Transforming Medical Education to Meet Societal Needs

Eric S. Holmboe, MD

Disclosures

Eric Holmboe works for the ACGME and receives royalties from Mosby-Elsevier for a textbook.

Outline

- Current health system challenges

- Millieu matters

- Think developmentally

- Milestones reaching a milestone?
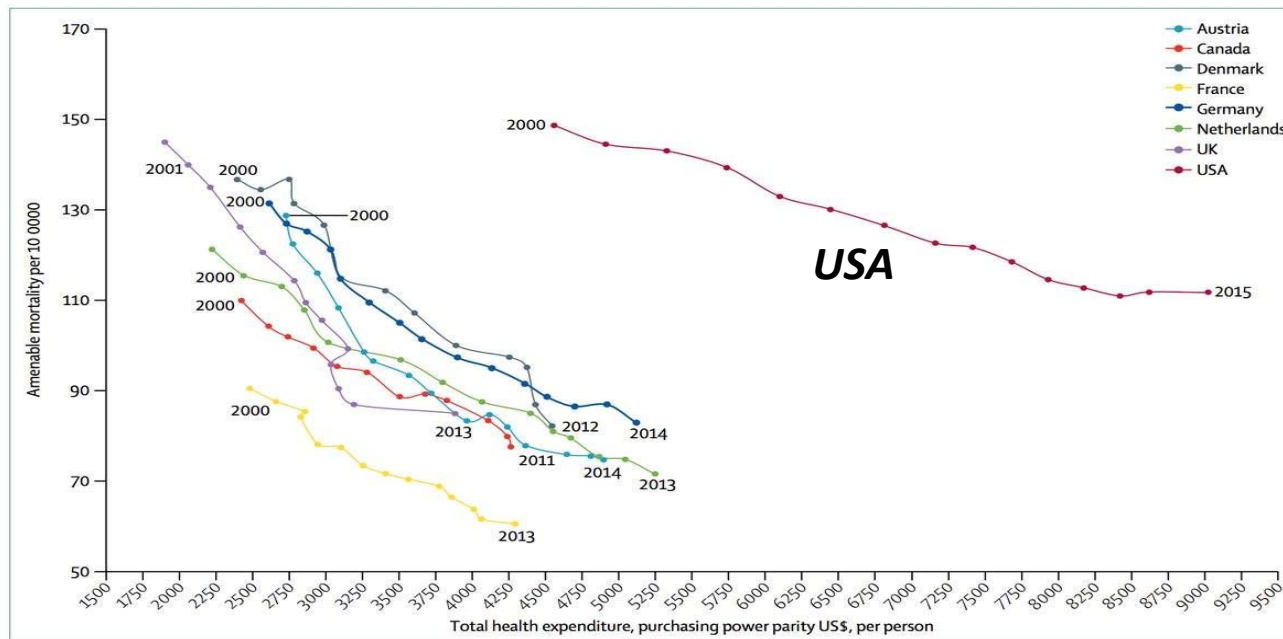
How are Our Healthcare Systems Performing?

Commonwealth Report 2017

	AUS	CAN	FRA	GER	NETH	NZ	NOR	SWE	SWIZ	UK	US
OVERALL RANKING	2	9	10	8	3	4	4	6	6	1	11
Care Process	2	6	9	8	4	3	10	11	7	1	5
Access	4	10	9	2	1	7	5	6	8	3	11
Administrative Efficiency	1	6	11	6	9	2	4	5	8	3	10
Equity	7	9	10	6	2	8	5	3	4	1	11
Health Care Outcomes	1	9	5	8	6	7	3	2	4	10	11

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Amenable Mortality

Figure 6: Amenable mortality per 100 000 people and changes in total health expenditure in Germany and selected countries, 2000–14[70]
The graphs show age-standardised changes in amenable mortality and include all persons aged 0–74 years of age.

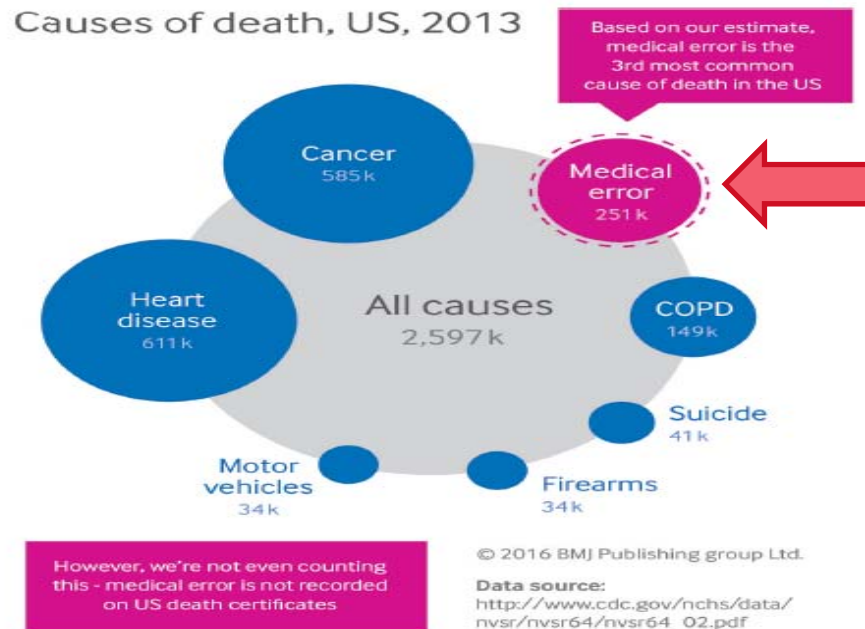# Diagnostic Errors (2015)

IMPROVING DIAGNOSIS IN HEALTH CARE

IOM Report

- At least 5 percent of U.S. adults who seek outpatient care each year experience a diagnostic error.
- Postmortem examination research shows diagnostic errors consistently contribute to ~ 10 percent of patient deaths.
- Diagnostic errors account for 6 to 17 percent of hospital adverse events.
- ***Every American will experience at least 1 Dx error in their lifetime***

Makary and Daniel (2016)

Causes of death, US, 2013

Based on our estimate, medical error is the 3rd most common cause of death in the US

Cancer
585k

Medical error
251k

Heart disease
611k

All causes
2,597k

COPD
149k

Suicide
41k

Motor vehicles
34k

Firearms
34k

However, we're not even counting this - medical error is not recorded on US death certificates

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Data source:
http://www.cdc.gov/nchs/data/nvsr/nvsr64/nvsr64_02.pdf

Fig 1 Most common causes of death in the United States, 2013[2]

Makary and Daniel, based on review of published reports, that medical error is the THIRD leading cause of death in the U.S.

They also pointed out the vast majority of errors never show up on death certificates

Should Learners Train in Poorly Performing Institutions?

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Training Environment and Future Practice

All these studies found an association between hospital level quality, safety or costs where the physician trained and their future practice after graduation:

- Asch (2009)
  - Obstetrical complications
- Chen (2014); Phillips (2017)
  - Costs of care in IM and FM practice
- Sirovich (2014)
  - Appropriate conservative management (on exam)
- Bansal (2015)
  - Surgical complications

Environment and Conservative Practice

Table 3. Adjusted Patient Expenditures for Primary Care[a]

| | All Physicians | | Years of Practice | | | | | |
| | | | 1-7 Years | | 8-15 Years | | 16-19 Years | |
	β (95% CI)[b]	P Value	β (95% CI)	P Value	β (95% CI)	P Value	β (95% CI)	P Value
Physicians, No.	2851		480		1694		677	
Medicare beneficiaries, No.	491 948		60 996		302 869		128 083	
Training HRR spending[c]								
Low	Reference		Reference		Reference		Reference	
Average	0.05 (0.00 to 0.09)	.04	0.22 (0.01 to 0.44)	.04	0.01 (−0.04 to 0.07)	.70	0.06 (−0.04 to 0.17)	.23
High	0.07 (0.02 to 0.12)	.007	0.29 (0.13 to 0.45)	<.001	0.08 (0.02 to 0.15)	.02	−0.02 (−0.12 to 0.07)	.63

Chen C, et. al. Spending Patterns in Region of Residency Training and Subsequent Expenditures for Care Provided by Practicing Physicians for Medicare Beneficiaries. *JAMA*. 2014;312(22):2385-2393.

Competency-based Medical Education: Facilitating the Desired Outcomes

Early Principles: CBME

World Health Organization (**1978**):

"The intended output of a competency-based programme is a health professional who can practise medicine at a defined level of proficiency, in accord with local conditions, to meet local needs."

McGaghie WC, *Miller GE, Sajid AW, Telder TV. Competency-based Curriculum Development in Medical Education. World Health Organization, Switzerland, 1978.*
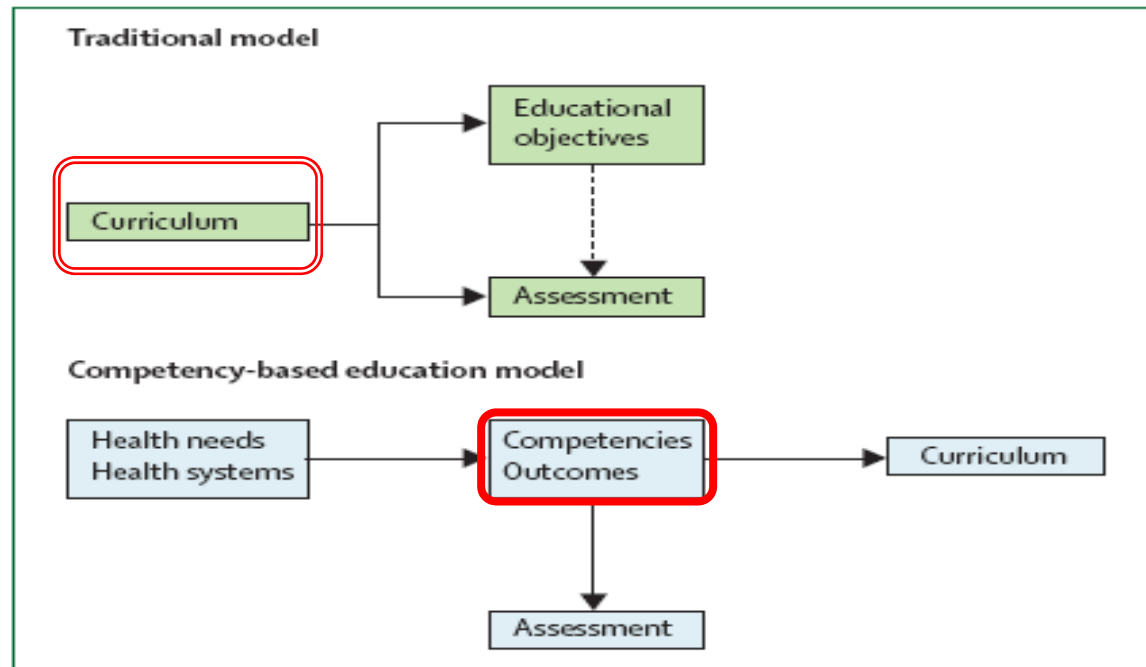
CBME Today

An <u>outcomes-based</u> approach to the design, implementation, assessment and evaluation of a medical education program using an organizing framework of competencies[1]

[1]Frank, JR, Snell LS, ten Cate O, et. al. Competency-based medical education: theory to practice. Med Teach. 2010; 32: 638–645
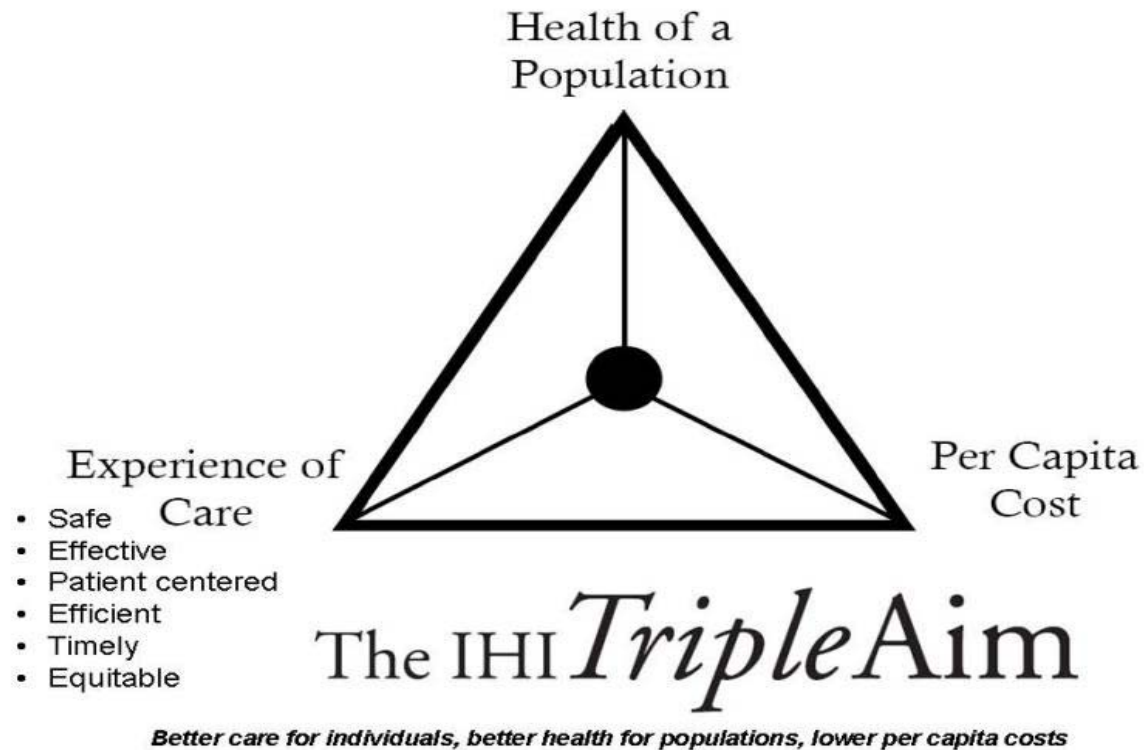
Why CBME: Start with *System* Needs

Frenk J, et al. Health professionals for a new century: transforming education to strengthen health systems in an interdependent world. Lancet. 2010
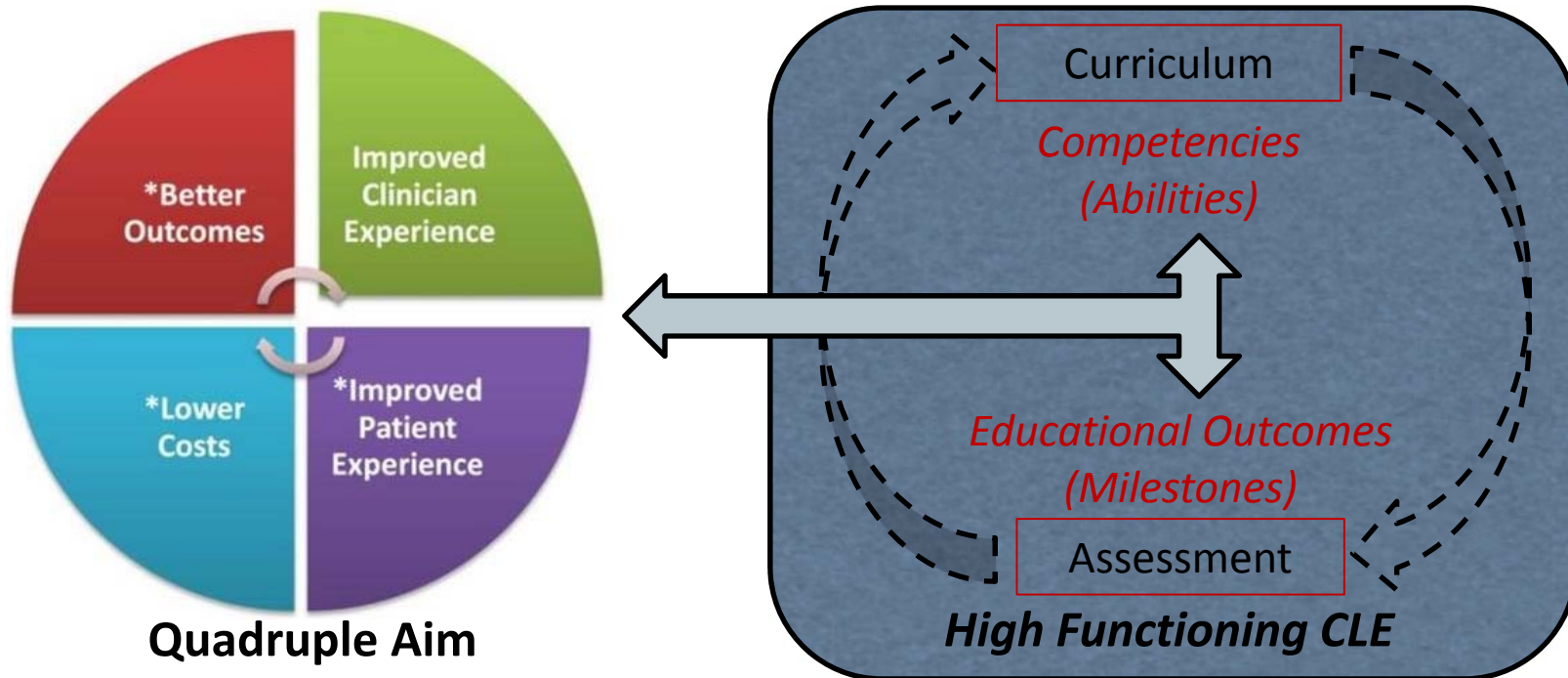
What Are The Ultimate Outcomes?

Health of a Population

Experience of Care
- Safe
- Effective
- Patient centered
- Efficient
- Timely
- Equitable

Per Capita Cost

The IHI *Triple*Aim

Better care for individuals, better health for populations, lower per capita costs

The Quadruple Aim

The Missing Aim

ACGME Physician Wellness Resources:
http://www.acgme.org/What-We-Do/Initiatives/Physician-Well-Being

The Ultimate Goal of CBME

Quadruple Aim

- *Better Outcomes
- Improved Clinician Experience
- *Lower Costs
- *Improved Patient Experience

High Functioning CLE

Curriculum

Competencies (Abilities)

Educational Outcomes (Milestones)

Assessment

Pair and Share

What is the responsibility and role of the graduate medical education (GME) system to address the quadruple aim?

Competencies

- Love them or hate them, they have forced medical education to attend to critical domains too long missing from training programs:
  - Interprofessional teamwork; quality of care; patient safety; care coordination
- They are just a framework
  - "a basic structure underlying a system, concept"

Fundamental Characteristics of CBME

Graduate <u>outcomes</u> in the form of achievement of <u>predefined desired competencies</u> are the goal.

Competencies are derived from the ***needs of patients***, organized into a coherent guiding <u>framework.</u>

Time is a <u>resource</u> for learning, not the basis of progression of competence.

Teaching and learning experiences are <u>sequenced</u> to facilitate an <u>explicitly defined</u> ***progression*** of ability in stages.

Fundamental Characteristics of CBME

Learning is <u>tailored</u> to the learner's individual ***progression*** in some manner.

Numerous <u>direct observations</u> and focused <u>feedback</u> contribute to effective learner ***development of expertise.***

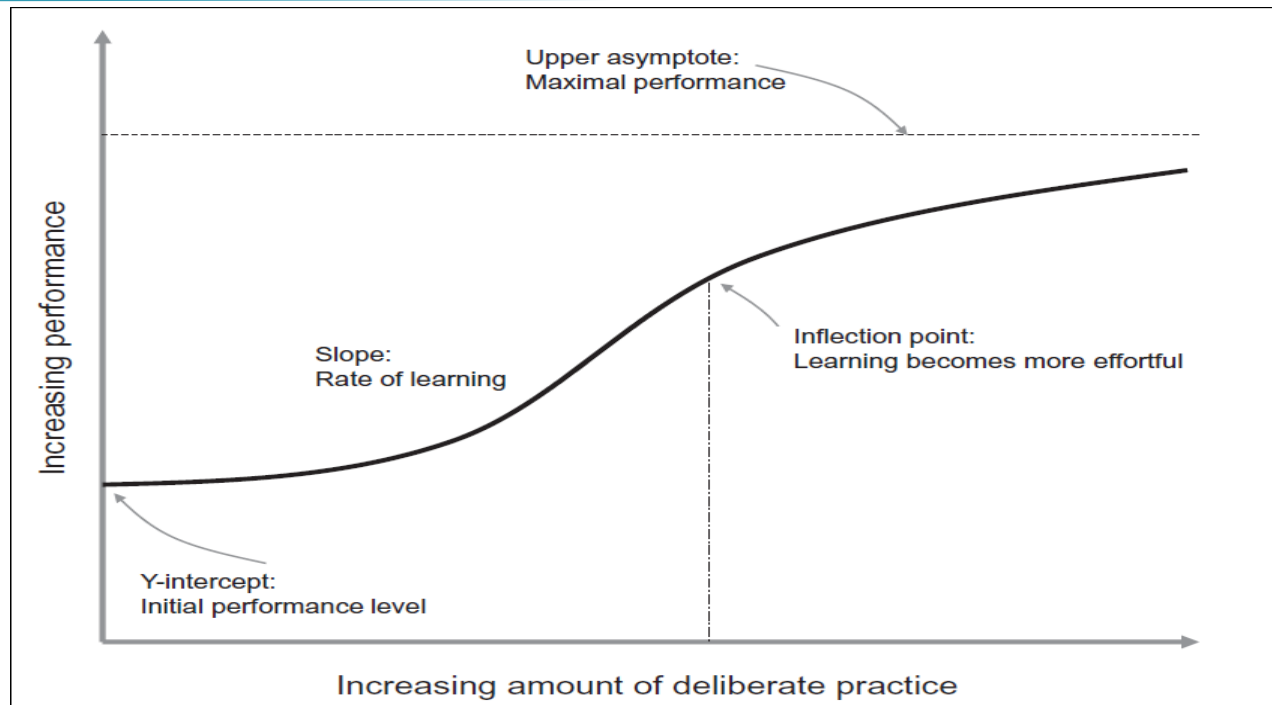<u>Assessment</u> is planned, systematic, systemic, and integrative.

Medical Education is a Developmental Process

Expertise is the Ultimate Goal

# Generic Learning Curve

From Pusic, et. al. Acad Med. 2014

Dreyfus Developmental Model Stages

Dreyfus Stage	Description
Novice	Rule driven; analytic thinking; little ability to prioritize information
Advanced beginner	Able to sort through rules based on experience; analytic and non-analytic for some common problems
Competent	Embraces appropriate level of responsibility; dual processing of reasoning for most common problems; can see big picture; Complex problems default to analytic reasoning. Performance can be exhausting.
Proficient	More fully developed non-analytic and dual process thinking; comfortable with evolving situations; able to extrapolate; situational discrimination; can live with ambiguity
Expert	Experience in subtle variations; distinguishes situations

Reading Radiographs: An Example
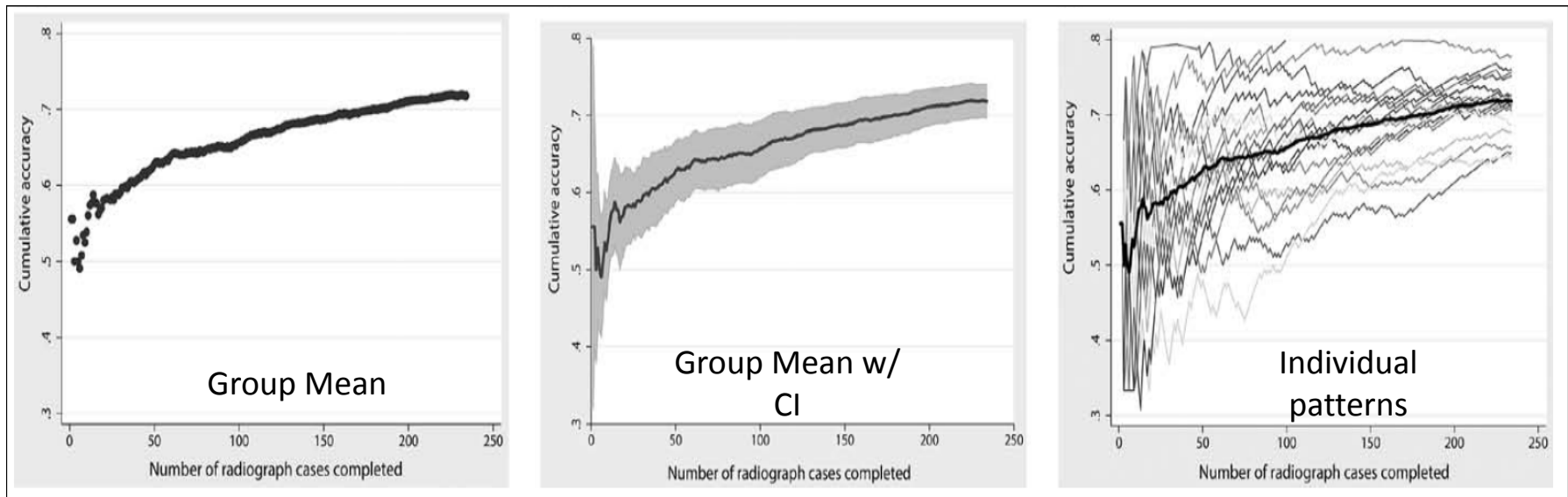
18 residents reading pediatric ankle radiographs

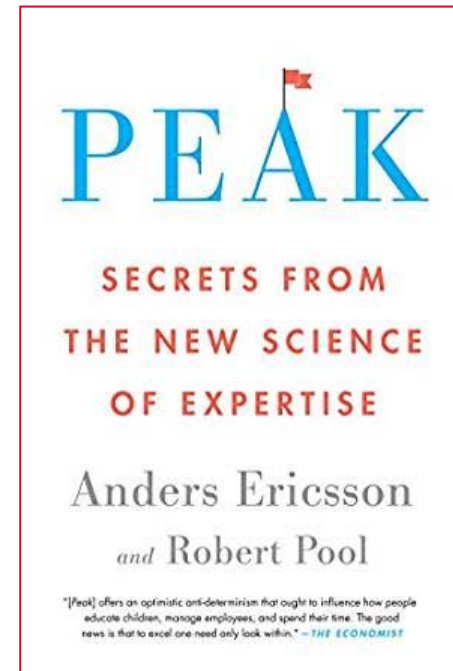# Ericsson: Purposeful Practice

- Has well defined, specific goals
  - Putting steps together to achieve a well-defined goal
- Is focused
- Involves feedback
- Requires getting out of one's comfort zone

…However, "*trying hard and pushing yourself to the limit isn't enough.*"

PEAK

SECRETS FROM THE NEW SCIENCE OF EXPERTISE

Anders Ericsson
and Robert Pool

"[Peak] offers an optimistic anti-determinism that ought to influence how people educate children, manage employees, and spend their time. The good news is that to excel one need only look within." *—THE ECONOMIST*

Deliberate Practice

In addition to purposeful practice, deliberate practice…

- Requires a field that is reasonably well developed. *Clear mental representations* of the tasks of the field are essential.

- Requires a *teacher* who can provide practice activities that can help learners improve their performance.

Ericsson KA and Pool R. Peak: Secrets from the New Science of Expertise. 2016

Overlapping Concepts

- Shared understanding

- Shared mental models

- Mental representation of tasks

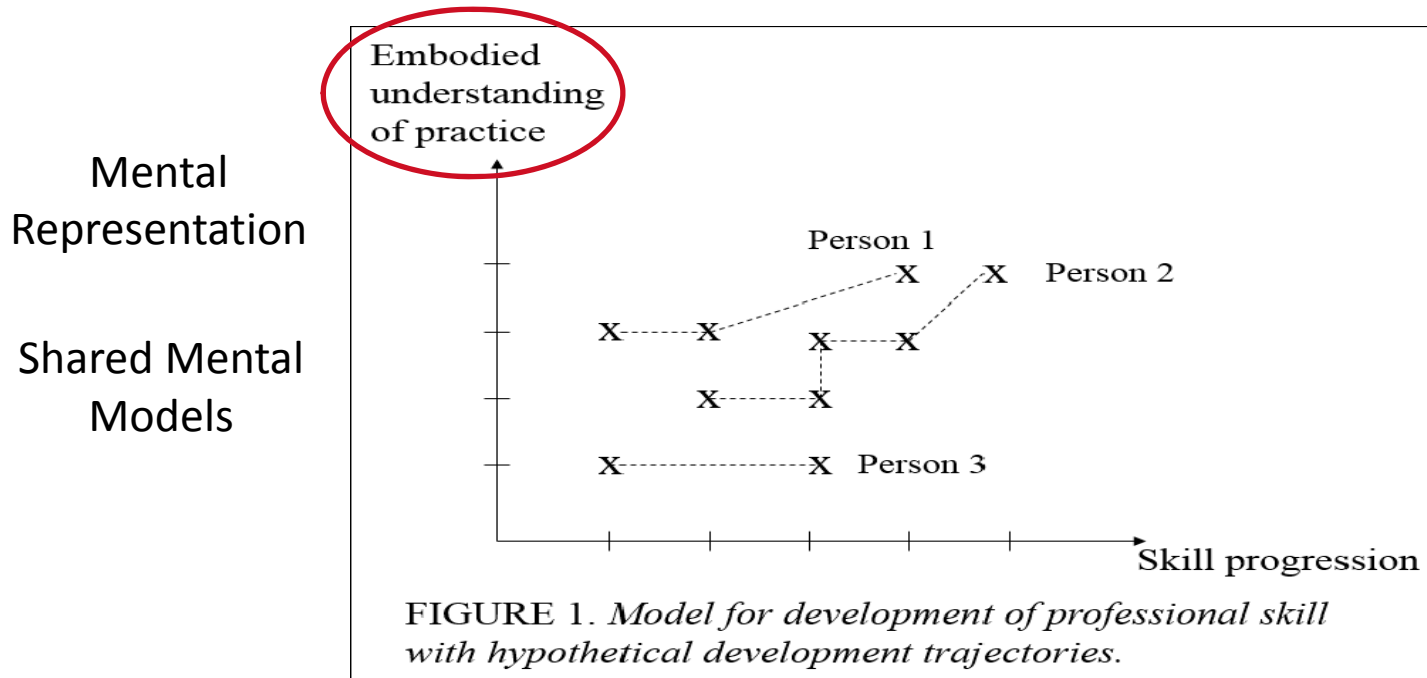- Frame of reference

- Embodied understanding of practice
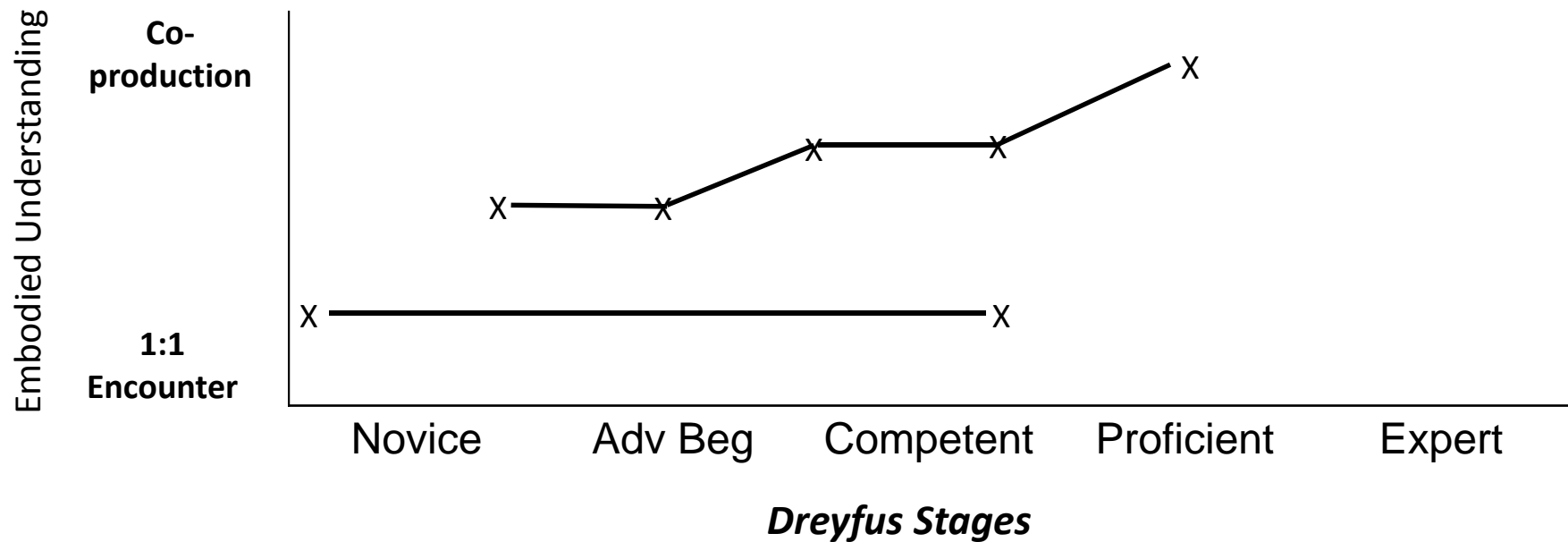
The Understanding Problem

- In many areas of our educational programs, we have either:

  - Incompletely developed mental representations (embodied understanding) of clinical practice or…

  - Highly variable conceptions/understanding of optimal clinical practice or…

  - Faculty with variable clinical skills who are the assessors and coaches

Dall'Alba and Sandberg 2006

Mental
Representation

Shared Mental
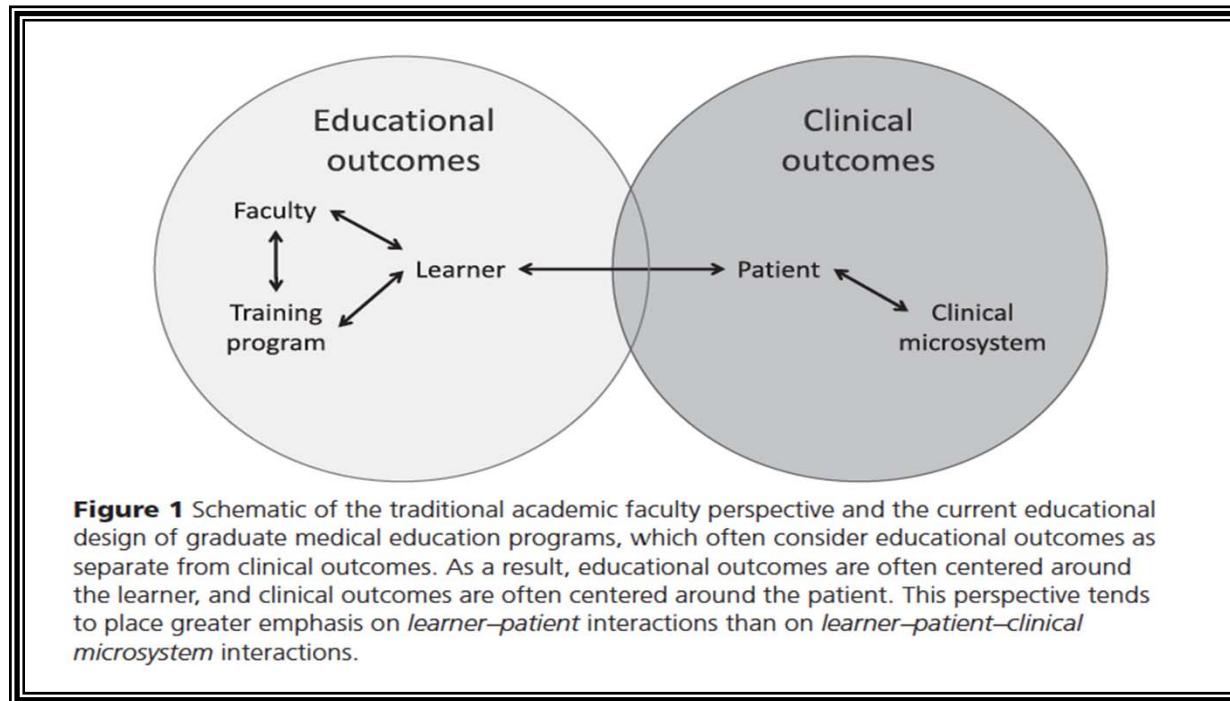Models

FIGURE 1. *Model for development of professional skill with hypothetical development trajectories.*

Dall'Alba and Sandberg Example

Traditional Perspective

Figure 1 Schematic of the traditional academic faculty perspective and the current educational design of graduate medical education programs, which often consider educational outcomes as separate from clinical outcomes. As a result, educational outcomes are often centered around the learner, and clinical outcomes are often centered around the patient. This perspective tends to place greater emphasis on *learner–patient* interactions than on *learner–patient–clinical microsystem* interactions.

Needed Perspective

Figure 2 Schematic of the proposed framework for academic faculty perspective and educational design of graduate medical education training programs, where both educational and clinical outcomes are centered around the patient. This reorganization recognizes that (1) the dynamic interplay between the faculty, learner, training program, and clinical microsystem ultimately influences the quality of physician that emerges from the training program *and* the environment, and (2) patient outcomes relate to the quality of education and the success of clinical microsystems.
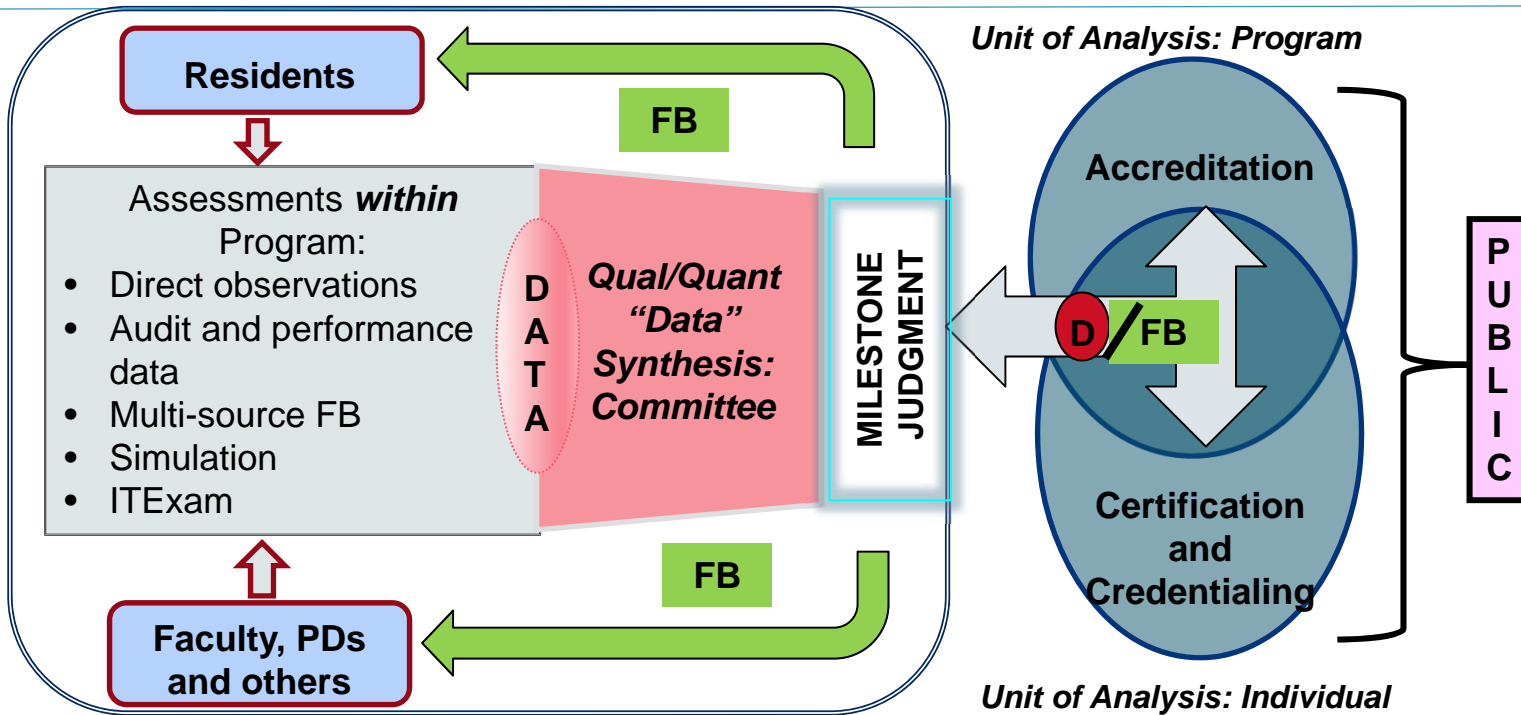
Have Milestones Reached a Milestone?

The GME Assessment "System"

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Validity Studies

- National or multi-institutional validity studies have now been published for:

  - Internal medicine

  - Emergency medicine

  - Pediatrics

  - Family medicine

  - Neurosurgery

- Annotated bibliography now available for Milestones research (in appendix of 2017 Annual Report)
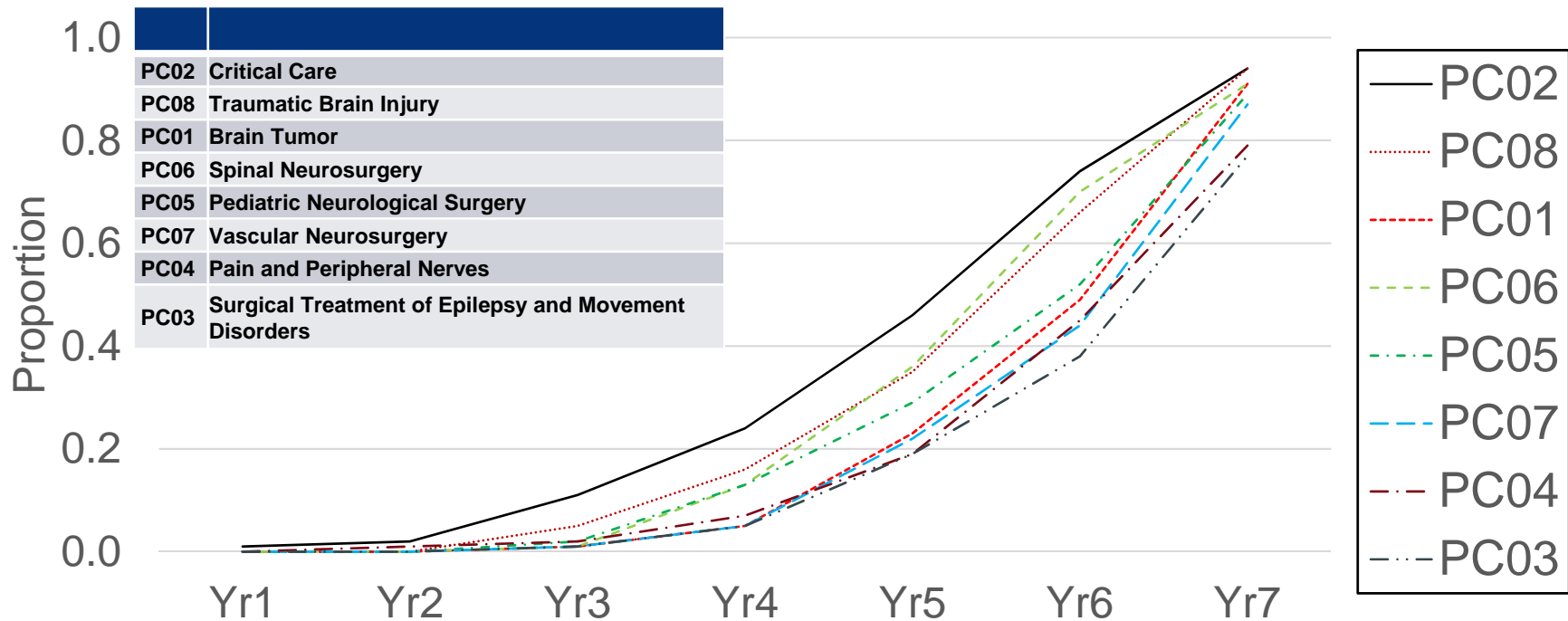
Qualitative Studies

- Neurosurgery
- General surgery
- Internal Medicine
- Family Medicine
- Pediatrics
- Emergency Medicine

**Residents Attaining Level 4 or Higher for PC Sub-Competencies (June 2016) – Neurological Surgery**

| PC02	Critical Care
PC08	Traumatic Brain Injury
PC01	Brain Tumor
PC06	Spinal Neurosurgery
PC05	Pediatric Neurological Surgery
PC07	Vascular Neurosurgery
PC04	Pain and Peripheral Nerves
PC03	Surgical Treatment of Epilepsy and Movement Disorders

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Mapping Individual Trajectories

Emergency Medicine Milestones trajectories over time (e.g., Wound Management)
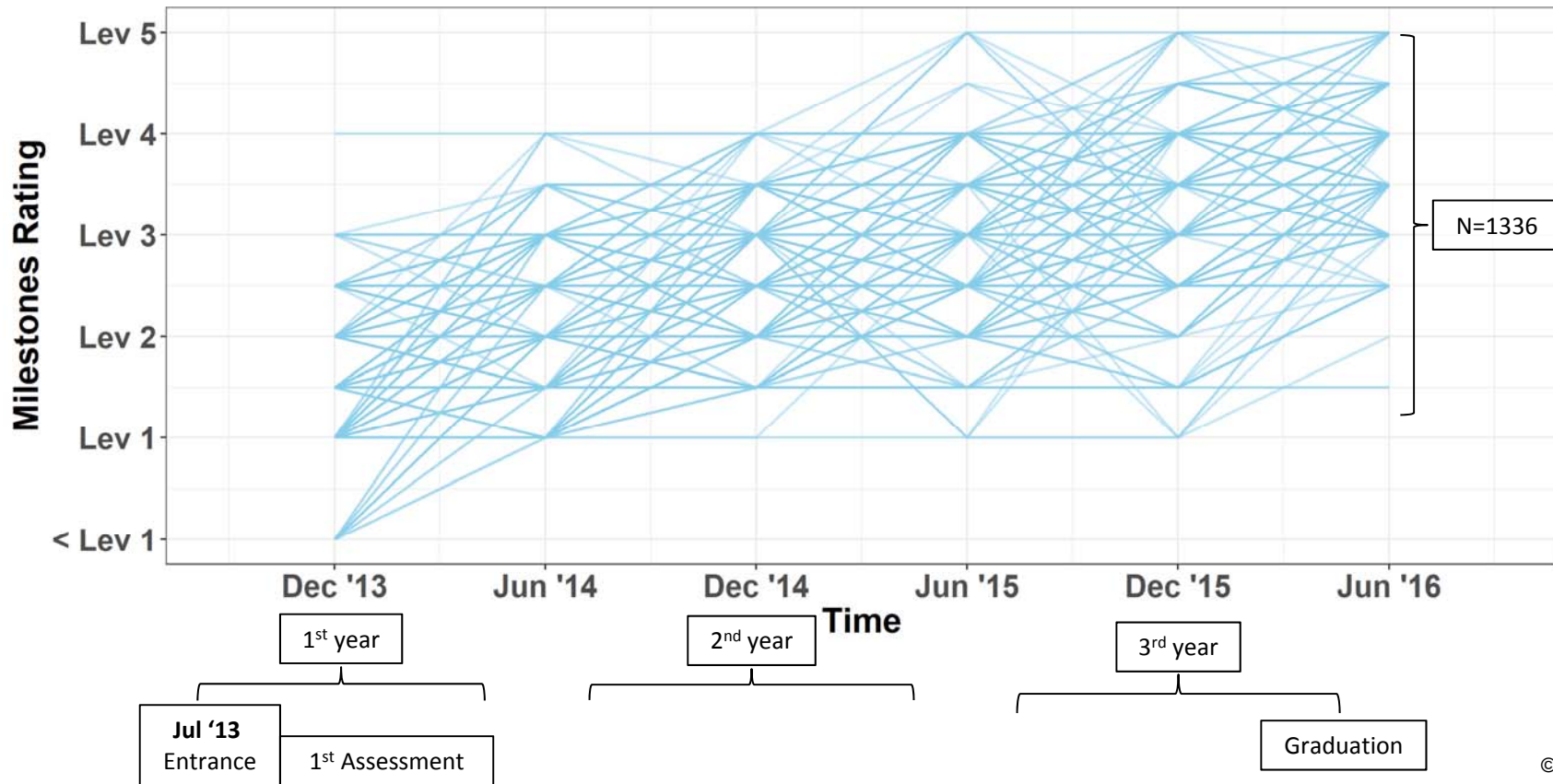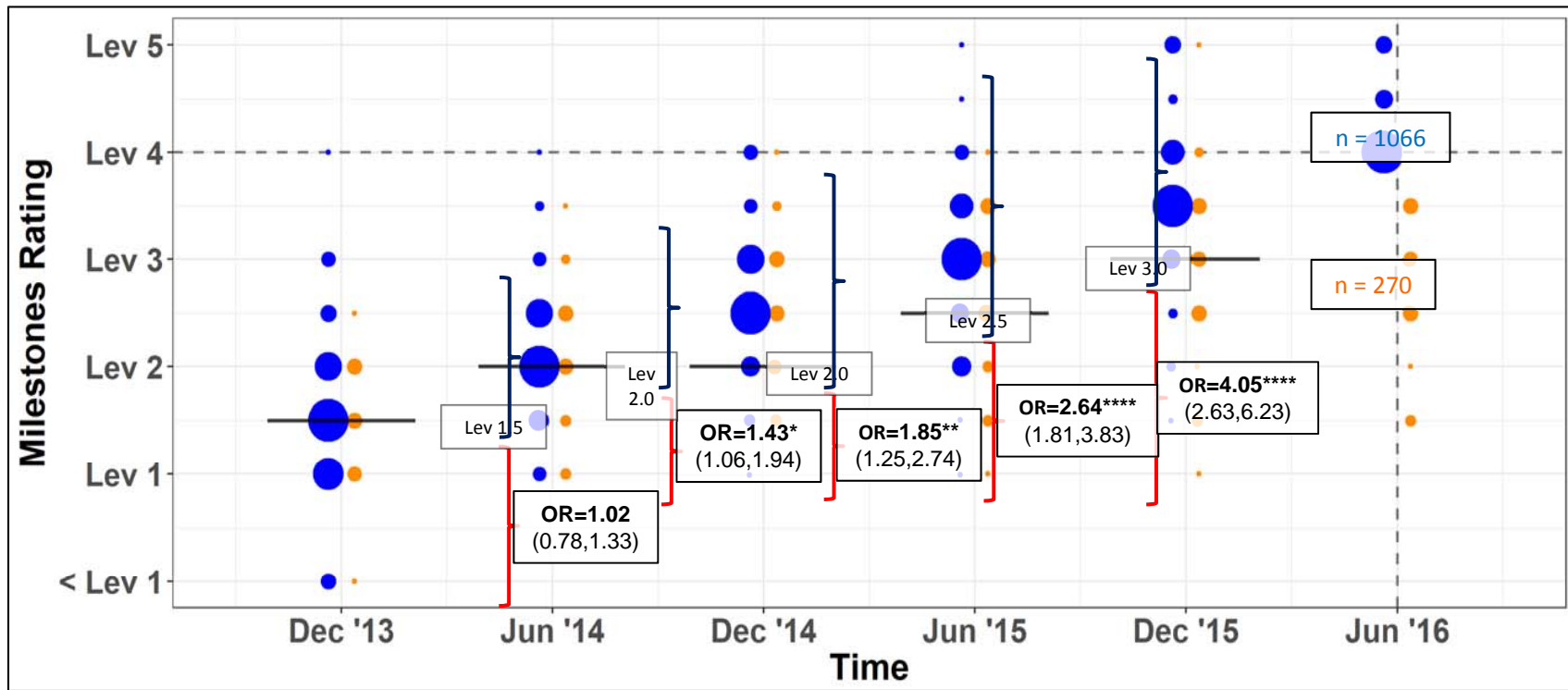
Results – EM Wound Management

Milestones trajectories for residents who attained Level 4 and those who did not
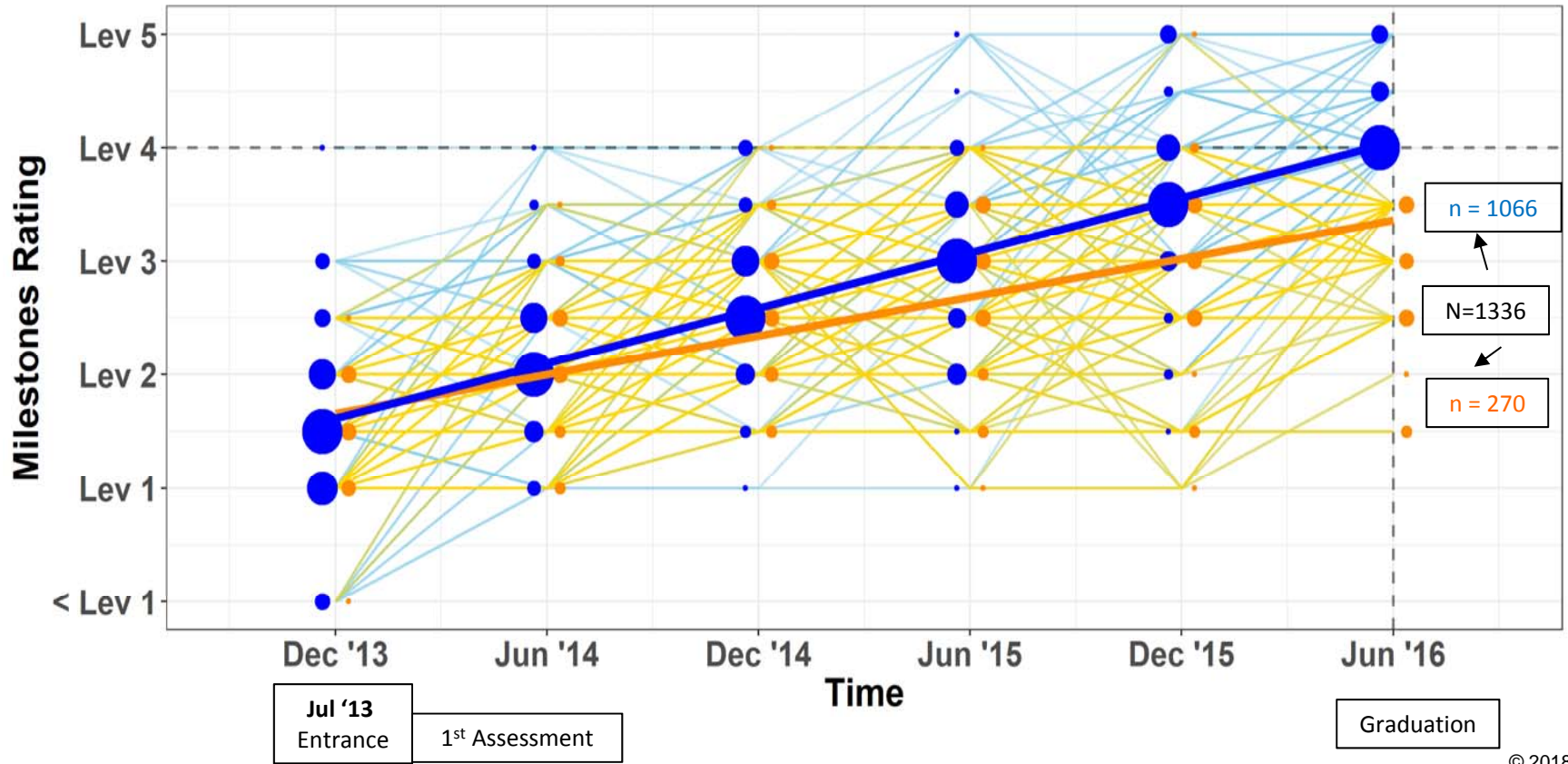
Results – EM Wound Management

Odds ratio (OR) for residents not attaining Level 4 under the threshold over time

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Odds Ratios for Specific Patterns: IM

IM	Achieved Level 4	Achieved < Level 4	Plateau	<=2.0 middle PGY2	<=2.5 middle PGY2	<=2.5 at the end of PGY2	Regression
PC01	94.4% (n=6678)	5.6% (n=394)	1.78**** (1.40,2.27)	4.61**** (2.87,7.39)	3.18**** (2.39,4.24)	5.14**** (3.62,7.30)	1.68**** (1.32,2.13)
PC02	93.7% (n=6626)	6.3% (n=446)	1.61**** (1.27,2.03)	6.65**** (4.59,9.65)	4.47**** (3.47,5.78)	6.62**** (4.99,8.80)	1.62**** (1.31,2.01)
PC03	93.6% (n=6620)	6.4% (n=452)	1.63*** (1.27,2.09)	2.76*** (1.55,4.94)	3.53**** (2.72,4.59)	5.86**** (4.25,8.07)	1.63**** (1.31,2.04)
MK01	88.7% (n=6271)	11.3% (n=801)	1.77**** (1.51,2.08)	4.18**** (3.10,5.65)	5.19**** (4.24,6.34)	5.43**** (4.37,6.75)	1.62**** (1.38,1.90)
MK02	89.8% (n=6352)	10.2% (n=720)	1.73**** (1.46,2.04)	3.22**** (2.30,4.52)	3.51**** (2.88,4.28)	4.06**** (3.16,5.22)	1.49**** (1.26,1.75)
SBP01	94.1% (n=6658)	5.9% (n=414)	2.08**** (1.62,2.67)	5.39**** (3.24,8.97)	3.04**** (2.32,3.98)	5.47**** (3.89,7.71)	1.85**** (1.47,2.32)

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$; ****$p < 0.0001$*

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Connecting the Continuum

Mastery-based Programs

EPAs
Milestones

Milestones
EPAs

Deliberate
Expert

CPD

Warm
handoffs

GME

Milestones?
EPAs?

UME

Feedback

Novice
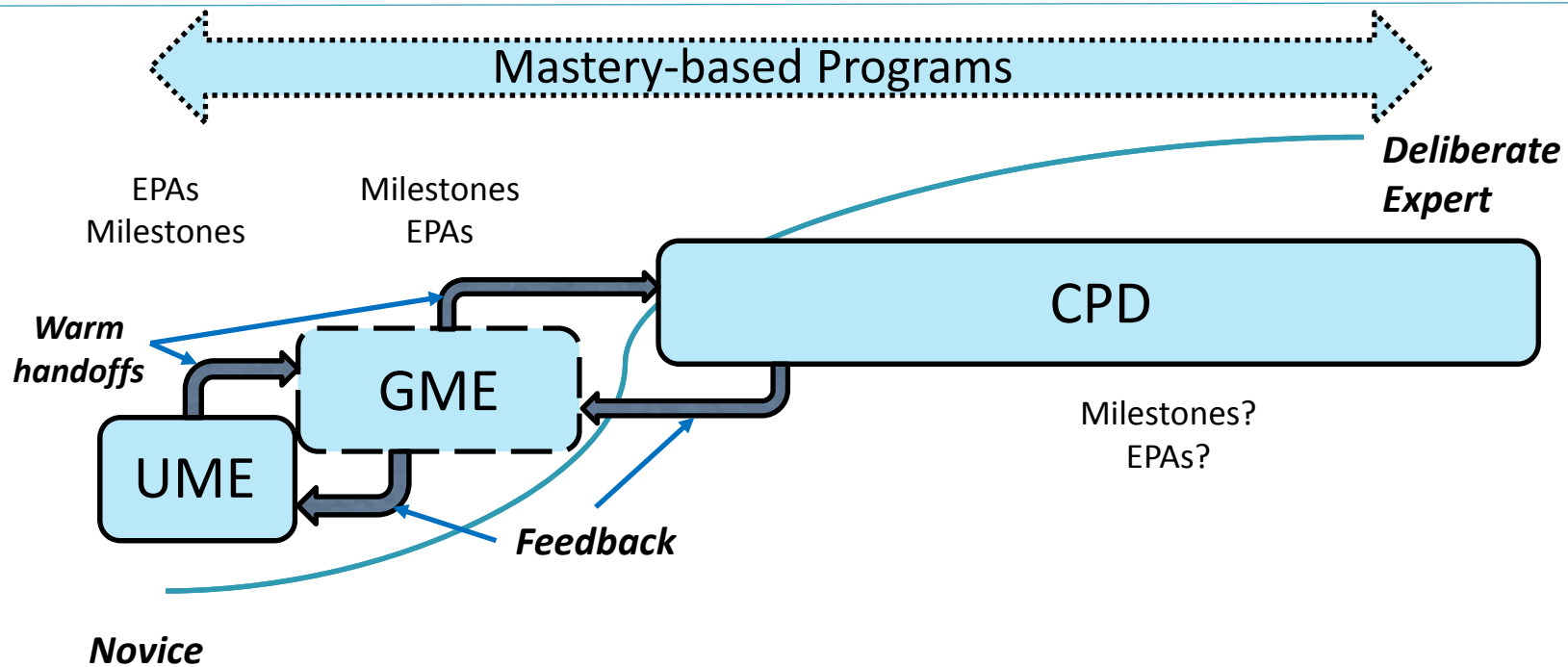
Conclusions

- Patients and populations ***must*** remain at the center of our work and transformation
- Medical Education must be and can be a major facilitator in health systems reform
- We are now moving into the stage of developmental design in curriculum and assessment

Questions and Discussion

eholmboe@acgme.org