eSimulation can Replace Lecture
Summary of Research Study 2009

Improving Learning of Airway Management with Case-based Computer Microsimulations
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Introduction

Study Addressing Neomillenial Learning Styles in Nursing Education

The traditional classroom lecture is being challenged by larger class sizes and rising student/faculty ratios and by students looking for alternative learning modes. Fluent in multiple media, the neomillenial student seeks more personalized learning experiences, values direct participation and guidance, and prefers active learning based on real situations with opportunities for reflection. As computer based self-directed learning systems with patient scenarios designed to train medical knowledge, problem solving and decision-making skills fit right into the neomillenial mind set, there was an interest in exploring whether this learning tool was at least as effective and efficient as traditional classroom lecture.
Purpose of Study

The purpose of this study was to evaluate the usefulness of eSimulation in learning the principles and concepts of airway management by comparing learning outcomes achieved with eSimulation to those achieved with traditional lecture.

2 primary questions were asked

1. Are there differences in knowledge acquisition, knowledge transfer, knowledge retention and timeliness/accuracy of care decisions associated with instructional approach (Lecture vs eSimulation)?

2. Are there differences in learner receptivity associated with instructional approach (Lecture vs eSimulation)?
Method

Initial Learning
- Lecture
- eSimulation scenario (Acute asthma)

1 week

Full-scale Simulation
(Bronchiolitis)

2 weeks
8 weeks

Knowledge Acquisition
Assessment Method: Written exam questions

3 weeks

Knowledge Transfer
Assessment Method: eSimulation scenario (Severe asthma)*

24 weeks

Knowledge Retention
(Accuracy/Timeliness of Care)
Assessment Method: OSCE following full-scale simulation scenario (Acute respiratory distress)

* Both groups had prior experience with eSimulation.
Sample Sizes

1. Lecture versus eSimulation

Knowledge Acquisition
Scores available from 76 students:
38 students in Lecture Group
38 in eSimulation Group

Knowledge Transfer
Scores available from 76 students:
38 students in Lecture Group
38 in eSimulation Group

Knowledge Retention
Scores available from 40 students:
22 students in Lecture Group
18 in eSimulation Group

2. Receptivity to learning with eSimulation

Survey
Scores available from 49 students:
26 students in Lecture Group
23 in eSimulation Group
Results

Knowledge Acquisition

Written Exam Scores showing eSimulation was equally effective as was lecture.¹

<table>
<thead>
<tr>
<th></th>
<th>Lecture Group</th>
<th>eSimulation Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct score on unit exam</td>
<td>73.0%</td>
<td>74.3%</td>
</tr>
<tr>
<td>Correct score on final exam</td>
<td>90.8%</td>
<td>92.1%</td>
</tr>
<tr>
<td>Correct score on all questions</td>
<td>78.9%</td>
<td>80.3%</td>
</tr>
</tbody>
</table>

¹ Assuming this footnote refers to the effectiveness comparison between lecture and eSimulation.
**Knowledge Transfer**

First attempt scores on the 2nd Computer Based Scenario showing the eSimulation group had better scores on the eSimulation scenarios on Severe Asthma than did Lecture group. Lecture group achieved best scores equivalent to the eSimulation group on the same scenario but required longer engagement with the eSimulation scenario.  

- **Average First Score**
  - Lecture Group: 70.5%
  - eSimulation Group: 75.6%

- **Average Best Score**
  - Lecture Group: 79.7%
  - eSimulation Group: 79.8%

- **Time spent completing scenario**
  - Lecture Group: 24.4 minutes
  - eSimulation Group: 15.3 minutes
Results

Knowledge Retention

Performance on the OSCE entailing assessment and care of an infant (SimBaby) in respiratory distress showing the eSimulation group had significantly better retention on 3 key assessment actions.²

<table>
<thead>
<tr>
<th>Assessment Action</th>
<th>Lecture Group</th>
<th>eSimulation Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessed oxygen saturation</td>
<td>55%</td>
<td>83%</td>
</tr>
<tr>
<td>Assessed respiratory rate</td>
<td>64%</td>
<td>89%</td>
</tr>
<tr>
<td>Noted cyanosis</td>
<td>36%</td>
<td>83%</td>
</tr>
</tbody>
</table>
Results

Receptivity to Learning

- All students were receptive to eSimulation.\(^1\)
- Lecture group reported higher agreement that eSimulation strengthened understanding.\(^1\)
- Both groups agreed eSimulation challenged their ability to think.\(^1\)
Conclusions

- Students learning concepts and principles of airway management via eSimulation outperformed those who learned via lecture.\(^3\)

- The results suggest that systematic implementation of eSimulation for other care concepts should be evaluated as eSimulation may help graduates improve their readiness for practice.\(^3\)
Vocabulary

- Knowledge Acquisition: gaining knowledge
- Knowledge Transfer: applying gained knowledge to new situations
- Knowledge Retention: preservation of the after effects of experience and learning that makes recall or recognition possible. (www.merriam-webster.com)
- Decision Making Skills: accuracy and timeliness of care decisions (Cason, 2009)
- Learner Receptivity: Learner’s ability or inclination to receive (www.merriam-webster.com)
- Cyanosis: bluish or purplish discoloration of skin due to deficient oxygenation of blood. (www.merriam-webster.com)
- OSCE: Objective Structured Clinical Examination (http://www.wikipedia.org/)
References

1. Improving learning of airway management with case-based computer microsimulations (Clinical Simulation in Nursing, 2010).
   Carolyn L. Cason, RN, PhD, Mary A. Cazzell, RN, BSN, Kristine A Nelson, RN, MN, Victoria Hartman, RN, NSN, CPNP, Jennifer Roye, RN, MSN, CPCP, Mary E. Mancini, RN, PhD, FAAN

2. Learning the principles and concepts of airway management: The efficacy of replacing lecture with eSimulation™ (Final report, November 2008).
   Project Team: Carolyn L. Cason, RN, PhD, Professor and Associate Dean for Research, Principal Investigator; Kristine A. Nelson, RN, MN, Lead Teacher Undergraduate Pediatric Nursing Course, Project Coordinator; Victoria L. Hartman, RN, MSN, CPCP, Faculty, Undergraduate Pediatric Nursing Course, Co-Investigator; Jennifer Roye, RN, MSN, CPNP, Faculty, Undergraduate Pediatric Nursing Course, Co-Investigator; Mary E. Mancini, RN, PhD, FAAN, Professor and Associate Dean Undergraduate Program, Co-Investigator; and Mary Cazzell, RN, BSN, Graduate Research Assistant. University of Texas at Arlington, Arlington, TX, United States.

3. Using eSimulation to enhance student nurses’ clinical skills [Abstract] (Society for Simulation in Healthcare, 2010).
   Carolyn L. Cason, RN, PhD, Mary A. Cazzell, RN, BSN, Kristine A Nelson, RN, MN, Victoria Hartman, RN, NSN, CPNP, Jennifer Roye, RN, MSN, CPCP, Mary E. Mancini, RN, PhD, FAAN

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Recommended links:
The University of Texas at Arlington, School of Nursing
Smart Hospital
Product Information

eSimulation
Self-directed learning system

For this study the eSimulation application used was MicroSim InHospital by Laerdal Medical. eSimulation InHospital is designed for use by all healthcare students and professionals, especially for physicians, nurses, physician assistants, and medical residents.

eSimulation InHospital Modules:
- Airway & Breathing
- Chest Pain
- Cardiac Arrest 1
- Cardiac Arrest 2
- Cardiac Arrhythmia 1 (Tachycardia)
- Cardiac Arrhythmia 2 (Bradycardia)
- Metabolic & Environmental Emergencies
- Poisoning & Overdose

*Each module has 5 patient cases.