



Stanford
MEDICINE

Anesthesia Informatics
and Media Lab (AIM)
Anesthesiology, Perioperative and Pain Medicine



the future of anesthesia education*

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Stanford | MEDICINE X

THE INTERSECTION OF MEDICINE AND EMERGING TECHNOLOGIES

SEPTEMBER 23-24, 2015

THE FUTURE OF MEDICAL
EDUCATION

<http://medicinex.stanford.edu/ed/>

A wide-angle photograph of the Stanford University main building, a large stone structure with a red-tiled roof and multiple arches. In front of the building is a vast, well-maintained green lawn with several paved walkways. The sky is blue with some light clouds. The text 'AIM funding' is overlaid in white at the top center.

AIM funding

Stanford University Department of Anesthesia • Agency for Healthcare Research Quality International Anesthesia Research Society, National Institutes of Health

Cedars-Sinai Medical Center
St. Elizabeth's Medical Center
University of Cincinnati
University of Iowa
SUNY Downstate Medical Center
John H. Stroger, Jr. Hospital

University of Kansas-Wichita
Mayo Clinic
Tulane University
University of Illinois
Loyola Medical Center
The Tides Foundation

Columbia University
New York University
Tufts University
University of Rochester
University of Tennessee
San Antonio Foundation

SOME OF THE PEOPLE WHO HELPED



Amy Ahearn
Learning Specialist
Stanford AIM Lab



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Stanford AIM Lab



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- *Harvard University – Massachusetts General Hospital (Meredith Albrecht, MD)*
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- *Tufts University (Iqbal Ahmed, MD)*
- *University of Rochester, New York (Carol Diachun, MD)*
- *University of Massachusetts (Elifce Cosar, MD and Ellie Duduch, MD)*
- *Tulane University (Michael Yarborough, MD)*
- *UC San Diego (Beverly Newhouse, MD)*
- *University of Alabama (Susan Black, MD and Lee Ann Riesenber, MD)*



1: TEACHERS AS DESIGNERS

EFFECTIVE LEARNING BY DESIGN



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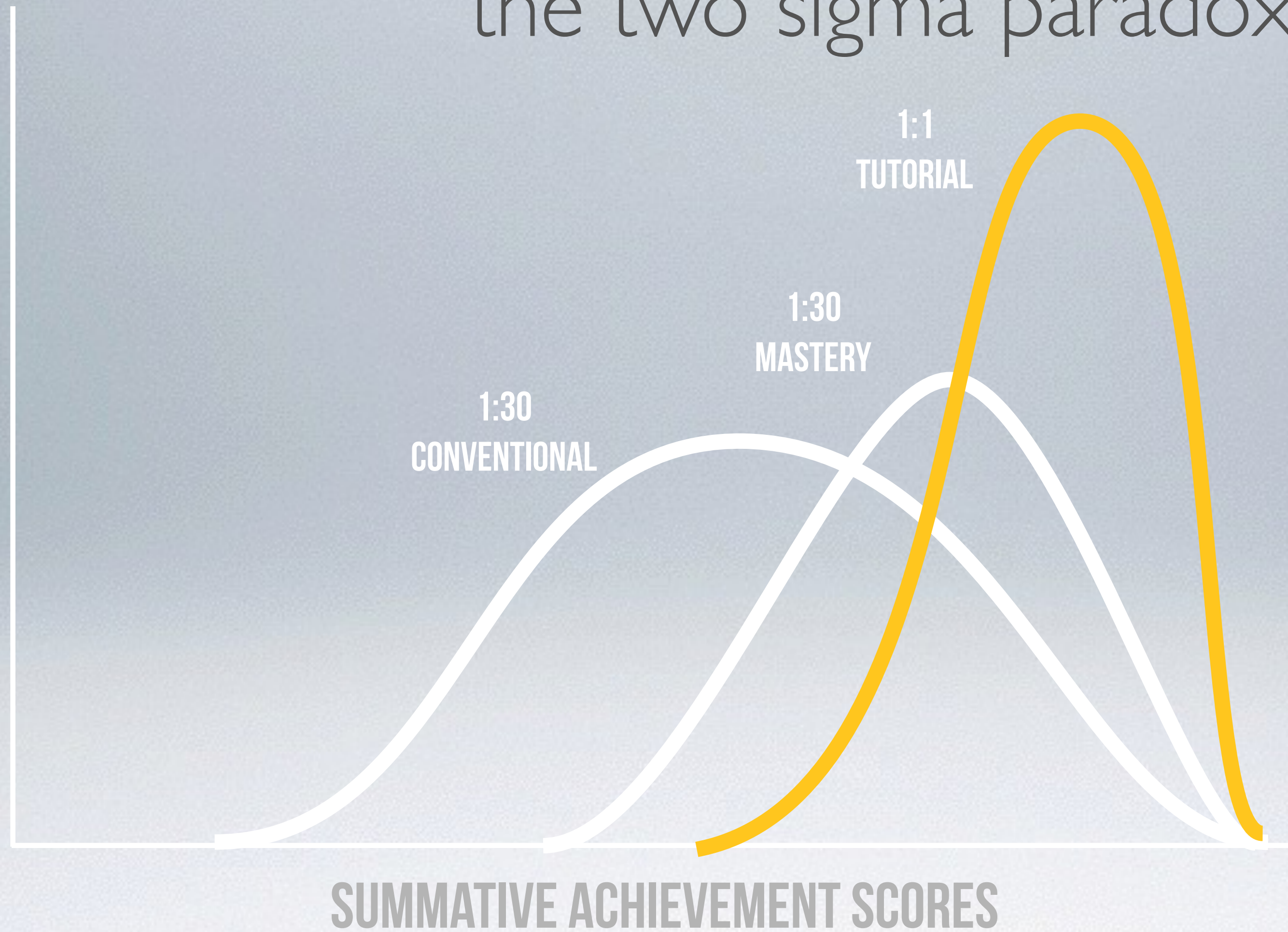
AIM



benjamin bloom



the two sigma paradox



**AVERAGE STUDENT
IN TUTORIAL**

>98% CONTROL

IN MASTERY

>84% CONTROL



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AIM





NEWTTOOLS—SAME GOALS
EFFECTIVE LEARNING BY DESIGN



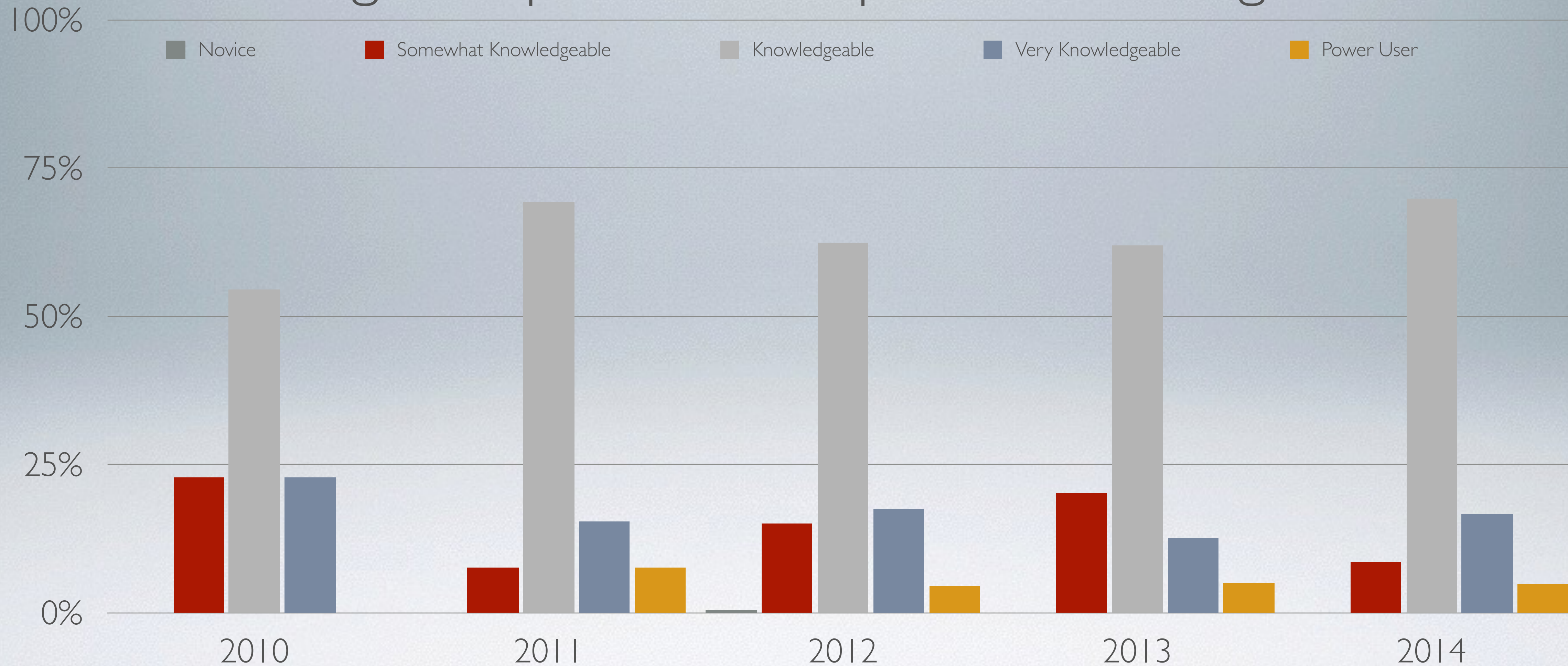
CHALLENGE FOR TEACHERS
UNDERSTAND NEW INSTRUCTIONAL TECHNOLOGIES



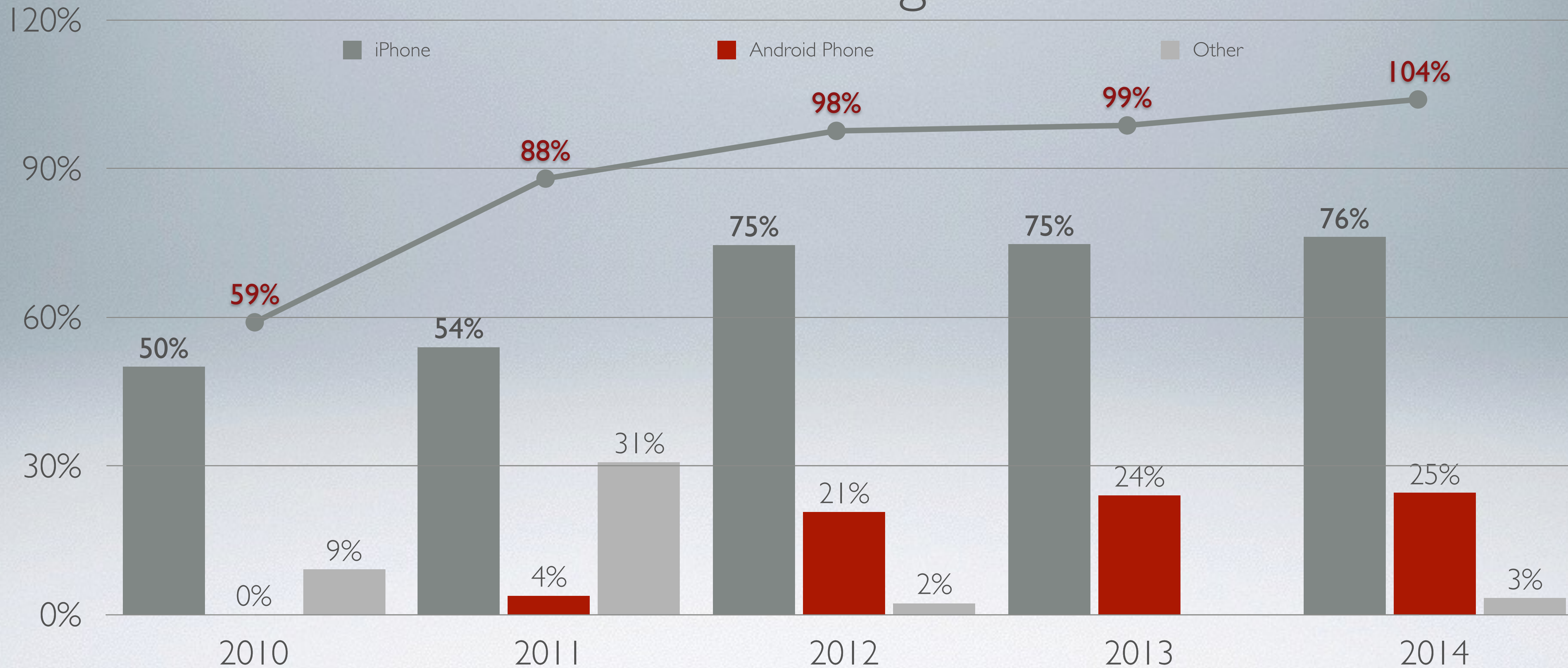
#2: EMPATHY FOR LEARNERS

WHO ARE TODAY'S ANESTHESIA LEARNERS?

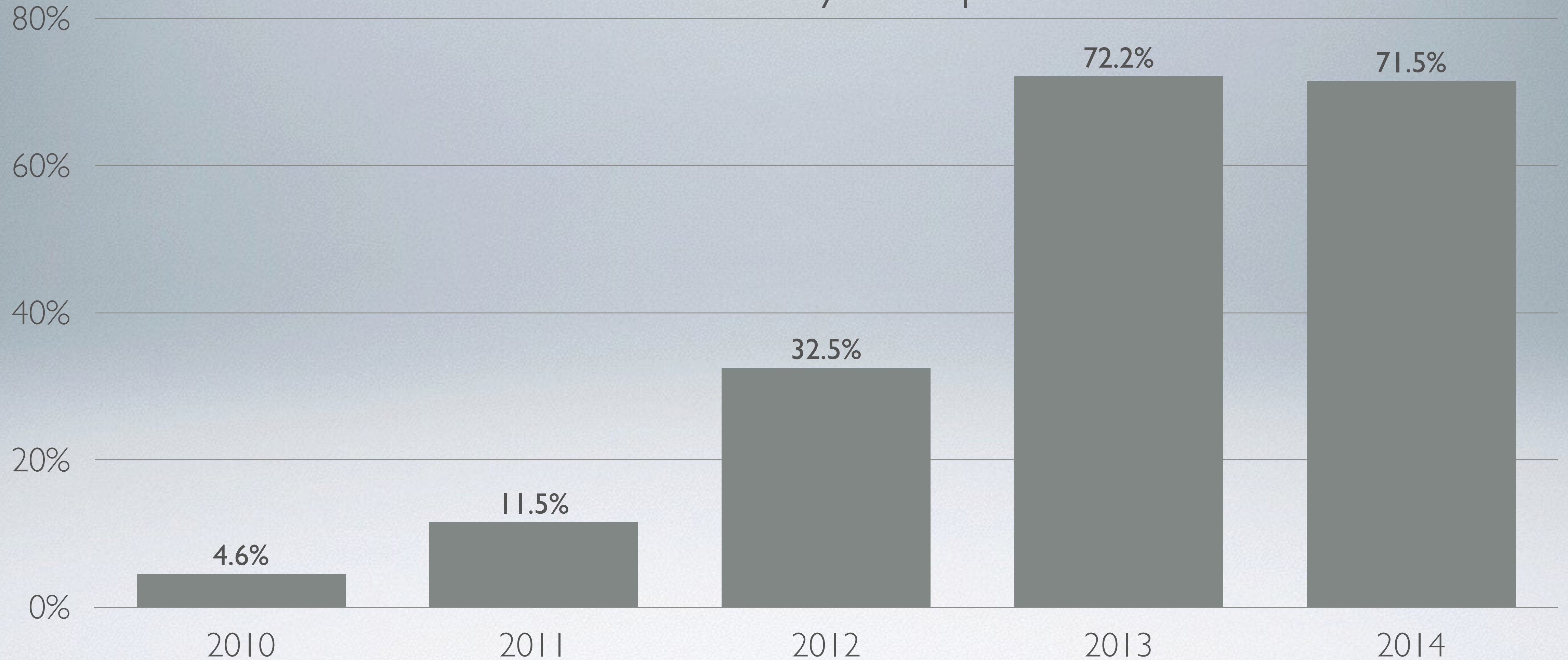
high adoption of computer technologies



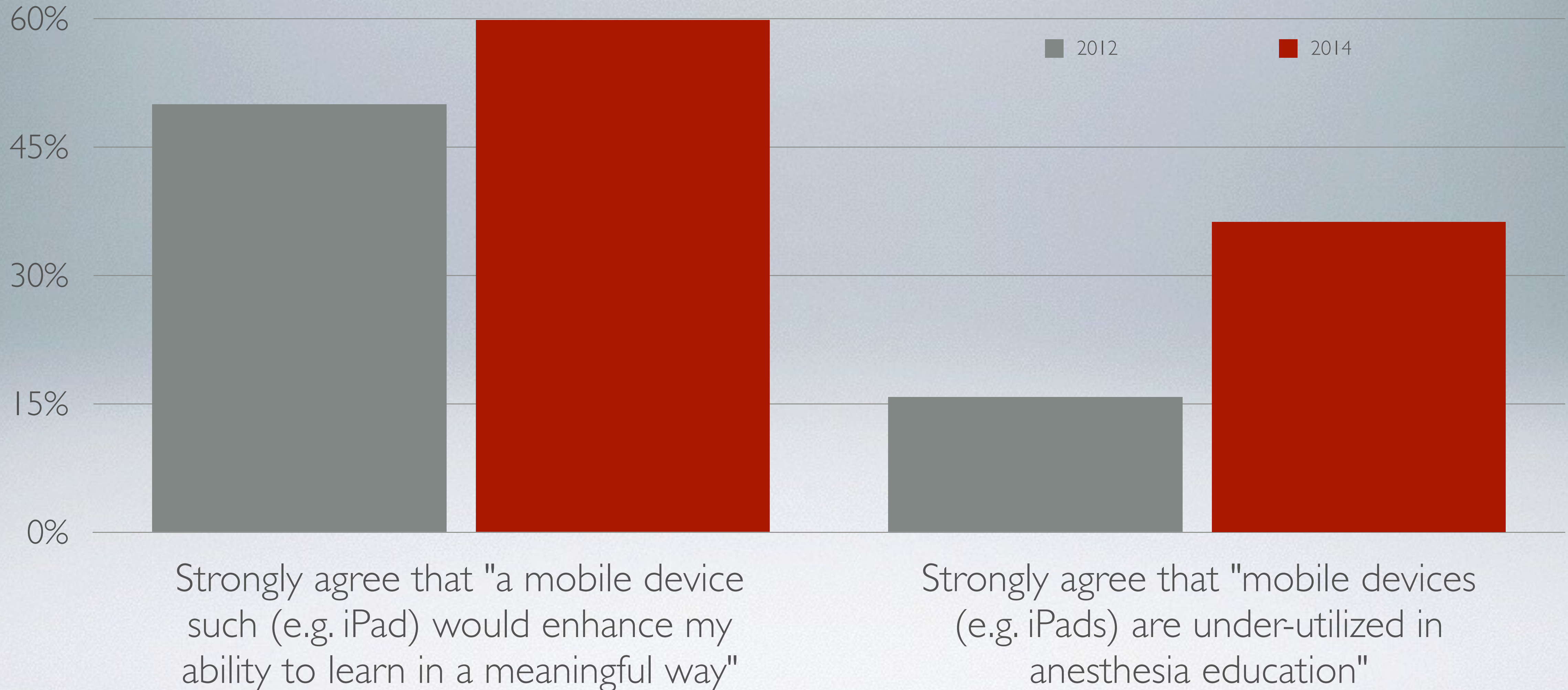
mobile and data-connected generation of learners



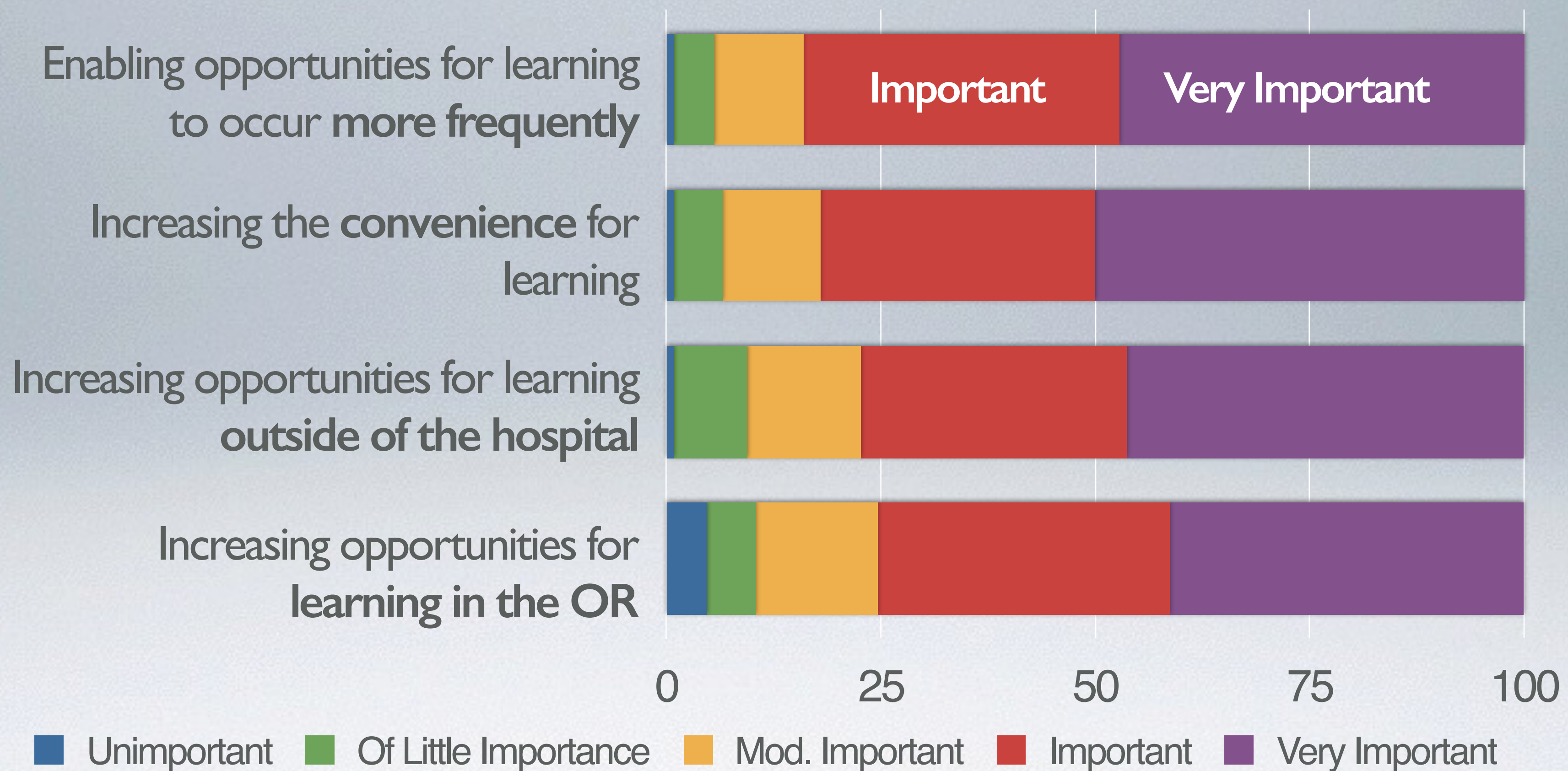
anesthesia residents are heavy adopters of tablet devices



residents believe tablets under-utilized in their education



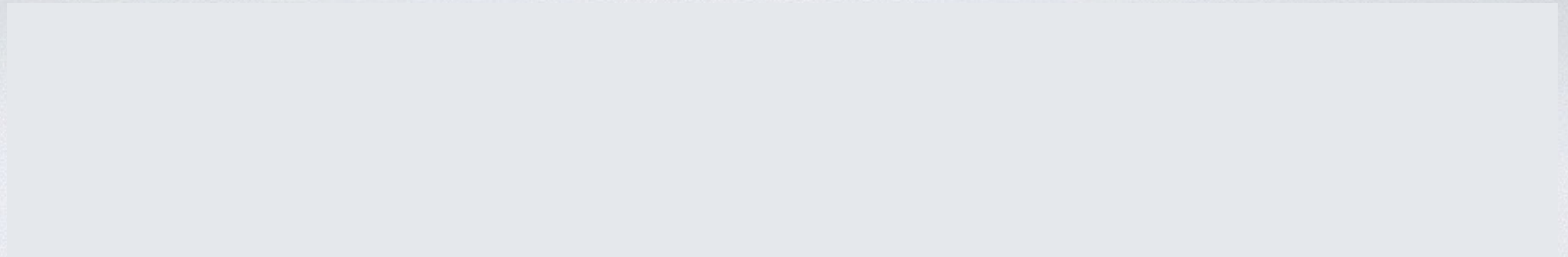
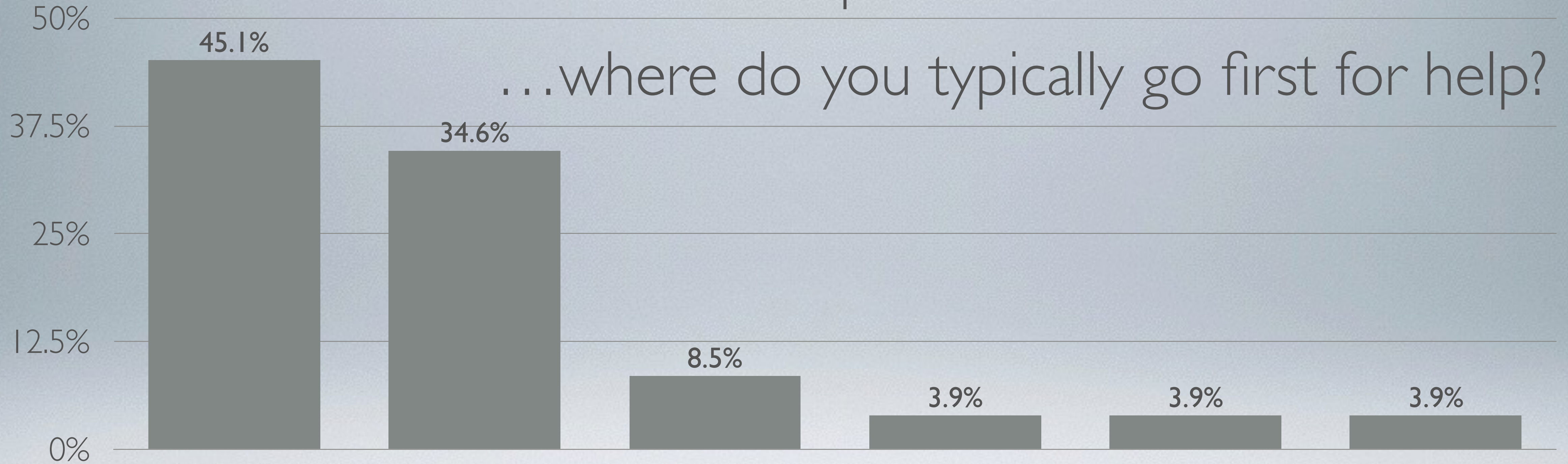
residents believe tablets enhance multiple educational uses





anesthesia residents seek help first from online sources

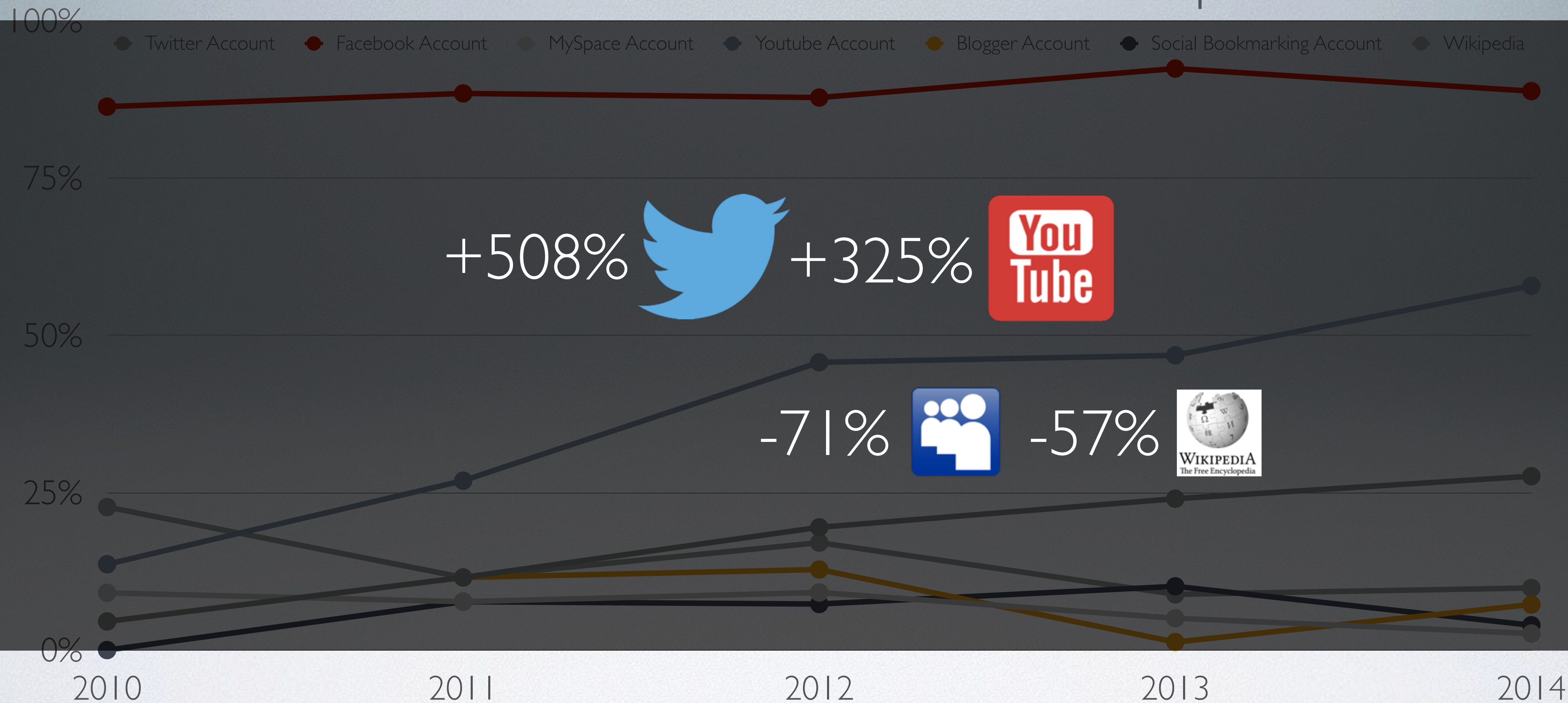
...where do you typically go first for help?



anesthesia residents are not content creators, they're consumers



social media account ownership





#3: THOUGHTFUL USE OF EDTECH

WHAT ARE THE UNIQUE AFFORDANCES YOU SEEK?

screen-based simulation increases feeling of preparedness



PROJECT

10 month online elearning curriculum designed to prepare anesthesia interns for residency training. Launched in 2009. Now deployed at 23 schools nationwide.

RESULTS

Post-curriculum quiz scores improved by an average of 24% each month ($p < 0.0001$), self-assessed preparedness scores improved by 72.2% ($p = 0.02$) after completing the online course. Mean AKT-1 scores were 14% higher in the START cohort (86.2%ile nationally) vs. historical control (75.8%ile national) ($p = 0.03$).

Journal of Graduate Medical Education: March 2013, Vol. 5, No. 1, pp. 125-129.

how might we scale experiential learning?

“Net Gen learners are *experiential*, prefer to *learn by doing* rather than being told what to do. This enables them to better retain information and use it in creative, meaningful ways.”





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★ REAL EXAMPLE ★





ethercast

INDUCTION OF GENERAL ANESTHESIA



#4: BRING LEARNING TO SCALE

ROLE OF CURATION AND PERSONALIZE LEARNING

CURRENT AIM LAB MOOC COURSES



Medical
Education in the New
Millennium



Engage + Empower
Me



STARTprep:
Anesthesia
Basic Sciences



START
Anesthesia
Residency

DEFINITION

MASSIVE OPEN ONLINE COURSE

What is massive?

- 100?
- 1,000?
- 10,000?
- 100,000?

Open registration?

Local cohorts?

Self-paced?

Start/end dates?

College credits?

Badges?

Role of the instructor?

Learning community?

Scripted assessments and feedback?

M O O C
MASSIVE OPEN ONLINE COURSE

Open content?

Free of charge?

Affordable?

Real-time interaction?



FOCUS ON SCALABILITY



FOCUS ON COMMUNITY AND CONNECTIONS



Help

Medical Education in the New Millennium

YOU ARE REGISTERED FOR THIS COURSE

VIEW COURSEWARE



VIEW ABOUT PAGE IN STUDIO

overview

ABOUT THIS COURSE

This **interdisciplinary course** features talks from thought leaders and innovators from medical education, instructional design, cognitive science, online learning, and emerging technology. Over the course of eleven weeks, we'll consider how to build educational experiences that address the unique learning preferences of today's Millennial medical students and residents. As the volume of new medical knowledge outpaces our ability to organize and retain it, how might educators disrupt outdated practices through thoughtful use of technology and learning design? How might MOOCs, social media, simulation and virtual reality change the face of medical education? How might we make learning continuous, engaging, and



i Course Number **ANES204**

📅 Classes Start **Oct 01, 2014**

OUR RESEARCH COMMUNITY

Stanford University pursues the science of learning. Online learners are important participants in that pursuit. The information we gather from your



Courseware

Course Info

Discussion

Progress

Instructor

Staff view

Help

Introduction to the Course

Getting Started with Medical Education in the New Millennium

A Patient's Perspective: Britt Johnson

Speakers: Larry Chu, MD, MS, Kyle Harrison, MD, Nikita Joshi, MD

Discussion Question

Cognition and Learning

Bringing the Patient Voice to Medical Education

Reimagining Undergraduate Medical Education

Simulation, Part-task Trainers, and 3D-printing

Social Media: Harnessing Distributed Expertise

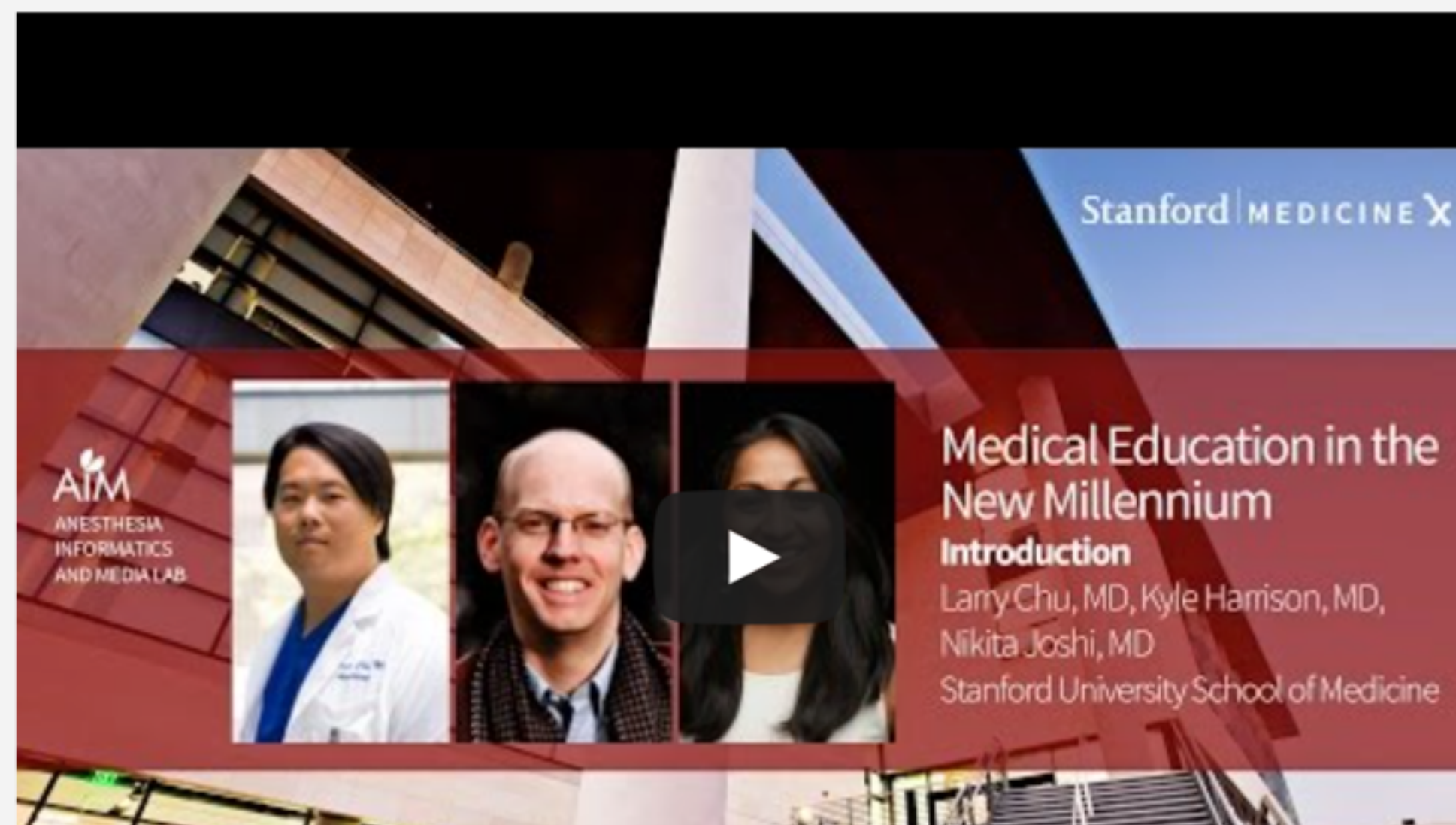


[VIEW UNIT IN STUDIO](#)



[STAFF DEBUG INFO](#)

VIDEO



victim.
But in recent years the patient movement have redefined what it means to be a patient.
We are no longer the noun or the passive definition of the patient.
We're the adjective quote, quietly and steadily persevering.
Well, maybe not so quietly, but we are the provocation.
We have expressed our annoyance with the healthcare system.

- ▶ Bringing the Patient Voice to Medical Education
- ▶ Reimagining Undergraduate Medical Education
- ▶ Simulation, Part-task Trainers, and 3D-printing
- ▶ Social Media: Harnessing Distributed Expertise
- ▶ Massively Learning Together, Scaling Distributed Learning- MOOCs
- ▶ The Power of Peer-to-peer Learning
- ▶ Patient Safety and Cognitive Bias
- ▶ Bringing Virtual Learning into the Real World
- ▶ Challenging Authority in Different Medical Cultures

Stanford MEDICINE X

AIM ANESTHESIA INFORMATICS AND MEDIA LAB

Medical Education in the New Millennium
Introduction
 Larry Chu, MD, Kyle Harrison, MD, Nikita Joshi, MD
 Stanford University School of Medicine

0:00 / 8:39 SPEED 1.0x

This video was recorded in front of a live studio audience at Stanford University.

>> So hi there, I'm Larry Chu, associate professor of anesthesia at Stanford, and executive director of Medicine X.

On behalf of my course co-directors, Kyle Harrison and

Nikita Joshi, welcome to medical education in the new millennium, a new course from

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KEY INSIGHT

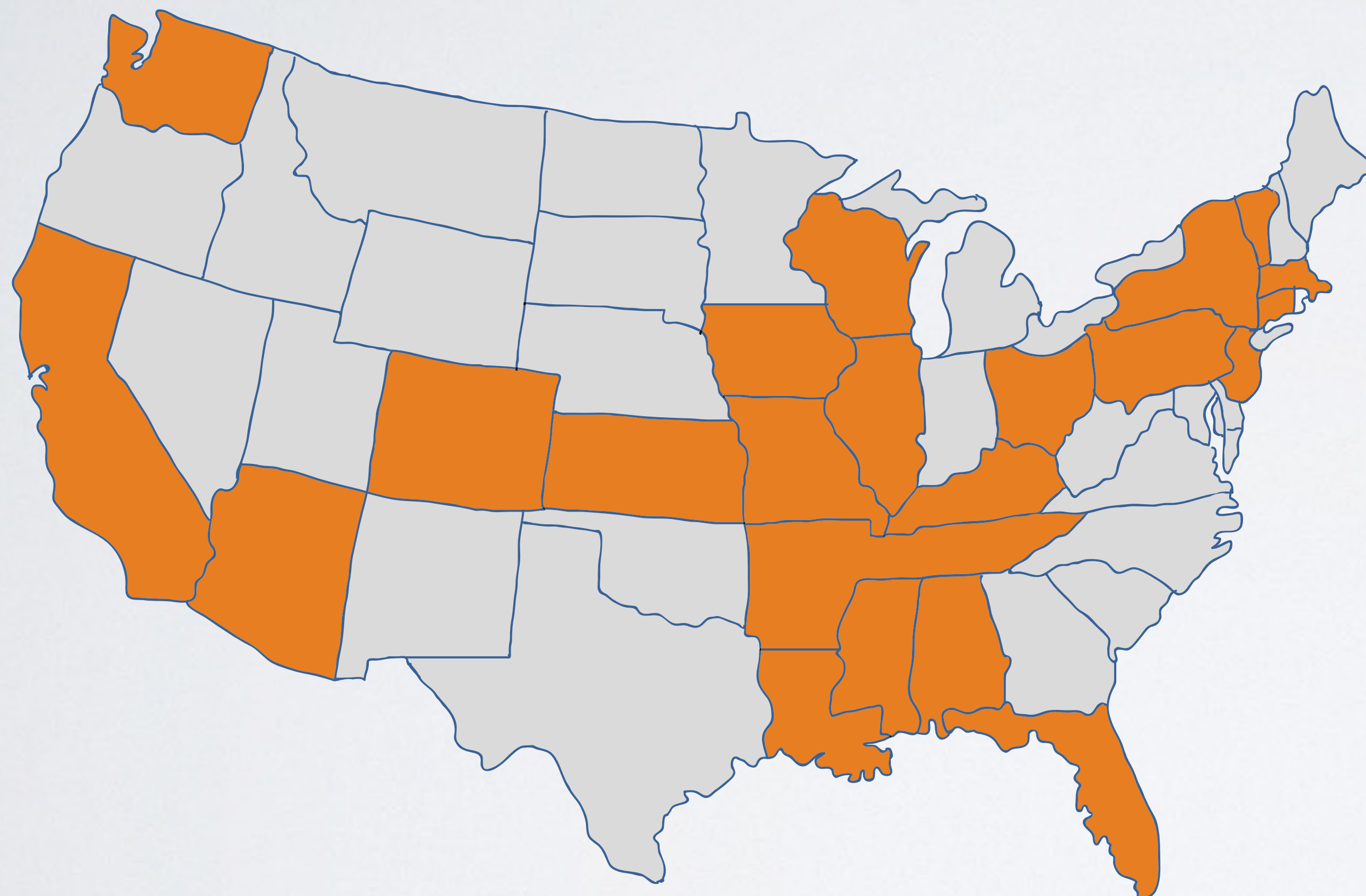
"If the practice of participatory medicine requires a team effort, could we think of medical education in the same way?"

-Dr. Larry Chu

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Use the arrow below to move on to the next screen.

STARTPREP MOOC



21 Months

1400 Anesthesia Learners

48/133 Programs = 36% US

1 Australia

1 South Africa

2014: 1400/3517 = 40% US

BACKGROUND

- **Majority of current residents are millennial learners**, incorporating new technologies and fast, mobile delivery of information.
- **Accustomed to mobile, online learning from grade school through medical school**, expecting similarly sophisticated teaching modalities in residency.
- **STARTprep was created to meet this need for a time-shifted, place-shifted method of learning that strategically promotes an incremental model of studying** (vs. cramming) to prepare residents for high stakes educational milestones.

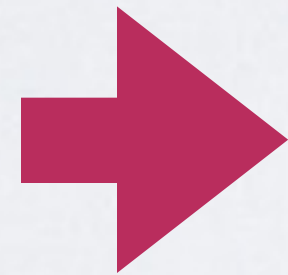
UNIQUE AFFORDANCES

340+ online learning modules,
organized around anesthesia basic sciences.
STARTprep is not marketed as a board
review course.

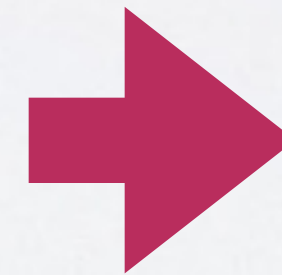
UNIQUE AFFORDANCES



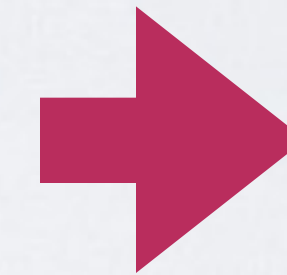
Daily trigger
email



Short online
reading



Knowledge
Assessment
Questions



Introduction to Lesson

Monday, September 8, 2014

Ventilators: Classification: Flow Generation vs. Pressure Generation



James M. Hunter, Jr., MD

Assistant Professor of Anesthesiology and Surgery
University of Alabama at Birmingham

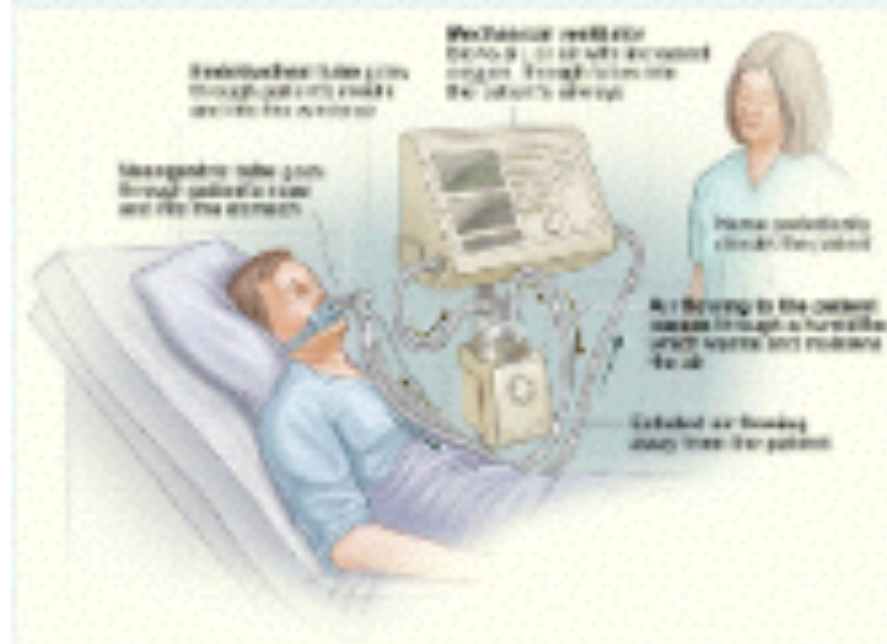
Support

Learning Objectives:

After completing this lesson the learner will be able to:

1. Describe the flow patterns in flow-targeted and pressure-targeted mechanical breaths.
2. Contrast how changes in lung compliance and chest wall compliance affect airway pressure and tidal volume in a flow-targeted breath vs. a pressure-targeted breath.
3. Contrast how changes in airway resistance affect airway pressure and tidal volume in a flow-targeted breath vs. a pressure-targeted breath.
4. Explain how pressure support differs from pressure control.

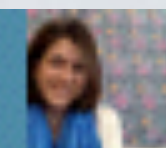
What would you do?



A 52-year-old woman is slow to awaken after general anesthesia for total abdominal hysterectomy. She is transported to the PACU and mechanical ventilation with volume-control is initiated. 30 minutes later, the nurse calls because the patient is "fighting the ventilator" and the peak inspiratory pressure alarm is sounding. Evaluation reveals that the patient is attempting to exhale toward the end of mechanical inspiration. *How might the choice of mechanical breath type influence the patient's ability to tolerate mechanical ventilation? How would changing to pressure-support change the situation?* You'll uncover our answer after completing today's module!

[Lesson with Writable Questions -->](#)

[Lesson With Reflection Questions -->](#)



Mon 09/08/14 - Ventilators: Classifications: Flow Generation vs. Pressure Generation ?

Preview

Edit

Reports

Grade essays

Positive Pressure Breaths

The flow pattern of a mechanical breath is determined by parameters controlled by the ventilator. These include: airway pressure, tidal volume, flow, and duration.

This chapter describes the common types of positive pressure breaths:

- volume-control
- pressure-control, and
- pressure support.

Each of these breath types is useful in the operating room. For example, pressure support can be used with an LMA during eye surgery to reduce movement of the eye due to the patient's inspiratory efforts.



Support

Check your understanding!

- List the parameters that can be controlled by the ventilator in delivery of a positive pressure breath.

[Move on to the next section!](#)

**Question 1**

Marked out of 1.00

[Flag question](#)

Write a personal note

[save question note](#)

Send feedback to teacher

[send feedback](#)[Edit question](#)**Question # Q1L1D66W13**

How is most blood carbon dioxide transported?

Select one:

- A. As carbaminohemoglobin
- B. As bicarbonate ion (HCO_3^-)
- C. As dissolved CO_2
- D. As carbonic acid (H_2CO_3)

Question 2

Marked out of 1.00

[Flag question](#)

Write a personal note

[save question note](#)

Send feedback to teacher

[send feedback](#)[Edit question](#)**Question # Q2L1D66W13**Which of the following is **NOT** a determinant of mixed venous oxygen content?

Select one:

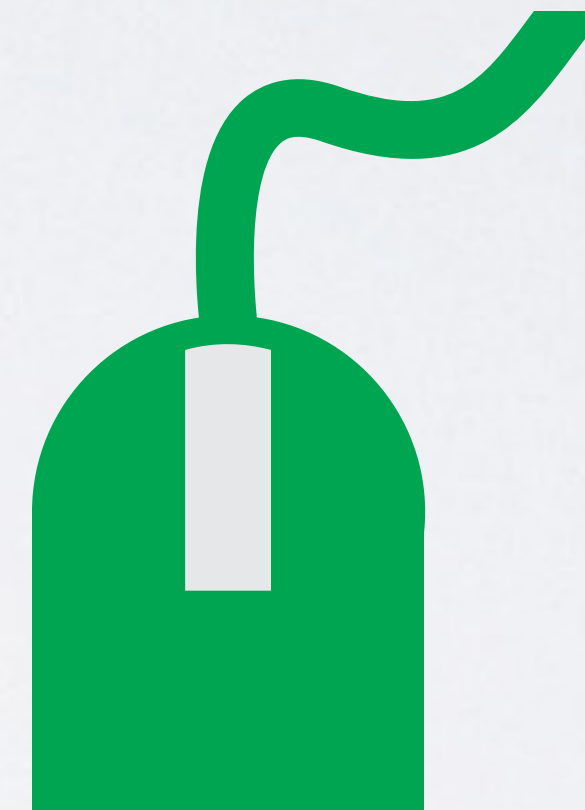
- A. Hemoglobin
- B. Arterial oxygen content
- C. Oxygen consumption
- D. Partial pressure carbon dioxide
- E. Cardiac output



WHO'S USING STARTPREP?



99% used learning technologies in college



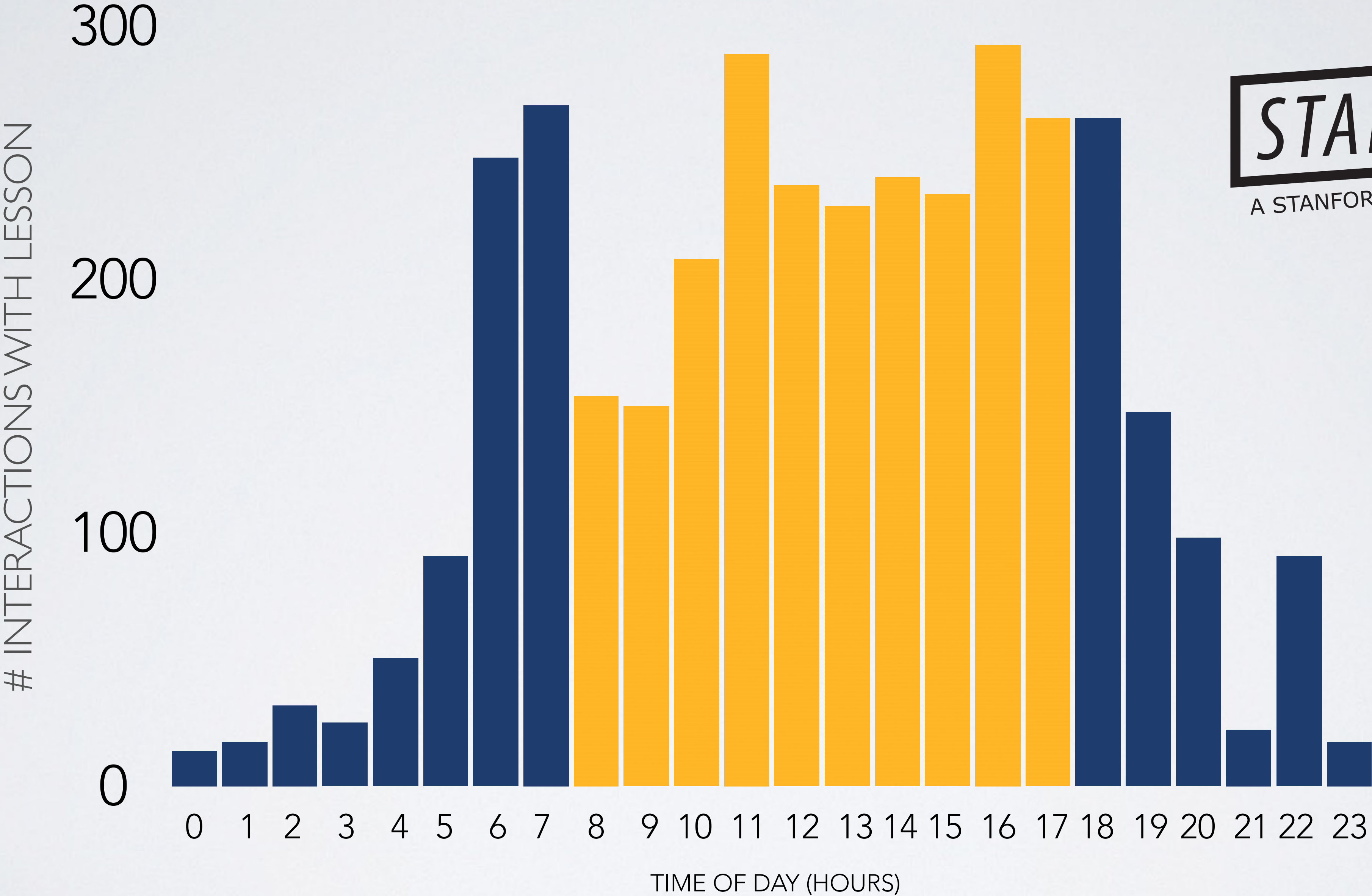
59% completed an online course before



STARTPREP MORE ENGAGING

- **81% of residents** who have been using the course for at least 3 months **say that STARTprep is more engaging than traditional study methods**
- **86% of residents** say STARTprep is more engaging than **traditional lectures**

LEVEL OF ENGAGEMENT OVER 24 HOURS



STARTPREP
A STANFORD **AIM LAB** PROJECT



STARTPREP MORE USED, MORE PREPARED

37% of STARTprep residents are regular users,
compared with 7% average completion rate for MOOCs

**88% of STARTprep residents say makes them feel
more prepared** for high stakes milestone exams



Time Shifting

98% of residents say they use STARTprep to learn and study at convenient times not possible with in person courses



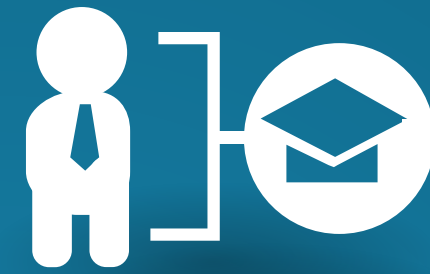
Podcasts

Podcast episodes have been downloaded 2,604 times across eight countries



Participation

1/3 of residents open daily course emails and 29% click through to the course



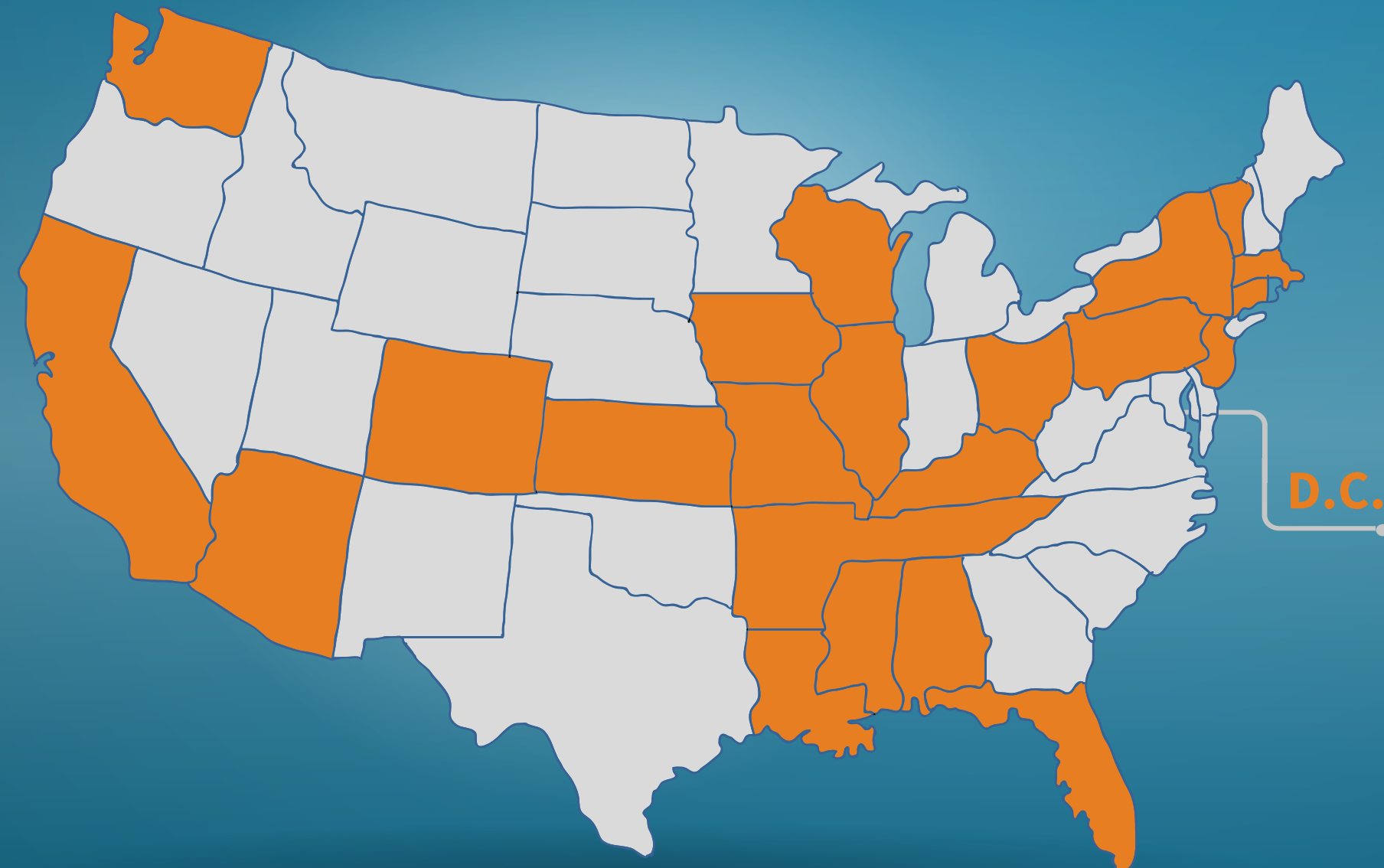
Demographics

42% female
 62% ages 25-30
 45% on facebook
 22% 1° caregiver



Mobile Learners

58% of residents primarily access STARTprep from a mobile device such as an iPhone



990 Residents

Residents from 38 residency programs across US, 1 in Australia and 1 in South Africa

95% of residents rate STARTprep chapters as being good, very good or excellent.

95%



86% of residents say STARTprep is more engaging than traditional lectures.

86%



88% of residents say that STARTprep makes them feel more prepared for high stakes educational milestones.

88%





CLINICAL APPLICABILITY

- **92% of respondents** say that STARTprep helps them **make better clinical decisions**
- **94% say** STARTprep helps them **feel more prepared for daily cases**



SUMMARY

Initial results show the program helps learners:

- **Feel more prepared for high stakes educational milestones**
- **Engages learners more** than traditional lectures and study methods
- Allows residents to **learn at times that are convenient** to their needs and lifestyles
- **Reveals strengths and gaps in residents' knowledge** of the anesthesia basic sciences



STUDENT FEEDBACK

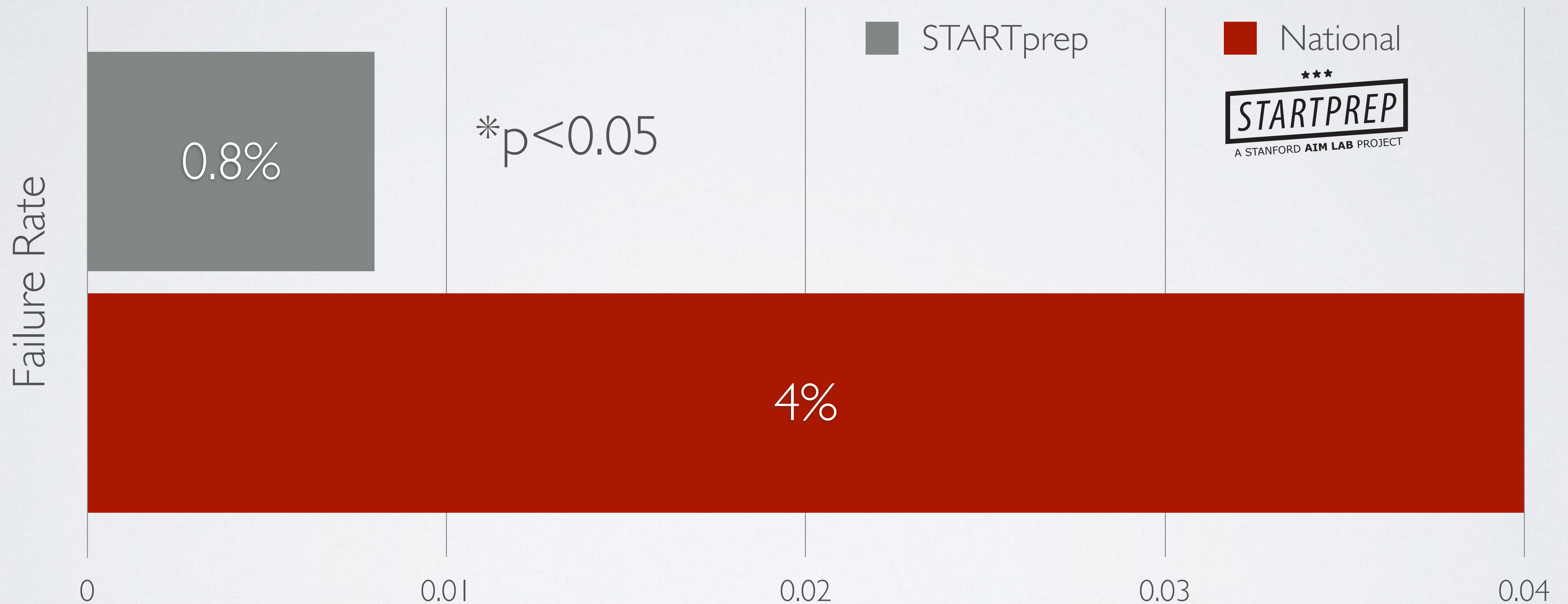
“

Slow and steady wins the race! The key of STARTprep is it cuts out the wasted time in figuring out what to study. Each day there is a set topic for review.

”

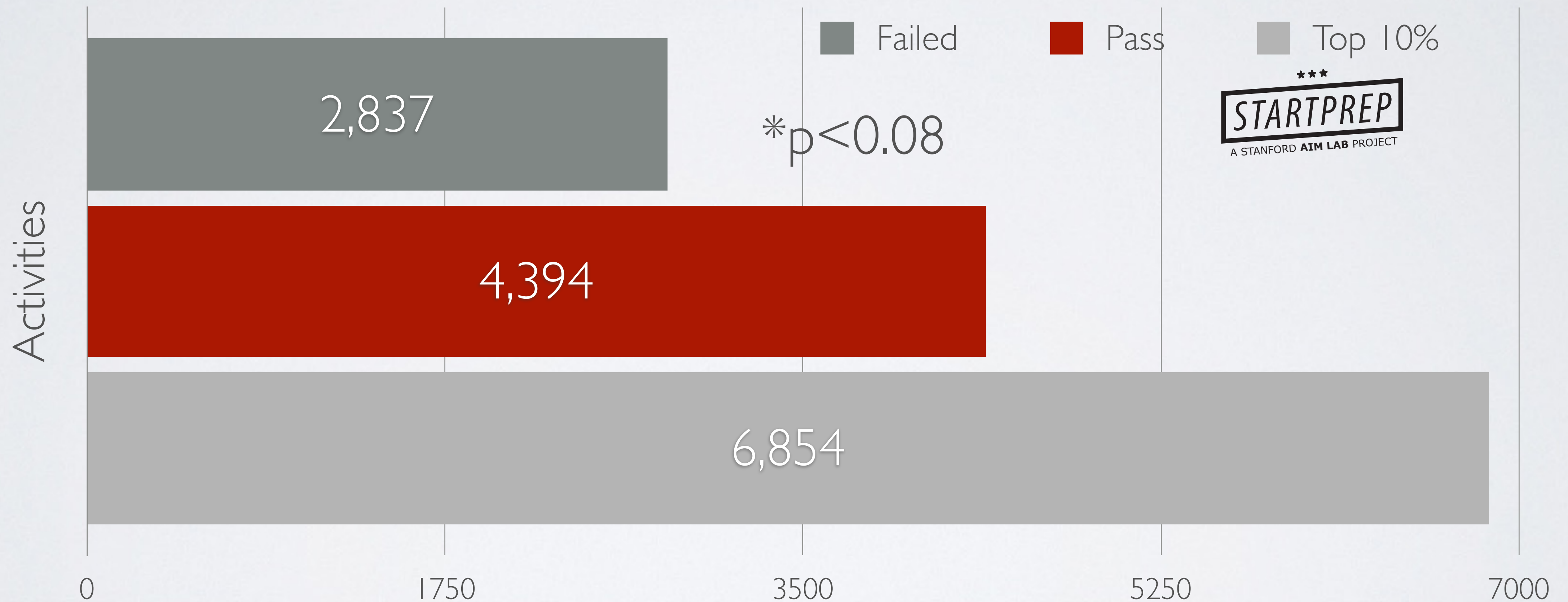


OUTCOMES (2013 COHORT)



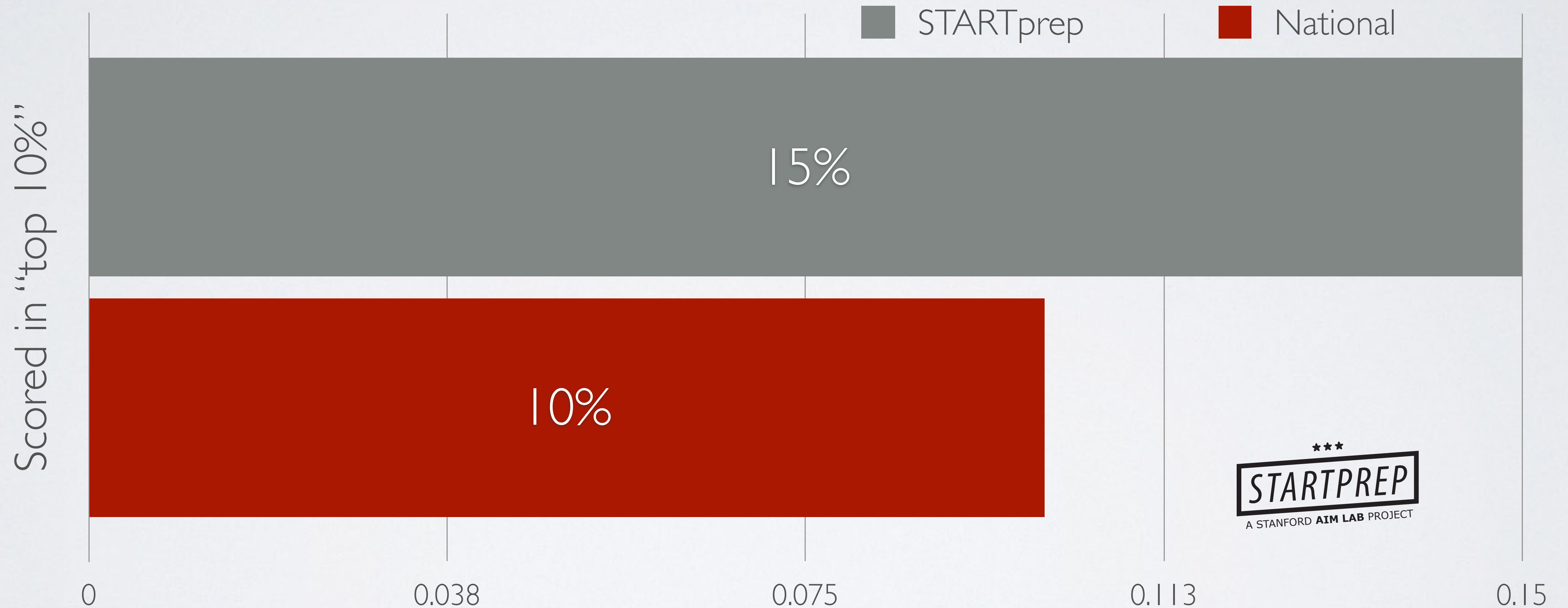


OUTCOMES (2013 COHORT)





OUTCOMES (2013 COHORT)





#5: QUALITY OF LEARNING EXPERIENCE

ACKNOWLEDGE VULNERABILITY OF RESIDENTS



Dhruv Khullar, MD
MGH Resident

The New York Times

The importance of sitting with patients

“She asked me to sit for a few minutes and, shamefully, I hesitated. I had eight more patients to see before rounds and was already running behind.”



Dhruv Khullar, MD
MGH Resident

The New York Times

The importance of sitting with patients

“So far, residency educational reform has focused on the quantity of hours worked, not necessarily improving the quality of time spent at work.”



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<http://medicinex.stanford.edu/ed/>