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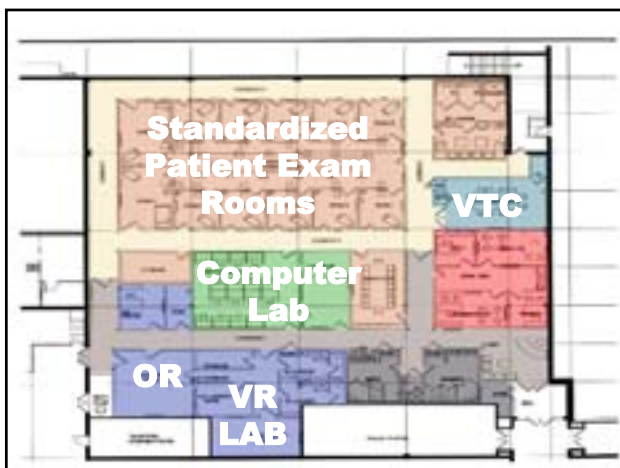
Medical Simulation: The State-of-the-Art and Beyond (MMVR 2004)

**The National Capital Area
Medical Simulation Center-
A Case Study
MMVR 2004 Tutorial**

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National Capital Area Medical Simulation Center
Uniformed Services University
Bethesda, MD
<http://simcen.usuhs.mil/MMVR2004>

**Learning to Care for Those in
Harms Way**

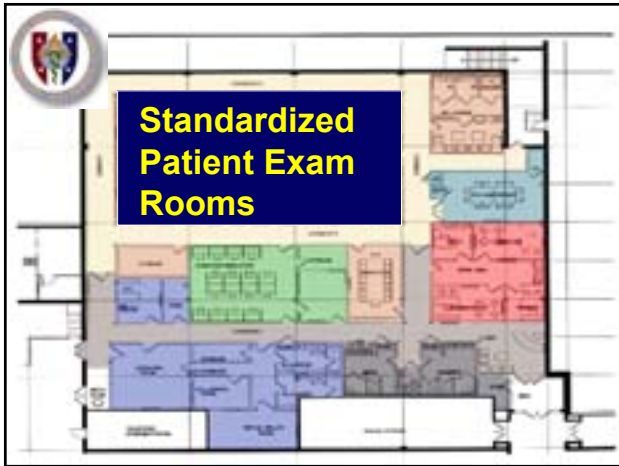
**NATIONAL CAPITAL
AREA MEDICAL
SIMULATION
CENTER
USUHS**



**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**

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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)

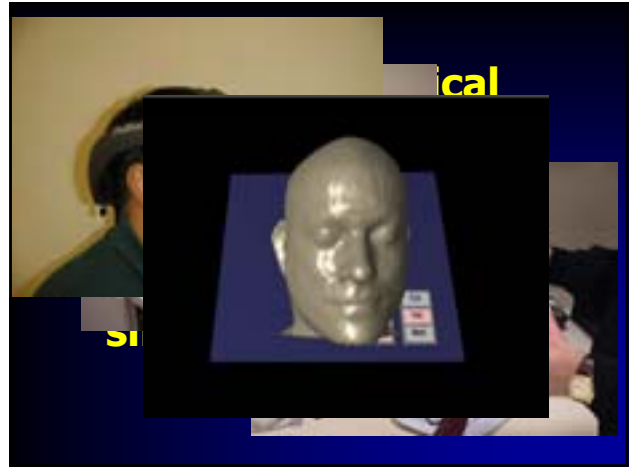
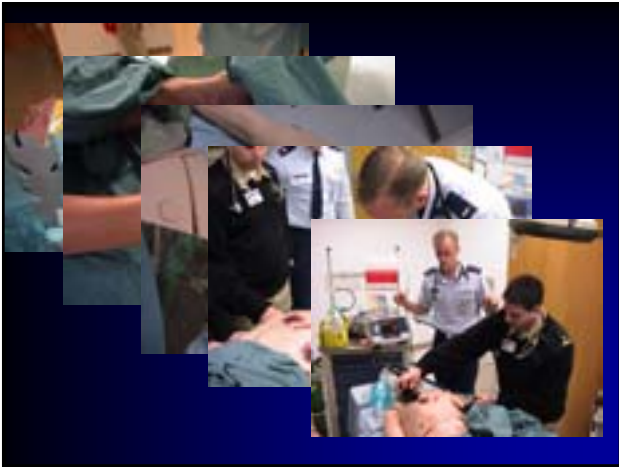
Medical Simulation: The State-of-the-Art and Beyond (MMVR 2004)



Surgical Simulation Suite

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

Medical Simulation: The State-of-the-Art and Beyond (MMVR 2004)



Surgical Simulation: Laparoscopic Surgery



The NCA SimCenter
Is an ideal test bed for
Validation of Medical
and Surgical
Simulators



Where do we go from here?

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)



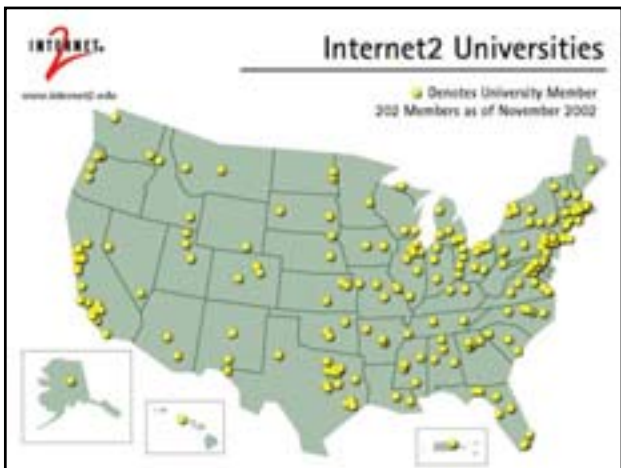
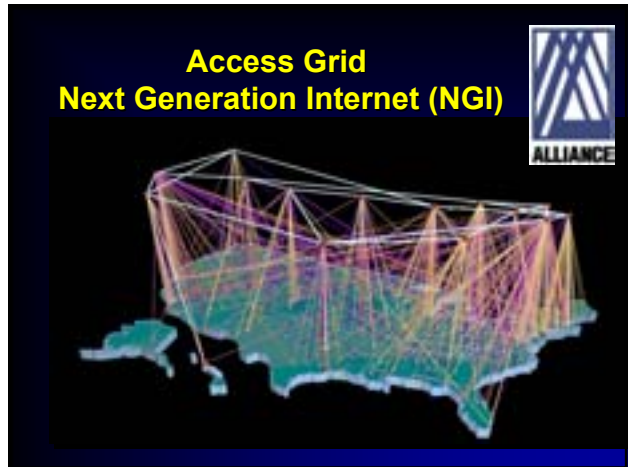
What is the future of Simulation?



Distributive Learning

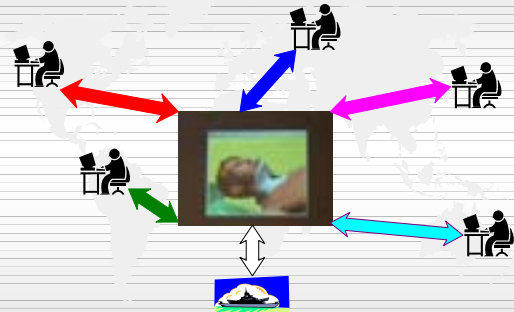
- Training groups who are geographically separated
 - Real time
 - disparate
- Training teams

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Advanced Collaborative Immersive Virtual Interaction

Distributed Learning using Next Generation Internet-2



Opportunities for secure "just-in-time" training

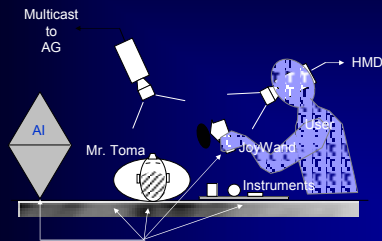
Immersive Virtual Reality Patient Simulator

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



TOUCH Phase I Development Patient Simulator Schematic

Patient Simulator Schematic



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

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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

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Injury visualization



Extremity fracture



Abdominal penetration

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Medically-Relevant Animations



Vomiting



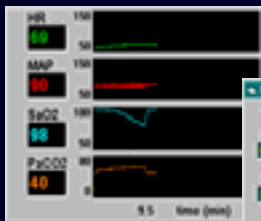
Nausea



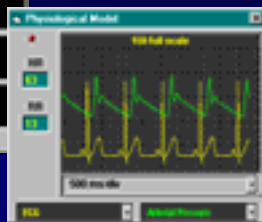
Convulsions

Medical Simulation

Physiological Data



Real-Time Data and Waveforms



Trend Data - airway obstruction relieved by jaw thrust maneuver



Patient and Device Interactions



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Medical Simulation: The State-of-the-Art and Beyond (MMVR 2004)



Medical Simulation: The State-of-the-Art and Beyond (MMVR 2004)



Mass Casualty in CAVE



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The text "Thank You!" is written in a large, bold, pink font, slanted upwards. It is overlaid on a photograph of a sunset or sunrise over a landscape. A single palm tree stands prominently in the center, silhouetted against the colorful sky. The foreground shows dark silhouettes of trees and hills.