2008 Modeling & Simulation Leadership Summit:

M&S in the Medical Education Realm

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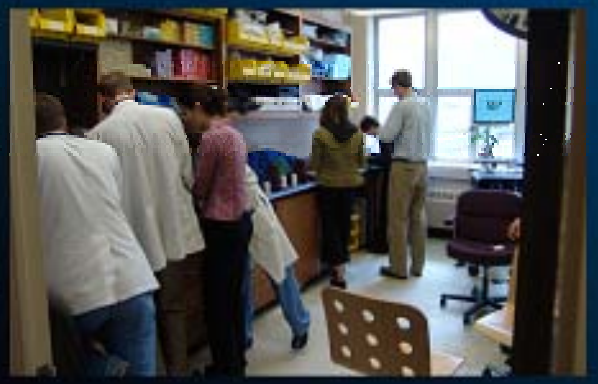
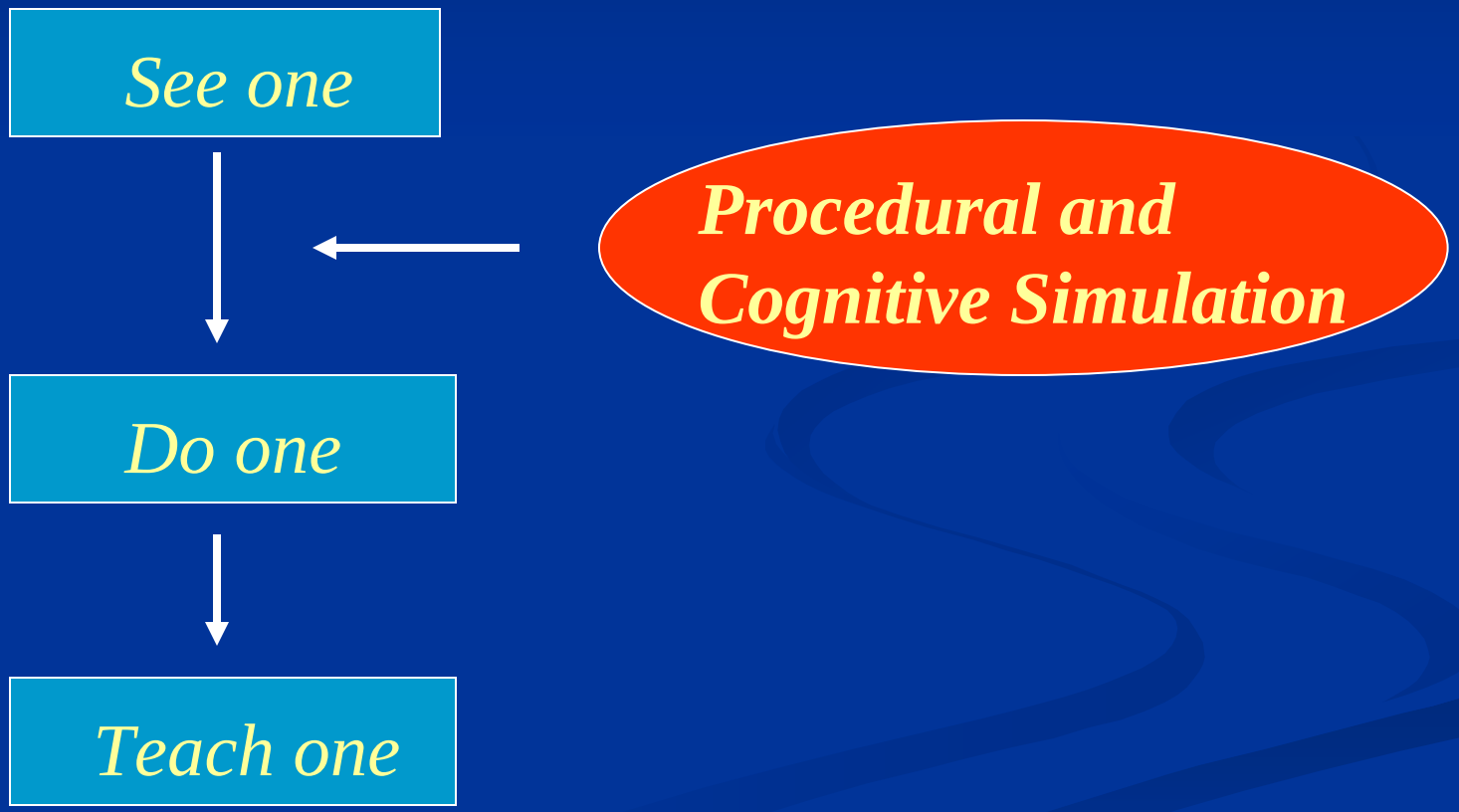
ISIS

THE INSTITUTE FOR SURGICAL AND INTERVENTIONAL SIMULATION AT THE UNIVERSITY OF WASHINGTON



Medical Training

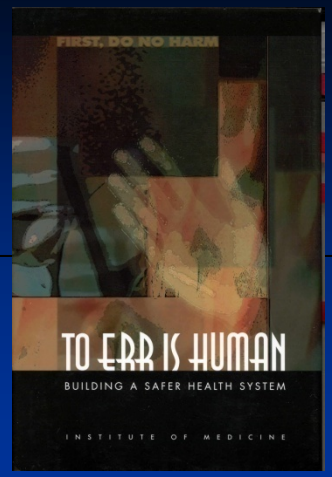
Can we improve our current apprentice system of training?



Rationale for Action in Medical Simulation Now

- Intense national focus on patient safety

Surgical Complications



IOM Report (To Err is Human, 2000)

Single academic institution study

Surgical M&M reports

McGuire et al, 1992

- 2,428 (5.4%) of 44,603 procedures with complications
  - ½ attributed to error
- 749 (1.7%) deaths
  - 7.5% attributed to error

Academic medical center review

Calland et al, 2002

- 119 (1.6%) of 7379 procedures - death within 30 days
  - 19% of deaths due to adverse events
  - 2/3 of deaths due to adverse events preventable

Challenges for Medical Training

Technical proficiency requires instruction and practice

- Work hour limitations
- Public awareness and concern of teaching institutions
- Fewer independent opportunities

Rationale for Action in Medical Simulation Now

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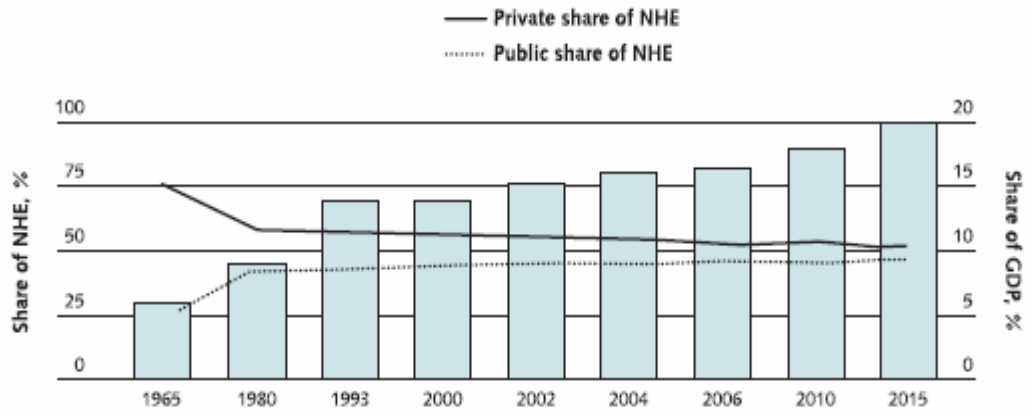
- Cost-inefficiency of current apprenticeship training model in medicine

Healthcare Economic Impact

- 43.6M people without insurance in 2006
- 89.5M people without insurance for > 1 month in 2006

Figure 1. U.S. national health expenditures (NHE) as a share of gross domestic product and private and public shares of NHE, selected years 1965–2015.



Healthcare Economics
Revenue Sources

- Health insurance premiums increasing 8 to 13% per year
- 2000-2005, family healthcare premium increase 73% vs. inflation 14%, wages 15%
- Major components of cost:
  - Hospitals – 30%
  - Physician svc – 21%
  - Drugs – 10%

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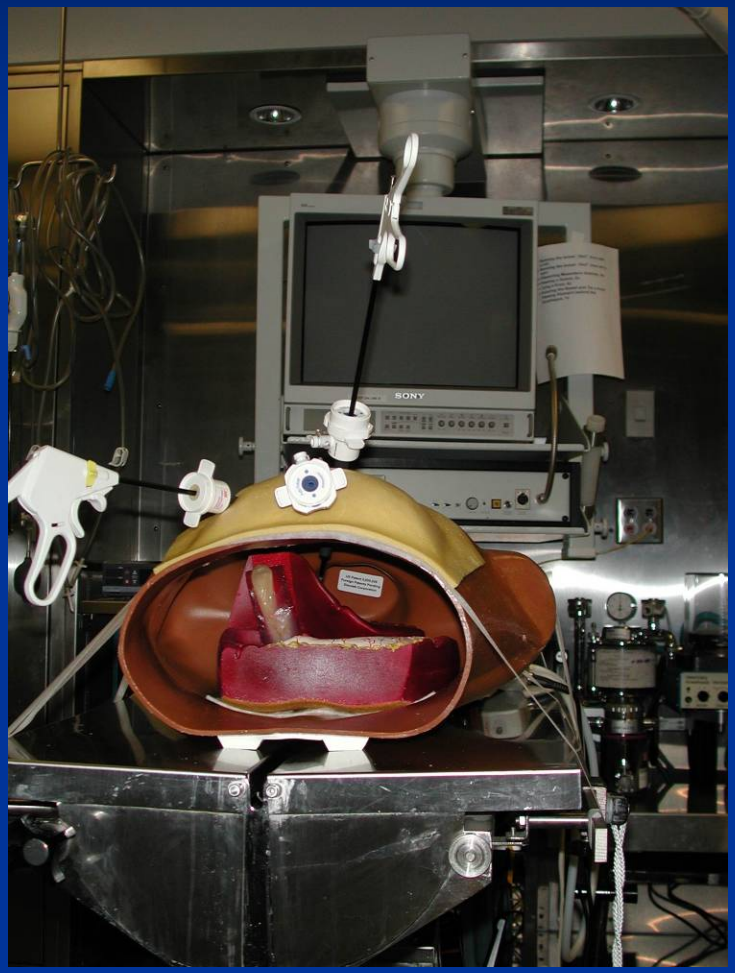
- Maturing technology AND curriculum

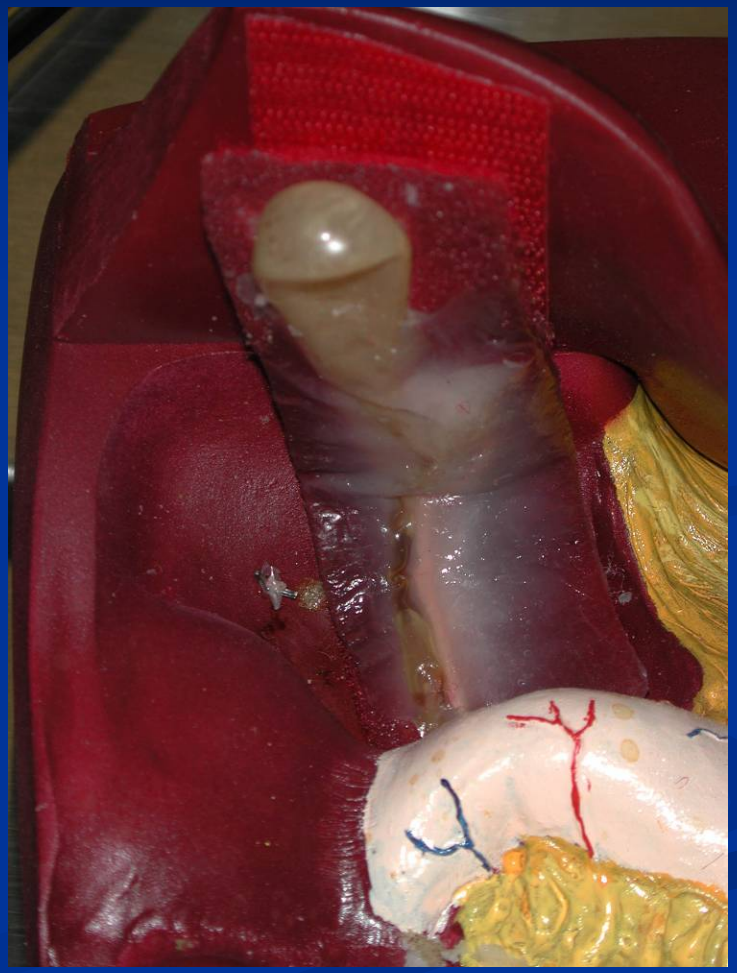
Mannequin-based Simulator - Realistic physiologic response Individual and Team Training

The Realization

The Dream

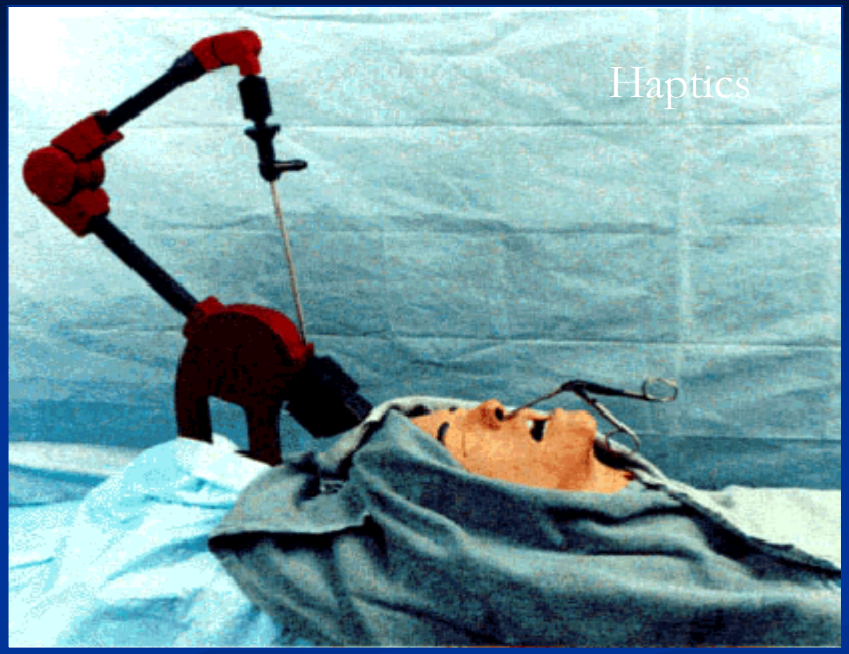
Lap Cholecystectomy Simulator (Simulab and CVES)

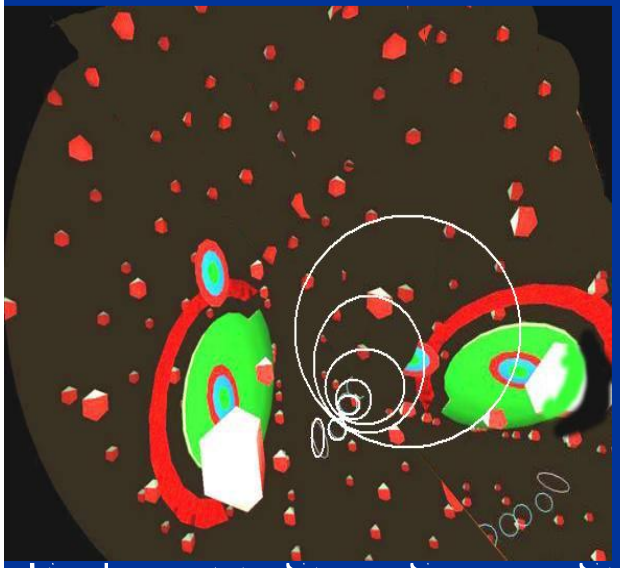


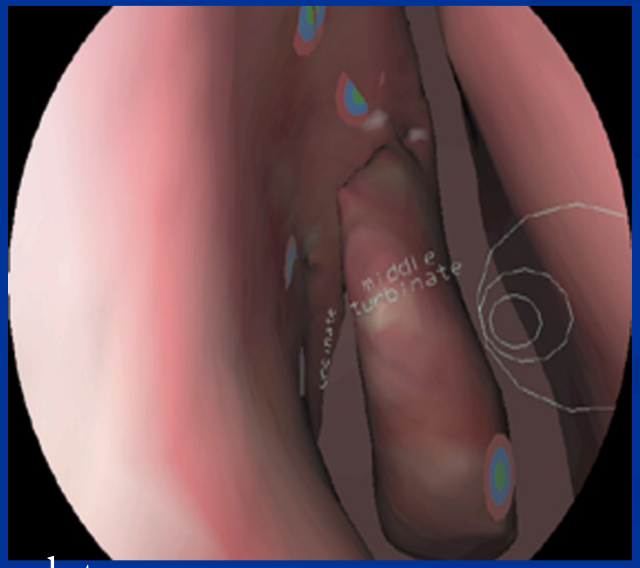


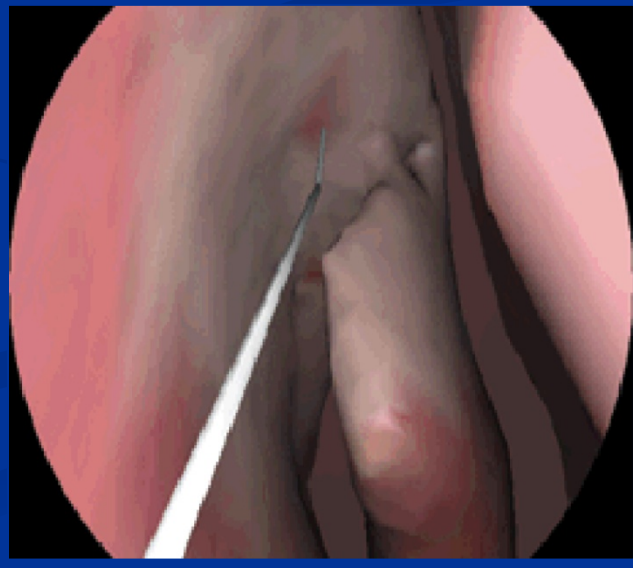
Hybrid simulators - Mannequin and virtual reality

Augmented
Mixed, etc



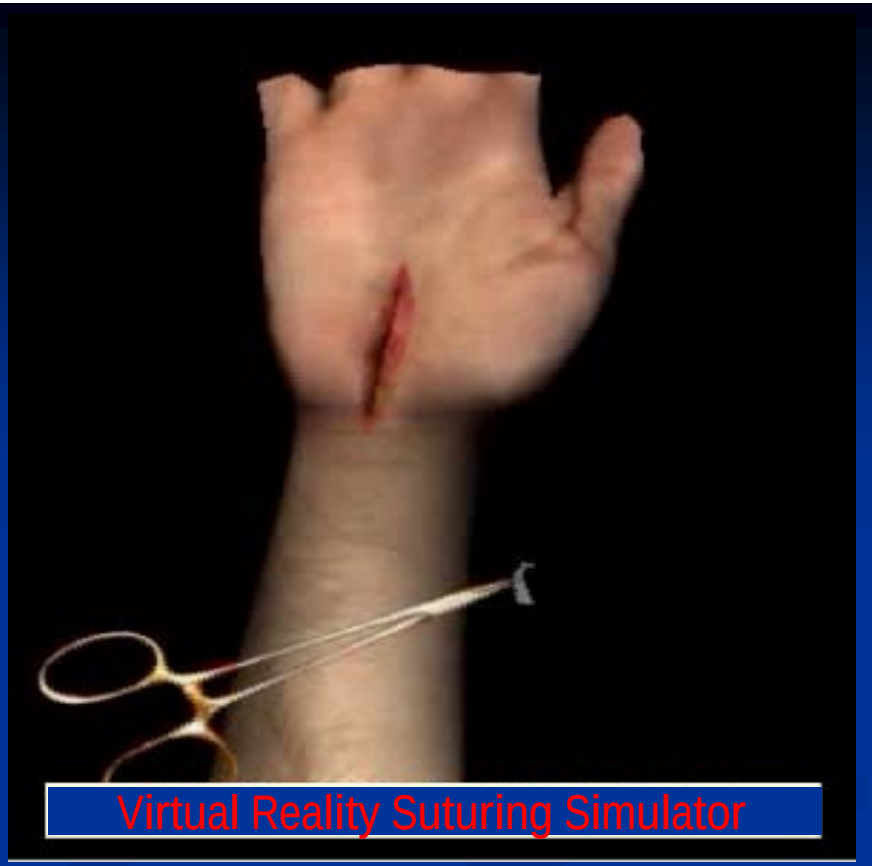






Endoscopic Sinus Surgery Simulator Lockheed Martin 1999

Virtual Reality Simulators
Pre-operative planning



Virtual Reality Suturing Simulator

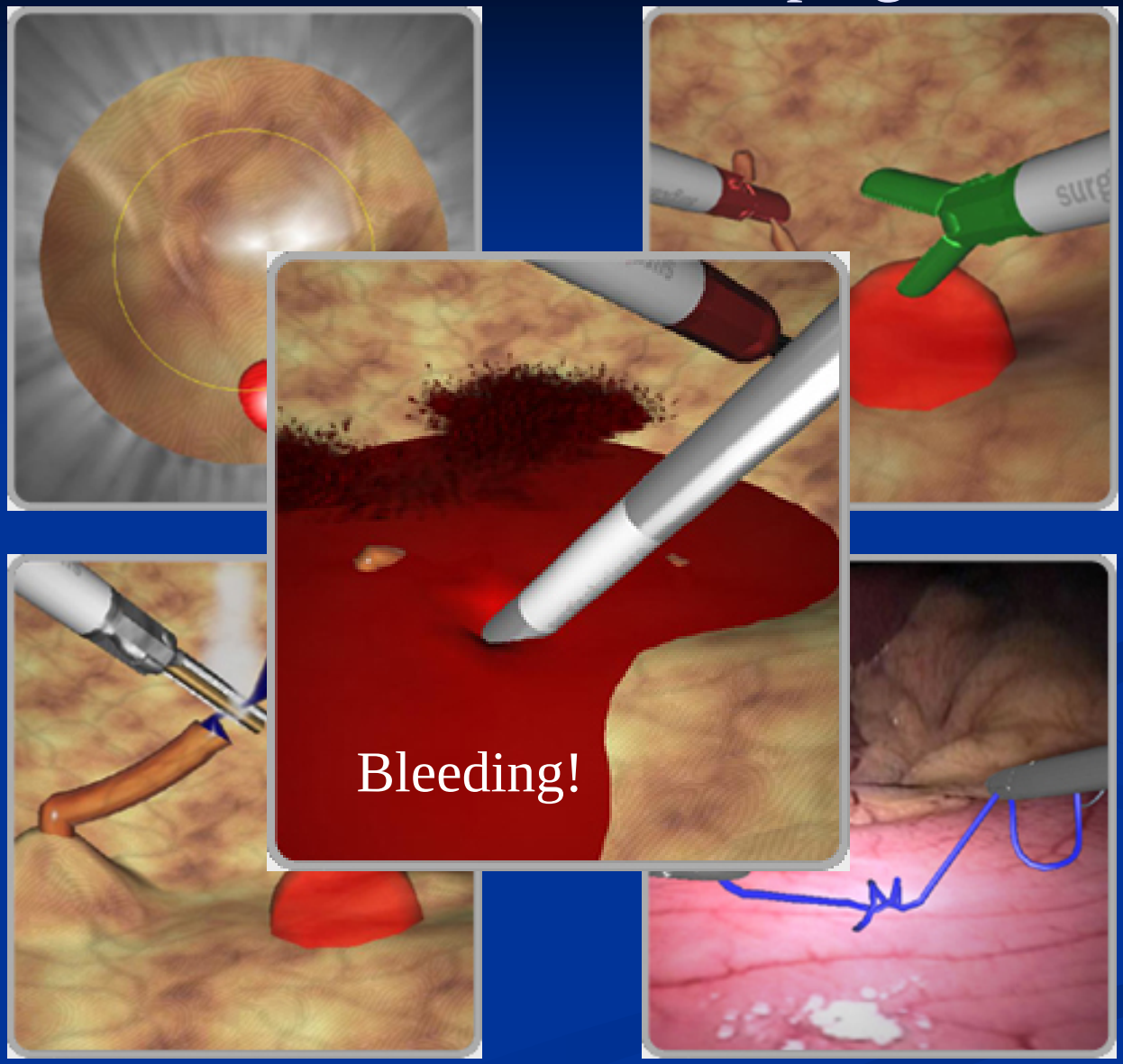
Computer-based wound planning

LapSim Basic Skills

- 3D virtual reality
- Adjustable level of difficulty for each task
- Courses can be modified for each individual
- Feedback during and immediately after each task
- Database archives performance and errors for summative analysis

Camera Navigation

Grasping



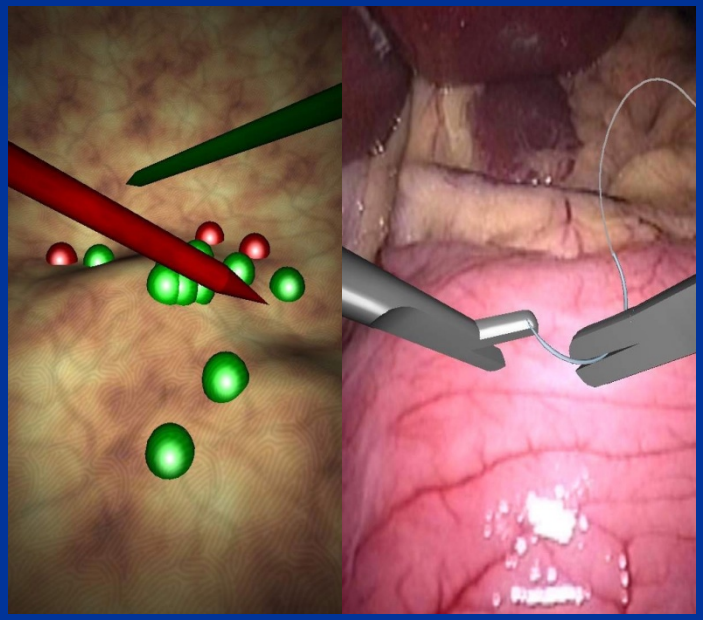
Cutting

Suturing

Courtesy of Surgical Sciences - LapSim™

Simulation and Objective Assessment

Surgical Simulators



Laparoscopic Hysterectomy

Courtesy Michael van Lent, ICT, Los Angeles, CA

CONSORTIUM of ACS

Accredited Education Institutes

Origins of a National Network?

Rationale for Action in Medical Simulation Now

- Intense national focus on patient safety
- Cost-inefficiency of current apprenticeship training model in medicine
- Maturing technology AND curriculum
- Regulatory requirements for medical skills-training

Accreditation Council for Graduate Medical Education (ACGME Bulletin, Dec 2005)

- Every patient deserves a competent physician every time.
- Every resident deserves competent teachers and an excellent learning environment.
- Simulation serves both of these core principles.

ACGME Principles of Simulation-Based Training

- Clinical skills should be learned away from the patient.
- Mistakes are tolerated and are a powerful training tool.
- Systems of practice can be simulated and optimized BEFORE patients are exposed.
- Simulation-based training illuminates thought processes, leadership, AND psychomotor skills.
- Simulation respects the learner with competency-based education and professional development.

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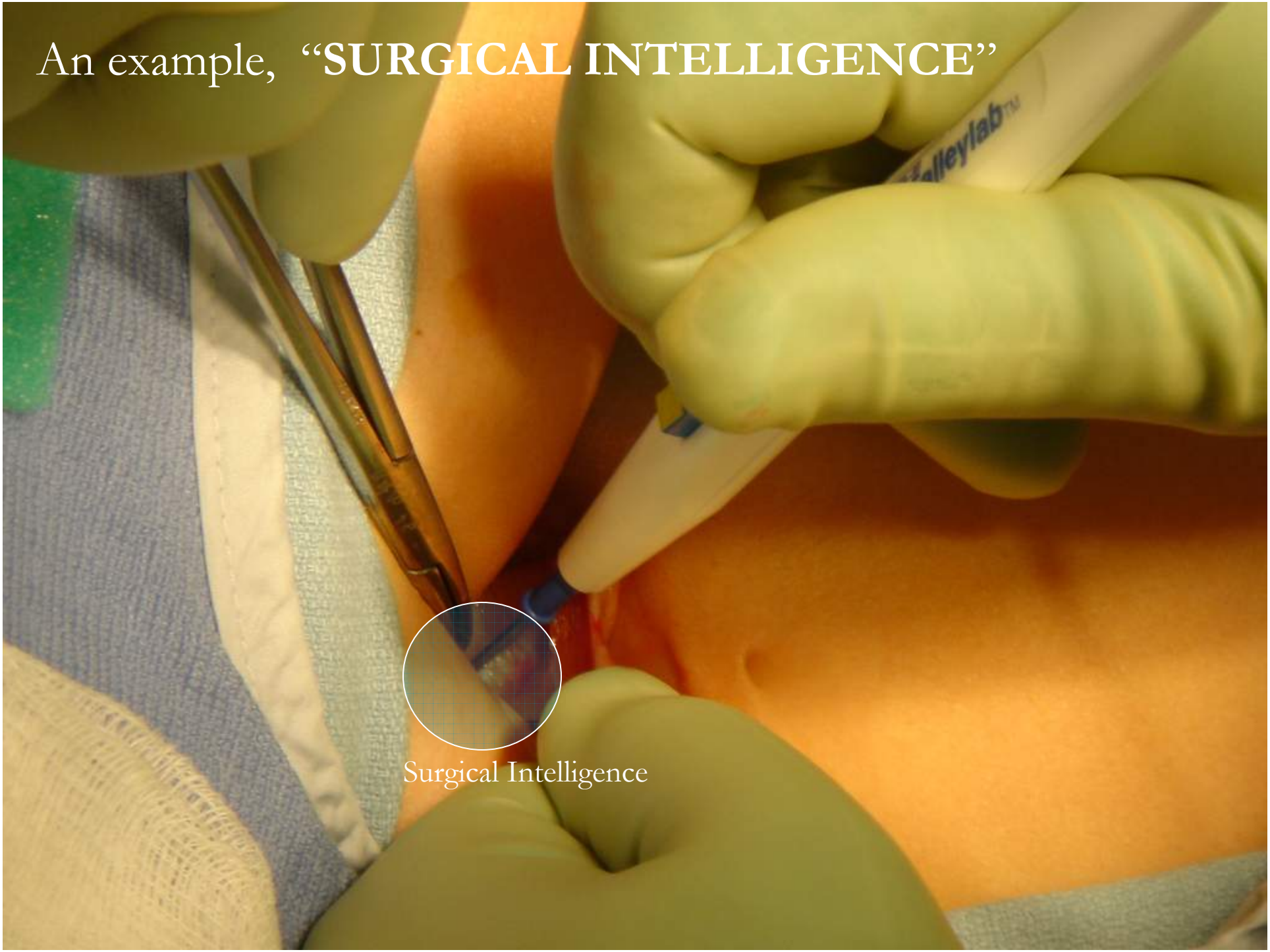
- Benefits of learner-focused training

An example, "**SURGICAL INTELLIGENCE**"



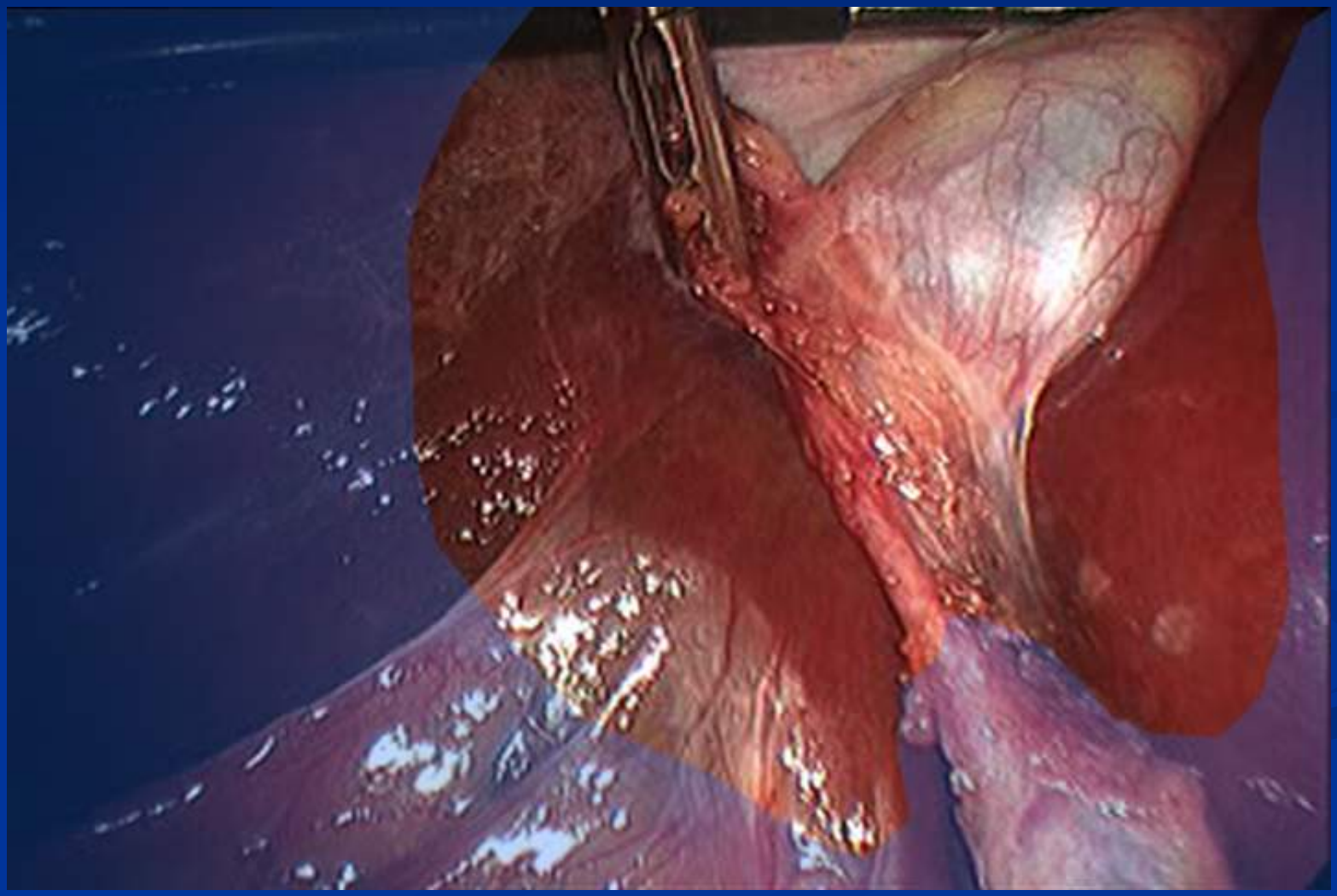
Surgical Intelligence

- Deep understanding of patient factors – tolerance, prior surgery
- Awareness of your skills, the achievable and the reasonable
- Awareness of the requisite skill for "competency"
- Situational awareness & control in the OR and at the bedside

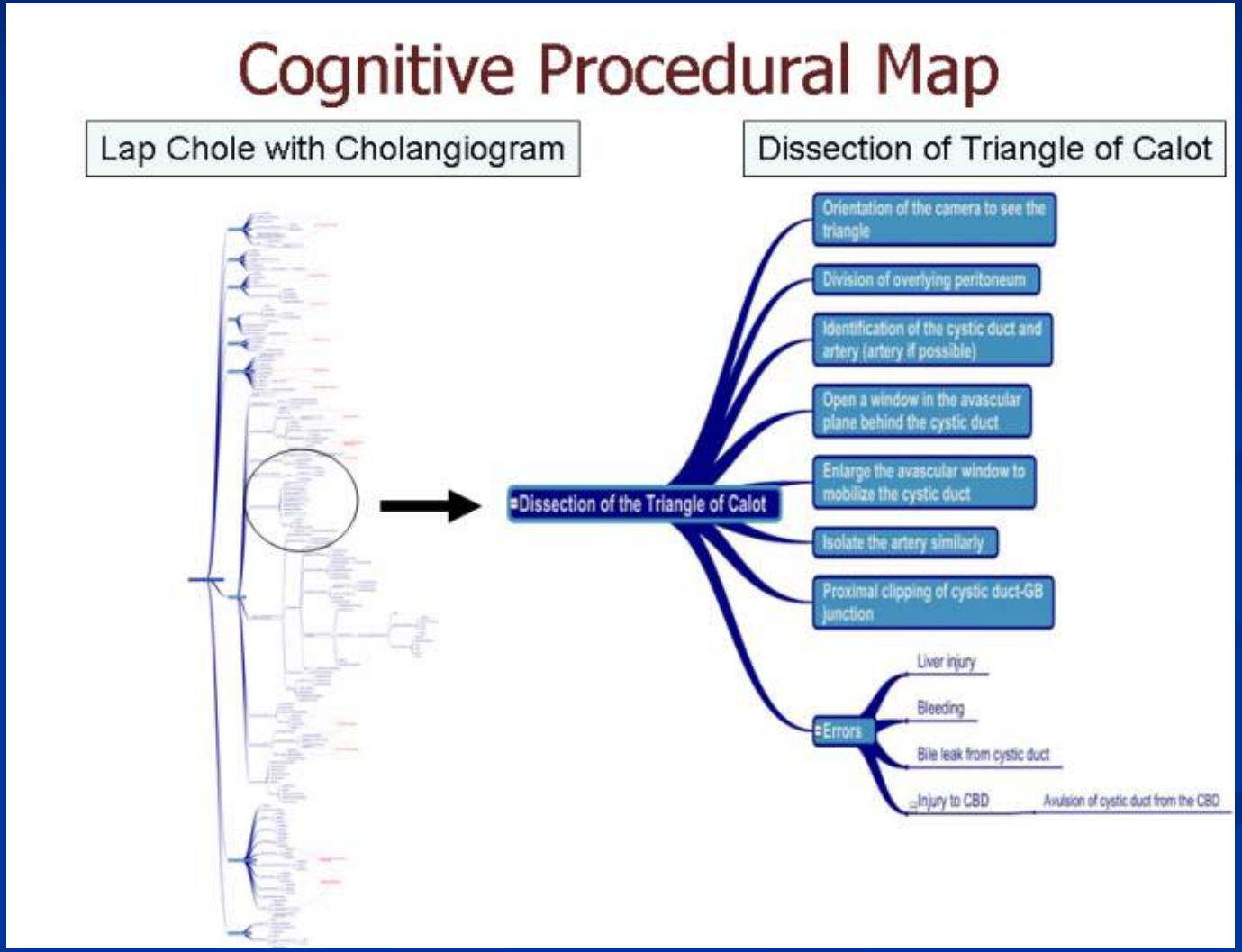
Simulation

- Realistic enough to engage at an emotional level
- Principles of Adult Learning – needs-based, practical, delivered with continuous and relevant feedback
- Environment for practice and repetition
- Incremental – builds on prior experience
- Self-directed, on an individual timetable

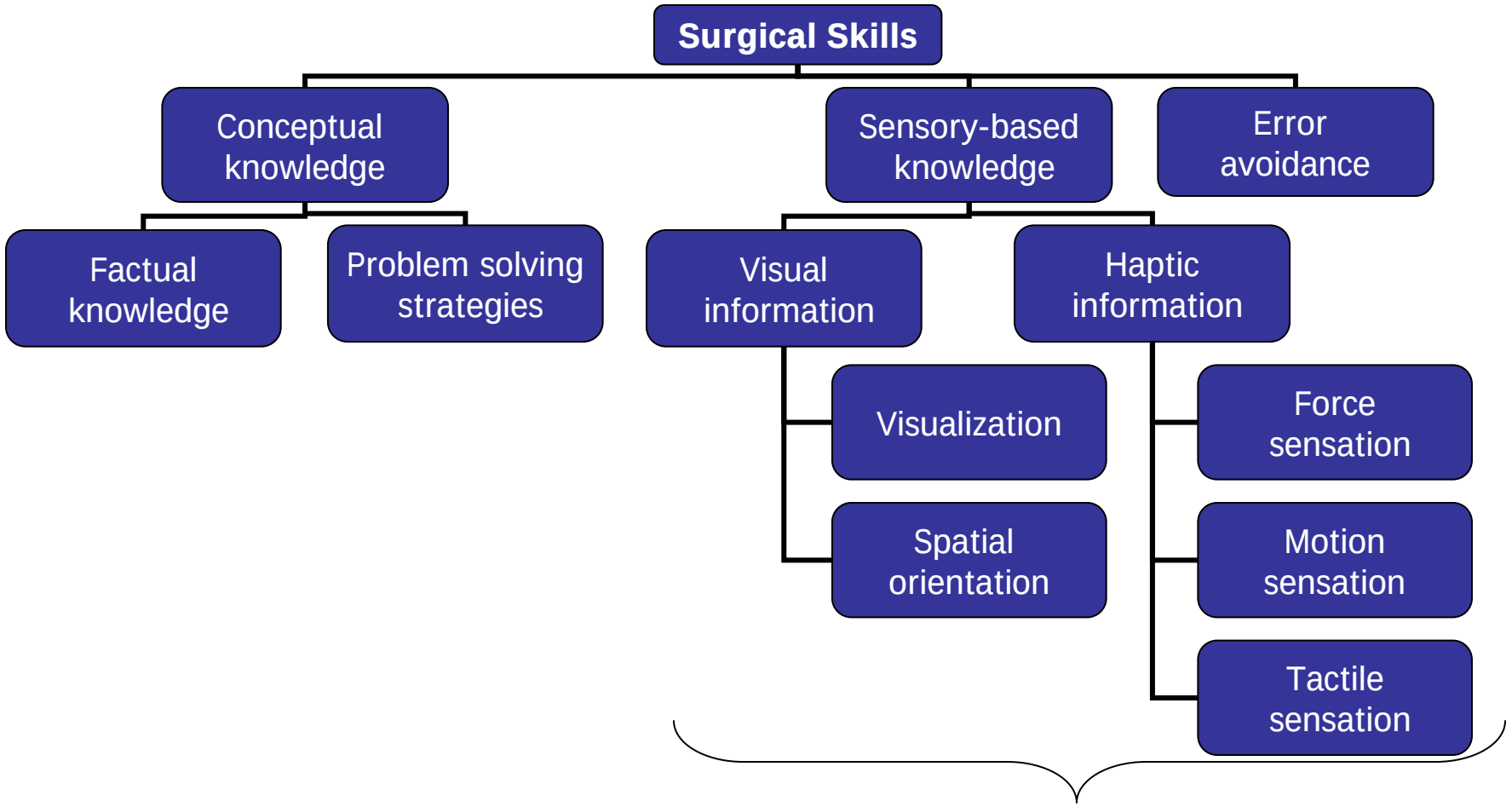
Dissection of the Triangle of Calot Outside the Envelope



Laparoscopic Cholecystectomy: Dissection of Triangle of Calot



Elements of Technical Expertise*



*After Reis M, et al.

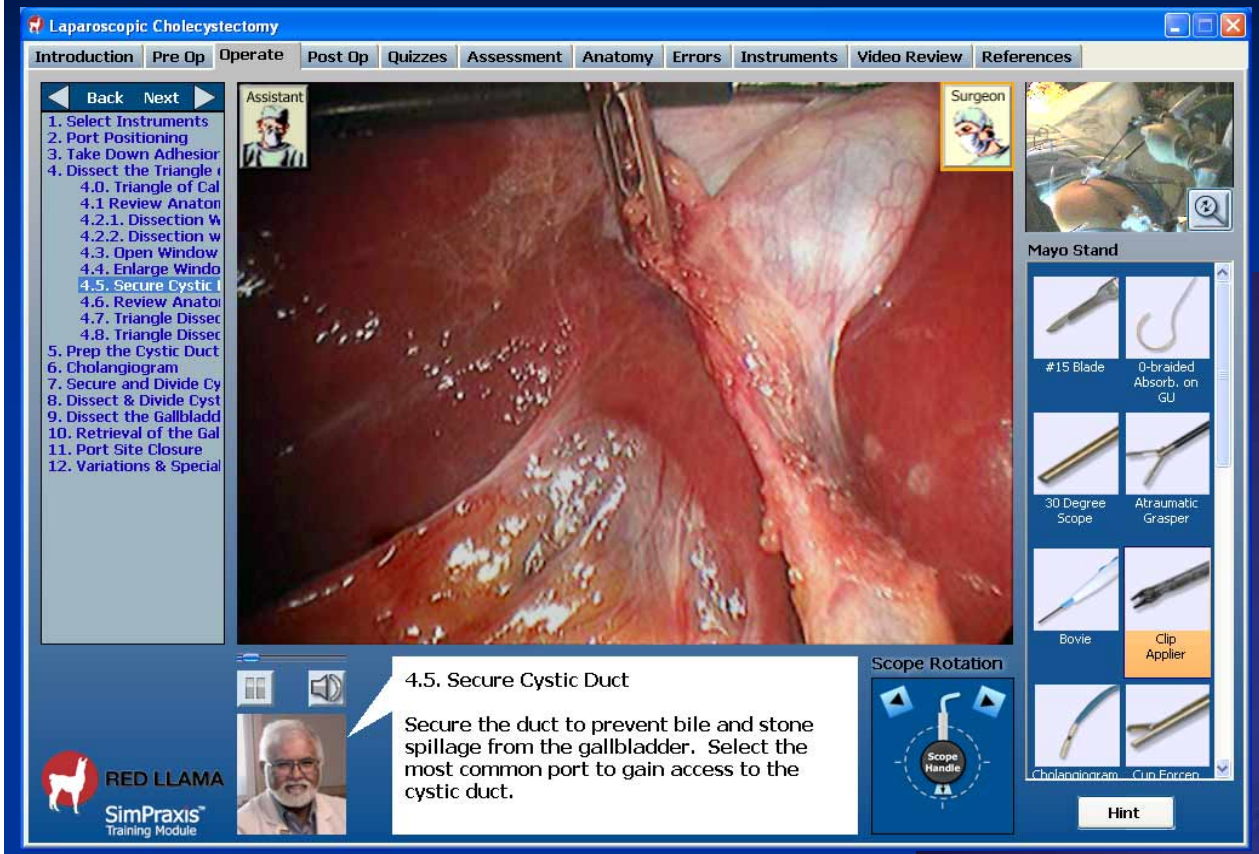
Integrated into "**experiential models**" – templates of experience

ISIS Curriculum

Standardized curriculum http://depts.washington.edu/isisinfo/isis_curriculum_dev.pdf/

- **Goals, objectives, and expected outcomes**
- **Anatomy**
- **Steps of the procedure**
- **Errors**
- **Pre-test (cognitive skills)**
- **Skills training and assessment**
- **Outcome analysis, results reporting, and feedback**
  - **Individual learner evaluation, team evaluation, web-based learner evaluation**

Psychomotor Training



Clinical Applications for Modeling & Simulation

- Pre-operative planning
- Pre-operative warm-up
- Surgical rehearsal
- Intra-operative assistance (incl navigation)
- Automatic assessment and outcomes analysis

Integrating simulation into robotics

Training, assessment, planning, warm-up, rehearsal

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- Benefits of learner-based and learner-focused training
- Team training, maintenance of competency, introduction of new technology, and outreach to serve rural and remote training needs

EAGLE Patient Simulator

Innovations in Medical Training

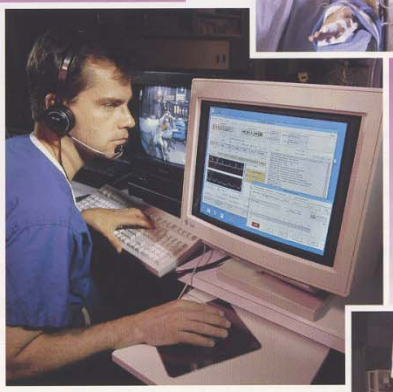
Innovations in Medical Training

Leading the World in Medical Simulation

Teaching the full range of required skills - from basic procedures to full crisis management training.

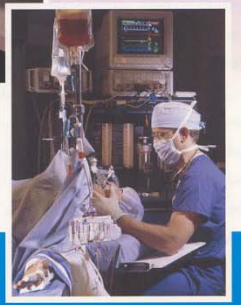
Models Over 75 Drugs and 28 Critical Events

State-of-the-Art Real Time Computer System



Highly Realistic Interactive

Full Medical Training in a Clinical Environment

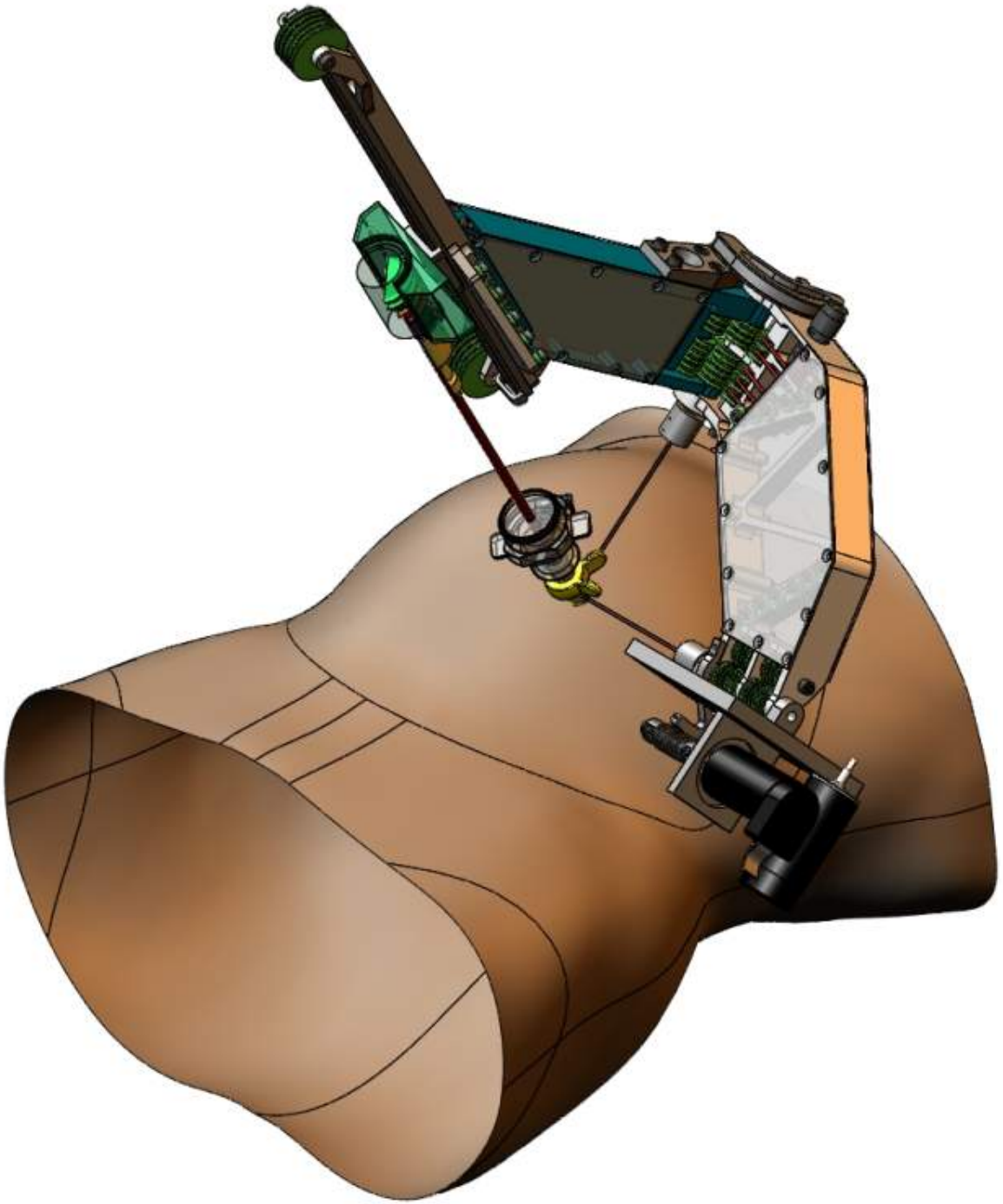


Eagle Simulation, Inc.
Box 2367
Binghamton, NY 13902-2367
Phone: (607) 779-6021
Fax: (607) 779-6049

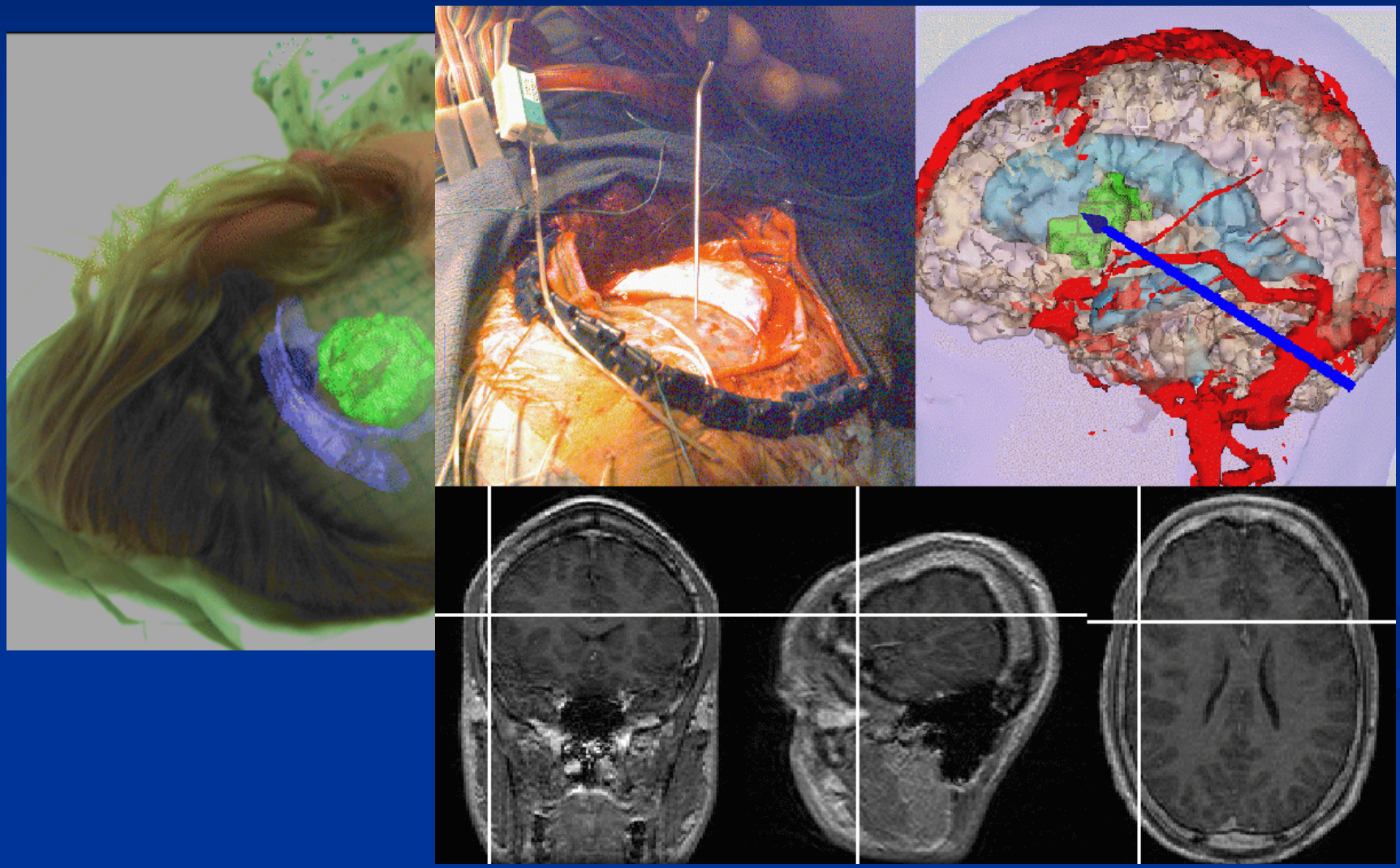
Eagle Patient Simulator

Team Training: ACGME

Beyond the training of individuals is a level of dynamic team training that crosses divisions within the organization and allows communication, accountability, and the development and maintenance of interdisciplinary teams.



Guided Surgical Navigation



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National Needs
Medical Modeling & Simulation

1. Definitions and standards
2. Uniform curriculum
3. Validation methodology
4. Certification and quality assurance
5. Research agenda and educational research funding
6. National network and infrastructure
7. Access for rural and underserved areas
8. Infrastructure funding
    - Initial capital expenses
    - Long term maintenance

ISIS

INSTITUTE FOR SURGICAL AND INTERVENTIONAL SIMULATION

AT THE UNIVERSITY OF WASHINGTON

The Vision

2005

Human Patient Simulation Lab

Multimedia Conference Facility

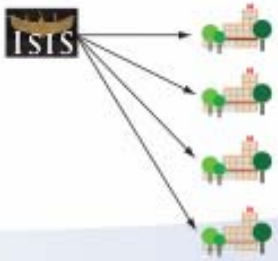
Center for Videoendoscopic Surgery

Simulation Skills Lab

O.R. Teleconference Link

Cerebral Vascular Lab

ISIS UW Medicine



ISIS expands to UW Medicine partner institutions:

- Children's
- Harborview
- V.A.
- Madigan

ISIS expands to WWAMI region through telemedicine

ISIS goes "on the road" to community hospitals in the region

2010

Simulation hospital

On-site "hospital" that mirrors patient experience from beginning to end (emergency, surgery, critical care, etc.)