

Medical Student Course Proposition: Pathophysiology of the Liver

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Course Description:

This course is directed towards medical students and encompasses hepatic anatomy and development, pathophysiology of a variety of hepatic conditions (including viral hepatitis, steatotic liver disease, autoimmune hepatic conditions, metabolic liver disease, and hepatic vascular complications) as well as a brief overview of liver transplantation. Students will be assessed through weekly open-book multiple choice exams, as well as discussion posts and case studies with peer review. The final assessment will be a comprehensive individual care plan for a sample patient integrating an electronic medical record system.

Learning Outcomes:

1. Learners will gain an understanding of hepatic anatomy and physiology, and apply this knowledge to a variety of disease processes involving the liver (including hepatocellular, biliary, and extra-hepatic conditions)
2. By incorporating content from lectures and clinical guidelines, learners will apply their knowledge of liver diseases to provided clinical scenarios to generate clinical plans
3. Discuss indications for liver transplant from a medical perspective
4. Combine concepts learned through hepatic pathophysiology and anatomy and identify the steps undertaken during transplant surgery
5. Apply principles of immunosuppression and post-transplant complications to provided clinical cases

Teaching strategy:

For this course, my teaching strategy would incorporate elements from social cognitive theory (as described by Albert Bandura) through Reciprocal Determinism. Behavior factors affecting learner education would include reinforcement of weekly readings/educational content through open-book multiple choice questions that reflect real-life clinical scenarios (with immediate feedback), as well as leveraging the advantages of asynchronous online education using audio-visual weekly lectures. Taking into account what we have learned about Mayer's cognitive theory of multimedia (Mayer & Moreno, 2003), I plan to use the principles of signaling and segmenting while minimizing redundancy during the weekly online lectures to improve information transfer as well as to keep learners motivated. This would also complement the personal or cognitive factors described by Bandura (Schunk, 2020).

The problem-solving case scenarios are intended to model real-life clinical cases that students would be expected to encounter once they start their clinical rotations. I intend to draw on my personal clinical experience to create realistic clinical cases, and I plan to be active in the discussion boards to push students to critically evaluate their plans and help keep a dynamic/active approach to education (incorporating the 'behavior' aspect of Bandura's reciprocal determinism). For example, one of the clinical case scenarios would be related to a patient with acute liver failure. This is

considered a Hepatology emergency given the high risk for mortality. One potential complication of acute liver failure is the development of cerebral edema, which may lead to irreversible cerebral herniation and subsequent death. As effective learning requires active participation, I would like to push learners on the discussion board and progress the clinical scenario to closer model real-life scenarios. So, for a provided sample patient in acute liver failure, I may opt to post a reply discussing how a patient has clinically worsened despite the learner's plan of treatment (i.e., developed cerebral edema) to push the discussion and see how the proposed plan of treatment may change. Other students on the discussion board would also benefit from observing/reading the clinical case progression, which may motivate them to incorporate this into their care plans or aid with information retention (incorporating the 'environmental factors' affecting human behavior and learning described by Bandura).

The final assessment would incorporate modeling through students virtually presenting their assigned sample patient to the group through a recorded video. I intend to have an upper-level medical student (or medical resident) have a sample video uploaded for students to observe as they create their own individual plans and recording. Environmental factors would be controlled by incorporating a sandboxed read-only electronic medical record system for students to obtain a sample patient history/presentation to hospital that would accurately mimic a real-life clinical scenario. Students would then be expected to create an individual care plan for their sample patient referencing current medical guidelines. Through anonymous peer review, learners would be able to observe a variety of styles of presentation and compare against a set example or standard. Learning how to present a patient's clinical presentation is an important concept for students to practice, especially before they start their clinical rotations in medical school. By having a sample video already available, not only does this set expectations for students (cognitive or personal factor), but also helps control environmental and behavior factors to truly embody the social cognitive theory model.

Mayer, R. E., & Moreno, R. (2003). Nine ways to reduce cognitive load in multimedia learning. *Educational Psychologist*, 38(1), 43–52. https://doi.org/10.1207/s15326985ep3801_6

Schunk, D. H. (2020). *Learning theories: An educational perspective* (8th ed.). Pearson.

Recommended Course Textbook:

Schiff, E. R., Maddrey, W. C., & Reddy, K. R. (2018). *Schiff's diseases of the liver*. John Wiley & Sons Ltd.
ISBN: 9781119251224

Course Outline:

Learning Topic	Learning Outcomes	Readings/Assignments	Assessments
Week 1: Anatomy and development of the liver	1	Schiff – Chapters 1, 2, 4	Open-book multiple choice questions, ice-breaker

			discussion post (" <i>Bucket-List Activity</i> ")
Week 2: Jaundice and bilirubin disorders	1,2	Schiff – Chapter 3, 5	Open-book multiple choice questions, clinical case with discussion post
Week 3: Viral hepatitis	1,2,3	Schiff – Chapters 23, 24, 25	Open-book multiple choice questions
Week 4: Steatotic liver disease (including alcohol and non-alcohol)	1,2,3	Schiff – Chapter 10, 26, 32	Open-book multiple choice questions, clinical case with discussion post
Week 5: Autoimmune liver diseases	1,2,3	Schiff – Chapters 20, 21, 22	Open-book multiple choice questions
Week 6: Drug-induced liver disease & acute liver failure	1,2,3	Schiff – Chapters 17, 18, 28	Open-book multiple choice questions, clinical case with discussion post
Week 7: Genetic diseases of the liver	1,2,3	Schiff – Chapters 29, 30, 31	Open-book multiple choice questions
Week 8: Vascular disorders of the liver	1,2,3	Schiff – Chapters 33, 34	Open-book multiple choice questions
Week 9: Cirrhosis and portal hypertensive complications	1,2,3	Schiff – Chapters 12, 13, 15, 16	Open-book multiple choice questions, clinical case with discussion post
Week 10: Liver masses	1,2,3	Schiff – Chapters 35, 36	Open-book multiple choice questions
Week 11: Pregnancy and liver disease	1,2,3	Schiff – Chapter 9	Open-book multiple choice questions, clinical case with discussion post
Week 12: Liver transplant indications and pre-transplant considerations	1,4	Schiff – Chapter 41	Open-book multiple choice questions, clinical case with discussion post
Week 13: Intra-op and early post-operative liver transplant principles	1,3,4	Schiff – Chapters 43, 45	Open-book multiple choice questions
Week 14: Pharmacology and immunology of immunosuppression	5	Schiff – Chapter 42	Open-book multiple choice questions
Week 15: Late complications of liver transplantation	4,5	Schiff – Chapter 44	Open-book multiple choice questions. Clinical Plan from EMR

Assessments

Weekly multiple-choice questions

- 5-10 multiple choice questions per week, to total 100 MCQ for the course (each worth 1 point)
- Feedback would be automated (correct vs incorrect answers provided with explanations and references) and immediately provided

Clinical Case Discussion Posts (6 throughout the semester)

- Students are expected to generate differential diagnosis to provided clinical scenarios and create therapeutic plans for their most likely diagnosis through discussion posts
- Clinical interventions should be backed up with references to support their use
- Fellow learners are expected to reply to at least two other discussion posts, in addition to responding to discussion post replies from the clinical instructor

Criteria	Fully Met	Partially Met	Not Met
Relevance of differential diagnosis (5 points)	Relevant differential diagnosis provided that are reasonable and pertain to the provided clinical scenario <i>4-5 points</i>	Some differential diagnoses are provided but may not be fully relevant to the clinical scenario <i>2-3 points</i>	Differential diagnoses are not provided, or do not apply to the provided clinical scenario <i>0-1 point</i>
Pertinent labs/workup (5 points)	Pertinent labs and other workup (such as imaging, or additional testing) are provided that are pertinent to the clinical scenario <i>4-5 points</i>	Some labs or workup is suggested but either is not fully relevant to the scenario, misses some important components, or is too generic/not focused on the provided scenario <i>2-3 points</i>	Labs/workup is not provided, or misses several important components <i>0-1 point</i>
Accuracy of proposed therapeutic plan (5 points)	An accurate therapeutic plan is proposed that is supported by clinical references and would not cause harm to the patient <i>4-5 points</i>	A therapeutic plan is provided, but may miss important components <i>2-3 points</i>	Therapeutic plan is not provided, does not contain literature to support plan, or would cause harm to patient <i>0-1 point</i>
Contributions to the discussion board (5 points)	Substantive, relevant replies to discussion posts and addresses instructor replies/comments in a timely fashion <i>4-5 points</i>	Replies are posted but not fully relevant or substantive <i>2-3 points</i>	No replies posted, or replies are not relevant. <i>0-1 point</i>

Clinical Plan from EMR (Final Assessment, 30 points)

- Students will be provided with a sample patient and electronic medical record number, along with access to a read-only electronic medical record system with sample data (not live patients)
- Students are expected to summarize the pertinent findings from the electronic medical record system and present the clinical case (i.e., medical history & physical exam) through a recorded video
- Students will also be expected to create a differential diagnosis along with assessment and plan for management of their most likely differential to include in their video presentation
- Assessment will occur through peer evaluation of recorded videos using an anonymous Google Docs for Peer Evaluation exercise (adapted from Conrad & Donaldson, 2012)

Conrad, R.M. Donaldson, J.A. (2012) Continuing to Engage the Online Learner. (1st ed.) Jossey-Bass.