Health Systems Science for Physicians-in-Training

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Professor of Medicine

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Professor of Medicine

November 8, 2022
Virginia Tech Carilion School of Medicine

Roadmap and Objectives

Presentation

1. State a shared vision for incorporating health systems science as **the third pillar** in medical education

2. Discuss the **current literature** pertinent to our approach to integrating health system science in medical education

3. Describe **program outcomes and success factors** in integrating learners and clinicians in learning health systems

Questions and Discussion

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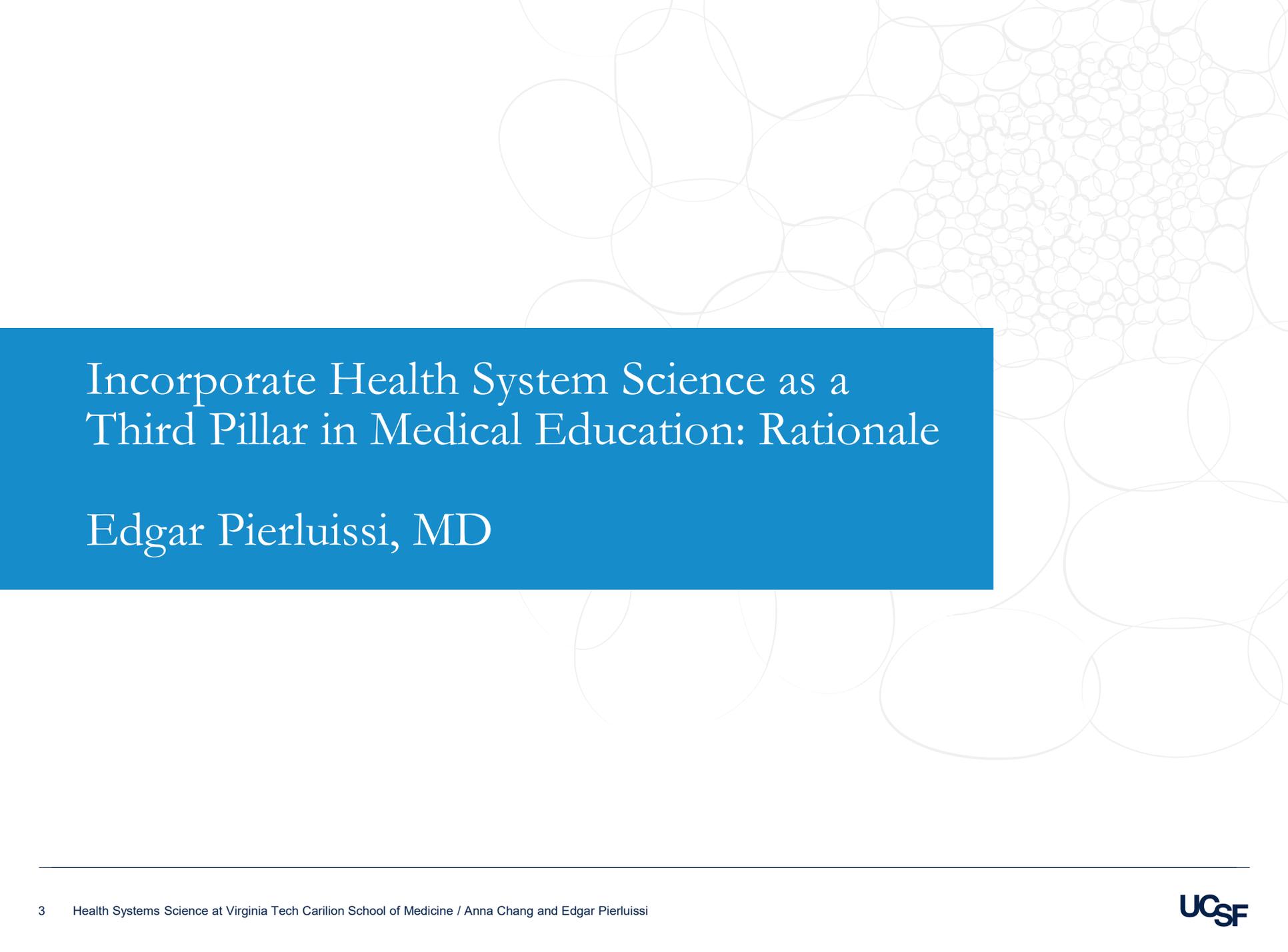
Incorporate Health System Science as a Third Pillar in Medical Education: Rationale

Edgar Pierluissi, MD

The Problem: U.S. Health Care System

Despite being the costliest in the world;
quality, safety, disparity, patient, and provider experience
are lower than expected

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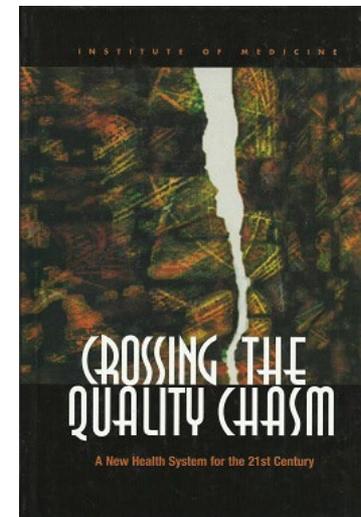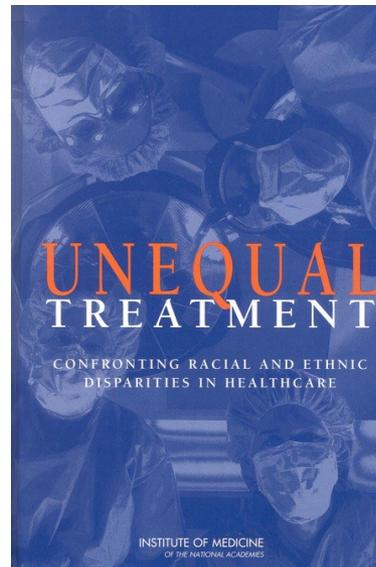
Access

Rank (highest to lowest)	1	2	3	4	5	6	7	8	9	10	11
Access, %											
Able to get same- or next-day appointment[a]	NLD 77	Australia 67	UK 57	France 56	Germany 53	US 51	Sweden 49	Canada 43	CHE NA	Denmark NA	Japan NA

JAMA. 2018;319(10):1024-1039

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Clinical Outcomes

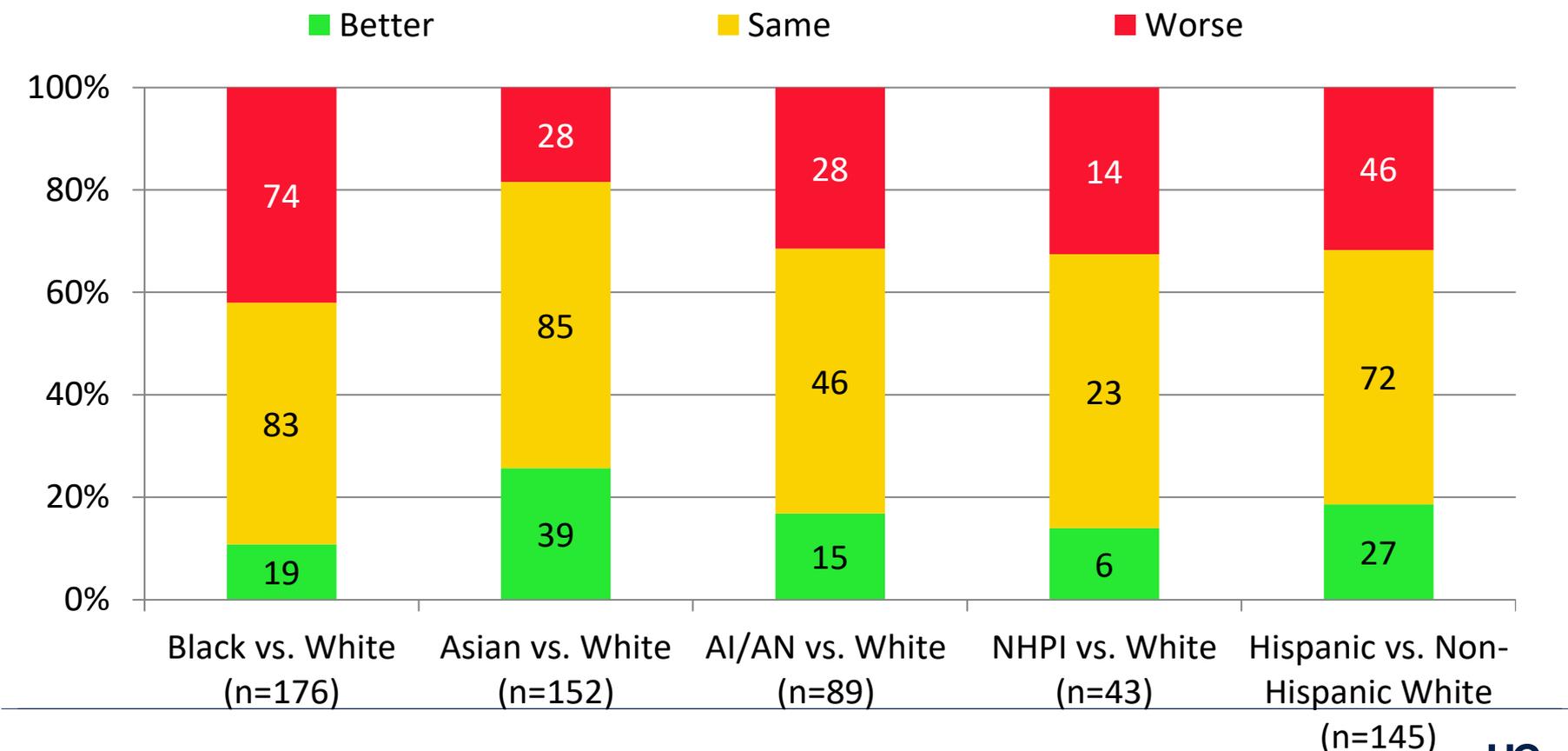| Rank (Highest to Lowest)	1	2	3	4	5	6	7	8	9	10	11
Clinical Outcomes											
30d Stroke Mortality per 1000 patients	Canada 10	Sweden 9.6	Australia 9.3	UK 9.2	France 7.9	CHE 6.9	Germany 6.4	US 4.2	NLD NA	Denmark NA	Japan NA
30d Mortality per 1000 patients with acute myocardial infarction	Germany 8.7	Sweden 8.3	CHE 7.7	UK 7.6	France 7.2	Canada 6.7	US 5.5	Australia 4.1	NLD NA	Denmark NA	Japan NA

Rank (Highest to Lowest)	1	2	3	4	5	6	7	8	9	10	11
Avoidable Hospitalizations											
Diabetes hospitalizations as a ratio of people with diabetes	Japan 2.8	Australia 2.8	Germany 2.4	US 2	Sweden 1.9	Denmark 1.8	UK 1.7	Canada 1.3	France 1.2	NLD 1.2	CHE 1.2
Asthma hospitalizations as a ratio of people with asthma	US 1.2	UK 1.0	France 0.8	Denmark 0.8	Germany 0.7	NLD 0.7	Australia 0.6	CHE 0.4	Sweden 0.3	Japan 0.3	Canada 0.2

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Life Expectancy

Rank (Highest to Lowest)	1	2	3	4	5	6	7	8	9	10	11
Life expectancy in total population at birth, mean, y	Japan 83.9	CHE 83	Australia 82.5	France 82.4	Sweden 82.3	Canada 81.7	NLD 81.6	UK 81	Denmark 80.8	Germany 80.7	US 78.8
Health-adjusted life expectancy, mean, y	Japan 74.9	CHE 73.1	France 72.6	Canada 72.3	NLD 72.2	Sweden 72	Australia 71.9	UK 71.4	Germany 71.3	Denmark 71.2	US 69.1

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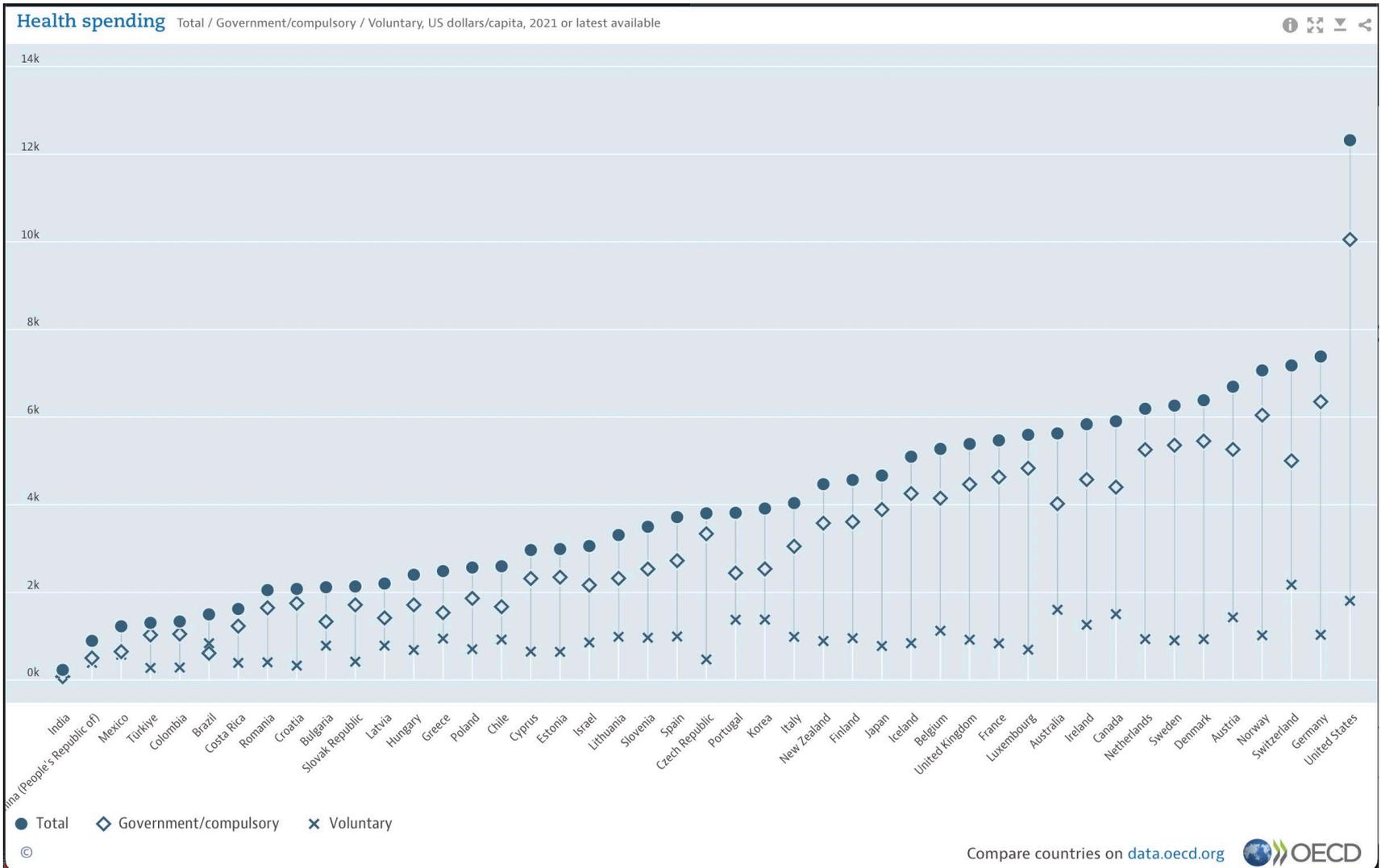
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Health care disparities

Number and percentage of quality measures for which members of selected groups experienced better, same, or worse quality of care compared with reference group (White) in 2014-2016

Legend: ■ Better ■ Same ■ Worse

	Black vs. White (n=176)	Asian vs. White (n=152)	AI/AN vs. White (n=89)	NHPI vs. White (n=43)	Hispanic vs. Non-Hispanic White (n=145)
Worse	74	28	28	14	46
Same	83	85	46	23	72
Better	19	39	15	6	27

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Patient Perceptions

Perceptions, %											
System works well	Germany 60	CHE 58	France 54	UK 44	Sweden 44	Australia 44	Canada 35	US 19	NLD NA	Denmark NA	Japan NA

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Developed Countries Healthcare Spending per Capita

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If we do nothing to slow these skyrocketing costs, we will eventually be spending more on Medicare and Medicaid than every other government program combined.

Put simply, our health care problem is our deficit problem. Nothing else even comes close.

Sep 9, 2009

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What does this have to do with medical education?

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Medical Education Consensus

AMA

Accelerating Change in Medical Education

Perspective

Medical Education
Part of the Problem and Part of the Solution

Catherine Reinis Lucey, MD

Medical Education and Health Care Delivery:
A Call to Better Align Goals and Purposes

David P. Sklar, MD, Paul A. Hemmer, MD, MPH, and Steven J. Durning, MD, PhD

Opinion

Value-Added Medical Education: Engaging Future Doctors to Transform Health Care Delivery Today

Steven Y. Lin, MD[1], Erika Schillinger, MD[2], and David M. Irby, PhD[3]

VIEWPOINT
Transforming From Centers of Learning
to Learning Health Systems
The Challenge for Academic Health Centers

Kevin Grumbach, MD
Department of Family
and Community
Medicine, University of

Health care organizations face intensifying pressure to achieve the triple aims of better patient experience, better health, and affordability. Although all health systems grapple with these imperatives, the tripartite mis...

nities who voice concern that clinical operations already do not adequately accommodate the other academic missions. They are apprehensive that the clinical enterprise's heightened attention to customer...

Teaching Systems Improvement to Early Medical Students: Strategies and Lessons Learned

Monica W. Harbell, MD, Descartes Li, MD, Christy Boscardin, PhD,
Edgar Pierluissi, MD, and Karen E. Hauer, MD, PhD

Preparing Medical Students to Improve Health Care

Preparing Medical Students for the Continual Improvement of Health and Health Care: Abraham Flexner and the New "Public Interest"

Donald M. Berwick, MD, MPP, and Jonathan A. Finkelstein, MD, MPH

Health Systems Science: The "Broccoli" of Undergraduate Medical Education

Jed D. Gonzalo, MD, MSc, and Greg Ogrinc, MD, MS

TRAINING
TOMORROW'S DOCTORS

The Medical Education Mission of Academic Health Centers

A Report of The Commonwealth Fund
Task Force on Academic Health Centers

April 2002

Article

AMERICAN COLLEGE OF
Medical **Quality**

Validity of the Health Systems Science Examination: Relationship Between Examinee Performance and Time of Training

Michael Dekhtyar, BA[1], Linette P. Ross, MA[2], Jean D'Angelo, BA[2],
Jeanne Guernsey, MA[2], Karen E. Hauer, MD, PhD[3],
Luan Lawson, MD, MAEd[4], Martin V. Pusic, MD, PhD[5],
and Richard E. Hawkins, MD[1,6]

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We want to graduate leaders who are not running away from the fire but running towards it with a water hose. Our learners will become system citizens who improve health and healthcare.

Dean Lee A. Learman, MD, PhD

August 2022

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A Hypothesis

By incorporating Health Systems Science, medical education can be a part of the solution for complex health care delivery problems, and improve:

- Health and healthcare disparities

- Social determinants of health

- Quality of care

- Health care value

- Interprofessional teamwork

- Physician career satisfaction

2013 Lucey JAMA Int Med
2017 Gonzalo, Lucey, Chang Acad Med

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Current Concepts: UCSF Example

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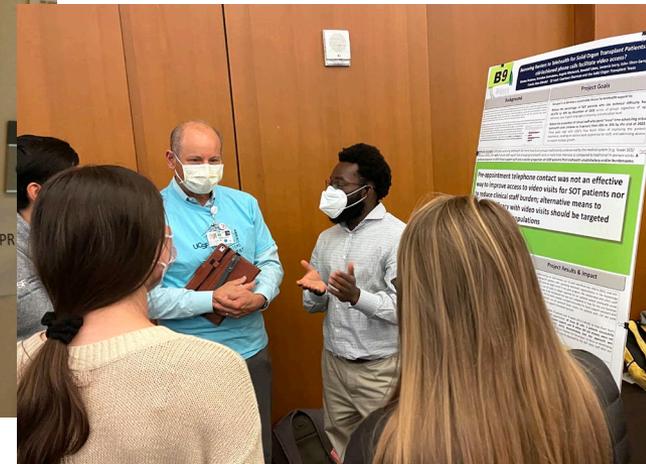
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Our Million Dollar Question:

How do physicians-in-training arrive at the understanding that health system science is a part of their professional identity?

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Our Approach at UCSF:

Design the **learning environment**
that allows **communities of practice**
to shape learners' **professional identities**.

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In Other Words…

The UCSF approach is based on these 3 concepts from the medical education literature:

1. The Learning Environment

2. Communities of Practice

3. Professional Identity Formation

ACADEMIC MEDICINE | AAMC
Journal of the Association of American Medical Colleges

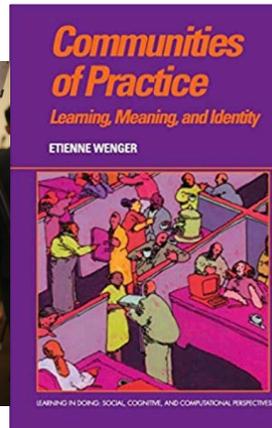Articles & Issues ✓   Collections ✓   For Authors ✓   Journal Info ✓

PERSPECTIVES

Conceptualizing Learning Environments in the Health Professions

Gruppen, Larry D. PhD; Irby, David M. MDiv, PhD; Durning, Steven J. MD, PhD; Maggio, Lauren A. MS(LIS), PhD

Author Information ⊙

Academic Medicine: July 2019 - Volume 94 - Issue 7 - p 969-974

Communities of Practice
Learning, Meaning, and Identity
ETIENNE WENGER

LEARNING IN DOING: SOCIAL, COGNITIVE, AND COMPUTATIONAL PERSPECTIVES

ACADEMIC MEDICINE | AAMC
Journal of the Association of American Medical Colleges

Articles & Issues ✓   Collections ✓   For Authors ✓   Journal Info ✓

PERSPECTIVES

A Schematic Representation of the Professional Identity Formation and Socialization of Medical Students and Residents
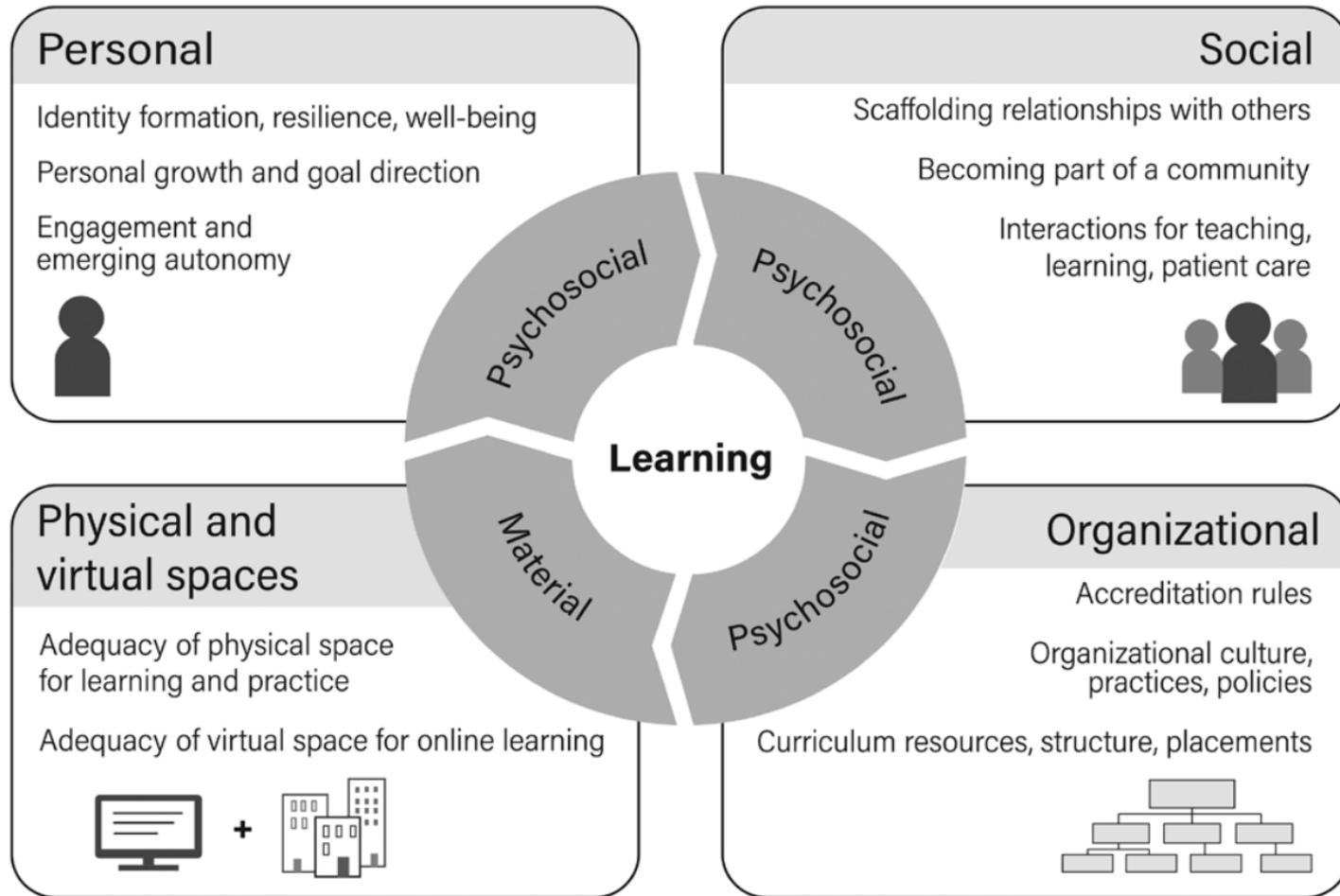A Guide for Medical Educators

Cruess, Richard L. MD; Cruess, Sylvia R. MD; Boudreau, J. Donald MD; Snell, Linda MD, MHPE; Steinert, Yvonne PhD

Author Information ⊙

Academic Medicine: June 2015 - Volume 90 - Issue 6 - p 718-725

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Current Concept #1

The Learning Environment: The Conceptual Framework

Personal

Identity formation, resilience, well-being

Personal growth and goal direction

Engagement and emerging autonomy

Social

Scaffolding relationships with others

Becoming part of a community

Interactions for teaching, learning, patient care

Physical and virtual spaces

Adequacy of physical space for learning and practice

Adequacy of virtual space for online learning

Organizational

Accreditation rules

Organizational culture, practices, policies

Curriculum resources, structure, placements

Learning — Psychosocial, Psychosocial, Material, Psychosocial

2019
Gruppen,
Irby,
Durning,
Maggio
Acad Med

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Current Concept #1

The Learning Environment Facilitates Transformative Learning

- Transformative learning influences professional identity

- It is best facilitated through immersion in the workplace

- Being faced with real, complex, and unfamiliar contexts, described as "disorienting dilemmas," transforms learners' values, attitudes, beliefs, and behaviors.

2019 Van Schalkwyk Medical Education

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Current Concept #2

Communities of Practice: The Theory

Definition: a social network that shares overlapping knowledge, beliefs, values, history, and experiences on shared practice

Outcomes:

Communities Increase

- Sense of collective identity and shared purpose
- Knowledge and skills
- Satisfaction
- Productivity

1991 Lave, Wenger Situated Learning
2013 Wenger, McDermott, Snyder Cultivating Communities of Practice
2018 Cruess, Cruess, Steinert Acad Med

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Current Concept #2

Communities of Practice and Expertise

Expertise is not simply a property that passes from teacher to learner, but a dynamic commodity that resides within communities of practice…

…learning, according to the theory, is a process of absorbing and being absorbed into the culture of such a community

2007 Dornan Medical Education
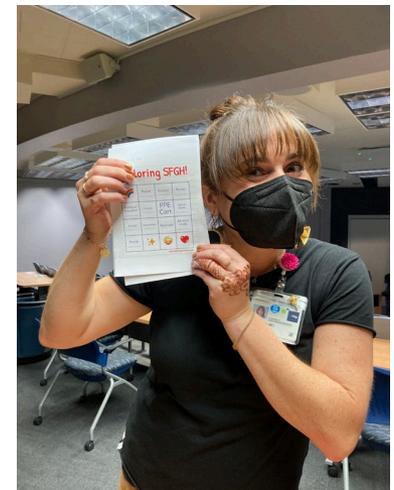
UCSF UME Example:
Clinical Microsystems Clerkship (CMC)

Medical Students Start New Bridges
## Curriculum

Original Post Date: 07/28/2016   🖶 Printer-friendly version

Students gather for the 2016 White Coat Ceremony.
Photo: Elisabeth Fall

By Mitzi Baker

The new School of Medicine Bridges curriculum is considered the most innovative training currently offered at a medical school in the country. Immersed in clinical teams from the start, Bridges students will be trained to continuously improve care. Their understanding of the foundational sciences will be in sync with what they are learning in active clinical settings. They will be challenged to ask questions that advance not just their understanding of human health and disease but the very frontiers of science.
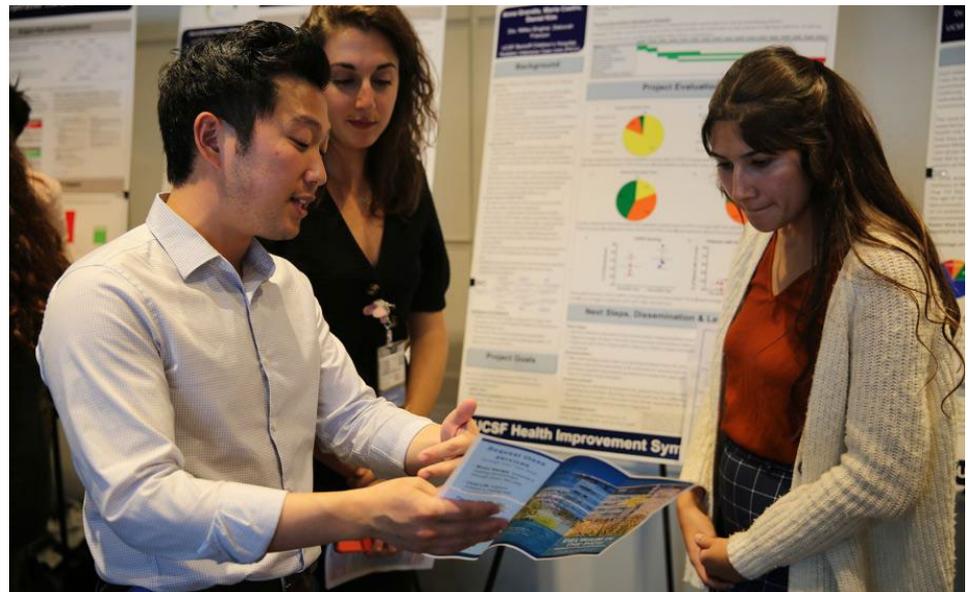
2013 Lucey JAMA Int Med
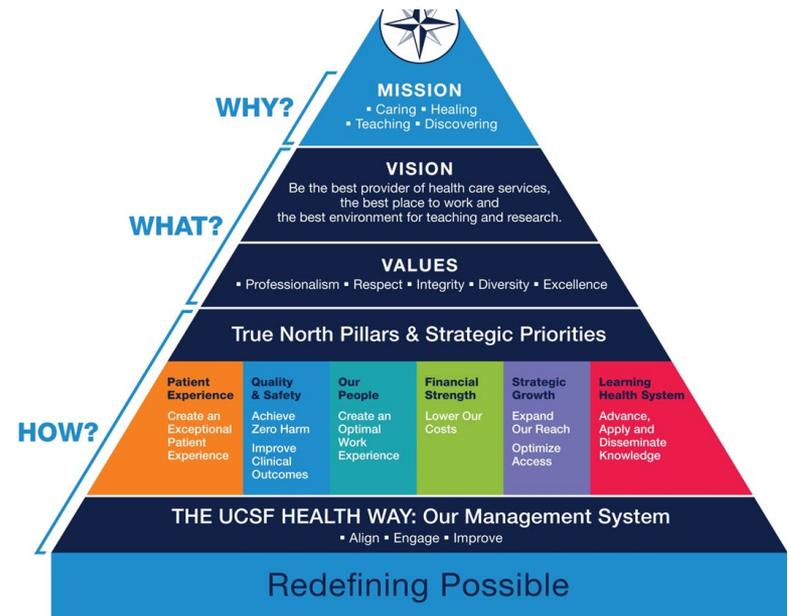2022 Chang, Pierluissi et al. Acad Med

UCSF CMC Design Principle:
Medical Education and Health System Partnership

Medical Students
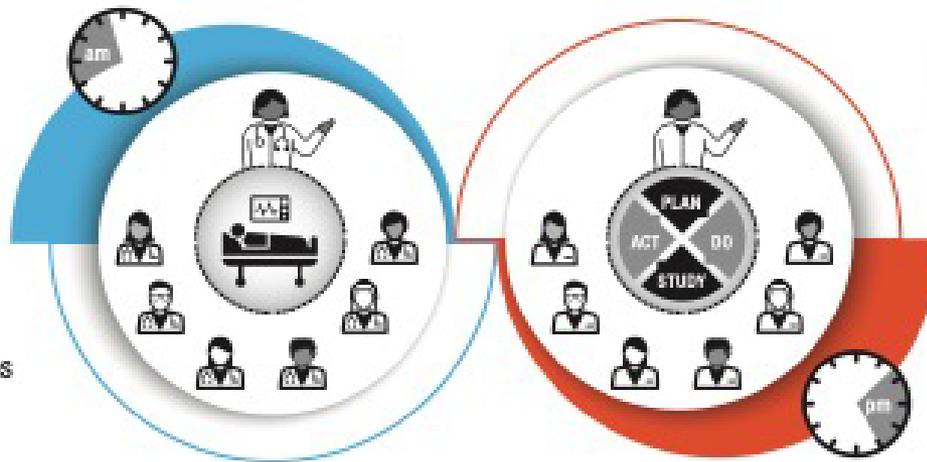
Faculty and Clinicians

2017 Gonzalo, Lucey, Chang Acad Med

UCSF UME Example:
Clinical Microsystems Clerkship (CMC) Curricular Day

AM / Direct patient care:
- Medical history
- Physical examination
- Clinical reasoning
- Patient communication
- Notes and presentations

PM / Health systems improvement:
- Identify a problem
- Set concrete goals
- Perform a gap analysis
- Conduct interventions
- Measure outcomes

2022 Chang, Pierluissi, et al. Acad Med

UCSF HSS Faculty Educator Community

- **Faculty Development**
  - Knowledge and skills
  - Curricular understanding
  - Approach to learners
  - Health system context
  - Microsystem team culture

- **Faculty teach flexibly over time, individualized to each student group**

2022 Hauer, Chang, Lucey Teaching & Learning in Med
2020 Harbell, Pierluissi, Hauer Acad Med

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UCSF Faculty-Student Learning Communities

- Educators are MDs and interprofessional clinicians

- Students and faculty both benefit from being in community

- Most (86%) report health systems learning was achieved, regardless of project outcome.

2019 Gonzalo, Chang Acad Med
2022 Hauer, Chang, Lucey Teaching & Learning in Med
2022 O'Brien, Zapata, Chang, Pierluissi Perspectives Med Educ

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UCSF CMC Outcomes:
Kirkpatrick Model of Evaluation

2016 Kirkpatrick

Image: https://elearning.adobe.com/2018/02/measuring-elearning-roi-with-kirkpatricks-model-of-training-evaluation/

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UCSF CMC Outcomes:
Student Satisfaction (Kirkpatrick Level 1)

Student Satisfaction:	Mean Rating (SD; N=50)
Overall quality of the CMC	4.10 (SD 0.92)
Value to development as a physician	4.14 (SD 0.86)

Scale of 1 (poor) to 5 (excellent)

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UCSF CMC Outcomes:
Student Assessment (Kirkpatrick Level 2 & 3)

	MS1 Assessments (N=152)	MS2 Assessments (N=152)
Direct Patient Care	**Clinical Skills Examinations Mean Percentage (SD)[a]**	
Patient Communication	90% (SD 5.3)	86% (SD 5.7)
Medical History	85% (SD 5.9)	96% (SD 4.6)
Physical Examination	78% (SD 6.2)	70% (SD 7.4)
Interprofessional Collaboration	**Interprofessional Feedback Percentage of All Students[b]**	
Communication and Teamwork	98%	*Assessed as MS1s*
Health Systems Improvement	**Health Systems Improvement Knowledge Tests Percentage of All Students[c]**	
QIKAT-R	80%	*Assessed as MS1s*
	Health Systems Improvement Project Skills Percentage of All Students[c]	
Project: Problem and Aims	90%	*Assessed as MS1s*
Project: Gap Analysis	93%	*Assessed as MS1s*
Project: Interventions	*Assessed as MS2s*	88%
Project: Reflections	*Assessed as MS2s*	100%

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Recap of Concepts:

The UCSF approach is based on 3 concepts from the literature:

We have discussed so far:

1. The Learning Environment

2. Communities of Practice

Now the final concept:

3. Professional identity formation

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Current Concept #3

Professional Identity Formation: The Theory

<u>Definition</u>: Professional identity formation is the process through which learners are transformed from members of the lay public into skilled professionals.

- The most powerful factors having an impact:
  - Role models and mentors
  - Experiential learning

- Progression from legitimate peripheral participation to full participation in medicine's community of practice

2019 Cruess, Cruess, Steinert Medical Teacher

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Can it work…?

Back to Dean Learman's vision:

Can we design education to graduate system citizens who improve health and healthcare?

In other words,
Can we train physicians to have health systems science as a part of their professional identity?

We think yes

Here's what we've seen…

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Outcomes & Success Factors: UME and GME

Edgar Pierluissi, MD

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Questions and Discussion

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UCSF UME CMC Outcomes: Health Systems Improvement

- **289 improvement projects**
  - 15 clinical departments
    - surgery, anesthesia, radiology
  - With interprofessional clinicians
    - psychology, social work, pharmacy
  - 3 health systems
    - academic, county, VA
- **Improved disparities, quality, safety, value, patient experience**

2022 Chang, Pierluissi Acad Med
2022 O'Brien, Chang, Pierluissi Perspectives Med Educ

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UCSF CMC Outcome:
Sample Student Projects (Kirkpatrick Level 4)

	Project Aim (Fall 2017)	**Project Outcome (Fall 2018)**
Academic Medical Center		
Primary Care	**Reduce disparities** in hypertension control for Black patients	Increased percentage of patients with at-goal blood pressures by 38%
Gynecologic Oncology	**Improve safety** of opiate use after minimally-invasive surgery	Decreased prescriptions for discharge opiates by 30%
Neurology	**Improve access** of multiple sclerosis neurogenic bladder treatment	Increased provider knowledge of pelvic floor physical therapy referral to 80%
Endocrine Surgery	**Improve experience** of post-surgical discharge process	Increased patient understanding of discharge instructions in 5/5 patients
Pediatrics	**Improve experience** by reducing clinic wait times	Decreased average vaccination wait time from 9 to 5 minutes
Public Safety Net Health System		
Psychiatry	**Decrease readmissions** after discharge from inpatient psychiatry	Achieved 64% attendance at first outpatient mental health appointment
Obstetrics	**Improve safety** of vaginal and cesarian obstetric hemorrhage	Implemented quantitative blood loss measurement in 84% of deliveries
Emergency Department	**Improve quality** in acute stroke treatment with thrombolysis	Achieved goal door-to-needle time of <45 min for 84% of stroke patients
Pediatrics	**Improve quality** in management of second-hand smoke for children	Improved smoking cessation intervention implementation rate from 36% to 88%
Primary Care	**Improve disparities** in depression screening	Increased screening rate to 63% for non-English speaking and visually-impaired

UCSF UME CMC Outcomes: Professional Identity

UCSF Graduating MS4s

Professional Identity:	Mean Rating (SD; N=55)[a]
I believe that clinical skills and health systems knowledge are both important to patient experience and clinical outcomes	4.73 (SD 0.48)
A physician needs to have both clinical skills and health systems knowledge to be successful	4.40 (SD 0.63)

1 (poor) to 5 (excellent)

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UCSF UME CMC Outcomes: Health Systems Improvement

"At the end of my career, I'll be in a position where the system is still not perfect and still has several holes in it, but hopefully I will look back and see patches I've made along the way… That would be something I would be proud of"
– UCSF MS2

"Understanding the system is definitely important, in the same way that if you are a plumber, you should have a good understanding of the pipes that are not within the house itself."
– UCSF MS4

2022 Leep Hunderfund, Gonzalo, Chang Acad Med

UCSF CMC Outcome: UME to GME Transition

Career Development:	Percentage of Students[b]
I listed my CMC health systems improvement project in my residency application curriculum vitae	85% Yes (N=44)
I disseminated my CMC health systems improvement project (e.g. as a local or national poster or oral presentation, or a paper in a journal)	54% Yes (N=28)
I discussed my CMC health systems improvement project in my residency personal statement or interview	31% Yes (N=16)

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Quality improvement is always a goal when it comes to patient care. In residency, I will likely see how I can use my power and experience to change parts of the system – UCSF student

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UCSF GME Example:
Health Systems Leadership Pathway

- **Trains residents and fellows**

- **Knowledge, skills, and mentorship for leadership careers in health systems improvement and policy**

- **Two-year longitudinal curriculum:**

  - Speaker series

  - HBR articles on leadership skills

  - Mentorship on team management

  - Health policy projects

2022 FLOYD RECTOR (VIRTUAL) RESIDENT RESEARCH SYMPOSIUM

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UCSF GME Outcomes:
Health Systems Leadership Pathway

- **Residents and fellows (125/10yr)**
  - Many become chief residents
  - Lead health care innovations
  - Medicine, Pediatrics, Anesthesia, etc.

- **Group projects:**
  - Academic medical center participation in Medicare bundled payment program
  - Reducing heart failure hospital readmissions
  - Home-based primary care in the era of value-based reimbursement

Lessons Learned:
Success Factors Align With

The Principles of Professional Identity Formation

1. Establish professional identity as an educational objective
2. Embrace communities of practice
3. Engage learners in the workplace
4. Provide faculty development
5. Assess educational outcomes

2019 Cruess, Cruess, Steinert Medical Teacher

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Local UCSF Success Factors:
Health Systems and Medical Education

1. Integrate learning about patients and systems

2. Invite learners to join efforts aligned with health system priorities

3. Engage stakeholders, including health system leaders

4. Show gratitude to clinical teams that engage with learners

5. Showcase and celebrate successes!

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Summary:

1. Education can **integrate health systems science** as a solution to complex healthcare problems.

2. Educators can **design learning environments and communities of practice** for workplace learning aligned with health system needs.

3. Health systems science and clinical skills can be incorporated into the **professional identity** of physicians-in-training.

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Acknowledgements
The UCSF Clinical Microsystems Clerkship Team

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Thank You

Questions and Discussion

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