The Role of Simulation in Medical Education

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Disclosures

• None
Objectives

1. Understand the use of simulation as an educational tool for medical education.

2. Describe the utility of medical simulation to identify systems and safety issues as a quality improvement process.

3. Recognize the research/publication/CME potential from the use of medical simulation.
Simulation
Background

- “Just In Time” originated at Toyota (1952)
  - Manufacturing via Toyota Production System

- Translated to simulation training
  - Simulated environment provides trainees competency via practice (Kneebone et al 2009)

    - Use of mastery training checklists in simulation training
Context of Health Care Systems

Processes

Environment

User

Tool

Team

Task
Simulation in Medical Education

• “See one, do one, teach one.”
• Limited procedural/code opportunities for trainees
  • Work hours
  • Patient safety
• Alternative way to learn and assess in a uniform way
Mock Code: Knowledge

Simulation scenarios evaluated resident use of cognitive aids during cardiac arrests

- Most residents use cognitive aids
- 25% chose wrong algorithm
- PALS cards changed

Resident Performance After Simulation

- Increasing number of simulation based mock codes resulted in a 50% increase in survival rate after pediatric cardiopulmonary arrest
  - Benefit sustained over three years (Andreatta 2011)
- Procedural benefit for central venous catheter (CVC) insertion with simulation-based mastery learning
  - Increased residents' skills in simulated CVC insertion
  - Decreased the number of needle passes when performing actual procedures
  - Increased resident self-confidence (Barsuk 2009)
In-Situ Simulation: Task Distribution

Setting: New Pediatric ED with new staffing model

Goal: Define optimal staff roles before facility opens

Method: Iterative lab and in-situ simulations
  - NASA Taskload Index
Building Hope Timeline

- **Design/Construction**
  - ED Design

- **Simulation Testing**
  - Identified ~350 latent safety threats/unit

- **Staff Training**
  - Verified safety threats addressed

- **Clinical Opening**
  - Command center closed in 3 days
Building Hope Data

1844 Latent Safety Threats identified
  • 207 critical/high priority threats
  • 98% addressed before building opening
Simulation Publications: MedEdPortal

- Free open, online publication, academic resource
- 1500+ Peer reviewed publications and educational modules
- 1000+ publications downloaded weekly
- Educational scholarship
## 9. Skill Training

### Skills Training Scenario:

**Patient**

| Age: 3 years | Weight: 14 kg | Gender: Male |

**Scenario:** The triage nurse is bringing back an “ill-appearing” child with a chief complaint of a first time seizure. She has obtained vitals and placed the child on monitors. The patient is initially fully clothed. The patient appears sleepy and less interactive. Anticipated interventions include primary assessment and initiation of seizure evaluation. The patient then develops a recurrence of generalized tonic-clonic seizures with respiratory depression. Anticipated interventions include supporting ABC’s, IV access and advanced seizure management. The patient stabilizes after escalating therapy.

### Medical Management Learning Objectives:

1. Obtain a SAMPLE history
2. Perform a primary and secondary survey
3. Recognize generalized tonic-clonic seizures
   a. Signs:
      i. Extremity movements
      ii. Decreased mentation
      iii. Diminished respiratory drive
4. Treat recurrent seizures
   a. Support ABCs
   b. Benzodiazepines
5. Identifying + treating INH toxicity
   a. Escalating therapy:
      i. Pyridoxine
      ii. Bicarbonate

### Teamwork Learning Objectives:

1. Demonstrate effective teamwork skills
   a. Create team structure and leadership
      i. Determine and indicate team leader and member roles
2. Employ effective communication skills
   i. Brief prior to starting the scenario
   ii. Huddle as needed during the scenario
   iii. Utilize directed communication
   iv. Utilize check-back for closed loop communication

### Scenario Intro:

ED: Tyler is 3 year old boy. His mom brought him in today because he’s had a seizure while at the park.

Triage Vitals Signs:
T: 36.8 HR; 110 RR; 40 BP; 115/70 SaO2; 98% RA wt; 14 kg

**Facilitator Notes:**

Give team intro outside the simulation area.
Patient is clothed

**Further HPI (if asked):**

He was well until 1hr ago when he began complaining of a stomach ache. He vomited x 1 (NBIN, + white chunks – if asked). He ate breakfast 3 hours ago. He also seemed confused and I had difficulty understanding what he was saying. While we were at the park, his arms and legs shook, he was sweaty and initially wouldn’t wake up. No fevers, diarrhea, URI sx. No known sick contacts.
Conclusions: Simulation in Medical Education

- Can be applied at all levels, settings
- Positive training environment and educational method
  - Focus on low-frequency, high-risk tasks
- Assess existing system, implement new system
  - Identify, mitigate latent safety threats before patient harm
- Potential for publication via MedEdPortal as a generalizable, comprehensive, stand alone curricula
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