Design and Assessment in Medical Simulation

Erik Dutson, Eva L. Baker
University of California, Los Angeles

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Disclosures: None

(Though this may remind you of the movie ‘Inception’)

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Multidisciplinary Team Training Using a Simulation Curriculum

Department of Surgery & Anesthesiology, David Geffen School of Medicine at UCLA, Los Angeles, CA

Soo Hwa Han, MD, Victor Duval, MD, Randolph Steadman, MD, Yue-Ming Huang, EdD, Cecilia Canales, BS, Jonathan Hiatt, MD, Joe Hines, MD, Areti Tillou, MD, Barbara Jaffe, EdD & Erik Dutson, MD
Multidisciplinary Team Training Using a Simulation Curriculum

- Justification
- Pilot curriculum
- Organization and format
- Demonstration
- Summary
Multidisciplinary Team Training
Using a Simulation Curriculum

- **Justification**

  - **Multidisciplinary Team**
    - Organization of diverse disciplines
    - Essential for quality health care delivery

  - **Simulation: ACGME Bulletin 2005**
    - Enhance safety and predictability
    - Part of new system of graduate medical education

  - **Communication: JCAHO 2005**
    - Failure in communication – #1 root cause of sentinel events between 1995-2005

  - **Team work: ACS 2006**
    - Integral component of a culture of good communication
Multidisciplinary Team Training Using a Simulation Curriculum

➢ **Pilot Curriculum Objectives:**

- To address competence in communication, professionalism and systems-based practice

- To expand current laparoscopic surgical skills training to include complex environment

- To promote cooperative environment and interaction among the OR staff

- To promote team work and develop competence in crisis management

- To develop greater cognitive flexibility and facilitate better situation awareness
Multidisciplinary Team Training
Using a Simulation Curriculum

Set up:

Multidisciplinary Team
- Categorical general surgery residents (PGY 3)
- Anesthesiology residents (PGY 3 & 4)
- Nursing staff

OR Crisis Scenarios
- Anaphylaxis
- Malignant Hyperthermia
- Difficult Airway
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- **Set up**

- **Staff**
  - Attending surgeon
  - Attending anesthesiologist
  - Research Resident
  - Education Research Fellow

- **Resources**
  - Anesthesiology Simulator – SimMan, Laerdl, UK
  - Fundamentals of Laparoscopic Surgery (FLS) trainer box
  - Simulated Operating Room
  - Control Room
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- SimMan, Laerdal, UK – anesthesiology simulator
  - Simulate hemodynamic parameters
  - Can intubate & ventilate using the anesthetic machine
  - Create software driven critical events
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- Control Room
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- Fundamentals of Laparoscopic Surgery trainer box
  - Inanimate system developed to teach & measure technical skills in laparoscopy
  - Reliable, valid & useful educational tool, endorsed by ACS
  - Standardized curriculum for PGY 3
Multidisciplinary Team Training
Using a Simulation Curriculum

• Format

  ▪ Orientation
  ▪ Simulation session
  ▪ Debriefing session
Multidisciplinary Team Training
Using a Simulation Curriculum

- General orientation
  - Consent form
  - Session format
    - scenarios are created from actual events
    - participants are to act as fully trained physicians
  - Simulation interaction
    - team interaction
    - co-management of crisis
    - verbalization of thoughts
    - simulator capabilities
    - simulator limitations
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- **Surgery Orientation**
  - **Technical aspect**
    - perform laparoscopic surgical tasks
    - graded for accuracy and speed
  - **Cognitive aspect**
    - crisis management
    - teamwork
    - communication
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Using a Simulation Curriculum

- Simulation session
  - Case stem - H&P, labs, intended operation
  - Induction of general anesthesia
  - Laparoscopic surgical tasks
  - Co-management of crisis situation
  - Session ends with correct diagnosis & treatment or after 20 min
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- **Debriefing Session**
  - Discuss performance
  - Constructive feedback
  - Crisis management:
    - Situation awareness
    - Leadership
      - Task delegation
      - Interactive clinical decision making
      - Closing the communication loop
  - Anesthetists’ Non-Technical Scoring (ANTS) system
  - Normalized Task Score (NTS)
  - Anonymous questionnaire
## Multidisciplinary Team Training Using a Simulation Curriculum

<table>
<thead>
<tr>
<th>Category</th>
<th>Element</th>
<th>*Rating</th>
<th>Observation on Performance</th>
<th>Category rating and debriefing notes</th>
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<tbody>
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<td>Re-evaluating</td>
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*4 Good; 3 Acceptable; 2 Marginal; 1 Poor; N Not Observed
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- **Intracorporeal Knot Tying Technical Score:**
  - Time to complete = ___ sec
  - Penalty = mm from edge of pre-drawn dots, mm gap in incision, security of knot
  - 600 sec - task time (sec) - penalty score = Raw task score
  - Raw task score / 520 x 100 = Normalized task score (NTS)

Passing = Task completion in 240 sec with >68 NTS
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Intracorporeal Knot Tying Task Score

Normalized Test Score (Passing >68)

Blue: Pre-crisis
Red: Post-crisis
White: Passing
# Multidisciplinary Team Training Using a Simulation Curriculum

## Post-Simulation Session Survey

1. This simulation experience will help better prepare me to manage a similar type of critical situation in the OR.
2. This simulation session was realistic.
3. Combined surgery/anesthesia simulation session should be built into the curriculum.
4. Interdisciplinary/interdepartmental training in a simulated environment will encourage improved communication in the OR.
5. This simulation training will help improve my task management skills in the OR (planning, preparing, prioritizing, maintaining standards, identifying and utilizing resources). 
6. This simulation training will help improve my teamwork in the OR (coordinate activities, exchange information, using authority and assertiveness, assessing capabilities and supporting others).
7. This simulation training will help improve my situation awareness in the OR (gathering information, recognizing and understanding, anticipating).
8. This simulation training will help improve my decision-making ability in the OR (identifying options, balancing risks and selecting options, re-evaluating).
9. This simulation exercise will help me provide safer patient care in the future.
10. I prefer interactive training over lecture formats.

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strongly agree 4=agree 3=undecided 2=disagree 1=strongly disagree
Summary

Simulated multidisciplinary team training

-Mandated by accrediting organizations
-Essential for quality health care delivery
-Requires financial and personnel resources
-Needs validated performance assessment tools
-Will benefit from advances in simulator technology
-May represent an important new learning paradigm
Structure

- Context of medical simulations
- Team and Individual
- Technology continuum
- Design elements for assessment
- Design elements for simulation
- Technical quality
- Integration, use and evaluation
Structure

- Context of medical simulations—ER? OR?
- Team and Individual
- Technology continuum
- Design elements for assessment
- Design elements for simulation
- Technical quality
- Integration, use and evaluation
Structure

• Context of medical simulations

• Team and Individual- surg/anes v. procedural

• Technology continuum

• Design elements for assessment

• Design elements for simulation

• Technical quality

• Integration, use and evaluation
Structure

- Context of medical simulations
- Team and Individual
- Technology continuum—*box trainer v. VR v. hybrid (robotic simulation)*
- Design elements for assessment
- Design elements for simulation
- Technical quality
- Integration, use and evaluation
Structure
Structure

- Context of medical simulations
- Team and Individual
- Technology continuum
- Design elements for assessment
- Design elements for simulation
- Technical quality
- Integration, use and evaluation
Structure
Design of Assessment Elements

• Connected explicitly to goals by ontology

• Ontology
  • Specifies relationships
  • Provides first cut order for simulation design
  • Identifies clear entry and exit skills
  • Transparent
  • Validated by expert and empirical means
  • e.g., Kerr’s sign=ruptured spleen, depressed T-waves on ECG=MI, air-knot=failed suture line
Domain Ontology Strategy

- Ontology—“schematic” of the domain
  - Substrate for assessment, instructional, and game design
  - Develop learning and assessment for node clusters
Structure

- Context of medical simulations
- Team and Individual
- Technology continuum
- Design elements for assessment
- Design elements for simulation
- Technical quality
- Integration, use and evaluation
Design of Simulation Elements

- Test-bed
  - Modifications for experimental development
- Part-whole
- Situational variations
  - Contexts
  - Surprise
  - Communication protocols
- Common design of scenarios
  - Narrative
  - Degree of verisimilitude
  - Seamlessness Vs. deliberate intercession
- Cross-training and role-taking
- Degree of interaction and dynamic feedback
Structure

• Context of medical simulations
• Team and Individual
• Technology continuum
• Design elements for assessment
• Design elements for simulation
• Technical quality
• Integration, use and evaluation
Technical Quality Concerns

- Validity of assessments used to evaluate simulation quality
- Psychometric properties for small samples and few tasks
- Multidimensionality of performance
- Developmental expertise
- Robustness
- Evidence of transfer, retention, prevention of skill decay
Structure

• Context of medical simulations
• Team and Individual
• Technology continuum
• Design elements for assessment
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Thank you for your attention

Questions?
http://casit.ucla.edu/

http://www.cse.ucla.edu

Erik Dutson
voice 310.206.7235
day
fax 310.267.4632
day
email EDutson@mednet.ucla.edu
day

Eva L. Baker
voice 310.206.1530
day
fax 310.267.0152
day
email baker@cse.ucla.edu
day