Engineering Distinguished Lecture Series

Bioengineering: Robotics and Life Sciences

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Applications of Simulation in Healthcare

- Milestones in medical simulation
- Types of surgical simulation in use today
- Why simulation?
- Impact of simulation on:
  - New technologies
  - New procedures

✓ PATIENT SAFETY AND BETTER OUTCOMES
Timeline of Medical Simulation Milestones

1969: SimOne (first PC driven patient sim), University of Southern California
1974: Harvey, University of Miami
1986: CASE/Eagle, Stanford University
Gainesville Anesthesia Simulator (GAS), UFlorida
1996: METI introduces the HPS
1997: Mentice introduces First surgical virtual reality (VR) simulator: MIST
1999: Mentice releases First cardiac catheterization VR simulator
2000: Immersion launches first GI/bronch VR simulator, Gaumard introduces Noelle birthing simulator
2001: Laerdal introduces SimMan; METI the ECS
2010: VIMEDIX introduces first U/S TTE and TEE simulator
Types of simulation in use today- *Surgical VR and AR*

**Surgical VR simulators**

- CAE Healthcare *LapVR and EndoVR*
- Simbionix *LAP Mentor™ & LAP Mentor™ Express*
- Surgical Science *LapSim®*
- SimSurgery® *SEP*
- Epona Medical *LapX*

**Surgical AR simulators**

- CAE Healthcare *ProMIS*

**Surgical Robot simulators**

- Intuitive Surgical *da Vinci® Skills Simulator*
- Simulated Surgical Systems, LLC *RoSS™ (Robotic Surgical Simulator)*
- Simbionix *Suturing Module* for the Intuitive Surgical *da Vinci® Skills Simulator*
- Mimic Technologies *dv-trainer™*
Types of simulation in use today - *Task Trainers*

**Surgical Task Trainers**

- SAGES *Fundamentals of Laparoscopic Surgery (FLS)*
- 3-Dmed® *Lap Tab Trainer™ and Insufflated Abdomen MITS*
- *Limbs & Things*
- SimuLab Corporation *LapTrainer*
- Applied Medical
- *And many, many others...*
Results:

121 of the 300 operations were considered “essential” level procedures by a majority of program directors (PDs). Graduating 2005 US residents (n = 1022) performed only 18/121 of these procedures, an average of more than 10 times during residency; 83/121 procedures were performed on an average less than 5 times and 31 procedures less than once.

For 63 /121 procedures, the mode of experience was 0.

Why not stay the course? Is there a problem?
It’s not just in the USA!

Laparoscopy is important in the management of many surgical diseases

82% of Canadian residents surveyed consider their training in laparoscopic surgery inadequate (Chiasson PM et al Surg Endosc 2003)

18% graduating residents in Netherlands planning GI or onc surg career felt adequately trained in advanced MIS (Schijven MP, Surg Endosc 2004)
The need for change is being driven by

- The technology revolution
  - Medicine today is not static
  - What we do tomorrow will not be what is done 10 years from now
- The enormous information glut
- Increasing specialization
  - Individual needs will vary enormously within each specialty
- Preparation for life-long learning
End Goal

- Improve safety and patient outcomes
- Decrease errors
- Save OR time
  - Offer unlimited practice in a safe environment for students and faculty
  - Validate and implement curriculum with performance metrics (objectives) for training, evaluation and M.O.C