Learning Curves: Exploring the Trajectories of Individual Residents in an Obstetrics and Gynecology Residency Training Program

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The Problem

• Surgical skill has a direct impact on patient safety and outcomes

• Competency based medical education (CBME) aims to ensure competence in the tasks thought important to medical practice

• Little is known about the trajectories through which residents achieve competence with respect to surgical skills or the stability of success once it has been achieved
What do we know?

• Learning curves demonstrate the relationship between learning effort and achievement

• Potential for increased learner engagement and more effective instructional design

Do distinct and interpretable patterns of resident surgical performance emerge in the context of an obstetrics and gynecology training program?
Methods

• Dalhousie Obstetrics and Gynecology Program, Halifax
• REB approval
• Retrospectively examined performance/curves over a time based model
• Daily resident surgical assessments in gynecologic surgery
  • 10 years, 33 residents, 4552 entries
Results: Distinct patterns do emerge...
Results: Improvement is the rule...

60/66 (91%) curves in 33 residents demonstrated growth over time
Results: Exceptions are rare...

2/66 curves (3%) in 33 residents demonstrated decline

4/66 curves (6%) in 33 residents demonstrated plateau
Results: Some may need more time…

2/60 (3%) of curves did not reach a performance score of 4.5 by the end of a 5 year training program but continued to demonstrate growth.
Results: Initial performance level is not necessarily predictive of peak performance...
Results: Getting beyond initial impressions...
Results: Impact of gaps in practice and assessment...

29/66 curves (44%) demonstrate decline after first gap

37/66 curves (56%) demonstrate stability or improvement after first gap
Conclusions

• Distinct learning trajectories and patterns of development exist for individual residents

• These may be useful to guide further development of assessment strategies and to more effectively target educational interventions

• Timing and intervals between surgical rotations may impact the trajectories and peak performances of some residents
Strengths

• 10 years of data with over 4500 assessments of surgical performance
• Real life
• Granularity allowing for detailed pattern recognition
• Roughly 80-85% of procedures were captured
Limitations

• Retrospective
• Missing rotations (Gyn Onc)
• Limitations in assigning technical difficulty to individual surgeries
• Difficulty accounting for role of the resident (entrustment)
Future Directions

Next Questions:

1. Do learning curves correlate with other metrics of ability?

2. Can these patterns be utilized to identify residents in need early in their training?

3. Can interventions be applied at more precise times of need in order to be most effective?

4. Do making these trajectories available to learners have any influence on motivation and learning behaviors?

Thank you
Extra Slides
Why?

- Patient Outcomes and Surgeon Technical Skill

<table>
<thead>
<tr>
<th></th>
<th>Lowest 1/4 skill (%)</th>
<th>Highest 1/4 skill (%)</th>
<th>Birkmeyer et al., New England Journal of Medicine, 2013.</th>
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</thead>
<tbody>
<tr>
<td>Complication Rate</td>
<td>14.5</td>
<td>5.2</td>
<td>1/3</td>
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<tr>
<td>Reoperation Rate</td>
<td>3.4</td>
<td>1.6</td>
<td>1/2</td>
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<td>Readmission Rate</td>
<td>6.3</td>
<td>2.7</td>
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<tr>
<td>Mortality</td>
<td>0.26</td>
<td>0.05</td>
<td>1/5</td>
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The Problem

• Decreasing resident operative experience and confidence

• Existence of a “failure to fail” culture and variable levels of surgical competence

• Assessment and training interventions remain underutilized and highly variable

• Utilization of effective training interventions for individual learners
Research Paradigm & Conceptual Framework

- Dreyfus and Dreyfus (1980)
- Ericson (2004)

What do we know?

- Practicing surgeons demonstrate differential learning curves with new techniques.
- Simulation has variable benefit depending on experience and skill.

What do we know?

- Surgical trainees demonstrate differential learning curves in a simulated environment over short time periods.

Future assessment strategies

• Improved measure of complexity and time as additional variables
  • BMI
  • Previous surgery
  • Anatomic variations

• Movement towards entrustment scales to better define curves
  • Minimize restriction of range
  • Better accounts for role of the resident in the procedure