A Model for Evaluating Healthcare Simulation Systems

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A Model for Evaluating Healthcare Simulation Systems

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Introduction

- Laboratory for Investigation, Validation, and Verification of Emerging Simulators
  - LIVES Lab

LIVES Lab: Mission

- To establish a functional model to evaluate healthcare simulation systems based on sound scientific principles, national and international standards, and industry-established best practices.
- To inform the greater medical community of the effectiveness, ease of use, consumer satisfaction, reliability, validity, and durability of medical simulators and simulations.

LIVES Lab: Stakeholders

- Established by: National Center for Collaboration in Medical Modeling & Simulation (NCCMMS)
- NCCMMS is a joint venture
  - Eastern Virginia Medical School (EVMS)
  - Old Dominion University's Virginia Modeling, Analysis, and Simulation Center (VMASC)

The LIVES Lab Team

- Multidisciplinary:
  - clinical medicine and nursing,
  - professional graduate medical and healthcare education,
  - bioengineering,
  - human factors psychology,
  - computer science,
  - modeling, simulation, and visualization,
  - and others.

LIVES Lab: Human Factors

- One goal: Apply Human Factors assessment methods to medical and healthcare training simulators and simulations
- Assessment process comparable to that used for medical devices intended for direct patient use
- Methods include
  - Rigorous experimental design
  - Test cases
  - Validated questionnaires
  - Performance metrics
  - Established standards and guidelines

LIVES Lab: Standards

- ANSI/AAMI HE75
  - HF Engineering: Design of medical devices
- ANSI/HFES 200
  - HF Engineering of software user interfaces
- ANSI/AAMI/IEC 62366
  - Application of usability engineering to medical devices
- ISO/IEC 25010
  - Systems and software quality evaluation
- Among others…

LIVES Lab: Current Work

- Assess current healthcare simulators that exists on the marketplace
- Define an evaluation process based on current standards (e.g., the ISO25010)

LIVES Lab: Current Work

The evaluation process:

- Addresses the purpose and requirements of the simulator
- Establishes a quality model
- Employs hierarchical/cognitive task analyses (HTAs & CTAs)
  - For the training task
  - For the simuland task
- Includes Subject-Matter Expert (SME) interviews
- Addresses best clinical practices
- Includes user testing

LIVES Lab: Current Work

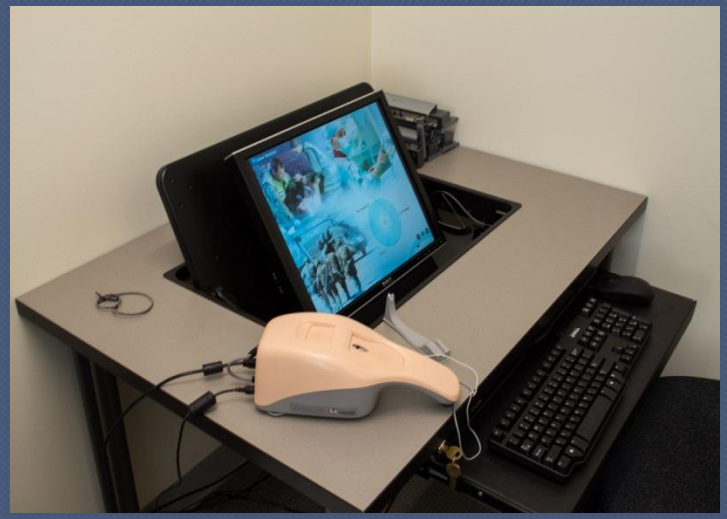
- Initial evaluation: Virtual I.V. Self-Directed Learning System
- Two goals:
  - To test the established evaluation process
  - To deliver a comprehensive report to potential users and consumers of the system that may inform purchasing decisions and system usage

LIVES Lab: Current Work

- Established Quality Model
  - System purpose
  - User population
  - SME population
  - Functionality
  - Reliability
  - Usability
  - Efficiency
  - Maintainability
  - Portability

LIVES Lab: Current Work

- Usability tests:
  - HTA/CTA
  - Standards checklists
  - SME interviews
  - User testing
    - Questionnaires
    - Performance metrics
    - Unstructured user interviews



LIVES Lab: Initial Results

- Initial Results:
  - Interface easy to use, but some problem areas (e.g., icon design) identified
  - Follows most standards, but falls short on fault tolerance and customizability
  - SMEs and users agreed on the usefulness of the system, but noted some problems (irreversible errors, lack of flexibility, poor representation of psychomotor tasks)
  - May properly train procedural skills, but not social or psychomotor skills

LIVES Lab: Initial Results

- Process Evaluation
  - The evaluation demonstrated the utility of the established process
  - Areas of improvement were identified and addressed
  - Established working procedures among members of the multidisciplinary team
  - First step to establishing a body of simulation/simulator evaluations

Takeaway

- LIVES Lab is a new entity that will work to inform the greater user community of healthcare and medical simulators and simulations.
- LIVES will apply scientifically sound testing procedures derived from established industry standards with a multidisciplinary approach
- LIVES is an independent entity that does not produce competing products for the medical simulation market

Questions?

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