University of Colorado Denver
School of Medicine

See One, Do One, Teach One
Dangerous (Inefficient, Flawed)

Objectives

- Surgical Education
  - Past and Present
  - Future directions of technical training
- Dangers
- Areas of Improvement
- Implications for our program

Historical Perspective

http://www.med.yale.edu/library/historical/cushing/jpgs/JHH_staff_c1897.jpg

DR. WILLIAM S. HALSTED

- Apprenticeship to Residency
  - Internship
  - Residency
  - Housestaff

Present

- Resident focused
- Apprenticeship within a residency
- Work hours restrictions
- Complex skills
- Increasing regulations

Framework for Systematic Training and Assessment of Technical Skills

Rajesh Aggarwal, MA, MRCS, Teodor P Grantcharov, MD, PhD, Ara Darzi, KBE, MD, FACS, HonFREng, FMedSci

- Literature Review; PubMed, Medline
- Medical Subject Headings (MeSH):
  - Education, Professional, Curriculum, Clinical Competence, Teaching
- Keywords
  - Skills, Assessment, Simulation

Aggarwal R. *JACS*, 2007

Proposed Framework

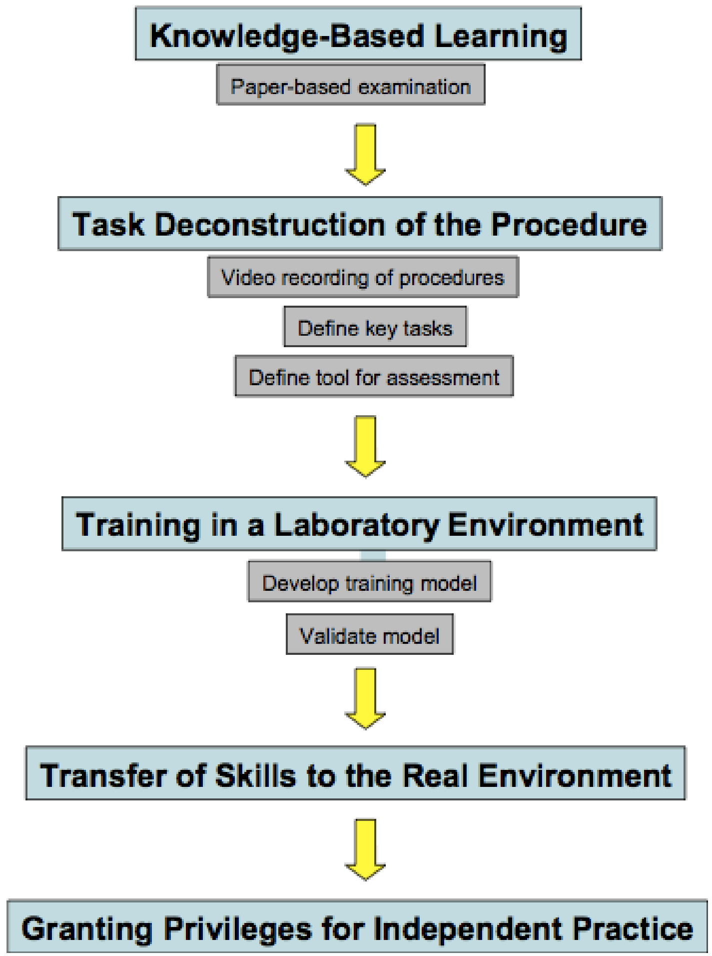

Figure 2. Framework for systematic training and assessment of technical skills (STATS).

Aggarwal R. *JACS*, 2007

Procedural Learning

- See One
  - Knowledge based learning
  - Task Deconstruction

Procedural Learning

- See One
  - Knowledge based learning
  - Task Deconstruction
- Do One
  - Practice in a clinical setting

Procedural Learning

- See One
  - Knowledge based learning
  - Task Deconstruction
- Do One
  - Practice in a clinical setting
  - Training in a laboratory

Procedural Learning

- See One
  - Knowledge based learning
  - Task Deconstruction
- Do One
  - Practice in a clinical setting
  - Training in a laboratory
- Teach One

Virtual Reality Training Improves Operating Room Performance

Results of a Randomized, Double-Blinded Study

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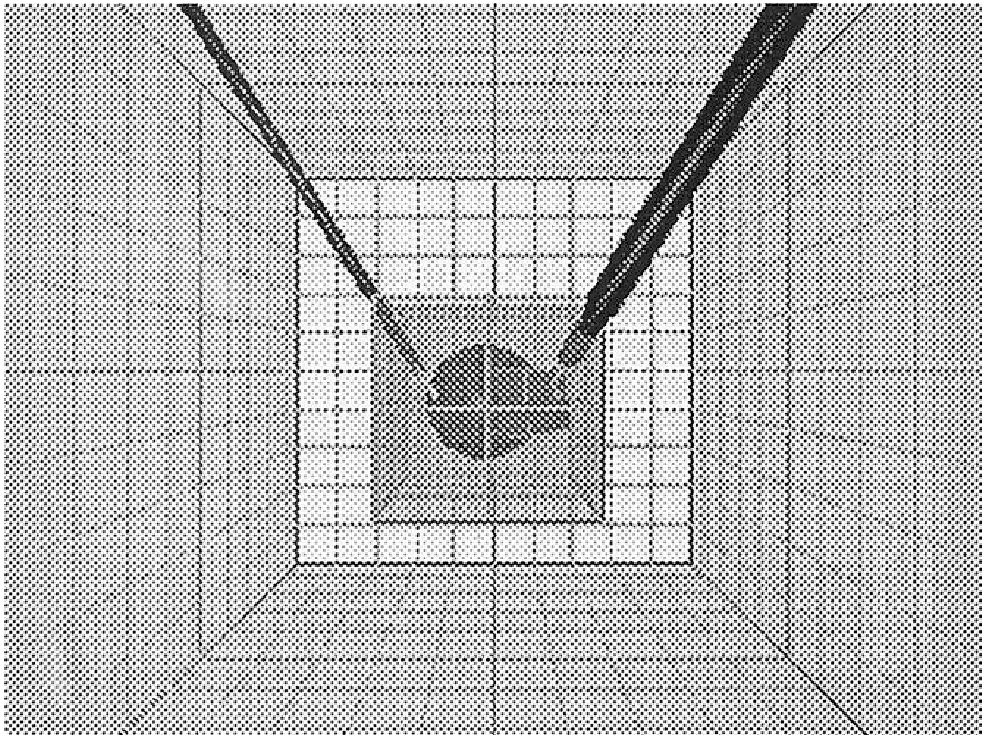
*From the *Department of Surgery, Yale University School of Medicine, New Haven, Connecticut, U.S.A., and the †Department of Psychology, Queens University, Belfast, Northern Ireland, U.K.*

Seymour, et al. *Annals of Surgery* 2002

- Randomized Controlled Trial
- 16 surgical residents
  - PGY 1-4; Yale
- Control vs. Virtual reality
- Assessed skills
  - Visuospatial, perceptual, psychomotor



Seymour, et al. *Annals of Surgery* 2002

- Randomized Controlled Trial
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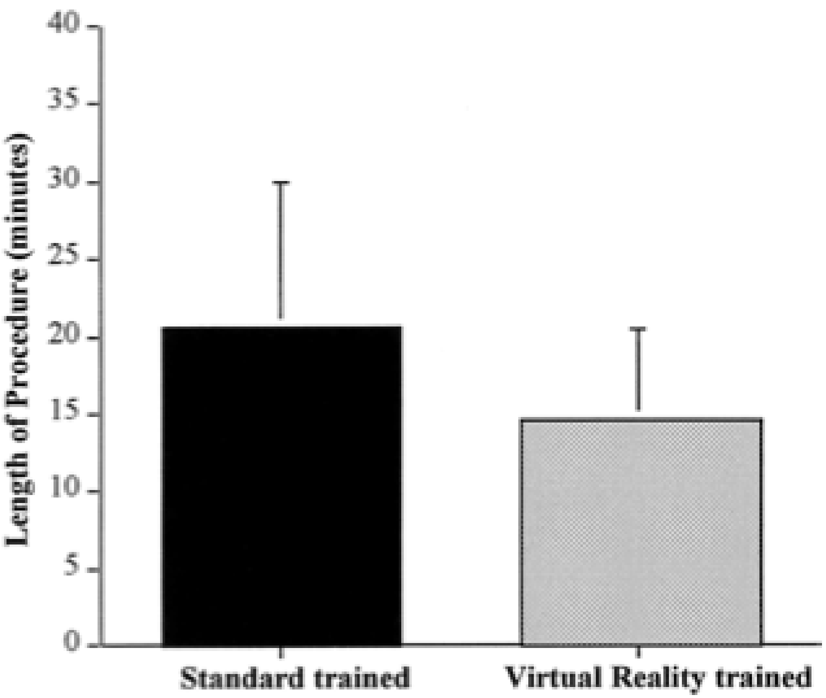
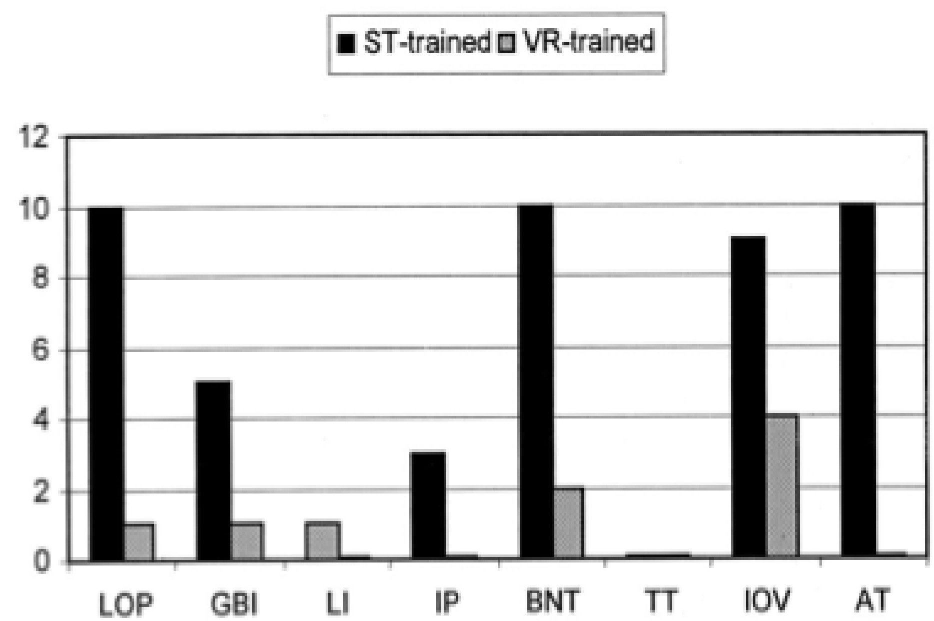
Table 1. ASSESSED OPERATIVE ERROR DEFINITIONS

1. LACK OF PROGRESS: No progress made in excising the gallbladder for an entire minute of the dissection. Dealing with the consequences of a predefined error represents lack of progress if no progress is made in excising the gallbladder during this period.
2. GALLBLADDER INJURY: There is gallbladder wall performation with or without leakage of bile. Injury may be incurred with either hand.
3. LIVER INJURY: There is liver capsule and parenchyma penetration, or capsule stripping with or without associated bleeding.
4. INCORRECT PLANE OF DISSECTION: The dissection is conducted outside the recognized plane between the gallbladder and the liver (i.e., in the submucosal plane on the gallbladder, or subcapsular plane on the liver).
5. BURN NONTARGET TISSUE: Any application of electrocautery to nontarget tissue, with the exception of the final part of the fundic dissection, where some current transmission may occur.
6. TEARING TISSUE: Uncontrolled tearing of tissue with the dissecting or retracting instrument.
7. INSTRUMENT OUT OF VIEW: The dissecting instrument is placed outside the field of view of the telescope such that its tip is unviewable and can potentially be in contact with tissue. No error will be attributed to an incident of a dissecting instrument out of view as the result of a sudden telescope movement.
8. ATTENDING TAKEOVER: The supervising attending surgeon takes the dissecting instrument (right hand) or retracting instrument (left hand) from the resident and performs a component of the procedure.

Seymour, et al. *Annals of Surgery* 2002

- Length of Procedure
- Errors





Seymour, et al. *Annals of Surgery* 2002

Results

- No differences in baseline assessments
- Gallbladder dissection was 29% faster for VR-trained residents.
- Control group residents:
  - nine times more likely to transiently fail to make progress (P <.007)
  - five times more likely to injure the gallbladder or burn nontarget tissue (P <.04)
  - ten times more likely to have attending take over
- Mean errors were six times less likely to occur in the VR-trained group (1.19 vs. 7.38 errors per case; P <.008).

Seymour, et al. *Annals of Surgery* 2002

Proving the Value of Simulation in Laparoscopic Surgery

Gerald M. Fried, MD, Liane S. Feldman, MD, Melina C. Vassiliou, MD, Shannon A. Fraser, MD, Donna Stanbridge, RN, Gabriela Ghitulescu, MD, and Christopher G. Andrew, MD

Fried GM. *Annals of Surgery* 2004

- 5 centers
- 215 surgery residents, fellows, attendings
- Basic tasks such as FLS peg transfers, etc

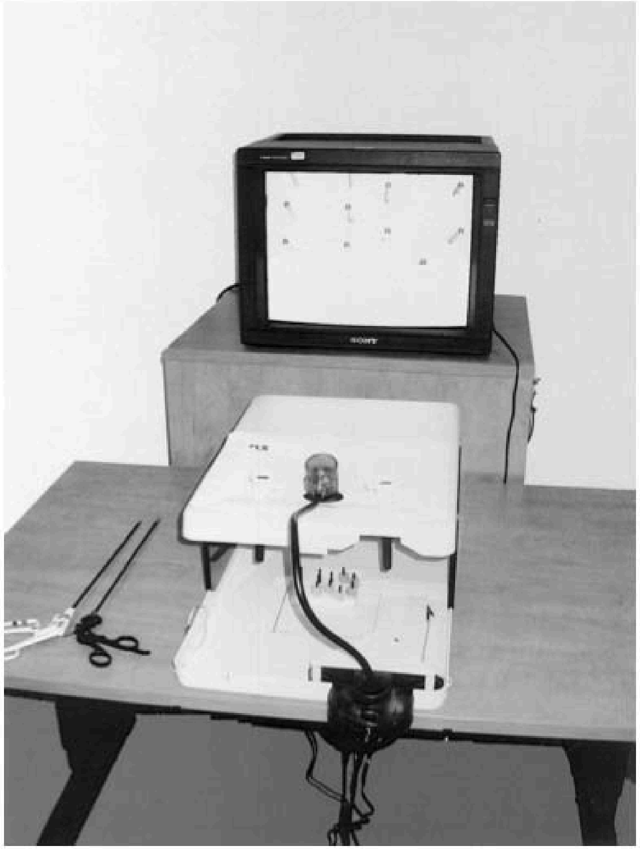


FIGURE 1. MISTELS Box with gooseneck camera. Camera projects image on a monitor. Pneumatic table can be positioned at comfortable working height.

TABLE 1. MISTELS Scores for Each Task and for Total Score

	Junior (n = 82)	Intermediate (n = 66)	Senior (n = 67)	*P*
Peg	42 (36–48)	65 (60–71)	76 (72–80)	<0.0001
Cut	38 (34–43)	51 (47–56)	63 (58–68)	<0.0001
Loop	33 (28–39)	47 (39–54)	62 (55–69)	<0.0001
IC knot	26 (20–32)	54 (48–60)	69 (64–75)	<0.0001
EC knot	41 (35–48)	58 (51–64)	67 (60–74)	<0.0001
Total	36 (32–40)	55 (51–59)	68 (64–72)	<0.0001

EC indicates extracorporeal knot; IC, intracorporeal knot.

MISTELS (McGill Inanimate System for Training and Evaluation of Laparoscopic Skills) normalized test scores (mean and 95% confidence intervals) for each task and total score for juniors (PGY1–2), intermediate (PGY3–4), and seniors (PGY5, laparoscopic fellows, practicing laparoscopic surgeons). Differences between groups were significant for each task and total score.

Fried GM. *Annals of Surgery* 2004

Results

- Results in institutions did not vary
- Laparoscopic scores highly correlated with intraop rating during laparoscopic cholecystectomy (n=19, P<0.0004)
- Novice laparoscopists randomized to practice/no practice of the transfer drill for 4 weeks
  - Improvement in intracorporeal knot tying (P<0.001), independent of baseline ability

Fundamentals of Laparoscopic Surgery simulator training to proficiency improves laparoscopic performance in the operating room—a randomized controlled trial

Gideon Sroka, M.D., Liane S. Feldman, M.D., Melina C. Vassiliou, M.D., Pepa A. Kaneva, M.Sc., Raad Fayez, M.D., Gerald M. Fried, M.D.*

Steinberg-Bernstein Centre for Minimally Invasive Surgery and Innovation, McGill University, Montreal, QC, Canada

Fried GM. *American Journal of Surgery,* 2010

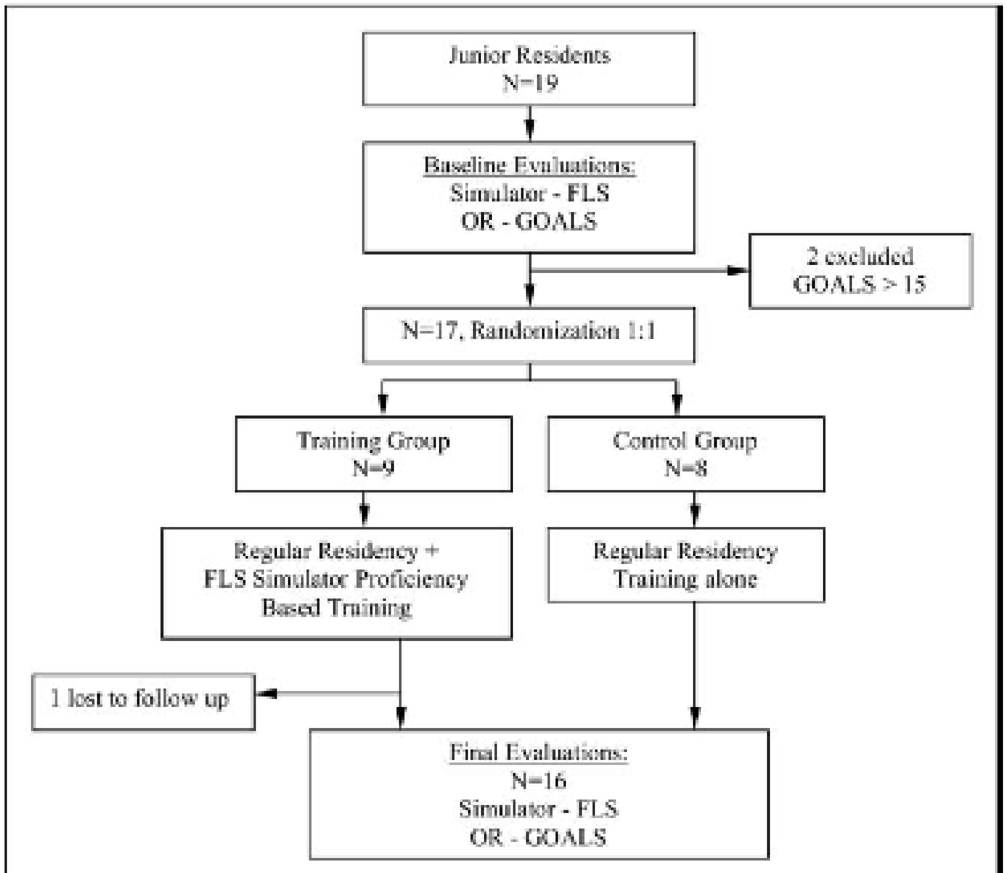


Figure 1 Flow of participants through the study.

Fried GM. *American Journal of Surgery,* 2010

Table 1 Comparison of simulator trained and control groups at enrollment and during the study period

	No simulator training (n = 8)	Simulator training (n = 8)	*P*
PGY 1/2/3	6/2/0	5/2/1	.58
Age (y)	27 (27–28)	27 (26.5–28.5)	.85
Gender (male/female)	3/5	6/2	.13
Hand dominance (right/left)	7/1	7/1	1
Time between baseline and final evaluations (d)	113 (40–167)	162 (100–256)	.13
LC performed as primary during study (no.)	3.5 (2–5)	4.5 (3–7)	.21
LC participated as assistant during study (no.)	4.5 (4–6)	4.5 (3.5–8)	.92
Other laparoscopic cases performed/participated during study (no.)	2.5 (2–3.5)	2.5 (1–3.5)	.75

Data expressed as median (IQR).
LC = laparoscopic cholecystectomy.

Fried GM. *American Journal of Surgery*, 2010

Table 2 Comparison of the difference (mean ± SD) in operating room performance in the domains assessed by GOALS from baseline to final assessment after simulator training compared with controls

	No simulator training (n = 8)	Simulator training (n = 8)	*P*
Depth perception	.5 ± .8	1.25 ± .7	.08
Bimanual dexterity	.5 ± 1.1	1.25 ± .6	.04
Efficiency	.4 ± 1.1	1.13 ± 1.0	.24
Tissue handling	.3 ± .7	1.13 ± 1.0	.04
Autonomy	.3 ± 1.0	.6 ± 1.1	.58
Total score	1.8 ± 2.1	6.1 ± 1.3	.0003

Each domain is scored from 1 (worst) to 5 (best) and the results summed to get a total score.

Fried GM. *American Journal of Surgery*, 2010

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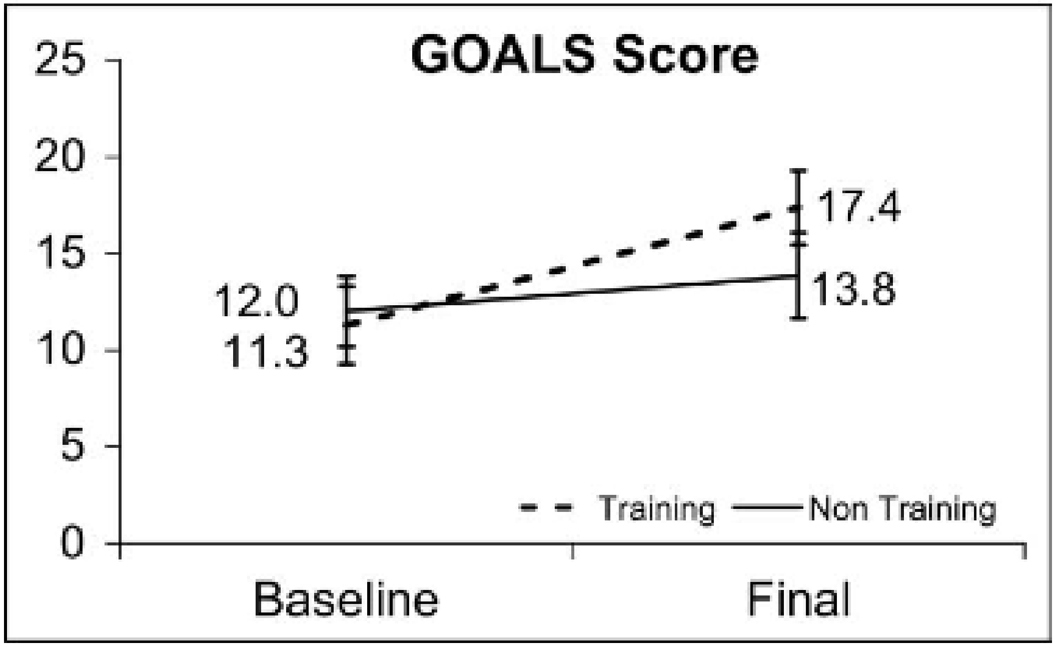

Figure 2 Evaluation of laparoscopic OR performance during dissection of the gallbladder from the liver bed during laparoscopic cholecystectomy. There was no difference in the groups at baseline ($P = .47$). The group trained in the simulator improved more than the nontrained group ($P = .0003$).

Fried GM. *American Journal of Surgery,* 2010

- What does this mean?
- Where are we headed?

New directions in simulation-based surgical education and training: Validation and transfer of surgical skills, use of nonsurgeons as faculty, use of simulation to screen and select surgery residents, and long-term follow-up of learners

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Scott DJ. *JACS* 2011

Conclussion

- Practice makes us more prepared for clinical learning opportunities
- The See One, Do One, Teach One paradigm is…
  - Potentially harmful to patients
  - An inefficient way to learn

Conclussion

- Technical preparation is important to maximize clinical learning opportunities

- Skills knowledge gained from simulation is transferrable to the operating room

Questions?