Developing Problem Based Simulations: Goals, Objectives, Curricular Fit and Outcomes

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Outline for Presentation

• Why simulation?
• Our experience at the University of Pittsburgh
• What are the advantages & disadvantages of simulation?
• How, when and where to incorporate simulation into a curriculum?
• How to prepare a course?
• What is the best way to debrief?
• How to determine success?

% Retention: various activities

Why Simulation?

Pitt School of Nursing

Pitt School of Nursing Experience with Simulation

• Undergraduate
  – Freshman
    • Introduction – patient interaction & assessment
  – Sophomores
    • Partial task education
  – Junior
    • Pediatric, Obstetric, Med-surg
  – Senior
    • Crisis management

Pitt School of Nursing Experience with Simulation

• Graduate education
  – Acute care nurse practitioner
  – Clinical nurse specialist
  – Nurse anesthesia
What are the advantages & disadvantages of simulation?

Advantages of Simulation

• Students prefer simulation to traditional lecture
• Effectively conveys factual information and result in attitude change
• Allows experiential learning conducted in a safe, responsive environment
• Avoids the pitfalls of interruptions or unplanned events such as occur in the clinical setting
• Allows reflection

Disadvantages of Simulation

• Lack of full understanding of the consequences of an action to a real situation
• Poor design = poor experience
• More time consumption for educators
• Educators may not have the expertise / are uncomfortable with the new format
• Lack of prospective evidence on validity and reliability
• Lack of standardized development tools
• Cost in development and administration
Simulation training represents an opportunity for competency evaluation that is unique.

What is competence?

- More generally, competence is “the state or quality of being adequately or well qualified, having the ability to perform a specific role.”

The competence development process

- Is a lifelong series of doing and reflecting
- Occurs during clinical practice after a baseline has been established
- Novices require more rules and structure
Competency Development

• Levels of competence in competence development
  – Novice: Rule based behavior, strongly limited and inflexible
  – Experienced Beginner: Incorporates aspects of the situation
  – Practitioner: Acting consciously from long term goals and plans
  – Knowledgeable practitioner: Sees the situation as a whole and acts from personal conviction


Competency Development

• Levels of competence in competence development.
  – Expert: Has an intuitive understanding of the situation and zooms in on the central aspects (Benner stops here)
  – Virtuoso: Has a higher degree of competence, advances the standards and has an easy and creative way of doing things
  – Maestro: Changes the history in a field by inventing and introducing radical innovations


How, when and where to incorporate simulation into a curriculum?
Proposed Definition

• Curriculum Integration Plan
  – A comprehensive plan consisting of categorizing the problem, developing a 'traditional' educational plan (including simulation activity) and then developing a corresponding operational plan

Important Considerations in Curricular Integration

• Simulation fit to purpose
  – What methods?
  – Skill training vs. team training, fidelity, partial vs. full context
• Adequacy of instruction and demonstration
• Learner centeredness (respect for individual learning curves)
• Use of deliberate and repetitive practice
• Clinical variation and increasing complexity
• Immediacy, frequency and validity of feedback

Initial Triage Questions

• Is it suited to simulation?
• What are the specific educational and outcome objectives?
• Who can be assigned to the work team to help create the course?
• Is there leadership support and can we afford it?
• What is the target date for alpha testing and offering the course?
• Is there existing content?
Typical Goals or Learning Targets

Assessment
Individual Psychomotor Skills
Monitoring and Intervention Skills
Clinical Problem Solving
Communication and Teamwork skills
Clinical Reasoning

7 Principles of Best Practices in Undergraduate Education

1. Active learning
2. Prompt feedback
3. Student/faculty interaction
4. Collaborative learning
5. High expectations
6. Allowing for diverse learning styles
7. Time on task must be adequate

What are Simulation “best practices”

• Establish clear learner outcomes
• Clearly connecting course & clinical objectives to simulation session
• Establishing ongoing training & supervision of faculty, staff & participants
• Collaborating with participants and faculty in planning, implementation and evaluation of each session
• Offering a debriefing session after each simulation experience
Curriculum Integration – WISER Model

1. Initial contact
2. Triage and funding discussions - WHAT IS IT?
3. Planning meeting - WHERE DOES IT FIT?
4. Form a team (course bus) - WHO?
5. Use of Tools and Templates (scenario, course, instructor)
6. Technology 101 (PPT, SIMS, pdf, audio, video, SimMan & other software etc....)
7. Curriculum development - pre, intra and post-course materials that integrate within the current curriculum
8. Assessment development and testing
9. Overall course testing and administration - WHEN?
10. Quality improvement activities (meetings and observation)

10 Point Checklist in Scenario Development

1. Identify student level
2. Refer to course objectives
3. Develop scenario outline and student stem
4. Develop instructor notes and scenario flow
5. Create programming or assessment construct and embed in SimMan software system
6. Create appropriate order set
7. Establish pre-course student preparation requirement
8. Develop study/debriefing questions
9. Identify and gather equipment, supplies and props
10. Reference topics to best evidence or standards in education

Course Development Pyramid

1. ID the Problem (survey)/ Develop course concept and objectives/
   Describe correct processes in detail/ Consolidate into steps (8)
2. Identify goals for each step linked to a measurement/
   Categorize into can/cannot be simulated/ Build simulations
3. Develop materials: PPT/videos/policy/
   pdfs/ Best evidence summary for each sim
4. Post materials/organize content/ Develop assessments- KAS
5. Test sims / revise/ train trainers
6. Roll-out
Incorporation of Simulation in the Nurse Anesthesia Program at Pitt

- Foundations of Nursing Anesthesia
  - Positioning workshop
  - IV, arterial line insertion, suturing
  - Spinal & epidural workshop
  - Airway management
  - Mock induction
  - Think on your feet
  - Chemistry and Physics
    - Gas machine workshop

Incorporation of Simulation in the Nurse Anesthesia Program at Pitt

- Applied Physiology and Pathophysiology
  - Problem based learning simulation
- Advanced Principles I
  - Pediatric simulation
  - Regional anesthesia techniques

Incorporation of Simulation in the Nurse Anesthesia Program at Pitt

- Advanced Principles II
  - Regional anesthesia technique
  - Central line workshop
  - Double lumen endobrochial tube workshop & high frequency jet ventilation
Incorporation of Simulation in the Nurse Anesthesia Program at Pitt

- Advanced Principles III
  - Anesthesia crisis leadership training
  - Trauma workshop
  - Difficult airway workshop
- Team Training in Patient Safety
  - Teach in a simulation course
    - Teach in undergraduate simulation
    - Teach in 1st year anesthesia courses

Incorporation of Simulation into the Applied Physiology and Pathophysiology Course

Problem-based learning is a student-centered instructional strategy in which students collaboratively solve problems and reflect on their experiences. (Wikipedia, 2010)
Characteristics of Problem Based Learning

- Students work in groups
- Faculty are facilitators
- Students work in a real world context
- Learning driven by open-ended, ill-defined problems

How to Apply PBL to Applied Physiology and Pathophysiology?

- Patient problems in simulation sessions reinforce lecture content
- Students are provided readings and the patients problems prior to the simulation sessions
- Students work with each other during the sessions and during the debriefing sessions to solve problems
- Faculty focus on facilitating the debriefing sessions

Simulation Sessions
Session 1: 72 yo Colon Resection

Objectives: Bronchospasm

At the end of the simulation training the student will:
1. Describe the etiology of bronchospasm
2. Discuss the typical situations that increase the risk for bronchospasm
3. Discuss appropriate measures to prevent bronchospasm
4. Describe the clinical manifestations of bronchospasm
5. Demonstrate appropriate management of a patient that develops bronchospasm
6. Describe potential complications from bronchospasm if not treated appropriately

Required Reading:

Session 1: Case Stem

Mr. William Jones is a 72 yo, 73 inch, 93 kg patient for bowel surgery. Airway: M-2, oral opening > 5 cm, decreased CROM. 40 pk-yr history of smoking, currently ½ pack/day. Has diagnosis of COPD manifested by SOB and occasional wheezing. Uses albuterol inhaler. History of CAD, HTN, MI in '93, CABG in '93 X 3 vessels. Current EKG NSR with LBBB. Type II Diabetic. Osteoarthritis. Meds: Lipitor, ASA, Metoprolol, Metformin, HCTZ, naproxyn, plavix. The naproxyn and plavix were discontinued 2 days ago.

Preoperative Evaluation
Session 1: Scenario Flow

Patient has just entered the OR and will be induced. Will become bronchospastic with saturation falling to 75%. Will improve with deepened anesthesia, B2 agonist, increased FiO2. Patient has an epidural catheter in place and the GA level is ‘light’

What is the best way to debrief?

Lots of Debriefing Modes

- Private bedside debrief by facilitator immediately post scenario
- Private ‘debriefing room’ debrief by facilitator immediately post-scenario
- Debrief by peers outside of simulation suite
- Self-guided reflection of video performance

Courtesy Nigel Wynne, 2008
Debriefing Methods based on Reflection

- GAS
  - Gather
  - Analyze
  - Summarize
- ADPIEC
  - Assess/anticipate
  - Diagnose
  - Plan
  - Intervene
  - Evaluate
  - Communication

- ADNOTE
  - Anticipation
  - Detection
  - Notification
  - Treatment
  - Evaluation

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**SCENARIO 1: 72 Y/O WITH COPD UNDERGOING COLON RESECTION DEVELOPS BRONCHOSPASM**

**Debriefing Template**

**Overall Goal:** Detect and treat bronchospasm related to the patient with COPD

**Specific Goals:**
- Demonstrate safety behaviors in avoidance of bronchospasm
- Demonstrate skill in prompt detection and assessment of bronchospasm
- Develop plan for definitive treatment and follow-up

**Scenario 1:** Pre-Event Anticipation Behaviors

**ANTICIPATION: RISK ASSESSMENT BEHAVIORS**
- Obtain adequate report (using SBAR?)
- Verify written record
- Patient assessment
- Environmental assessment
Debriefing Powerpoint - Bronchospasm

- Bronchospasm is caused by airway hyperreactivity to physical, chemical, and pharmacologic stimuli. Causes: histamine, cholinergic agonists, prostaglandin, irritant gases, chemically inert dusts, and cold air.
- In patients with COPD, irritant reflex mechanisms usually predominate; blocking either the afferent or efferent limb of the irritant reflex effectively prevents and treats bronchospasm.
- Airway viral infections render normal people hyperreactive for at least three weeks following symptomatic recovery.

Bronchospasm

Anesthetic management

- The goal of the anesthetist is to prevent the development or reverse the occurrence of airway constriction.
- Anesthetics block parasympathetic irritant reflexes by directly relaxing the smooth muscle of the airway, by inhibiting release of mediators, and by augmenting beta2-adrenergic sympathetic responses.
- Lidocaine (1mg/kg) and atropine prevent irritant-induced airway constriction.

Debriefing Points

- Impossible to debrief everything at once
- Debriefing should be learner-centric and conducted within a safe environment
- Participants need and value the feedback
- An accurate log should be created and used
  - Video, SimMan log, checklist
  - Debriefing points are derived through setting appropriate session/course objectives
  - In other words, looking for specific points
How can we determine success?

• Instructor perceptions
• Trainee perceptions
• Program/faculty evaluation
• Trainee assessment
• Clinical change in providers or patients
• Change in clinical costs

Pre/Post Quiz

Post Course Evaluation by Students
### QI Tool - Post Course

**WHIRL Quality Improvement Observation Instrument**

This tool is designed to conduct a quality improvement quasi-checkpost simulation instructor training.

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**Actions That the observer observed or believes have an effect based on their observations:**

- Specific interaction of objectives and activities
- Peer-teacher assignments
- Self-guided interactive tasks
- Self-blending in interactive tasks
- Self-teaching in interactive tasks
- Self-recording in interactive tasks
- Self-assessment of interactive tasks
- Self-study
- Self-recording
- Self-assessment
- Self-study
- Self-recording
- Self-assessment

**Teaching Techniques that were effective:**

1. 
2. 

**Teaching Techniques that could be improved:**

1. 
2. 

**Overall Instructor Effectiveness:** (1 = ineffective, 2 = slightly effective, 3 = effective, 4 = highly effective, 5 = highly effective)

### Questions and Discussion