

# Modern Day Medicine Meets Modern Day Learning

## Your Smartphone as a Resource for Lifelong Learning

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Division of Hospital Medicine | OHSU

ACP Oregon 2020 Annual Meeting

# Disclosures

I have received past compensation (> 12 months ago) from the following sources:

- VisualDx - Medical Advisory Board
- Figure1 - Brand ambassador

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# Objectives

--Briefly review educational state of Electronic Health Information Education

--Discover various electronic resources for asynchronous learning & clinical practice

--Explore how smartphone applications can specifically help clinicians in their personal lifelong learning

The “What”

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# “Electronic Health Information”

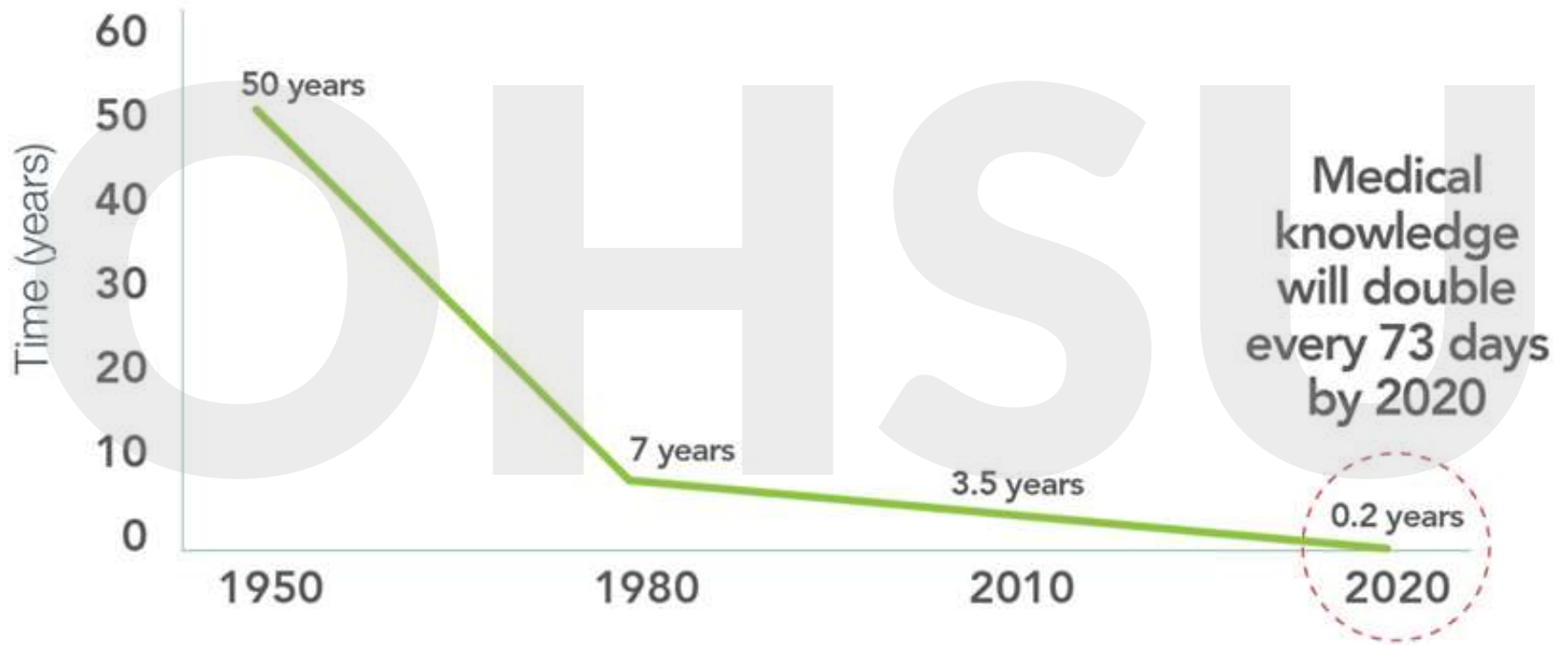
A Blanket term to describe electronic clinical resources

- The Promise: reliable, timely, and evidence based answers to clinical questions.
- Can be accessed through computer, tablet, or smartphone
- Today's Focus:
  - Smartphone based resources
    - “Clinical Decision Support Software”
    - “There’s an app for that”
    - Podcasts

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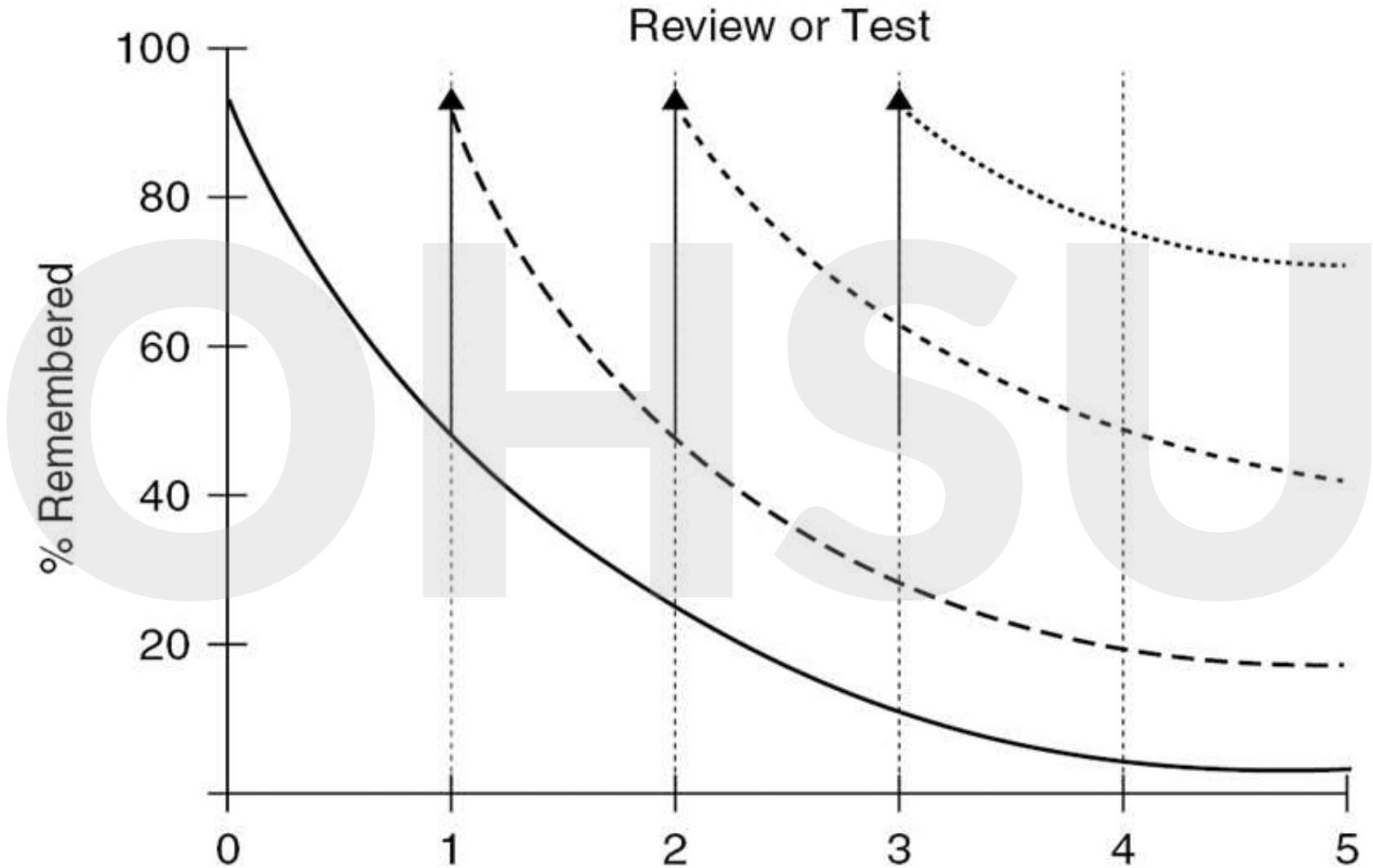
The “Why”

# Time To Double Medical Knowledge Is Decreasing



Graphic source, NCBI, "CHALLENGES AND OPPORTUNITIES FACING MEDICAL EDUCATION"  
Peter Densen, MD, 2011

# Ebbinghaus' Forgetting-Curve





# Extrinsic Motivation

CMEHSMOCC

# OHSU

The “How”

# There is a WRONG way...

**Introduction:** The study objective was to determine the accuracy of answers to clinical questions by emergency medicine (EM) residents conducting Internet searches by using Google. Emergency physicians commonly turn to outside resources to answer clinical questions that arise in the emergency department (ED). Internet access in the ED has supplanted textbooks for references because it is perceived as being more up to date. Although Google is the most widely used general Internet search engine, it is not medically oriented and merely provides links to other sources. Users must judge the reliability of the information obtained on the links. We frequently observed EM faculty and residents using Google rather than medicine-specific databases to seek answers to clinical questions.

**Methods:** Two EM faculties developed a clinically oriented test for residents to take without the use of any outside aid. They were instructed to answer each question only if they were confident enough of their answer to implement it in a patient-care situation. Questions marked as unsure or answered incorrectly were used to construct a second test for each subject. On the second test, they were instructed to use Google as a resource to find links that contained answers.

**Results:** Thirty-three residents participated. The means for the initial test were 32% correct, 28% incorrect, and 40% unsure. On the Google test, the mean for correct answers was 59%; 33% of answers were incorrect and 8% were unsure.

**Conclusion:** EM residents' ability to answer clinical questions correctly by using Web sites from Google searches was poor. More concerning was that unsure answers decreased, whereas incorrect answers increased. The Internet appears to have given the residents a false sense of security in their answers. Innovations, such as Internet access in the ED, should be studied carefully before being accepted as reliable tools for teaching clinical decision making. [West J Emerg Med. 2011;12(4):442–447.]

# But No Agreed Upon “Best” Way

[Cochrane Database of Systematic Reviews](#)

## Interventions to increase the use of electronic health information by healthcare practitioners to improve clinical practice and patient outcomes

Cochrane Systematic Review - Intervention | Version published: 14 March 2015 [see what's new](#)

<https://doi.org/10.1002/14651858.CD004749.pub3>

### Key results

The results of this review showed that **when provided with a combination of EHI and training, practitioners used the information more often.** Two studies measured doctors' use of electronic treatment guidelines, but showed that the **electronic aspect of the guidelines did not mean that doctors followed the guidelines.** This review provided no information on whether more frequent use of EHI translated into improved clinical practice or whether patients were better off when doctors or nurses used health information when treating them.



## RESEARCH ARTICLE

# Improved patient satisfaction and diagnostic accuracy in skin diseases with a Visual Clinical Decision Support System—A feasibility study with general practitioners

## Abstract

Patient satisfaction is an important indicator of health care quality, and it remains an important goal for optimal treatment outcomes to reduce the level of misdiagnoses and inappropriate or absent therapeutic actions. **Digital support tools for differential diagnosis to assist clinicians in reaching the correct diagnosis may be helpful, but how the use of these affect patients is not clear.** The primary objective of this feasibility study was to investigate patient experience and satisfaction in a primary care setting where general practitioners (GPs) used a visual clinical decision support system (CDSS) compared with standard consultations. Secondary objectives were diagnostic accuracy and length of consultation. Thirty-one patients with a dermatologist-confirmed skin diagnosis were allocated to consult GPs that had been randomized to conduct either standard consultations (SDR,  $n = 21$ ) or CDSS ( $n = 16$ ) on two separate study days one week apart. All patients were diagnosed independently by multiple GPs ( $n = 3–8$ ) in both the SDR and CDSS study arms. Using the CDSS, more patients felt involved in the decision making ( $P = 0.05$ ). In addition, more patients were exposed to images during the consultations ( $P = 6.8e-27$ ), and 83% of those that were shown images replied they felt better supported in the consultation. **The use of CDSS significantly improved the diagnostic accuracy (34%,  $P = 0.007$ ), and did not increase the duration of the consultation (median 10 minutes in both arms).** This study shows for the first time that compared with standard GP consultations, CDSS assist the GP on skin related diagnoses and improve patient satisfaction and diagnostic accuracy without impacting the duration of the consultations. This is likely to increase correct treatment choices, patient adherence, and overall result in better healthcare outcomes.

In Short:

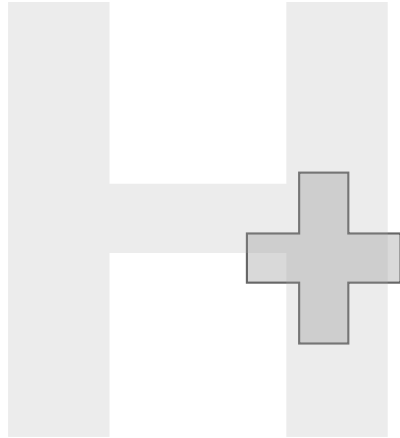
START

SOMEWHERE

OH SU

# Smartphone Prescription

1. Be “fluent” with at least one “all inclusive” reference application
1. Have at least one “case based” learning method on your smartphone that is used at least weekly
1. Extra Credit:
  - a. Explore niche applications to expand knowledge in areas of weakness
  - b. Subscribe to podcasts to passively expand knowledge





“All inclusive” Point-  
of-Care  
Clinical Decision  
Support Software

# UpToDate<sup>®</sup>

## Beneficial Features:

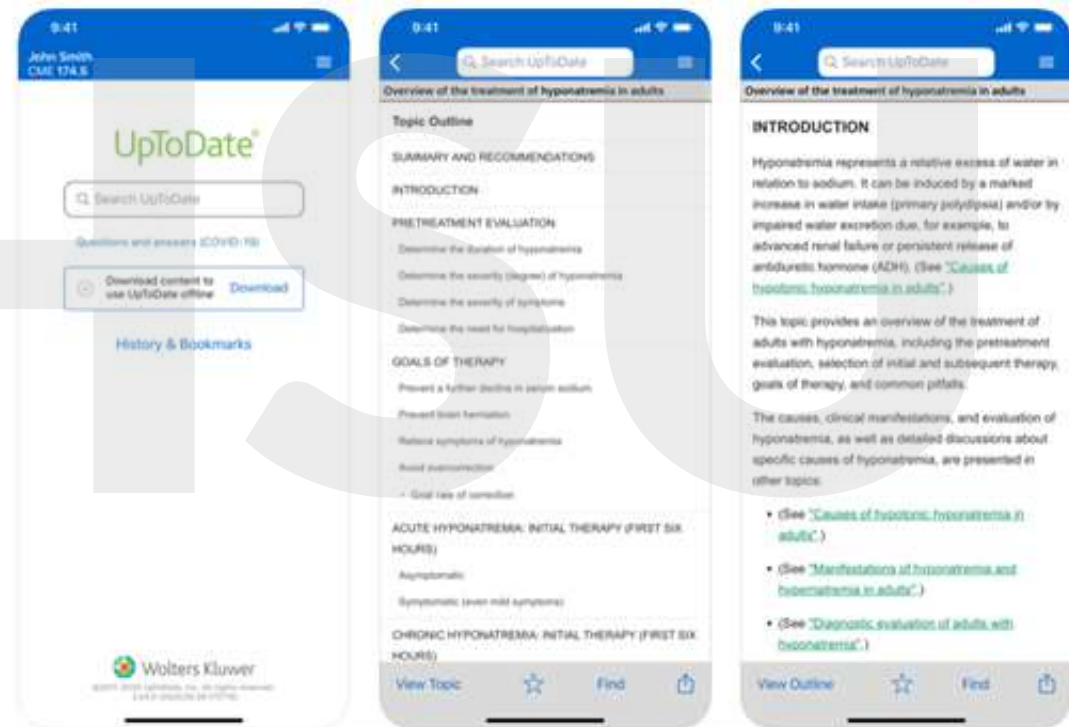
- Comprehensive & provides citations to primary literature
- Has infiltrated the market at is ubiquitously recognized (Is used on “open book” formats for some medical boards)
- Lexicomp drug reference

## Caveats:

- Recommendations are often “expert opinion”

Educational Credit: CME & and ABIM MOC available

Cost: \$519+ / yr (individual physician subscription)



# DynaMed Plus

## Beneficial Features:

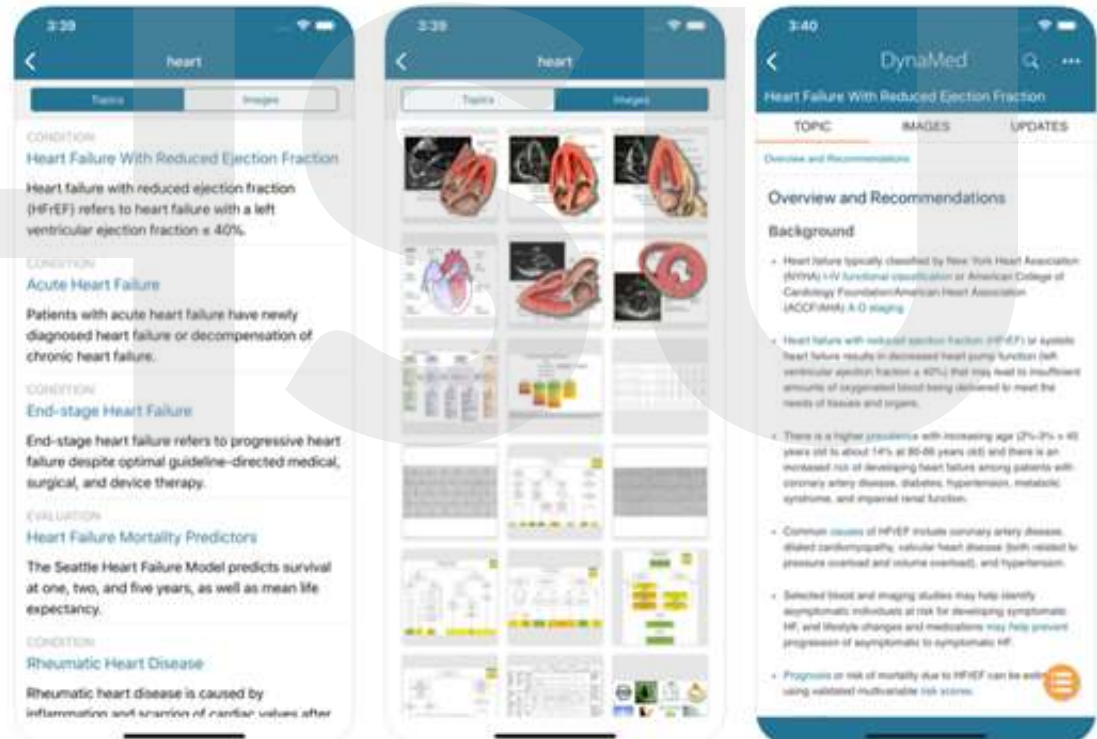
- Good for brief, succinct pearls about conditions
- “Goldilocks” amount of info - not too much, not too little
- Often written in collaboration with guideline committees/orgs

## Caveats:

- Bullet point style leaves off some nuanced discussion

Educational Credit: CME & and ABIM MOC available

Cost: \$395/yr for individual physicians, free with ACP membership



# BMJ Best Practice

## Beneficial Features:

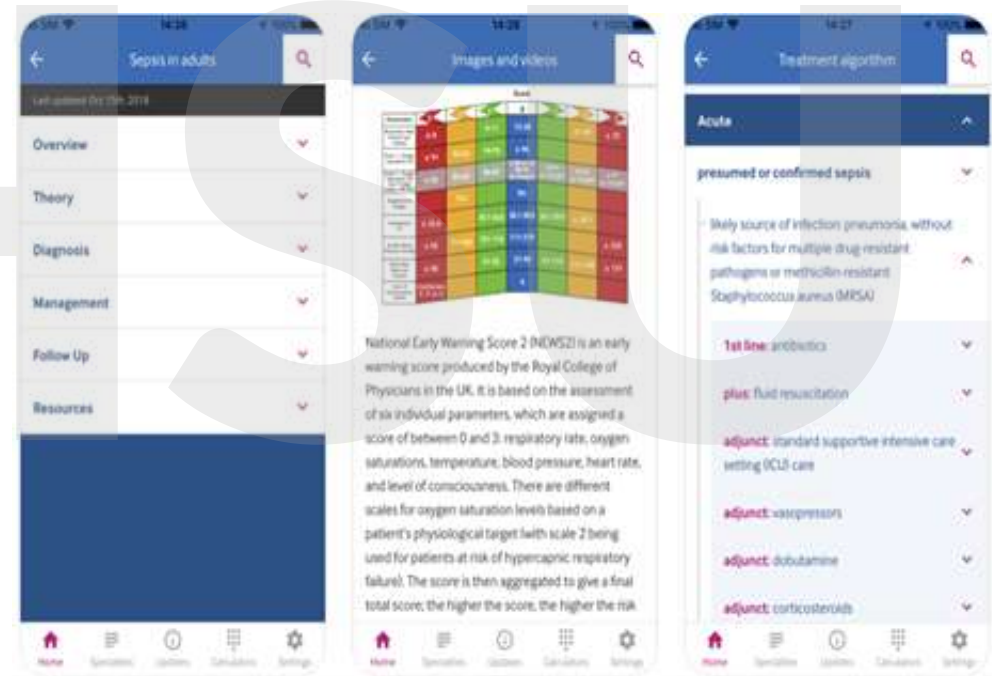
- Good for brief, succinct pearls about conditions, treatment
- Succinct in content
- Great User interface & very clinically focused

## Caveats:

- Does not readily provide primary literature citations
- Not as much content compared to Dynamed/Up to Date

Educational Credit: Up to 20 hrs AAFP CME available (In theory AMA CME as well)

Cost: ~ \$300 /yr for individual physicians subscribers





### Beneficial Features:

- The gold standard for dermatology applications
- Most pictures of reference applications
- DDx Engine

### Caveats:

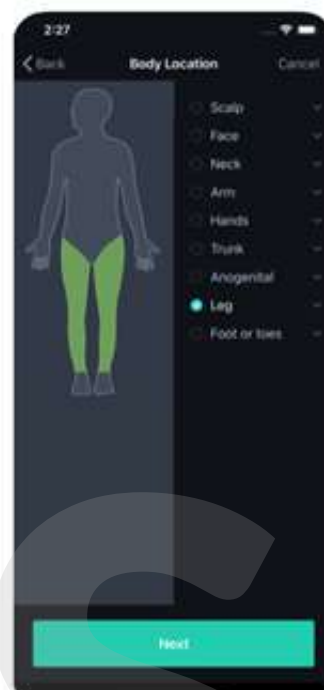
- Less robust evidence based compared to others :all inclusive” reference

### Educational Credits:

CME for individual subscribers

### Cost:

\$399 + / yr for individual physician subscribers



epocrates<sup>®</sup>  
an athenahealth service

Free basic version (pill identifier, pharmacopoeia with dosing)

Premium version with robust clinical engine

Beneficial Features:

- Very easy to use at point of care
- Lowest cost
- Has a built in “alternative medicine” reference

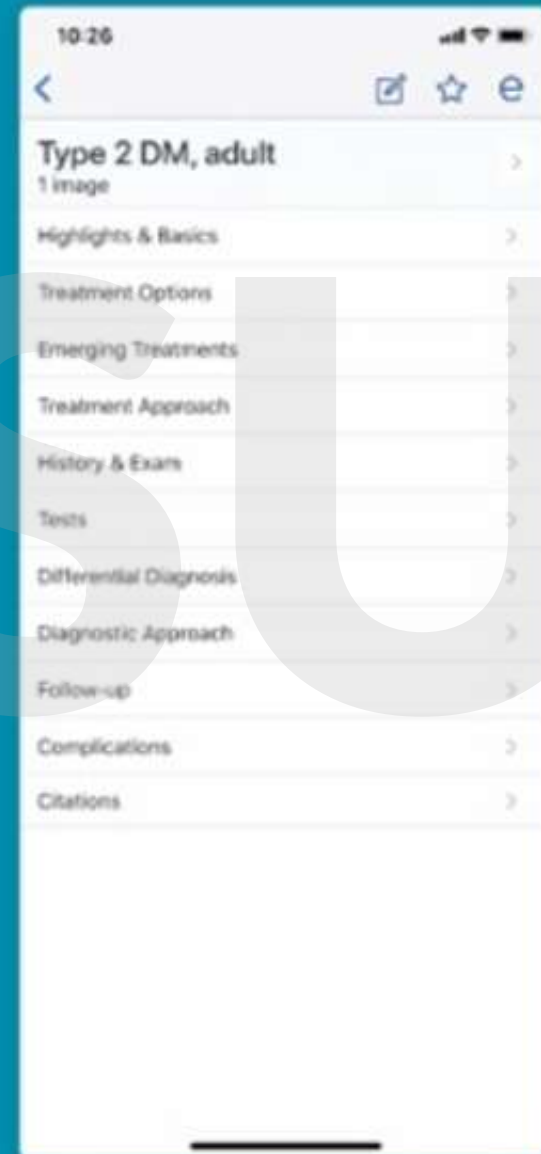
Caveats:

- Pharmacists more leery about credibility of pharmacopoeia
- less robust evidence based compared to others in this section

Educational Credits: No CME

Cost: \$399 + / yr

Review expert disease content  
from the BMJ



# Case Based Learning

OHIO STATE UNIVERSITY



# ACP | MKSAP<sup>®</sup> 18

## Description:

Long-standing resource for exam-prep and CME for internal Medicine offered by American College of Physicians

## Beneficial Features:

- App has good interface
- Can get through a few questions/cases in just a few minutes
- Great for long elevator rides

## Caveat:

- Quite heavy on outpatient knowledge for full-time hospital medicine based practitioners

Educational Credit: CME & and ABIM MOC available

Cost: \$639 (\$479 ACP members) for digital only subscriptions





THE HUMAN DIAGNOSIS PROJECT  
One open system. For all of humankind. Together.

(also referred to as “Human Dx”)

### Description:

“The Human Diagnosis Project is a worldwide effort, created with and led by the global medical community, to build an open intelligence system that maps the steps to help any patient. “

### Focus

- Clinical Reasoning
- Illness Script Building

Learning Credits: Working towards providing CME (not yet)

Cost: Free

Verizon 00:04 40%

Finding 1 of 7

### 66-year-old man with encephalopathy

Created by Zaven Sargayan  
PM in Internal medicine, Baylor College of Medicine

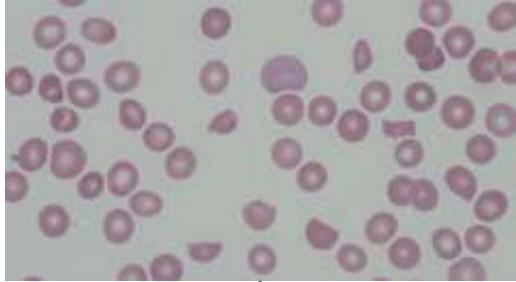
Findings

**1. Confusion**

- Onset: 3 days
- Associated with: Urinary incontinence
- Associated with: auditory hallucination

- What's the updated differential diagnosis?
1. Wernicke's encephalopathy
  2. Alcohol Withdrawal Syndrome
  3. Nutrition deficiency due to a part...
  4. Delirium due to known physiologic...
  5. Urinary tract infection
  6. Nontraumatic subdural hemorrhage
  7. Cerebral infarction
  8. CAA - Cerebral amyloid angiopathy
  9. Encephalitis
  10. Brain abscess
  11. Normal pressure hydrocephalus

4. Hgb 9.4, platelets 8, WBC 4.8 with normal differential. INR 1.2, PTT 29. Cr 1.2.



What's the initial differential diagnosis?

1. Urinary tract infection
2. Delirium due to known physiologic...
3. Alcohol Withdrawal Syndrome
4. Wernicke's encephalopathy
5. Nutrition deficiency due to a part...
6. Nontraumatic subdural hemorrhage
7. Normal pressure hydrocephalus
8. Cerebral infarction
9. CAA - Cerebral amyloid angiopathy
10. Encephalitis
11. Add diagnosis

NEXT FINDING

### 66-year-old man with encephalopathy

Created by Zaven Sargayan  
PM in Internal medicine, Baylor College of Medicine

Findings

**1. Confusion**

- Onset: 3 days
- Associated with: Urinary incontinence
- Associated with: auditory hallucination

**2. Gait instability**

**3. Medical History: Substance use disorder**

- Active use of heroin, marijuana, alcohol, cocaine

THE DIAGNOSIS

## Thrombotic thrombocytopenic purpura

It's an easy first differential diagnosis  
ADDED after 7 findings revealed

VIEW ALL ACCEPTED ANSWERS

Teaching points

- Case resolution: He received FFP and steroids overnight, and plasma exchange (PLEX) the following day. His symptoms resolved after 1 session. Two months later he had a relapse and was treated with rituximab.
- Diagnostic reasoning: it is helpful to consider the "discerning features" of an illness. For instance: anemia, thrombocytopenia, confusion, and renal dysfunction occur very frequently in sepsis. The discerning feature in thrombotic microangiopathies (TMAs) is intravascular hemolysis, appreciated quickly by noting schistocytes on the peripheral smear.



THE HUMAN DIAGNOSIS PROJECT  
One open system. For all of humankind. Together.

Apple App Store



Android App Store



# Figure 1

## Description:

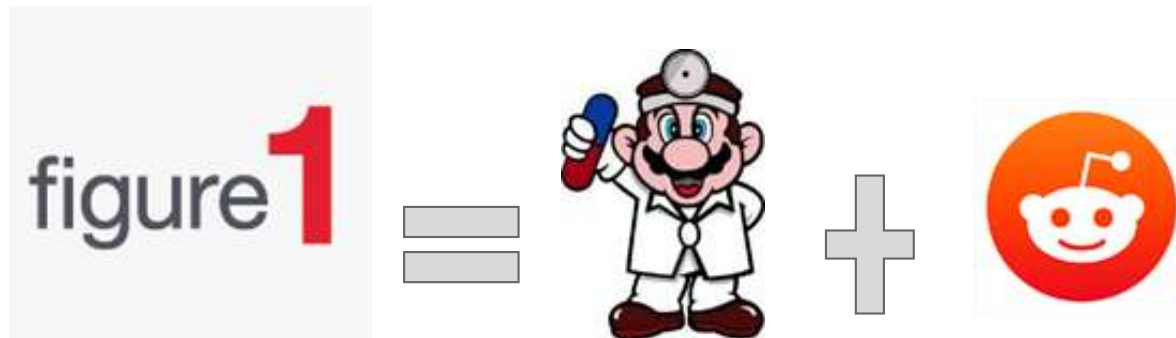
Figure 1's mission is to democratize medical knowledge and improve the future of healthcare.

## Focus

- Clinical image sharing
- Crowdsourcing Medical Questions

Learning Credits: No CME/MOC available

Cost: Free





**T** **iburress**  
Paramedic

Follow

This case is from a DOA any idea what may have caused this reaction?

**daleeni** Family Medicine 23.8k

That's venous marbling. It develops post mortem when hydrogen sulphide produced by bacteria reacts with hemoglobin from lysed erythrocytes. It's part of the decomposition process (edited)

Like • 96 Reply

**vandygirl** Nurse Practitioner

Iron deposits from venous pooling in Rigor Mortice vessels from the arm lying supine for a prolonged time then turned prone : large vessels in arms and capillary beds in fingers

Like Reply

**daleeni** Family Medicine 23.8k

Venous pooling and eventual extravasation of erythrocytes cause livor mortis, which is what I suspect you are referring to. This isn't that. Lm doesn't have the 'veiny' marbling pattern we see here.

Like • 14 Reply

**NelsonMa\_PA-S** Physician Assistant Student

Is it possible that MSM (or similar) is the causative and not bacterial? (edited)

Like Reply

**daleeni** Family Medicine 23.8k

In theory that is certainly possible. A quick search didn't yield any literature to that effect but I didn't search very comprehensively.

Like • 2 Reply

**NelsonMa\_PA-S** Physician Assistant Student

Venous SulphHb dyshemoglobinemia. Due to sulphur binding from drug or H2S poisoning.

Like • 21 Reply

Search

### PAGING AN INTERNAL MEDICINE RESIDENT

View 73 Paging Cases



rolojo81

Internal Medicine and Subspecialties Resident

✓ Verified Physician 📍 OR

Impact Factor

2,710

Boost My Impact Factor

Internal Medicine Resident interested in Med Ed & Infectious Diseases:

Interests

Education, Medical Education, Medical, Graduate

Education, Medical, Undergraduate + 5

Edit Profile

### Saved Cases

56 CASES



Internal Medicine and Subspecialties Res...

### Cases in this collection



figure 1

Apple App Store



Android App Store





# #TwitterReport



## Description:

- Physicians at Pittsburgh lead a semi-synchronous case discussion on twitter
- Follow their account and monitor twitter

Downside: requires twitter account and must check regularly



### MedEd Pittsburgh

@MedEdPGH Follows you

Some Pittsburgh doctors with smart friends learn medical stuff and teach it back to the world. [#TwitterReport](#) [#PhysioQuizzo](#) Posts don't replace medical advice.

 Pittsburgh, PA

 Joined May 2017



<https://twitter.com/MedEdPGH/status/1151506163483238400>



# Helpful Niche Applications

OHIO STATE UNIVERSITY

# Microbiology and Antibiotics

## Beneficial Features:

- Succinct background, evaluation, empiric antibiotic selections
- Both are well supported with evidence with links to literature

*The Hopkins app seems to be a little more “inclusive” on all the information you could want on a topic at the expense of being a little more difficult to navigate comparatively to Sanford*

Cost: \$29+ / yr



Apple App Store



Android App



Apple App Store



Android App



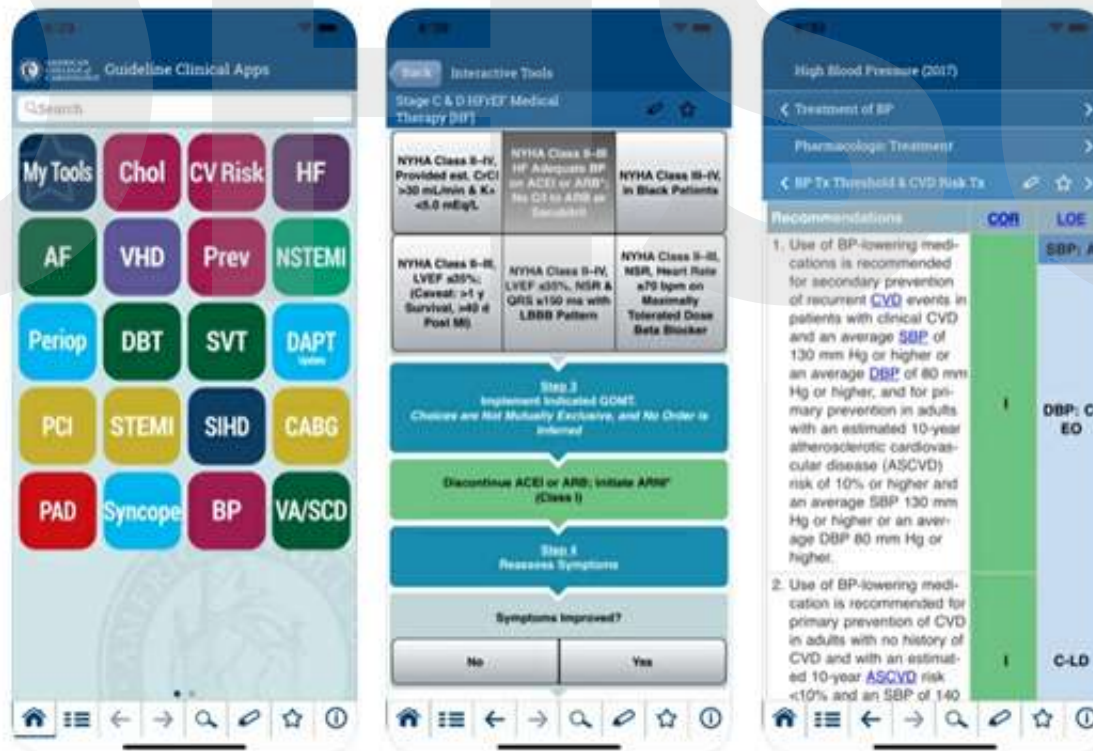
# Cardiology: ACC “Guideline App”

## Beneficial Features:

- One of the most user friendly and actually “helpful” guideline apps on the market
- Includes many Dx & Tx algorithms based on ACC guidelines

Cost: Free

Apple App Store



Google Play

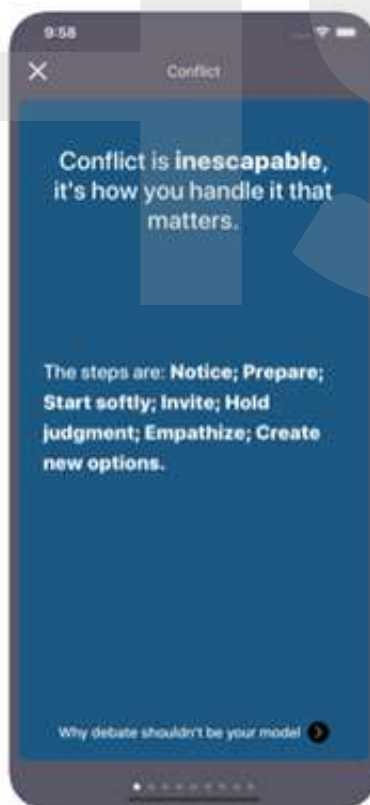


# Palliative & Hospice Care: Vital Talk Tips

## Beneficial Features:

- Provide very useful language/scripts surrounding difficult conversations
- Has updates on how to address difficult questions re: COVID-19

Cost: Free



Apple App Store



Android App



# MD Calc

## Beneficial Features:

- Have access to hundreds of clinical calculators and scoring systems (NIH stroke scale, MELD, Pneumonia Severity Index, etc) even when not connected to internet

Cost: Free (with free registration), can pay to earn CME



Apple App Store



Android App





# Canopy Speak

## Beneficial Features:

- Medical interpreter app co-produced by NIH
- Quick reference for “yes/no” style questions for dozen + languages
- Integrates with Translator services

## Cost: Free



Apple App Store



Google Play

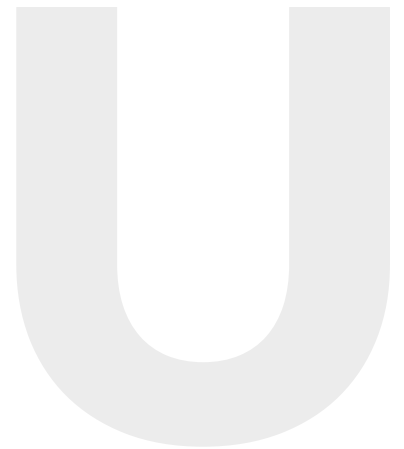


# Visualmed

## Features:

- Visual abstract formats of landmark trials
- Can sort by specialty or year

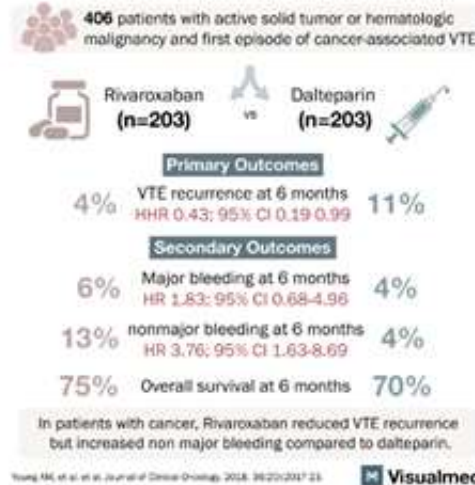
Cost: \$4.99 once



Apple App Store



Google Play



EBM diagnosis

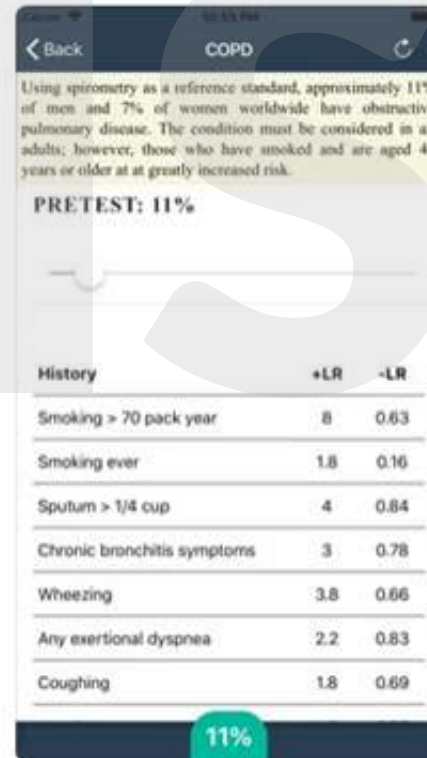
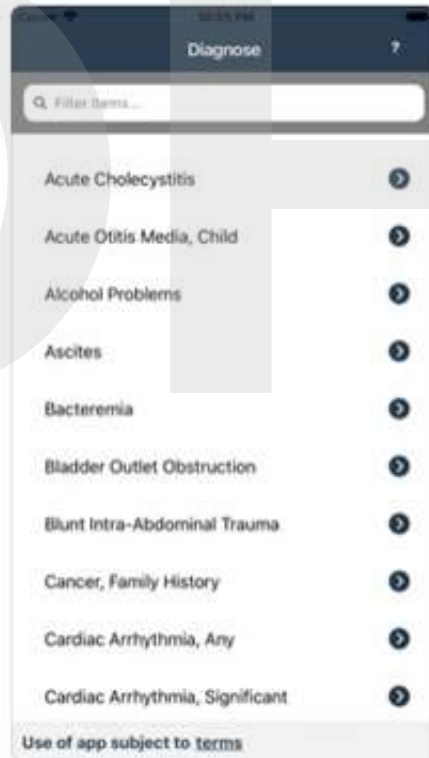


# Diagnose

## Features:

- Consolidates the JAMA Rational Clinical exam series into an application to guide Bayesian diagnostic approach

Cost: free



Apple App Store



Google Play

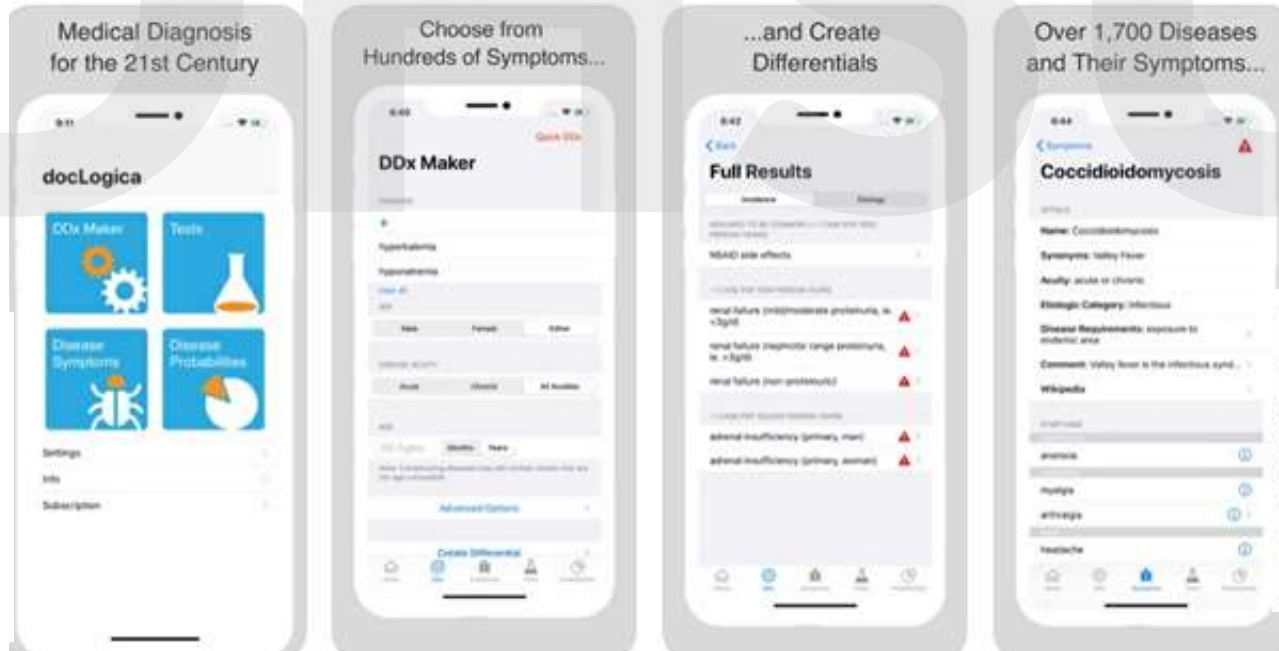


# DocLogica

## Features:

- Very robust database of physical exam / history findings and their likelihood ratios
- Has a differential diagnosis engine

Cost: \$9.99 / yr



Apple App Store



Google Play

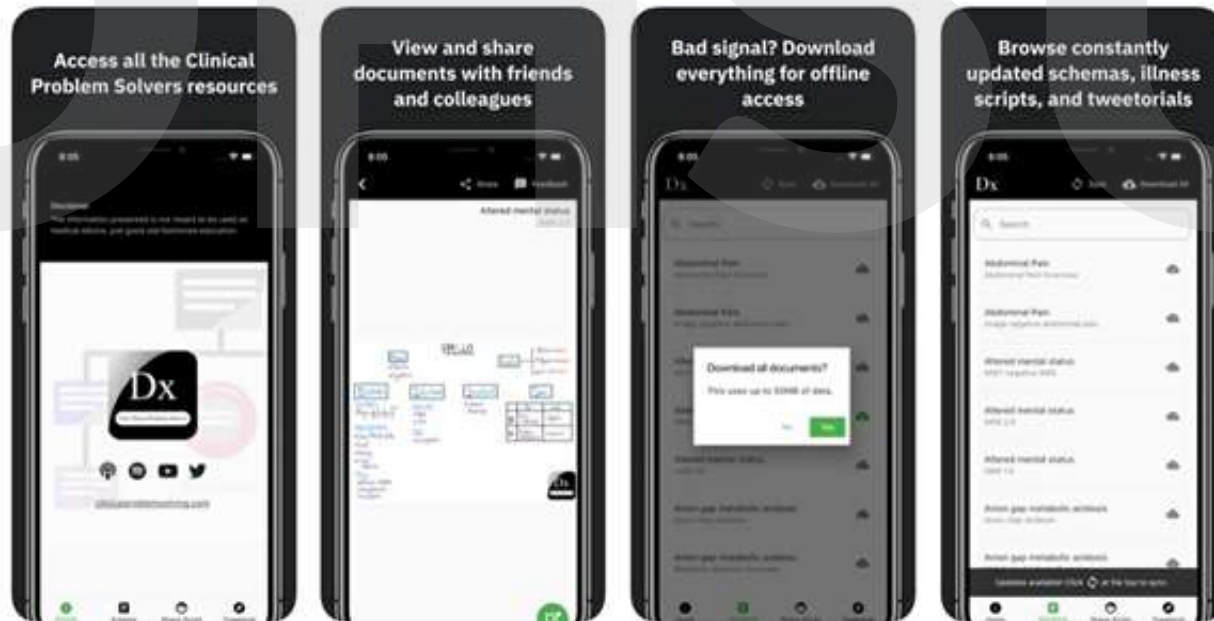


# Clinical Problem Solvers

## Features:

- Growing list of diagnostic frameworks - originates from the podcast “Clinical Problem Solvers”

Cost: \$9.99 (free on the website)



Apple App Store

Google Play



Master your  
POCUS

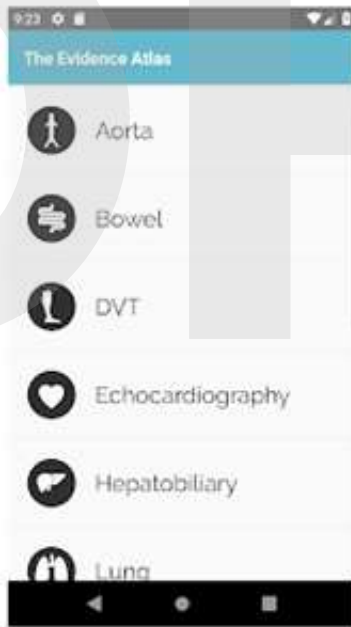
OHSU

# Evidence Atlas

## Beneficial Features:

- Synthesizes the diagnostic utility of specific Point-of-care Ultrasound findings
- Links to citations and brief image library

Cost: Free



Apple App Store



Google Play

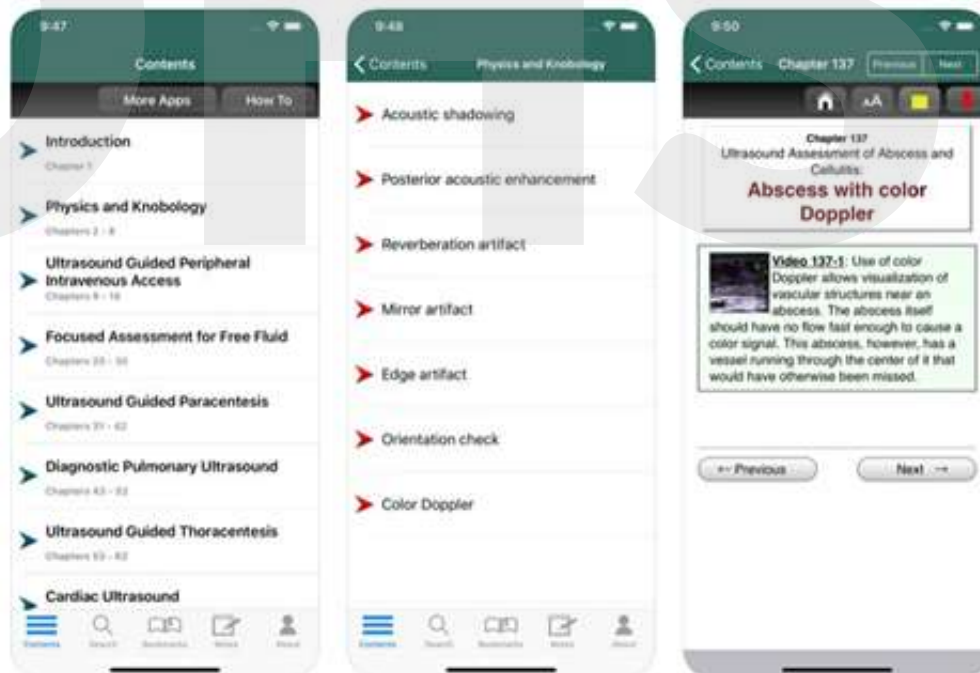


# Videos for POCUS: Ultrasound

## Beneficial Features:

- An app meant as an adjunct for a textbook but can be used as a stand-alone quick POCUS reference library

Cost: Free



Apple App Store



Google Play



Podcasts

OHHSU



# Get Your Knowledge Food with a Side of CME/MOC



## The Curbsiders Internal Medicine Podcast

Matthew Watto MD, Stuart Brigham MD,  
Paul Williams MD

CME/MOC



## Bedside Rounds

Adam Rodman, MD, MPH, FACP

CME/MOC



## Core IM | Internal Medicine Podcast

Core IM Team

CME/MOC



## Annals On Call Podcast

American College of Physicians

CME/MOC

ACP Online Learning Center:  
Podcasts and Audio Content  
CME & MOC instructions



# Just Really Good Stuff



## The Clinical Problem Solvers

The Clinical Problem Solvers



## This Podcast Will Kill You

Exactly Right



## EMCrit Podcast - Critical Care and Resuscitation

Scott D. Weingart, MD FCCM



## Explore the Space

Mark Shapiro MD



## Plenary Session

Vinay Prasad, MD MPH



## The Nocturnists

The Nocturnists



## Persiflagers Infectious Disease Puscast

Mark Crislip



## IMreasoning

Drs. Art Nahill & Nic Szecket

Now What?

OHIO STATE UNIVERSITY

# Self Educational Rx:

## 1. Clinical Decision Support Software

- a. Have at least one you're comfortable with.
- b. Navigation speed can be a barrier, so fluency will keep you coming back for more learning

## 2. Case Based Learning

- a. Consider setting a case quota (ex. "I will do 1 case per day/week etc")
- b. Find which format appeals to you and your learning style

## 3. Niche Apps can be helpful, but too many can be clutter

- a. A mastercraftsman slowly adds tools to the toolbox over time
- b. Trying to use too many apps all at once is overwhelming...add new ones in slow increments

## 4. Podcasts are a great filler for multitasking

- a. Bike/car commute
- b. Chores at home

# Using Apps for Educational Tools

## Human Dx:

### Diagnostic Reasoning Rounds

Review a case in real time, have everyone on the team work through their differential and share at various points

## Twitter:

#PostItF



Learner D



al

## Physical Diagnosis Rounds:

\_\_\_\_\_ Review a presentation of a classic case, and review how strong/weak diagnostic certainty should be using exam/history: Diagnose or DocLogica

Refer back to this later  
(save the web-link to your phone)

