Using Simulation to Show the Impact of Variability on Training Transplant Surgeons

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How does the stochastic nature of transplant arrivals impact our ability to train cardiothoracic surgeons?
Background

- 3 of 10 deaths due to cardiovascular disease or Chronic Obstructive Pulmonary Disease in the United States
- Medicare population expected to double by 2030
- Aging cardiothoracic (CT) surgeons
- Decreasing number of CT surgeons nationally
- Projected shortage of CT transplant surgeons by 2020
Transplant Surgery at UMHS

- 2-year Fellowship in Section of Thoracic Surgery
- 2 junior + 2 senior fellows each year
- UNOS Certification Requirements:
  - 20 heart transplants
  - 15 lung transplants
In an Ideal World...

Program Size × UNOS Requirements = Case Volume
The Problem

- Experience based certification
- Fixed Q4 call schedule
- Randomly occurring transplant opportunities

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If a program has 4 fellows on a Q4 call schedule and expects 40 transplants per year, what is the probability that each fellow participates in at least 10 transplants within a year?

A) 5%
B) 25%
C) 45%
D) 65%
E) 85%
Conclusions

• Stochastic nature of transplant arrivals means that more cases are needed than we might think to adequately train fellows

• We can use simulation to visually demonstrate this randomness and allow healthcare providers to see how uncertainty impacts the fellow training process

• The simulator may also be used in other environments and to evaluate the effectiveness of alternative scheduling paradigms
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Questions / Comments

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http://tiny.cc/TransplantSimulator