Effects of simulation on radiographers’ critical thinking skills, self-efficacy, and clinical competence

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Objectives

At the completion of this session the participant will be able to:

• Discuss the paradigm shift in healthcare education – Use of simulation
• Identify the need for simulation training as a learning method.
• Develop methods for increasing critical thinking skills, and self-efficacy of radiologic science students during simulation.
• Analyze components of a radiography program in relation to developing the competency skills of students.
• Describe the key operational components of a simulation enhanced activity.

Introduction

• It is estimated that 98,000 patients each year die as a result of medical errors making it the fifth most common cause of death

  According to the Institute of Medicine in the United States

  • More than 70% of these preventable deaths are due to lack of communication and teamwork
  • Healthcare is a decade behind other high risk industries in its ensuring basic safety
Introduction

- Over two billion medical x-rays are taken each year in the United States (Bos, Blobel, Marsh, & Carroll, 2008)
- Diagnostic errors leading to patient death include errors in:
  - Requests
  - Image acquisition
  - Radiologic reports
  - Communication to the treating team
- Ensuring the competency of each technologist is essential
  - Patient Assessment and patient history
  - Selection of proper technical factors
  - Radiation safety
  - Proper positioning
  - Patient Care & Safety
  - Infection Control

Problem may lie more in education than practice!!

Traditional Education

- Limited experience of managing rare events
- Ethical considerations of using patients for learning
- Current environment makes it difficult to discuss and learn from mistakes
- Limits opportunities to practice and acquire proficiency of skills in procedures
- Lectures to disseminate information and assess through written or multiple-choice examinations.
Slide 7

Simulation Enhanced Education

- Replace or amplify real experiences with guided experiences that evoke or replicate the real world in a fully interactive manner (Gaba, 2004).
- Provides opportunities for students to integrate their knowledge and skills in a safe learning environment without fear of causing peril to a patient (Bandali et al., 2008).
- Can be used to assess performance and competency in all disciplines of health care (Gaba, 2004; Panaretos and Meryon, 2005; Bandali et al., 2008).
- Although simulation cannot replace clinical internships, it does allow students to better understand conceptual relations and perfect basic skills (Gaba, 2004).

Slide 8

Simulation Enhanced Education & Self-efficacy

- Simulation is the most effective method to significantly improve self-efficacy (Tompson and Dass, 2000).
- Increased the student’s level of self-confidence resulting in increased interest, perseverance, willingness to exert effort, and task performance (Jarzemsky and McGrath, 2008; Pike and O'Donnell, 2010).
- Increased overall self-efficacy and confidence through mastery experiences (Goldenberg et al., 2005; Chan et al., 2005; Jarzemsky and McGrath, 2008; Pike and O'Donnell, 2010).
- Enhance learner self-efficacy resulting in improved clinical competence and result in a higher quality of care (Bandura, 1986, 1997; Pike & O'Donnell, 2010).
- The quality of the simulation planning directly affects the perception of self-efficacy (Pike and O'Donnell, 2010; Schieman, 2011).

Slide 9

Simulation Enhanced Education & Critical Thinking Skills

- Simulation has been an increasingly used strategy to promote critical thinking skills and has become a primary teaching strategy to develop critical thinking, learning, and confidence (Bruce et al., 2007; Rush et al., 2008; Kaddoura, 2010; Schubert, 2012).
- Incorporate scenarios and case studies promoting the use of critical thinking to make sound clinical decisions to improve patient outcomes. (Rush et al., 2008; Kaddoura, 2010).
- A specific simulation activity proven to build critical thinking skills is role-play.
- Simulation was found to be an effective teaching tool in enhancing knowledge and critical thinking in many competencies (Bruce et al., 2007; Turner et al., 2008; Shubert, 2012).
**Slide 10**

**Purpose of the Study**

Compare radiographers’ perception of their self-efficacy, critical thinking skills on image evaluation, and critical thinking skills on patient assessment, by level of simulation training received as a student and its relationship to clinical competence.

**Slide 11**

**Clinical Competence in Radiography**

- Patient Assessment and Management
- Room Preparation
- Equipment Operation
- Technique Selection
- Positioning Skills
- Radiologic Operation
- Image Processing and Evaluation
- Radiation Safety
- Receiving and Storing

**Slide 12**

**Subjects and Setting**

- Random sample of certified radiographers located in the United States of America
- Successfully passed their ARRT Radiography certification examination within the last two years
### Slide 13

**Instrument**

- Part I – Demographics
- Part II – Simulation Training Rubric
- Part III – 5-Point Scale – Critical Thinking (Assessment and Evaluation), and Self-Efficacy (General and Radiographer)
- Part IV – Scenario Questions – Clinical Competence

### Slide 14

**Research Question**

How do radiographers who receive different levels of simulation training in their program of study compare in their perceptions of self-efficacy, critical thinking skills in image evaluation, critical thinking skills in patient assessment, clinical competence, and self-reported ARRT radiography examination score?

### Slide 15

**Results**

<table>
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<tr>
<th></th>
<th>Source of Variation</th>
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### Slide 16

<table>
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### Slide 17

#### Results

Assessments for self-efficacy and critical thinking skills in image evaluation by level of simulation:

<table>
<thead>
<tr>
<th>Level of Simulation</th>
<th>Self</th>
<th>Dependent Variable</th>
<th>Post Hoc Test</th>
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<td>97</td>
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<tr>
<td>High</td>
<td>66</td>
<td>103</td>
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### Slide 18

#### Strengths and Weaknesses

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<tr>
<td>Moderate</td>
<td>97, 97</td>
<td>62, 142</td>
</tr>
<tr>
<td>High</td>
<td>42, 132</td>
<td>113, 113</td>
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Slide 19

Weaknesses by Simulation Level

<table>
<thead>
<tr>
<th>Competency</th>
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<th>Low Simulation</th>
<th>Moderate Simulation</th>
<th>High Simulation</th>
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<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RP</td>
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<tr>
<td>PM</td>
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<td>X</td>
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<td>X</td>
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<tr>
<td>TS</td>
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<tr>
<td>IE</td>
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</tbody>
</table>

PA = Patient Assessment
RP = Radiation Protection
PM = Patient Management
EO = Equipment Operation
TS = Technique Selection
PS = Positioning Skills
RS = Radiation Safety
IP = Image Processing
IE = Image Evaluation

Slide 20

Limitations

- Population of this study is considered competent.
- Study did not include students enrolled in programs that did not achieve certification and licensure.
- All participants had clinical training in hospitals and imaging centers that may have affected their level of competence.
- Competence was measured by multiple choice scenarios and the ARRT radiography examination, not actual performance.
- Geographic location of each participant is unknown.

Slide 21

Use of Simulation: Innovative Learning Strategy

- Standardized patient simulation
  - Used of actors to play the role of patient, family members, and members of the clinical team.
  - Used for basic training, increasing compassionate skills, general team, and interprofessional training.

- Live simulation with high-fidelity simulators
  - Used for skill training, decision making, communication and reflection on professional behaviors.

- PACS Simulator
  - Used to manipulate the Picture, Archiving and Communication system.
  - Used for sending, storing, printing, sharing information.

- Technique / Task based simulation
  - Basic Positioning, Radiation Safety, Patient Safety, Tumor
  - Calcium Arterial, Diameter of Contrast
  - Exit Image Using for better formats for printing.
Slide 22

It's not about the simulator.

- The power of individual or team training in a simulation environment lies in the integration of validated educational methods into the real simulation experience (Dunn, 2008).

Slide 23

Debriefing

- Key component in the learning process—Feedback
- Most learners feel that inadequate feedback is provided during educational training.
- Without feedback, poor performance is not corrected, appropriate behavior is not reinforced, and learners develop their own system of self-validation.

Slide 24

Establishing a Simulation Center

<table>
<thead>
<tr>
<th>Facilities</th>
<th>Integrated and/or Free-Standing</th>
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<tbody>
<tr>
<td></td>
<td>Anticipate the volume and nature of programs</td>
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<tr>
<td>Storage</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Technology</th>
<th>AV system for video debriefing</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Internet Access</td>
</tr>
<tr>
<td></td>
<td>Telephones</td>
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<td></td>
<td>IT Support</td>
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<table>
<thead>
<tr>
<th>Equipment</th>
<th>Matched to program needs</th>
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<tbody>
<tr>
<td></td>
<td>Human Patient Simulators</td>
</tr>
<tr>
<td></td>
<td>Part-task Trainers</td>
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<tr>
<td></td>
<td>Virtual Reality</td>
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<td>Warranty and Service Contracts</td>
</tr>
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</table>
Establishing a Simulation Center

Faculty and Staff
- Educators
- Subject Matter Experts

Built around ensuring competence and ongoing development
Established standards and road map for the design of activity

Establishing a Simulation Activity

1. Simulation environment setup
2. Simulation device programming or preparation
3. Educator and/or facilitator preparation
4. Clear objectives of activity
5. Learning outcomes and assessment methodology
6. Briefing methods
7. Debriefing methods
8. Reflection Exercises

Remember:
- Learner-centric environment
- Experiential, emotionally engaging activity
- Enhance learning and discovery through debriefing and reflection
- Must emphasize learning outcomes
- Must stress teamwork and communication

Slide 27

QUESTIONS

danken

thank you

gracias

Obrigado

merci