



Simulation for Medical and Surgical Training: The National Capital Area Medical Simulation Center- A Case Study

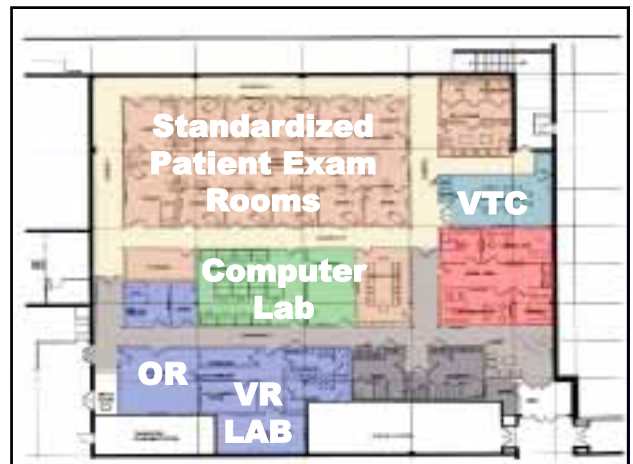
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<http://simcen.usuhs.mil/miccai2003>

Learning to Care for Those in Harms Way



NATIONAL CAPITAL AREA MEDICAL SIMULATION CENTER USUHS



Mission of the NCA SimCen

- Training of Medical Students, Residents & Allied Health providers using simulation
- In-house & collaborative development of medical and surgical simulators and advanced distributive learning
- Research (collaborative and in-house)
 - **Validation**
 - **Curriculum Design**



12 Clinical Exam Rooms

- Teaching through the use of Standardized Patients (SP's) = actors taught to mimic signs and symptoms of specific diseases.



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Standardized Patient Examinations

- 97% of U.S. Medical Schools use Standardized Patients for instruction; 85 % use them for assessment
- Increasing use of SP's in residency training programs
- SP's used in "high stakes" testing: Medical Council of Canada USMLE (2002/2003)

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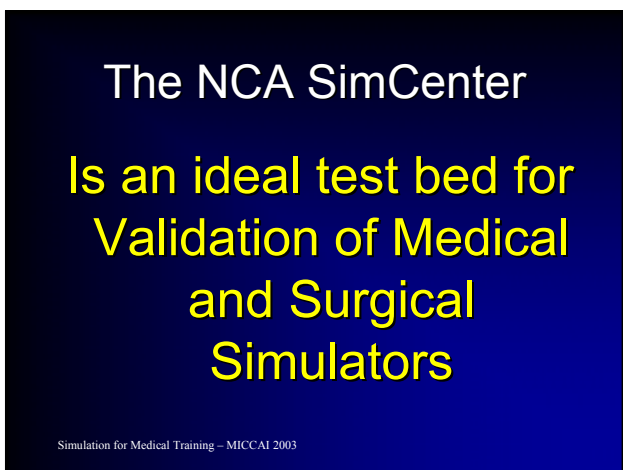
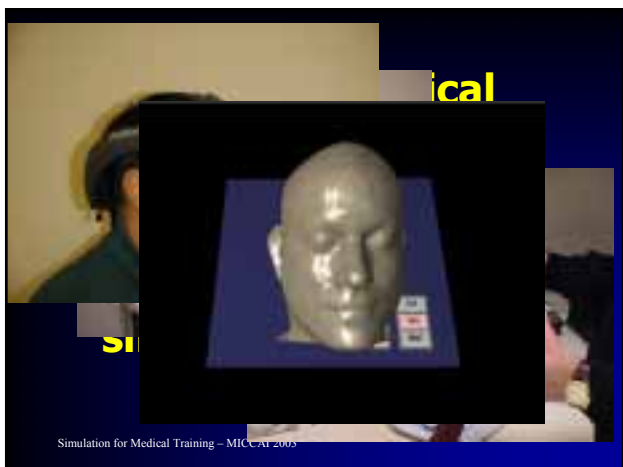
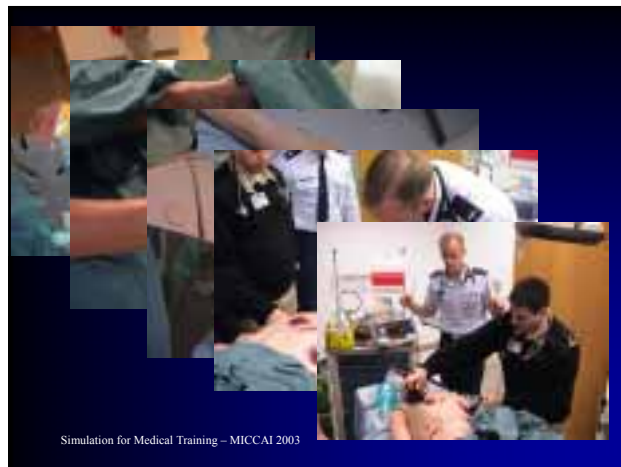
Surgical Simulation Suite

- state-of-the-art virtual reality lab and an operating room complete with human patient simulator mannequins

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The Way Forward

- Collaboration
- Integration
- Validation and Verification
- Innovation
 - Increased Realism
- “Bleeding Edge”
- Create a National Agenda (\$\$\$)
- Involve End Users Early

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Validation of a Virtual Reality Simulator for CT performance in the Trauma Bay; A prospective, randomized, double-blind controlled trial

VR to ER

Cricothyroidotomy Simulator (under development USUHS)



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What is the future of Simulation?



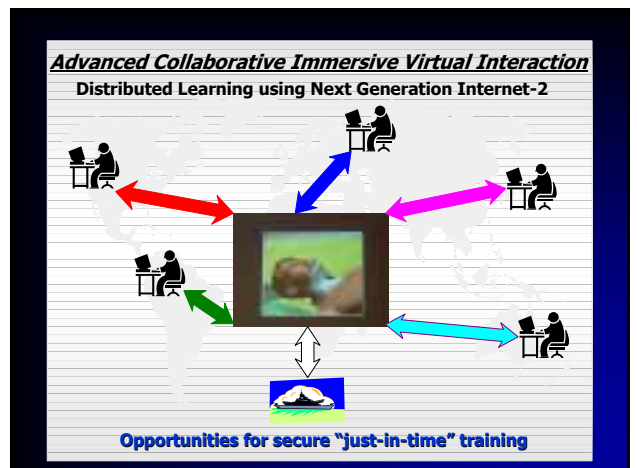
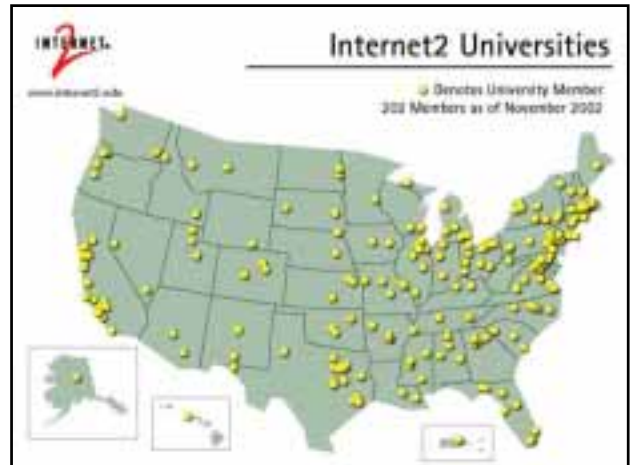
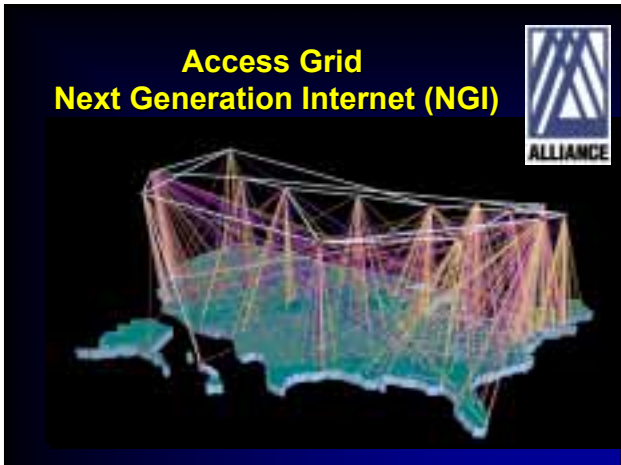
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Distributive Learning

- Training groups who are geographically separated
 - Real time
 - disparate
- Training teams

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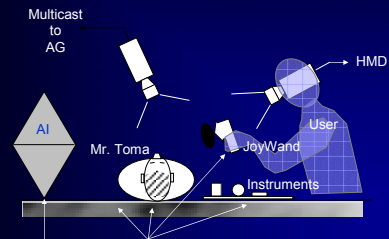
Immersive Virtual Reality Patient Simulator

A patient simulation A.I. engine has been developed by the TOUCH team



Simulation for Medical

TOUCH Phase I Development Patient Simulator Schematic



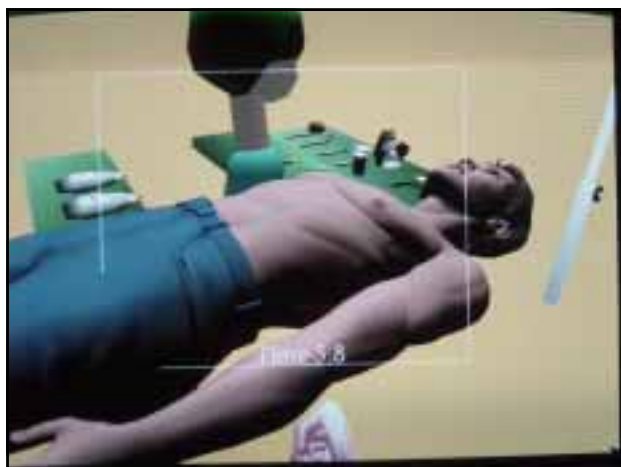
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Total Immersion



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Virtual Patient Simulation

Presence	realistic visual and aural presentation
Interaction	examination, medication, devices
Physiology	normal, disease, trauma, mental, Rx
Health states	injury, disease, chronic, psychological
Medical history	health states, medications, findings
Temporal history	recent events, meals, travel, activity
Emotions	anxiety, fright, sadness, quiescent
Behaviors	speech, reaction, movement, gesture

Character Features

Skin texturing of clinical signs & injuries
Interactive body regions (e.g., wrist, left)

Full-body medically-relevant animations
Multi-layered, deformable & removable clothing
Set pupil size and animate pupil response

Pharmacokinetic drug model
Level of consciousness
Breathing integrated with real-time physiology

Dynamic facial expression

Dynamic speech production

Injury visualization



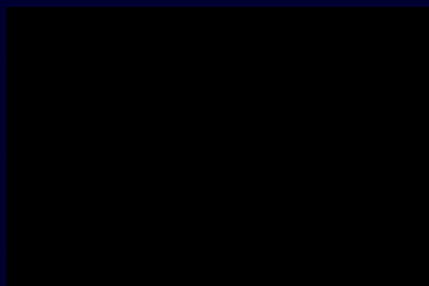
Extremity fracture



Abdominal penetration

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CD Based animations



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Medically-Relevant Animations



Vomiting



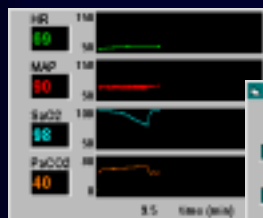
Nausea



Convulsions

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Physiological Data



Real-Time Data and Waveforms



Trend Data - airway obstruction
relieved by jaw thrust maneuver



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Patient and Device Interactions



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Mass Casualty in CAVE



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Thank You!