



AMA Innovations in Medical Education Webinar Series

Precision Education: A conceptual model for Medicine

Sanjay Desai, MD
Charles G. Prober, MD
Marc M. Triola, MD

November 28, 2022

Today's Host



@Maya_Michigan

Maya M. Hammoud, MD, MBA
Senior Advisor, Medical Education Innovation
American Medical Association

Professor and Associate Chair for Education
Obstetrics and Gynecology
University of Michigan Medical School

Objectives



Recognize challenges to learning outcomes due to limited personalization in our current medical education system.



Discuss how precision education can optimize physicians' lifelong learning by personalizing medical education.



Review an example of how precision education can be leveraged to impact broad, high-impact agendas.

Presenter



Charles G. Prober, MD

Professor, pediatrics, microbiology and immunology
Founding executive director, Stanford Center for Health
Education

Senior associate vice provost, health education
Stanford University

Presenter



Sanjay Desai, MD

Chief academic officer
AMA

Presenter



Marc M. Triola, MD

Associate professor, medicine
Associate dean, educational informatics
Director, Institute for Innovations in Medical Education
NYU Grossman School of Medicine
NYU Langone Health

What is your primary responsibility in education?

- UME
- GME
- CME
- Medical Student
- Resident
- Allied health profession
- Not for profit organization
- For profit company
- Other



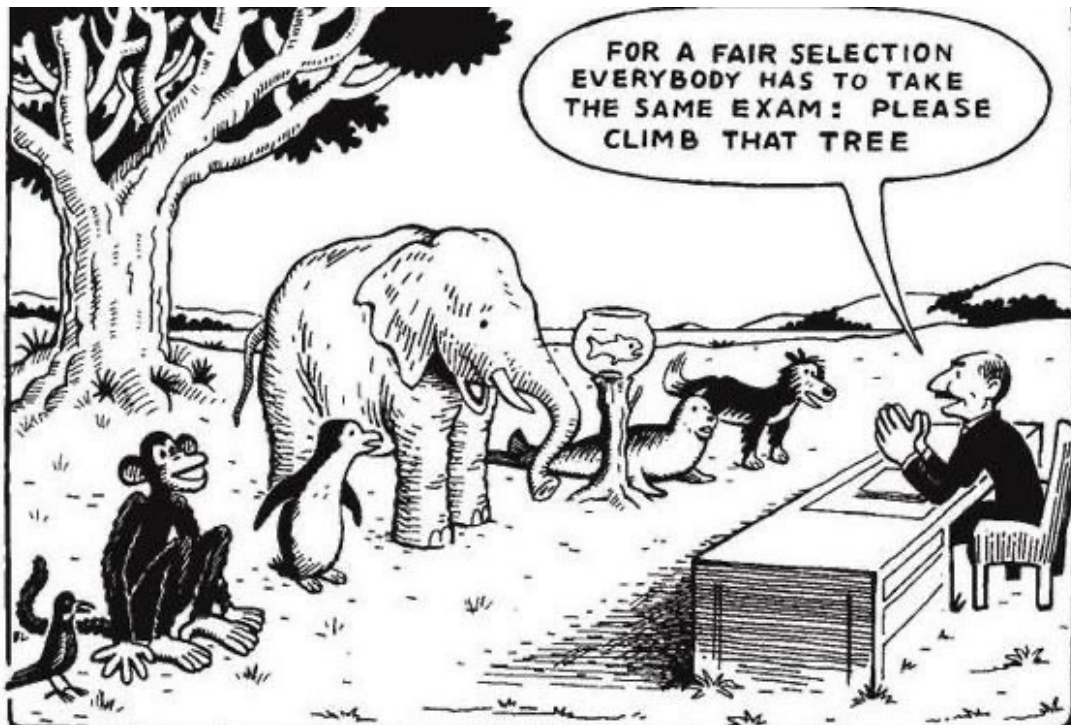
Physicians' powerful ally in patient care



Precision Education: A Conceptual Model for Medicine

Charles G. Prober, Professor, of Pediatrics, Microbiology & Immunology
Senior Associate Vice Provost, Stanford Center for Health Education

Recognize
challenges to
learning outcomes
due to limited
personalization in
our current medical
education system



PRECISION HEALTH

PREDICT, PREVENT, AND CURE TO
ADVANCE HEALTH AND WELL-BEING

LLOYD MINOR
WITH MATTHEW REES

11

The End Game
of Precision
Education is:
Precision
Health



Physicians' powerful ally in patient care

The P Soup of Precision in Health Care

Precise

Personalized

Predictive

Preventive

Preemptive

Prescriptive

Proactive

Precision Medicine

Precise Cures

Precision Health

Precision Education



alamy - PM0E64



Coached



Performance
Analytics





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Overarching Principles

Relevant (to improving health)

Accessible (to learners)

Equitable

Inclusive

Fosters curiosity

Cultivates collaboration

Human centered designed

Medical Education Reimagined: A Call to Action

Charles G. Prober, MD, and Salman Khan

Academic Medicine, Vol. 88, No. 10 / October 2013

Abstract

The authors propose a new model for medical education based on the “flipped classroom” design. In this model, students would access brief (~10 minute) online videos to learn new concepts on their own time. The content could be viewed by the students as many times as necessary to master the knowledge in preparation for classroom time facilitated by expert faculty leading dynamic, interactive sessions where

students can apply their newly mastered knowledge.

The authors argue that the modern digitally empowered learner, the unrelenting expansion of biomedical knowledge, and the increasing specialization within the practice of medicine drive the need to reimagine medical education. The changes that they propose emphasize the need

to define a core curriculum that can meet learners where they are in a digitally oriented world, enhance the relevance and retention of knowledge through rich interactive exercises, and facilitate in-depth learning fueled by individual students’ aptitude and passion. The creation and adoption of this model would be meaningfully enhanced by cooperative efforts across medical schools.

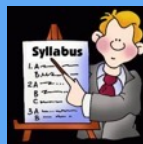
Science-Based, Interactive, Compelling, & Patient-Centered Material



Based upon school's resources & faculty



Core Foundational Principles & Knowledge



Based students'
passions & school's
resources & expertise



Deeper Dives



alamy - PM0E64

GME



Coached

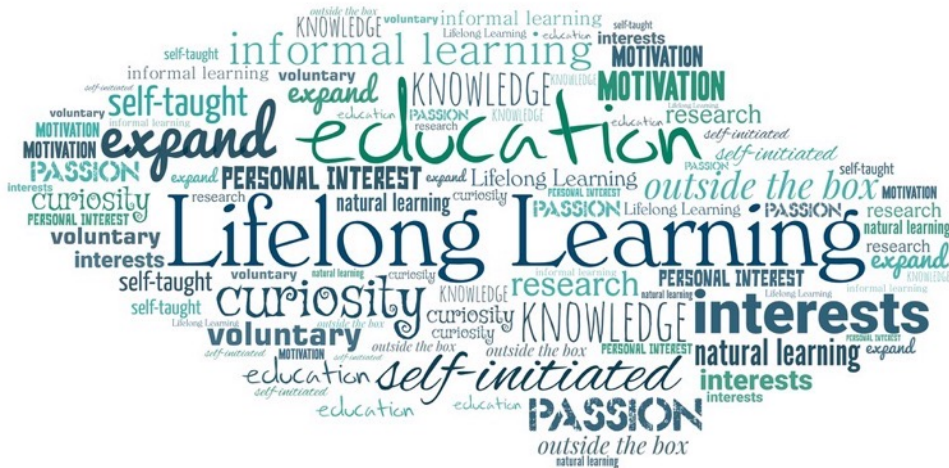


Performance
Analytics

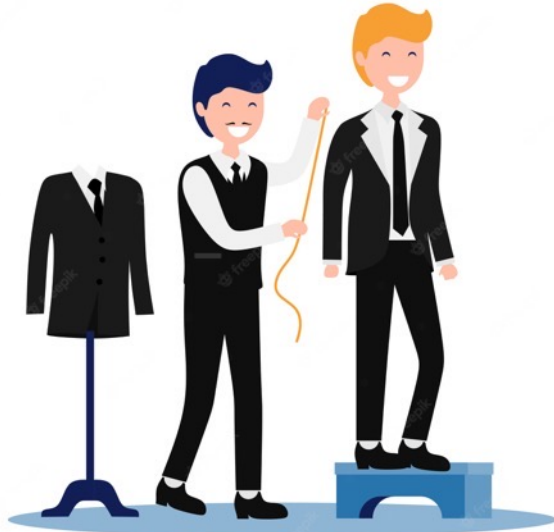


Recognize
challenges to
learning outcomes
due to limited
personalization in
our current medical
education system





Precision Education Aims to Promote





Physicians' powerful ally in patient care

Precision Education

Right Training, Right Physician, Right Time

Sanjay V. Desai, MD MACP

Chief Academic Officer, American Medical Association

Professor of Medicine, Johns Hopkins University

November 28, 2022

*Personalizing
Life Long
Learning*

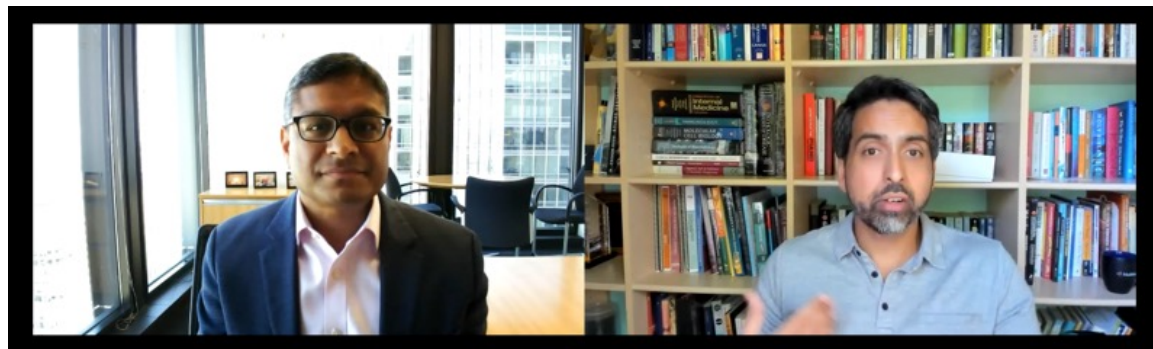


We Convened a Precision Education Summit to Learn More

- 12 nationally recognized leaders in education, healthcare and technology convened to advance a conceptual model of precision education and identify high-impact and near-term opportunities in this area

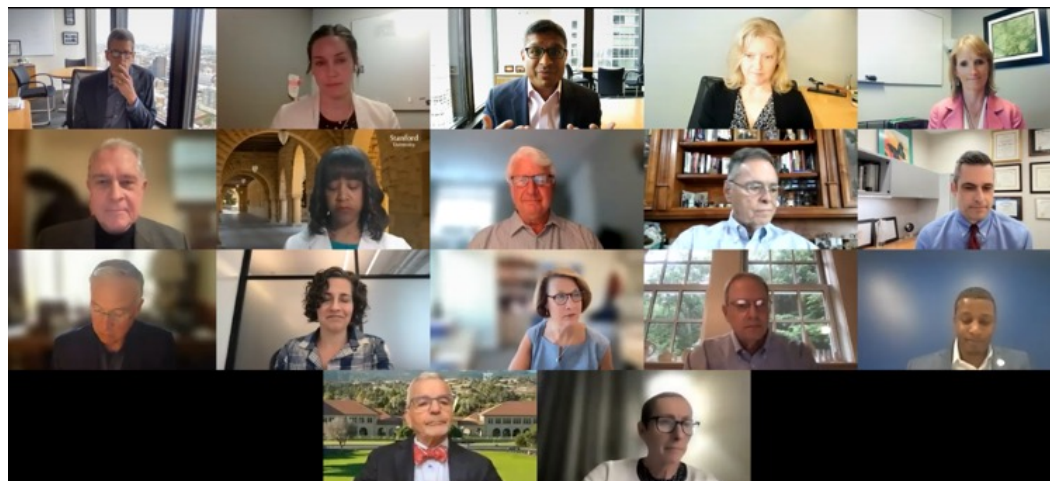
Topics:

- Conceptual model
- Use cases and opportunities
- Structuring and scaling



Sal Khan, Khan Academy

- Peter Clardy, *Google*
- Michael Crawford, *Howard*
- Sara Holoubek, *Luminary Labs*
- Charles Prober, *Stanford*
- Thomas Prudhomme, *Heartland*
- Carla Pugh, *Stanford*
- Fred Sanfilippo, *Emory*
- Marc Triola, *NYU*
- Betty Vandembosch, *Coursera*
- Robert Wachter, *UCSF*
- Ruth Watkins, *Strada Impact*
- James Woolliscroft, *Michigan*



Precision Medical Education

A system transforming lifelong learning by using data and technology to personalize education, increase efficiency, and improve patient outcomes.

Key attributes of innovation in this space:

- Customizes education to optimize care of patients and populations
- Prioritizes learner agency (assessments *with* the learner, not *of* the learner)
- Harmonizes with physician workflow (not an additional burden)
- Incorporates individualized and relevant assessments from dispersed sources
- Promotes learning health systems, coproduced with learners and physicians
- Is designed to be interoperable across health systems
- Uses advancing technologies, including virtual platforms for scale, personalization and reach
- Leverages coaching and adaptive learning principles
- Promotes equity
- Is built for the future

Opportunity: Medical Students

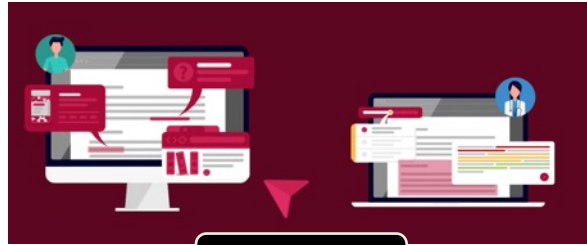
Interactive dashboard with
learner agency and MALF*



Dr. Sarah Kiani

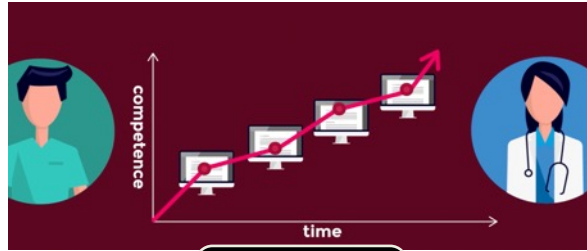
MAENI

MASTER ADAPTIVE EXPERTISE NOTE-WRITING INTERFACE



Student interface

Educator interface



Descriptive and graphical display of the students'



MAENI provides an opportunity to develop clinical reasoning skills using the MAF where each clinical note written becomes a new learning cycle for the student.

Design:

- Programmatic Improvement using PDSA over three cycles.

Duration

- Three successive Internal Medicine third-year medical student clerkships

Population:

- Third-year medical students and their clinical faculty

Outcome:

- Trends for the development of RIME competency
- Trends for the development of student clinical reasoning
- Accuracy, Reliability, and Timeliness of faculty feedback

AI driven Just-In-Time Learning for Students



Dr. Marc Triola

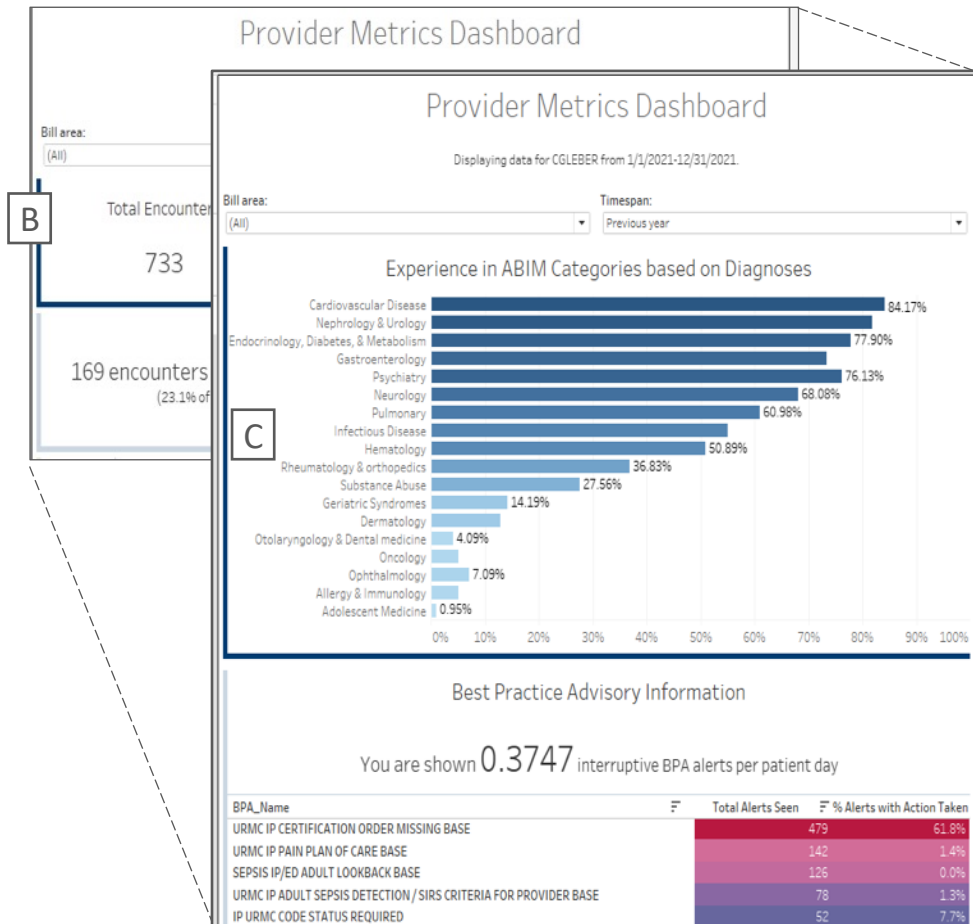
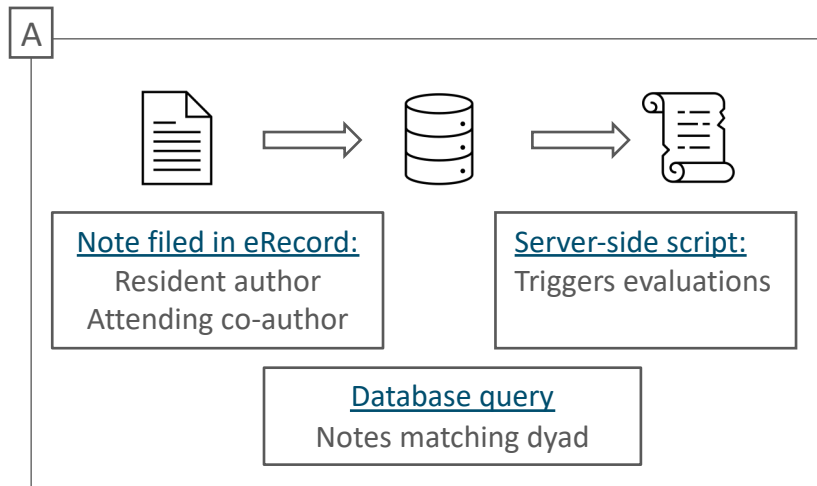
Opportunity: Trainees

Digital ecosystem with practice habits & “nudges”



Dr. Conrad Gleber

University of Rochester Digital Ecosystem



The GEL Study



JOHNS HOPKINS
MEDICINE

Brian Garibaldi
Heather Sateia
Paul O'Rourke
Michael Rosen
Amanda Bertram
Gail Berkenblit
Chris Myers
Erica Johnson
Maddie Rodriguez



Stanford
SCHOOL OF MEDICINE

John Kugler
Maja Artandi
Cati Johnson
Tait Shanafelt
Abraham Verghese
Donna Zulman



Stephen Russell
KeAndrea Titer
Lisa Willett
Stephanie
Sanders
Starr Steinhilber



SOCIETY OF
BEDSIDE MEDICINE

Real Time Location Systems



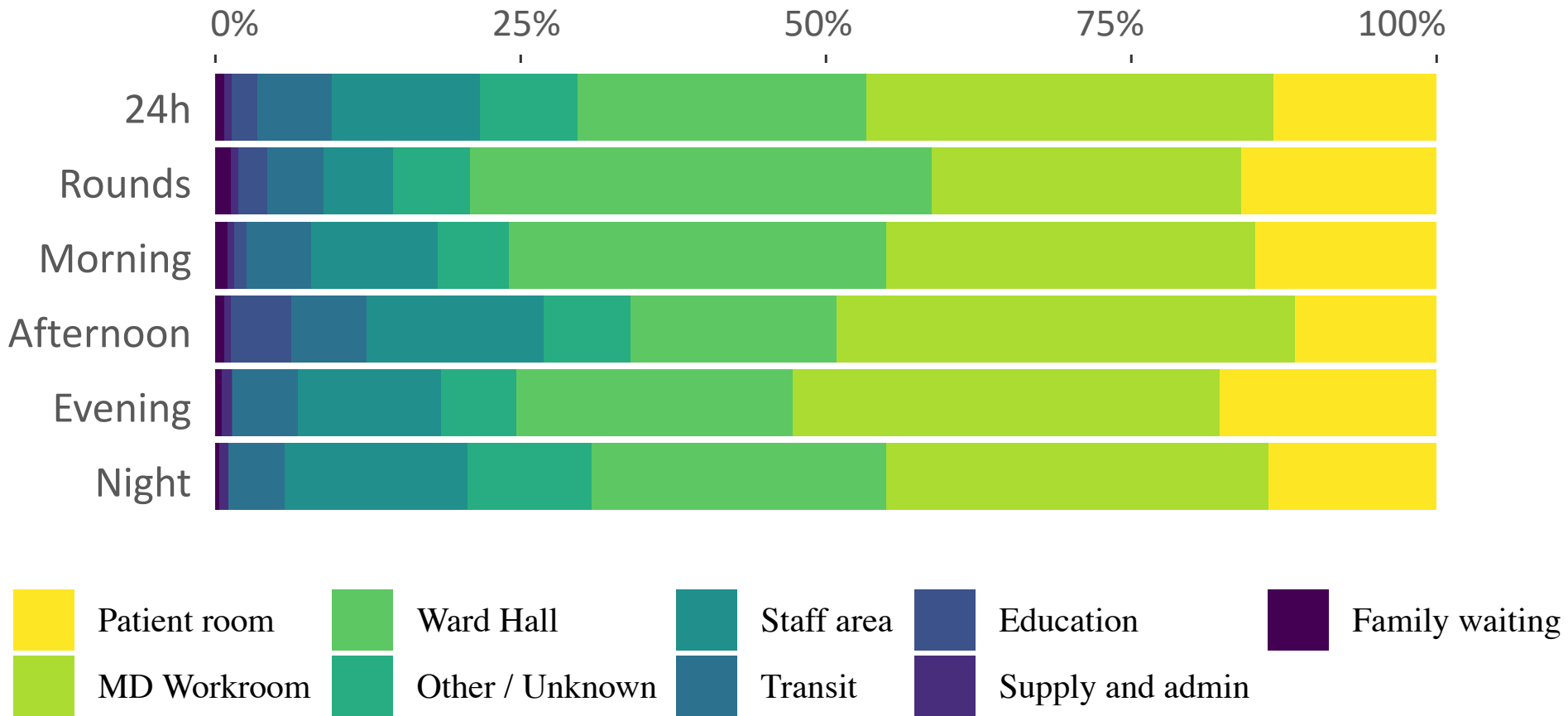
43 interns*

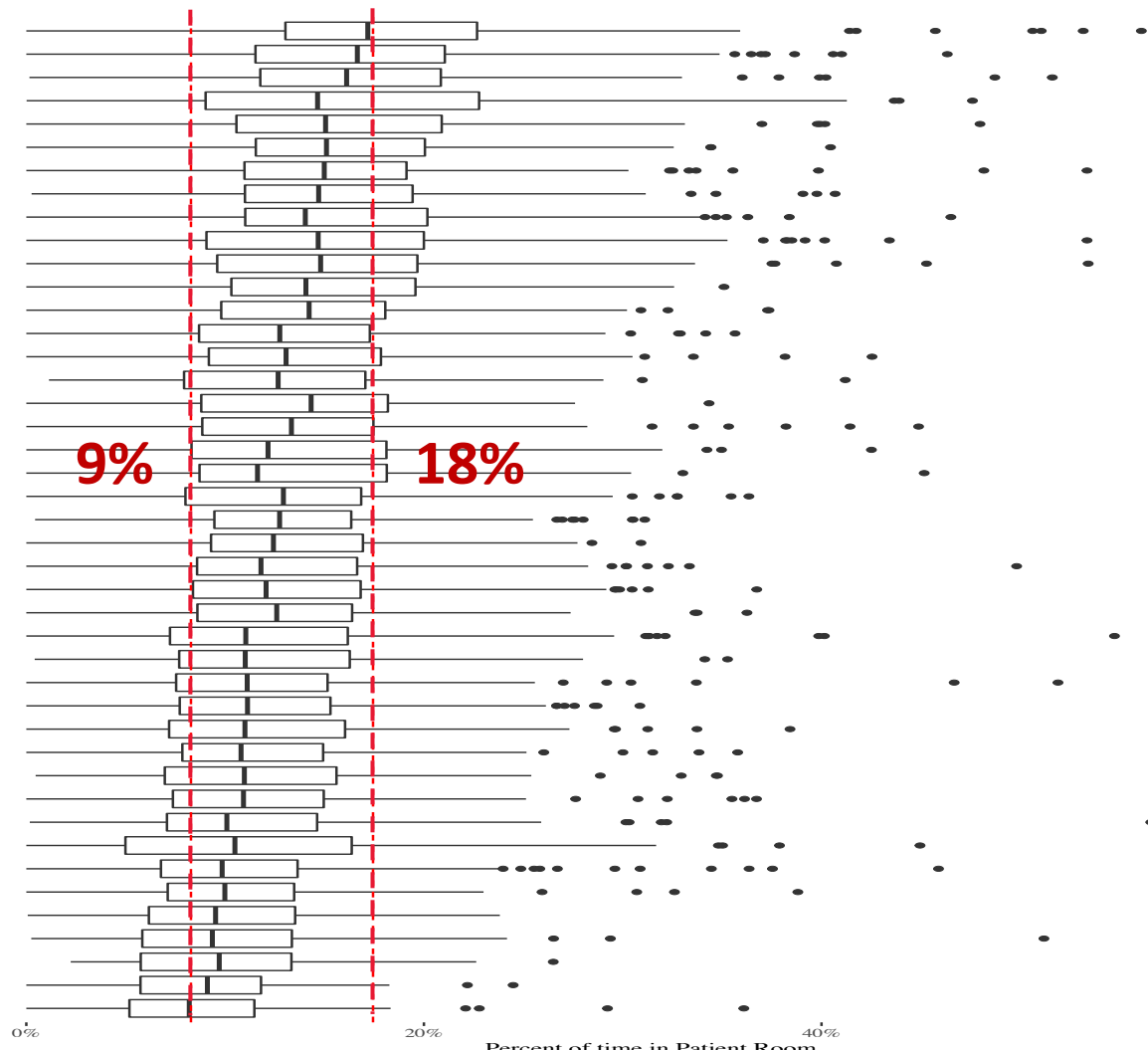
2 million badge hits

~100 thousand hours

*90% of interns captured

Interns spend 13% of time at the bedside



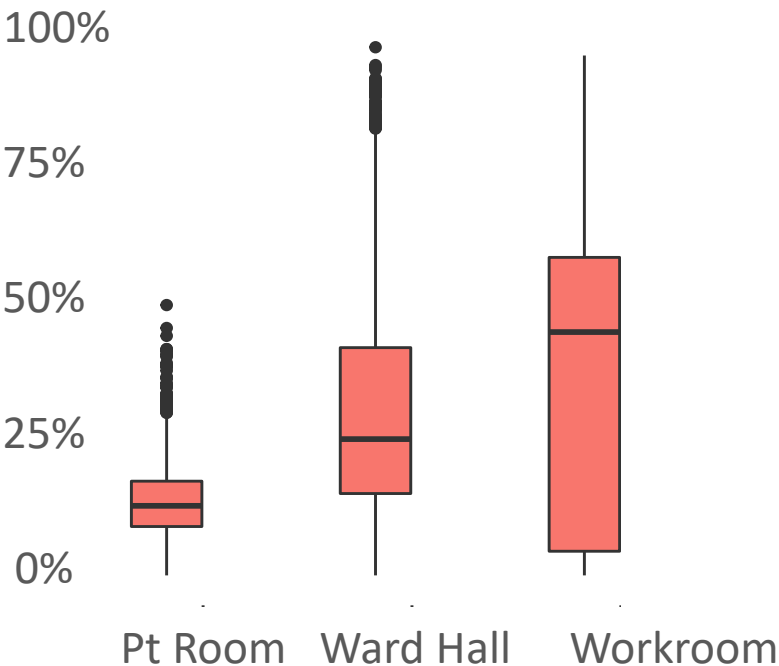


SUBSTANTIAL VARIATION

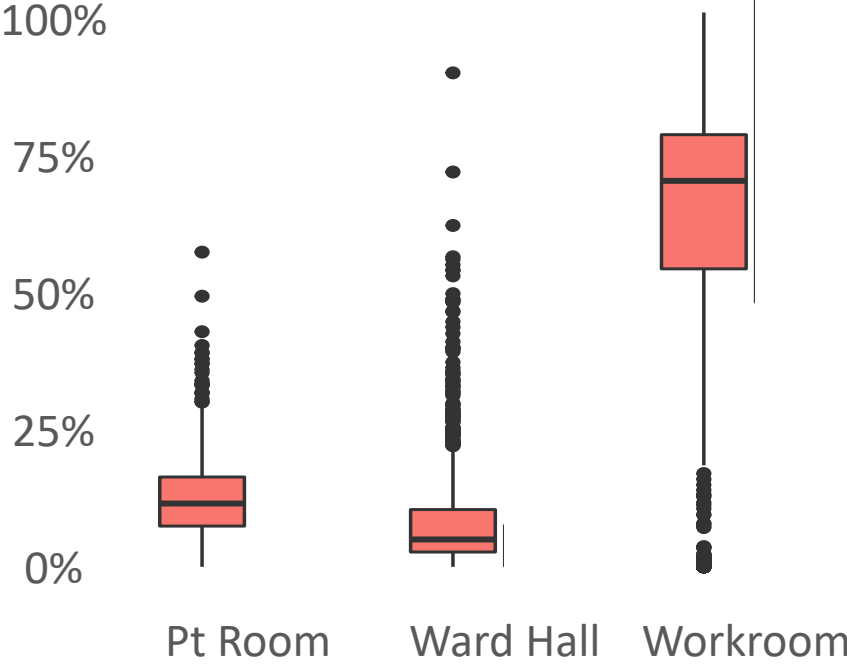
Highest intern – 18%
Lowest intern – 8.8%

Over course of year
that could translate to
**380 more hours
at the bedside**

General Internal Wards



Specialty Service



 All day

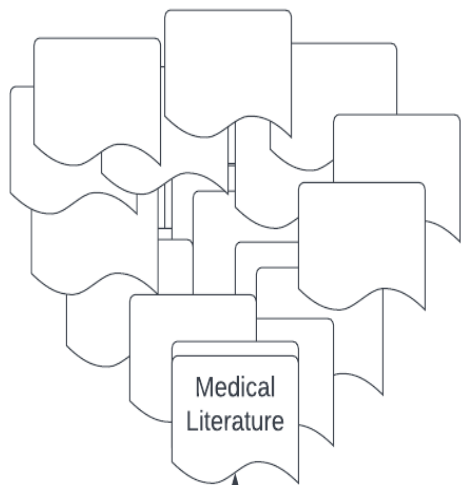
Opportunity: Practicing Physicians

The Reconnect Pilot

Larry Cohen
Paul Gee
Julie Gill
Dan Pickhardt
Joe Marks

HEALTH
2047





Physician



Patients





Physicians' powerful ally in patient care

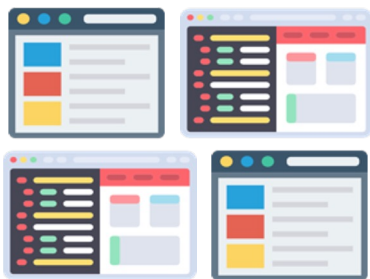


Precision Medical Education Examples and Impact

Marc M. Triola, MD
NYU Grossman School of Medicine

What is Precision Medical Education?

**Data and Outcomes from
UME/GME Education Apps
Clinical EHR Data**



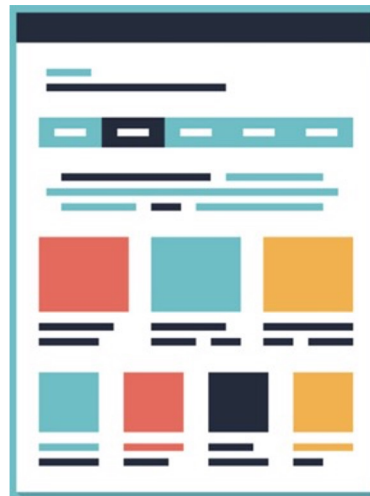
**Education Data
Warehouse**



**Personalization
Engine + AI**



**EHR/MyChart-like
Education Portal**



**Data-driven
coaching**



**Nudges
and Alerts**



**Action and
Learning Plans**



**Research and
Feedback Loop**

Examples

Admissions	Data-driven fair and consistent holistic admissions; Predictive analytics
Self-Directed Learning and Assessment	Tailored learning and assessment: suggested resources, adaptive assessments linked to demonstrated knowledge
Clinical Learning Environment	Clinical learning resources, guidelines, literature driven by cases seen and not seen; Tailored workplace-based assessment
Career Exploration and Specialty Selection	Pathway suggestions to students and coaches with predictive analytics; case mix informed by specialty; prompted learning on diagnostics and therapeutics
Transition to GME	Tailoring of terminal aspects of medical school to smooth the transition to GME; Precision portfolios that travel with the learner and inform GME coaching and goal-setting
Coaching and Planning	Data-driven coaching; aspirational goal-setting; personal learning plans; decision support tools to maximize student success

- We have real-time access to data from our local Epic electronic health record
- From this, we know which new patient diagnoses our students and trainees are seeing
- Can we use these routinely collected clinical data to automatically tailor suggested educational resources and the latest medical literature?

We used Natural Language Processing to map catalogs of high-quality medical education resources to the clinical diagnoses our trainees are seeing



Hi there,

You recently wrote a note in Epic for a patient with the diagnosis *Acute kidney failure, unspecified*. Below are some educational resources you may find useful in your learning about this patient.

Learning Resources:

- Amboss
 - [Acute kidney injury](#)
- Basic Science Clerkship Integration
 - [Renal cortical necrosis](#)
- Osmosis
 - [Acute kidney injury: Clinical practice](#)

Recent Review, Guideline, or Consensus Articles:

- [Extracorporeal Kidney-Replacement Therapy for Acute Kidney Injury. *The New England journal of medicine*](#)
- [Update in Critical Care 2020. *American journal of respiratory and critical care medicine*](#)
- [Contemporary Management of Severe Acute Kidney Injury and Refractory Cardiorenal Syndrome: JACC Council Perspectives. *Journal of the American College of Cardiology*](#)
- [Cardiovascular Consequences of Acute Kidney Injury. *The New England journal of medicine*](#)
- [Acute kidney injury. *Lancet \(London, England\)*](#)

[Search UpToDate for this diagnosis](#)

If you have feedback about these AI-generated suggestions, please [email us](#).

Using the AI and Natural Language Processing System we developed, our trainees now get computer-generated diagnosis-specific recommendations on learning resources and the latest articles from the medical literature.



Physicians' powerful ally in patient care

Hi there,

You recently wrote a note in Epic for a patient with the diagnosis *Schizophrenia, unspecified*. Below are some educational resources you may find useful in your learning about this patient.

Learning Resources:

- Amboss
 - [Schizophrenia](#)
- Basic Science Clerkship Integration
 - [Schizophrenia spectrum disorders: Pathology review](#)
 - [Schizophrenia](#)
- Osmosis
 - [Schizophrenia spectrum disorders: Clinical practice](#)

Recent Review, Guideline, or Consensus Articles:

- [Severe Mental Illness and Cardiovascular Disease: JACC State-of-the-Art Review. *Journal of the American College of Cardiology*](#)
- [Schizophrenia. *Lancet \(London, England\)*](#)
- [Human brain organogenesis: Toward a cellular understanding of development and disease. *Cell*](#)
- [Mechanisms governing activity-dependent synaptic pruning in the developing mammalian CNS. *Nature reviews. Neuroscience*](#)
- [Schizophrenia. *The New England journal of medicine*](#)

[Search UpToDate for this diagnosis](#)

If you have feedback about these AI-generated suggestions, please [email us](#).

This systems works across specialties and automatically updates its recommendations as new literature is published in top journals



Physicians' powerful ally in patient care

- The clinical patient note is an important record of a patient's diagnosis, their current status, and the plan for testing and care. Writing a good note takes skill.
- Trainees author hundreds of clinical patient notes in our Epic EHR each year, but get feedback on just a handful.
- We developed a Natural Language Processing System that automatically reads trainee notes and gives them precision feedback on their quality
- This can directly improve diagnostic accuracy, communication, and care coordination

PI Verity Schaye, MD, MHPE

The system was created based on human review of 300 notes using a gold-standard rubric.

Low Quality Note

50 y.o. female with a past medical history of chronic bilateral lower extremity lymphedema for 10 years presents with fevers, myalgias, and acute right lower extremity pain and erythema. Patient was admitted to the medicine service for further workup and management. #Cellulitis of the Right lower extremity -continue Vancomycin - pending ESR, CRP -monitor WBC and fever curve -pending Dopplers of the bilateral lower extremities to rule out DVT -tylenol PRN for fevers

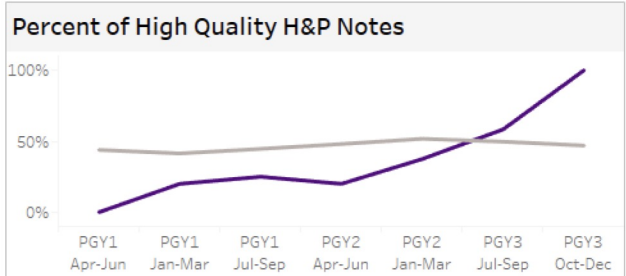
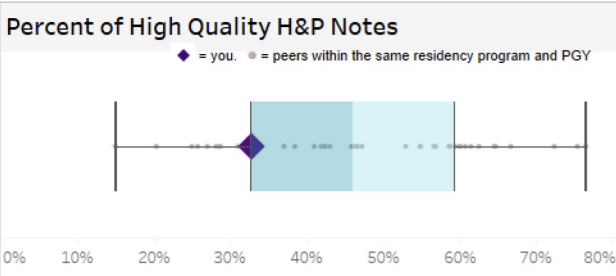
High Quality Note

84yo M with PMHx HTN, HLD, BPH, CAD with prior MI, presenting on 1/25 with a two hour hx of sudden onset epigastric pain radiating to mid back with associated nausea and dry heaving as well as watery diarrhea and fever, now improving. Abdominal CT showed pericolic fluid, currently performing repeat imaging and undergoing infectious workup, on Vanc/Zosyn. #Abdominal pain/fever/diarrhea: Nature of pain that patient describes is initially concerning for aortic dissection, but CT angio ruled out aortic dissection. In addition, as the pain was of sudden onset tumor is less likely on the differential. Most likely etiology is infectious (viral versus bacterial versus parasite). Stool PCR was negative but C.diff has not been tested yet and since patient has had 6-8 watery stools a day this could be potential etiology. Pericolic fluid is an interesting finding given that patient is experiencing most of the pain on the right side. Perforation less likely as patient does not have acute abdomen. Inflammatory etiology also possible (such as Crohns) although less likely as patient denies bleeding and would be unusual to manifest at this age. Other possible sources could be pneumonia (although patient has no cough and no lung findings on CT, making this less likely). UTI ruled out by UA and patient reports no cellulitis.

Clinical Reasoning Documentation Dashboard

★★★★★
Give us Feedback

- Introduction to Dashboard
- Criteria for a High Quality Note
- High Quality Note Sample 
- Low Quality Note Sample 



Click on [Note Date](#) to review your H&P in EPIC

Note Date: 8/29/2017 10/11/2019

Note Time: (All)

Quality: (All)

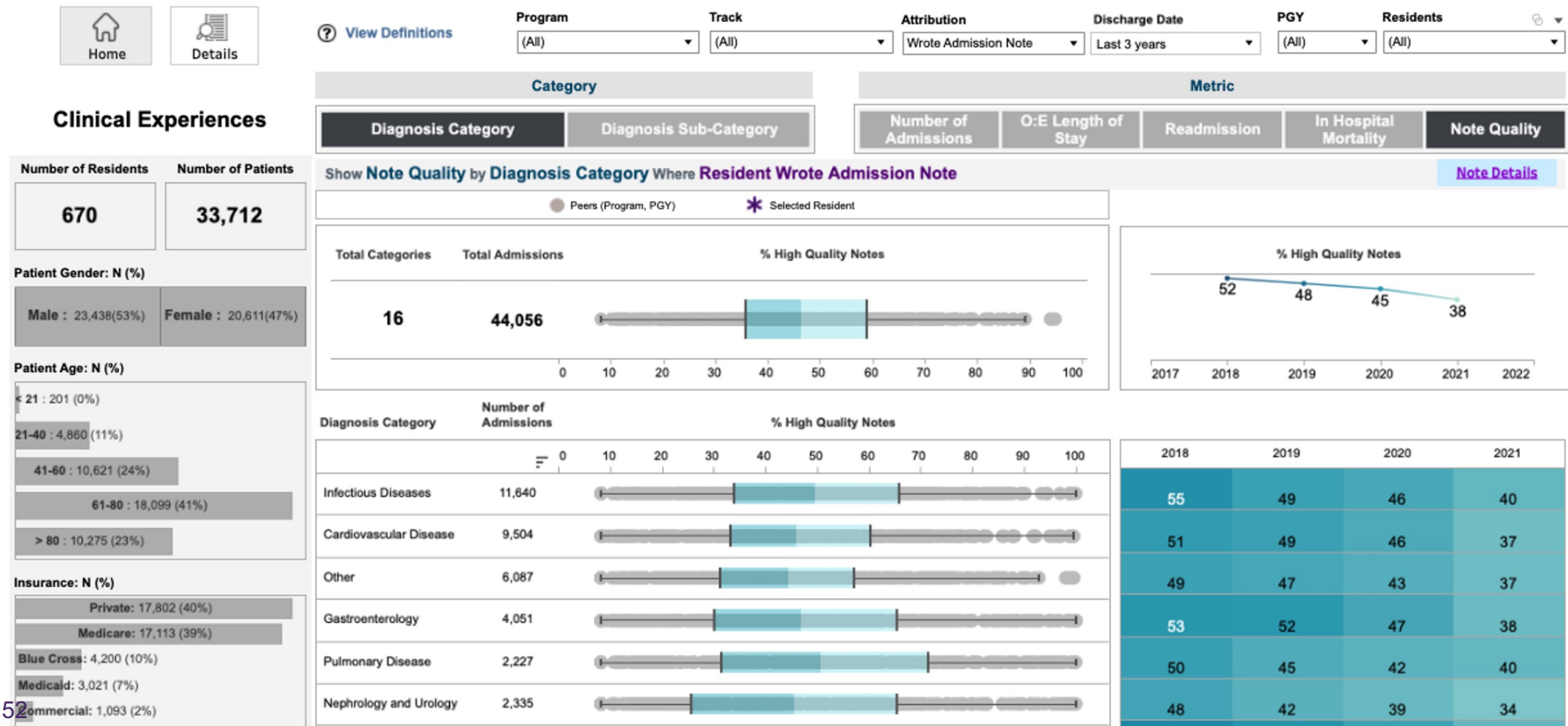
Note Date	Note Time	Chief Complaint	Primary Discharge Dx	Quality
10/11/2019	Night	FEVER	Fever, unspecified	
10/11/2019	Night	SHORTNESS OF BREATH	Pneumonitis due to inhalation of food and vomit	
8/21/2019	Night	ANEMIA	Glomerular disease in systemic lupus erythematosus	
8/16/2019	Day	LEG SWELLING,SHORTNESS OF BREATH	Supraventricular tachycardia	
8/10/2019	Night	CHEST PAIN,GI PROBLEM,SHORTNESS OF BREATH	Other disorders of calcium metabolism	
8/9/2019	Night	CHEST PAIN,PALPITATIONS,SHORTNESS OF ...	Malignant neoplasm of ascending colon	
8/9/2019	Night	ALTERED MENTAL STATUS,FALL	Sepsis, unspecified organism	
8/8/2019	Night	*Unspecified	Postsurgical malabsorption, not elsewhere classified	
8/6/2019	Night	FALL	Fracture of unspecified part of neck of right femur, initial encounter for closed fracture	

Every Medicine trainee now has a personal dashboard showing the quality of their diagnostic and clinical reasoning by diagnosis and case type.

They can compare themselves to their peers and over time.

Physicians' powerful ally in patient care

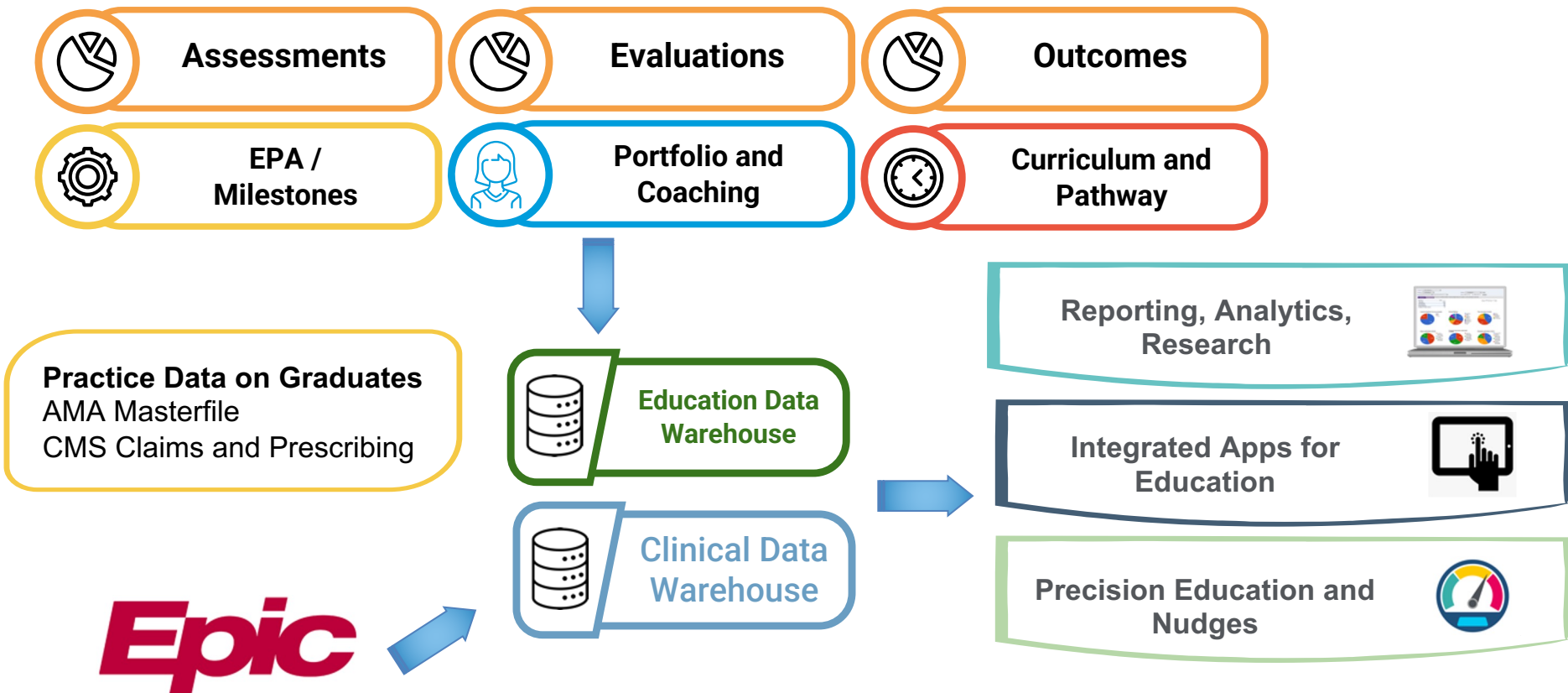
Programs can look across all trainees to target areas for improved clinical training that improve outcomes



How do we get to precision?



Panoramic Data: The Education Data Warehouse



How do we get there?

- Flexibility in the educational program / pathways
- Learners need scaffolding from Coaches empowered by panoramic data
- A systematic approach to address the complexity of precision education: each student has different data, duration, assessments
- Collaboration and data sharing
 - Groups underrepresented in medicine
 - The UME/GME/Practice continuum





Physicians' powerful ally in patient care



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Questions