



The Flipped Classroom: A How-To For Educators

Phoenix, AZ • April 13, 2015

Robert Cooney @EMEducation



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We do not have an affiliation (financial or otherwise) with a pharmaceutical, medical device or communications organization.

Tip	Topic
	Tools You'll Need For The Workshop
	Anatomy of a Flipped Classroom
1	Create Clear Objectives
2	Home Learning Modules
3	Use Sound Multimedia e-Learning Theory To Create Your Lessons
4	Storyboard your Module
5	Take Care With Images
6	Create Resources
7	Upload Modules to the Public Domain
8	Build Quizzes
9	Design Classroom Activities
10	Feedback (Finish Strong)

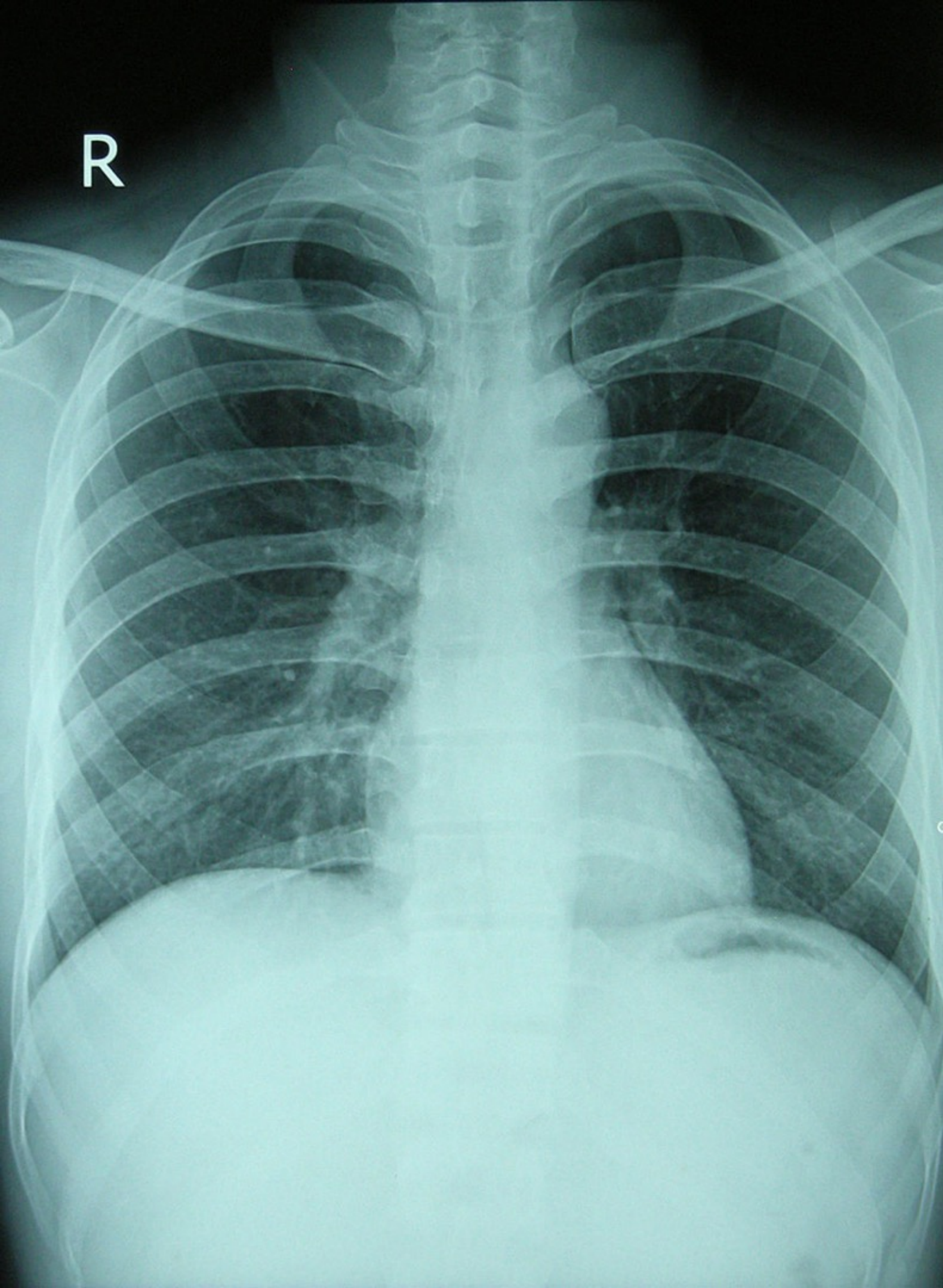
Tools You'll Need For this Workshop

Laptop Computer (or Tablet)

Presentation Software (or Drawing Software)

An Internet Connection

Handout



Workshop Activities

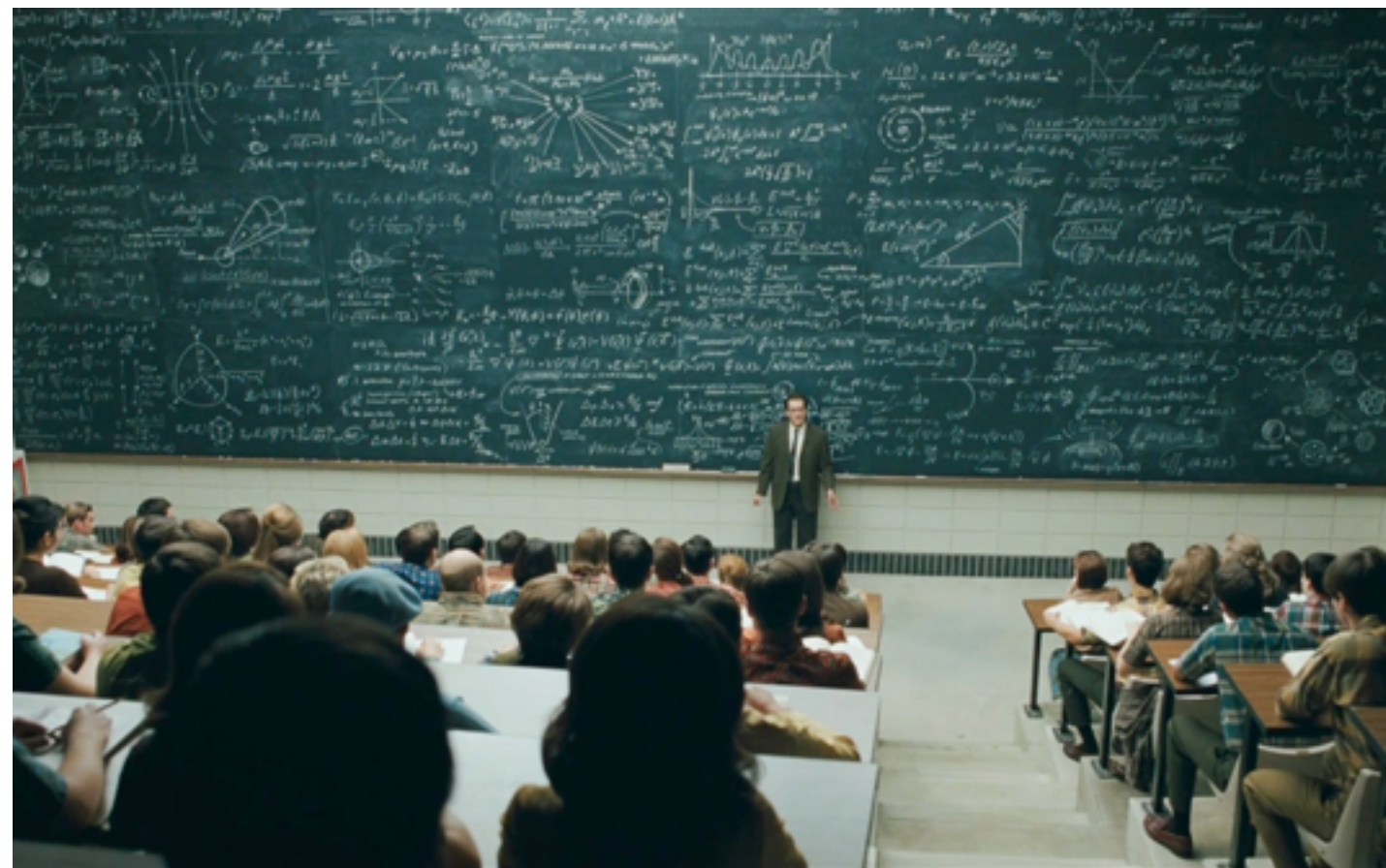
Create a lesson on reading a CXR

**Use the Handout
In Small Groups at your Tables**

Anatomy of A Normal Classroom

In Class

At Home

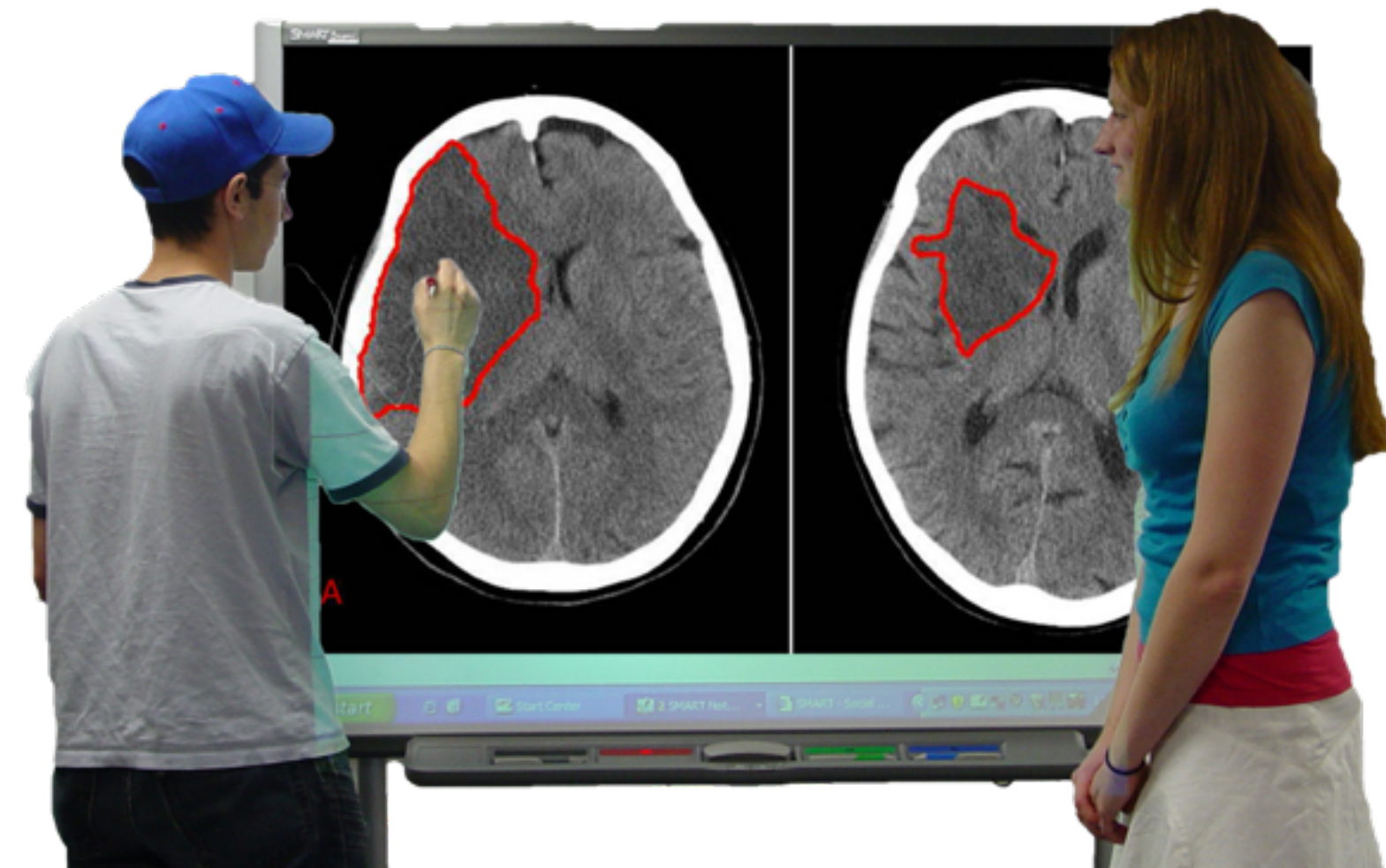


Anatomy of A Flipped Classroom

At Home



In Class



Anatomy of A Flipped Classroom

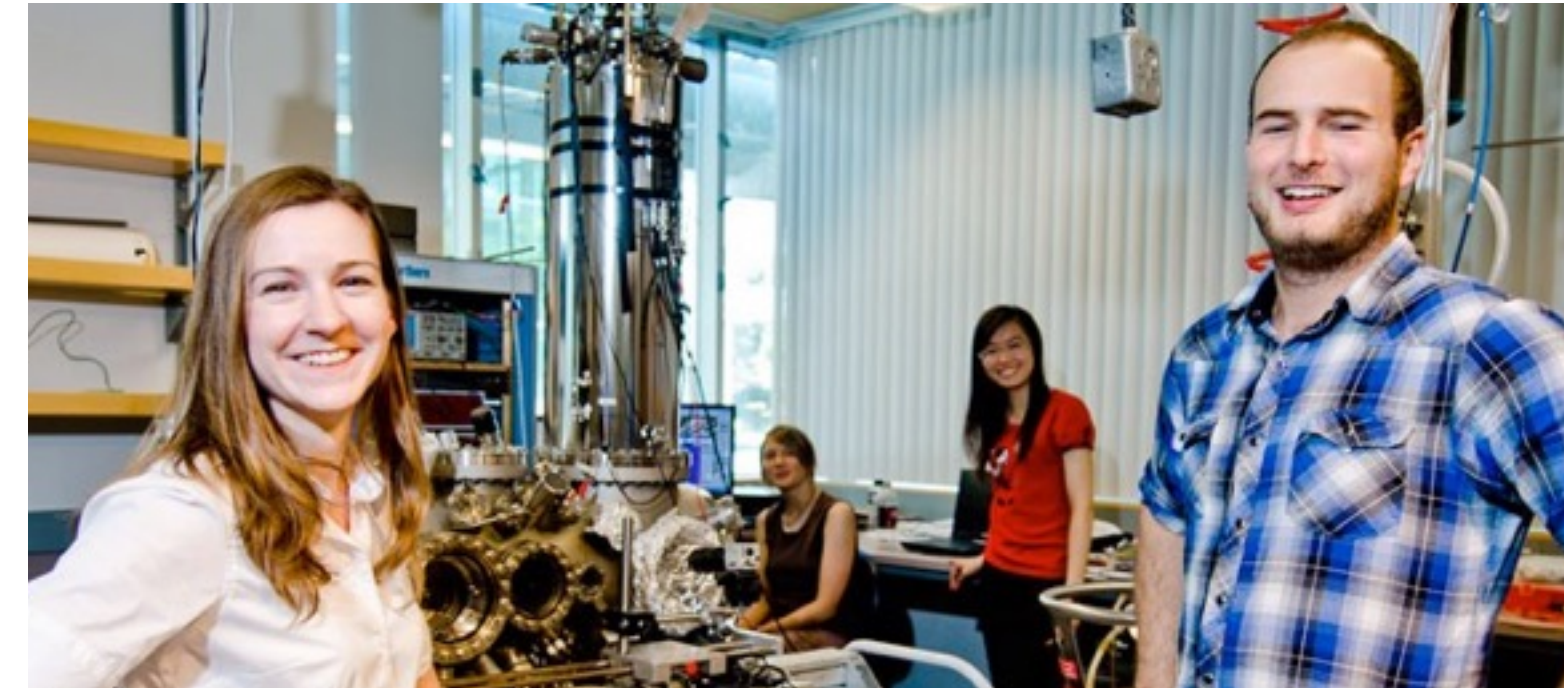
	At Home	In Class	At Home
Normal		INTRO TO TRAUMA LECTURE	MCE
Flipped	READ CHAPTER	WORK THROUGH CASES	MCE



U of BC Physics Class



traditional lecture, celebrated professor
problem sets at home



flipped class, taught by TA's
read at home
problem sets in small groups in class

Louis Deslauriers, Ellen Schelew and Carl Wieman, 'Improved Learning in a Large-Enrollment Physics Class', Science 13 May 2011:
Vol. 332 no. 6031 pp. 862-864

Each arm was similar

in testing, attendance and enthusiasm

Table 1. Measures of student perceptions, behaviors, and knowledge.

	Control section	Experimental section
Number of students enrolled	267	271
Mean BEMA score (13) (week 11)	47 ± 1%	47 ± 1%
Mean CLASS score (14) (start of term) (agreement with physicist)	63 ± 1%	65 ± 1%
Mean midterm 1 score	59 ± 1%	59 ± 1%
Mean midterm 2 score	51 ± 1%	53 ± 1%
Attendance before experiment*	55 ± 3%	57 ± 2%
Attendance during experiment		
Engagement before experiment*	45 ± 5%	45 ± 5%
Engagement during experiment		

*Average value of multiple measurements carried out in a 2-week interval before the experiment. Engagement also varies over location in the classroom; numbers given are spatial and temporal averages.

CQ5

Which of the following are forms of the wave equation for an EM wave propagating in vacuum along the x direction?

i)
$$\frac{d^2 E_y(x, t)}{dx^2} = \epsilon_0 \mu_0 \frac{d^2 E_y(x, t)}{dt^2}$$

ii)
$$\frac{dE_y(x, t)}{dx} = \epsilon_0 \mu_0 \frac{dE_y(x, t)}{dt}$$

iii)
$$\frac{dB_z(x, t)}{dx} = \epsilon_0 \mu_0 \frac{dB_z(x, t)}{dt}$$

iv)
$$\frac{d^2 B_z(x, t)}{dx^2} = \epsilon_0 \mu_0 \frac{d^2 B_z(x, t)}{dt^2}$$

- a) i and iv
- b) ii and iii
- c) ii
- d) i
- e) None of the above

Commentary: Practicing translation between mathematical representations and physical phenomena.

GT

A friend of yours reminds you that an EM wave consists of both an E and B field.

She asks you if the following electric field

$E(x,t)=100x^2t$ Volts/m could be that of an EM wave.

Can you help? Be quantitative in your answer.

[*Hint:* Is there an equation that the electric field portion of an electromagnetic wave, $E(x,t)$, must satisfy?]

Commentary: Recognize relationship between form of solution and its origin.

Attendance & Enthusiasm Increased

in flipped group compared to traditional

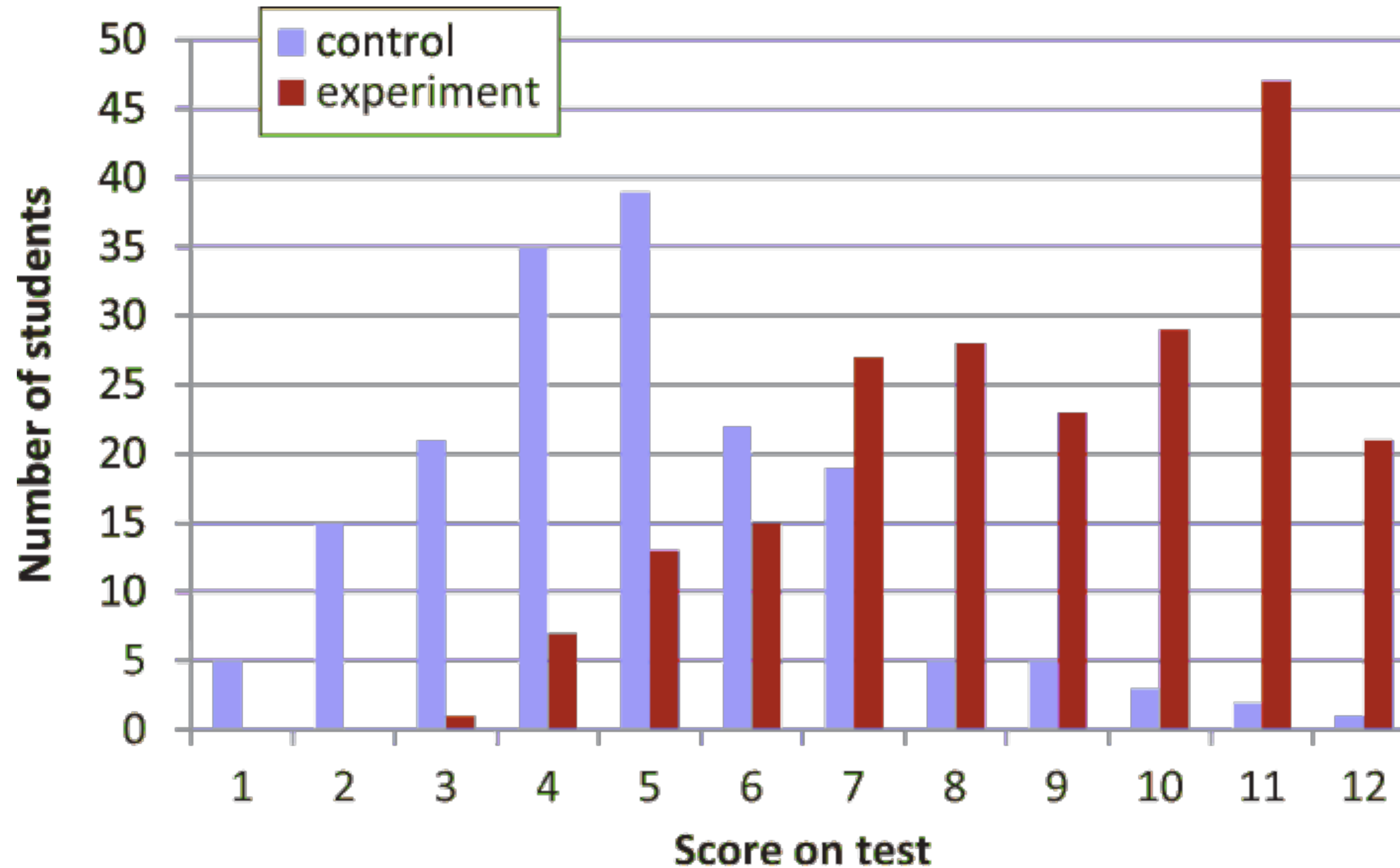
Table 1. Measures of student perceptions, behaviors, and knowledge.

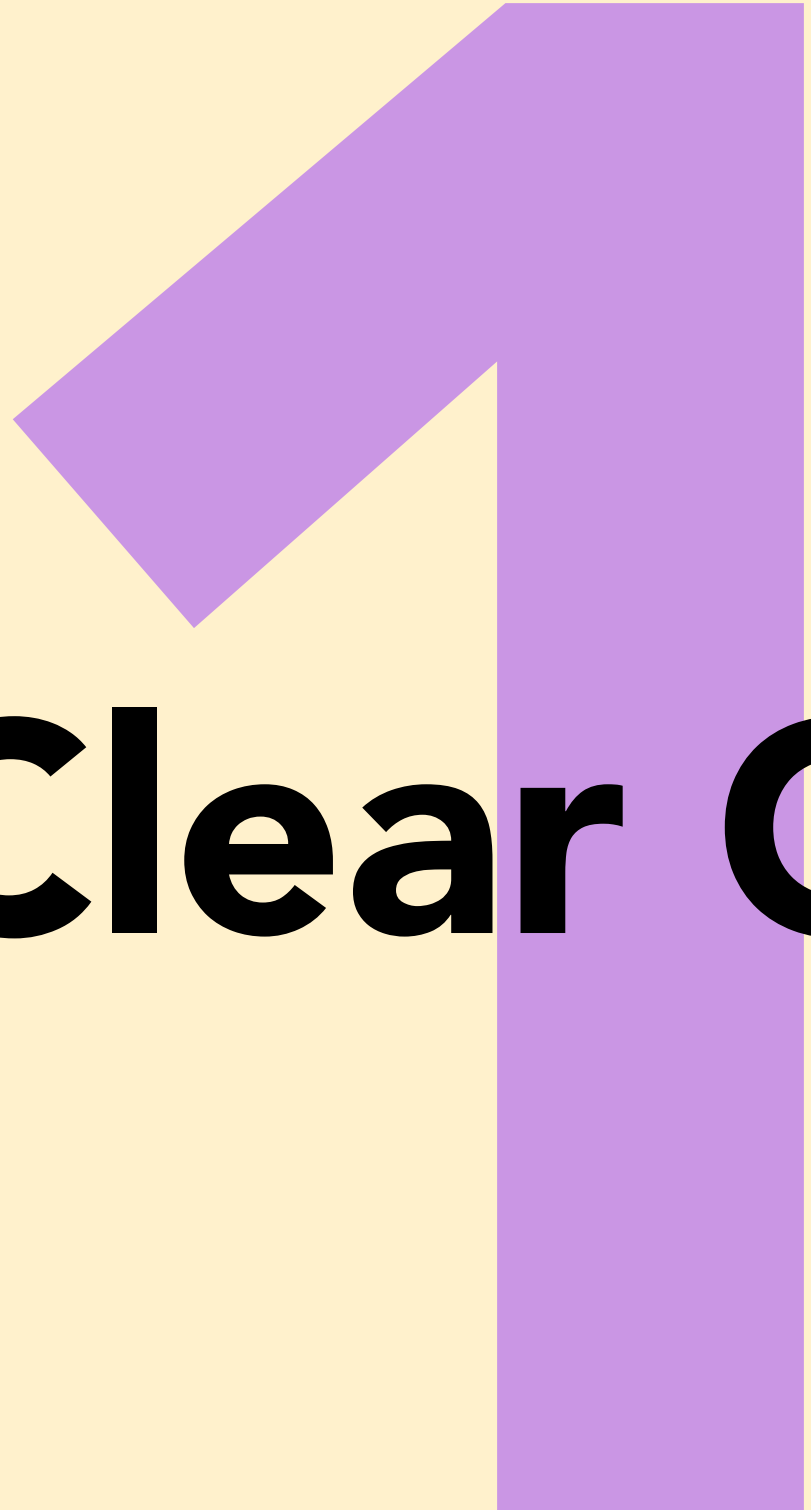
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Attendance before experiment*	55 ± 3%	57 ± 2%
Attendance during experiment	53 ± 3%	75 ± 5%
Engagement before experiment*	45 ± 5%	45 ± 5%
Engagement during experiment	45 ± 5%	85 ± 5%

*Average value of multiple measurements carried out in a 2-week interval before the experiment. Engagement also varies over location in the classroom; numbers given are spatial and temporal averages.

Test scores went up

despite not covering all the material





Create Clear Objectives

Split Bloom's taxonomy into 2 pieces

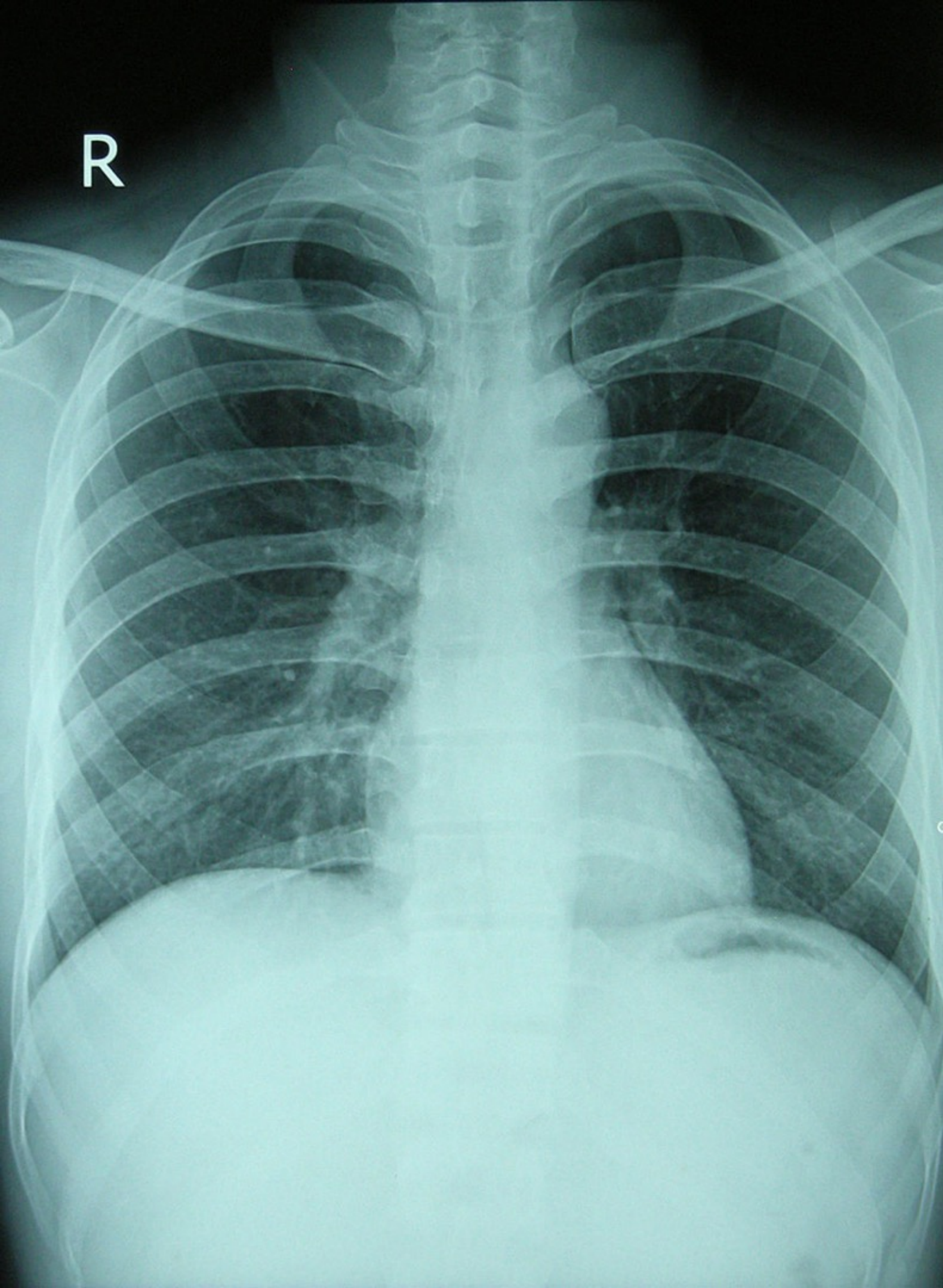
Cognitive Level	Activity
REMEMBER	<i>lecture, visuals, video, audio, examples, illustrations, analogies</i>
UNDERSTAND	<i>questions, discussion, review test, learner presentation, writing</i>
APPLY	<i>exercises, practice, demos, projects sketches, simulation, role play</i>
ANALYZE	<i>problems, exercises, case studies critical incidents, discussion</i>
EVALUATE	<i>case studies, critiques, appraisals</i>
CREATE	<i>projects, develop plans, construct simulations, creative exercises</i>

Split Bloom's taxonomy into 2 pieces

Cognitive Level	Activity
<i>REMEMBER</i> RECALL / RECOGNITION	<i>lecture, visuals, video, audio, examples, illustrations, analogies</i>
<i>UNDERSTAND</i>	<i>questions, discussion, review test, learner presentation, writing</i>
<i>APPLY</i>	<i>exercises, practice, demos, projects sketches, simulation, role play</i>
<i>ANALYZE</i> APPLICATION / PROBLEM SOLVING	<i>problems, exercises, case studies critical incidents, discussion</i>
<i>EVALUATE</i>	<i>case studies, critiques, appraisals</i>
<i>CREATE</i>	<i>projects, develop plans, construct simulations, creative exercises</i>

Other taxonomies split well, too

	COGNITIVE (BLOOM)	PSYCHOMOTOR (SIMPSON)	AFFECTIVE (KRAFTWOHL)
<i>RECALL / RECOGNITION</i>	<i>Remembering Understanding</i>	<i>Observing Imitating</i>	<i>Receiving Responding</i>
APPLICATION & PROBLEM SOLVING	Applying Analyzing Evaluating Creating	Practicing Adapting Originating	Valuing Organizing Characterizing



Workshop Activity

Create a lesson on reading a CXR

Create 3 lower order objectives

Create 3 higher order objectives



Find Pre-Existing Content

Why reinvent the wheel?

Find pre-existing content on the Internet

googlefoam.com

FOAM
SEARCH

Chest x-ray

WebImage

All resultsEM/Critical CareUltrasoundPHARMRural/GP/FMAnaesthesiaJournals

About 23,300,000 results (0.37 seconds)Sort by: Relevance

Ads by Google

[1, 2 & 3 Step X-Ray Steps](#)
www.medicus-health.com/
Radiologist Designed for Foot/Ankle X-rays. Best Prices, Ships Today

[Chest X-Rays](#)
www.medivaninc.com/
Achieve Your OSHA Needs With Us! Call Our Office For More Info.
[Hearing Tests](#) [Respirator Clearance](#)
[Laboratory Analysis](#)

[Chest Radiograph X Ray](#)
medical.toshiba.com/
Cardiovascular X-Ray Solutions. Unmatched System Flexibility.
[Cardiovascular X-Ray Sys.](#) [Infinix-i Hybrid](#)
[Infinix-i Dual Plane](#) [Floor Mounted, 5-axis](#)



Use Sound Multimedia Theory

Comparable Global Epidemiology



- 95 cases per 100,000
 - 2 week surveillance
 - 206 French ICUs
- 95 cases per 100,000
 - 3 month survey
 - 23 Australian/New Zealand ICUs
- 51 cases per 100,000
 - England, Wales and Northern Ireland.



MULTIMEDIA

Comparable Global Epidemiology



~~spoken words~~

spoken words
& images



COHERENCE



**only relevant
text & images**

Comparable Global Epidemiology



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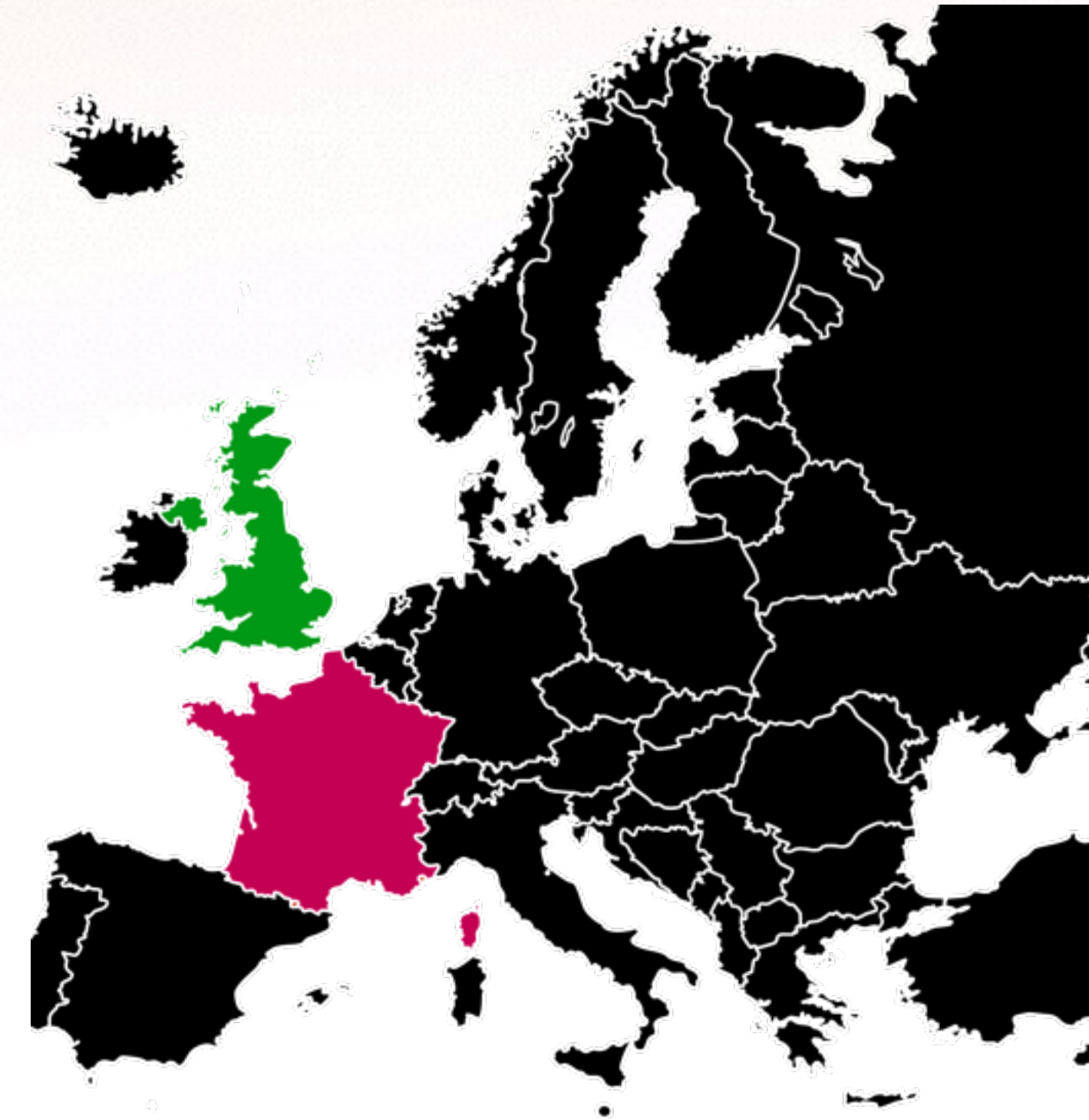
COHERENCE



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CONTIGUITY

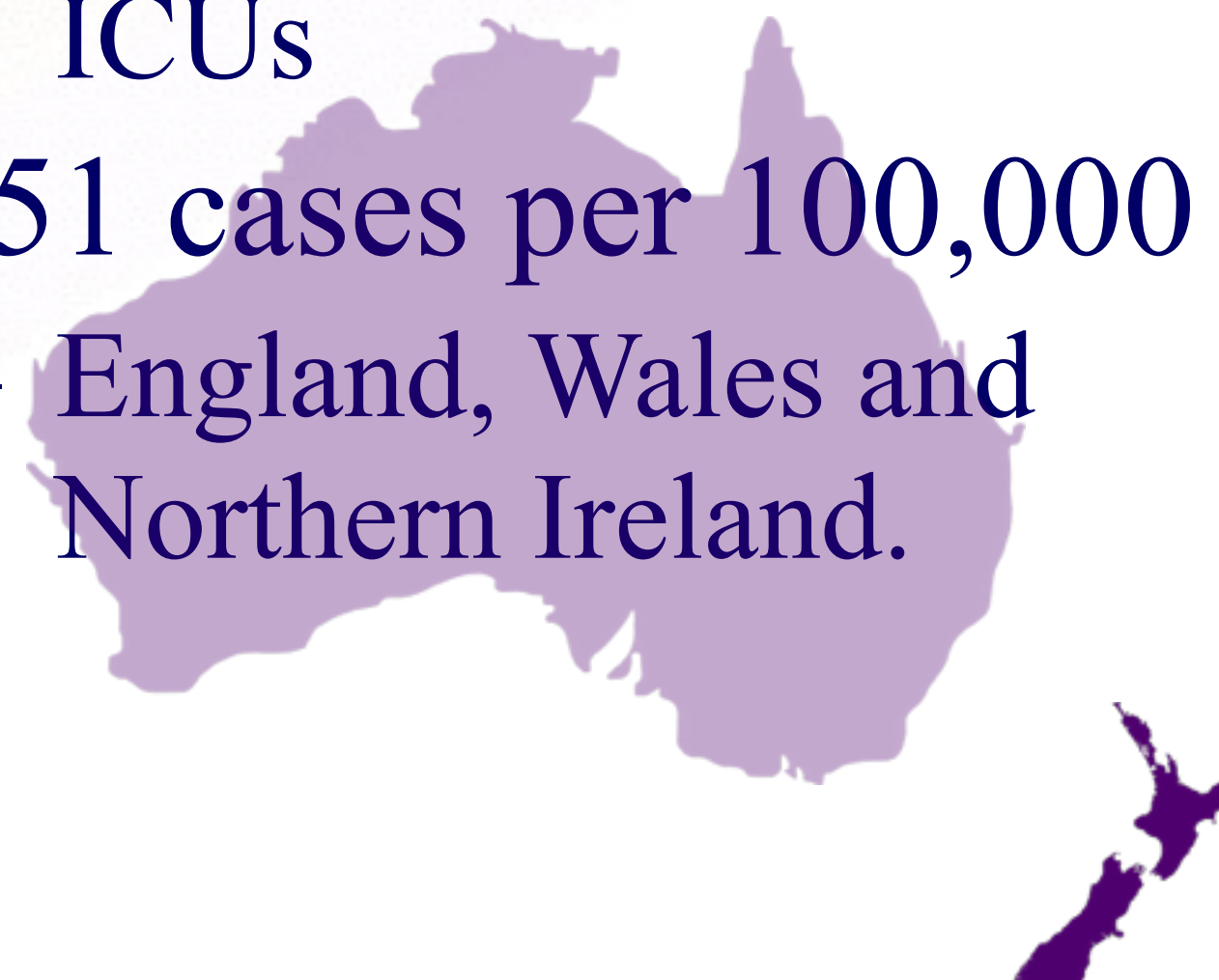
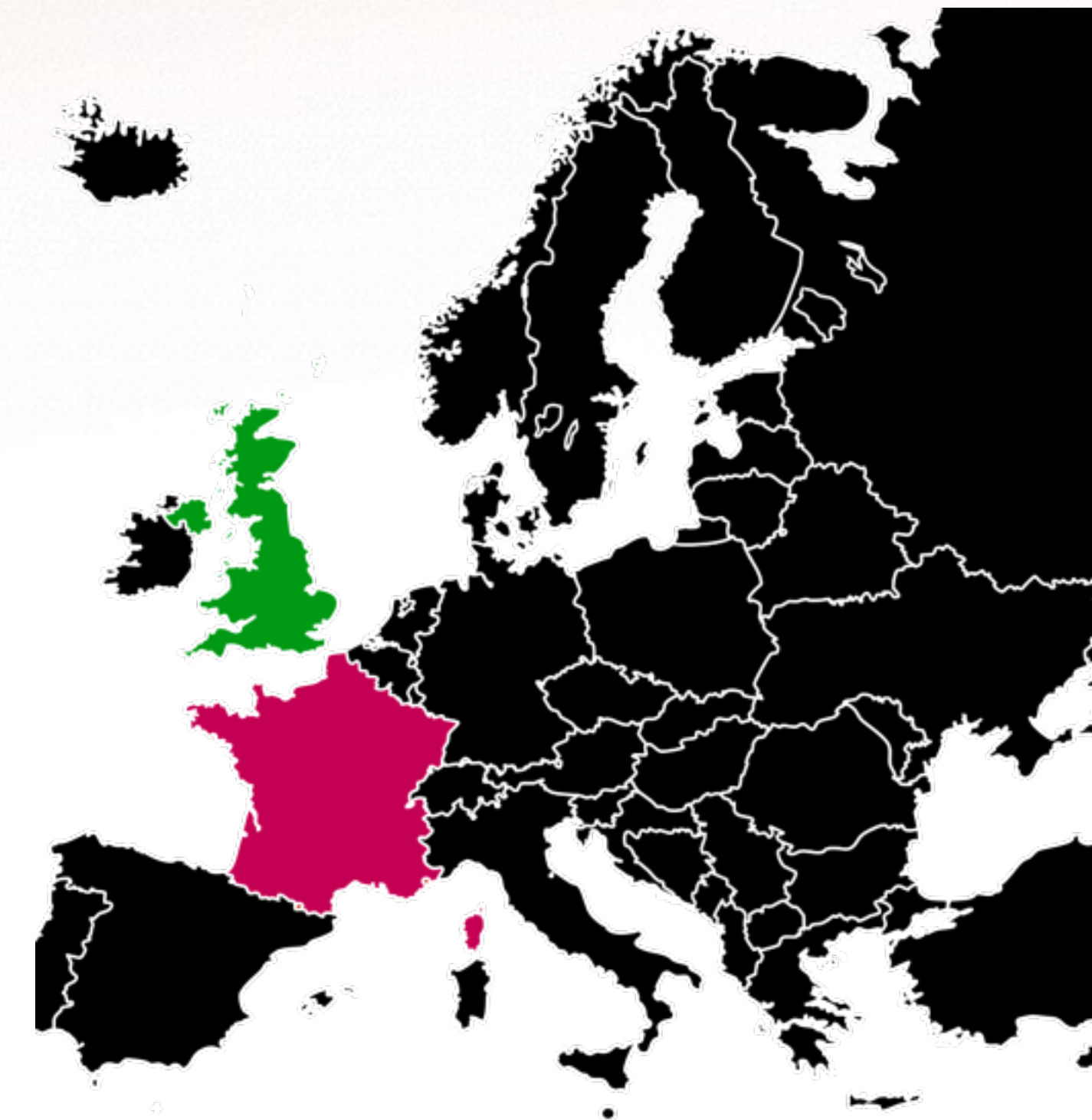
words

images

words
& images

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CONTIGUITY

words

images

words
& images

Comparable Global Epidemiology



**Surviving
Sepsis**

51 cases per 100,000
England, Wales and Northern Ireland.

95 cases per 100,000
3 month survey
23 Australian/New Zealand ICUs

95 cases per 100,000
2 week surveillance
206 French ICUs

SIGNALING

~~written text~~

written text
with keywords
highlighted

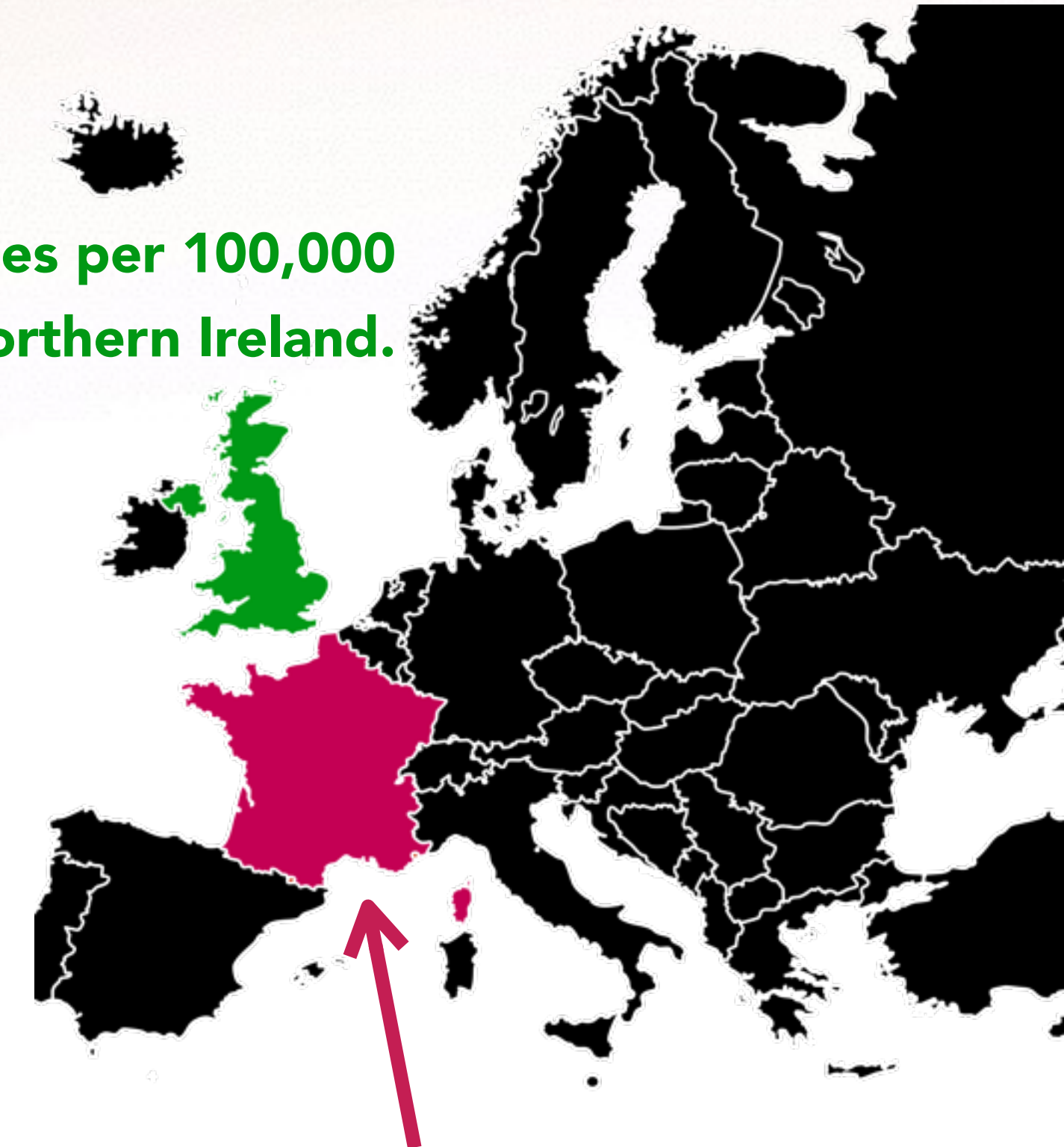
Comparable Global Epidemiology



95 cases per 100,000
3 month survey
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51 cases per 100,000
England, Wales and Northern Ireland.



95 cases per 100,000
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206 French ICUs

SIGNALING

~~written text~~

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Comparable Global Epidemiology

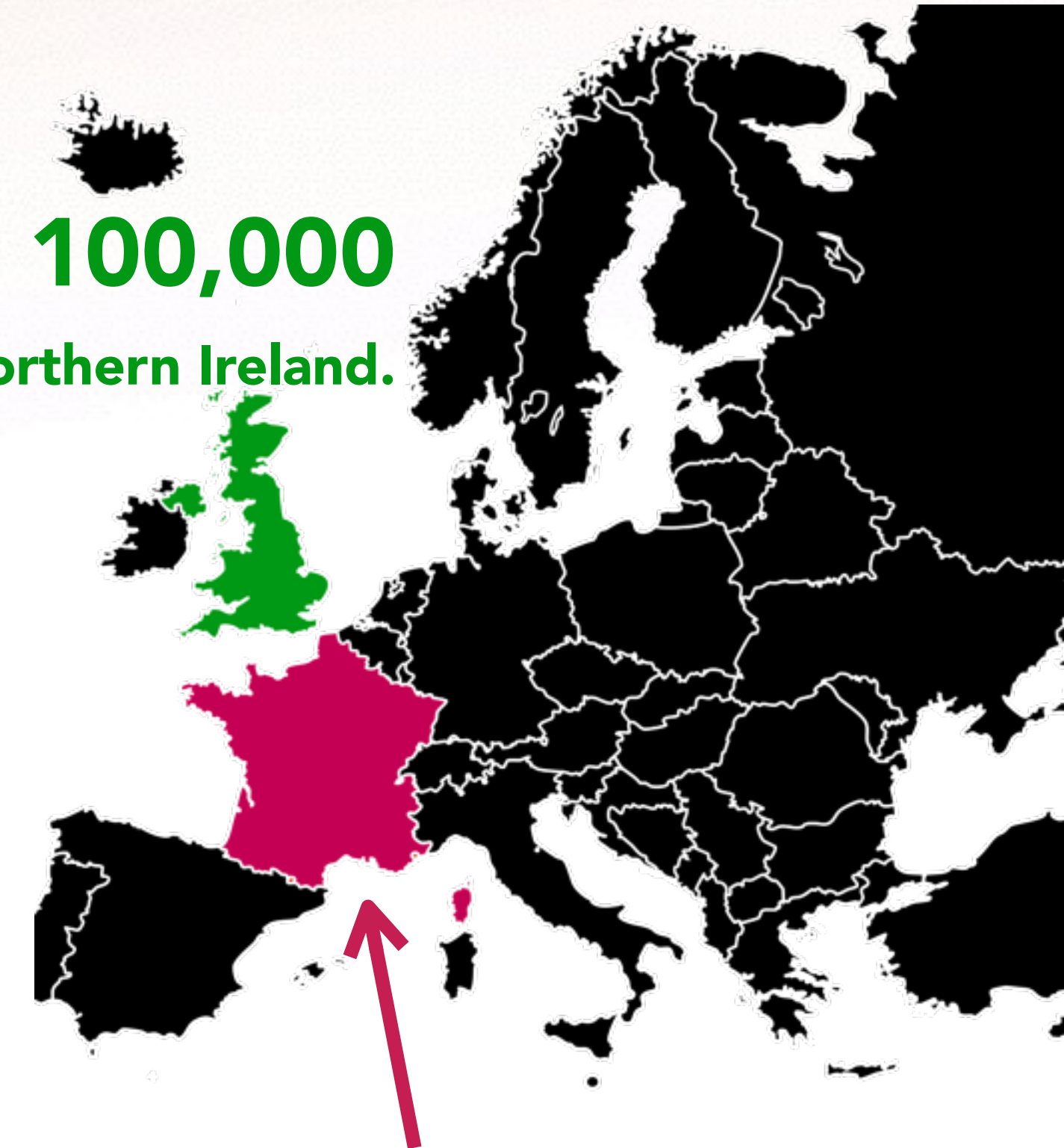


51 cases per 100,000
England, Wales and Northern Ireland.

95 cases per 100,000
3 month survey
23 Australian/New Zealand ICUs



95 cases per 100,000
2 week surveillance
206 French ICUs



REDUNDANCY

spoken words,
~~written~~ text
& images

spoken words
& images

Comparable Global Epidemiology

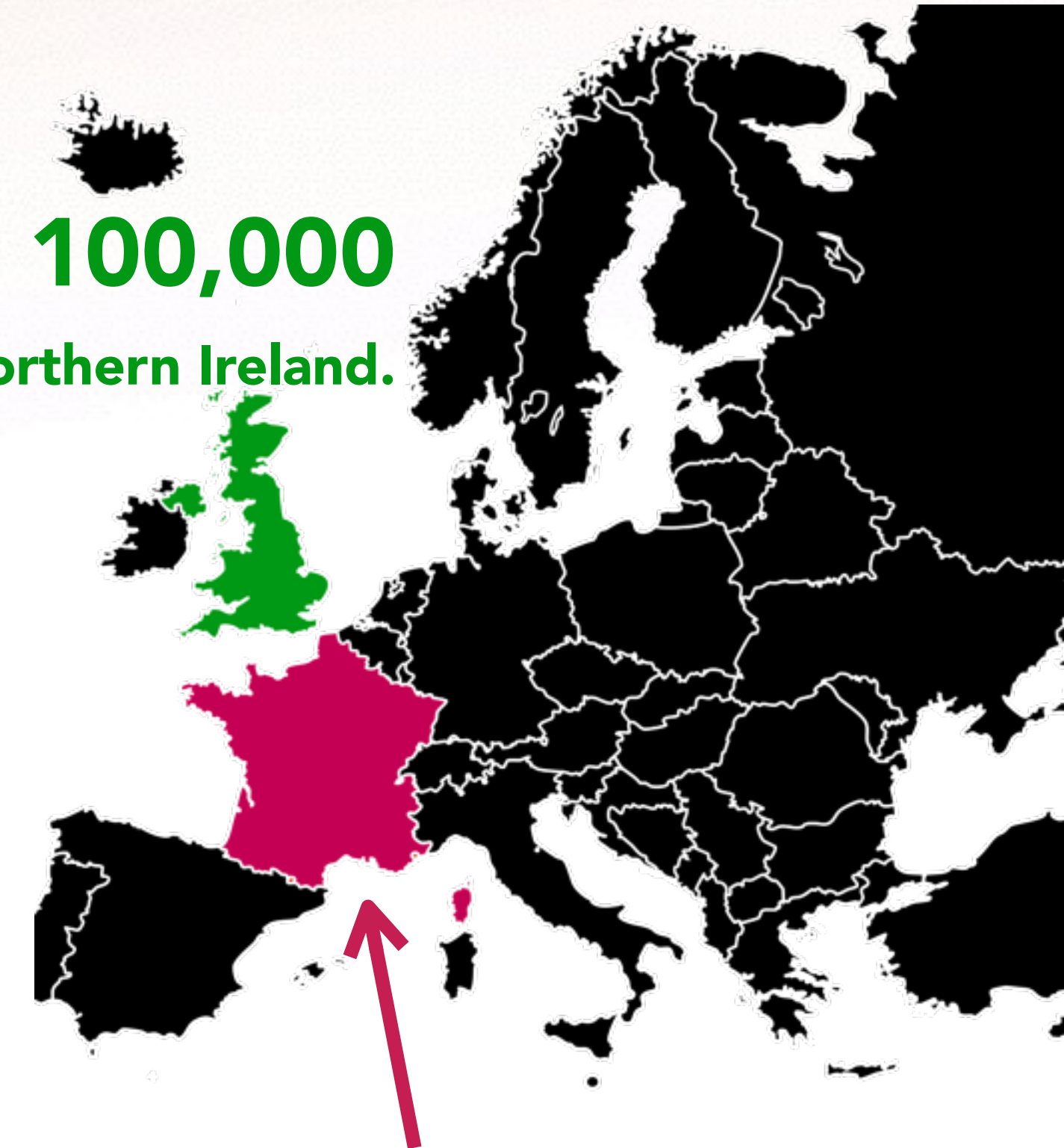


51 cases per 100,000
England, Wales and Northern Ireland.

95 cases per 100,000
3 month survey
23 Australian/New Zealand ICUs



95 cases per 100,000
2 week surveillance
206 French ICUs



IMAGE

Comparable Global Epidemiology



***Surviving
Sepsis***



**spoken words,
images & my
face**

**spoken words
& images**

95 cases per 100,000

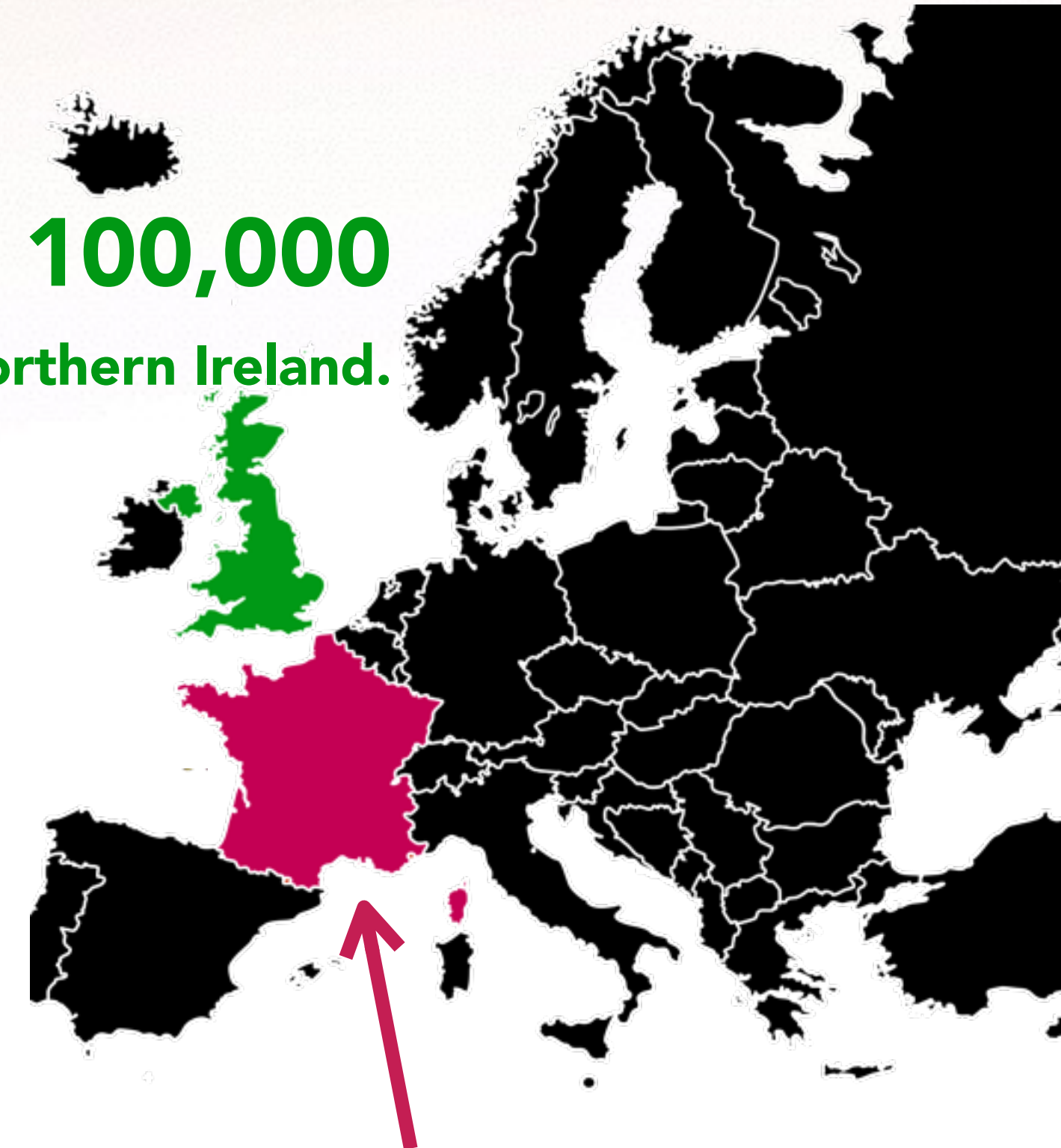
3 month survey

23 Australian/New Zealand ICUs



51 cases per 100,000

England, Wales and Northern Ireland.



95 cases per 100,000

2 week surveillance

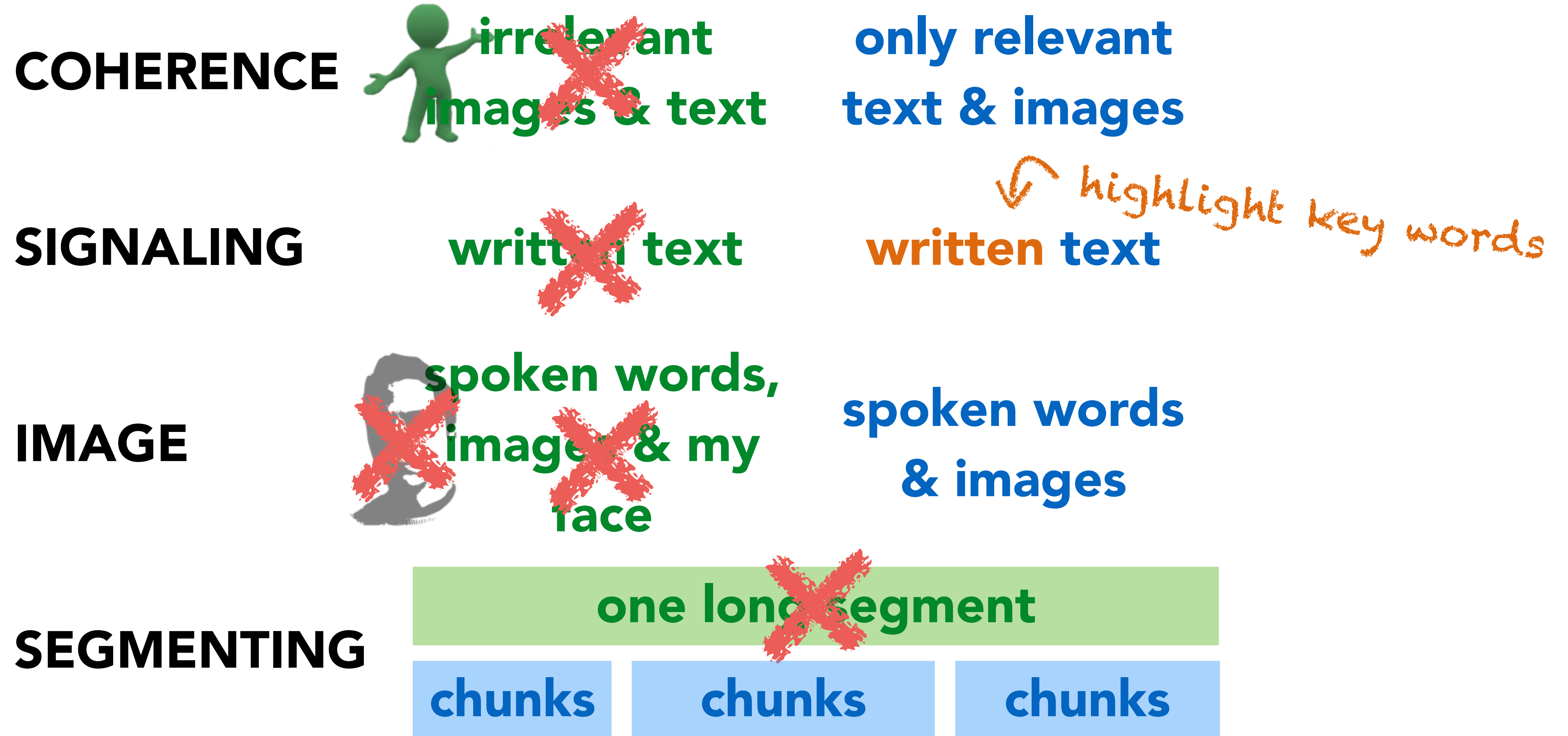
206 French ICUs



Mayer's Multimedia Learning Principles

MULTIMEDIA	spoke words	spoken words & images
MODALITY	written text & images	spoken words & images
REDUNDANCY	spoken words, written text & images	spoken words & images
CONTIGUITY	<div>spoken words</div> <div>images</div>	spoken words & images

Mayer's Multimedia Learning Principles



Mayer's Multimedia Learning Principles

PERSONALIZATION

~~formal speech~~

conversational
speech + stories

VOICE

~~robot voice~~

human voice

PRE-TRAINING

~~no introduction~~

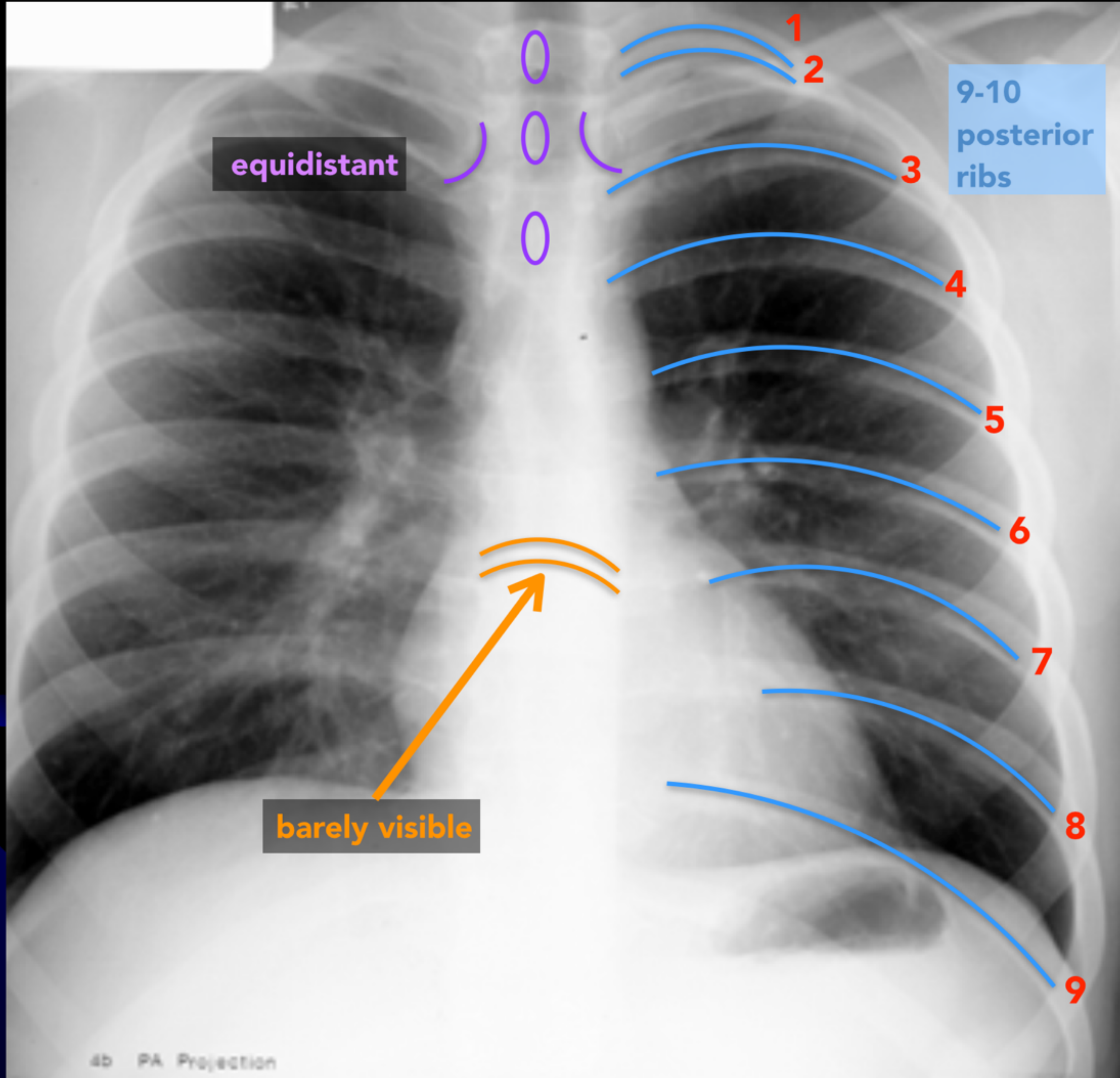
introduce names
and characteristics
of main concepts

Approach to the CXR: Technical Aspects

- Projection – PA or AP
- Position – Upright or Supine (Supine folks are sick)
- Inspiratory effort
 - 9-10 posterior ribs
- Penetration
 - thoracic intervertebral disc space just visible
- Positioning/rotation
 - medial clavicle heads equidistant to spinous process

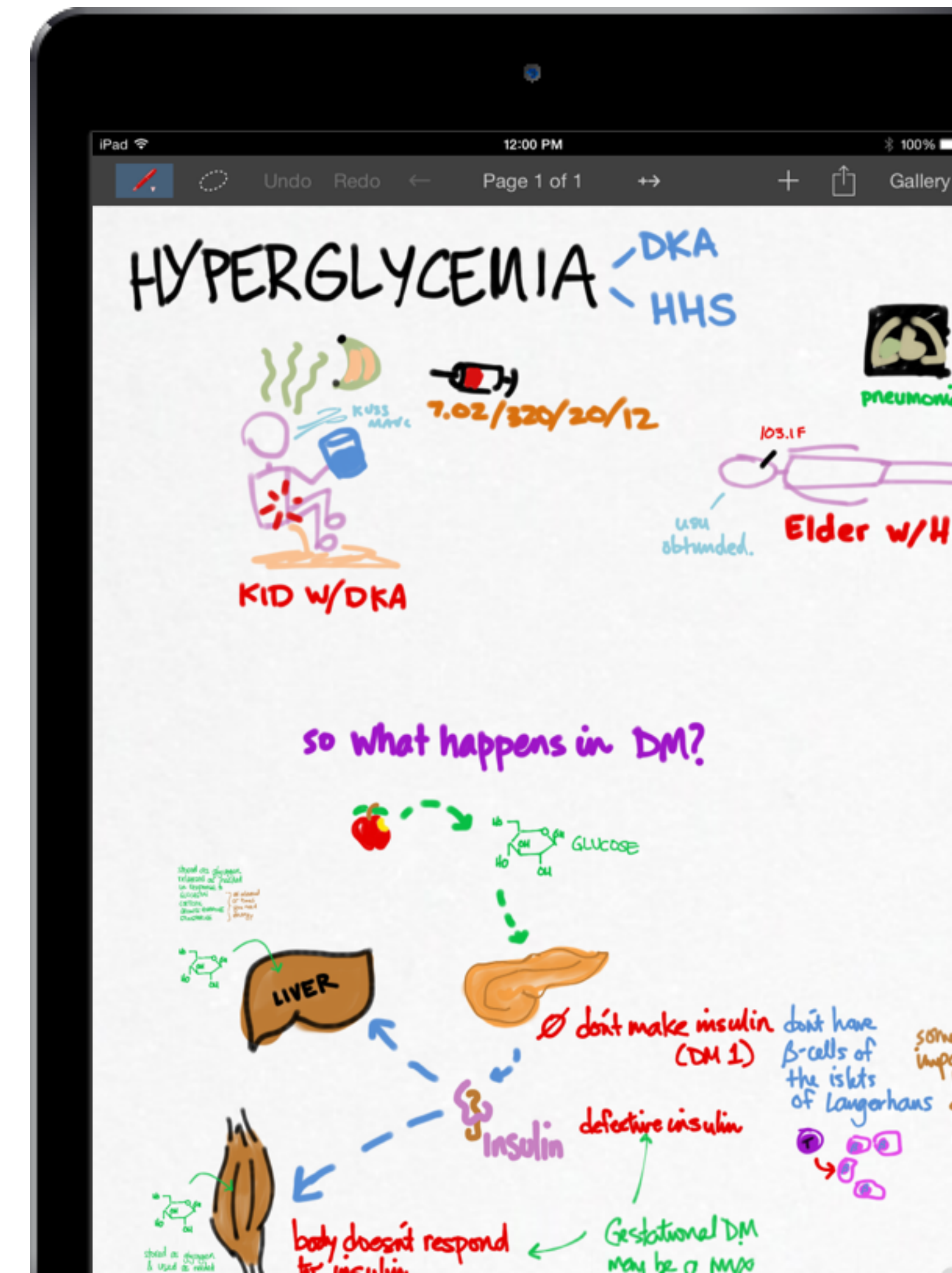
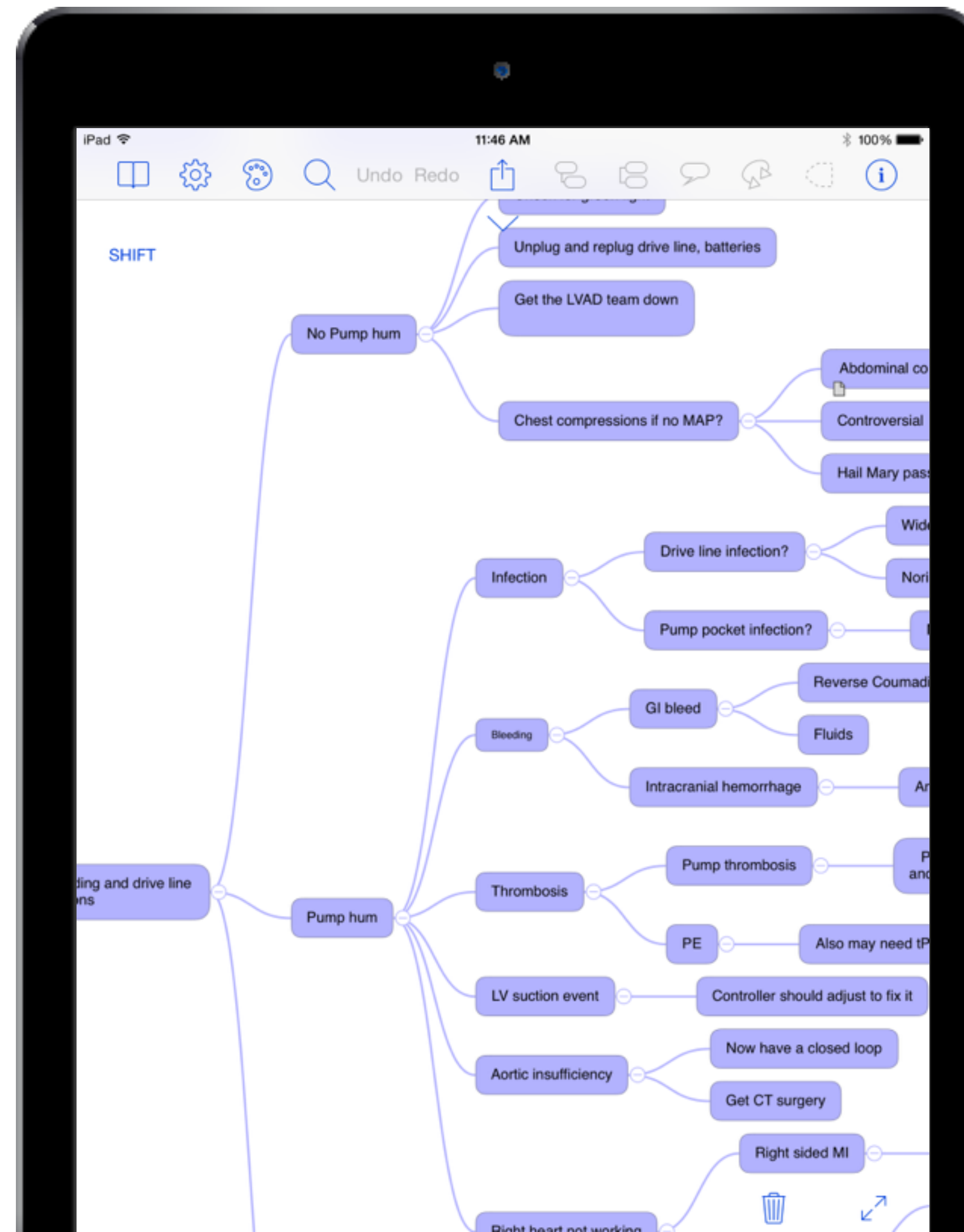
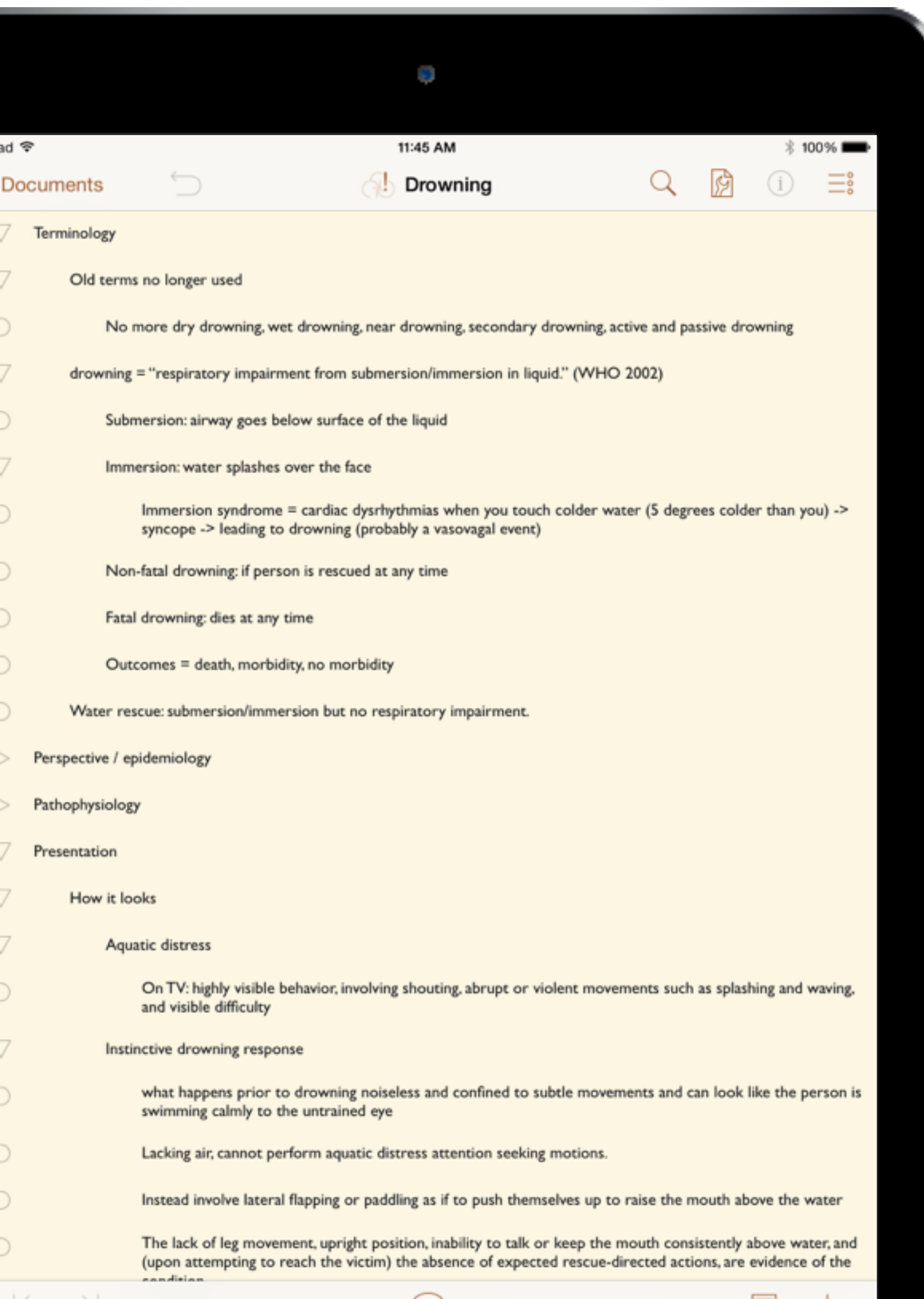


How would you redesign this slide?



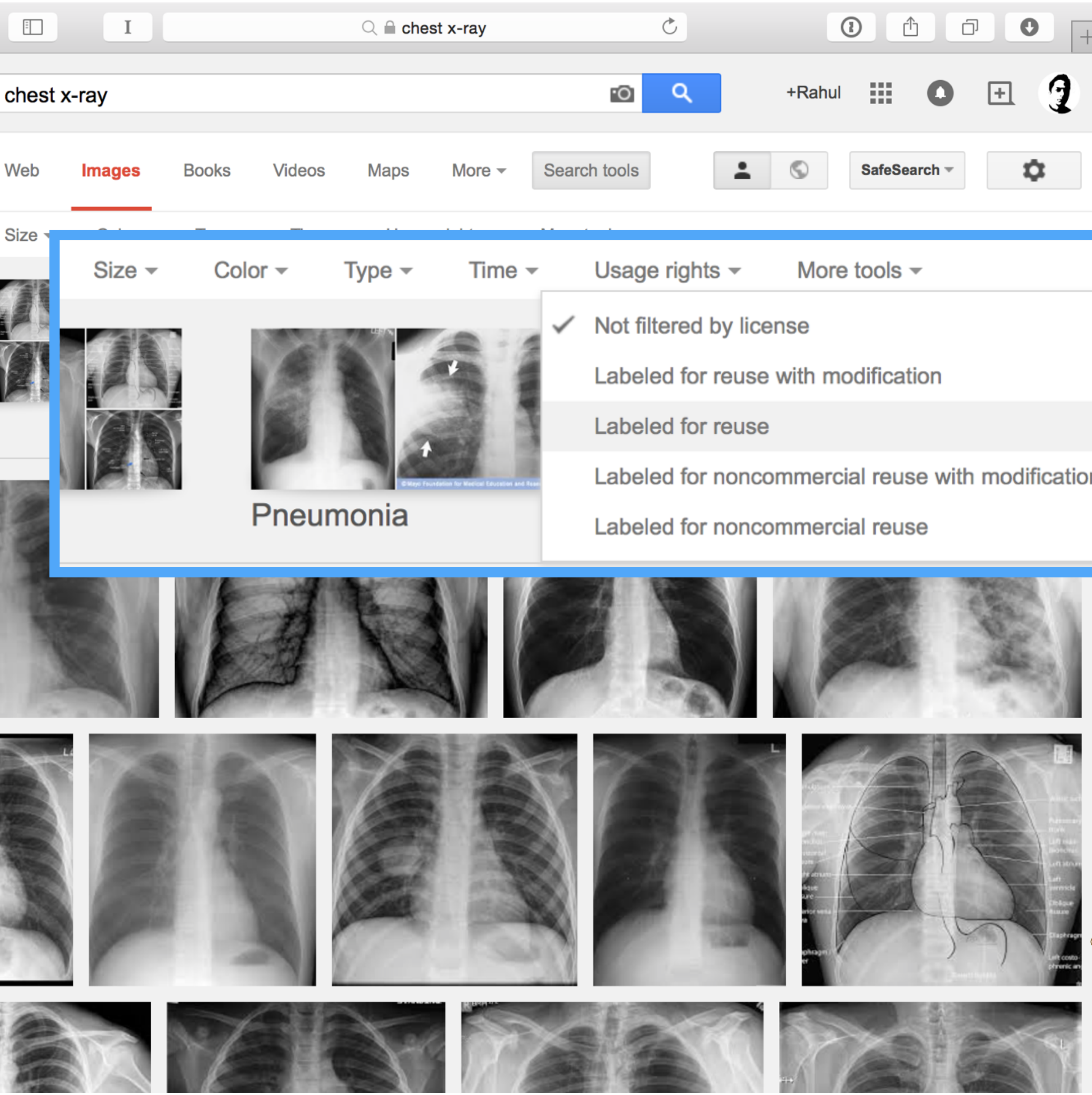
Storyboard Your Module

Outlines, Mind Maps, Storyboards... Oh my!



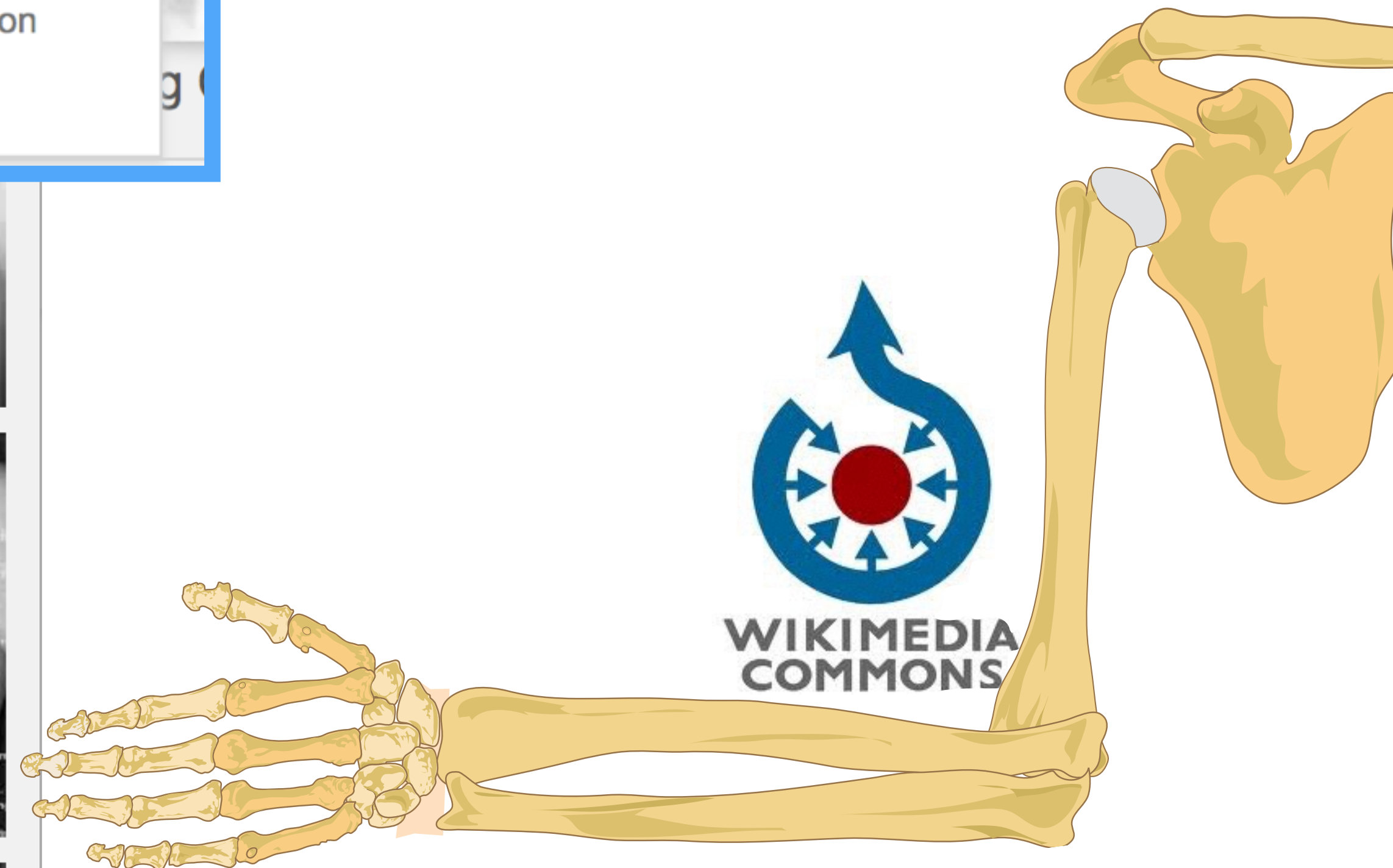


Take Care With Images



Dealing with copyright

Smart Google searches
Public Domain Images



Dealing with PHI

Covering PHI with a black box doesn't remove PHI



KEEPME J. PRIVATE

NID:1234567

12-APR-2015 10:36:37

CORD UNIVERSITY MEDICAL CENTER

49 yr
Male Caucasian

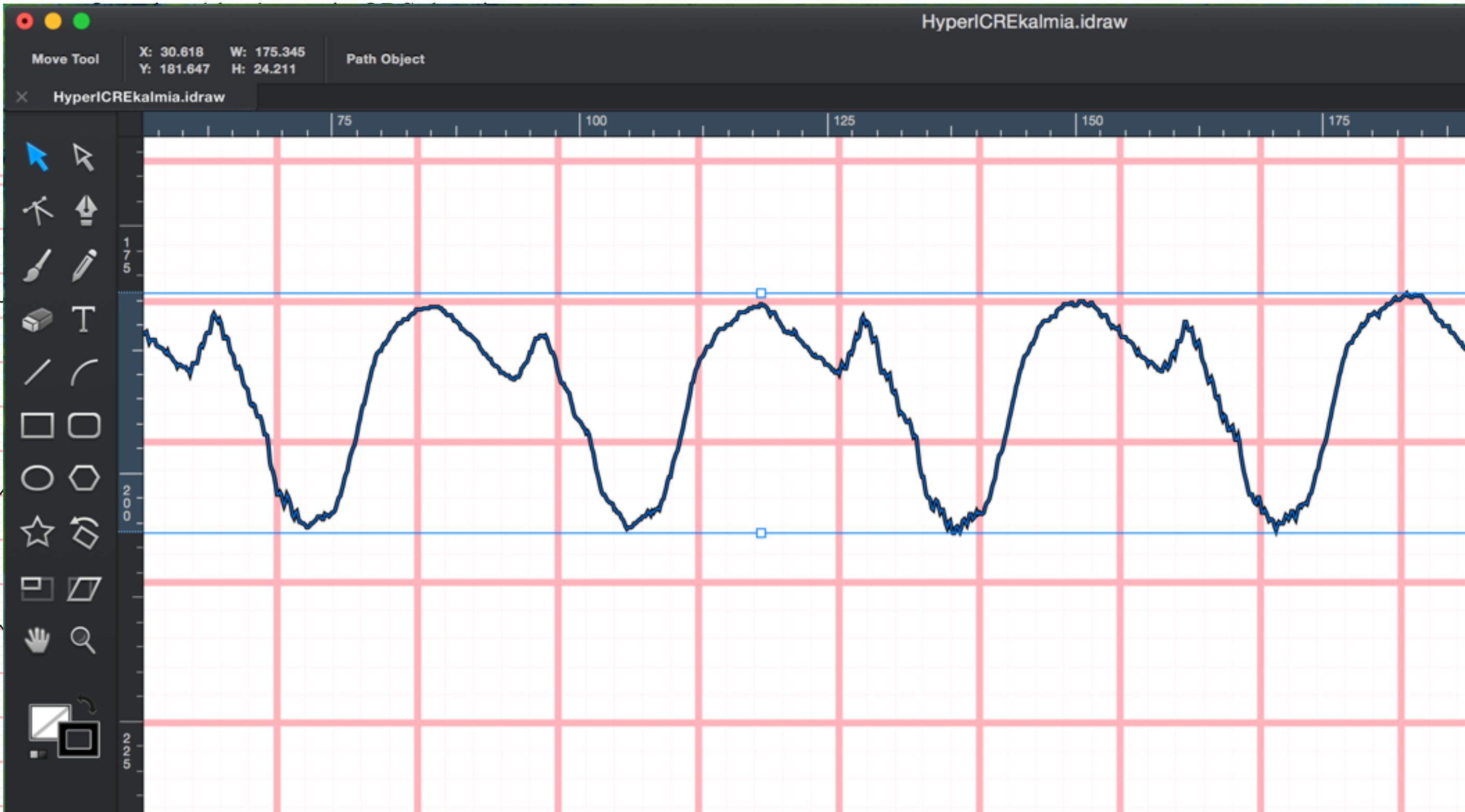
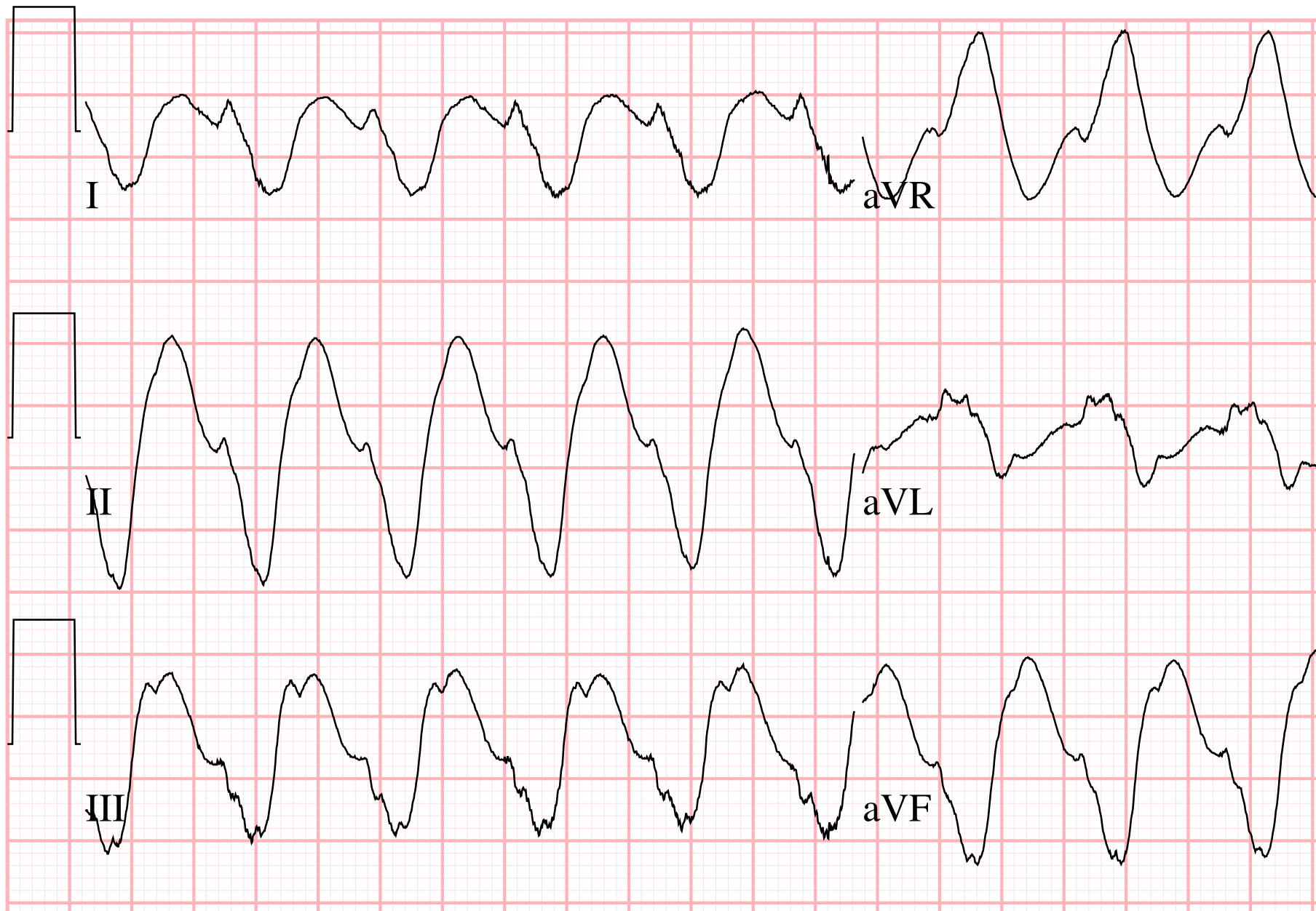
Vent. rate 130 BPM
PR interval 144 ms
QRS duration 198 ms
QT/QTc 352/518 ms
P-R-T axes * 247 80

Sinus tachycardia
Right superior axis deviation
Non-specific intra-ventricular conduction block
Right ventricular hypertrophy
Abnormal ECG
When compared with ECG of 15-AUG-2014 06:20,
Vent. rate has increased BY 69 BPM

Room:BCC22
Loc:1

Technician:AWESOME TECH
Test ind:786.05

GIVEN TO:MD

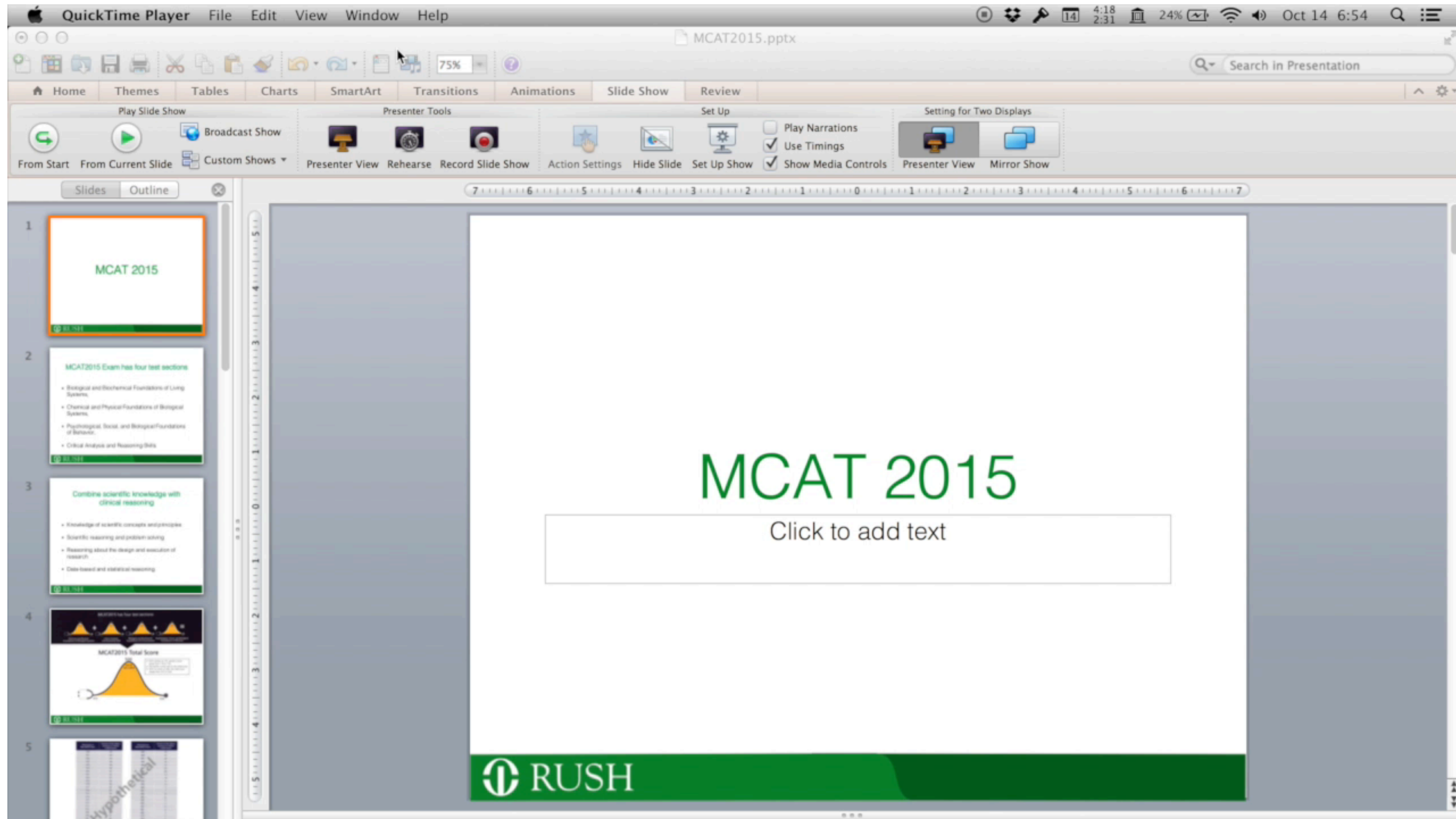




Create Resources

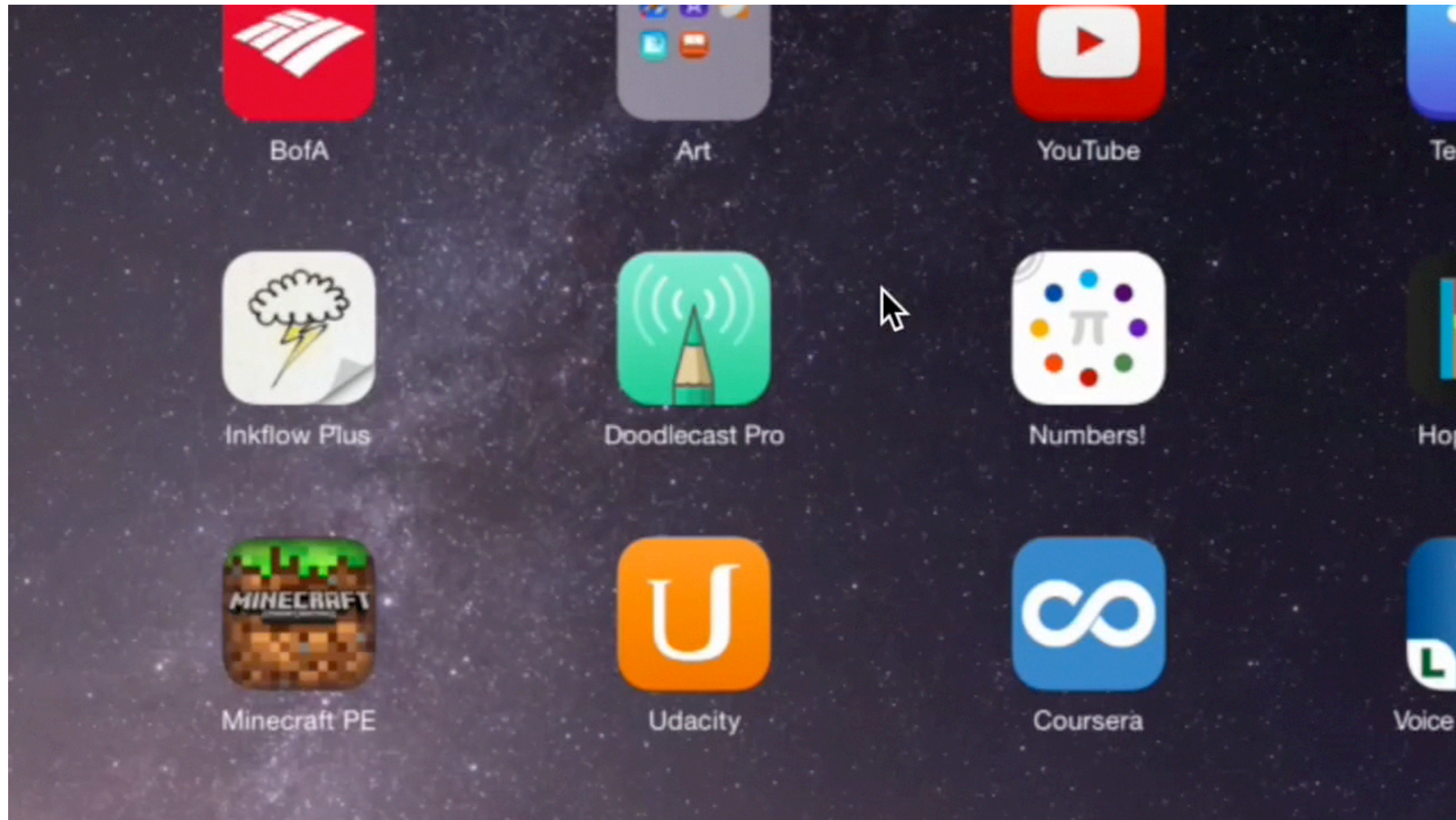
Record narrations with PowerPoint

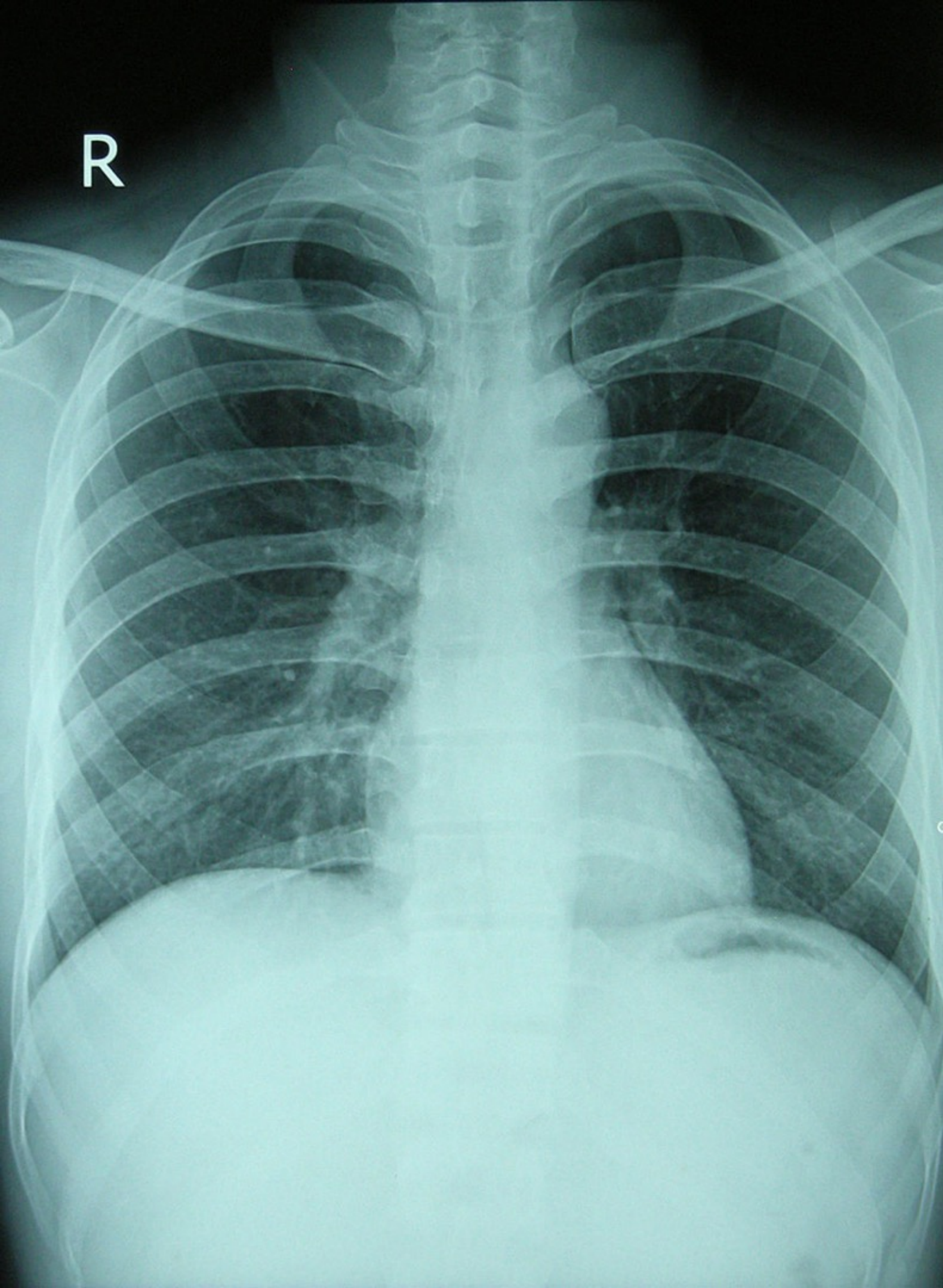
(works with Keynote, too)



iPad All-In-One Software

Explain Everything, DoodleCast Pro, Vittle





Workshop Activity

Create a lesson on reading a CXR

**Use PowerPoint or your Tablet
to Narrate and Record a Movie**

(you'll need to find images in the public domain)



Use the Public Domain

Why not the public domain?

Fear of criticism

I'm not an exhibitionist Don't want
to share my secrets

Another reason for students not to
come to class

Any other reasons?

Why the public domain?

Share with the world

promotions

FOAMed

Ease of access

any device / anywhere

let YouTube do the heavy lifting

Any other reasons?

WHERE

Videos

YouTube or Vimeo

Websites

Wordpress, Square Space, Blackboard

A large, solid purple number 8 is centered in the background of the slide.

Build Quizzes

Online quizzes with data collection

Wordpress, Google, Surveys

Form builder

Email notifications

Here's what your form will look like

Name (required)

Email (required)

Which of the following is the most worrying cause of hypotension in a trauma patient:

☐ Hemorrhage

☐ Blood loss

☐ Exsanguination

What are important questions to ask of a patient involved in a motor vehicle crash?

Add a new field

Add this form to my post

Page 1 of 1

Trauma Pre-Quiz

This is to be done before coming to class.

Which of these interventions is most often needed in the traumatically injured patient.

☐ Intubation

☐ Blood transfusion

☐ Intravenous fluids

☐ Cervical collar

Which of the following characterizes a Level I trauma center.

☐ On call neurosurgeon

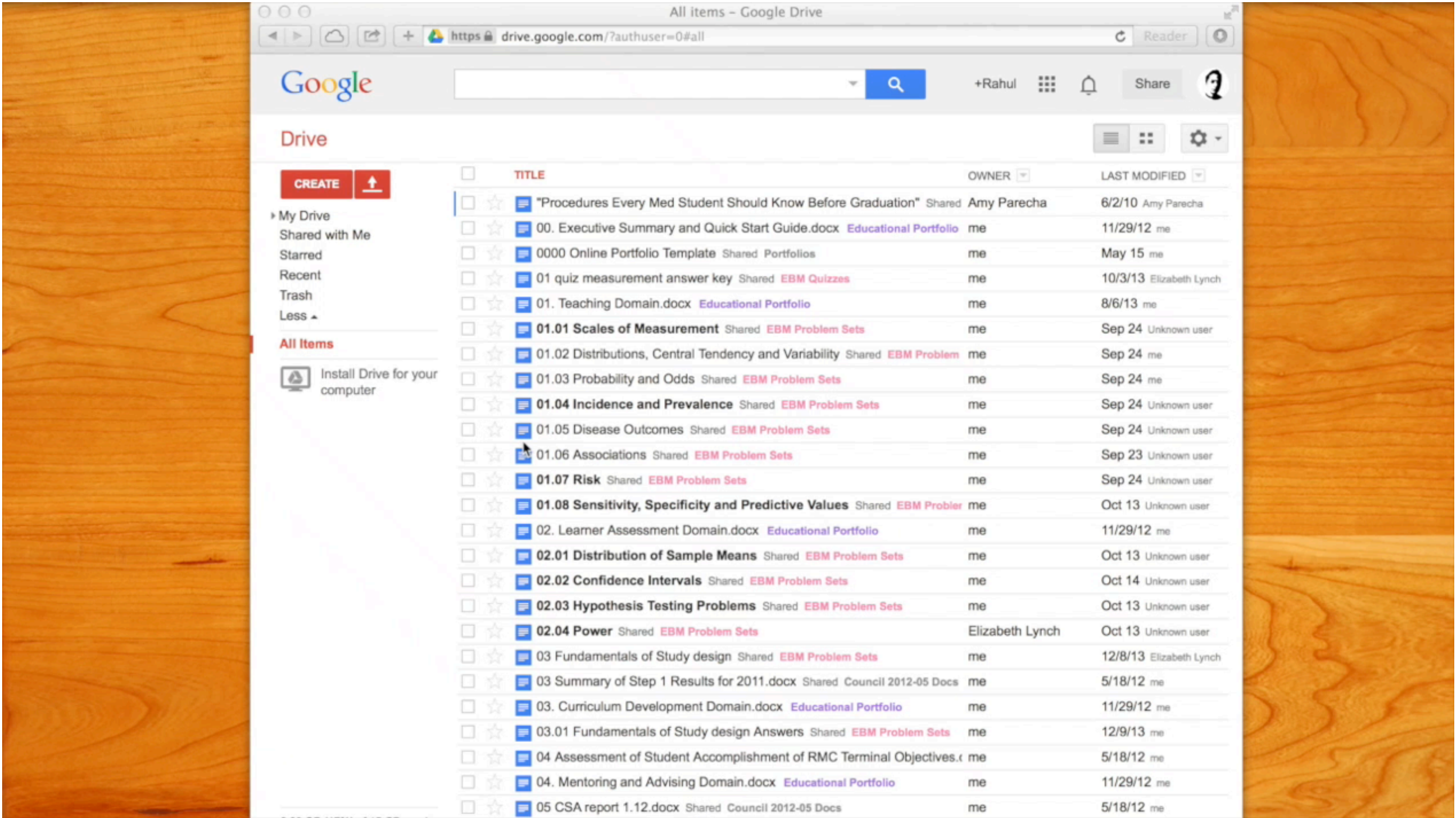
☐ 24-hour trauma surgeon

☐ Nurse practitioner run emergency department

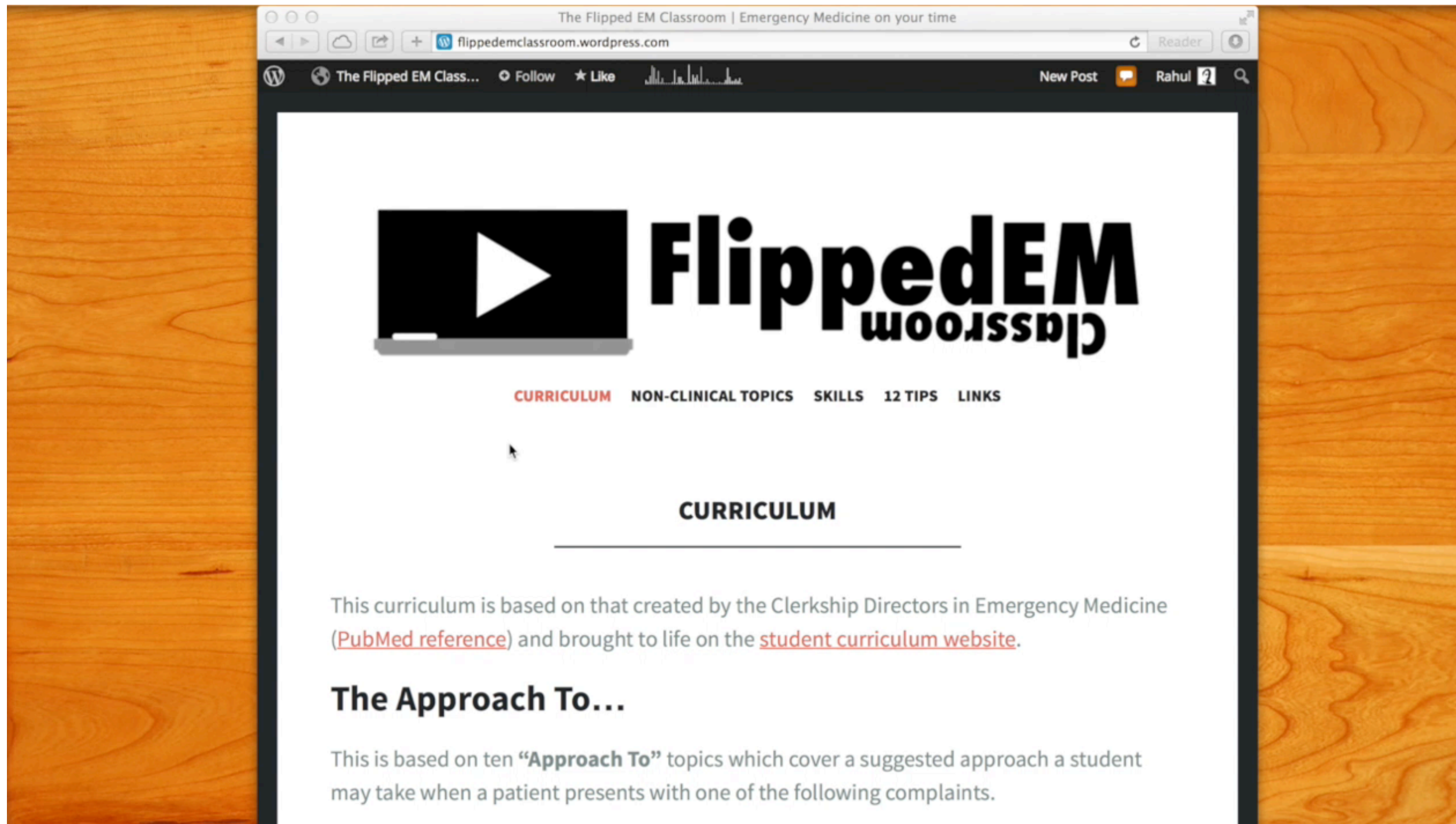
Add item

May not show this slide and the next one, just have them here in case we need filler.

Use Google Forms to embed quizzes



Use WordPress to embed quizzes



A large, stylized purple number 9 is positioned in the background, centered behind the text. It has a thick stroke and a circular top loop.

Design Classroom Activities

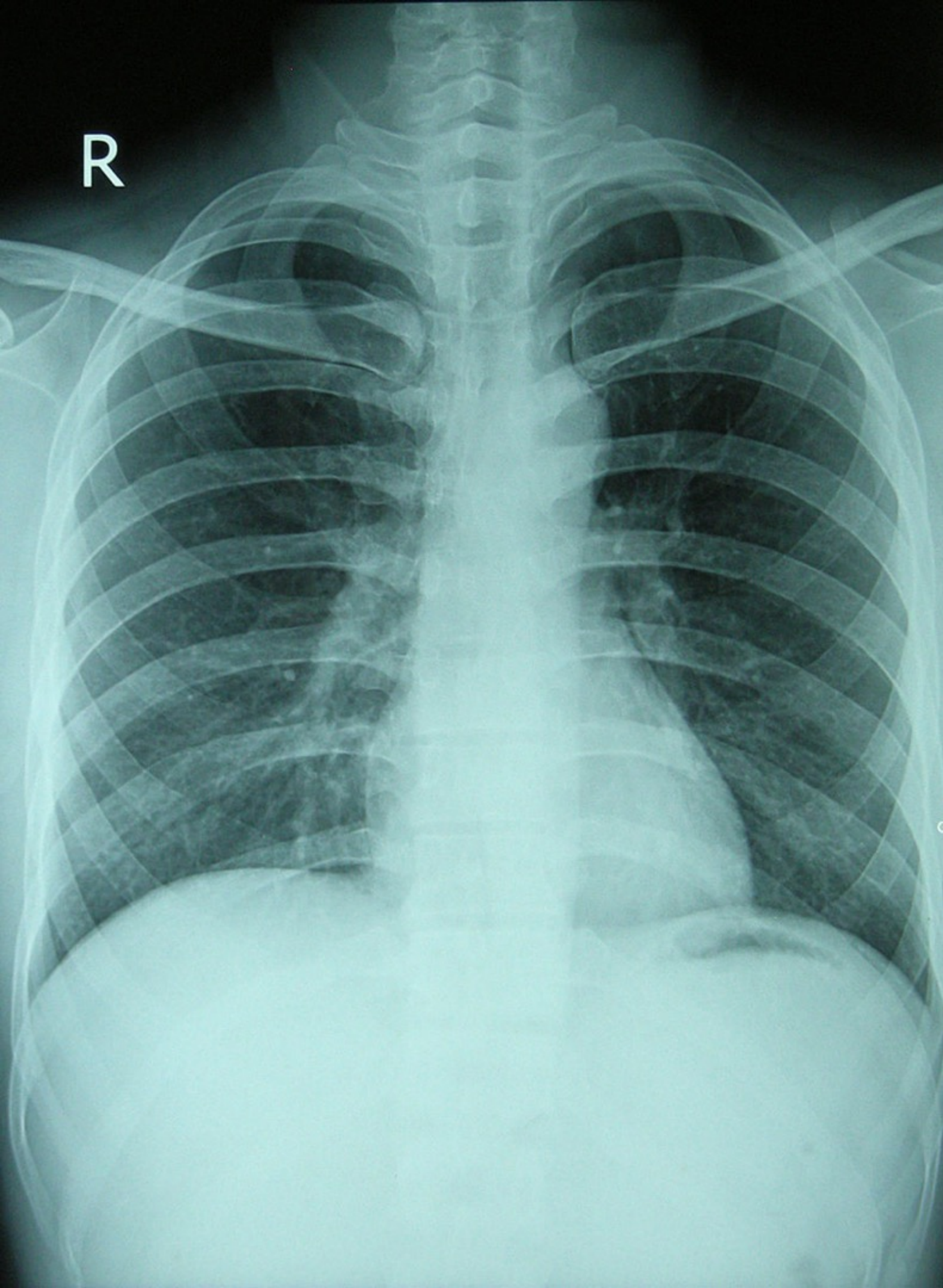
Tie in with your higher-order objectives

		APPLICATION & PROBLEM SOLVING			
REMEMBER	UNDERSTAND	APPLY	ANALYZE	EVALUATE	CREATE
List, Name, Identify, Show, Define, Recognize, Recall, State, Visualize	Summarize, Explain, Interpret, Describe, Compare, Paraphrase, Differentiate, Demonstrate, Classify	Solve, Illustrate, Calculate, Use, Interpret, Relate, Create, Manipulate, Apply, Modify	Analyze, Organize, Deduce, Contrast, Compare, Distinguish, Discuss, Plan, Devise	Evaluate, Choose, Estimate, Judge, Defend, Criticize	Design, Hypothesize, Support, Schematize, Write, Report, Justify
lecture, visuals, video, audio, examples, illustrations, analogies	questions, discussion, review, test, learner presentation, writing	exercises, practice, demos, projects, sketches, simulation, role play	problems, exercises, case studies, critical incidents, discussion	case studies, critiques, appraisals	projects, develop plans, construct simulations, creative exercises
RECALL / RECOGNITION					

 home modules

in class activities 





Workshop Activity

Create a lesson on reading a CXR

At your tables create an activity to match your higher-order objectives

10

Finish Strong with feedback!



Together we can bring order to the galaxy
If only you knew the power of the Dark Side

- Force is with you – but you are not a Jedi yet
- Join me and I will complete your training
- You can destroy the Emperor (you know this)
 - *It is your destiny*
- I am your father
 - *Search your feelings, you know it's true*
- Together we shall rule the galaxy as father and son
- Come with me, it is the only way.
- It is your destiny

Don't be the Sage on the Stage



Be The Guide On The Side

Feedback drives future performance

