Objectives

- Theory - Acquisition of Technical Skills
- Key studies in surgical education research
- Ideas for surgical education research projects

Surgical Training

- Prior to the 20th century surgical training was largely an apprenticeship model
- Sir William Halsted brought to North America in the early 1900’s new training methodology
- Based on graded responsibilities

How Do Surgeons Learn?

- Orthopedics Surgeons
  - Leaders and pioneers in Surgical Education
- Kopta
  - Outlined a scheme for technical skills development
  - Motor skills are learned in 3 phases
    - Cognitive
    - Integrative
    - Autonomous


Cognitive Phase

- Reading
- Watching
- The learner intellectualizes the task into its component steps
- Performance is erratic and step like in nature

Integrative Phase

- With hands-on practice and feedback
  - Learner begins to integrate knowledge of task into the appropriate motor behaviors
  - Performance becomes more fluid with fewer interruptions
Autonomous Phase

- Final stage
- With practice
  - Performance becomes smooth and autonomous
  - Minimal cognitive inputs

Perfect Practice Makes Perfect

Curriculum Development

- Supplementary Surgical Skills Course
  - Canada 1962 "medical student technical skills course"
  - US 1975 "Orthopedic Motor skills course" Washington University
  - UK 1977 "Microscopy Workshop"

Surgical Education Research

- Following curriculum design
- Research Questions:
  - Can we measure technical performance?
  - Can we predict surgical performance?
  - Can we measure the "effectiveness" of teaching interventions?

Interest in Surgical Education Research

- Derossis et al (2000) conducted a review of the surgical education research literature
  - 1988-1998
  - No studies in first two year
  - Gradual increase in number of publications towards end of the 10 year period

Landmark Studies in Surgical Education

Objective Structures Assessment of Technical Skills

• OSATS
  – Direct observation with criteria
  – Candidates perform standardized surgical tasks while being observed directly by an expert examiner
  – The tasks range from simple tasks (using surgical bench models) to large and complete operative procedures on live animals

Instruments

• Checklists are detailed, dichotomous, and task-specific evaluation instruments
  – Score is given if item is performed correctly
• Global rating scales consist of multiple items, each rated on a behaviorally anchored scale

Issues with OSATS

• Very labor intensive
• Significant cost to running a multi-station OSATS
• Models used
  – Animal
  – Cadaveric
• Skills centre versus Operating room

Foundation for Research

• Edited Videos (Scott et al 2000)¹
  – Direct versus Edit Video
  – Interrater reliability 0.57 and 0.33
• Fast forward Assessment (Dath et al 2002)²
  – Evaluator’s allowed to fast forward through unedited tape
  – Viable option

Foundation for Research

• End Product (Szalay et al 2000)
  – Assessing the end products of technical skills station
    • Choledochojejunosotomy
    • Hernia
    • Ileostomy
    • J-tube
    • Rectal Anastomosis
    • Vascular Anastomosis


Fidelity of Model

• How realistic does a model have to be?
• Does a model replicate a real life operation?

Fidelity of Model

• Anastakis et al 1999
  – burr hole insertion, chest tube insertion, small bowel anastomosis, abdominal wound closure, flexor tendon repair,and K-wire fixation of a fractured metacarpal on bench model and cadaver
  – showed that training on low-fidelity bench models was equivalent to training on cadavers


What about VR Simulators?

• Pilot training has been compared and contrasted with surgical training
• To date, there has been no “high fidelity” model that could offer all the necessary constructs to fulfill the need of a “complete” surgical trainer
• However, VR models are improving and potentially may become an important tool

Fidelity of Model

• Matsumoto et al 2002
  – RCT
  – High fidelity versus low fidelity bench model
  – Endoscopic removal of a ureteric stone


Fidelity of Model

• The results showed that training on the high-fidelity model conferred the same degree of benefit as training on the low-fidelity model
• IMPORTANT POINT
  – ”key constructs” of the task have to be incorporated into the model
  – Model should offer potential for practice and training of the most relevant aspects of the skill.

Relevant VR Studies

  - N=32
  - Two groups = trained VR and control
  - Trained group = higher GRS


Other VR Studies


  - Practice on a VR Endoscopy Simulator can improve Endoscopic skills


Transfer of Skills

- Another issue raised from the early surgical education studies was whether skills learned on bench models transfer to the operating room
- “Holy Grail” of surgical education research

Transfer of Skills to the OR

  - The experimental group performed significantly better in the operating room
  - According to four of eight global rating scale criteria, when compared with the control group


Transfer of Skills to the OR

- Naik et al (2001)
  - N=24 internal medicine and anesthesia residents
  - All naïve to fiberoptic intubation
  - Randomized to practice on a low fidelity bench model versus didactic teaching
  - Pre-tested and post-tested on the bench model
  - Final test-intraoperative fiberoptic intubation in the OR


Transfer of Skills to the OR

- Naik et al (2001)
  - For all outcomes measures the trained group did better than the control group


McMaster University Surgical Education Group

- Teaching in the Operating Room
  - Qualitative Study looking at issues around teaching in the OR
  - Focus groups
  - Develop Teaching Videos
  - Workshops on Teaching
  - Study – Effectiveness of Teaching Workshop on Teaching Behaviour in the OR

Resident and Fellows Initiatives

- Surgical Decision Making – Dr. Suman Chatterjee
  - Surgery is 75% cognitive and 25% technical
  - Medical students, urology residents and staff urologists (n=23) viewed clips from eight selected urological procedures and verbalized their thought processes
  - The clips were ordered in increasing complexity from lower level tasks (catheterization, cystoscopy) to more advanced procedures (laser lithotripsy, open and laparoscopic prostatectomy and nephrectomy)


Surgical Decision Making

- Performance was transcribed and blindly rated utilizing the previously validated SDM-RS
- The SDM-RS can reliably detect differences in knowledge and surgical judgment between medical students, urology residents and staff urologists
- The differences between groups in judgment and knowledge become more apparent as task complexity increases

Task-specific bench model training versus basic laparoscopic skills training for laparoscopic radical prostatectomy: a randomized controlled study

- Robert Sabbagh – Fellow
- N=28 experienced laparoscopic surgeons
- Randomized to task specific training on urethrovesical model versus foam bench model training
- Post-tested on the foam model and urethrovesical model

Transfer of laparoscopic radical prostatectomy skills from bench model to animal model: a randomized control study

- Same cohort of participants then performed a urethrovesical anastomosis on a live pig
- Group that trained on the task-specific urethrovesical model performed better than the control group

Orthopedic Studies

- Dr. Ivan Wong – Senior Orthopedic Resident
- Hypothesis- Training with a knee arthroscopy model can lead to a measurable improvement in operative arthroscopic skills

Diagnostic Knee Arthroscopy: do skills transfer from model to OR?
Diagnostic Knee Arthroscopy: do skills transfer from model to OR?

Research Question

- Good research needs a good research question
- Is it an interesting topic?
- Does it pass the "so what" test?

Research Design

- Pilot project?
- Randomized Controlled Study?
- Predicting performance?
- Transferring of Skills

Targeted Population

- Medical Students
- Residents
- Practicing Surgeons

Exercise

- Groups of 3-4
- Brain storm some study ideas
- Hypothesis
- Research Question
- Outline Research Design