AMA Innovations in Medical Education Webinar Series

Precision Education: A conceptual model for Medicine

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Today’s Host

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

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.
The End Game of Precision Education is: Precision Health
The P Soup of Precision in Health Care

- Precise
- Personalized
- Predictive
- Preventive
- Preemptive
- Prescriptive
- Proactive
- Precision Medicine
- Precise Cures
- Precision Health

**Precision Education**
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

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 unremitting 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.
Based upon school’s resources & faculty

Core Foundational Principles & Knowledge

Based students’ passions & school’s resources & expertise

Deeper Dives
Coached

Performance Analytics

GME

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Recognize challenges to learning outcomes due to limited personalization in our current medical education system
Precision Education Aims to Promote Growth Mindset
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
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 Vandenbosch, *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

MAENI provides an opportunity to develop clinical reasoning skills using the MALF 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

NYU School of Medicine

Dr. Marc Triola
Opportunity: Trainees
Digital ecosystem with practice habits & “nudges”

Dr. Conrad Gleber
University of Rochester Digital Ecosystem

Note filed in eRecord:
Resident author
Attending co-author

Server-side script:
Triggers evaluations

Database query
Notes matching dyad

Provider Metrics Dashboard

Displaying data for COLEBIR from 1/1/2012-12/31/2023.

Experience in ABIM Categories based on Diagnoses

Best Practice Advisory Information

You are shown 0.3747 interruptive BPA alerts per patient day
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
Opportunity:
Practicing Physicians
The Reconnect Pilot

Larry Cohen
Paul Gee
Julie Gill
Dan Pickhardt
Joe Marks
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
- Personalization Engine + AI
- Education Data Warehouse
- EHR/MyChart-like Education Portal
  - Data-driven coaching
  - Nudges and Alerts
  - Action and Learning Plans
  - Research and Feedback Loop
## Examples

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<tr>
<th>Admissions</th>
<th>Data-driven fair and consistent holistic admissions; Predictive analytics</th>
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<tr>
<td>Self-Directed Learning and Assessment</td>
<td>Tailored learning and assessment: suggested resources, adaptive assessments linked to demonstrated knowledge</td>
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<tr>
<td>Clinical Learning Environment</td>
<td>Clinical learning resources, guidelines, literature driven by cases seen and not seen; Tailored workplace-based assessment</td>
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<td>Career Exploration and Specialty Selection</td>
<td>Pathway suggestions to students and coaches with predictive analytics; case mix informed by specialty; prompted learning on diagnostics and therapeutics</td>
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<td>Transition to GME</td>
<td>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</td>
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<td>Coaching and Planning</td>
<td>Data-driven coaching; aspirational goal-setting; personal learning plans; decision support tools to maximize student success</td>
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• 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:**
- 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*

Search UpToDate for this diagnosis

If you have feedback about these AI-generated suggestions, please email us.
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
- 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.
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 pericolonic 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. Pericolonic 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.
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.
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

- Assessments
- EPA / Milestones
- Evaluations
- Portfolio and Coaching
- Outcomes
- Curriculum and Pathway

Practice Data on Graduates
AMA Masterfile
CMS Claims and Prescribing

Education Data Warehouse
Clinical Data Warehouse

Reporting, Analytics, Research
Integrated Apps for Education
Precision Education and Nudges

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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
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Questions