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ECFMG FAIMER

Developmental Thinking for Assessment in Outcomes-based Medical Education

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Disclosures

- Eric Holmboe works for the Intealth and receives royalties from Elsevier Publishing for a textbook on assessment.

Objectives

- Discuss the role of developmental theories for designing programs of assessment
- Explore implications of early Milestones outcomes research for improving GME programs
- Discuss the role of the learner in developmentally-based assessment

Lingering Effects of the Pandemic for MedEd

- Usual “proxies” for competence exposed as insufficient:
  - Volume and distribution of clinical experience (e.g. procedures)
  - Specific rotations to ensure clinical experiences
  - High stakes examinations
- Highlighted substantial gaps around all transitions
  - UME -> GME; GME -> GME; GME -> practice
- Further exposed gaps in assessment of the “other” competencies
- Exacerbation of implicit and explicit bias

Highlighting the need to accelerate the adoption of outcomes-based education

Outcomes-based Education: What is it?

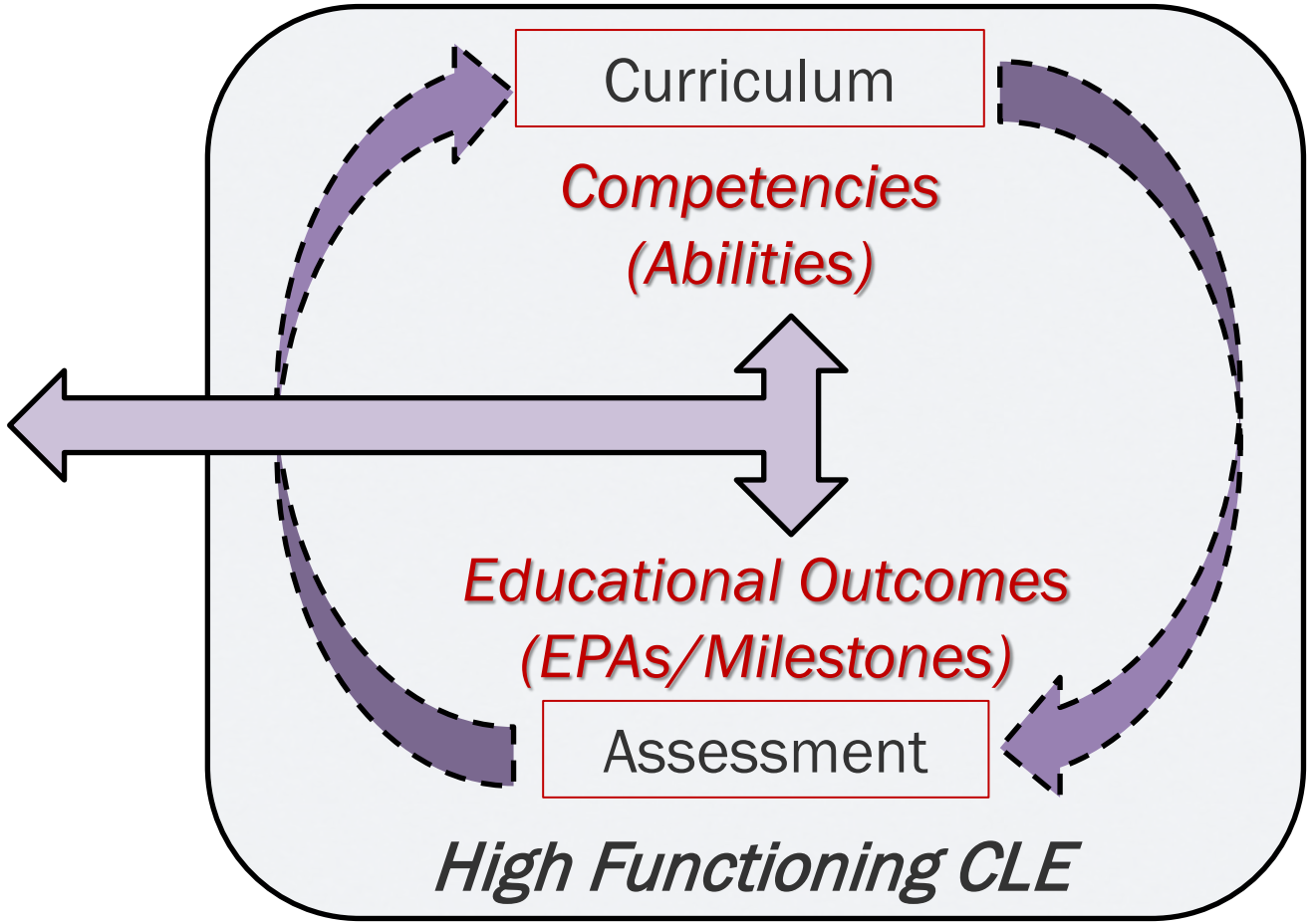
- Central tenet: *start with the end in mind*
  - Focus on what type of physician will be produced
  - Structure and process flow from the outcomes
- Educational outcomes should be "*clearly and unambiguously specified*."
- These educational outcomes determine:
  - Curriculum, assessment processes, and the learning environment

© AAFP: Collaboration Improves Patient Outcomes, Lowers Cost (aafp.org)

Harden RM. Outcomes-based education: Part 1-An introduction to outcomes-based education. Med Teach. 2009; 21: 7-14.

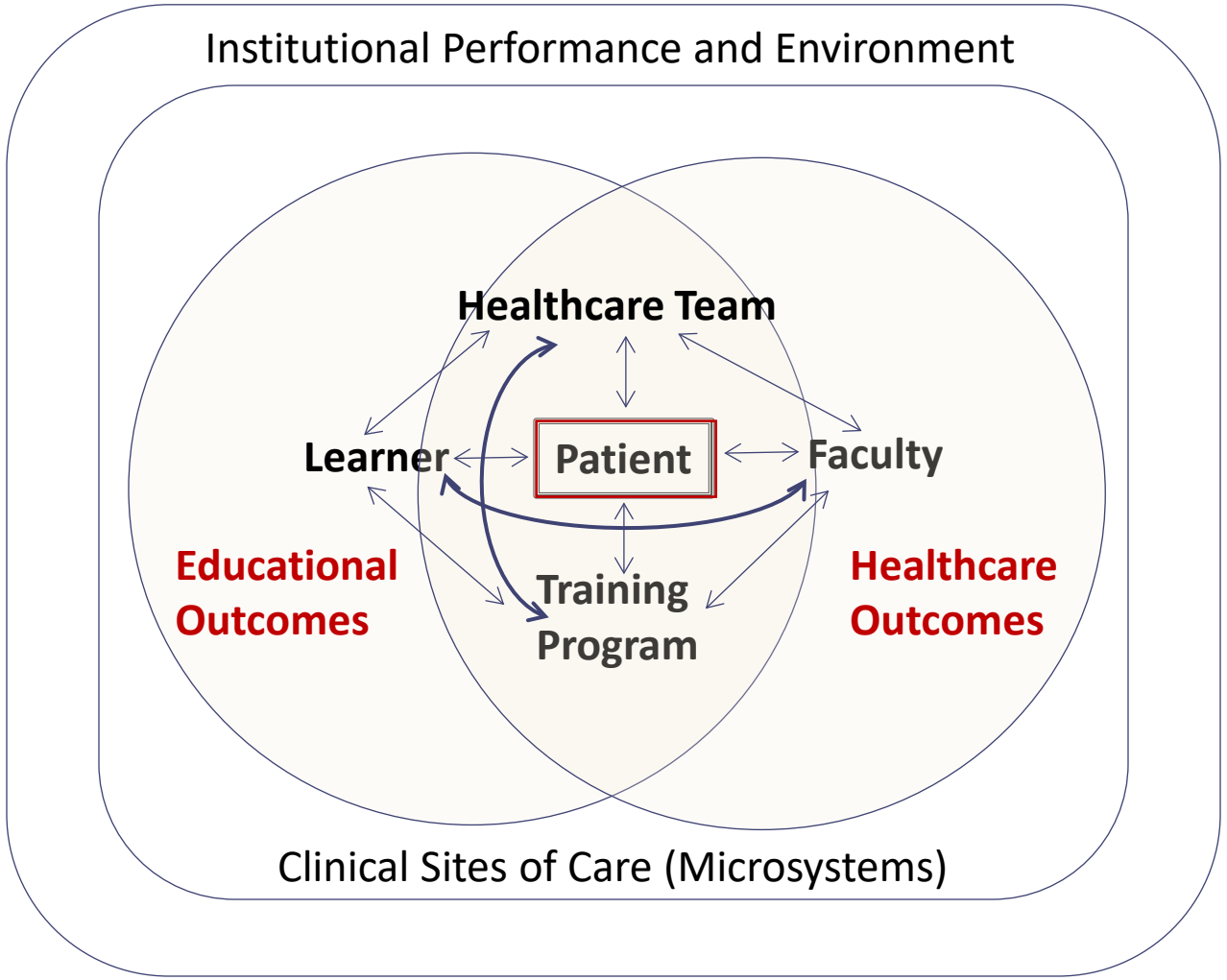
The Ultimate Goal of Medical Education

Quintuple Aim



Changing Perspective:
Patients at the Intersection of Educational and Healthcare Outcomes

Community Needs and Influences



Societal Needs and Influences

Wong BM, et. al. Acad Med. 2016; Holmboe ES and Kogan JR. Acad Med. 2023

Traditional Model: 20th Century

Define Curriculum:
Time-based Courses and Clinical Rotations

Educational Objectives
Guide focus on teaching

Weak ⋮ *Links*

Assessments:
MCQ Tests & Evaluations

Fixed Length: Time as Proxy for Competence

Exit per time: Assessment Tests

Assurance Focused
Minimal *Acceptable Competence*

Point-in-time, high-stakes assessments

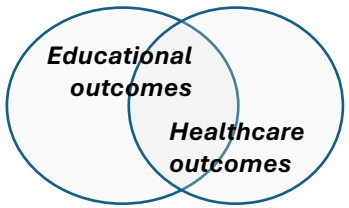
Weak link to Health System Needs

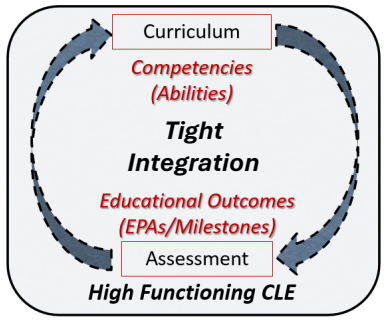
CBME Model

Health Needs
Health Systems

Quintuple AIM as Ultimate Outcome

Competencies
Outcomes
Link Educational & Clinical Outcomes





Variable Length: Time as Resource for Competence

Exit when ready: Programmatic assessment

Assurance *AND* *Outcomes Focused*

Prepared for Continuous, ongoing development

Operationalizing Outcomes: CBME

An approach to preparing physicians for practice that is fundamentally oriented to graduate outcome abilities and organized around competencies derived from an analysis of ***societal and patient needs***.

"It de-emphasizes time-based training and promises greater accountability, flexibility and learner-centeredness"

Frank et al. Toward a definition of CBME. Med Teacher 2010

“Time” Still Matters

- In OBME/CBME, time is viewed as a *resource* and not an *intervention/measure* (proxy for competence)
  - Shortening training is *not* the primary goal of OBME/CBME
  - Time should be used wisely
  - The amount of “training time” required should be based on outcomes
- The core principles of CBME can still be advanced “fixed” program lengths, designing outcomes-based flexibility where possible
  - Increasing flexibility in later years of training

Core Components Framework

Outcome Competencies	Sequenced Progression	Tailored Learning Experiences	Competency-focused Instruction	Programmatic Assessment (using Systems Thinking)
Competencies required for practice are clearly articulated.	Competencies and their developmental markers are *sequenced progressively.*	Learning experiences *facilitate*...	Teaching practices *promote*...	Assessment practices *support & document*...
		....the developmental acquisition of competencies.		

Philosophical Principles of CCF

- Grounded in a "*growth*" mindset:
  - Forms the basis for significantly redesigning assessment practices, instructional methods, and learning experiences
  - Focused on promoting learner growth and development through frequent formative assessment
  - Rich in feedback/coaching individualized to the learner and grounded in the desired competencies.
  - Provides rich and diverse learning experiences, steeped in clinical practice where learners can stay *as long as required*

Van Melle E, et. al. A Core Components Framework for Evaluating Implementation of Competency-Based Medical Education Programs. Acad Med. 2019 Jul;94(7):1002-1009.

Self-Reflection

How would you judge your training program’s effectiveness in the core components of CBME?

Thinking Developmentally: Progressive Sequencing and Tailoring of Learning and Teaching

CCF: Theory and Evidence Informed

Sequenced Progressively	Tailored Learning Experiences	Competency-focused Instruction
• Expertise Theory • Entrustment • Surface & Deep Approaches to Learning • Mastery-based Learning	• Situated Learning • Deliberate Practice • Self-regulated Learning • Workplace-based Learning • Professional Identity Formation	• Zone of Proximal Dev't • Constructive Friction • Learner-Centered Teaching • Cognitive Apprenticeship • Coaching Theory • Growth Mindset

Dreyfus Stage Model of Development

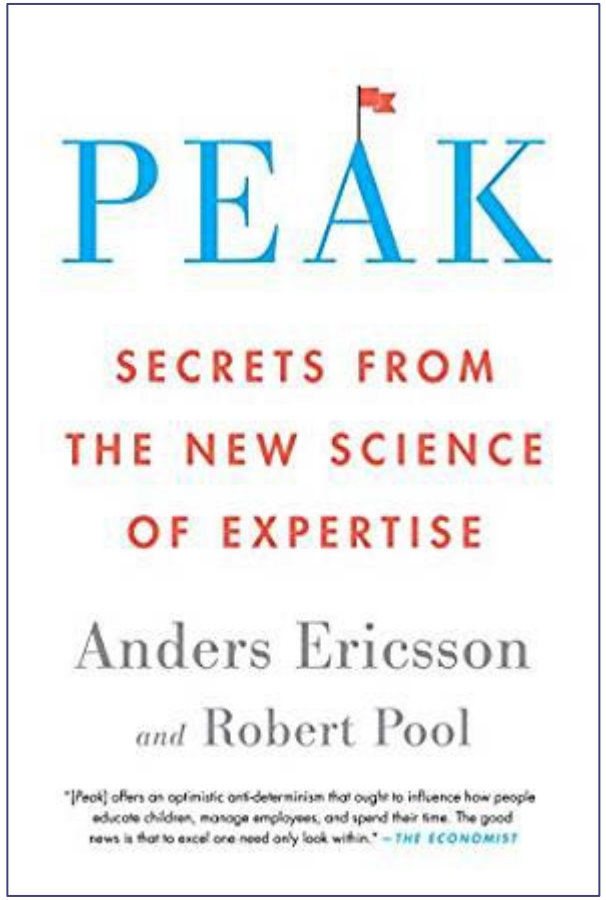
	Sample Characteristics of Stage	Level of Autonomy/Supervision Required
Novice	• Is rule drive & uses analytic reasoning & rules to link cause and effect • Has little ability to filter or prioritize information.	Needs close supervision and instruction (Direct supervision needed)
Advanced Beginner	• Is able to sort through rules and information to decide what is relevant on the basis of past experience • Uses both analytic reasoning and pattern recognition to solve problems	Able to achieve some steps and tasks using own judgment, but substantial supervision needed for overall task.
Competent	• Emotional buy-in allows an appropriate level of responsibility • More expansive experience tips the balance in clinical reasoning from methodical and analytic to more readily identifiable pattern recognition of common clinical problem presentations	Able to perform most tasks using own judgment. (Reactive or indirect supervision usually sufficient)
Proficient	• Breadth of past experience allows one to rely on pattern recognition of illness presentation such that clinical problem solving seems intuitive • Still needs to fall back to methodical and analytic reasoning for managing problems. Is comfortable with evolving situations & can live with ambiguity	Able to take full responsibility for their own work. (Ready for unsupervised practice)
Expert	• Thought, feeling, and action align into intuitive problem recognition and intuitive situational responses and management • Is perceptive in discriminating features that do not fit a recognizable pattern	Able to take responsibility for going beyond existing standards. (Can supervise others in majority of the tasks of the specialty)

U.S. GME Outcome Goal for Subcompetencies

	Sample Characteristics of Stage	Level of Autonomy & Supervision Required
Proficient	• Breadth of past experience allows one to rely on pattern recognition of illness presentation such that clinical problem solving seems intuitive • Still needs to fall back to methodical and analytic reasoning for managing problems. Is comfortable with evolving situations & can live with ambiguity	Able to take full responsibility for their own work. (Ready for unsupervised practice)

Deliberate Practice

- *"Individualized training activities especially designed by a coach or teacher to improve specific aspects of an individual's performance through repetition and successive refinement"*
- Requires a field that is reasonably well developed. ***Clear mental representations of the tasks of the field are essential.***

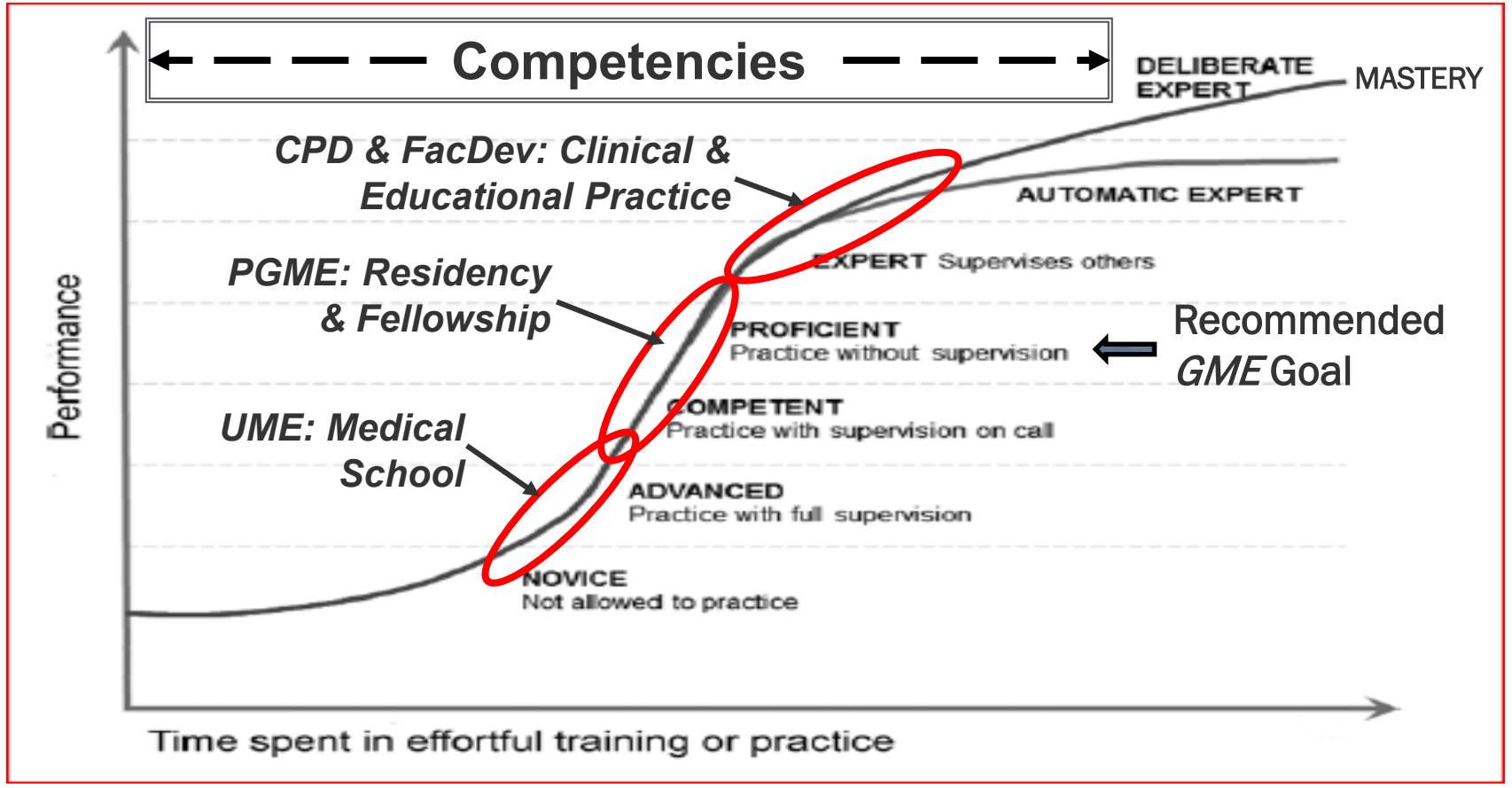


Mastery-based Learning

- Excellence is expected and achievable by all learners who are able, motivated and work hard.
- Little to no variation in measured outcomes.
- Learning in any domain, depends on learning a sequence of less complex components.
- If learners receive optimal quality of instruction and learning time required, the majority of learners should attain mastery.

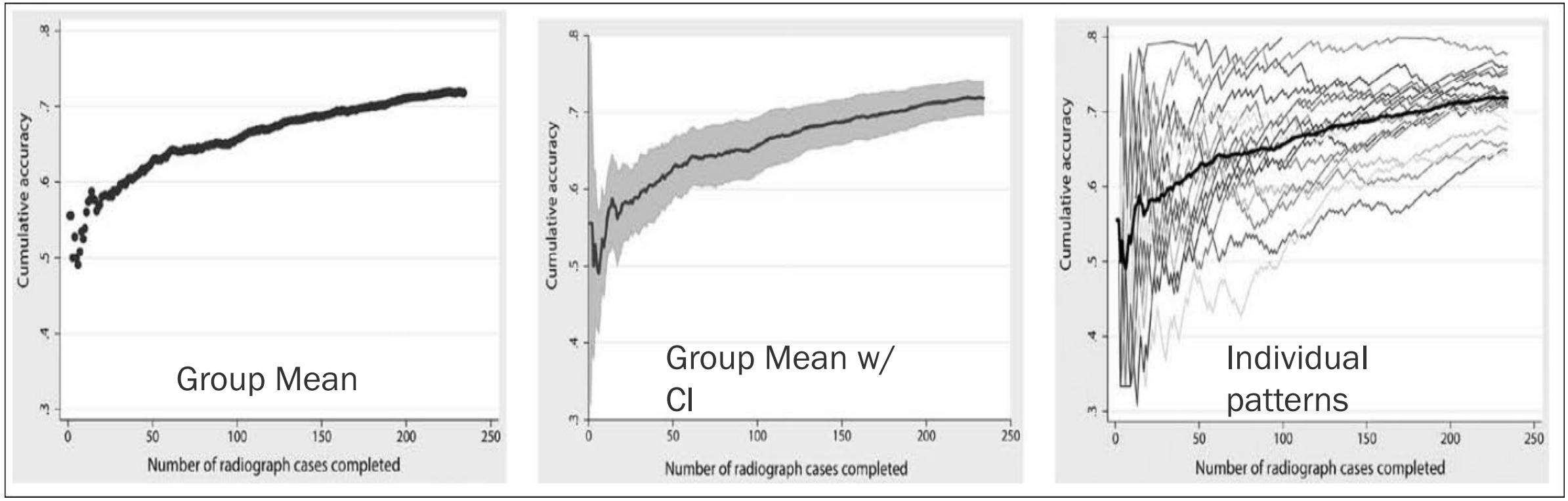
McGaghie WC. Mastery Learning: It Is Time for Medical Education to Join the 21st Century. Acad Med. 2015;90:1438–1441

Learning Curves and Developmental Models



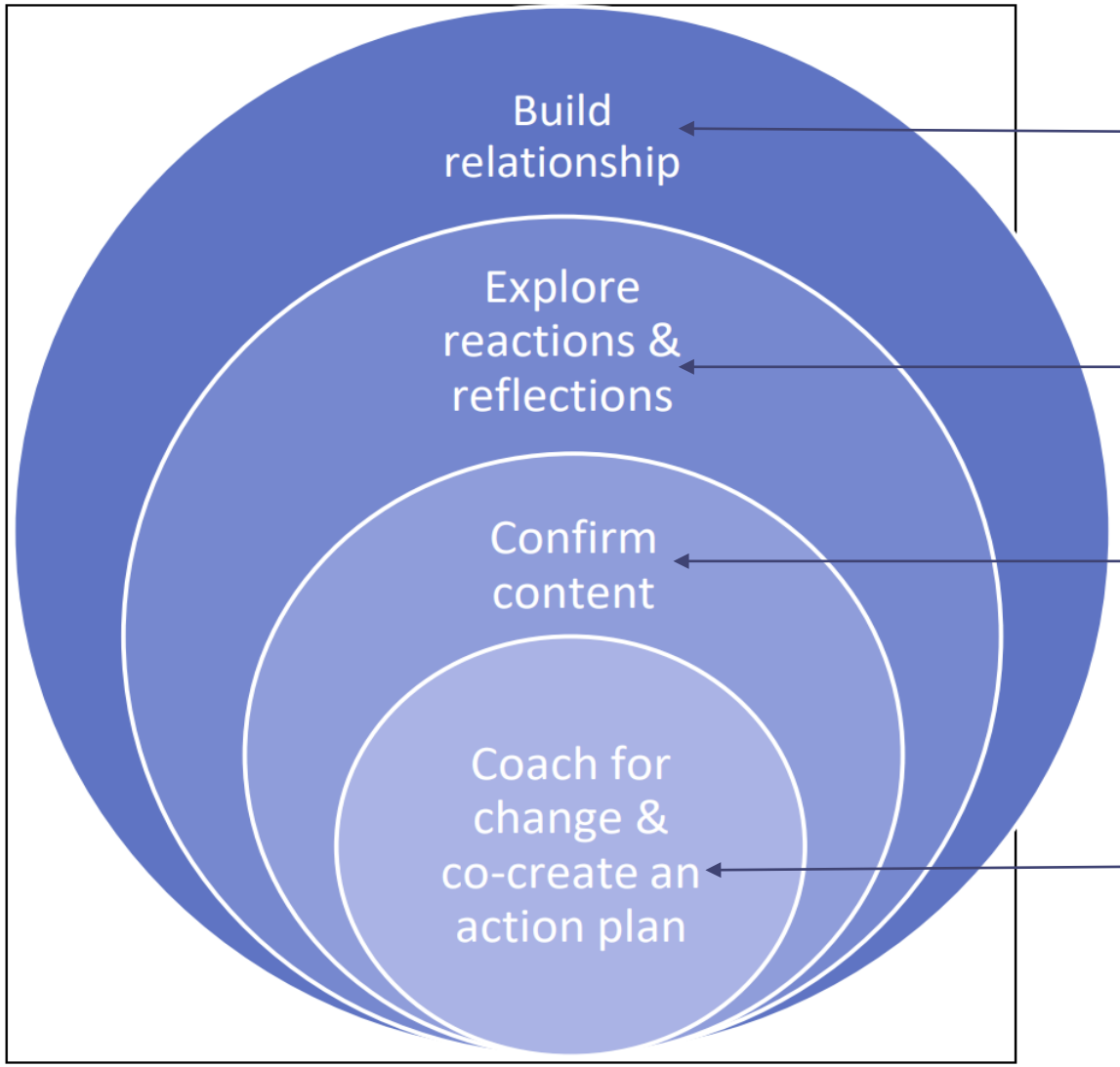
Pusic MV, Boutis K, Hatala R, Cook DA. Learning curves in health professions education. Acad Med. 2015 Aug;90(8):1034-42.

Reading Radiographs: An Example



18 residents reading pediatric ankle radiographs

R2C2 Model of Feedback & Coaching



Goal: To engage the physician, build relationship, mutual respect and trust.

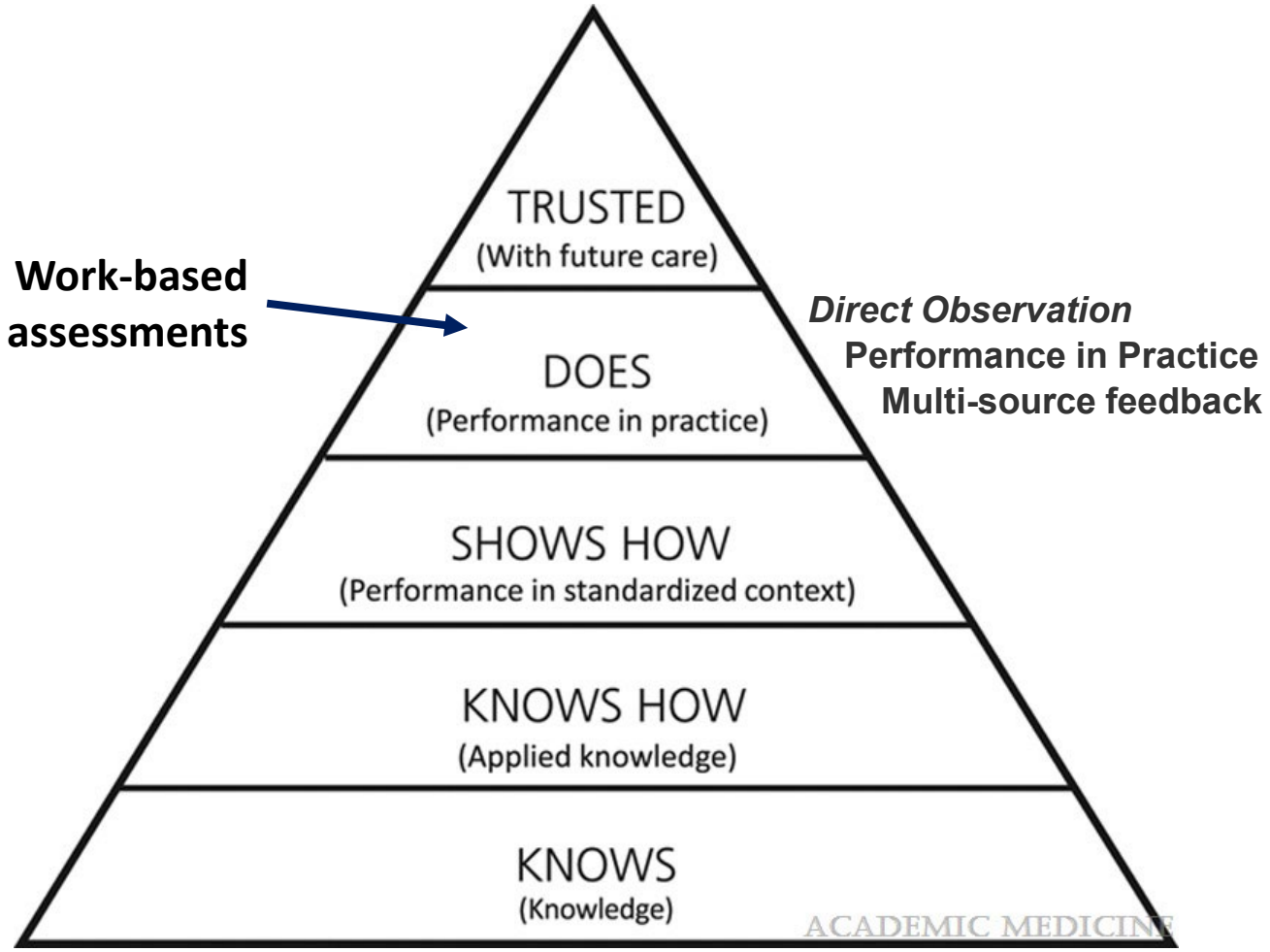
Goal: To ensure the physician feels understood and that their views are heard and respected.

Goal: To ensure the physician is clear about what the data mean for their practice and the opportunities they suggest for change.

Goal: To ensure the physician understands, reflects upon and assimilates the content of the report in order to develop an achievable action plan.

R2C2 feedback and coaching resources - Continuing Professional Development & Medical Education - Dalhousie University

“Extended” Miller Assessment Pyramid



A new fifth level (“trusted”) reflects the process for reaching the decision to award a learner an attestation of the completion of training, leading to a medical license or specialty registration or certification, that provides permission to act unsupervised and makes the grantors cognizant of the inherent risks.

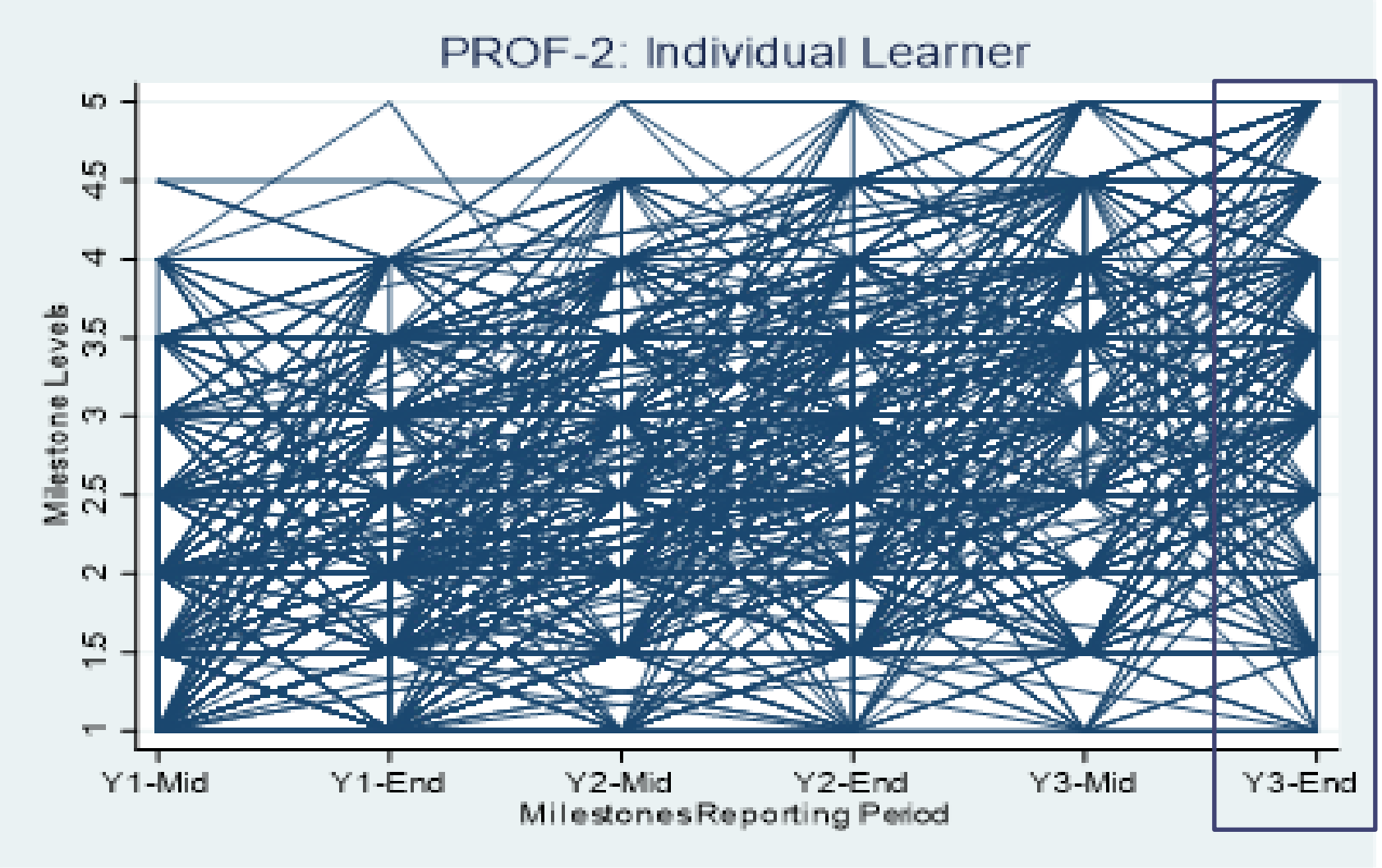
ten Cate, Olle; Carraccio, Carol; Damodaran, Arvin; Gofton, Wade; Hamstra, Stanley J.; Hart, Danielle E.; Richardson, Denyse; Ross, Shelley; Schultz, Karen; Warm, Eric J.; Whelan, Alison J.; Schumacher, Daniel J. **Entrustment Decision Making: Extending Miller’s Pyramid** Academic Medicine96(2):199-204, February 2021.

What The Graduate Medical Educational System Is Producing

Developmental Trajectories: Milestone 1.0 Example

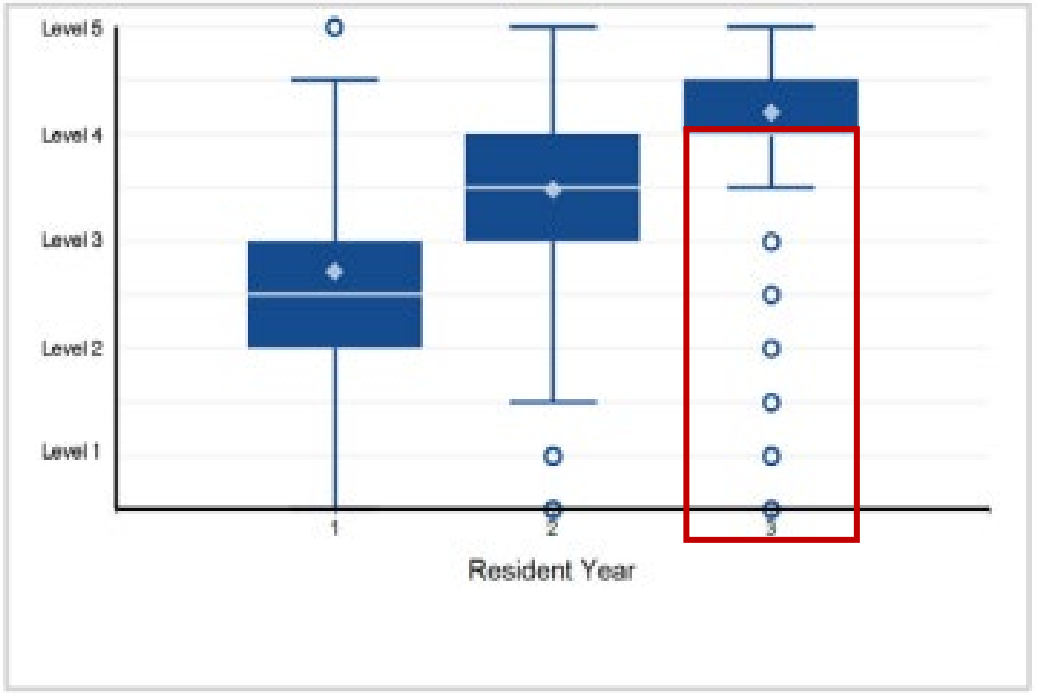
PROF-2: Demonstrates Professional Conduct and Accountability

Slide courtesy of Dr. Yoon Soo Park

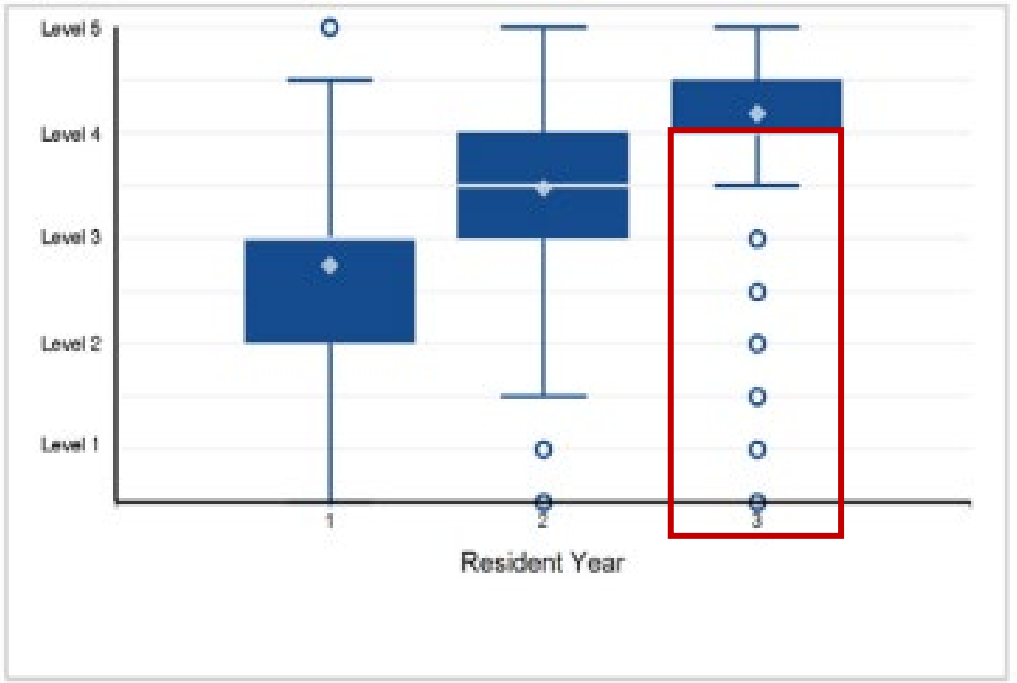


IM Milestone Box Plots 2024

16. Professionalism - Professionalism 2: Ethical Principles



17. Professionalism - Professionalism 3: Accountability/Conscientiousness



ACGME 2024 Milestones Report: 1201-acgme-milestones-report-2024_final.pdf

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

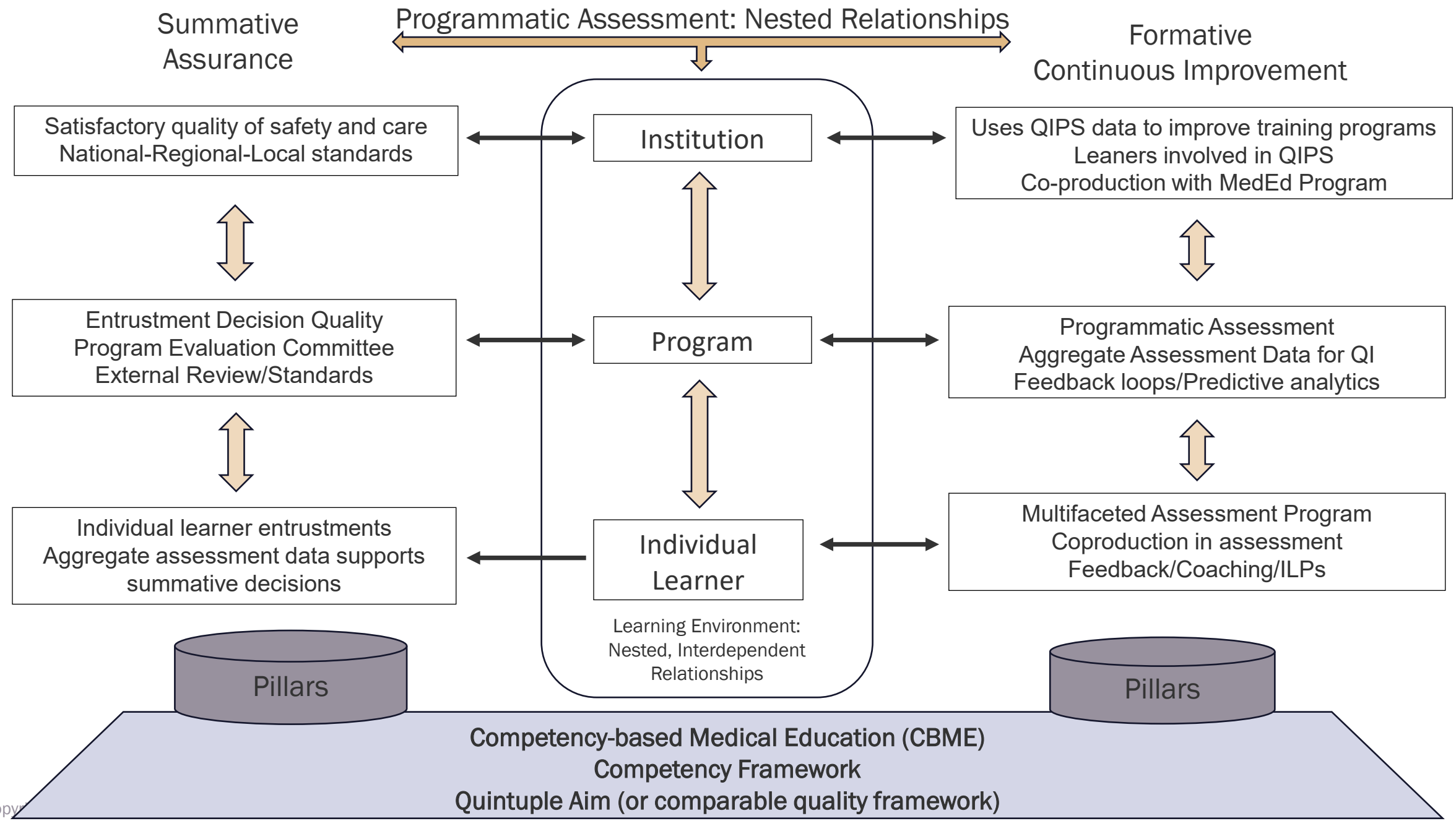
"Every System is Perfectly Designed to Get the Results it Gets"

We have multiple, ongoing examples of a "fixed-time" GME system persistently producing variable clinical and educational outcomes

Is This Really What We Want?

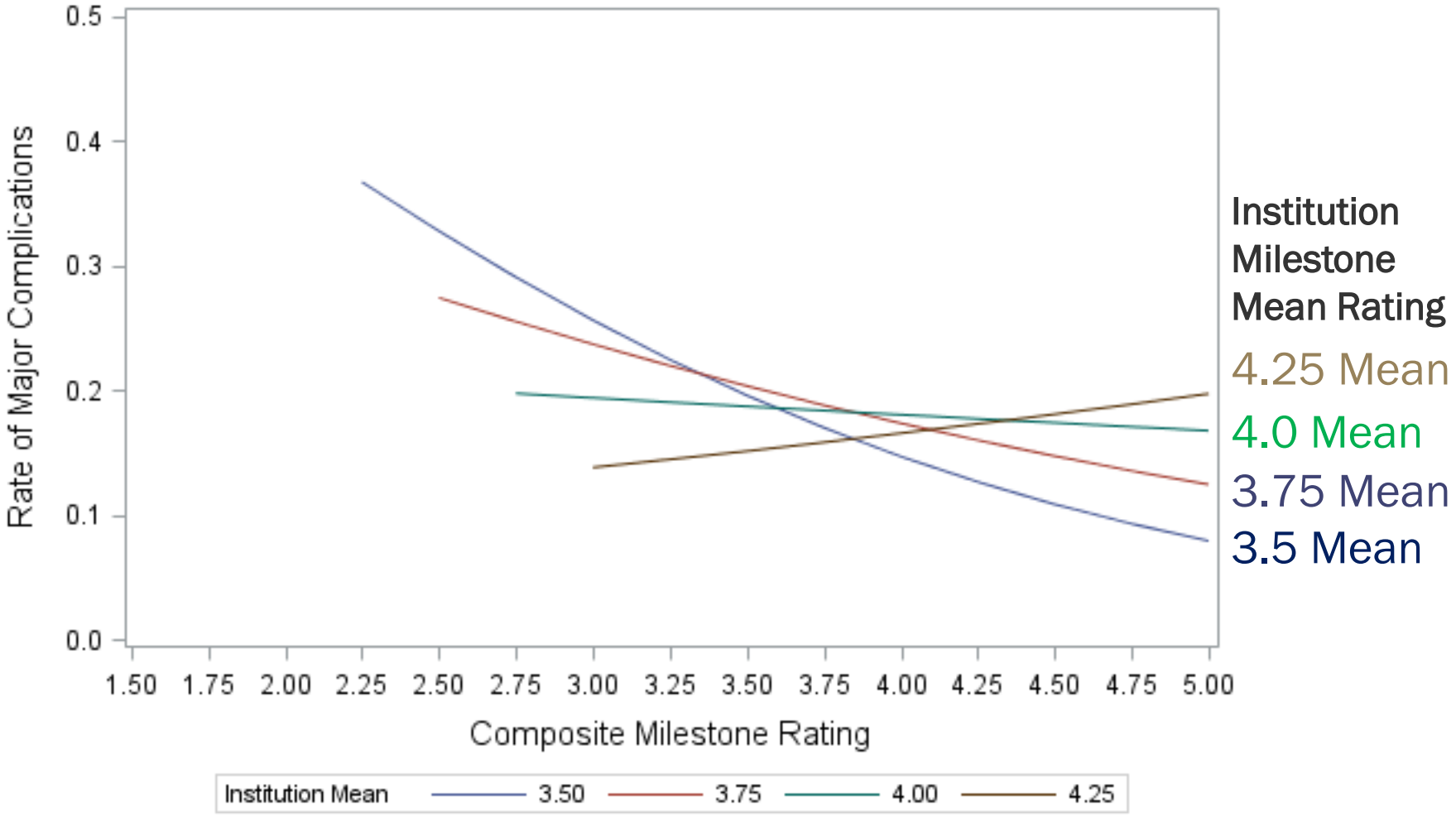
Arthur Jones. In Hanna, DP. Designing Organizations for High Performance. 1988. Addison-Wesley [now Prentice Hall].
Also variously attributed to W. Edwards Deming, Donald Berwick, and Paul Batalden. See
https://www.ihi.org/communities/blogs/origin-of-every-system-is-perfectly-designed-quote and https://deming.org/quotes/10141/

What Have We Learned During the Milestone Era?


Summative
Assurance
Programmatic Assessment: Nested Relationships
Formative
Continuous Improvement
Satisfactory quality of safety and care
National-Regional-Local standards
Institution
Uses QIPS data to improve training programs
Leaners involved in QIPS
Co-production with MedEd Program
Entrustment Decision Quality
Program Evaluation Committee
External Review/Standards
Program
Programmatic Assessment
Aggregate Assessment Data for QI
Feedback loops/Predictive analytics
Individual learner entrustments
Aggregate assessment data supports
summative decisions
Individual
Learner
Multifaceted Assessment Program
Coproduction in assessment
Feedback/Coaching/ILPs
Learning Environment:
Nested, Interdependent
Relationships
Pillars
Pillars
Competency-based Medical Education (CBME)
Competency Framework
Quintuple Aim (or comparable quality framework)

Milestone Judgments and Performance in Early Practice

Complications EVAR (Endovascular Aneurysm Repair)



Institution Milestone Mean Rating

4.25 Mean

4.0 Mean

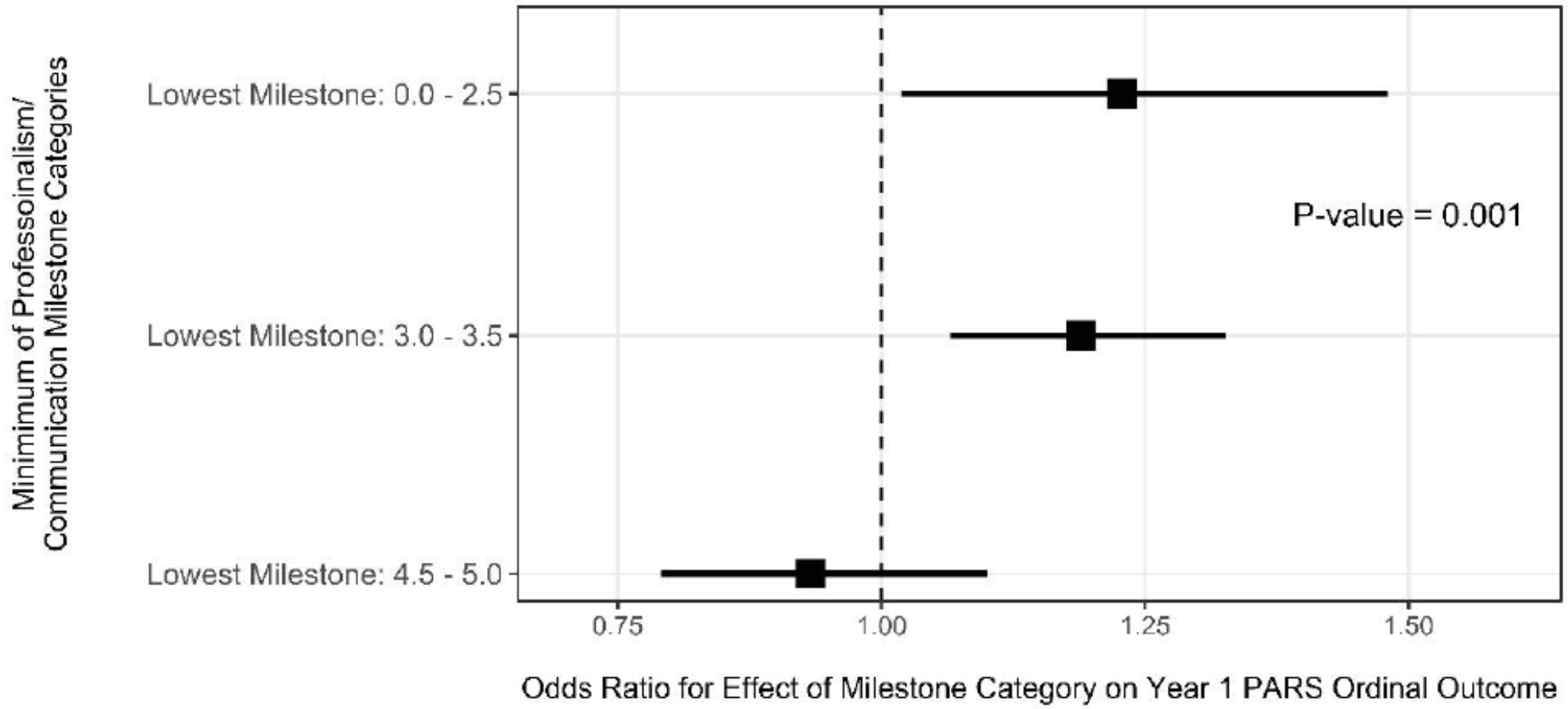
3.75 Mean

3.5 Mean

Program rating “behavior” matters (a lot!)

Adjusted Effect of Minimum Professionalism/Communication Milestone Category on PARS Year 1 Index Score Category

Reference:
Milestone Rating = 4.0



Procedure and Surgeon Cohort Characteristics Used for All Analyses in a Study Comparing U.S. General Surgical Residents' Milestones Competency Ratings and Their Patient Outcomes in Early Career Practice

Characteristics	Overall	Not yet proficient	Proficient	*P* value[a]
Presence of assisting surgeon	2,512 (20)	913 (20)	1,599 (20)	.64
Surgeon	n = 701	n = 261	n = 440	
Mean case volume/year (SD)	11 (9)	11 (8)	12 (9)	.16

Mean experience/year 11-12 pts.

Kendrick DL, et. al. Acad Med. 2023

Neurology Residents Achieving Epilepsy and Management/Treatment Level of Milestones at Graduation and Average Simulation-Based Status Epilepticus Skills Checklist Score by Milestone Level (N = 16)

Milestone	Milestone Level				*P* Value
	3.5	4	4.5	5	
Epilepsy					
N (%)	1 (6)	6 (38)	7 (44)	2 (13)	
Average checklist score (SD)	61.5% (N/A)	60.1% (14%)	57.1% (13%)	69.2% (0%)	.71
Management/treatment-patient care					
N (%)	0	6 (38)	6 (38)	4 (25)	
Average checklist score (SD)	. . .	63.5% (10%)	59.6% (14%)	55.5% (14%)	.63

Mean experience during residency < 8 pts.

Mikhaeil-Demo Y, JGME. 2021

No relationship with Milestone ratings in either study

Coproduction:

An Opportunity Moving Forward to Improve Clinical *and* Educational Outcomes

Coproduction

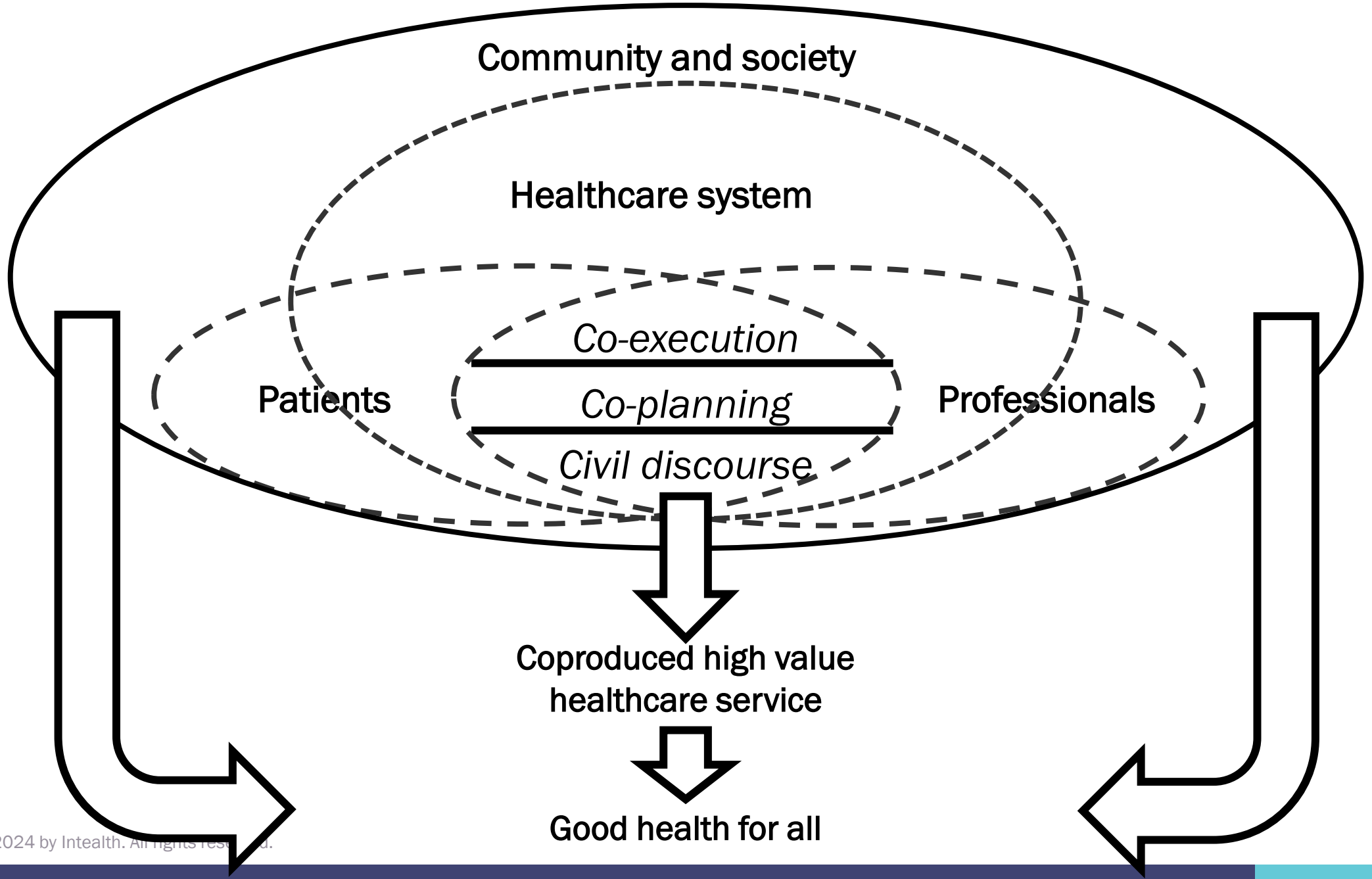
- P. Batalden: Coproduction is *"the interdependent work of users and professionals to design, create, develop, deliver, assess and improve the relationships and actions that contribute to the health of individuals and populations."*

From Batalden 2018; BMJ Qual Saf

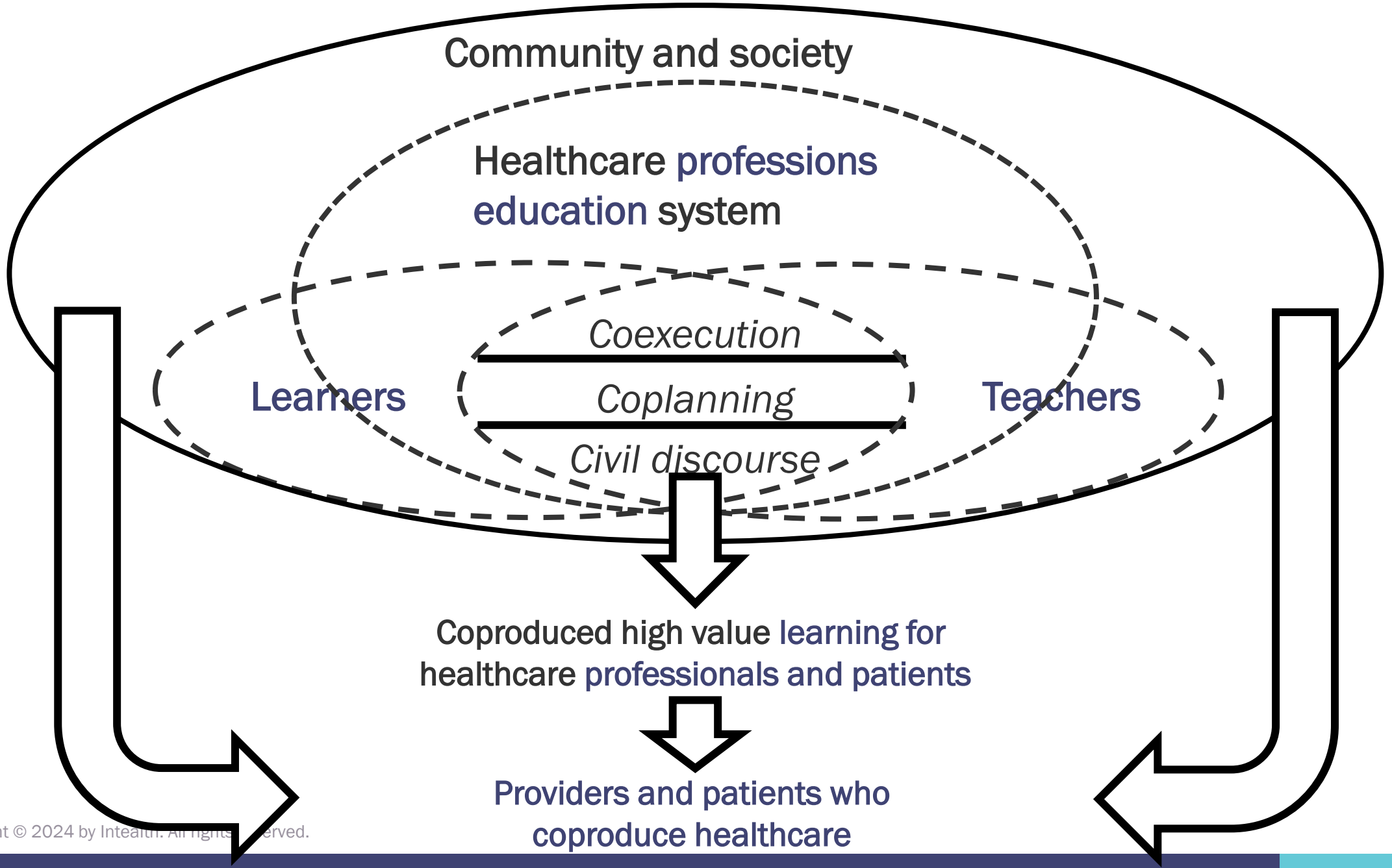
Coproduction and Service

- Healthcare and medical education are about providing a service, not making products[1]
  - Two parties are always involved in making a service
  - Both parties bring "expertise"
  - Services, when performed well, are always coproduced
- Richard Normann highlights the importance of a service *logic*—that is, "*forcing a shift of attention from production to utilization, from product to process, from transaction to relationship*."[2]

[1]Batalden 2018; BMJ Qual Saf; [2]Holmboe and Batalden 2015; Acad Med



Batalden M, Batalden P, Margolis P, et al. BMJ Qual Saf Published Online First. doi:10.1136/bmjqs-2015-004315



Englander R, et. al. Coproducing Health Professions Education: A Prerequisite to Coproducing Health Care Services? Acad Med. 2020.

Traditional Vs. Coproduction

System Variable	Traditional/Hierarchical	Coproduction
Logic dominant model	"goods" model (Learner as "product")	"service" model (Learner as service provider)
Primary driver	Teacher (teacher as expert)	Learner(s)-teacher partnership
Focus	Input focused (sequence, courses, rotations)	Learner and teacher as experts, in context and content, respectively

Englander R, et. al. Coproducing Health Professions Education: A Prerequisite to Coproducing Health Care Services? Acad Med. 2020.

Coproduction Cycle: MedEd

Co-assess. How do things stand (professional development)? Were previous educational interventions effective? Are changes needed?

Co-decide on next steps, based on the learner's and program's goals. Compare options to make informed, evidence-based educational choices.

Co-design the plan to fit the learner's and program's goals, context and capabilities. Design the intervention to maximize outcomes.

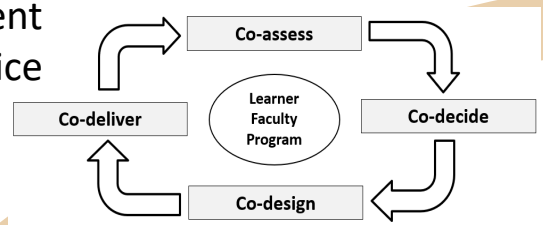
Co-deliver. How can the learner contribute? What can a medical educator or team do to support the learner?

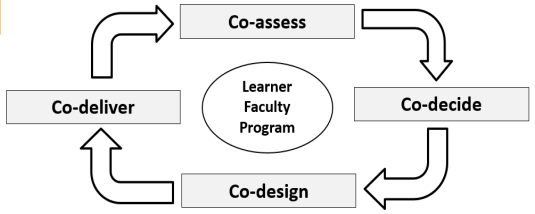
CBME and Coproduction

CBME Core Component	Coproduction Activities
Outcome Competency Framework	Early introduction and discussion with learners about the competencies and what they mean for them (building shared mental model)
Sequenced Progression	Development of shared individualized learning plan (ILP); necessary schedule adjustments based on stage of development and need
Learning tailored to competencies	Learner “feeds forward” current state of their development by competency (and EPA); develops ILP for each rotation with pertinent faculty and team members
Teaching tailored to competencies	Faculty use ILPs to guide teaching and learning activities; engage in co-learning with learners (e.g. QIPS; SBP, reflective practice)
Programmatic assessment	Learners involved in design of assessment program; learners contribute assessments to their portfolio; program possesses psychological safety for learners to ask for assessment by others

Co-production to Support Learning Trajectories Through Effective Programmatic Assessment

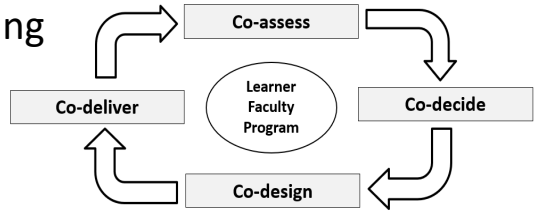
Proficient Unsupervised Practice

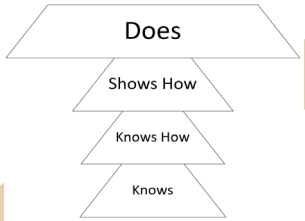




Journey to Expertise and Mastery

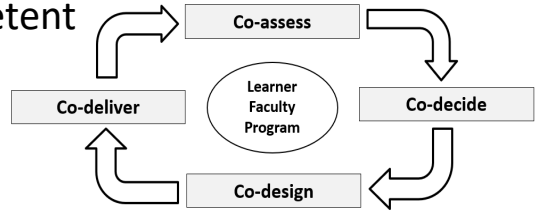
Competent within Supervised Training

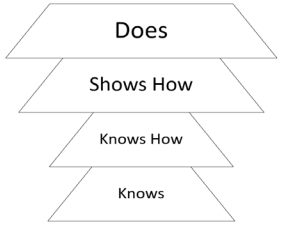




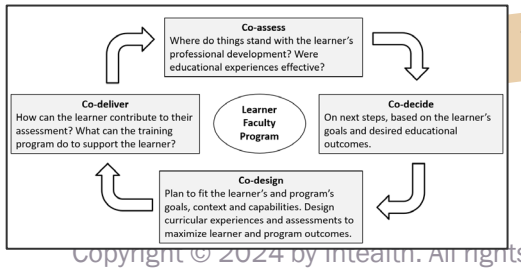
Maximize "does" assessment through ongoing reflection and professional development in practice, using other types of assessment to address competency gaps

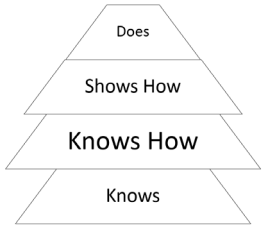
Advanced Beginner Transition to Competent





Novice/Early Development





Programmatic Assessment that Changes and Adapts Over Time and Supports Professional Development and Identity Formation

Conclusions

- Becoming a physician, or any health professional, is an intensely developmental process
- Assessment approaches and programs must think developmentally in their design and execution
- Expertise and mastery is the desired outcome
- Coproduction is important for developmentally-focused programmatic assessment

Questions and Discussion

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