Scheduling Residents to Achieve Adequate Training on Procedures with Random Occurrences

Presented by Ryan Chen
University of Michigan
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Contributors

• Rishindra Reddy, MD
• Andrea Obi, MD
• Jennifer Chung, MD
• Jacob Seagull, PhD
• Mark Daskin, PhD
• Amy Cohn, PhD
• William Pozehl, BSE
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Background

• Many applications of this research – we consider heart and lung (cardiothoracic/CT) transplant surgery as an example

• Projected shortage of CT transplant surgeons over the next 10 years

• CT surgeons constitute the oldest group of surgeons (mean = 55 years old)
Motivation

- Certification for CT transplant surgery is experience-based
- Transplant opportunities cannot be scheduled and occur randomly
- Fellows rotate on a fixed call schedule to acquire experience
Ask the Audience

If a program has 4 fellows (rotating call daily) and receives an average of 40 transplants per year, what is the likelihood that each fellow receives 10 within 1 year?

A) 0% - 20%  B) 21% - 40%  C) 41% - 60%
D) 61% - 80%  E) 81% - 100%
If a program has 4 fellows (rotating call daily) and receives an average of 40 transplants per year, what is the likelihood that each fellow receives 10 within 1 year?

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Answer: ~5%
Approach

- From previous research, found that the interarrival times of heart and lung transplant opportunities follow an exponential distribution.
- Developed software to simulate occurrences of transplants and assignment to fellows.
- Developed a Windows Form Application in Visual Basic.
Simulator Demo

• At this point, the slide deck won’t be showing, but here is a list of the features I want to demo and talk through:
  – Basic inputs
  – One repetition (and timeline)
  – Multiple repetitions
  – How to assign multiple procedures
  – Change rotation paradigms
  – “Sensitivity analysis” tab
Implications

• Changes to the current system?
  – Program sizing – less fellows?
  – Program case volume – get more volume? Is this possible?
  – Push for policy changes?
    • ACGME work hours regulations
    • Alternative certification methods
      – Usage of surgical simulators to count toward certification
      – Proficiency-based certification
Next Steps

• Expand the simulator:
  – ACGME work hour regulations
  – Different “types” of fellows
  – Other statistical distributions
  – More paradigms

• Evaluate other programs, both within UM and nationwide

• Build optimization models!