlike trying to float tubers down a river. The more fluid (deeper the water) and wider the system is (wider the river), the better the overall flow is. However too many people trying to float down a shallow and narrow river will simply slow things down. If Alyssa rehydrates and gets

more fluid in her system, then the fluid balance will be restored and thus her heart rate and blood flow should return to normal.

You see Alyssa in a year and she has stopped working out due to a back injury. She has gained 40 lbs. on her 112 pound frame. What does this do to her rate of blood flow?

Because the **a** of her vessels has **b** her resistance has **c** and her flow has **d**

A: diameter

B: decreased

C: increased

D: decreased

In a patient with a lumen diameter of 3 mm the flow rate is

81

Section 20.6, a review of the nervous system.

1.α 1 receptors in smooth muscle cells (of or around blood vessels) _____ (contract or relax?) in response to norepinephrine: Contract

2.β2 receptors in smooth muscle cells _____in response to _____

Relax; Norepinephrine

3.What are baroreceptors?

Specialized cells that detect changes in pressure within the body systems

4. Please summarize what happens as a result of BP decreasing, including nerves, heart rate, stroke volume etc.

HR: Increases

Neurological activity: Increases

SV: Increases

6. BP increases and…..(do the same here, please)

HR: Deceases

Neurological activity: Decreases

SV: Decreases

7. An increase in Cardiac Output (CO) or resistance or blood volume will increase blood pressure. Heart patients watch their sodium intake and monitor it by weighing themselves in the morning.

   Why?

   Sodium increases the amount of fluid that is stored within the body, which in turn increases blood pressure.

   What is the role of Antidiuretic Hormone (ADH)?

   ADH helps keep fluid within the body. In the case of heart patients, this fluid often builds up in the form of various edemas.

   ********Sections 20.9, 20.10. KNOW the vessels in BOTH Fig. 20.19**********

   For 10 Arteries in the systemic circulation, and 10 systemic veins, please tell me WHERE they are by telling me what the terms mean. For example (and please don't use mine) the Inferior Vena Cava is a vein that is underneath the diaphragm.

Systemic Artery Name	Location using prefixes and suffixes, etc.
Brachial Artery	Medial to the humerus.
Radial Artery	Lateral to the radius: Used for assessing pulse.
Femoral Artery	Medial to the femur, superficial compared the deep femoral artery.
Deep Femoral Artery	More proximal to the femur than the common femoral artery and deeper.
Descending Aorta	Beneath the heart, supplies blood to lower trunk. Branches around the pelvis into segments that supply the legs.
Popliteal Artery	Located behind the Patella and femur.
Ascending Aorta	Supplies blood for the entire body and eventually becomes the descending aorta.
Carotid Artery	Broken down into right and left subgroups. Commonly used for assessing the pulse of unconscious individuals.
Ulnar Artery	Follows the path of the ulna
Tibial Artery	Follows the tibia, and can be divided into the Posterior Tibial Artery and Anterior Tibial Artery.

Systemic Vein Name	Location using prefixes and suffixes, etc.
Subclavian Vein	Can be divided into right and left segments and follows the clavialcal.
Brachial Veins	Follow the humorous and eventually terminate into the subclavian.
Jugular Veins	Can be broken into the left/right and internal/external jugular veins. Drain blood from the cephalic region.
Median cubital vein	Located superficial to the cubital region. And is a common site for labs to be drawn from.
Palmar venous arches	Follow the palmar and digits. Can be seen/palpated rather easily.
Renal Vein	Located medially to the kidneys.
Iliac Veins	Can be subdivided into common, external, and internal. Follows the ileum into the inferior vena cava.

Femoral Vein	Follows the femur and can be subdivided into the “normal” and deep femoral veins.
Tibial Vein	Follows the tibial, and can be subdivided into posterior and anterior branches.
Dorsal Venous Arch	Follows the top of the plantar region. Like its palmar counterpart, it can be easily palpated and observed.

Thank you for your hard work on this. It truly does help you narrow down your reading and engage you in learning. ON behalf of your future, successful self, I say THANK YOU!