



A Virtual Case-Based Learning Module on Acute Ischemic Stroke for Pre-Clinical Medical Students

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Background

- 795,000 patients suffer strokes annually in the U.S. and is the fifth leading cause of death¹
- Meta-analysis shows small group learning in medical education increases learner and teacher enjoyment, student engagement, and students' perception of their learning²
- Paucity of case-based learning modules on acute ischemic stroke seen in survey of MedEd Portal.

Project Aim

Design and implement a case-based learning module on acute ischemic stroke for pre-clinical medical students in at the University of Colorado.

Learning Objectives

1. Describe the history, physical exam, laboratory, and imaging findings of acute ischemic stroke.
2. Correlate a pathologic brain CT with the locations of cranial nerve nuclei.
3. Describe the importance of time in the management of acute ischemic stroke.
4. Describe the deficits that will be encountered due to ischemia of the cranial nerve nuclei.
5. Identify the indications and contraindications for IV tPA in acute ischemic stroke.

Learning objectives:

- Identify gap in resources
- CU core competencies
- Coordinate with course directors

Collect resources:

- Donor medical records
- AHA stroke recs
- Yale CBL recs
- Literature search

Construct module:

- PowerPoint
- Design layout
- Write questions
- 3D animation

Pilot study:

- 38 students
- 12 groups of 3-4
- 90-minute session
- Likert-scale and narrative feedback

Learning Module Outline

1. Instructions and introduction

Introduces layout of module

Acute Ischemic Stroke-

A Case-Based Learning Module
Using Real Medical Records

Please enter full screen mode at this time.

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3. Patient case introduction

Introduction of patient and history of present illness

Case Part 1- Continued

TIME: 12:39
1 minute after arrival

You enter the room to find Jeff, a 45-year-old white male, sitting upright on the EMS cot. Through slightly slurred speech Jeff says, "I've been having a headache for the past two or three days, but I don't remember how it started. I didn't fall or hit my head." When you ask, he says that the worst his headache gets is an 8/10, but right now it is a 2/10.

You notice that he looks anxious and he has overt right-sided facial droop.

Jeff's mother confirms that he seemed completely normal when she saw him at about 9:50 that morning (approximately 3 hours ago).

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Next

5. Head computed tomography

Head CT from anatomic donor

Noncontrast Brain CT- Can you ID the defect?



Use UP or DOWN arrow to navigate CT

7. Treatment and clinical course

Discussion of IV tPA and case resolution

Take Home Points

Event	Time
ER Door to physician	≤10 minutes
ER Door to stroke team	≤15 minutes
ER Door to CT initiation	≤25 minutes
ER Door to CT interpretation	≤45 minutes
ER Door to drug	≤60 minutes
ER Door to stroke unit admission	≤3 hours

Time is critical in acute ischemic stroke! Once a diagnosis is confirmed, begin treatment as soon as possible.

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2. Pre-module survey

6 MCQs on scratch-off cards based on prior knowledge

Pre-Module Survey (scratch-off card)

1. The _____ supply the posterior circulation in the Circle of Willis, while the _____ supply the anterior circulation.

- a. External carotid arteries; Vertebral arteries
- b. Vertebral arteries; Internal carotid arteries
- c. Internal carotid arteries; Vertebral arteries
- d. Vertebral arteries; External carotid arteries

Click anywhere to advance slide

4. Initial case workup

HPI, PMH, Meds, NIHSS, physical exam, and lab tests

NIH Stroke Scale

TIME: 12:54
16 minutes after arrival

Level of Consciousness A	0	Left Leg Motor	2
Level of Consciousness B	0	Right Leg Motor	0
Level of Consciousness C	0	Left Arm Motor	0
Best Gaze	0	Right Arm Motor	0
Visual	0	Language	0
Facial Palsy	2	Dysarthria	1
Left Arm Motor	2	Extinction and Inattention	0
Right Arm Motor	0	Total Score	7

What do each of the positive scores mean for this patient?

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6. Discussion questions

Discussion prompts regarding workup and next steps

Why might this patient not be a good candidate for IV tPA?

Are there other therapies that you should consider for this patient?

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8. Neuroanatomic correlation

15 MCQs with dissected brain images and neurohistology



Ventral brainstem with normal basilar artery

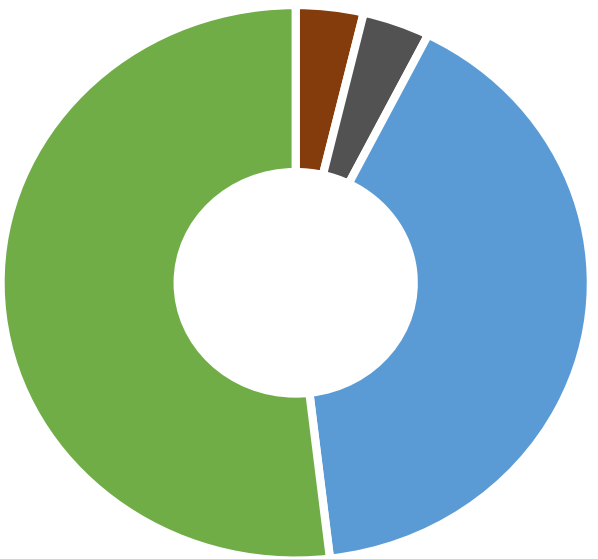


Ventral brainstem with 17 mm aneurysmal dilation of basilar artery.

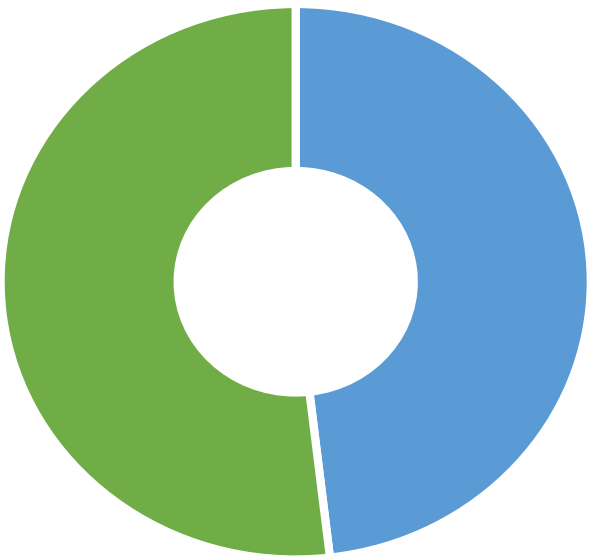
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Results

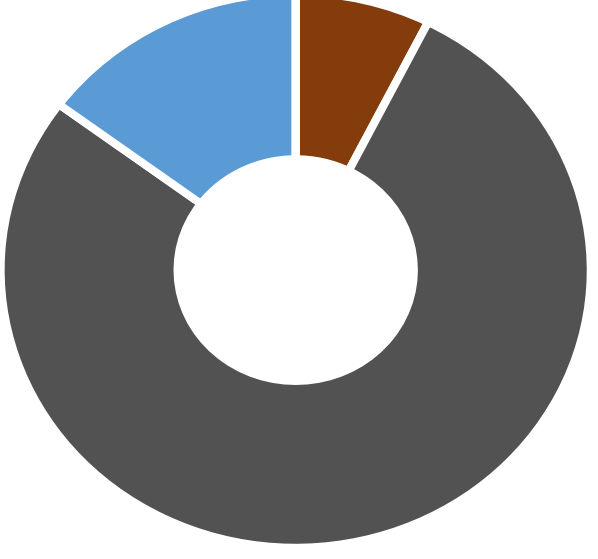
Clear learning objectives



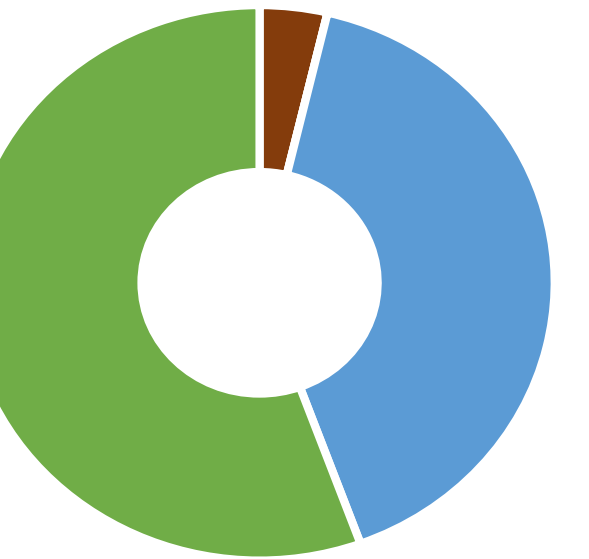
This is a valuable experience



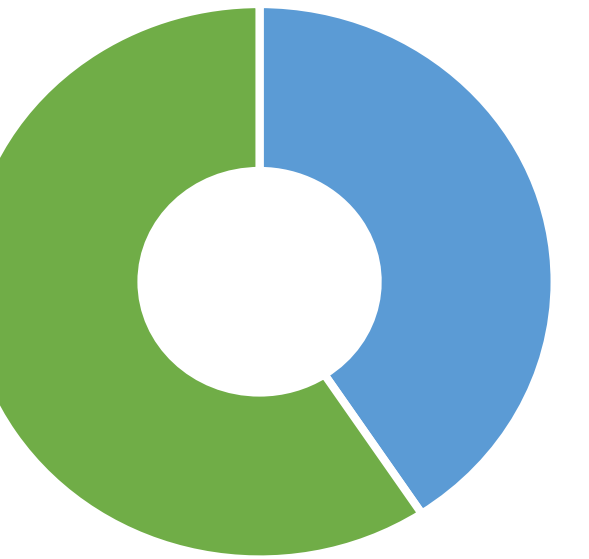
Questions were too hard



Followed logical order



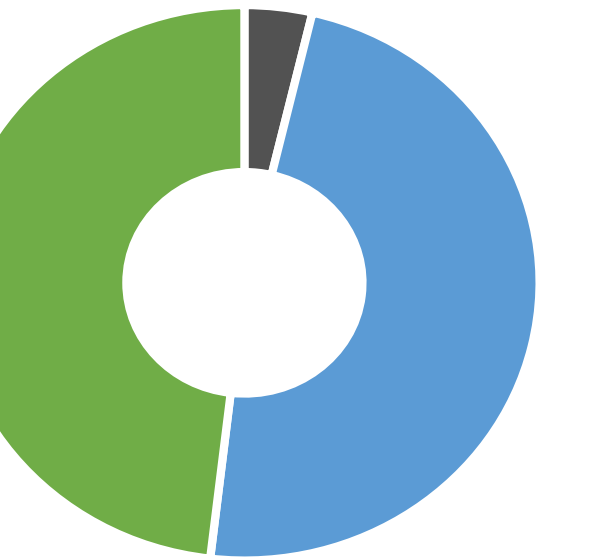
Would use similar modules



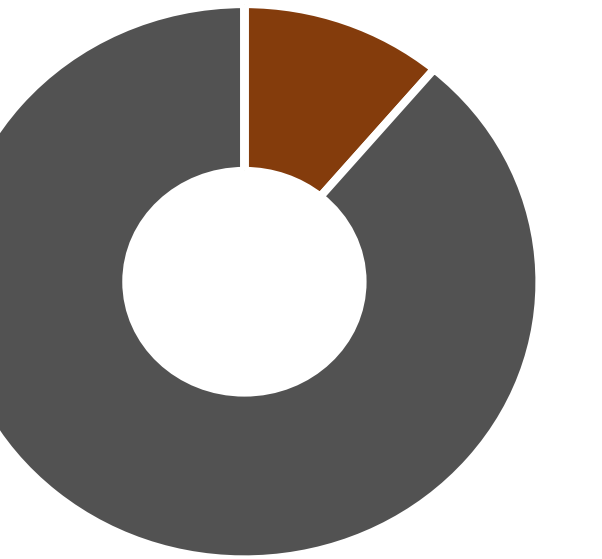
Enjoyed small group learning



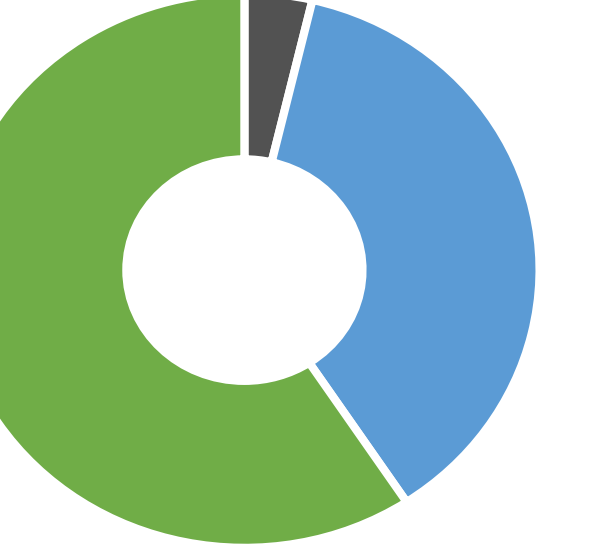
Able to follow patient's story



Questions were too easy



Enjoyed using scratch cards



Strongly Disagree **Disagree** **Agree** **Strongly Agree**

Conclusions

- A virtual case-based learning module was successfully created using real medical records, brain dissection images, 3D computer modeling, and histologic images.
- 100% of students reported enjoying working in small groups and would use similar modules.
- The COVID-19 pandemic has further increased the need for virtual learning in medical education.

Future Directions

We will implement this learning module into the Nervous Systems block in a 90-min session and add take-away points for discussion questions.

References

- ¹ 2018 Guidelines for the Early Management of Patients With Acute Ischemic Stroke: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association. Powers, WJ et al. Stroke. 2018;49:e46-e110.
- ² The Effectiveness of Case-Based Learning in Health Professional Education. A BEME Systematic Review: BEME Guide No. 20. Med Teach 2012;34(6):421-444.