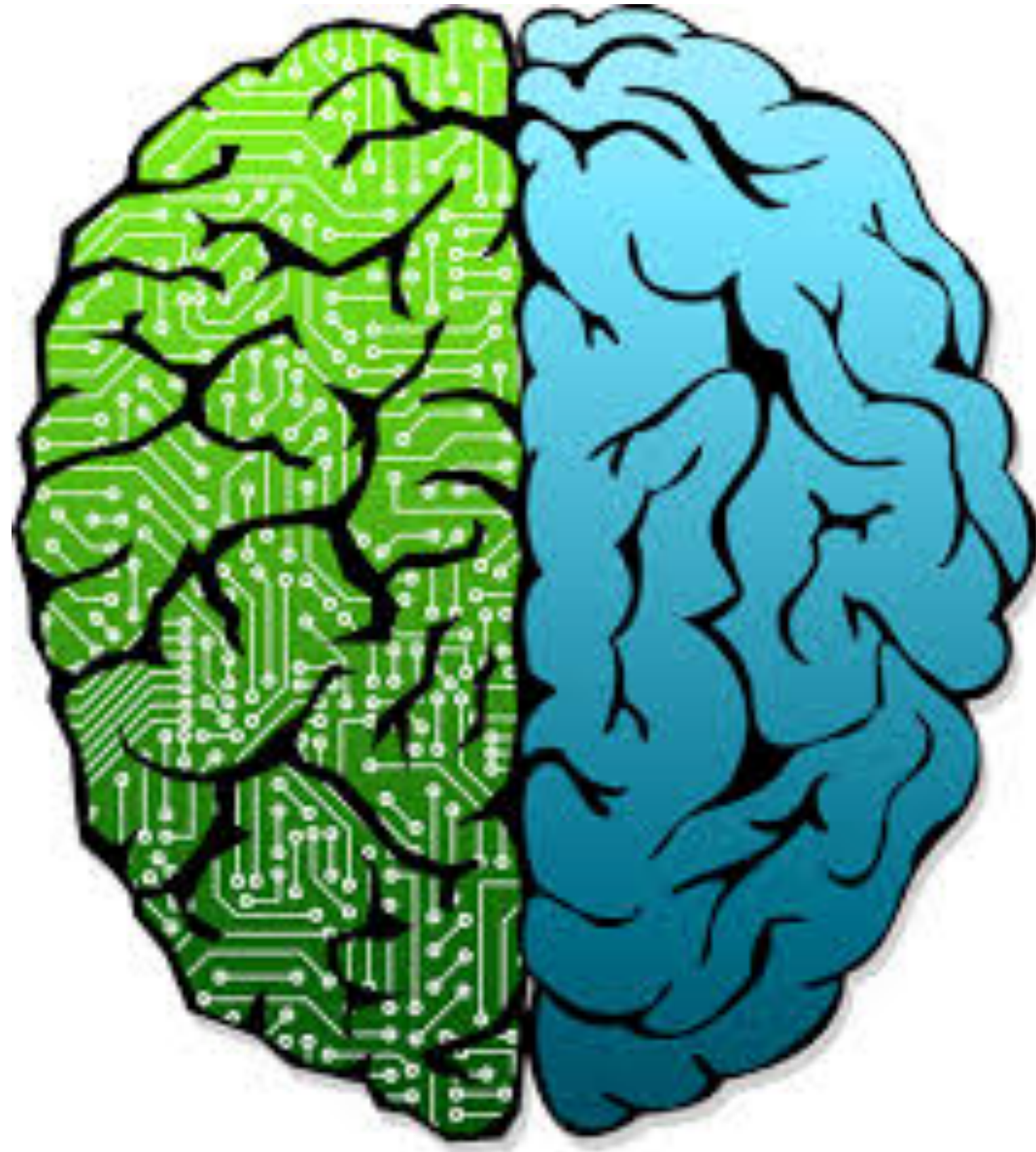


Applying learning science to medical education

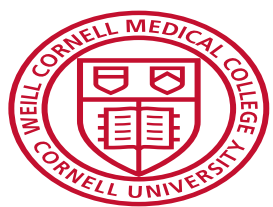


Rishi Desai, MD, MPH

DISCLOSURE STATEMENT

Rishi Desai, MD

- Has no relevant financial relationships to disclose
- Will not be discussing any unlabeled/unapproved use of drugs or products



Weill Cornell
Medicine-Qatar

Remember these words:

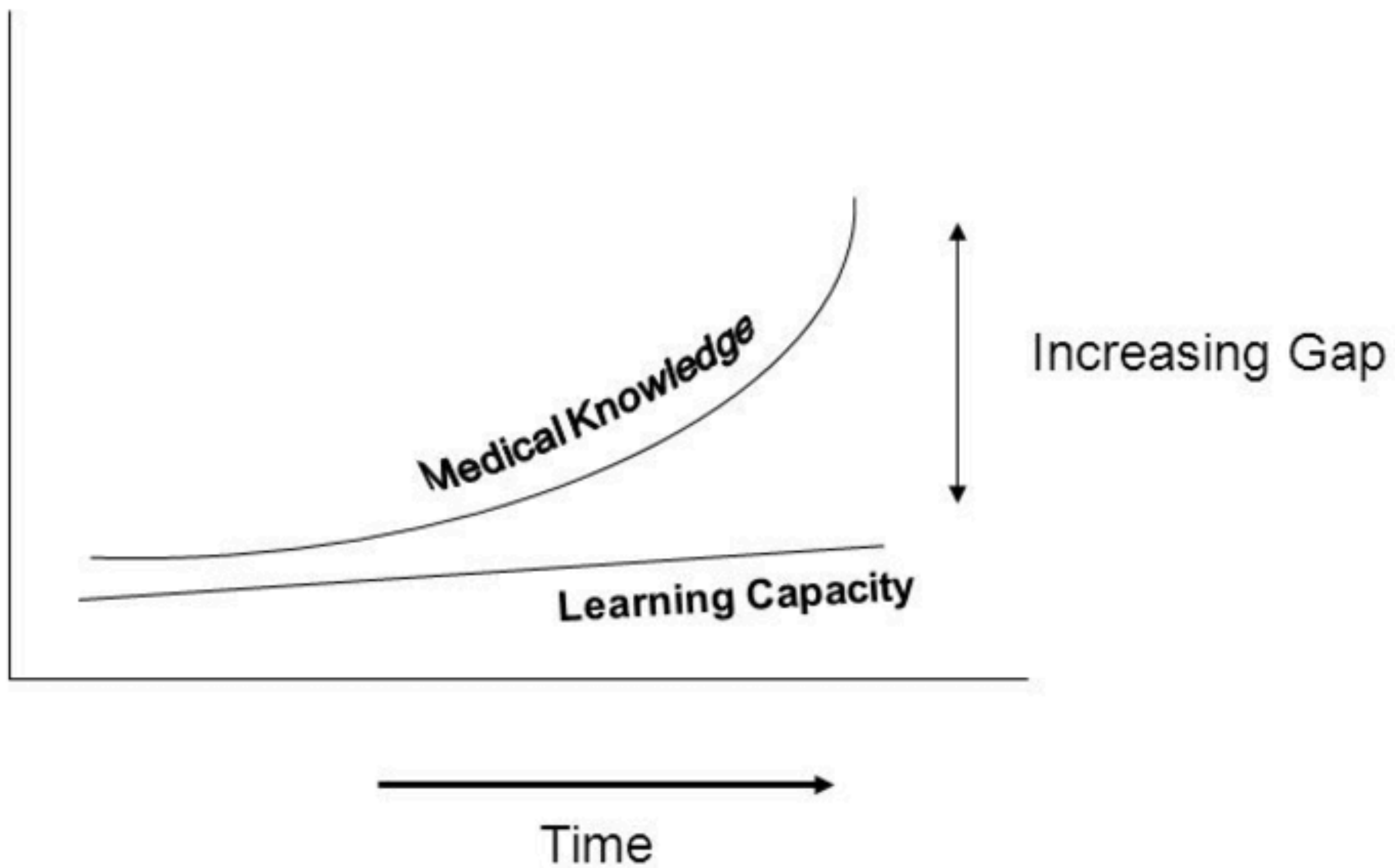
skateboard

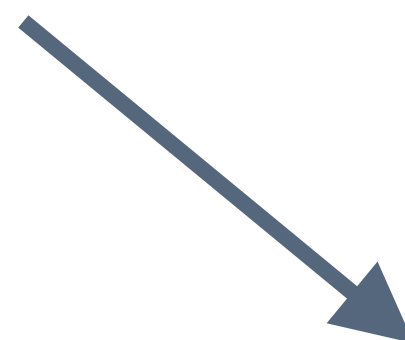
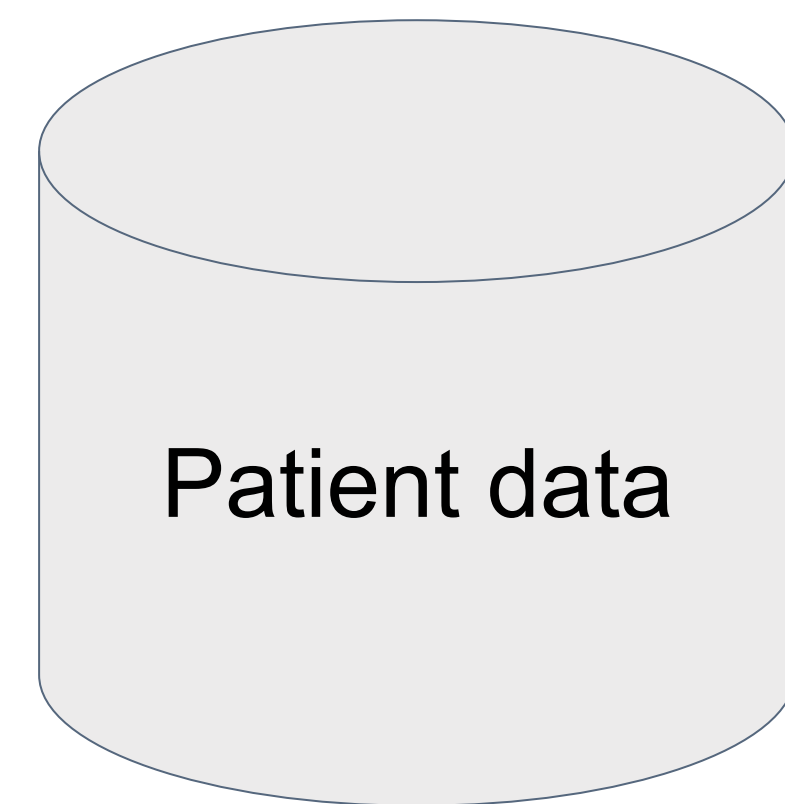
penguin

rain

lollipop



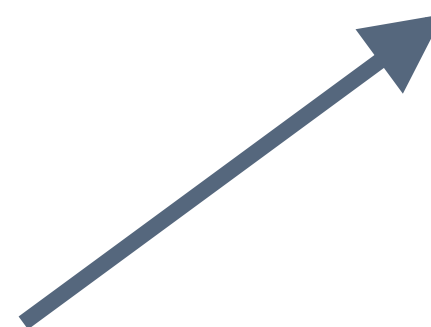
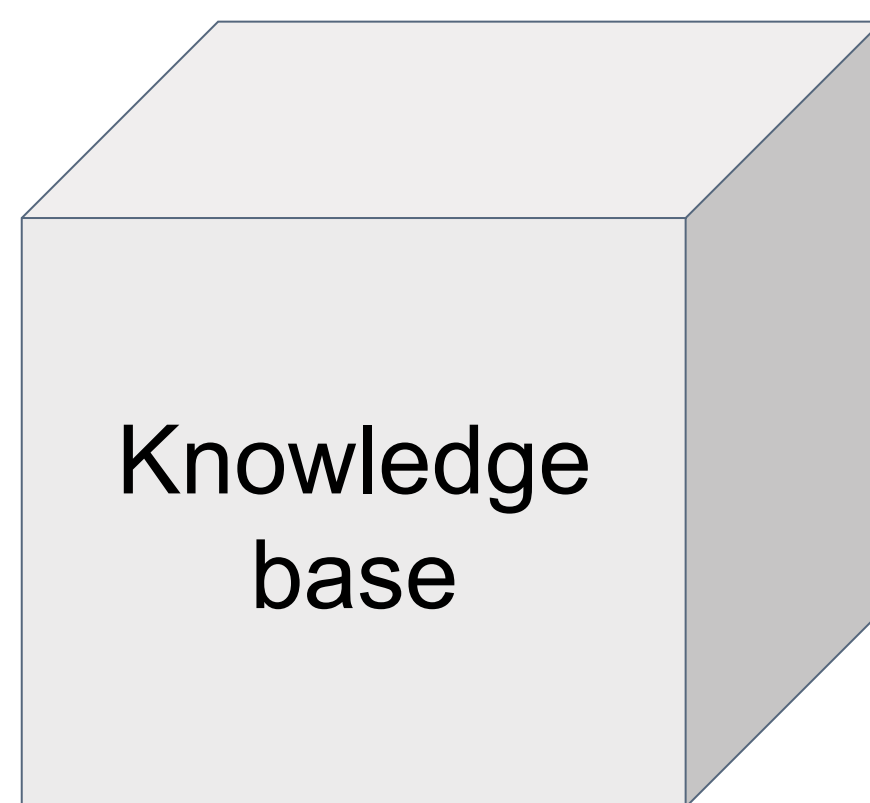


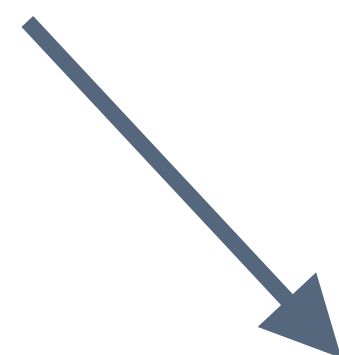
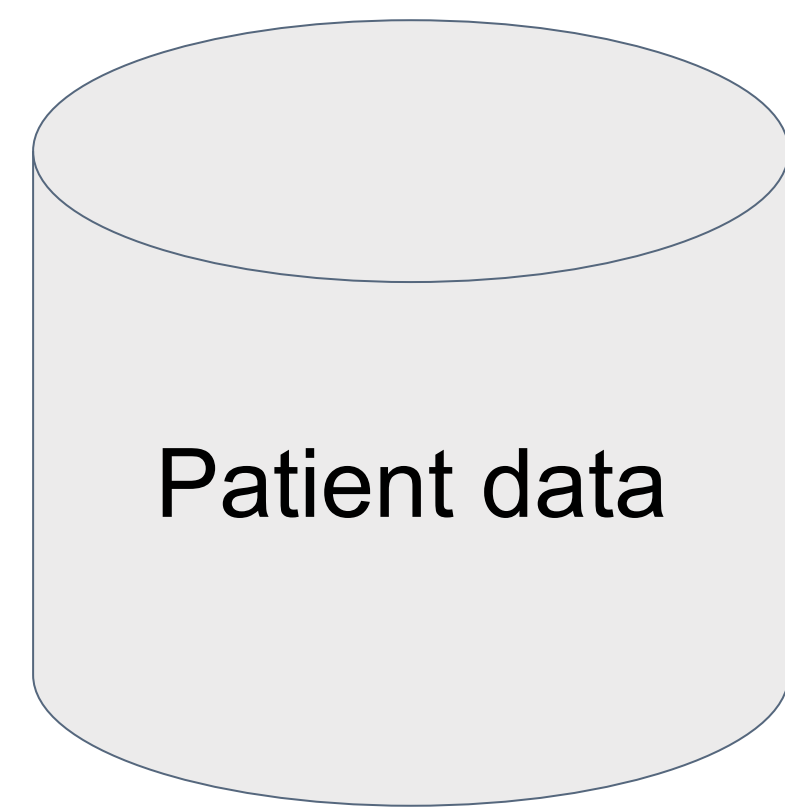


Doctor



Patient





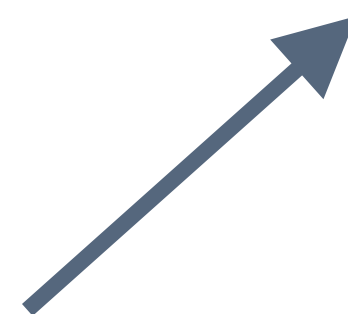
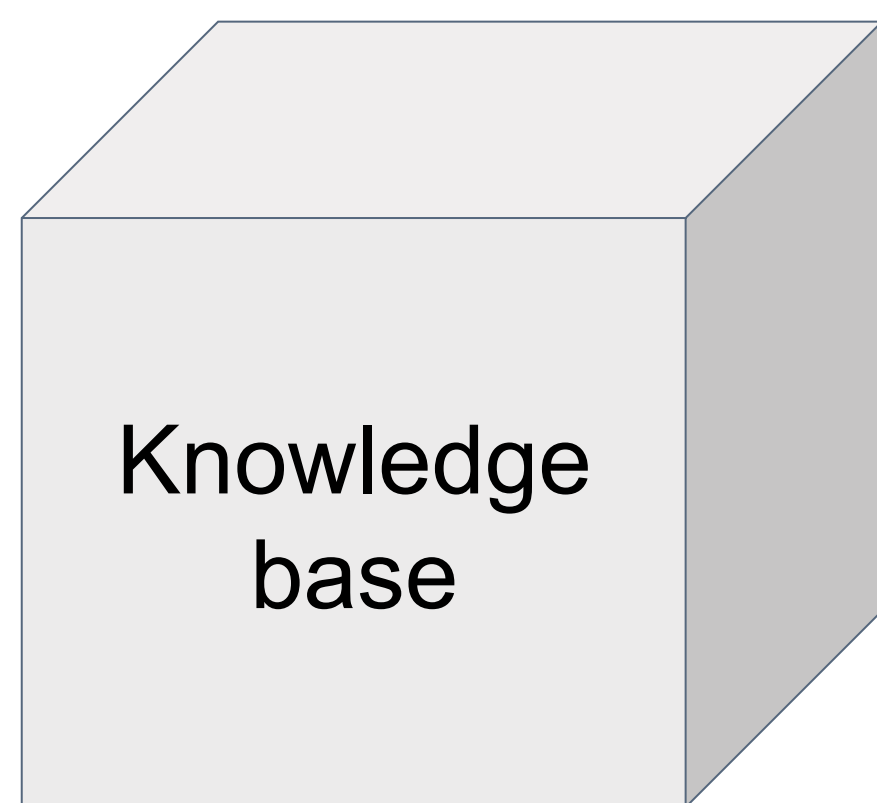
Artificial intelligence



Doctor

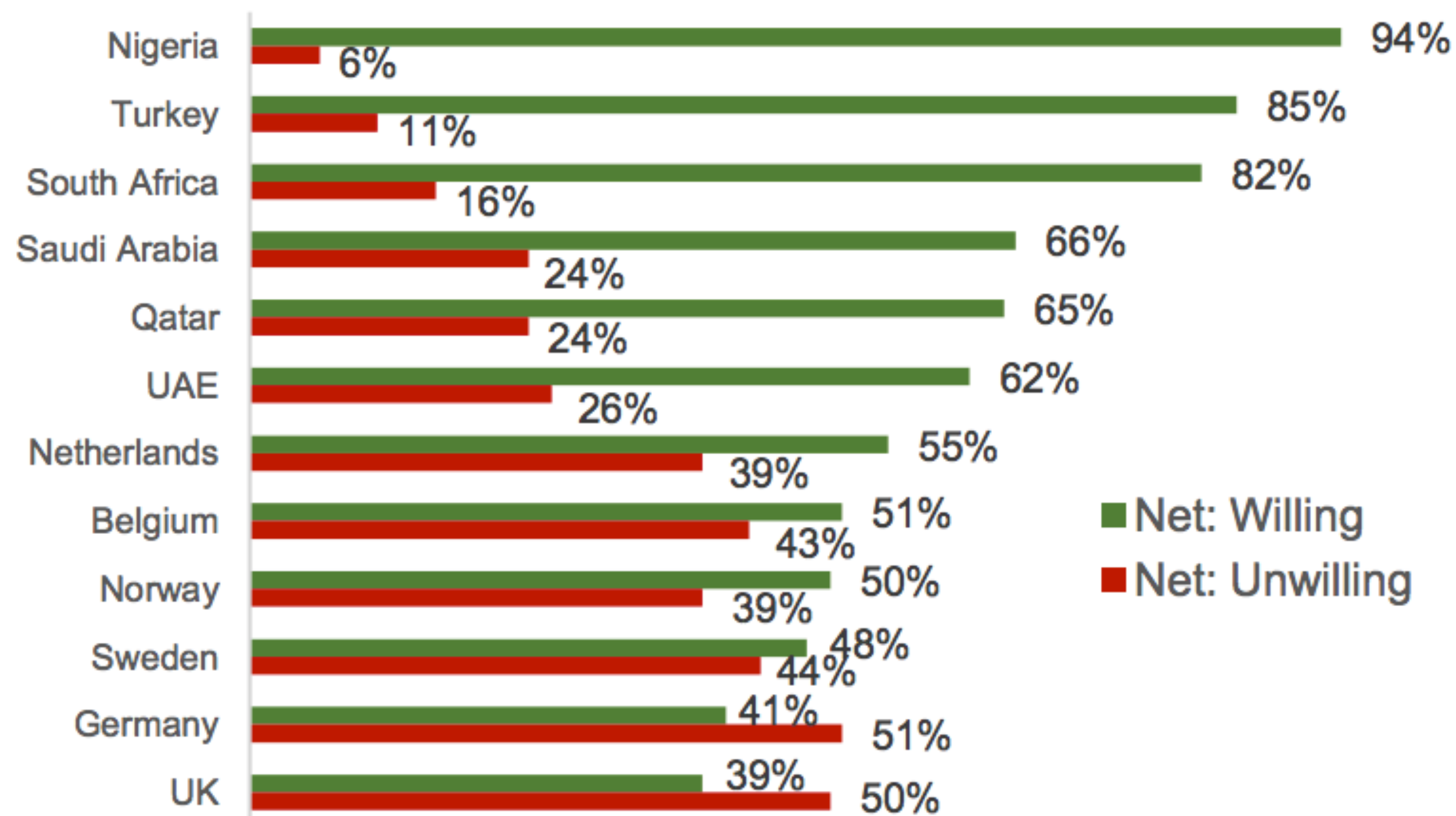


Patient



Middle East consumers ready to embrace AI and robots for their healthcare needs

Fig 1: Percentage of respondents willing/unwilling to engage with AI and robotics for their healthcare needs (by country)





Al Khor Hospital starts telemedicine for stroke care

🕒 05 Oct 2016 - 1:08

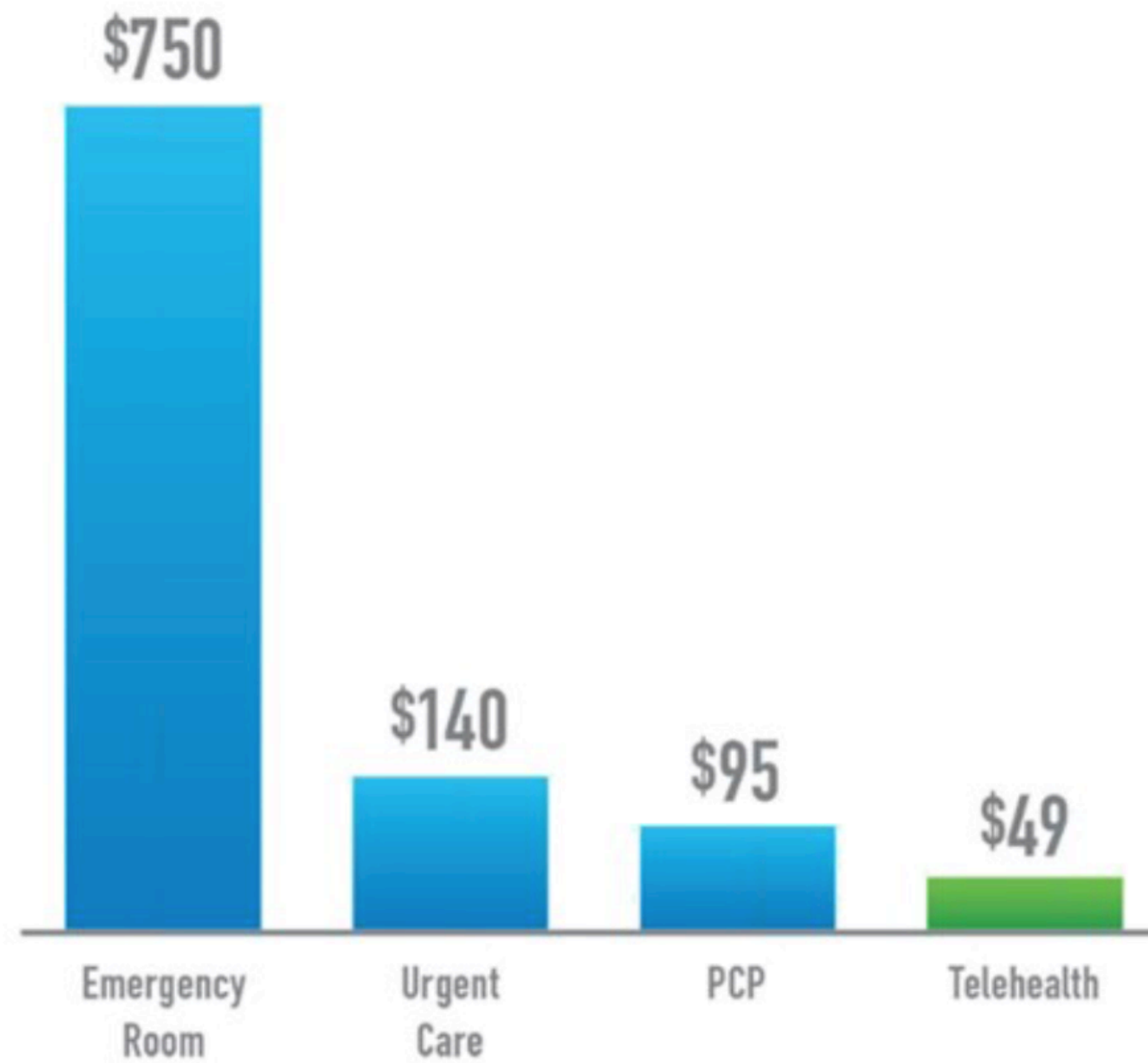
By Fazeena Saleem / The Peninsula

DOHA: Telemedicine system for real time evaluation of stroke patients has been introduced at Al Khor Hospital and it has significantly helped patients' chances of making a full recovery, said a senior official. Telemedicine is an advanced system that enables the diagnosis and treatment of patients by clinical teams situated in a different location to the patient. A collaborative initiative by teams across Hamad Medical Corporation (HMC) has led to the implementation of the system that is improving care for stroke patients at Al Khor Hospital, said Professor Ashfaq Shuaib, Director, Neurosciences Institute HMC.

"The telemedicine technology enables direct evaluation of stroke patients admitted at Al Khor's Emergency Department and allows real time examination of the CT scan imagery by HMC's expert stroke team based at HGH's Stroke Ward in Doha, facilitating immediate treatment with live saving therapies," Professor Shuaib told The Peninsula.

"Prior to the introduction of the telemedicine system, patients would often need to be transferred to HGH's Emergency Department for a full assessment before treatment was given. By significantly reducing the time period between the onset of stroke symptoms and the start of treatment, patients' chances of making a full recovery are greatly improved," he added.





Source: Healthcare Blue Book

Time is Money: In-Person vs. Online Care



IN-PERSON
DOCTOR VISIT

121
MINUTES

=

\$43 WORTH OF
YOUR TIME

(Travel, wait room, forms and actual visit)



TELEHEALTH
DOCTOR VISIT

15
MINUTES*

=

~\$5 WORTH OF
YOUR TIME

(Sign up, log-in, forms and actual visit)

SAVINGS
OF ONLINE CARE

106
MINUTES

=

\$38 WORTH OF
YOUR TIME

*Based on American Well data from Amwell, the consumer telehealth app. [Download it at www.amwell.com](https://www.amwell.com).
Sources: JAMA Internal Medicine; Harvard Medical School; American Well

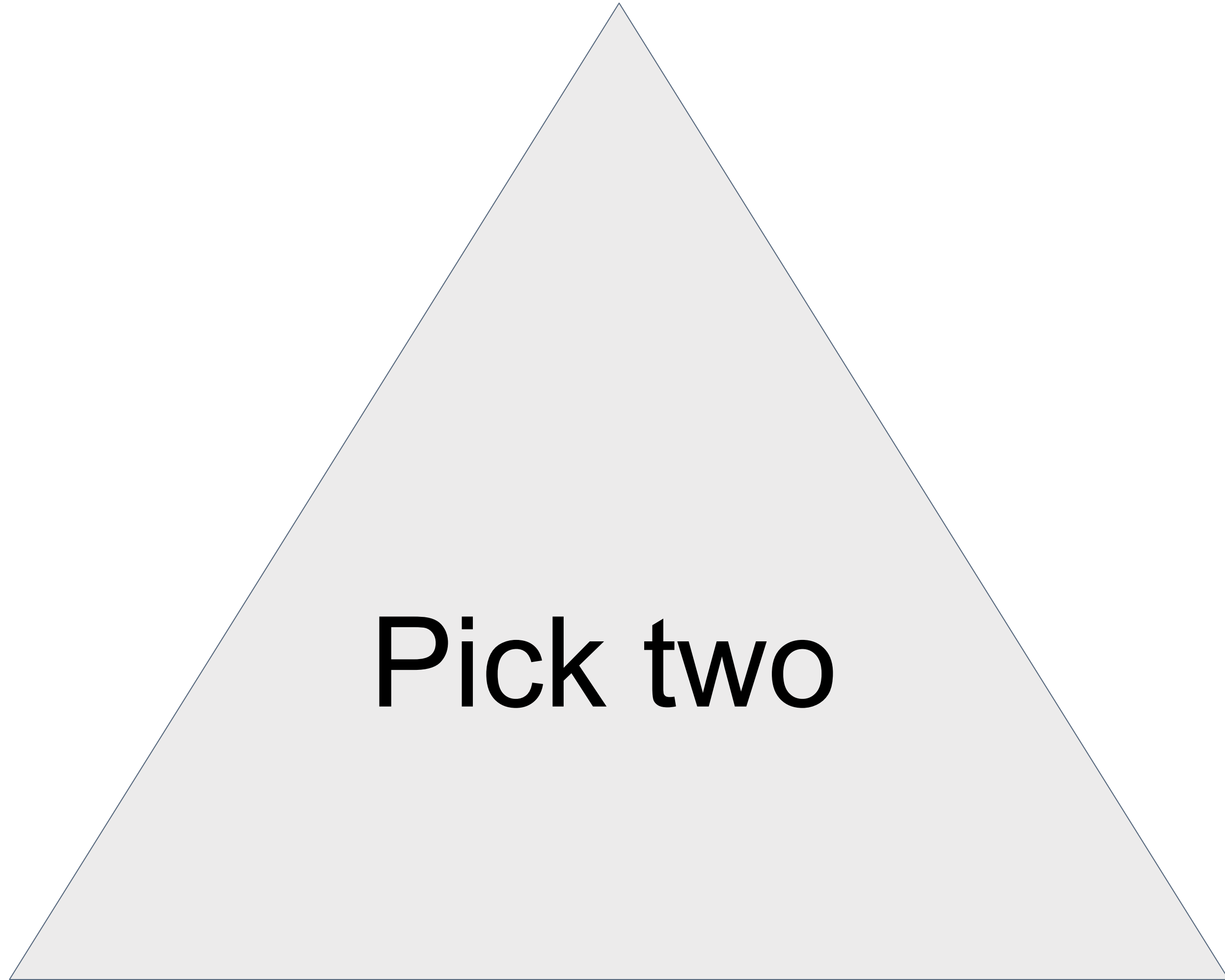


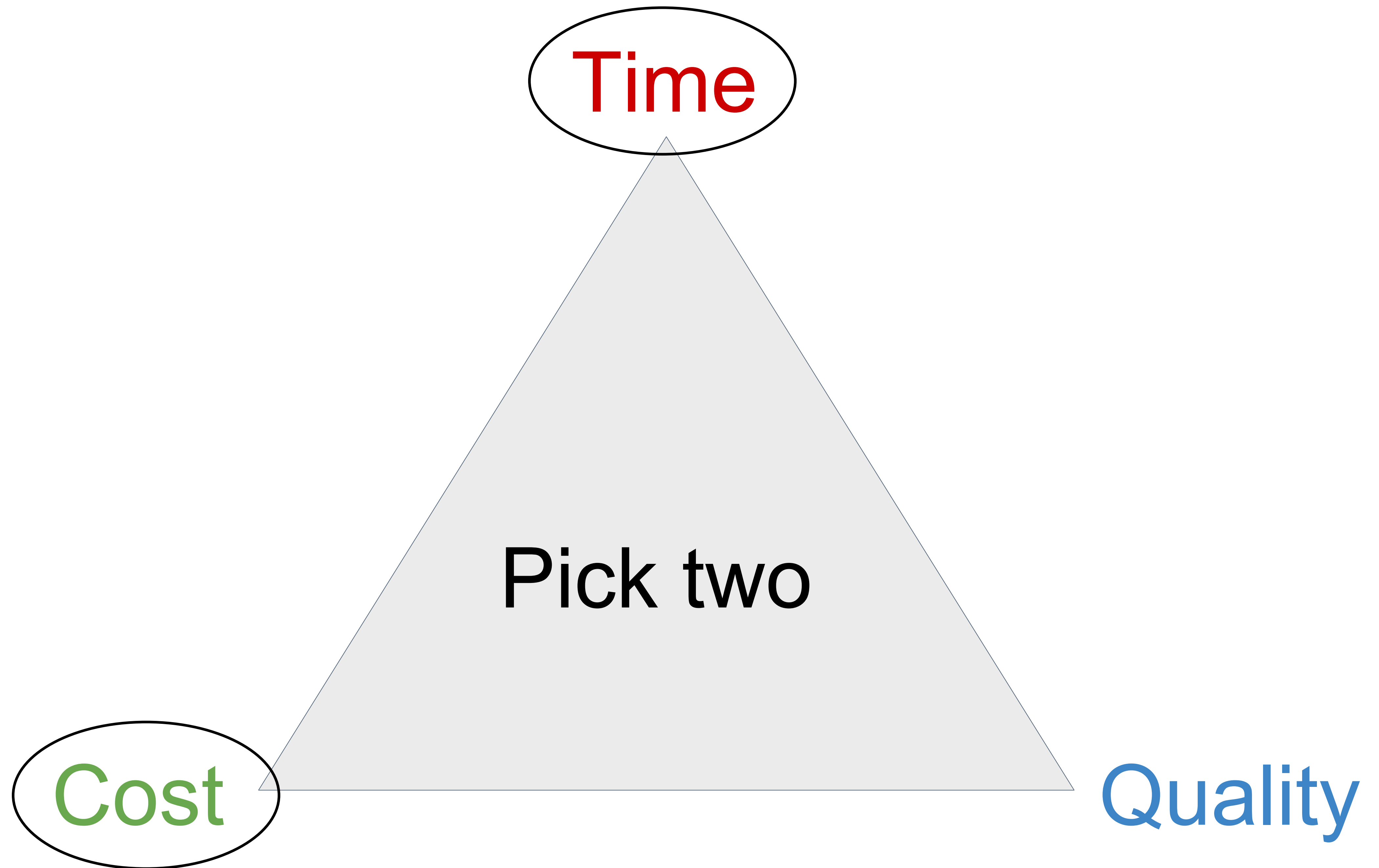
Time

Pick two

Cost

Quality







Didactic information



Facts



Empathetic listening



Motivational counseling



Teamwork



Cultural competency



Nutrition guidance



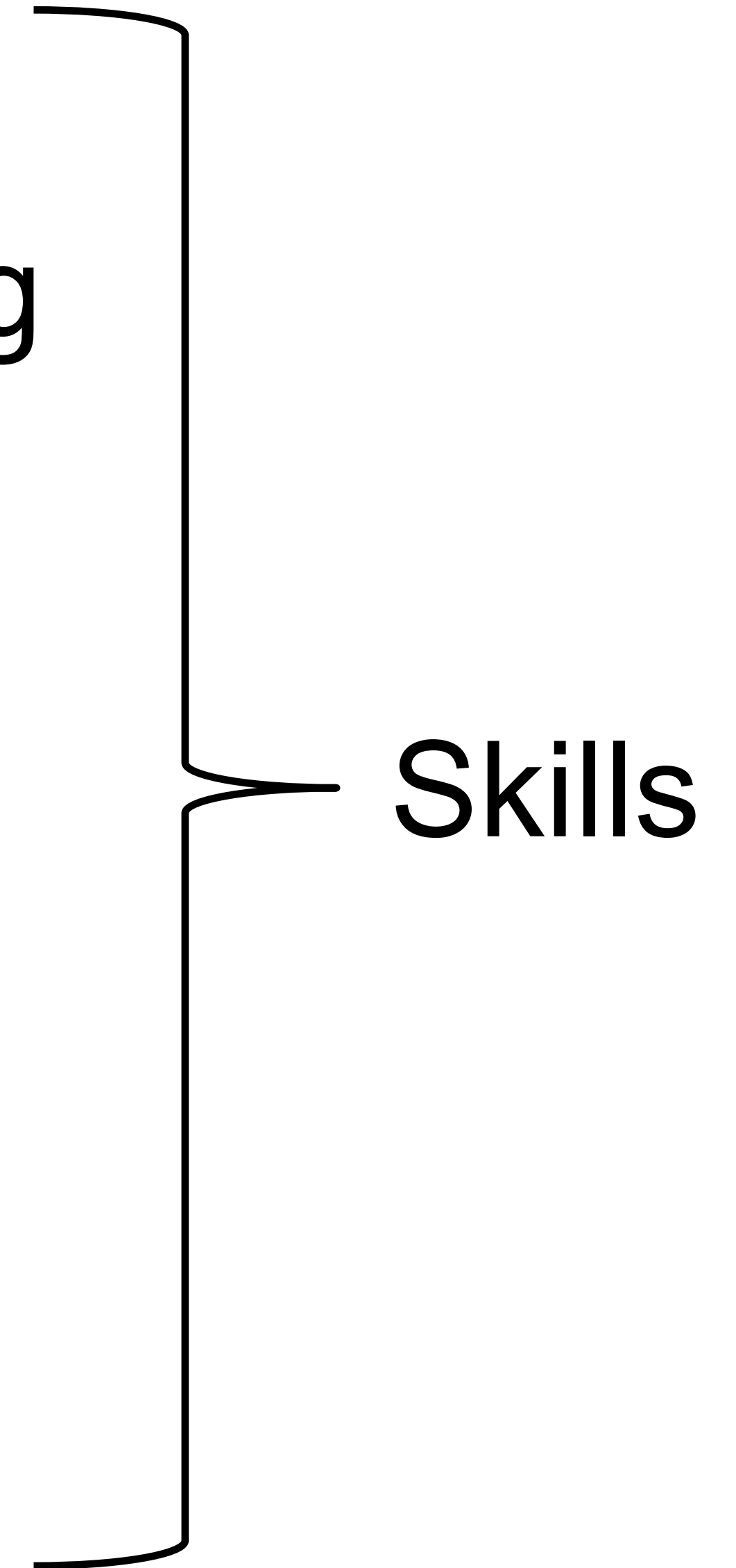
Technical abilities



Patient advocacy

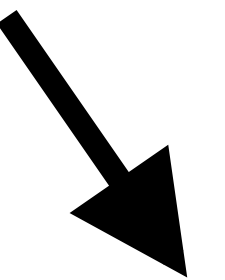


Life long learning



Medical education

Teaching skills



Teaching facts



Didactic information



Facts



Empathetic listening



Motivational counseling



Teamwork



Cultural competency



Nutrition guidance



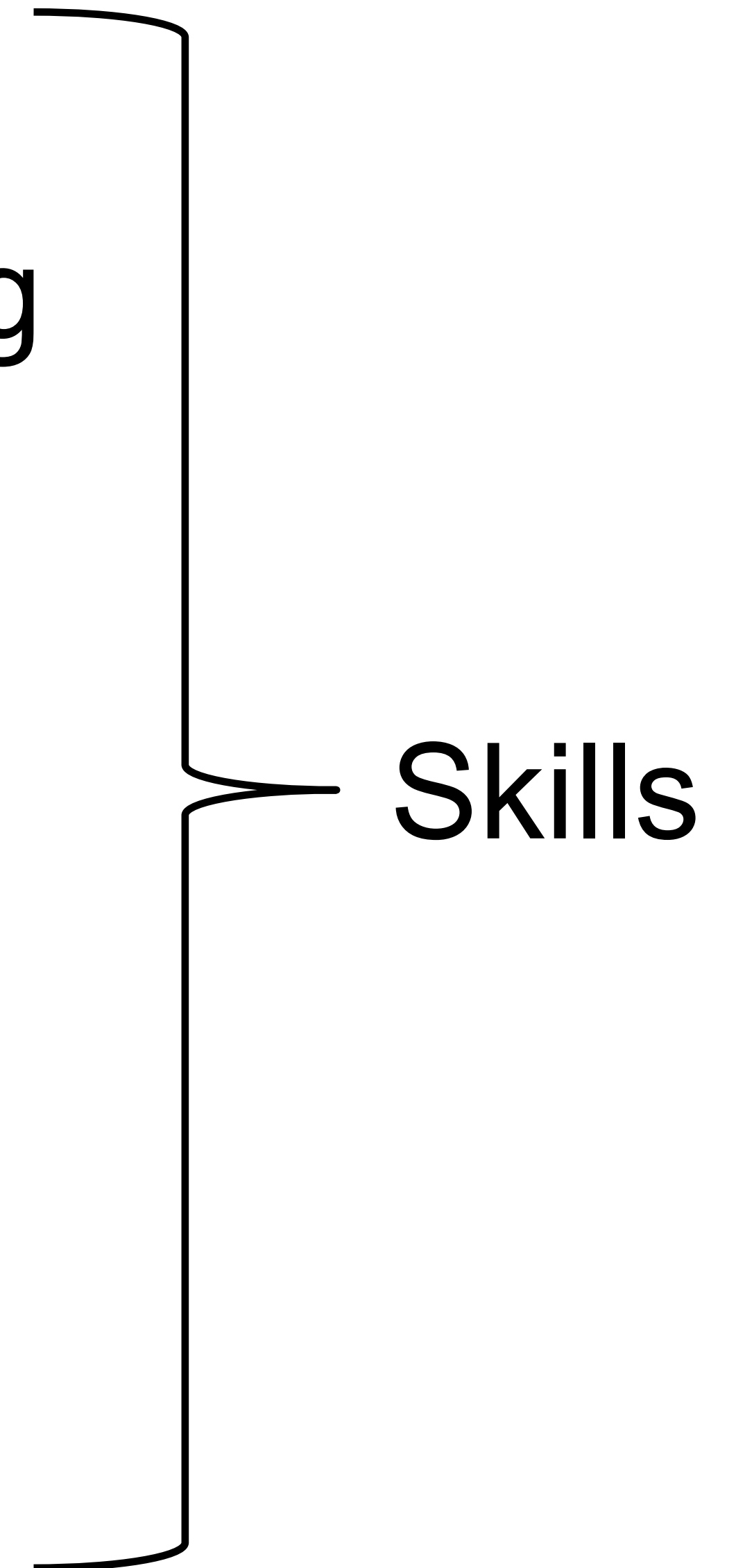
Technical abilities



Patient advocacy



Life long learning







**10-15% of medical
students attend
class**

Why don't you go to class?

Many of my professors don't teach me everything that I need for the USMLE and clinical rotations. *(My professors don't teach me all the facts I need)*

I can't learn by sitting for hours while someone reads me a list of bullets from a powerpoint. There are so many online resources that I'd rather use. *(I can't learn facts this way)*

I learn a lot more just by answering questions, and then looking things up when I get stuck. *(There are more effective ways for me to learn facts)*

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Three curriculums

Medical school classes

USMLE

Clinical knowledge

Three curriculums

Medical school classes

USMLE

Clinical knowledge

Three curriculums

A diagram illustrating three curriculums. At the top is a light blue box labeled 'Medical school classes'. Below it is a light pink box labeled 'USMLE'. At the bottom is a light purple box labeled 'Clinical knowledge'. A vertical red line is positioned to the left of the 'Medical school classes' and 'Clinical knowledge' boxes. There are also two empty light purple boxes, one to the left of the 'Clinical knowledge' box and one to the right of it.

Medical school classes

USMLE

Clinical knowledge

Three curriculums

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USMLE

Clinical knowledge

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Pathophysiology

- Ischemia develops when there is an increased demand for oxygen or a decreased supply of oxygen.
- Ischemia can develop within 10 seconds and if it lasts longer than 20 minutes, irreversible cell and tissue death occurs.
- Myocardial cell death begins at the endocardium. The area most distal to the arterial blood supply.

An ECG trace is shown at the bottom of the text, with a red line indicating ST-segment elevation.

HEART ATTACK

AKA MYOCARDIAL INFARCTION (MI)

ENDOCARDIUM (Smooth inner membrane)

COMPLETELY BLOCKED CORONARY ARTERY

3-6 hours → TRANSMURAL INFARCT

ECG

ST-segment elevation

CORONARY ARTERY

A diagram of a heart cross-section shows a red circle representing a completely blocked coronary artery. An ECG trace to the right shows ST-segment elevation. The endocardium is labeled as the smooth inner membrane.

1 answer

A 60-year-old male with a history of **myocardial infarction** 4 weeks ago presents to his follow-up appointment with a **chest pain** that is **not** relieved by **rest** for the past 2 weeks. The patient states he has never experienced this before, and is having a **hard time** putting on his shoes. The patient is otherwise healthy and complains of no other symptoms. Medication reconciliation is significant for an **antiplatelet** drug and daily **multivitamins**. Physical examination shows no signs of congestive heart failure, and **adenoma** is located in the lower inner only. Which of the following medications is most likely cause of the patient's **adenoma**?

A Atorvastatin Explain

B Enalapril Explain

C Furosemide Explain

D Hydrochlorothiazide Explain

E Metoprolol Explain

Myocardial infarction

From Wikipedia, the free encyclopedia

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Myocardial infarction (MI) or **acute myocardial infarction (AMI)**, commonly known as a **heart attack**, occurs when **blood flow** stops to a part of the **heart** causing damage to the **heart muscle**. The most common symptom is **chest pain** or discomfort which may travel into the shoulder, arm, back, neck, or jaw. Often it is in the center or left side of the chest and lasts for more than a few minutes. The discomfort may occasionally feel like **heartburn**. Other symptoms may include **shortness of breath**, **nausea**, **feeling faint**, a **cold sweat**, or **feeling tired**.^[1] About 30% of people have atypical symptoms,^[2] with women more likely than men to present atypically.^[2] Among those over 75 years old, about 5% have had an MI with little or no history of symptoms.^[3] An MI may cause heart failure, an irregular heartbeat (including serious types), cardiogenic shock, or cardiac arrest.^{[2][4]}

Most MIs occur due to coronary artery disease.^[5] Risk factors include **high blood pressure**, **smoking**, **diabetes**, **lack of exercise**, **obesity**, **high blood cholesterol**, **poor diet**, and **excessive alcohol intake**, among others.^{[2][6]} The mechanism of an MI often involves the complete blockage of a coronary artery caused by a rupture of an **atherosclerotic plaque**.^[5] MIs are less commonly caused by **coronary artery spasms**, which may be due to cocaine, significant emotional stress, and extreme cold, among others.^{[6][7][8]} A number of tests are useful to help with diagnosis, including **electrocardiograms (ECGs)**, **blood tests**, and **coronary angiography**.^{[7][9]} An ECG may confirm an ST elevation MI if ST elevation is present.^[9] Commonly used blood tests include **troponin** and less often **creatinine kinase MB**.^[11]

Aspirin is an appropriate immediate treatment for a suspected MI.^[12] Nitroglycerin or opioids may be used to help with chest pain; however, they do not improve overall outcomes.^{[13][14]} Supplemental oxygen should be used in those with low oxygen levels or shortness of breath.^[15] In ST elevation MIs treatments which attempt to restore blood flow to the heart are typically recommended and include **angioplasty**, where the arteries are pushed open, or **thrombolysis**, where

A diagram of a heart showing the Left Coronary Artery (LCA) and Right Coronary Artery (RCA). The LCA is labeled with a '1' and the RCA with a '2'.



Pathophysiology

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Major takeaway
 Nitroglycerin is a calcium channel blocker used to treat many medical conditions including hypertension. Side effects of the medication is peripheral edema localized to the lower extremities.

Medication
 The patient presents with symptoms of peripheral edema consistent with calcium channel blocker use. Calcium channel blockers (CCBs) are a class of drugs used to treat conditions such as systemic and pulmonary hypertension, angina, brain aneurysm complications, arrhythmias, migraines, and some circulatory conditions. Due to their properties, CCBs as a class are not very effective as diuretics, therefore they are not typically the first line of drugs used to treat hypertension. However in some populations (African American), CCBs may be more effective than beta blockers or ACE inhibitors. Of the drugs mentioned above, only amlodipine is a calcium channel blocker. It works by inhibiting transmembrane flow of calcium in peripheral and cardiac vascular smooth muscle. The result is reduced vascular tone, which can relieve coronary vasospasm and decrease blood pressure. Vasodilation in peripheral tissues may give rise to vascular leakage. The side effect of lower extremity edema is a common indication for discontinuation of CCB.

1
 A 65-year-old black male diagnosed with essential hypertension 4 weeks ago presents to the follow up appointment with bloodless, non-tender leg swelling for the past 2 weeks. The patient states he has never experienced this before, and is having a hard time putting on his shoes. The patient is otherwise healthy and complains of no other symptoms. Medication reconciliation is significant for an antihypertensive drug and daily multivitamin. Physical examination shows no signs of congestive heart failure, and edema is localized to the lower limbs only. Which of the following medications is most likely cause of the patient's edema?

A Amlodipine
B Enalapril
C Furosemide
D Hydrochlorothiazide
E Metoprolol

Myocardial infarction
 RCA
 LCA
 1
 2

HEART ATTACK
 AKA **MYOCARDIAL INFARCTION (MI)**
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 ↳ TRANSMURAL INFARCT
 ECG
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 CORONARY ARTERY

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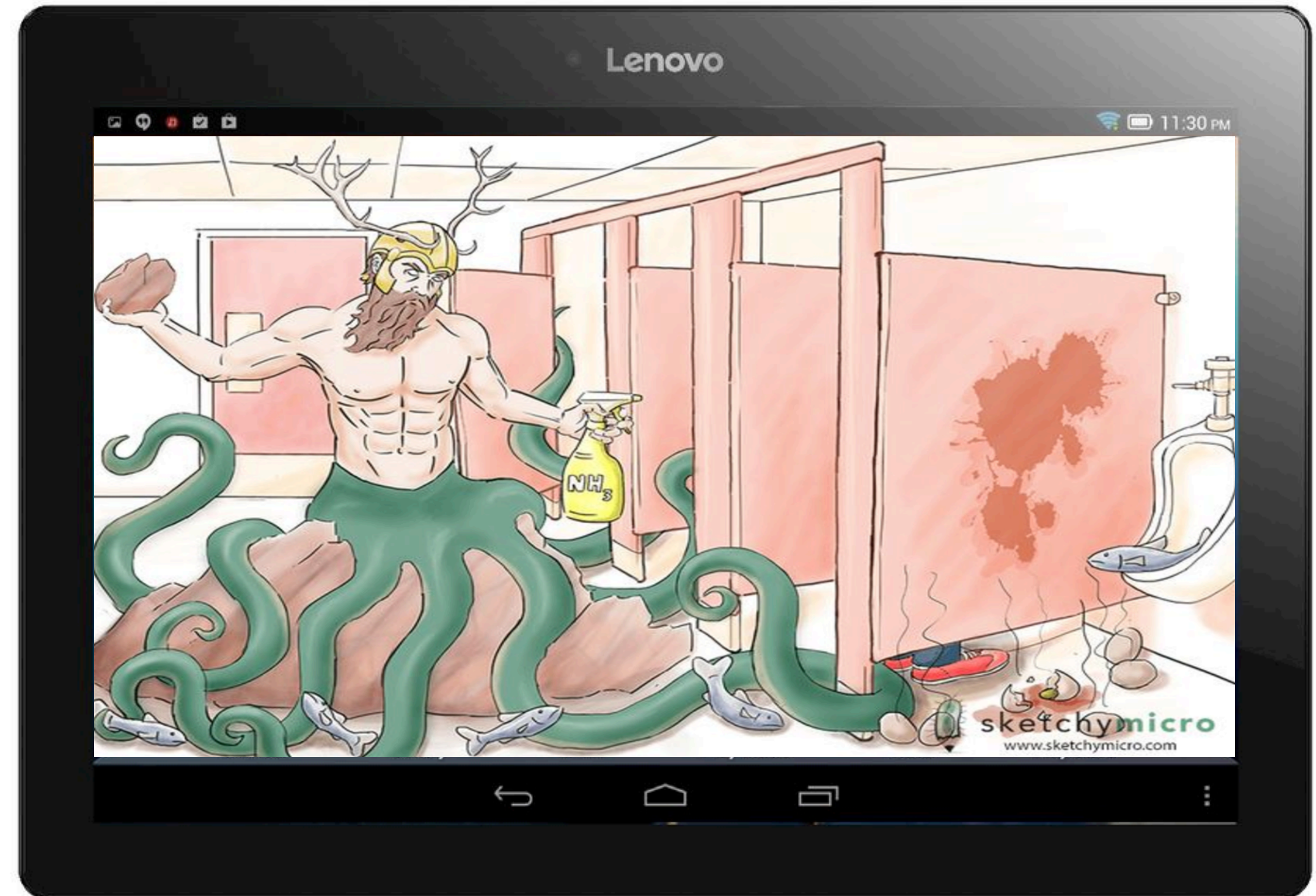
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Quiz

Memory anchor



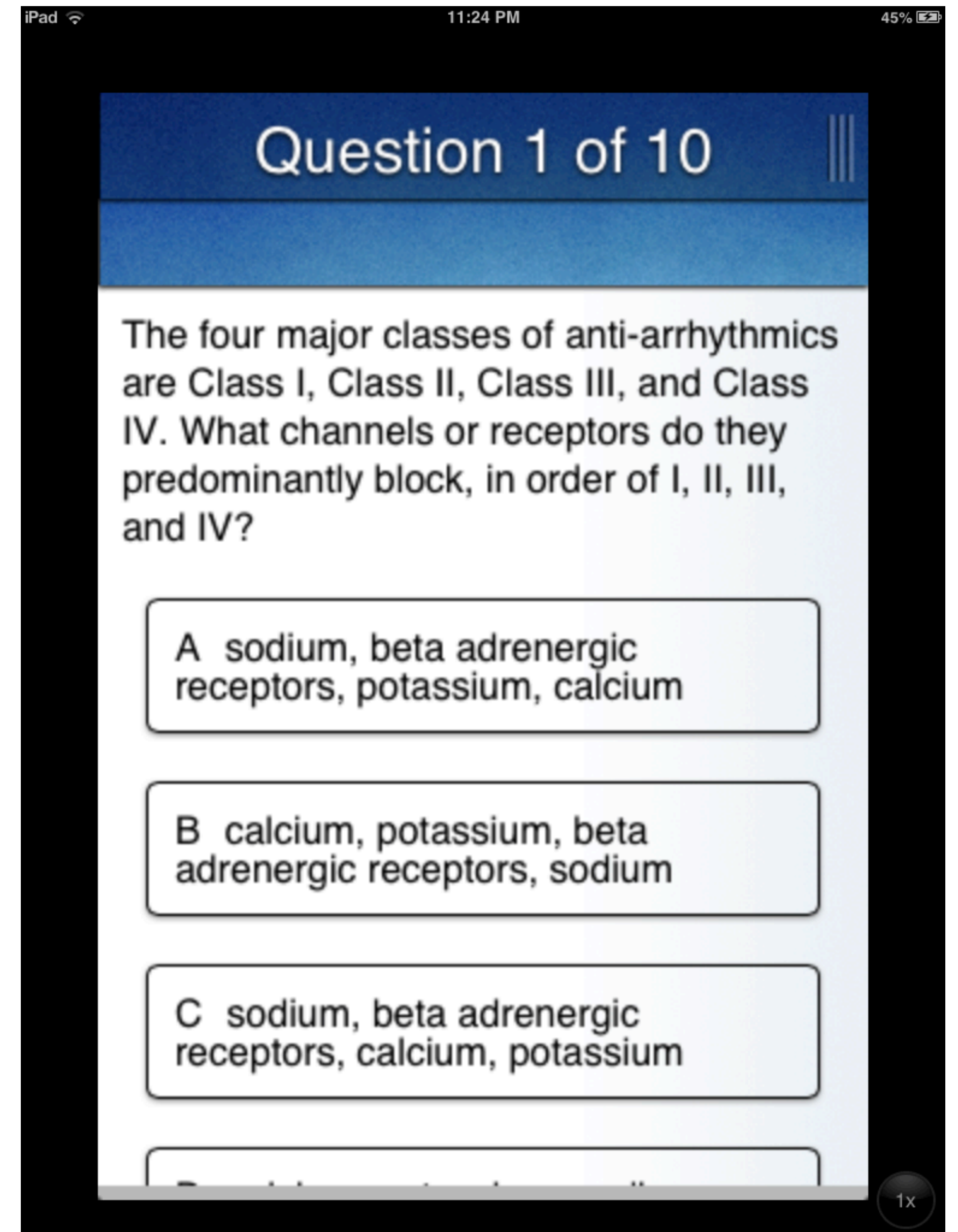
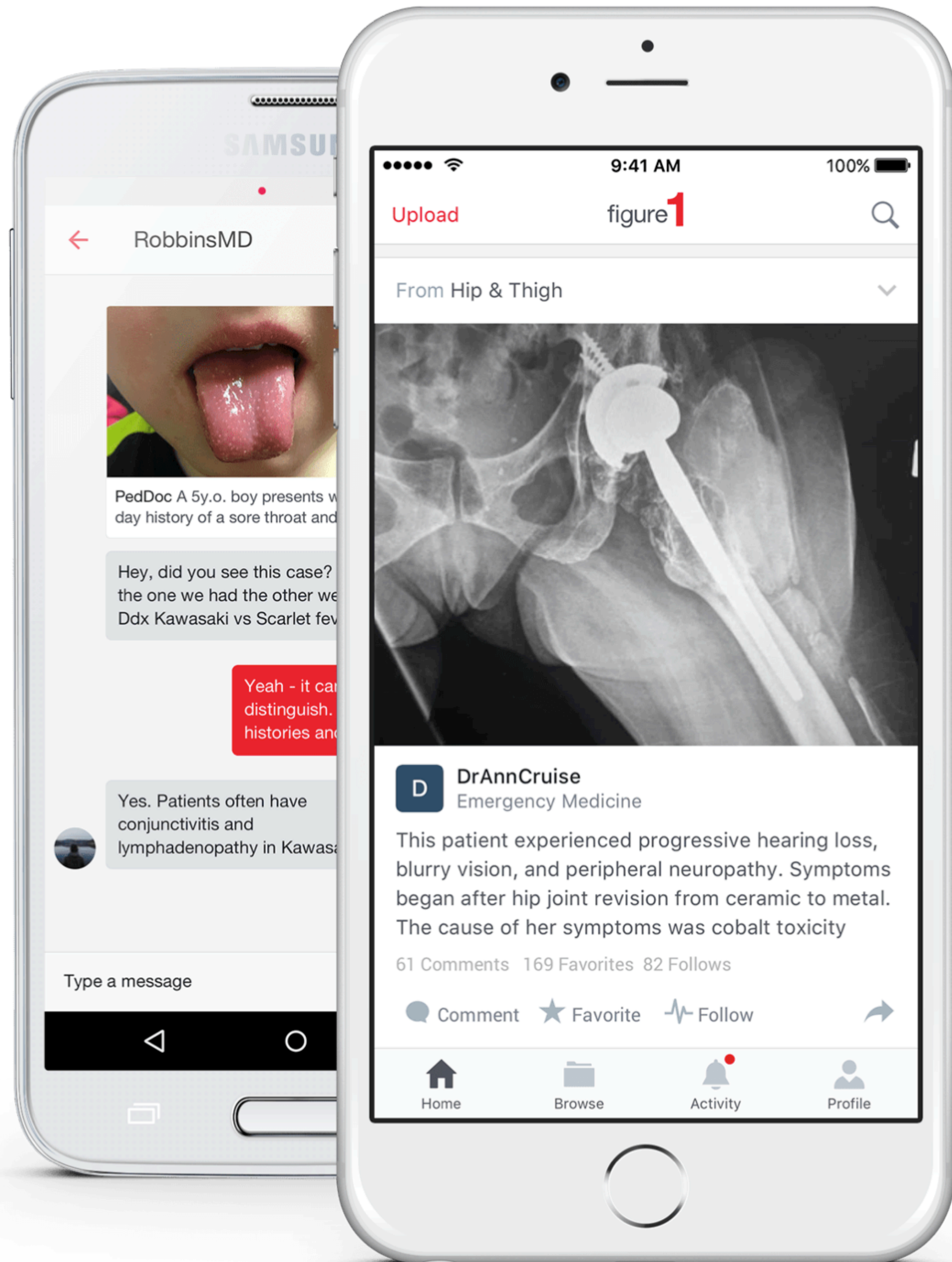


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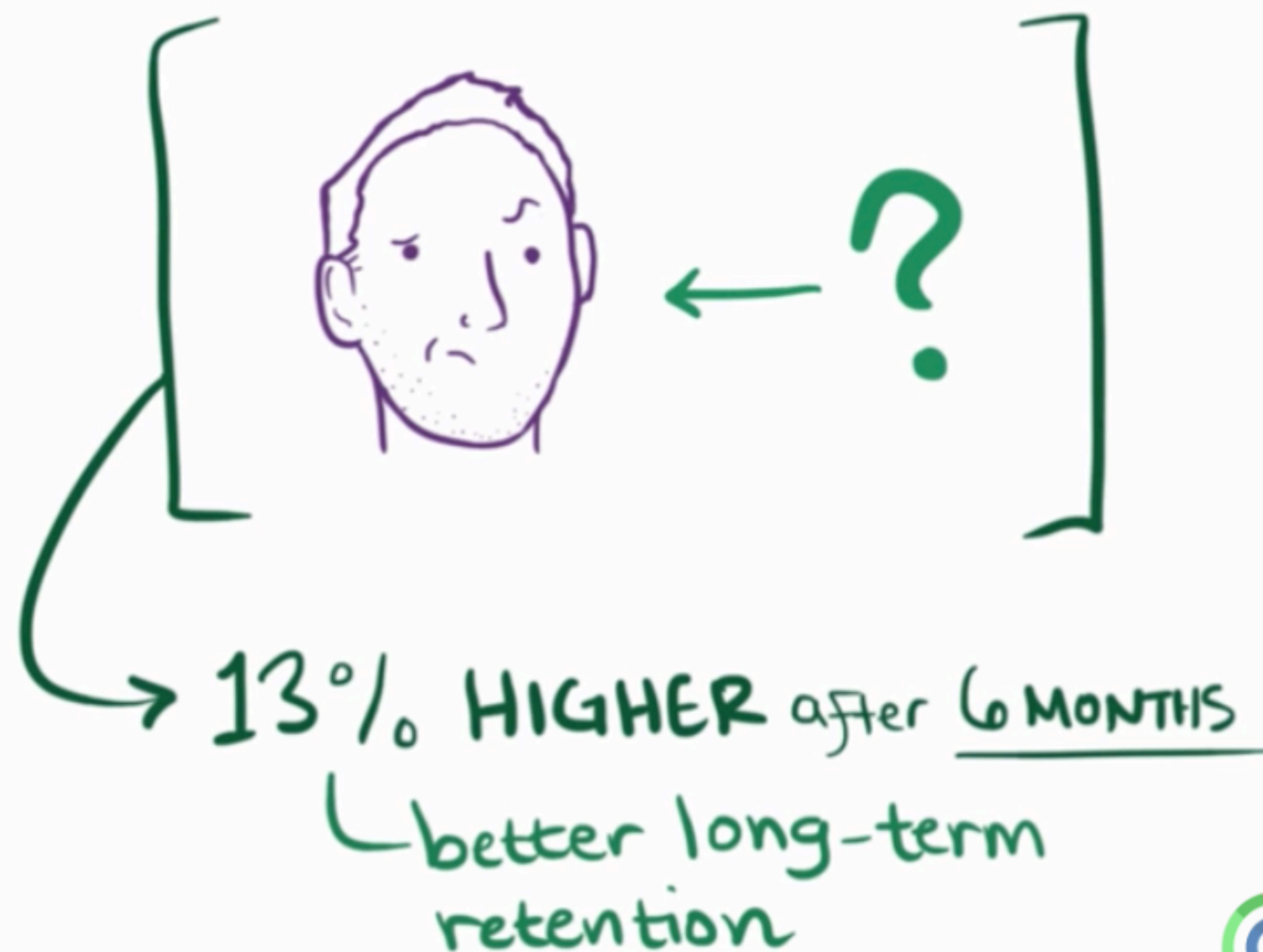


STUDY #1

RESTUDYING



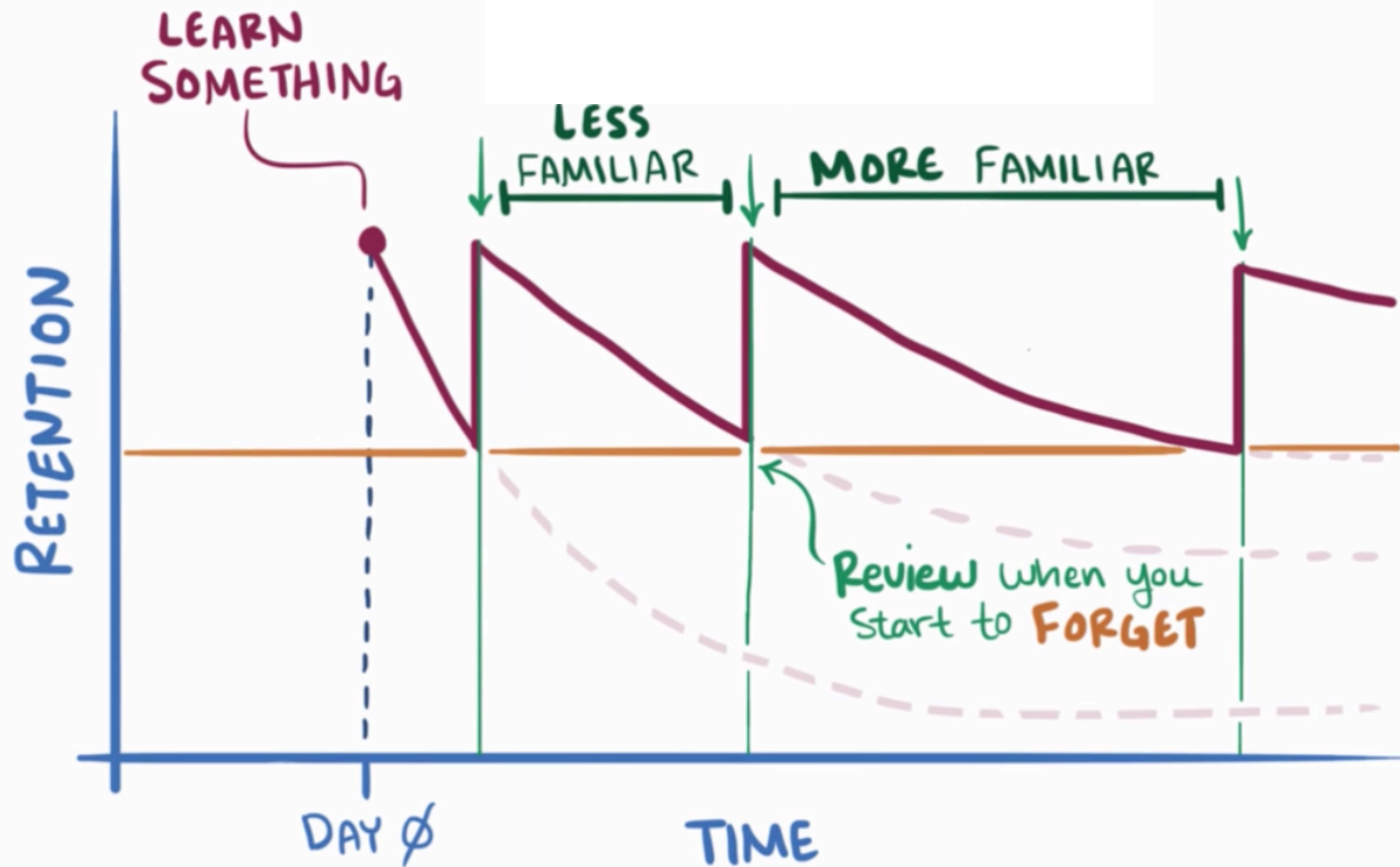
TESTING

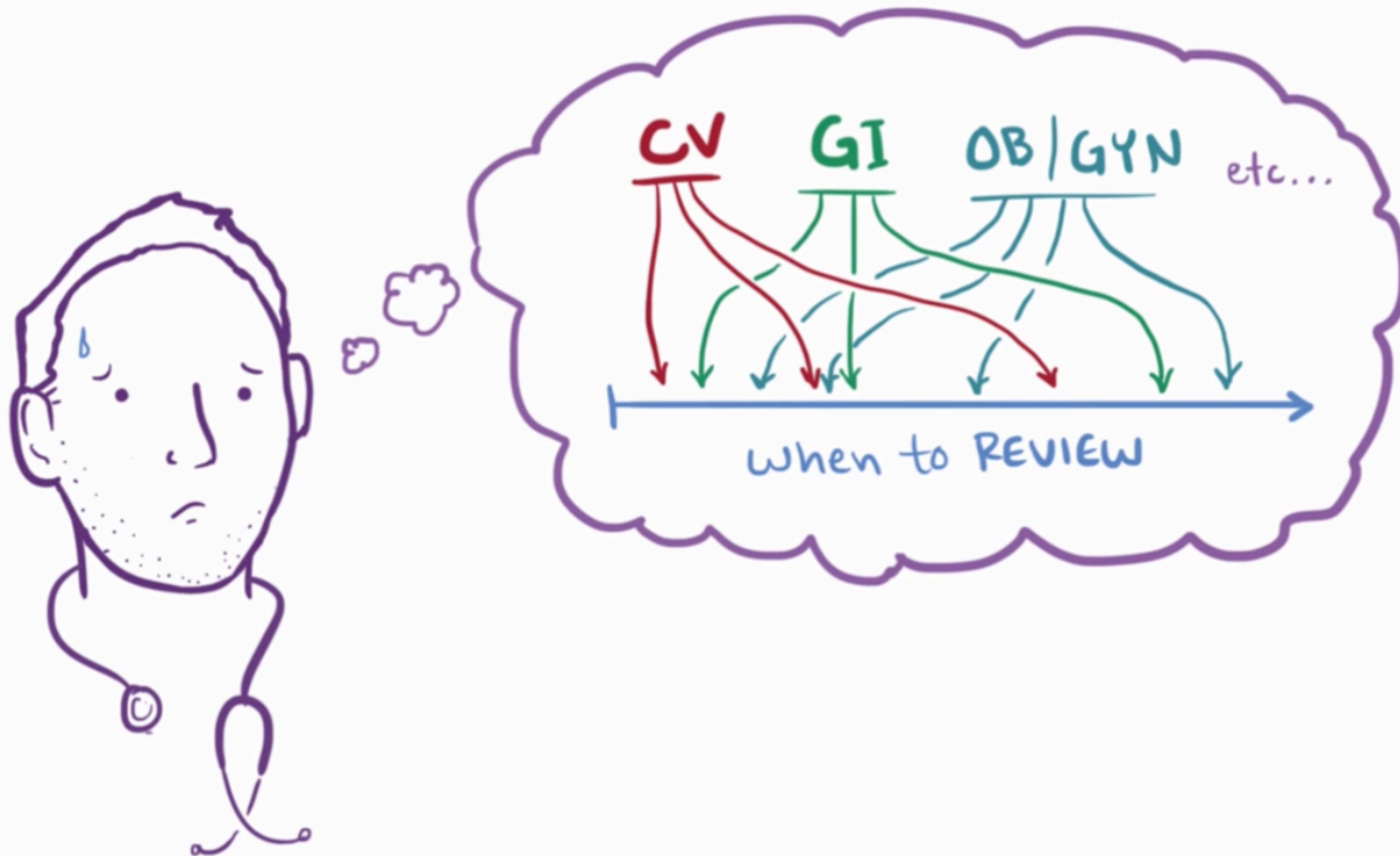


STUDY #2

TIMING OF TESTING







Medical education

Online

Teaching skills



The diagram features a large, light gray rectangular box. Inside this box, the text "Teaching facts" is centered and enclosed within a black oval. A curved black arrow originates from the top edge of the box, just to the right of the "Teaching facts" oval, and points towards the word "Online" located above the left side of the box. On the right side of the box, there is a thick, solid black vertical bar. A straight black arrow points from the word "Teaching skills" (located above the right side of the box) down towards the top of this black bar.

Teaching facts

Medical education

Teaching skills

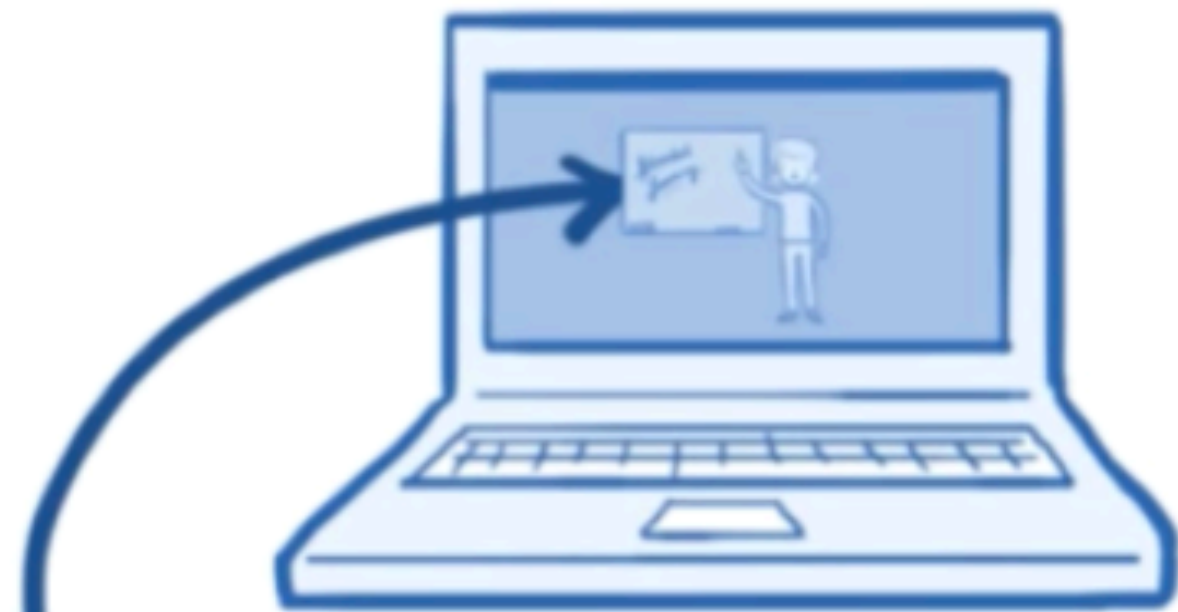
BLENDED LEARNING

~ FLIPPED CLASSROOM ~

ONLINE
RESOURCES

+

IN-PERSON
INSTRUCTION



CONSUME at
HOME

GUIDE
on the
SIDE

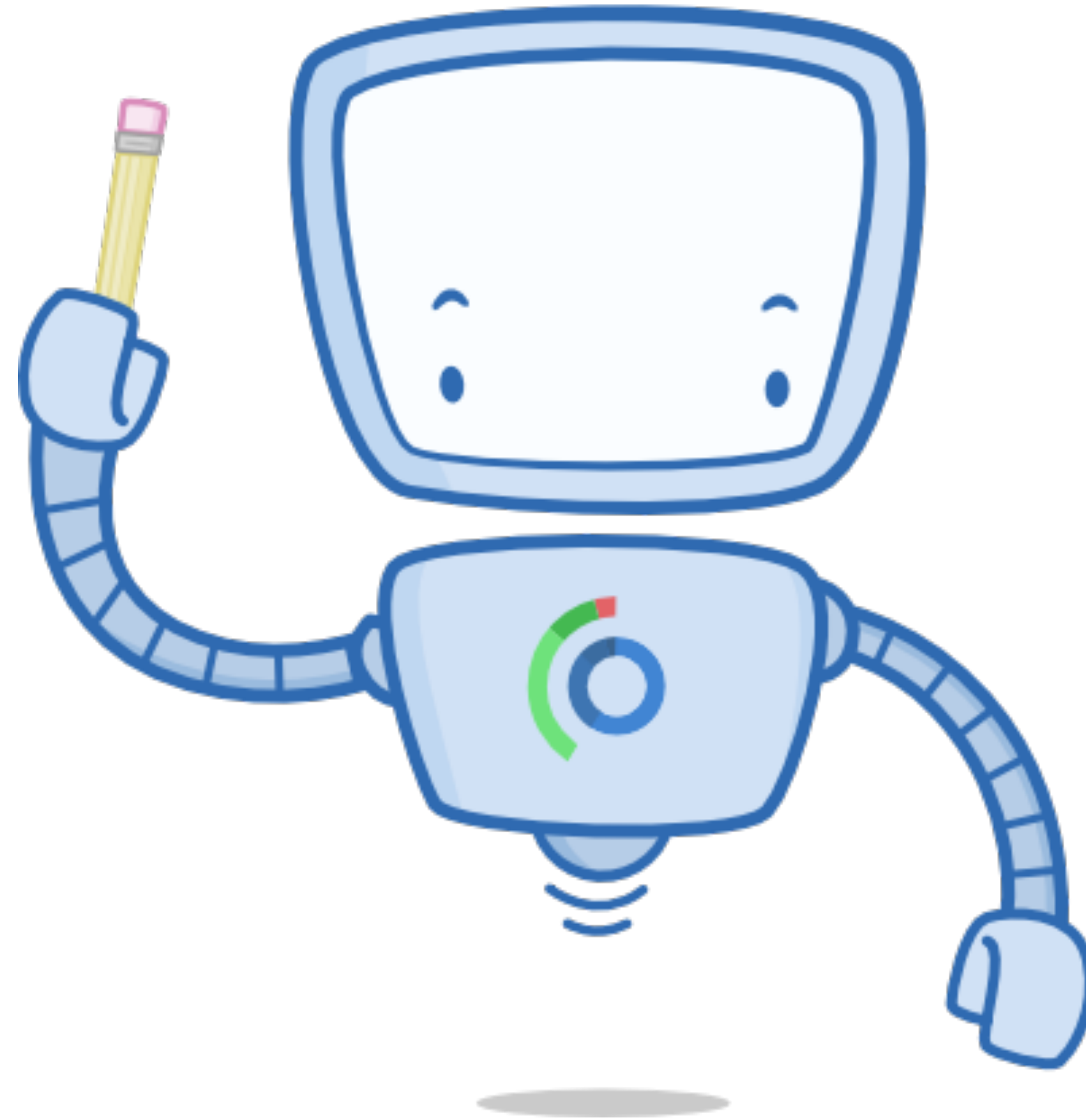


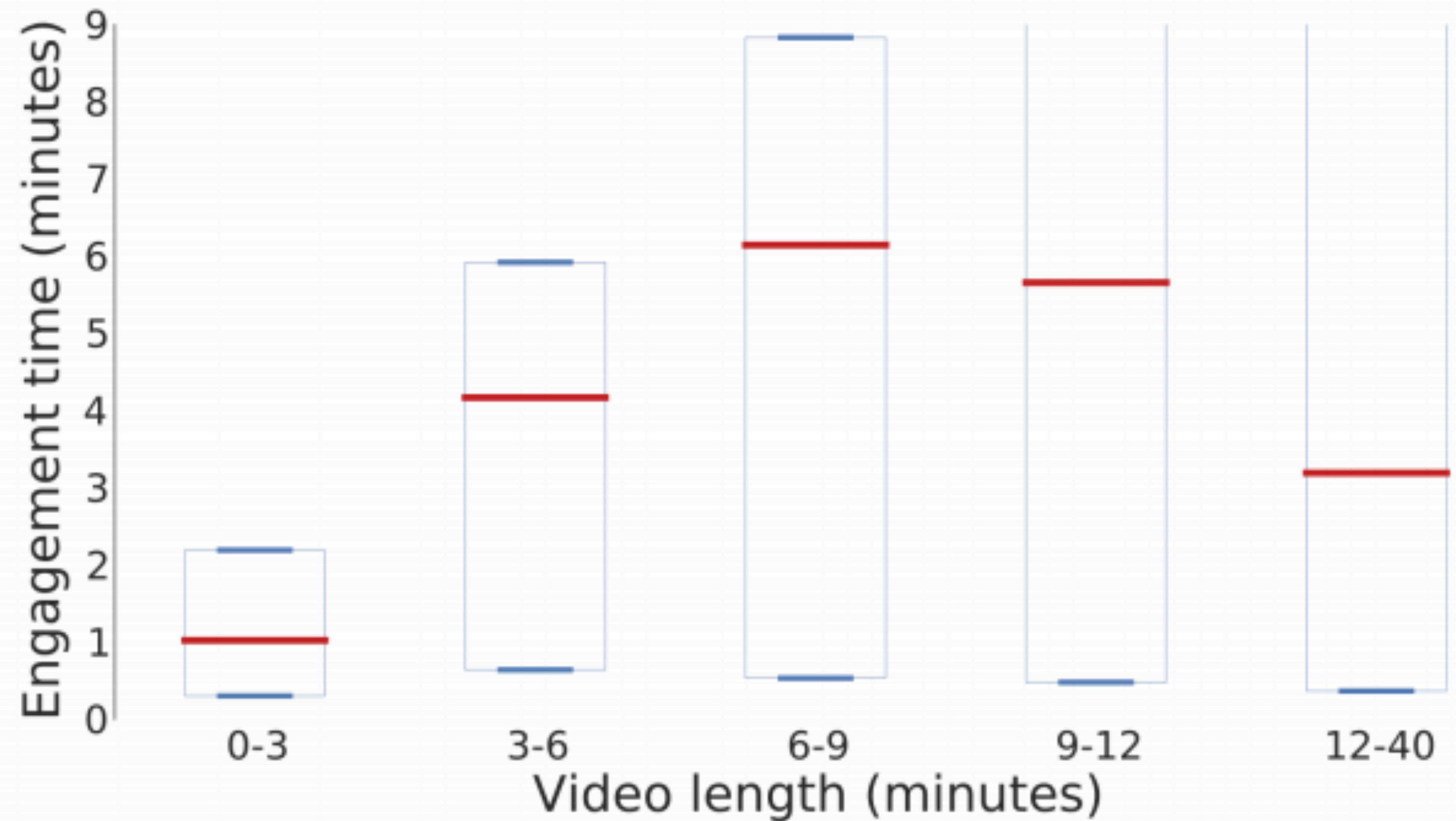
STUDENT
FOCUSED

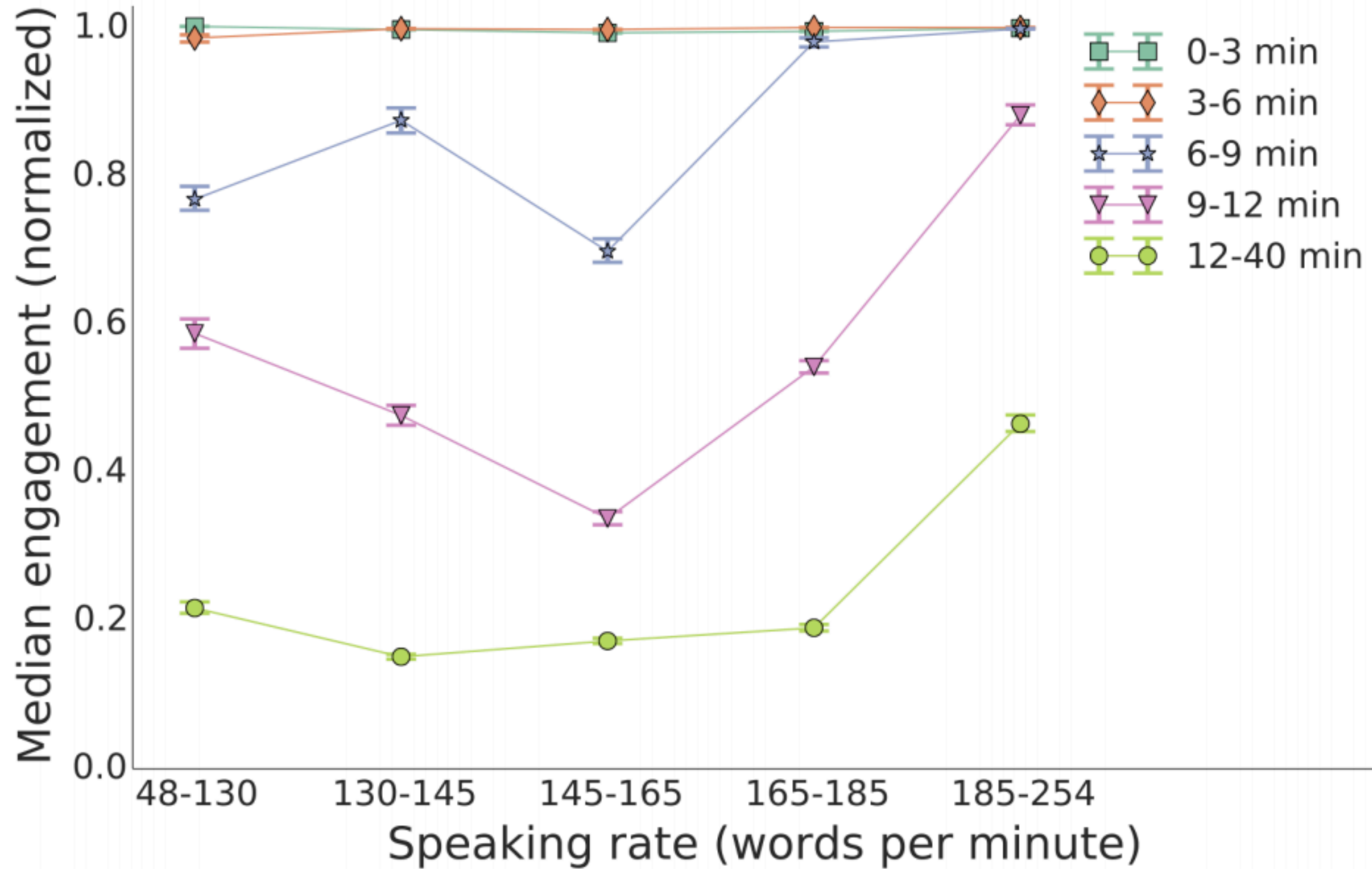
IN-CLASS
ACTIVITIES

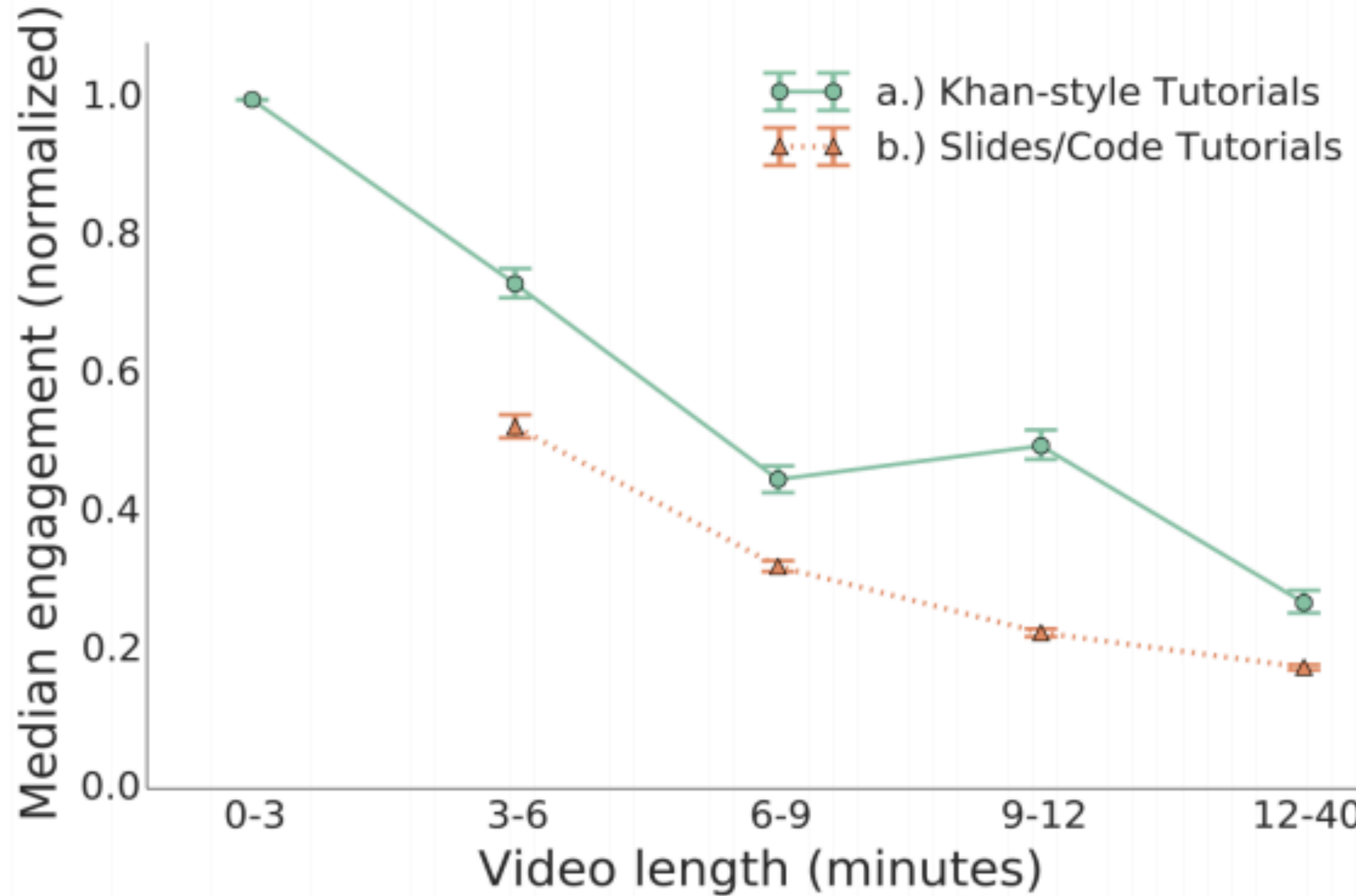


Content



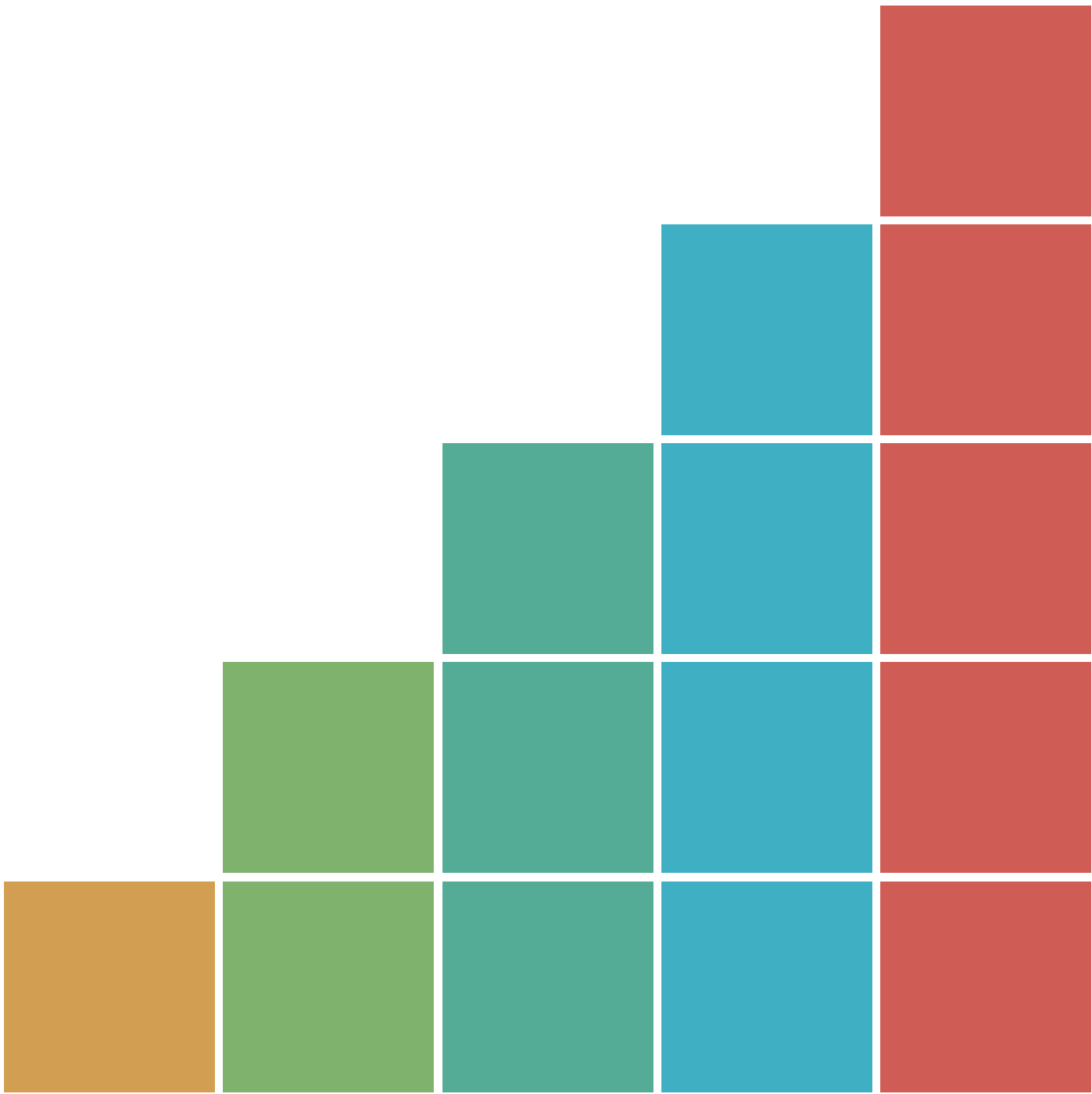
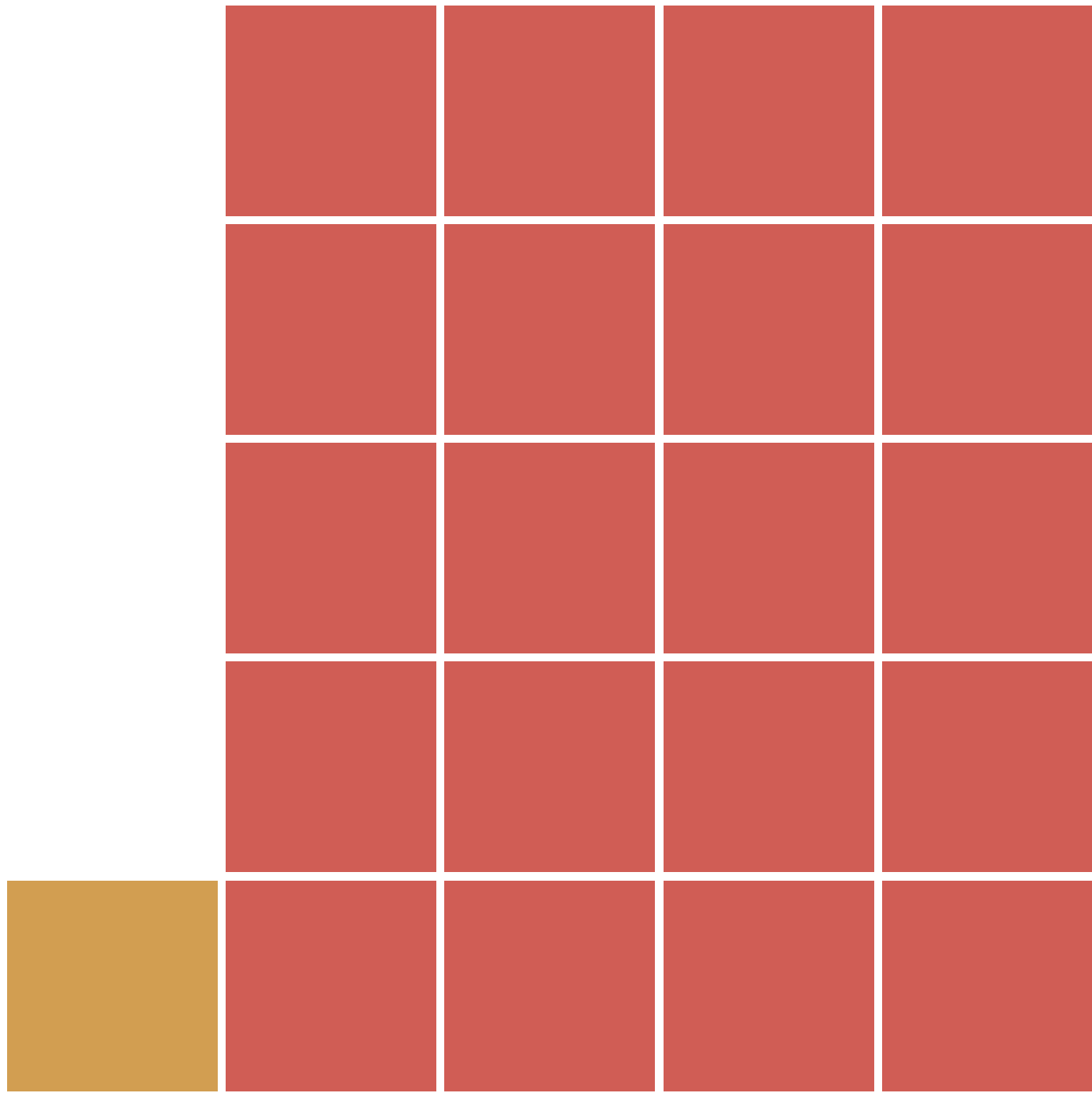






Guo, P, Kim, J, Rubin, R. How Video Production Affects Student Engagement: An Empirical Study of MOOC Videos, Proceedings of the first ACM conference on Learning @ scale conference. Pages 41-50 Association for Computing Machinery, New York, NY, USA. 2014

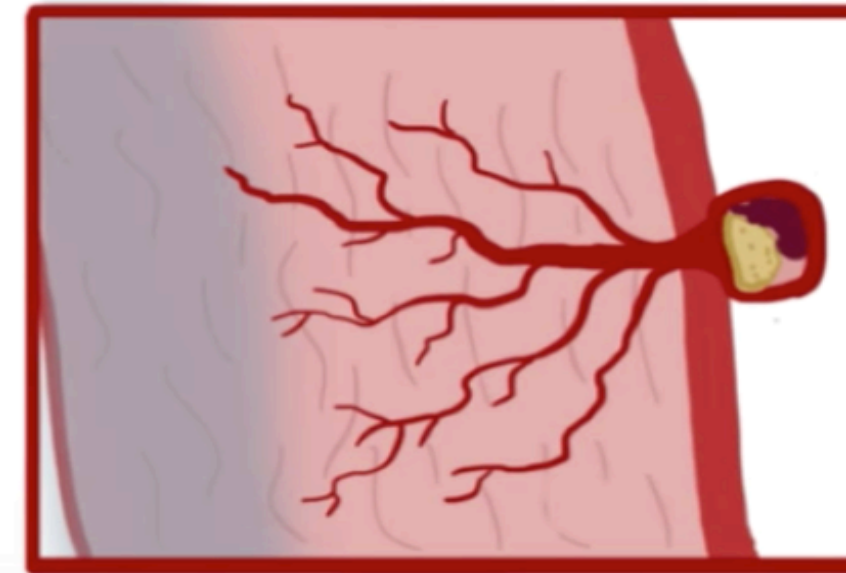
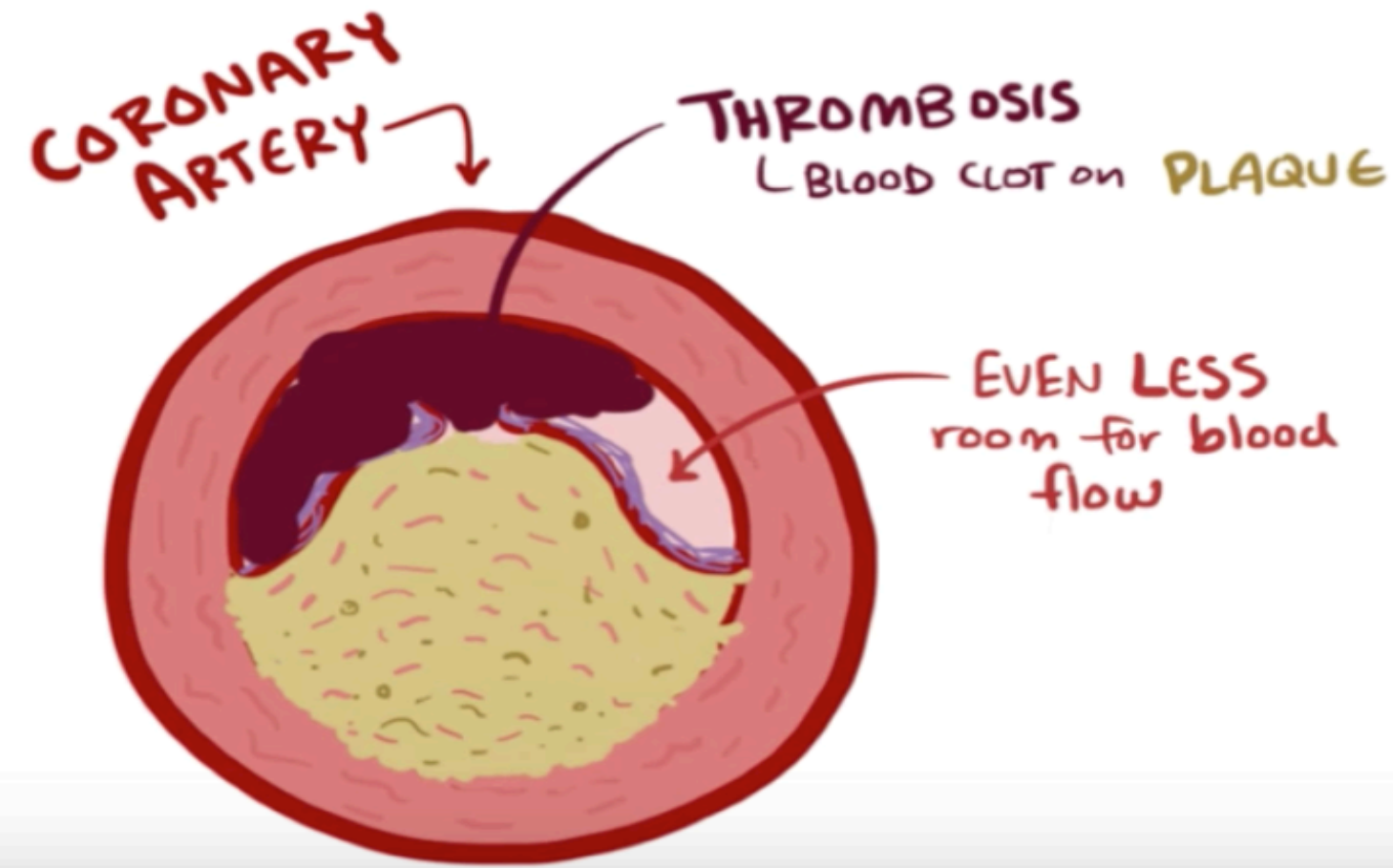
COGNITIVE LOAD



ANGINA PECTORIS

UNSTABLE ANGINA - pain during exercise or stress
or at REST

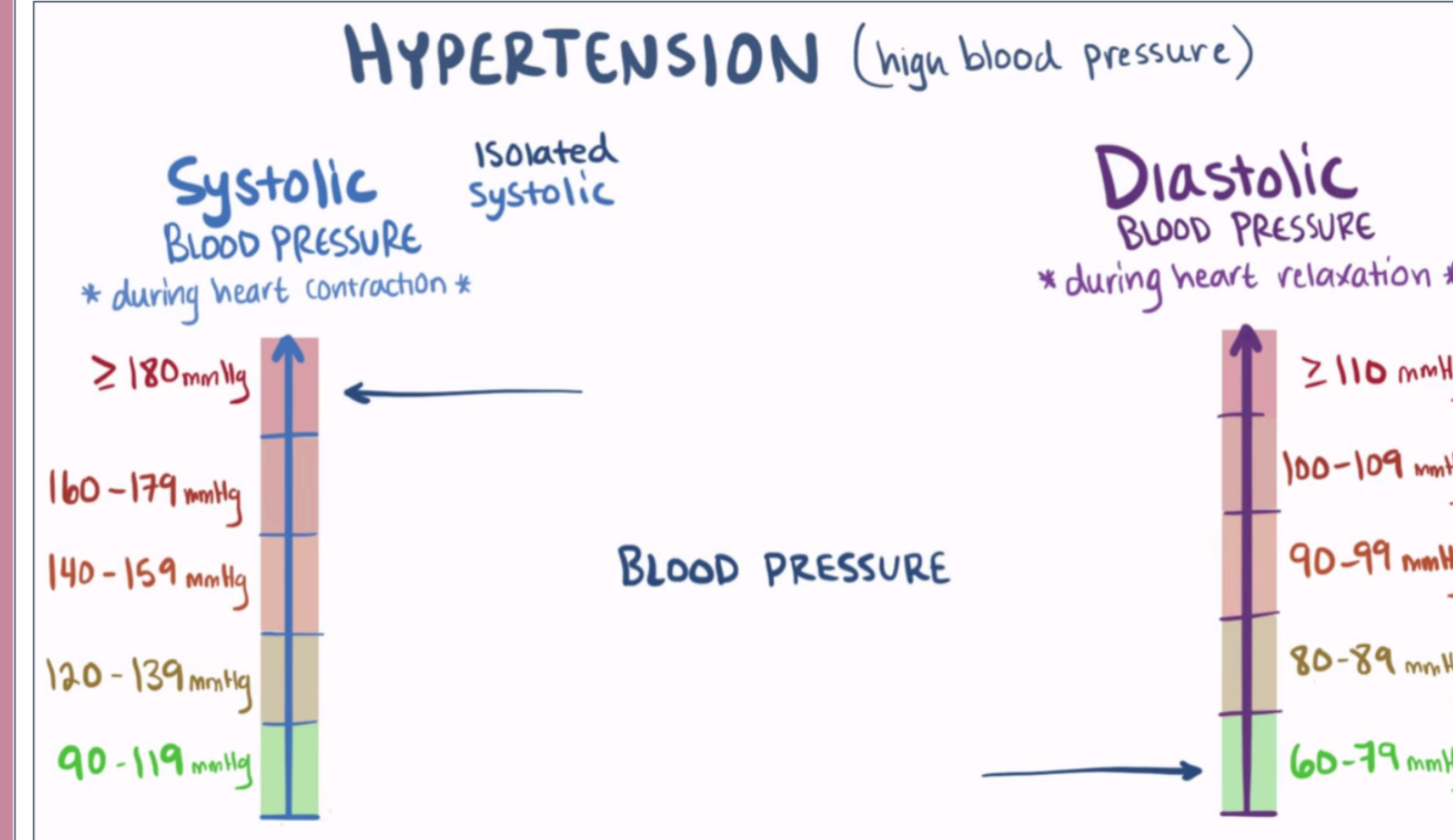
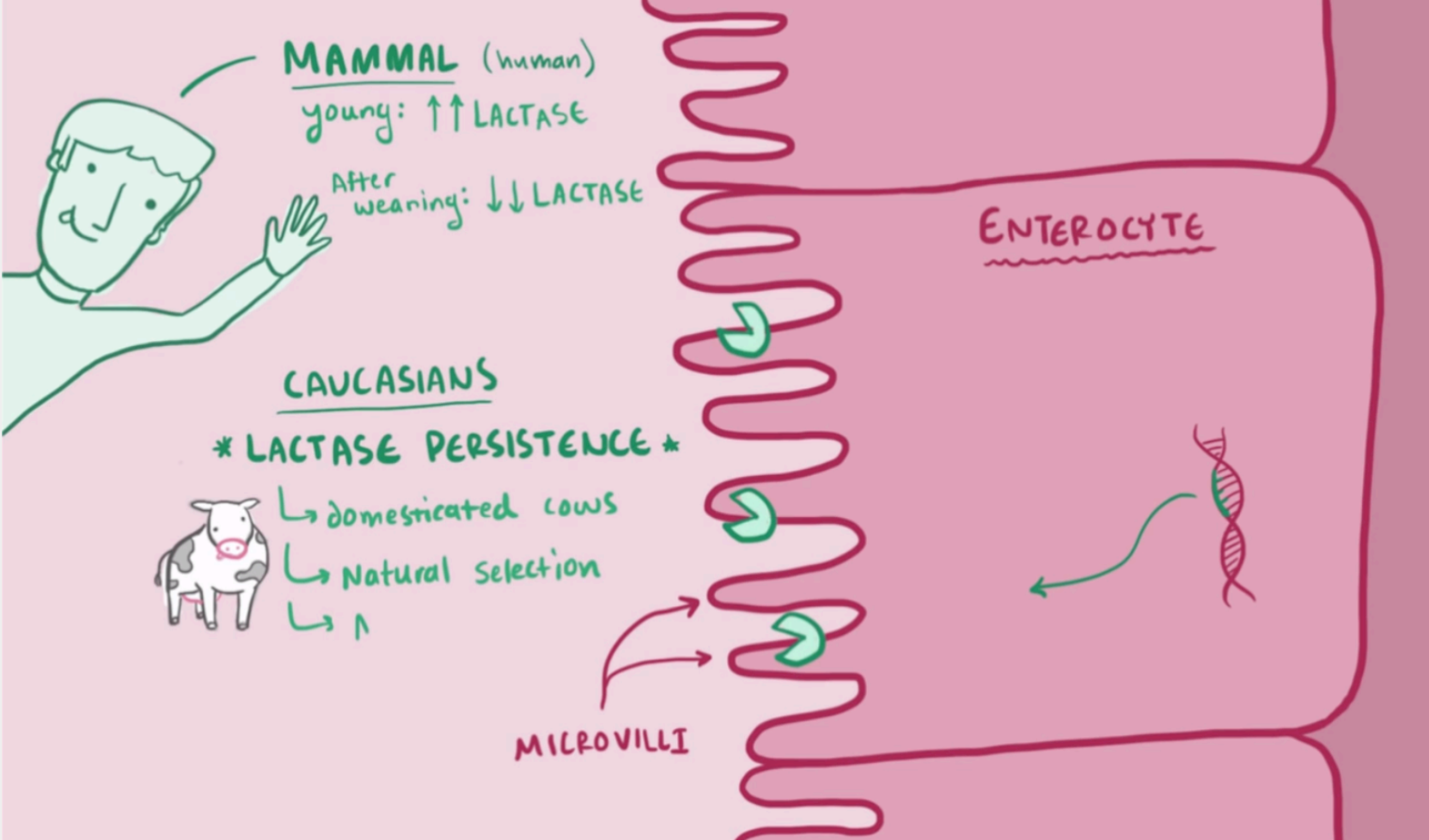
DOESN'T GO AWAY



Subendocardial

3:29 / 6:07





SYSTEMIC LUPUS ERYTHEMATOSUS

DIAGNOSIS ~ 4 or more criteria met

SKIN

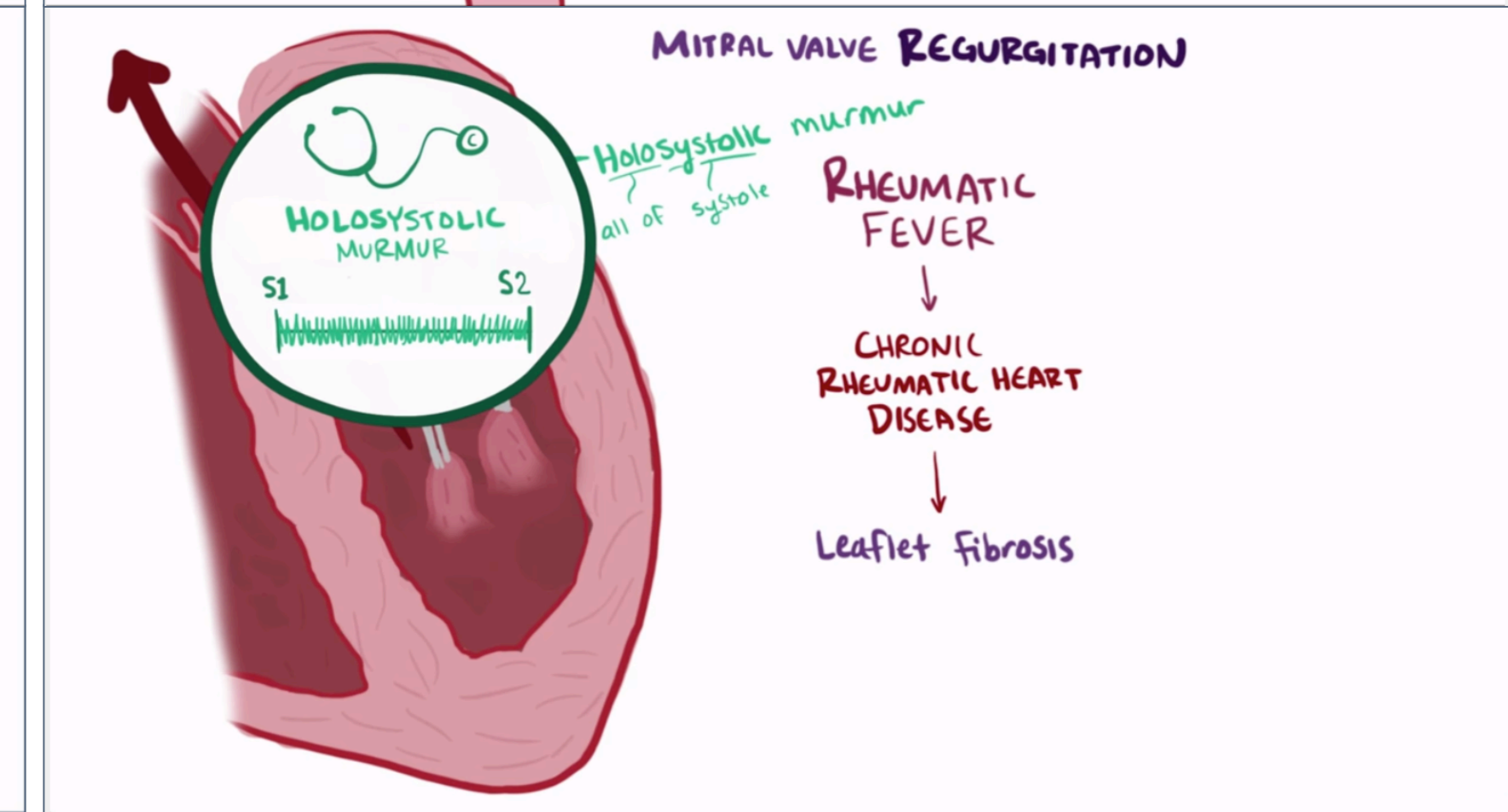
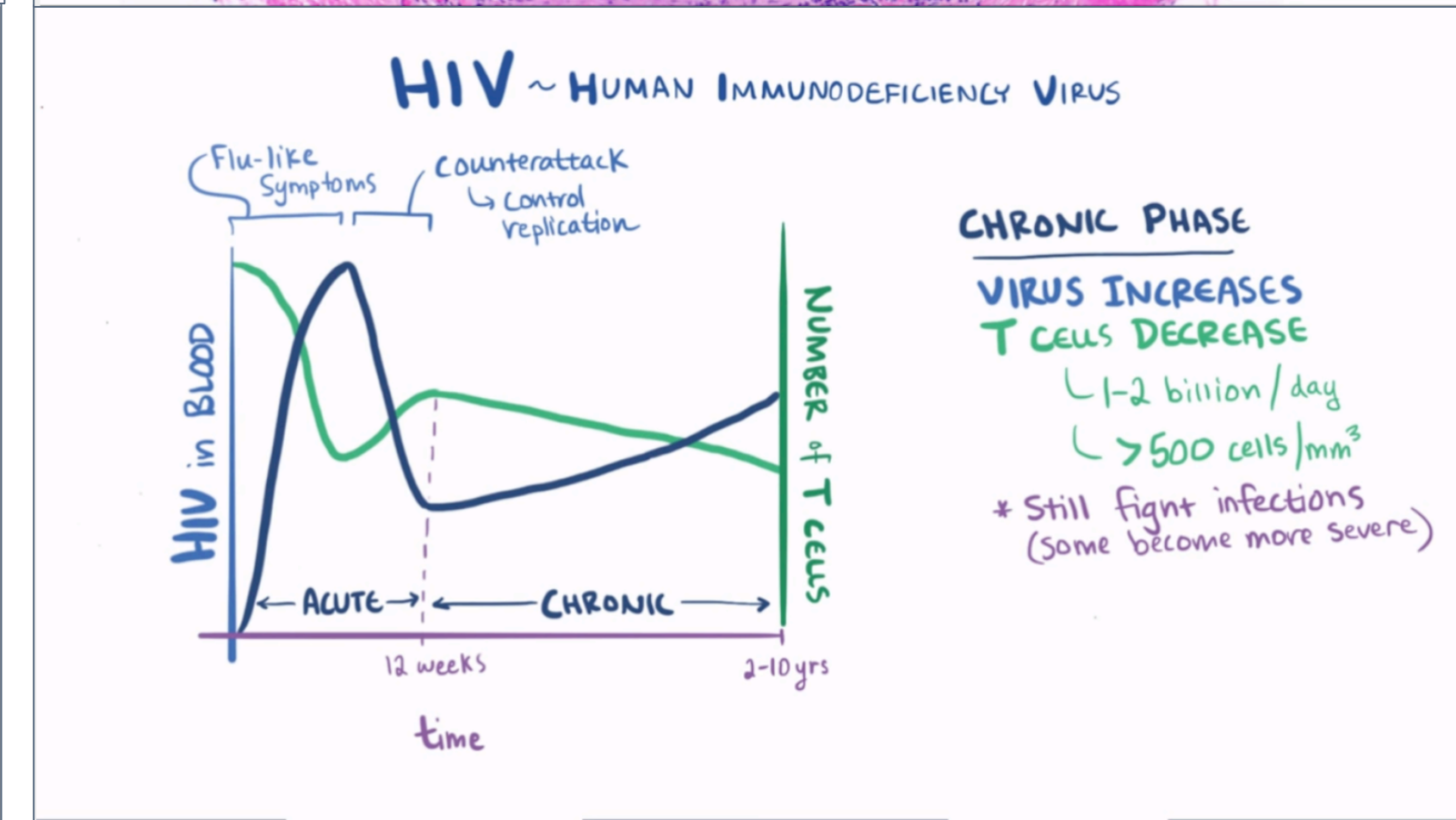
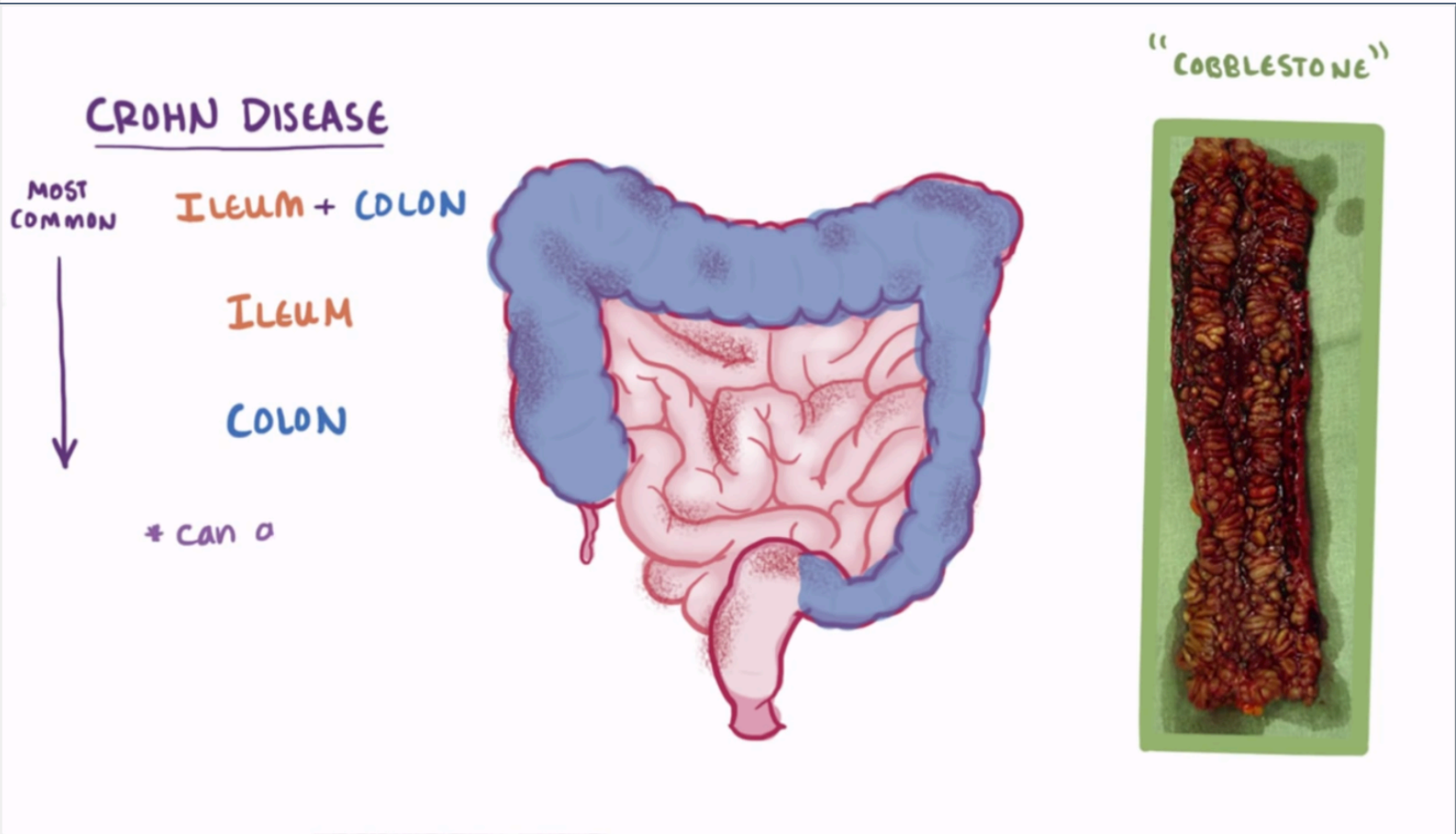
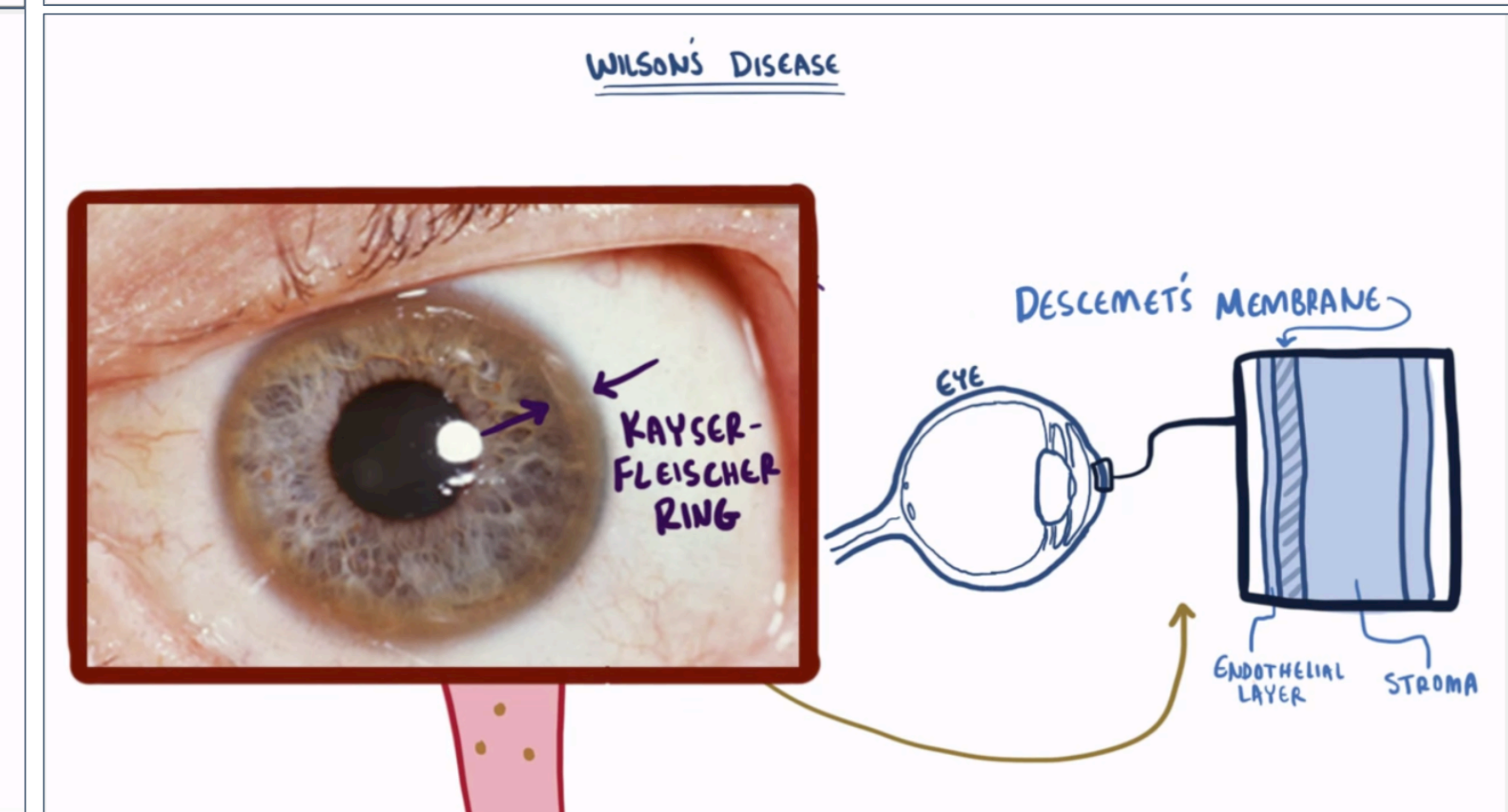
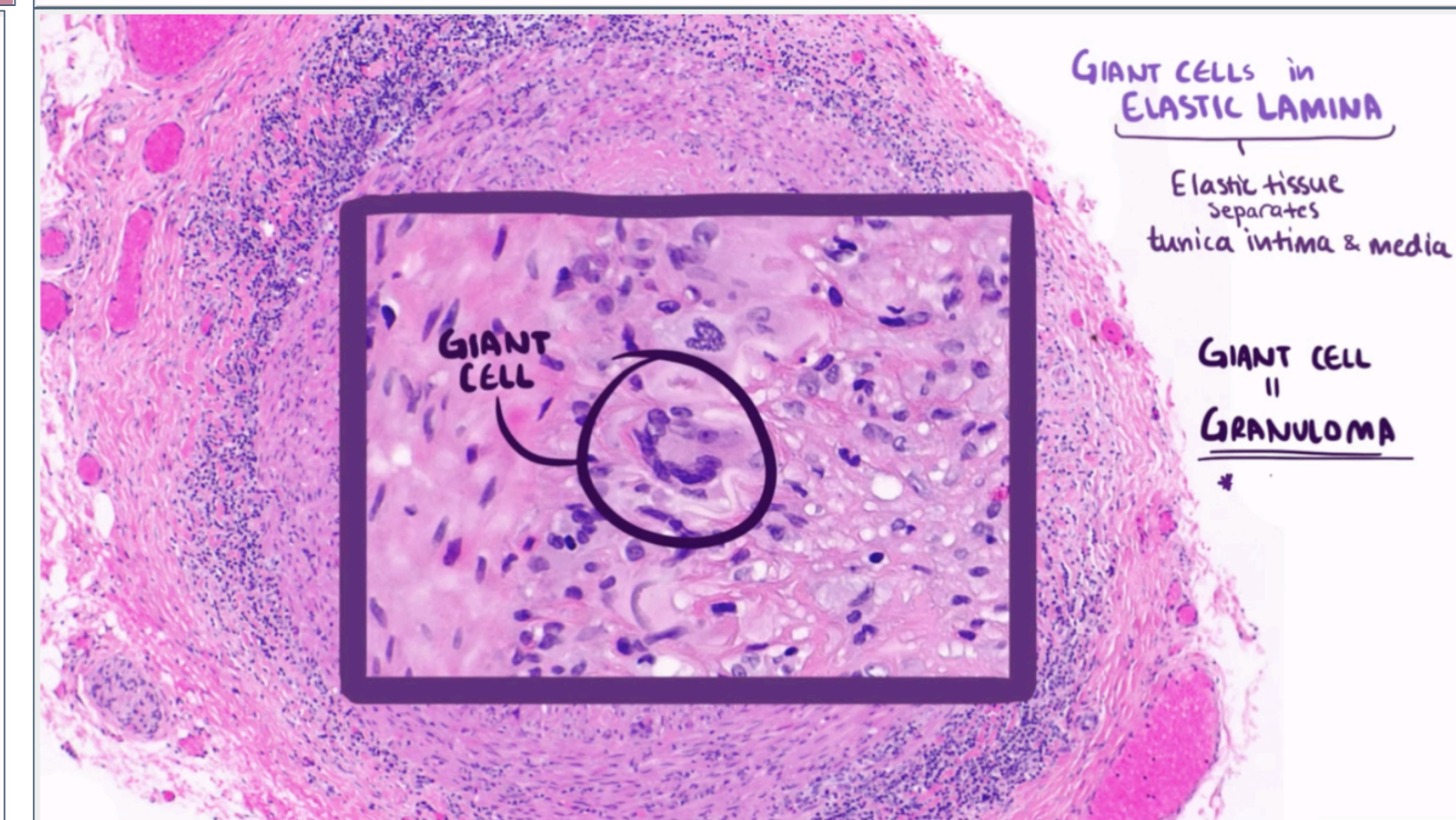
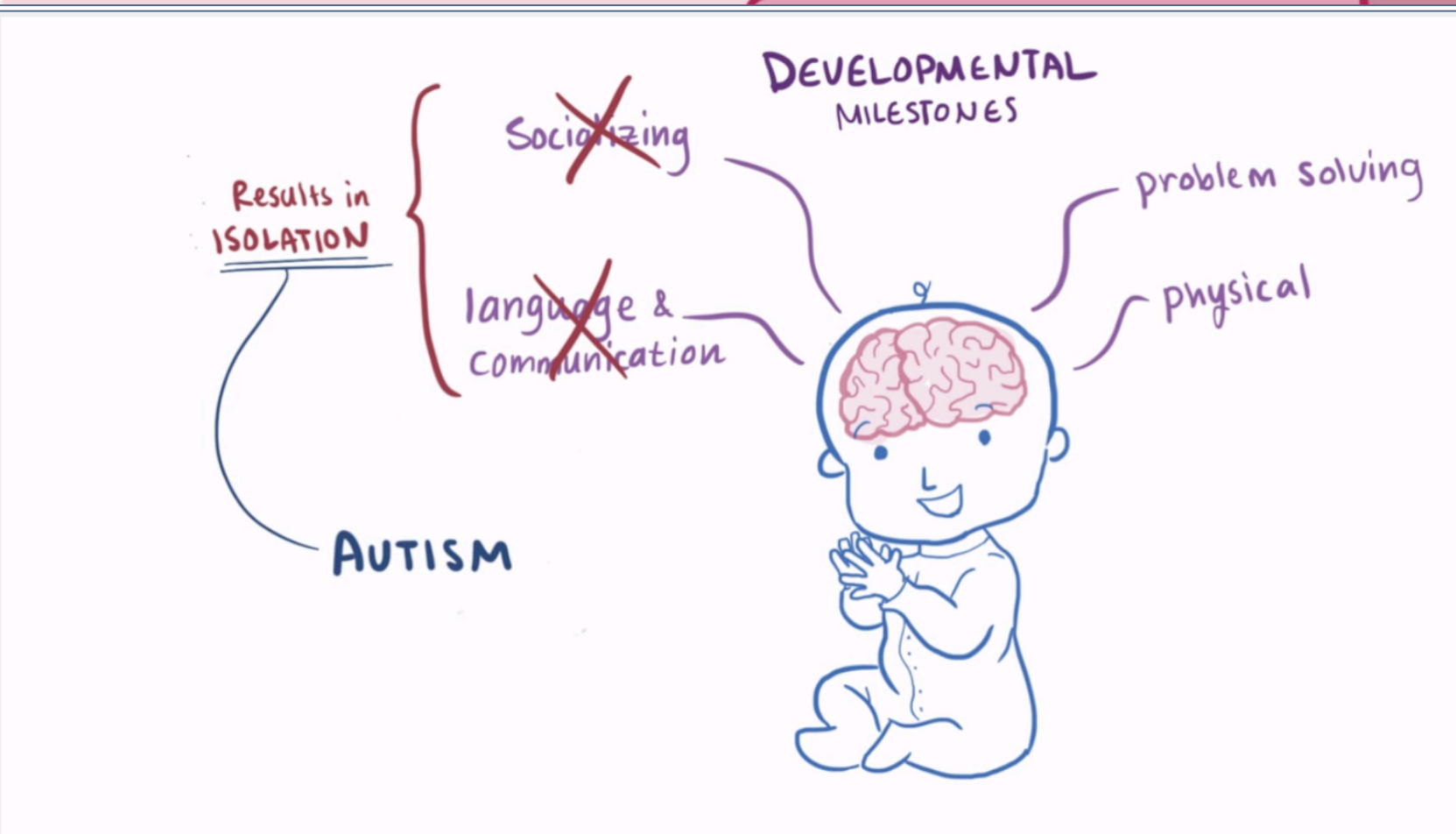
- MALAR RASH**
↳ butterfly rash
- DISCOID RASH**
↳ chronic
↳ can scar
- PHOTOSENSITIVITY**
↳ other rashes from sun exposure

MUCOSA ~ inner membrane

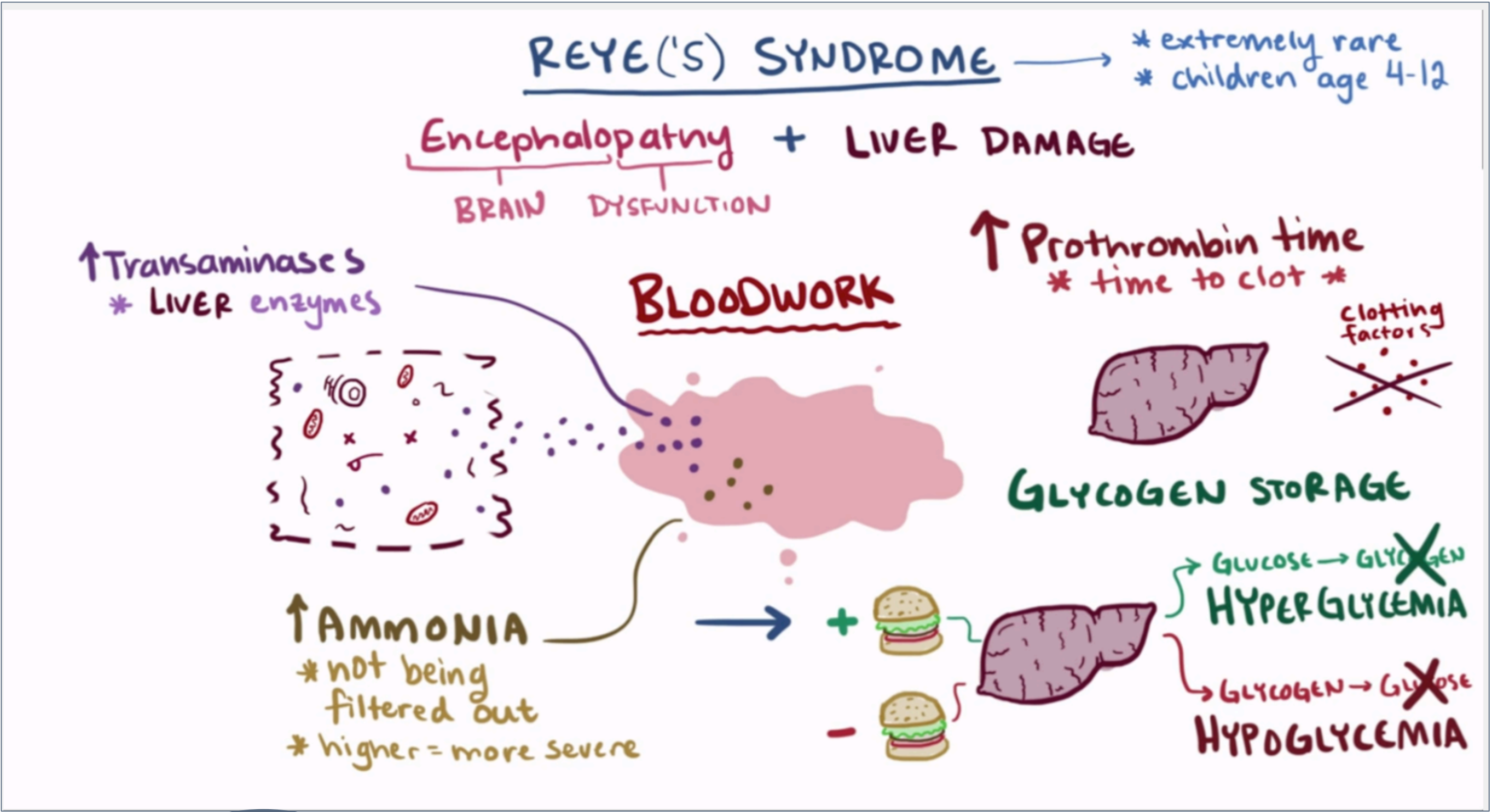
4. ULCERS
↳ mouth, nose

SEROSA ~ outer membrane

5. SEROSITIS



CONTENT IMPROVEMENT

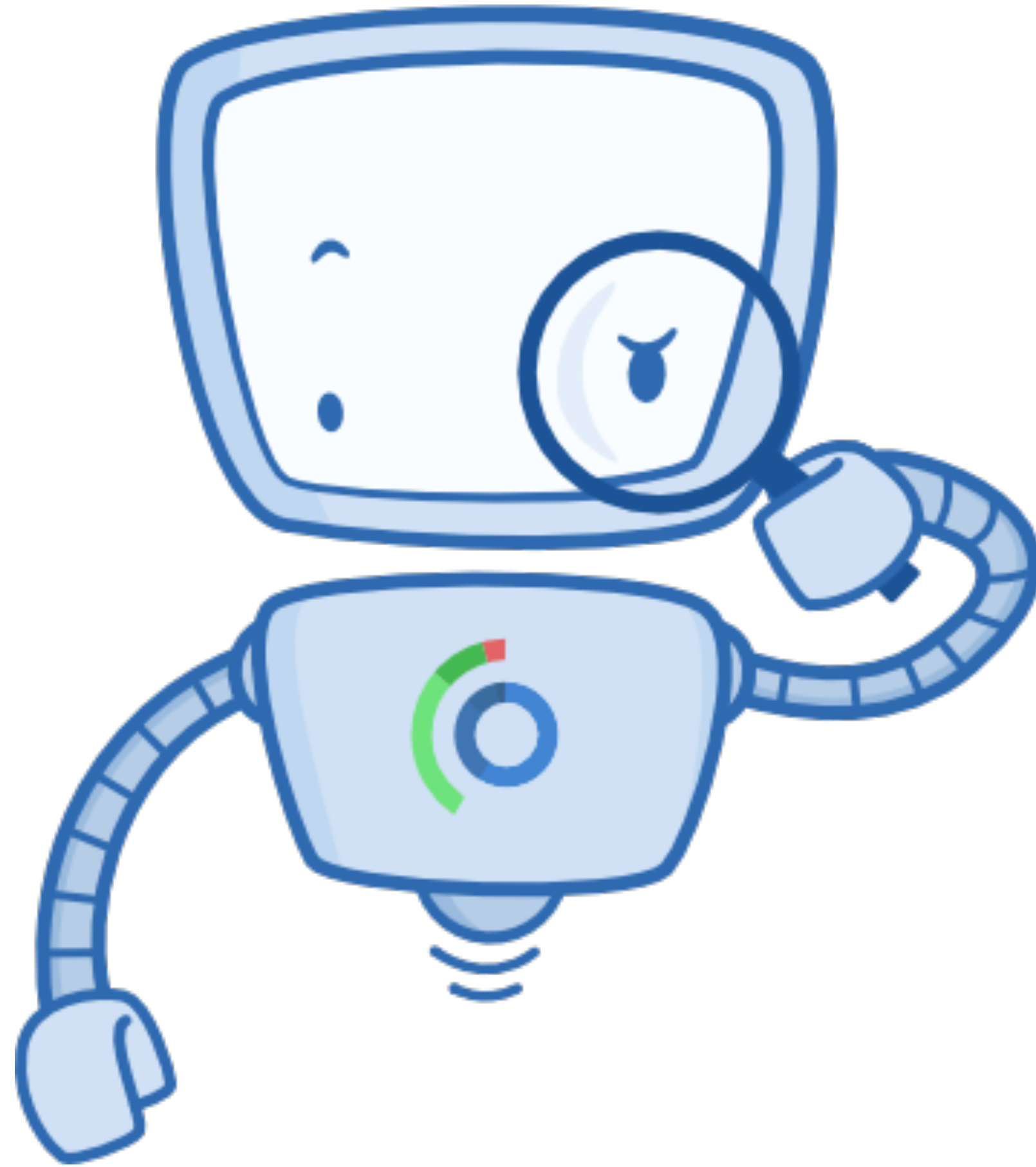


Osmosis 1 week ago

We've edited the most common ages to develop Reye syndrome to 5-12 years.

Reply • 👍 👎

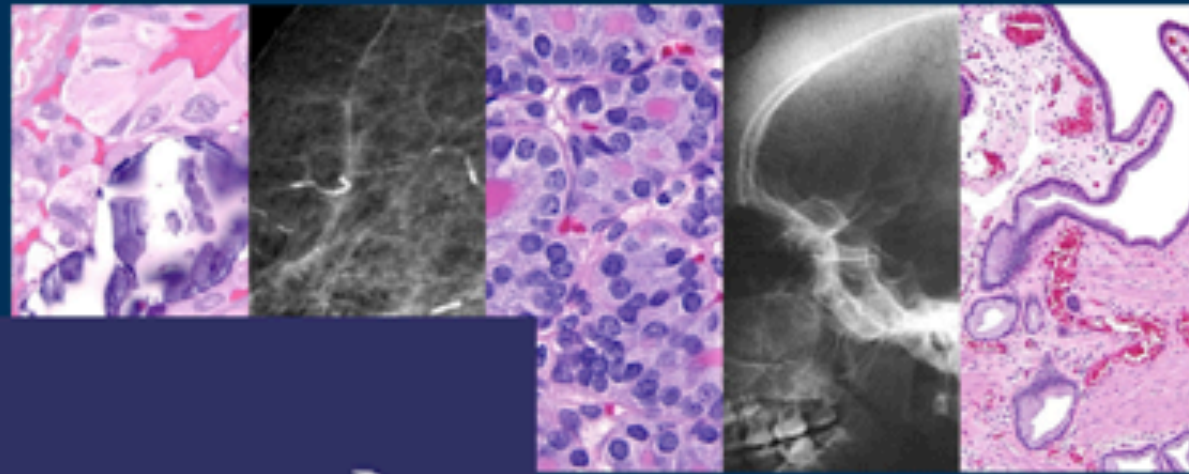
Platform





HUSAIN A. SATTAR

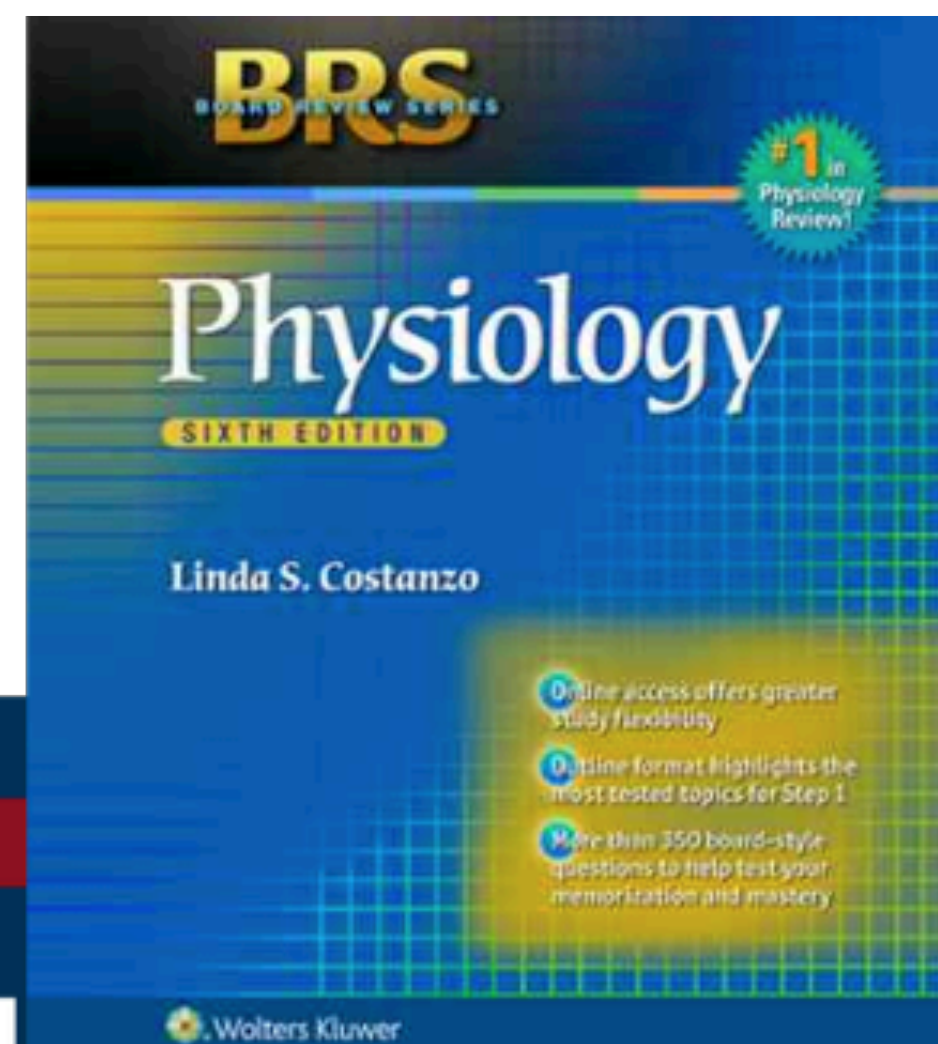
FUNDAMENTALS OF PATHOLOGY



SE AND STEP 1 REVIEW
6 EDITION

oma.com

a subscription to
taught by Dr. Sattar



WELCOME



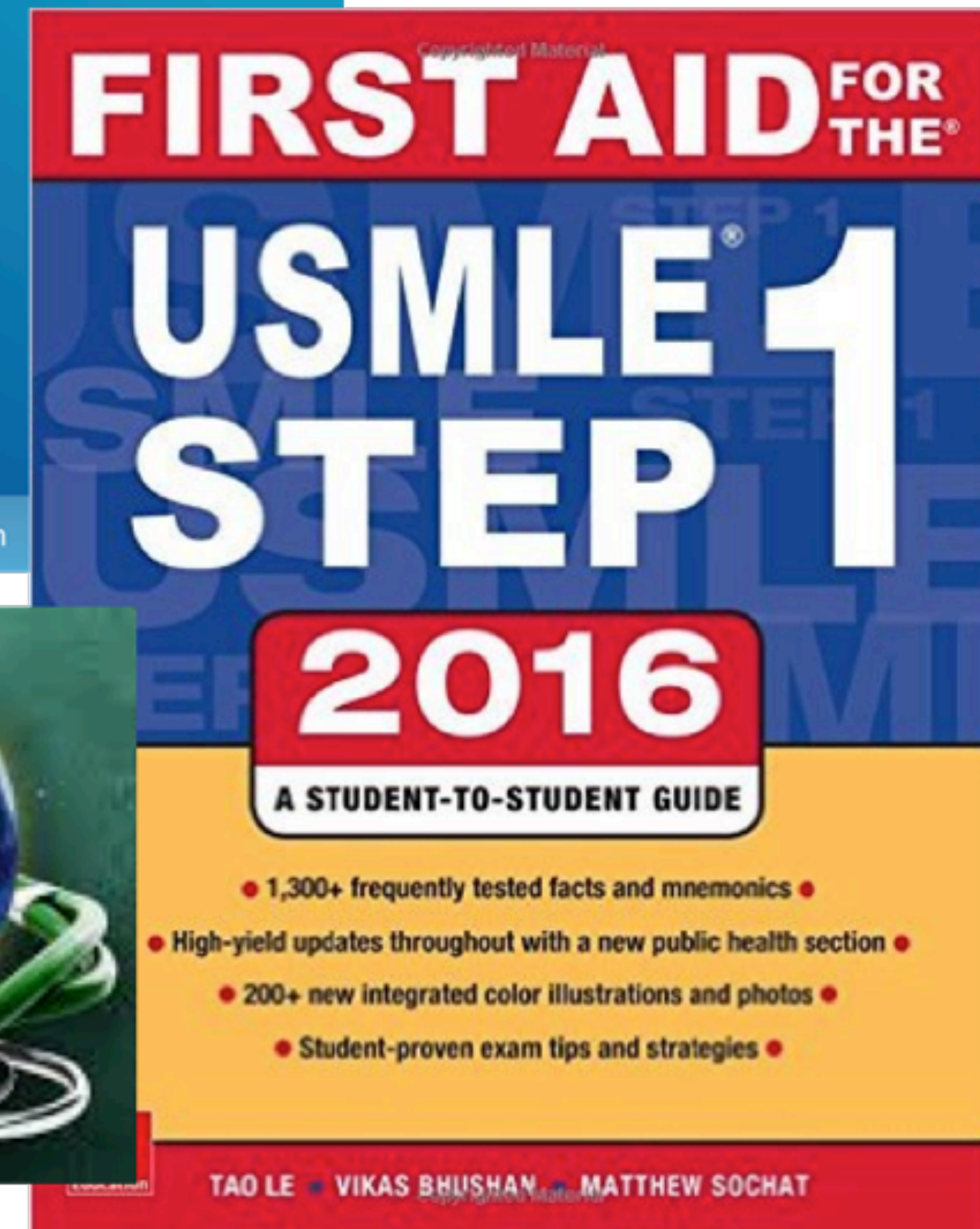
UWORLD

QBANK

This app requires an active username and password to UWorld

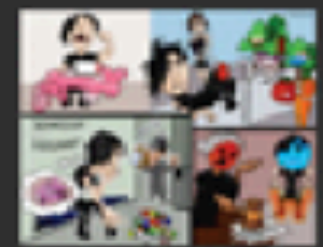
Sign up

Sign in



INTEGRATED EXPERIENCE

Real-Life Patient Video

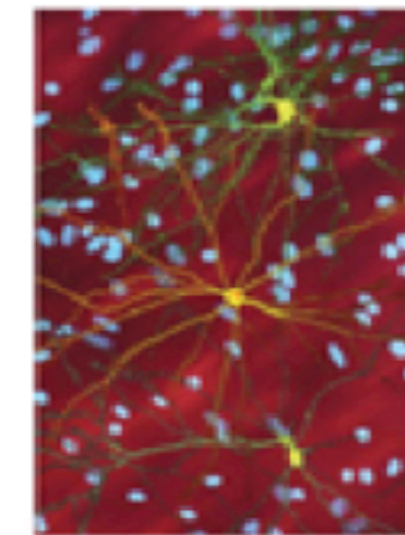
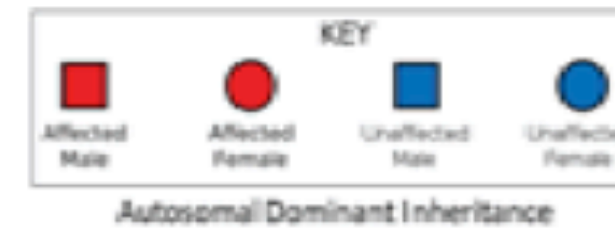
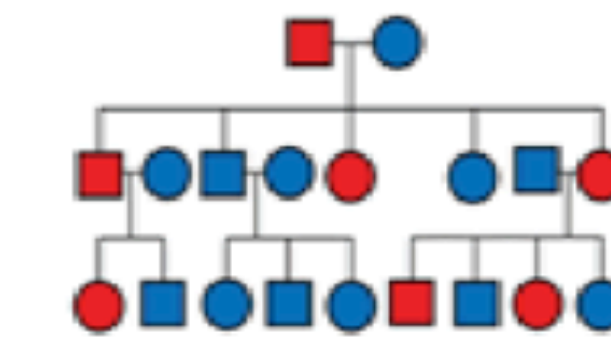


Depression (mood)
Dementia

Huntington's Disease

- Huntington's Disease is a neurodegenerative genetic disorder
- Pathophysiology
 - Trinucleotide repeat of cytosine-adenine-guanine (CAG)
 - Affects Huntingtin gene (*HTT*) on short arm of Chromosome 4 (4p16.3)
 - Early signs found in basal ganglia, particularly caudate nucleus
- Signs & Symptoms
 - Chorea
 - Jerky, random, and uncontrollable movements
 - Depression
 - Dementia
 - Other cognitive effects

See [Dementia](#) , [Depression \(mood\)](#) , [Huntington's disease](#) 



Nuclear inclusions (orange) in medium spiny neurons.

Student-Generated Content

+ Take Private Notes

+ Create Flashcard

+ Create Question

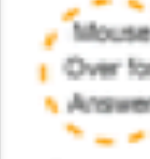


These facts are frequently tested on the boards. If they're relevant to your coursework, flag them!



Flag for Spaced Repetition

Huntington's and other hyperkinetic disorders typically reflect a problem with the _____ pathway of the basal ganglia.



Flag for Spaced Repetition

On what chromosome is the Huntingtin (*Htt*) gene found?

Picmonic

Curricular Document (e.g. Lecture Slide)

Board Exam-Relevant Fact Checkpoints

ATTACHED FLASHCARDS & QUESTIONS



Caleb Furnas

Questions and flashcards created by Caleb Furnas

Hide

FLASHCARDS 5

QUESTIONS

COMMENT/EDIT

`{c1::anki style}` blanks only add `{{c2::`
deletions. You can have them all blank
`{{c3::All blank}}`



1 ratings

Published · [Comment](#) · [Edit](#) · [Clone](#) · [Retire](#) · [Admin Edit](#) · ID: 5109096
· Added 2 months ago by Caleb Furnas

Everyone in this module can see this question and its author.

Add tags



Rishi Desai *(just now)*

Reason for comment

Ask around

Ask if anyone knows ____?

Lend a hand

I'm adding a mnemonic.

I'm adding some more info.

Critique

It may not be correct.

It contains a typo/spelling error.

It may be difficult to understand.

It may not be relevant

A 43 year old former NFL football player had a multiyear history of worsening mood swings, depression, and insomnia resulting in problems in home life and being unable to maintain employment. He had no significant psychiatric history and he had never taken performance-enhancing or illicit drugs. His family history was negative for dementia and psychiatric illness. He died of a self-inflicted gunshot wound to the chest. Post-mortem analysis of his brain showed a reduction in brain weight, neuronal loss in the hippocampus, substantia nigra and cerebral cortex, and extensive tau-immunoreactive pathology throughout the neocortex, medial temporal lobe, diencephalon, brainstem, and spinal cord. The neurofibrillary tangles seen in his brain are most similar to what other neurologic disease?

A Alzheimer's Dementia

I'm Sure

Feeling
Lucky

No Clue

B Huntington Disease

C Progressive Multifocal Leukoencephalopathy (PML)

D Creutzfeldt-Jakob Disease

Skip

Everything

Clear All Filters

Osmosis Official Packs

Questions

Flashcards



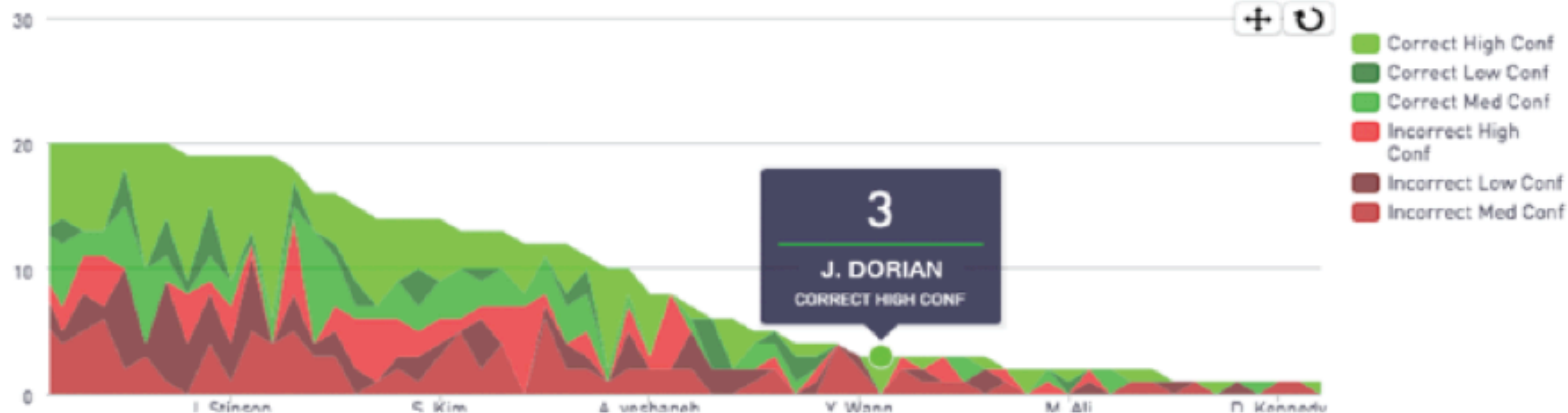
School Exam Modules

Questions

Flashcards

Choose a module...

Cell Physiology Questions

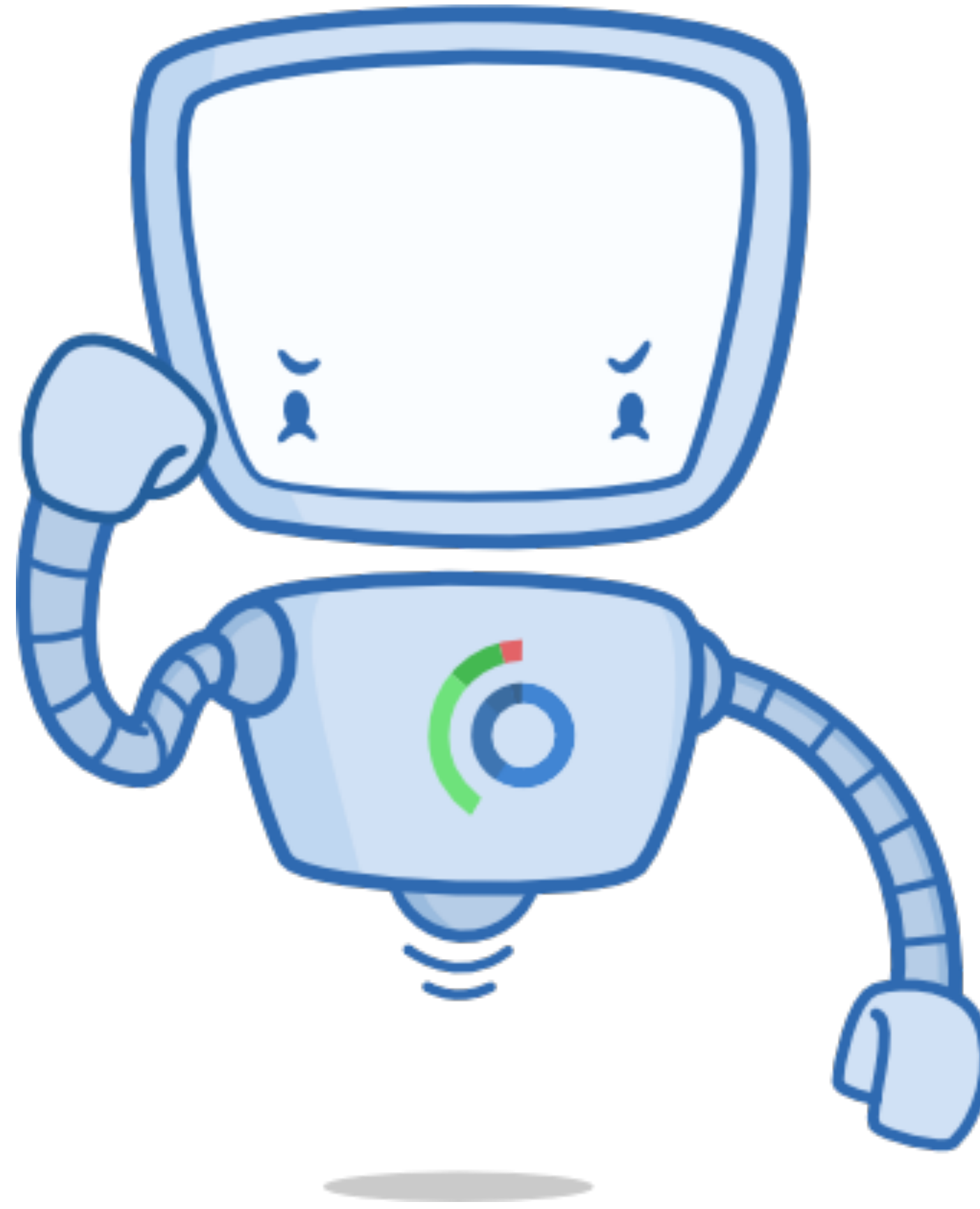


Name							Total
House, Gregory	1859	941	28	174	814	80	3896
Pierce, Hawkeye	529	28	27	116	77	62	839
McCoy, Leonard	14	13	6	23	12	10	78
Ross, Douglas		2		2	2		6
Howser, Doogie	4	1					5

SELF STUDY



Partnerships



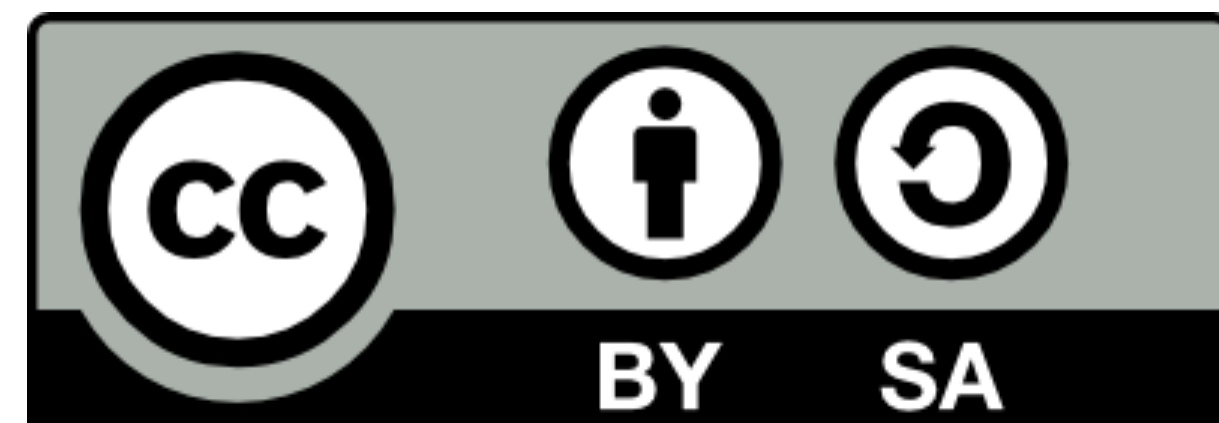
CONTENT PARTNERSHIPS



Robert Wood Johnson
Foundation



TRANSLATORS
WITHOUT BORDERS



WIKIPEDIA
The Free Encyclopedia

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COLLABORATION
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RÉSEAU CANADIEN DES MALADIES NEUROMUSCULAIRES





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THE MANUAL

Known as the Merck Manual in
US/Canada & the MSD Manual
in the rest of the world.

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TRANSLATIONS

- English
- French
- Arabic
- Mandarin
- Spanish
- Portuguese
- Russian
- German
- Italian
- Japanese



ZIKA VIRUS

certain arthropods
ARBOVIRUS

MOSQUITO-BORNE

carried

VECTOR

*transport the
virus



สิ่งที่พาหะเหล่านี้ทำมีเพียงขนส่งไวรัสเท่านั้น ดังนั้น
ไวรัสจึงเหมือนกับไวรัสที่มีอยู่เป็นพาหะอื่นๆ

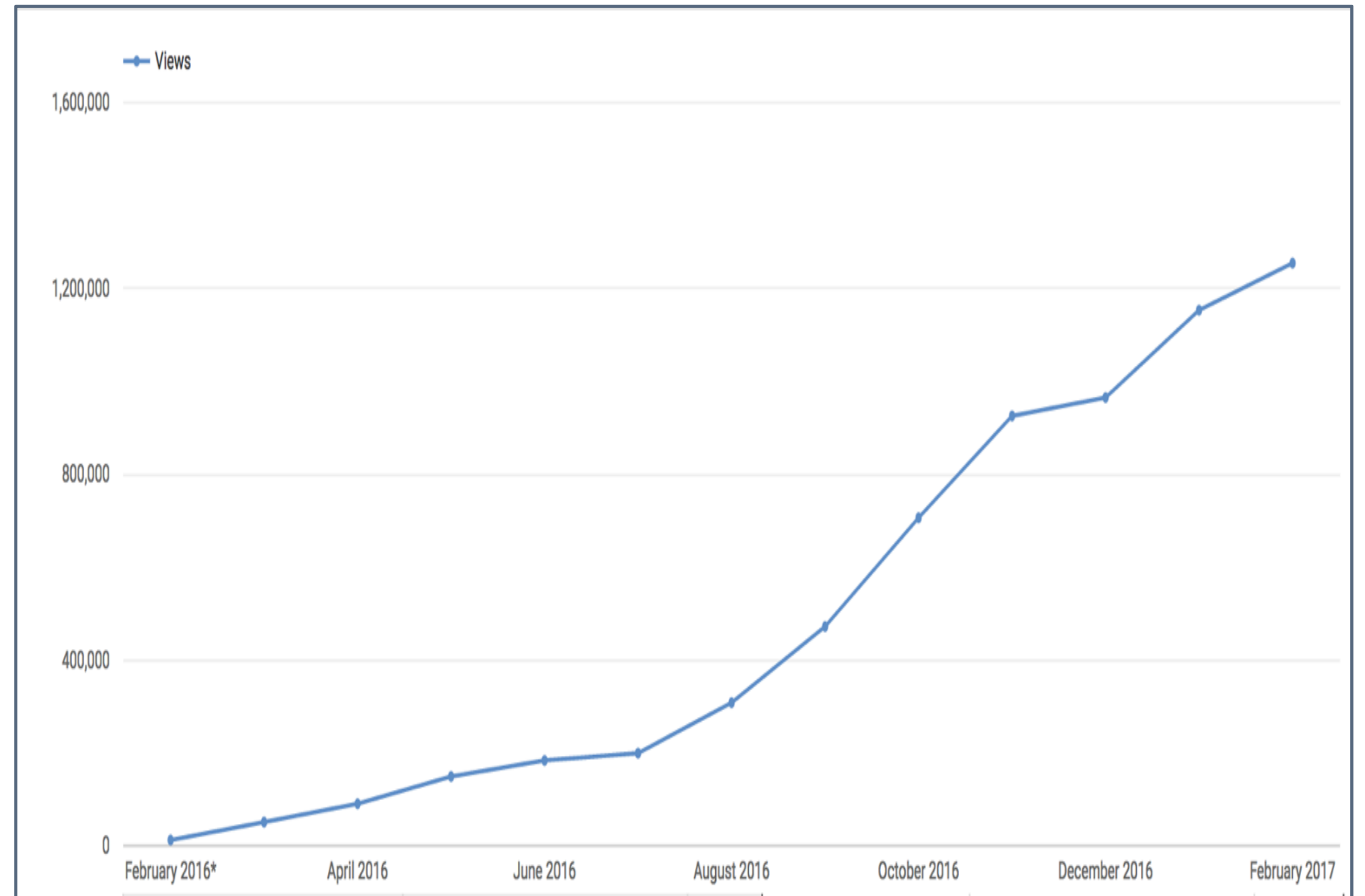
GROWTH

3,000,000+

video views each month
(100,000 today)

1,500,000+

problems completed each
month
(50,000 today)



FACULTY FEEDBACK

*“I think **these short videos are excellent and love the fact that they’re open access.** I’ve watched a few of the videos that cover Behavioral Science topics and think they could be a really nice supplement to some of our lecture materials. Of note, I appreciate the fact that they use the most current diagnostic criteria (DSM-V) but also reference the older criteria to talk about what has changed and why.”*

-Matthew Kraybill PhD, Ross University School of Medicine

*“Why would we need to travel to the other end of the city for a 1.5 hour long lecture to listen to someone talking about an aspect that could be explained in 10 minutes through YouTube? **We should consider making some serious changes of the education system** because the possibilities of the internet are enormous. Your channel is very helpful!” -*

-Medical student

Open Osmosis: Library of Open Educational Resources (OER) for Medical Education

Authors

Authors: Ersilia M. DeFilippis^{1,2,*}, Thasin Jaigirdar^{2,*}, Shiv M. Gaglani^{3,2,±}, Matthew Sakumoto^{4,2}, Vishal Punwani^{2,5}, Rishi Desai^{2,6}, M. Ryan Haynes², Michael W. Painter⁷

Abstract

Many resources currently available for graduate and undergraduate medical education are fragmented, difficult to access, and costly. Osmosis, a web- and mobile-based platform, was developed to create a shared and easily accessible repository of curated clinical educational resources. We have recently launched "Open Osmosis" - a public-facing portal that has become one of the largest databases of Creative Commons-licensed questions, among other open educational resources (OER) for medical education

including as question-writers ("Medical Contributors"), content organizers ("Medical Scholars"), and expert reviewers ("Clinical Advisors"). Here we describe our experience developing Open Osmosis as a case study for crowdsourcing medical education content, and to comment on potential future development of this platform.

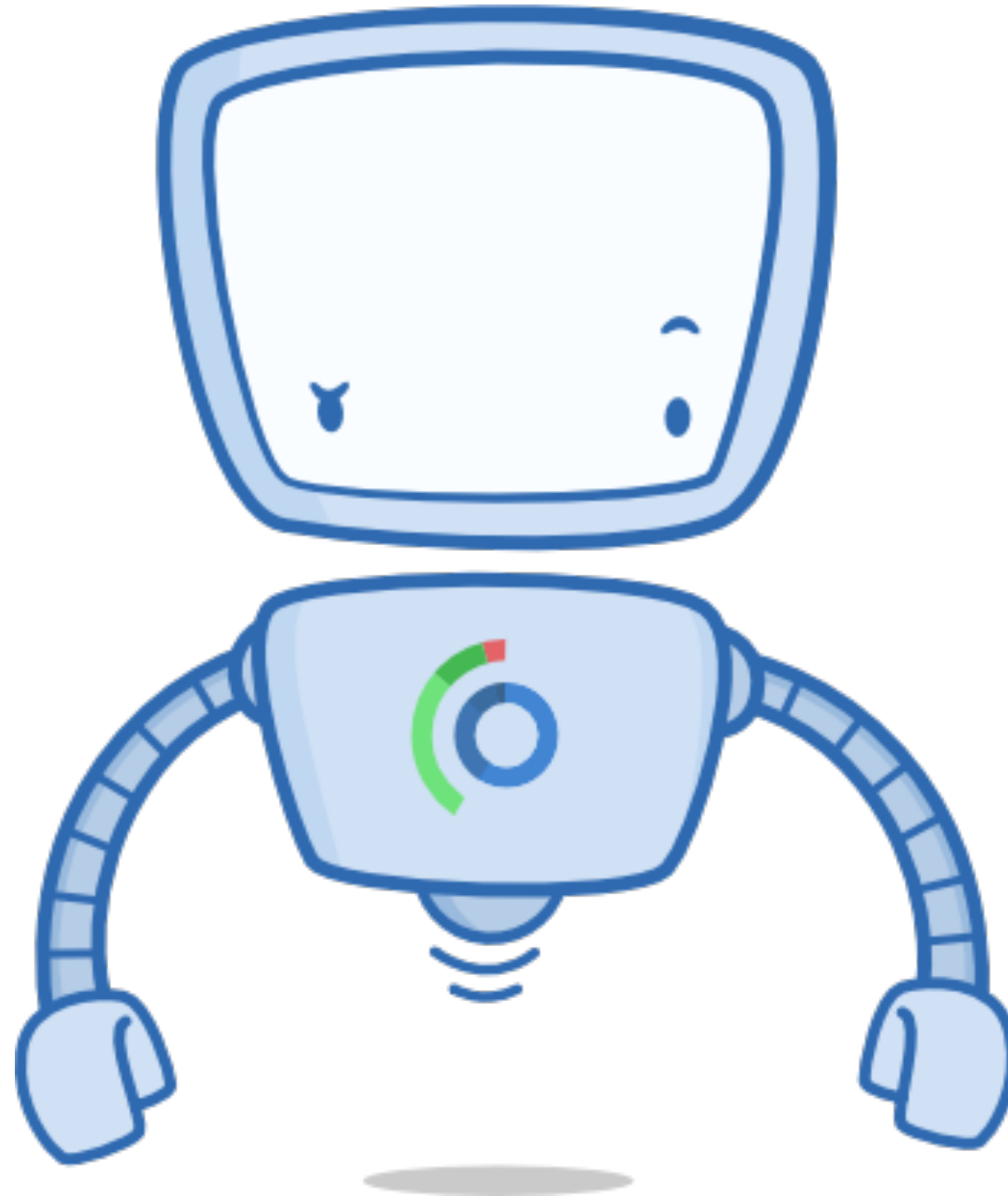
Key Words

medical education, open educational resources, crowdsourcing

Introduction

As the breadth and depth of medical knowledge grows exponentially, clinical students often feel inundated with content they are expected to learn during their training. Up to 50% of the time available for learning is spent on

Medical education



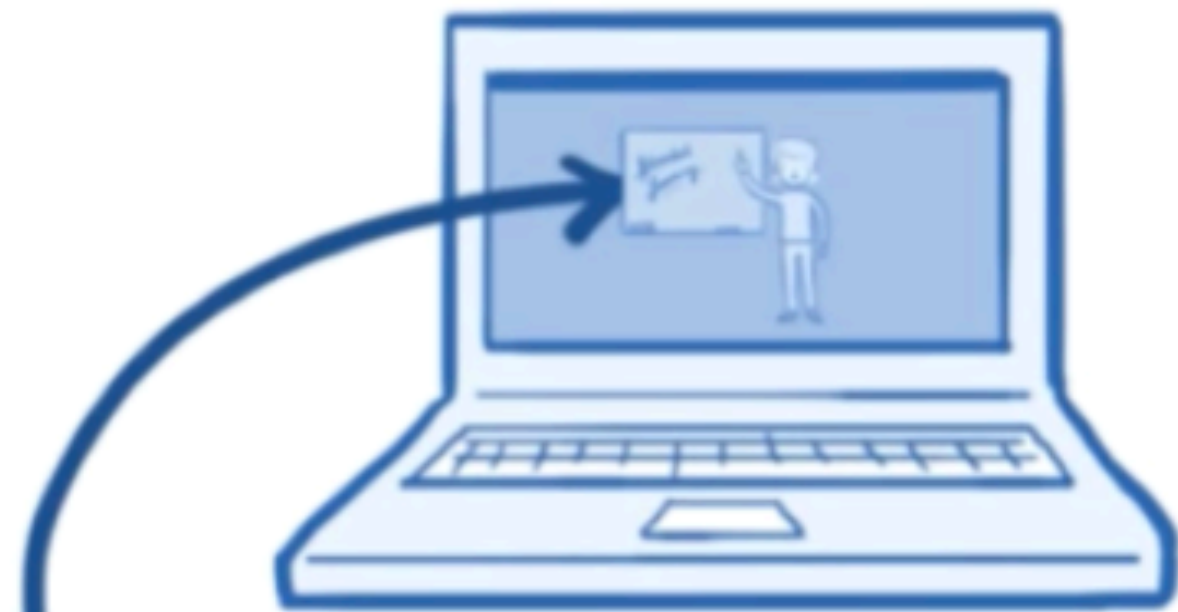
BLENDED LEARNING

~ FLIPPED CLASSROOM ~

ONLINE
RESOURCES

+

IN-PERSON
INSTRUCTION



CONSUME at
HOME

GUIDE
on the
SIDE



STUDENT
FOCUSED

IN-CLASS
ACTIVITIES





Didactic information



Facts



Empathetic listening



Motivational counseling



Teamwork



Cultural competency



Nutrition guidance



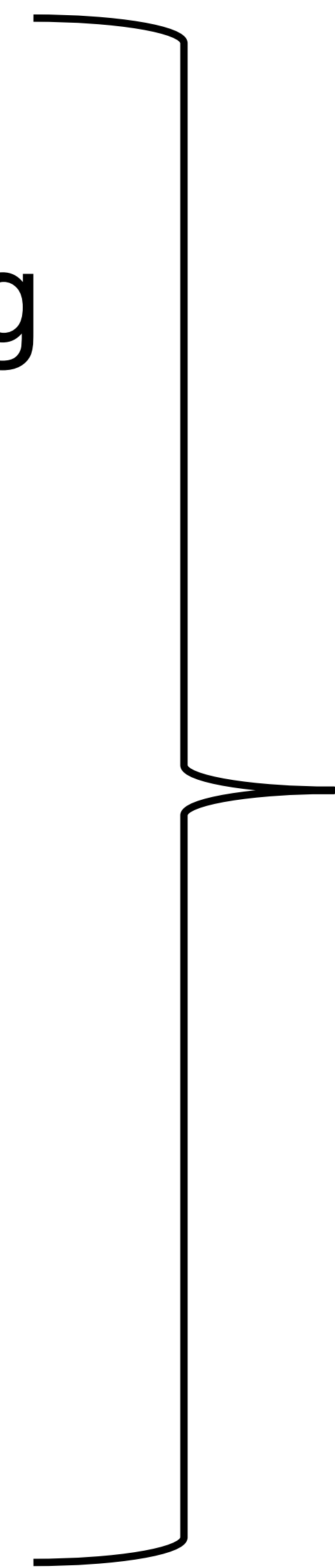
Technical abilities



Patient advocacy



Life long learning



Skills



Thank you

Rishi Desai, MD, MPH
RishiDesaiMD@gmail.com