Healthcare Systems Process Improvement

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

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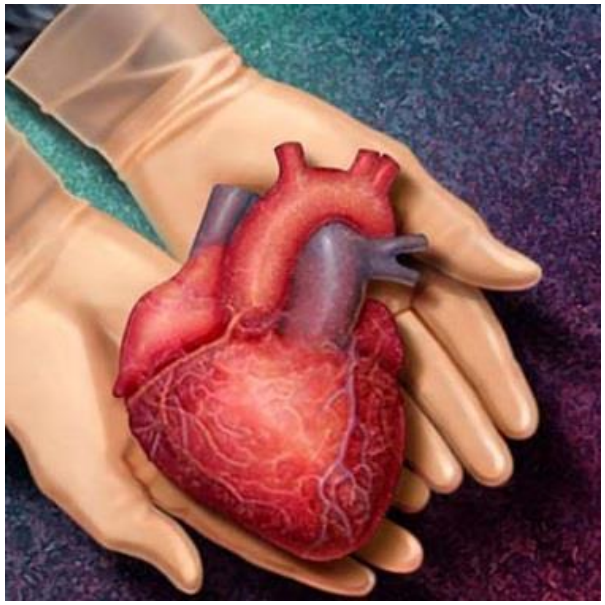
How does the stochastic nature of transplant arrivals impact our ability to train cardiothoracic surgeons?

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…

The Problem

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

July						
Sun	**Mon**	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**
	1 Chen	2 Jones	3 Smith	4 Reddy	5 Chen	6 Jones
7 Smith	8 Reddy	9 Chen	10 Jones	11 Smith	12 Reddy	13 Chen
14 Jones	15 Smith	16 Reddy	17 Chen	18 Jones	19 Smith	20 Reddy
21 Chen	22 Jones	23 Smith	24 Reddy	25 Chen	26 Jones	27 Smith
28 Reddy	29 Chen	30 Jones	31 Smith			

Ask the Audience

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