



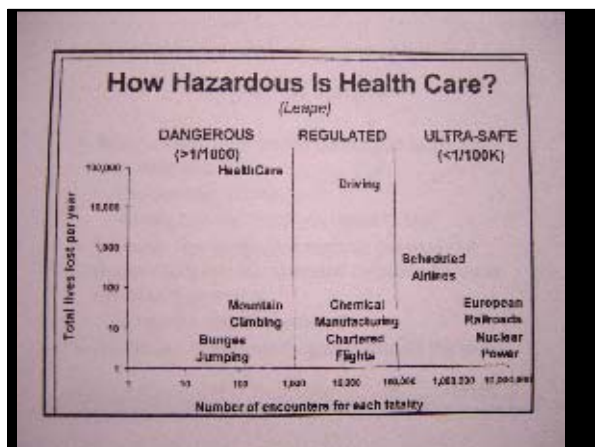
Surgical Simulation: A Clinical Perspective

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Typical Surgeon's Perspective

“We don't need simulation.”
“We have plenty of clinical material.”
(patients)

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Outline

- Surgery yesterday and today
- Surgical simulation yesterday and today
- Surgical education and certification
- Surgical patient care
- Simulation in trauma care
- Surgical simulator development
 - Today's challenges
 - Ultimate challenges

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Surgery: 50 years ago

- No vascular surgery
- No intracardiac surgery or pump
- Open surgery only
- Patients spend weeks in hospital

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Surgery: Today

- Vascular surgery, intracardiac surgery
- Minimally invasive surgery
- Expanding knowledge base
- More procedures\ increasingly technical
- 50% of US surgery is on outpatient basis

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Surgical Simulation: 50 years ago

- Patients
- Animals
- Cadavers
- Dolls

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Patients



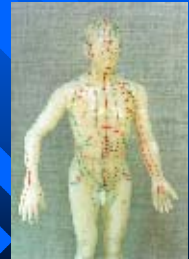
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Animals and Cadavers



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Dolls



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Surgical Simulation: Today

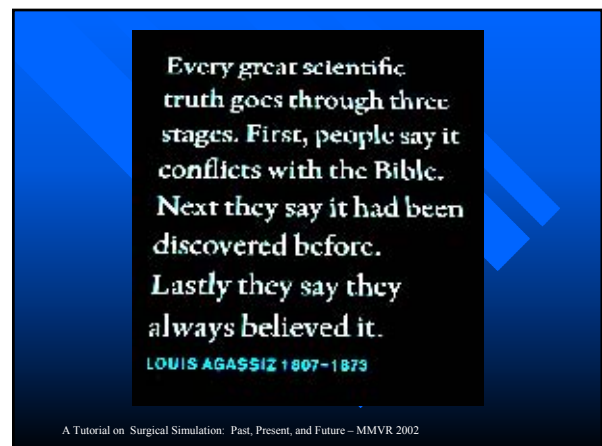
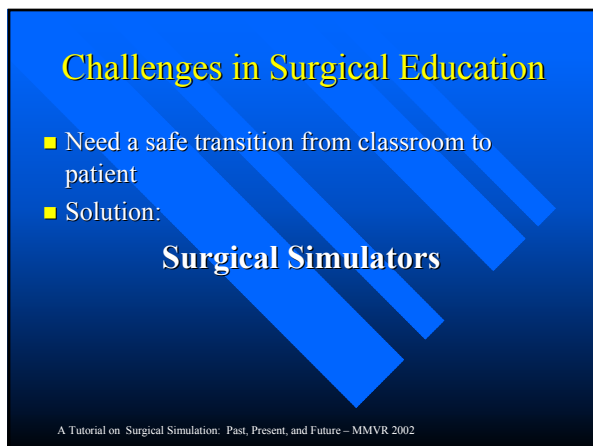
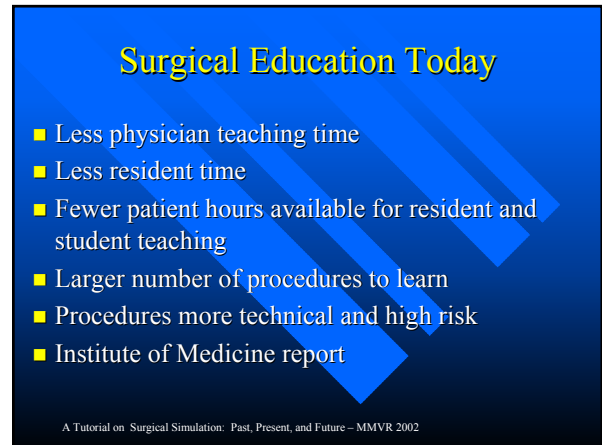
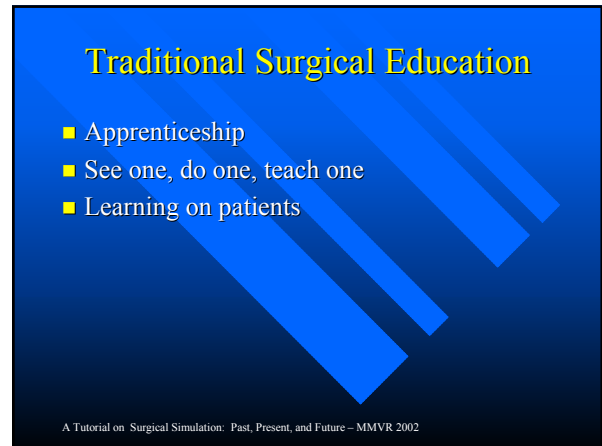
- Patients
 - Animals
 - Cadavers
 - Dolls
 - Virtual Reality
- no change
- Mannequins

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Mannequins



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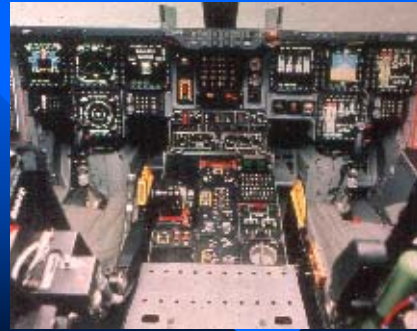


Definitions

- Virtual Reality (VR)
- Immersive Environment
- Haptics
- VR Simulators



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Surgical Selection and Certification

- Selection for training
- Selection for completion of training
- Written and oral examinations
- No technical skills examination
- Interest exists in using simulators to certify surgeons
- (Recertification also)

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Surgeon Patient Care Steps: Perceived

- See patient
- Cut patient

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Surgeon Patient Care Steps: Actual (Trauma Patient Care)

- Triage
- History and Physical Examination
- Resuscitation
- Diagnostic Studies
- Decision making
- Operative care
- Postoperative care

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Simulation in Trauma Care: Triage



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Simulation in Trauma Care: Triage



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Simulation in Trauma Care: History and Physical Examination



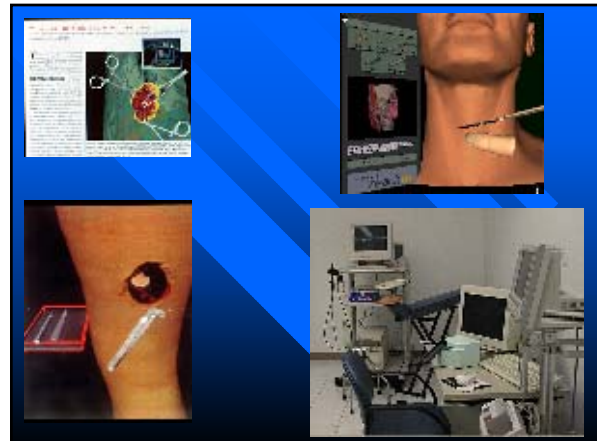
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Simulation in Trauma Care: Resuscitation

- A, B, C's of trauma care



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Simulation in Trauma Care: Diagnostic Studies



Simulation in Trauma Care: Decision Making



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Simulation in Trauma Care: Decision Making



Simulation in Trauma Care: Operative Care

- Technique/skill trainer
- Partial task trainer
- Task trainer
- Validity?
- Transference rate?

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Simulation in Trauma Care: Operative Care

- Educate/consent/prepare patient
- Preoperative planning
- Position, scrub, drape patient
- Skin and subcutaneous incision
- Deep (muscle, fascia) incision
- Tissue dissection
(sharp, blunt, cautery, hand)
- Suturing
- Knot tying (instrument, hand)

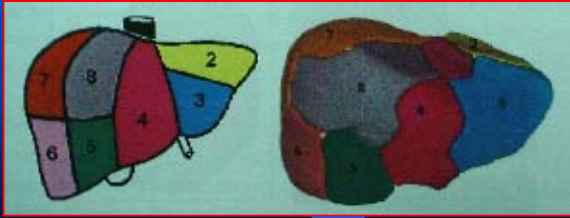
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Patient Counseling



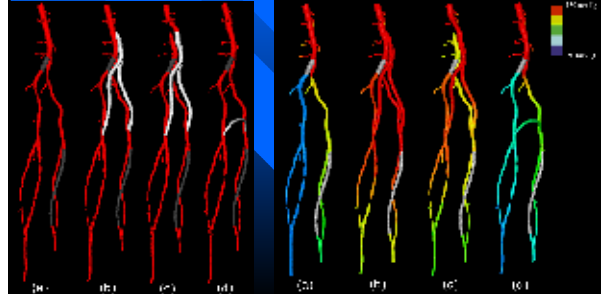
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Preoperative Planning



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Preoperative Planning



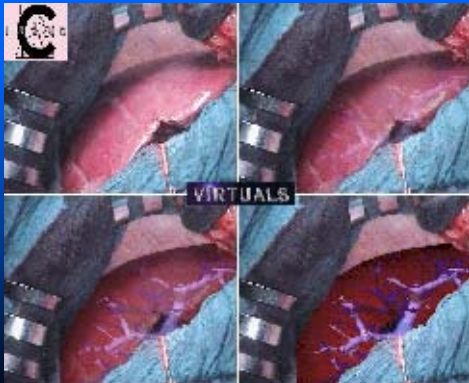
Simulation in Trauma Care: Operative Care



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Simulation in Trauma Care: Postoperative Care



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Simulation in Trauma Care: Postoperative Care



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Surgical Simulator Development Today's Challenges

- Multiple use
- Task training focus (integrated scenarios)
- High volume surgical cases or low volume/high risk
- Fidelity: adequate graphics and haptics
- Inexpensive
- Validated

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The Ultimate Challenges

- Open surgery – all procedures
- Instruments and hands
- 2 point tactile discrimination
- Kaufmann test (Can I tell if I'm operating on a real patient or a simulated patient?)

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