

Case-Based Teaching in the Preclinical Years

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Why cases?

Traditional Model

Pre-Clinical Curriculum

Basic Science Concepts

Clinical Curriculum

Clinical Cases/Reasoning

Integrated Model

Pre-Clinical Curriculum

Clinical Curriculum

Basic Science Concepts

The diagram consists of two overlapping blue ovals. The top oval contains the text 'Basic Science Concepts' and the bottom oval contains the text 'Clinical Cases/Reasoning'. The overlapping area in the center represents the integration of these two curriculum components.

Clinical Cases/Reasoning

Student/Faculty Resistance to Early Introduction of Cases

- Students “don’t know enough medicine” to solve cases
- Real-life cases are too complicated
- Basic science topics are hard to relate to clinical questions

Student/Faculty Resistance to Early Introduction of Cases

- Students “don’t know enough medicine” to solve cases
 - *How can we teach students how to begin applying basic science concepts toward the development of clinical reasoning?*
- Real-life cases are too complicated
 - *How can we design pedagogical cases that challenge students to apply basic science concepts to basic elements of case analysis?*
- Basic science topics are hard to relate to clinical questions
 - *How can we highlight the relationships between basic science concepts and clinical reasoning?*

Principles of Case Design

Design of Cases: Goals

- Demonstrate relevance of basic science to patient care
- Establish the foundations for anatomic/physiologic basis for later clinical reasoning
- Provide a framework that can be used by students to draw on basic science *principles* to develop the building blocks of clinical reasoning even as their knowledge base of particular *diseases* is still developing

Basic Pre-clinical Case Templates

- Presentation of symptom of *pain* allows for *anatomy-based* teaching/learning
- Presentation of *more complex symptom* allows for *physiology-based* teaching learning
- Presentation of *particular group of symptoms* allows for *disease-based* teaching / learning

Increasing complexity



Basic case templates – Pain/Anatomy-based

- Presentation of symptom of *pain* allows for *anatomy-based* teaching/learning

(Will ask group for some examples...)

Basic case templates- Pain/Anatomy-based

- Presentation of symptom of *pain* allows for *anatomy-based* teaching/learning
 - Chest pain: What are the anatomical structures in the chest that could become painful when affected by disease? (Heart, lungs, esophagus...)
 - Abdominal pain: What are the anatomical structures in the abdomen that could become painful when affected by disease? (Gut, liver, pancreas, spleen, genitourinary...)
 - Headache: What are the anatomical structures in the chest that could become painful when affected by disease? (Brain, meninges, vasculature...)

Basic case templates- Symptom/Physiology-Based

- Presentation of more complex *symptom* allows for *physiology-based* teaching/learning

(Will ask group for some examples...)

Basic case templates- Symptom/Physiology-Based

- Presentation of more complex symptom allows for physiology-based teaching learning
 - Shortness of breath: requires understanding mechanics of breathing, physiology of gas exchange, blood flow through cardiopulmonary system, and blood oxygen-carrying capacity
 - Weakness: requires understanding of motor pathways (upper motor neuron/lower motor neuron)
 - Jaundice: requires understanding of biliary anatomy, conjugation of bilirubin, hemolysis, etc.

Basic case templates- Symptom Complex/Disease-based

- Presentation of particular *group of symptoms* allows for *disease-based* teaching / learning

(Will ask group for some examples...)

Basic case templates- Symptom Complex/Disease-based

- Presentation of particular group of symptoms allows for disease-based teaching / learning
 - Fever and headache: meningitis
 - Fever, rash, arthritis: rheumatologic/autoimmune disease
 - Fever, murmur, and stroke: endocarditis
 - Recurrent fevers: chronic autoimmune disease, malignancy, chronic infection
 - .
 - .
 - .
 - Tremor and slowed movements: Parkinson's disease
 - Fatigable weakness: myasthenia gravis

Case components for complete case

- Basic *anatomy/physiology-based approach to a symptom*
- *Application of an anatomic or physiologic concept to a clinical scenario*
- *Knowledge of the features and treatment of a particular disease*

Student preparation

- Cases placed in curriculum after lecture(s), concept video(s) and/or reading on anatomic/physiologic concept(s) and disease processes under discussion in case
- Generally in same day/week as material is presented
- Also cumulative over course
- Students complete readiness assessment questions on their own before session (answers provided) to test their level of preparation

Faculty Preparation

- A detailed slide-by-slide faculty guide should be provided by case designers
 - Highlights questions to ask, main teaching points
 - Anticipates student questions/confusion and provides solutions
- Faculty should be familiar with all prep materials that students have been assigned
- Faculty development through simulated case with skilled facilitators

Case Study: HMS Pre-Clinical Neurology Cases

Neurology component of Mind/Brain/Behavior Course at HMS

Week 1 (July 9-13)				
Monday, July 9	Tuesday, July 10	Wednesday, July 11	Thursday, July 12	Friday, July 13
8:00-8:20 Course Introduction (TMEC Amphitheater)				8:00-10:00 Psychiatry 1 Mood Disorders (Learning Studios)
8:20-9:00 Introduction to Neuroanatomy and Localization (TMEC Amphitheater)	8:00-10:15 Neuroanatomy 1 Gross Brain and Spinal Cord Anatomy (Learning Studios and Damp Labs)	POM	8:00-10:15 Neuroanatomy 2 Corticospinal Tract (Learning Studios and Damp Labs)	10:00-10:50 Clinical Psychiatry Skills Mental Status Examination (Learning Studios)
9:10-9:50 Introduction to Neurological Disease and Diagnosis (TMEC Amphitheater)	10:30-12:30 Neuro Disease 1 Headache (Learning Studios)		10:30-12:30 Neuro Disease 2 Weakness (Learning Studios)	11:00-11:45 Psychiatry Patient Clinic (TMEC Amphitheater)
10:00-11:15 Neurology Patient Clinic (TMEC Amphitheater)				11:50-12:20 Synthesis (Learning Studios)
11:30-12:20 Overview of Clinical Psychiatry (TMEC Amphitheater)				

HMS Mind/Brain/Behavior Case 1

- Case 1: Headache/Meningitis
 - Anatomical review: learning the intracranial structures (brain, meninges, vasculature, ventricles etc.)
 - What is in the head that could become painful?
 - Physiologic: CSF flow
 - What is the pathway of CSF from its origin to the lumbar puncture needle?
 - Disease-based: CNS infections
 - What are the features, findings, and treatment of meningitis and encephalitis?
 - *Preparation:*
 - *Lecture/lab on basic intracranial anatomy and CSF flow*
 - *Reading and concept video on CNS infections*

HMS Mind/Brain/Behavior Case 2

- Case 2: Weakness/Guillain-Barre syndrome
 - Anatomical review: Motor pathways
 - How do signals get from the brain to the muscle?
 - Physiologic: Upper/motor neuron lesions, nerve physiology
 - How do different nervous system lesions cause different patterns of weakness?
 - Axonal vs demyelinating etiologies of neuropathy and how they affect electrophysiology?
 - Disease-based: Guillain Barre
 - What are the features, findings, and treatment of Guillain-Barre syndrome?
 - *Preparation:*
 - *Lecture/lab on motor pathways*
 - *Reading and concept video on causes of neuropathy including Guillain-Barre*

HMS Mind/Brain/Behavior Case 3

- Case 3: Sudden-onset neurologic deficit/Stroke
 - Anatomical review: Cortical anatomy, cerebral blood supply
 - Localization of stroke syndromes (e.g., aphasia/right-sided weakness)
 - Blood supply and vascular territories (e.g., MCA)
 - Physiologic: Pathophysiology of stroke
 - How does blood get from the heart to the brain?
 - What are the processes along this pathway that can lead to stroke (cardiac, carotid, intracranial)?
 - Disease-based: Stroke
 - What are the features, findings, and treatment of stroke?
 - *Preparation:*
 - *Lecture/lab on cortical regions, cerebral blood supply*
 - *Reading and concept video on stroke*

HMS Mind/Brain/Behavior Case 4

- Case 4: Gait difficulty/Parkinson's disease
 - Anatomical review: basal ganglia circuitry
 - How do lesions in the basal ganglia circuitry lead to increased/decreased movement disorders?
 - Physiologic: Dopaminergic pathways
 - How do different medications for Parkinson's disease affect the dopaminergic pathways?
 - Disease-based: CNS infections
 - What are the features, findings, and treatment of Parkinson's disease?
 - *Preparation:*
 - *Lecture/lab on basal ganglia circuitry, dopaminergic motor pathways*
 - *Reading and concept video on Parkinson's disease*

HMS Mind/Brain/Behavior Case 5

- Case 5: Episodic spells/epilepsy
 - Anatomical: cortical regions (already covered)
 - What types of seizure semiology could be seen with seizure activity in particular regions?
 - Physiologic: Excitation/inhibition and antiepileptic drug mechanisms
 - How do different AEDs work at the synaptic level?
 - Disease-based: Epilepsy
 - What are the clinical features, findings, and treatment of seizures/epilepsy?
 - *Preparation:*
 - *(Lecture/lab on cortex already completed)*
 - *Reading and concept video on epilepsy and anti-epileptic drugs*

HMS Mind/Brain/Behavior Case 6

- Case 6: Progressive personality change/brain tumors
 - Anatomical: cortical regions (already covered)
 - What types of cognitive changes could be seen due to alterations in particular regions/networks?
 - Physiologic: elevated intracranial pressure (Monro-Kellie equation)
 - How does an intracranial mass alter intracranial pressure?
 - Disease-based: brain tumors
 - What are the cellular origins of the various intracranial tumors?
 - *Preparation:*
 - *(Lecture/lab on cortex already completed)*
 - *Reading and concept video on brain tumors and intracranial pressure*

HMS Mind/Brain/Behavior Case 7

- Case 7: Progressive visual disturbance and cognitive decline/Lewy Body Dementia
 - Anatomical review: Visual pathways
 - How do different lesions along the visual pathways explain different visual deficits?
 - Physiologic: Cholinergic/glutamatergic pathways
 - How do different medications used for Alzheimer's disease interact with the cholinergic/glutamatergic pathways
 - Disease-based: Dementia
 - What are the features, findings, and treatment of Alzheimer's, Lewy Body Dementia, Frontotemporal Dementia
 - *Preparation:*
 - *Lecture/lab on visual pathways (completed in a prior week)*
 - *Reading and concept video on dementia and medications for dementia*

Strategies for Teaching Cases

Strategies for Facilitating Cases

- **Ask**, don't tell – *students should talk more than the faculty*
 - Teach through questions
 - If a student gives the wrong answer, ask if any other students have a different response/approach to the question (*facilitate discussion*)
 - If a student asks a question, ask them what they think the answer is; if unsure, ask other students what they think
- **Guide**, don't lead – *students should arrive at understanding rather than be 'told the answer'*
 - Again, comes through *asking* questions rather than answering them

Teaching Cases in Team-Based Learning Model

- 40 students in groups of 4
- Question is posed to students, who spend 5-10 minutes discussing at table
- Faculty facilitator circulates while students discuss
- Faculty facilitator then calls on table
 - Can call on table who 'got it right'
 - Can call on table who 'got it wrong' but instructive to discuss why
- Goal is: **active learning** facilitated by faculty

