



My experience from ISSoTL - Conceptmapping -

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Conceptmaps

- You have a blank skeleton map in front of you. This is the tool that's being used in the class. Predict some elements of student learning that would be visible from their completed maps.



Conceptmaps

- Now you have four maps that four different students have completed
 - What are some differences you notice about the four maps?
 - What do you think students learn from making these maps?
 - How do you think students (could) use these maps?



Student perceptions of using concept maps over four years

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Using Concept Maps to Teach Physiology

- Four year longitudinal study
- First year anatomy and physiology
- Second year pathophysiology and pharmacology



Use of Concept Maps Over the Four Years

- 1st yr - students used skeleton maps created by the A+P instructor.
- 2nd yr - some students were creating their own and the practice has been adapted and extended formally by some Nursing instructors.
- 3rd-4th yrs - some students independently carry them forward, even using them to study for their national exam

Related studies: (Carr-Lopez et al., 2014; Gul et al, 2006)

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What Do the Students Think?

We conducted 38 interviews of 26 participants. Twelve of these represent interviews of students we followed for 2-3 years.

This presentation focuses on the interview data, answering the question:

What are the student perceptions of using the concept maps?



URINE FORMATION:

3 Phases:

1. Glomerular Filtration



NFP:

GFR:

Intrinsic mechanisms

1.



Regulation of GFR



Extrinsic mechanisms

1.

2.

List the effects of angiotensin II:

What triggers its production?

What does it do to blood pressure?

Things I'm having trouble with or don't understand:

Kidney functions:

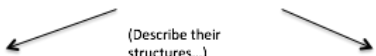
NEPHRON ANATOMY

Ch 25. Urinary System

Glomerulus:



A. Renal corpuscle (2 structures) = _____ + _____



(Describe their structures...)

C. Capillary beds:

- 1.
- 2.
- 3.

Route blood takes through the nephron:

Peritubular capillaries:



- Are found in this type of nephron:

Vasa recta:



- Are found in this type of nephron:

What are the differences between cortical and juxtamedullary nephrons?

B. Renal tubule:
(list and label on the diagram, next page)

D. Juxtaglomerular apparatus - 2 cell types:

- 1.
- 2.

E. Filtration membrane

URINE FORMATION:

- 3 Phases: ① Glomerular Filtration
 ② Tubular Reabsorption
 ③ Tubular Secretion

1. Glomerular Filtration

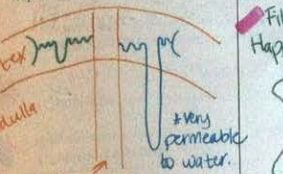
Passive process driven by hydrostatic pressure of glomerular blood (~55 mmHg)
 NFP: $HP_g - (OP_g + HP_c)$
 Net Filtration Pressure

Determined by:
 HP_g (glomerular hydrostatic P)
 2 opposing forces
 HP_c (capsular hydrostatic P)
 OP_g (blood colloid osmotic pressure)

GFR: Volume of filtrate formed/min by kidneys.
 proportional to: NFP, membrane permeability.

Kidney functions: Surface area.
 Removal of metabolic wastes, toxins + excess ions
 Regulation of blood volume, composition + pH
 Activation of Vit. D
 Endocrine functions
 ↳ Renin regulation of BP + kidney function
 ↳ EPO: regulation of RBC production.

What are the differences between cortical and juxtamedullary nephrons?



**Be aware, there's a lot of anatomy in this chapter and it's up to you to learn it.

REGULATION OF GFR

1. Myogenic Mechanism

- if systemic BP ↓
 - vasodilation of afferent arterioles
- if systemic BP ↑
 - vasoconstriction of afferent arterioles.

↳ Help maintain normal GFR. Protects glomeruli from damaging high BP.

Intrinsic effective at regulating BP unless it gets too ↑ or ↓.

The efferent arteriole is smaller than the afferent arteriole, what does this do to the pressure in the glomerulus? Why is this important? ↑ pressure in glomerulus which pushes fluid from capillaries into capsule.

2. Tubuloglomerular Feedback Mechanism

- if GFR ↑, filtrate flow rate ↑ in the tubules
- filtrate $[NaCl]$ will be high b/c of less time for reabsorption.
- Macula densa cells of the JGA respond to ↑ $NaCl$ by releasing a vasoconstricting chemical that acts on afferent arteriole, ↓ GFR.
- opposite occurs if GFR decreases.

↑ MAP, stimulates reabsorption of Na^+ stimulates release of ADH , constricts afferent arteriole.
 What triggers its production?
 Renin-Angiotensin Mechanism (Angin BP)
 What does it do to blood pressure?
 ↑ BP.

NEURAL MECHANISMS

1. Neural (Sympathetic) Controls

- Under extreme stress, SNS causes peripheral vasoconstriction to ↑ BP, and overrides auto-reg. in kidneys
- Nore and epinephrine constrict afferent arterioles
- if GFR ↓, filtration inhibited
- Release of renin triggered.

↳ act to maintain BP, so indirectly affect GFR.

2. Hormonal Mechanisms

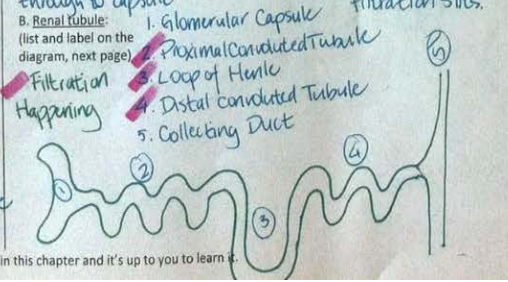
- Renin-angiotensin Mechanism triggered when granular cells release renin triggers for renin release:
 - ↓ in MAP below 90mmHg
 - chemical signal from activated macula densa cells
 - Nore from sympathetic fibers.

Things I'm having trouble with or don't understand:

NEPHRON ANATOMY

Glomerulus: ↓ A bundle of capillaries surrounded by a Bowman's Capsule
 A. Renal corpuscle (2 structures) = Glomerulus + Bowman's Capsule

Adapted for **FILTRATION**
 - Endothelium is fenestrated.
 ↳ Allows filtrate to pass through to capsule.
 B. Renal tubule: 1. Glomerular Capsule
 2. Proximal Convoluted Tubule
 3. Loop of Henle
 4. Distal convoluted Tubule
 5. Collecting Duct



Ch 25. Urinary System

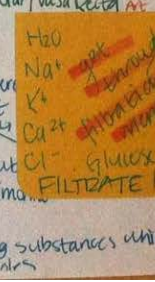
C. Capillary beds:
 1. Glomerulus
 2. Peritubular Capillaries
 3. Vasa Recta
 Route blood takes through the nephron:
 Renal Artery (95 mmHg) → Afferent arteriole → Glomerulus (90-95 mmHg) → Efferent arteriole → Peritubular/Vasa Recta (40-50 mmHg) → Veins → renal vein (0 mmHg)

D. Juxtaglomerular apparatus - 2 cell types:
 1. Granular Cells: Embedded in wall of afferent arteriole. stretch receptors detect ↓ Ca^{2+}
 2. Macula Densa cells: Embedded in wall of tubule. Act as chemoreceptors (measure $NaCl$ concentration). Secrete vasoconstricting substances which constrict arterioles.

Vasa recta:

- Are found in this type of nephron: **Juxtamedullary Nephrons**
 ↳ long capillary loops parallel to long loop of Henle
 ↳ Play important role in concentration of urine.

E. Filtration membrane
 ↳ Membrane between glomerulus and capsule.
 ↳ Regulates passage of H_2O and small solutes.
 ↳ Consists of:
 1. Fenestrated glomerular endothelium
 2. Visceral membrane of glomerular capsule
 3. Gel-like basement membrane between 2 layers



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Theme 1 - Learning Throughout the Term

The concept maps were a lot of work and they were really time consuming but I found I got that time back on the other side when I was studying for exams. I didn't have to spend nearly as much time going back over things because everything was so condensed and already kind of laid out for me to review. So it helped me budget my time better because I don't budget time, I am totally a person who crams so it totally forced me to review throughout the semester, but it definitely worked for me. (Participant 10)

Related studies: Hilbert et al (2008); Kaddoura et al (2016)



Theme 2 - Making Connections

Most of the chapters that we did in the beginning, some of the concepts were the same as to what we did in the last chapters, but I could, like, see the connections between them so I could remember them.

I think it definitely influenced the way that I link ideas together.
(Participant 15)

Related studies: Schwendimann (2015); D'Antoni, et al (2010), Kaddoura et al (2016)



Theme 3 - Memorizing vs. Knowing

When I was going into university, thinking that I just needed cue cards, like I can memorize values, no problem. But trying to remember why the values are that way, made the difference, which is why concept maps are helpful because it wasn't about memorizing, it was about actually knowing. You had to put things down that you knew, so I think that in all, it probably kept me in nursing school. (Participant 1)

Related studies: Schwendimann (2015); Taylor et al (2011)



Theme 4 - Long term retention

Because I still remembered stuff from Bio it made Pathopharm much easier by a large margin. He would mention something and I would be like, 'Oh yeah, I remember that system! I see how this works now!'

Because I had such a hard time learning that material, I remember drawing it out on the map, and I remembered the process! (Participant 3)

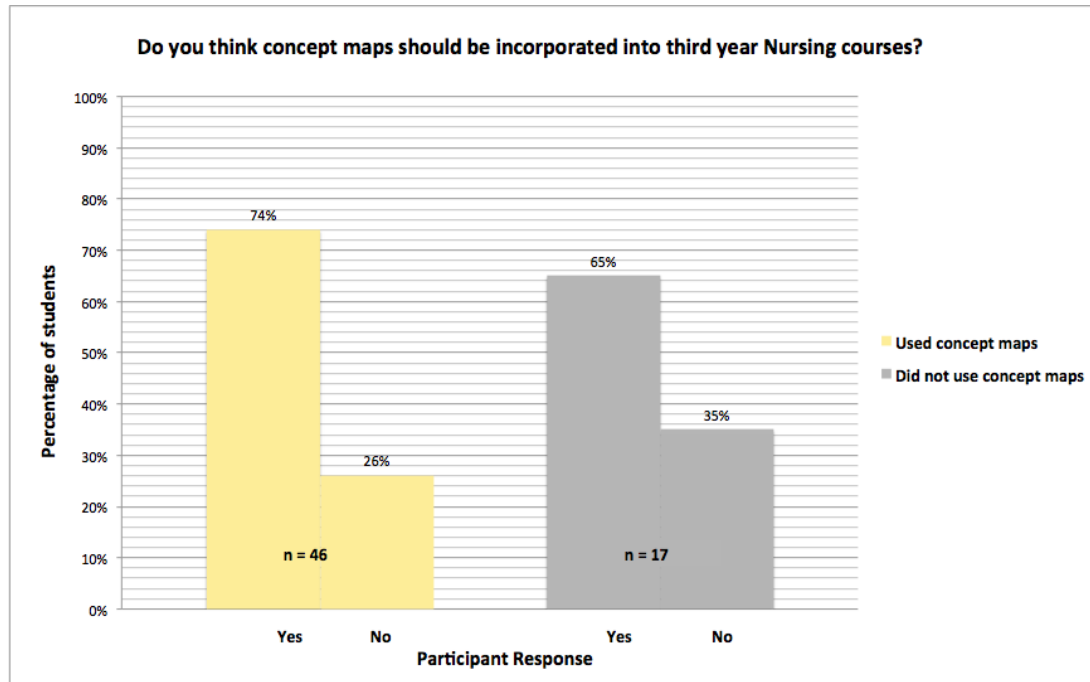
Once I would read them (the maps), it's like everything snapped back. I mean, it really shows that I did truly understand it. (Participant 1)



Theme 5 - Would recommend to others

In the first year, I had no idea what I was doing when I was studying and I think that's the case for a lot of students ...I mean, if it's possible, I would definitely implement them starting first year. (Participant 1)

Theme 5 - Would recommend to others





Theme 6 - Surprise at Having Learned

As soon as I finished the map, the next class I went to she would ask us questions and stuff and it was like, 'I know that! Awesome! I learned something!' So it was exciting. Especially in comparison to last terms when I would go to class and still be confused about what I learned, it was like, 'Oh my God! I know the answers!' (Participant 13)

Related studies: Hilbert et al (2008)



Implications for Practice...

- Need for ‘forced’ structure in the early years of program. Students still need guidance in second year.
- Much of the literature points to consistent use of concept maps and the importance of moving students from beginner - with samples provided and feedback given - to advanced proficiency in not only using maps in early years, but helping them to eventually move to creating their own maps in a format that makes sense to them.
- Within MRU Nursing, resources provided to faculty to develop beginner mapping in the early years and ongoing support for students throughout the program through regular drop-in teaching sessions.
- Uptake from students who have further guidance/support is high and has dramatically altered the trajectory of their understanding of complex material and their success in the program.



References

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Conceptmaps

- What is your opinion about the use of conceptmaps in our Pharmacy curriculum?
 - What are the benefits/disadvantages for students?
 - What are the benefits/disadvantages for teachers?
- How could we use conceptmaps in our Pharmacy curriculum?
 - Requirements, Contex,
- How could we use conceptmaps to study the learning of our students?