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# Incorporating Individualized Learning Styles in Surgical Training to Enhance Competency

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# CHEPS

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Rx

A prescription to address system complexity in healthcare

INNOVATING HEALTHCARE DELIVERY

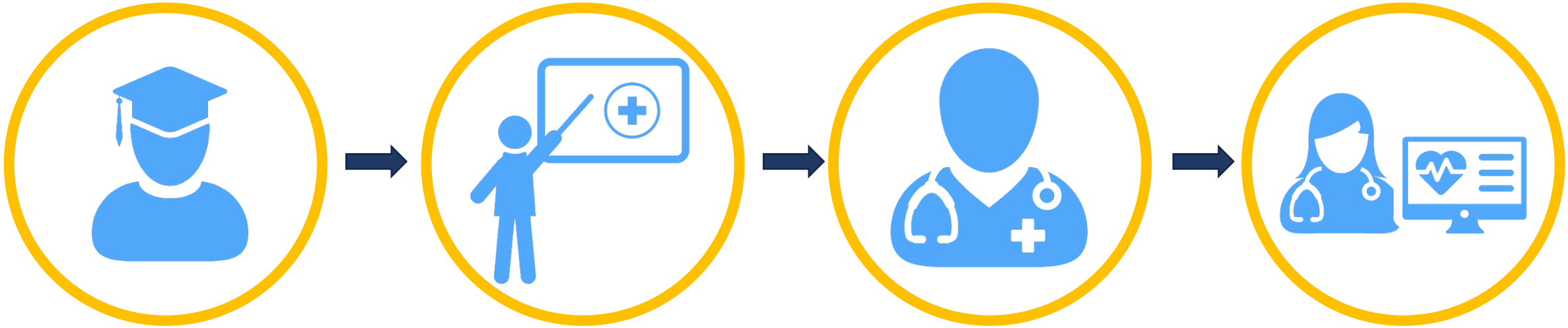
FOSTERING LEARNING

BUILDING COMMUNITY

POSITIVE IMPACT THROUGH...

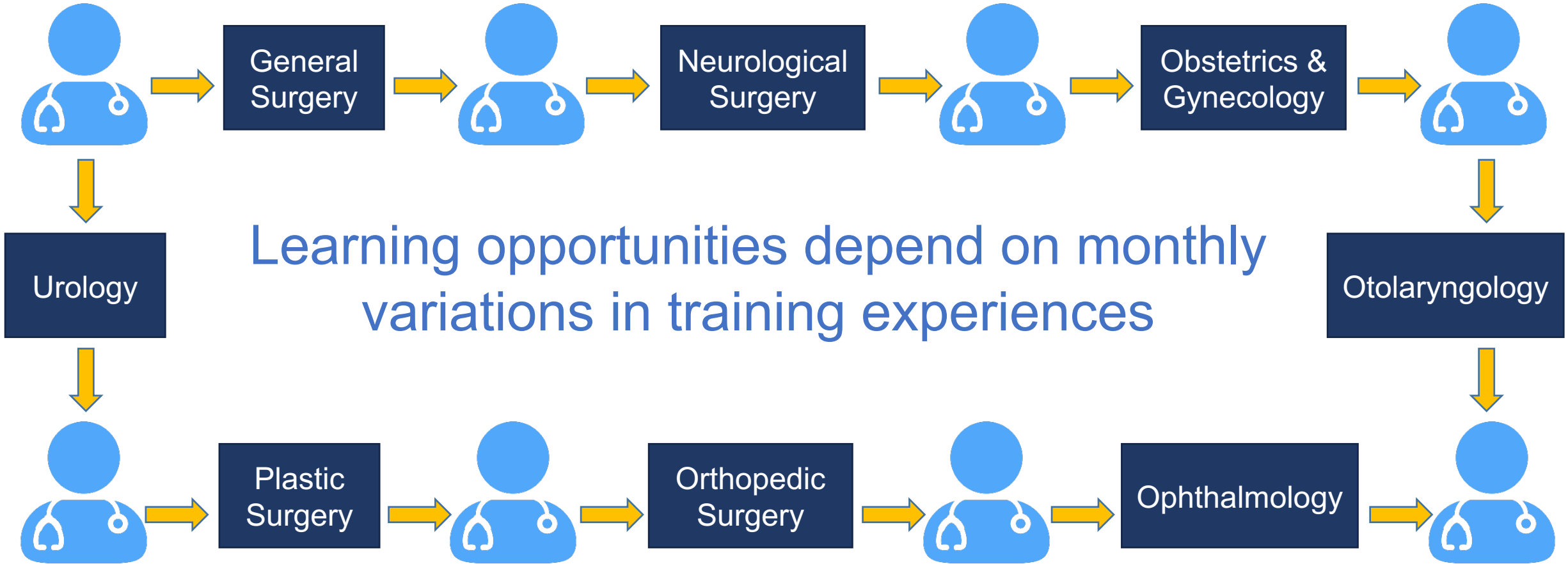
Research
Education
Implementation
Outreach
Dissemination

# THE PATH TO BECOME A SURGEON



Bachelor's Degree → Medical School → Residency → Fellowship to Specialize (optional)

# THE SURGICAL RESIDENCY PROGRAM




Learning opportunities depend on monthly variations in training experiences

# ACGME MINIMUM CASE REQUIREMENTS

- In order to achieve certification, trainees must achieve minimum case requires determined by the Accreditation Council for Graduate Medical Education (ACGME)
- Trainees are assumed to be competent in a procedure if they have met the minimum case requirements

# INACCURATE GENERALIZATIONS

- Having minimum case requirements that apply to every trainee:
  - Assumes every trainees achieves competency after the same number of cases for a given procedure
  - Assumes each time period (a month on a given service) provides the same number of cases for a given procedure
  - Assumes competency is binary (i.e. a trainee is considered to be competent or not competent based on if they have achieved the minimum case requirement)
- Studies show that not all trainees are competent at the end of their residency program

# INTRODUCING AND APPLICATIONS OF OUR MODEL

- Discrete event simulation can allow us to both assess the impact of variability and to analyze different policies
- For example, analyze how varying the length of time on service can impact the likelihood of achieving minimum case requirement
- Our model can also show inadequacies present in the current surgical training model by simulating a residency program and incorporating variabilities

# RANDOM PROCEDURE OPPORTUNITY

- Currently, the minimum case requirements assume that each trainee will have equal opportunities to cases for a given procedure
- Our model allows us simulate procedure opportunity as a distribution chosen by the user

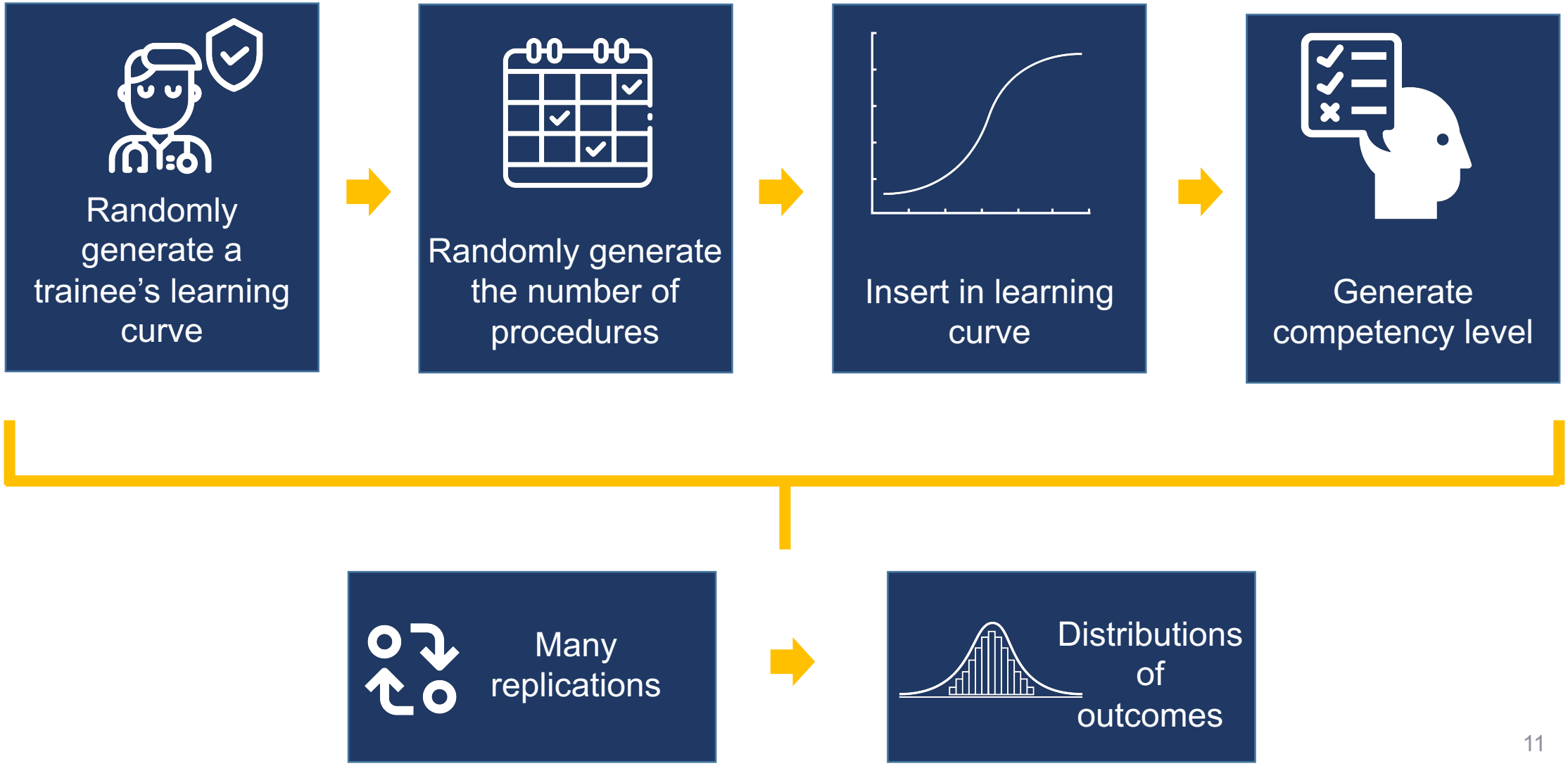
# CONTINUOUS LEARNING CURVES

- Currently, it is assumed that a trainee is competent in a procedure if they achieve the minimum case requirement
- In our model, we treat competency as a continuous function where it follows a logistic function
- The learning curve parameter is defined as the number of cases a trainee needs to achieve 90% competency

# RANDOM LEARNING CURVES

- Currently, the minimum case requirement assumes that all trainees will learn at the same rate
- Our model allows for variability in learning speeds by allowing the user to have the learning curve parameter be drawn from a random distribution

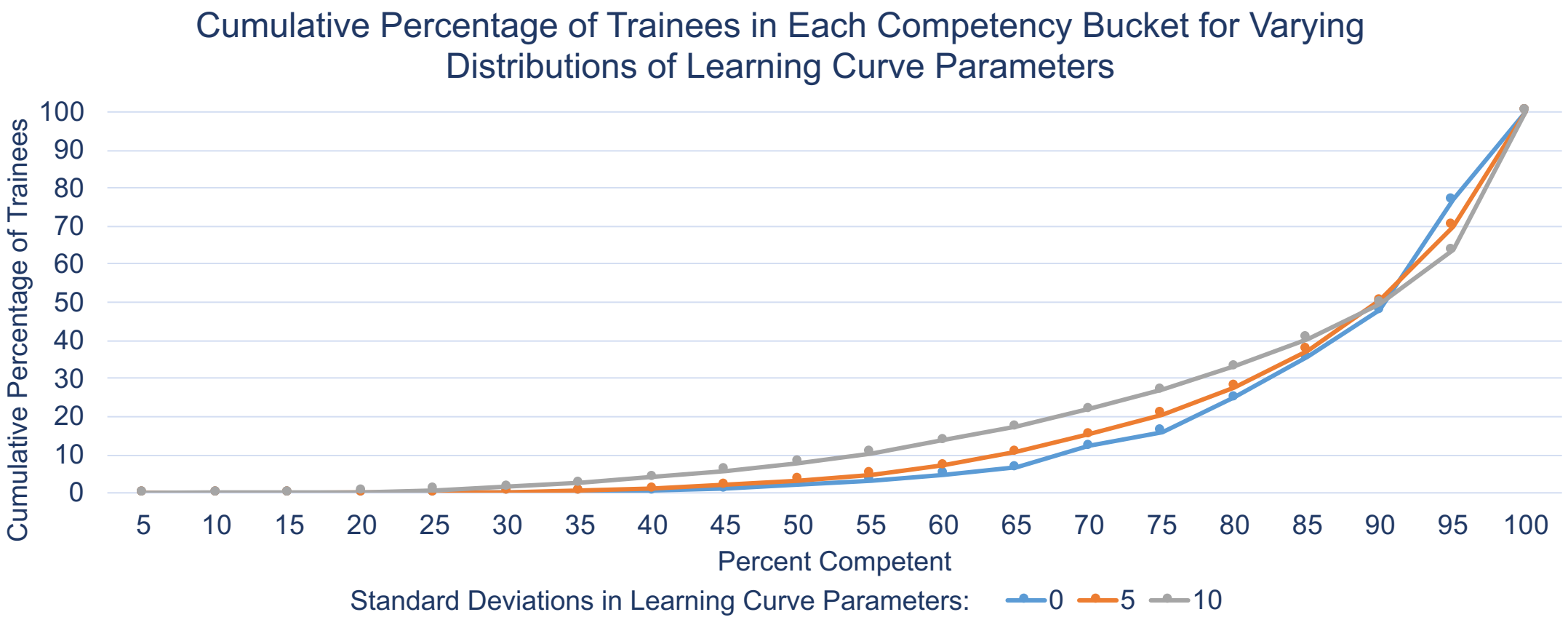
# LOGICAL FLOW



# WHAT HAPPENS WHEN YOU PUT IT ALL TOGETHER?

- Consider the following scenario:
  - ACGME minimum case requirement for a given procedure is 40
  - The residency program is 5 years long, with 7 trainees per year
  - Therefore, if every trainee learned at the same rate and was exposed to the same number of procedures, we would hypothetically need 280 cases per year for everyone to hit the threshold of 40
- What happens if we vary the learning rates?
- What happens if we vary the arrival rates?

# WHAT HAPPENS WHEN YOU PUT IT ALL TOGETHER?



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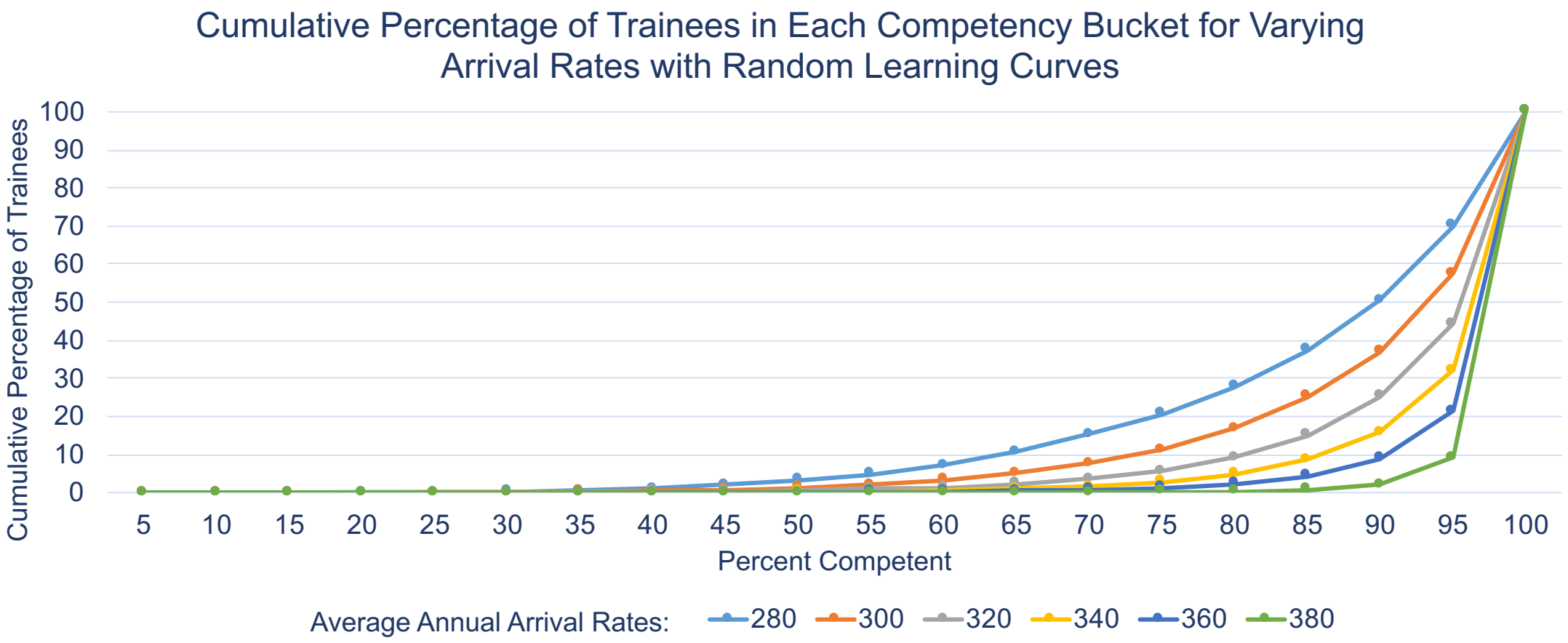

# FUTURE DIRECTIONS

- Expand our model to incorporate multiple services, multiple procedures, skill transfer, skill decay
- Collect data to make our simulations more accurate (such as procedure variability, learning curve variability)
- Create a time-based model that allows for further investigation of the effects of different policies

# ACKNOWLEDGEMENTS

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