Pediatric Simulation; Scenarios & Principles

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Pediatric Simulation; Scenarios & Principles

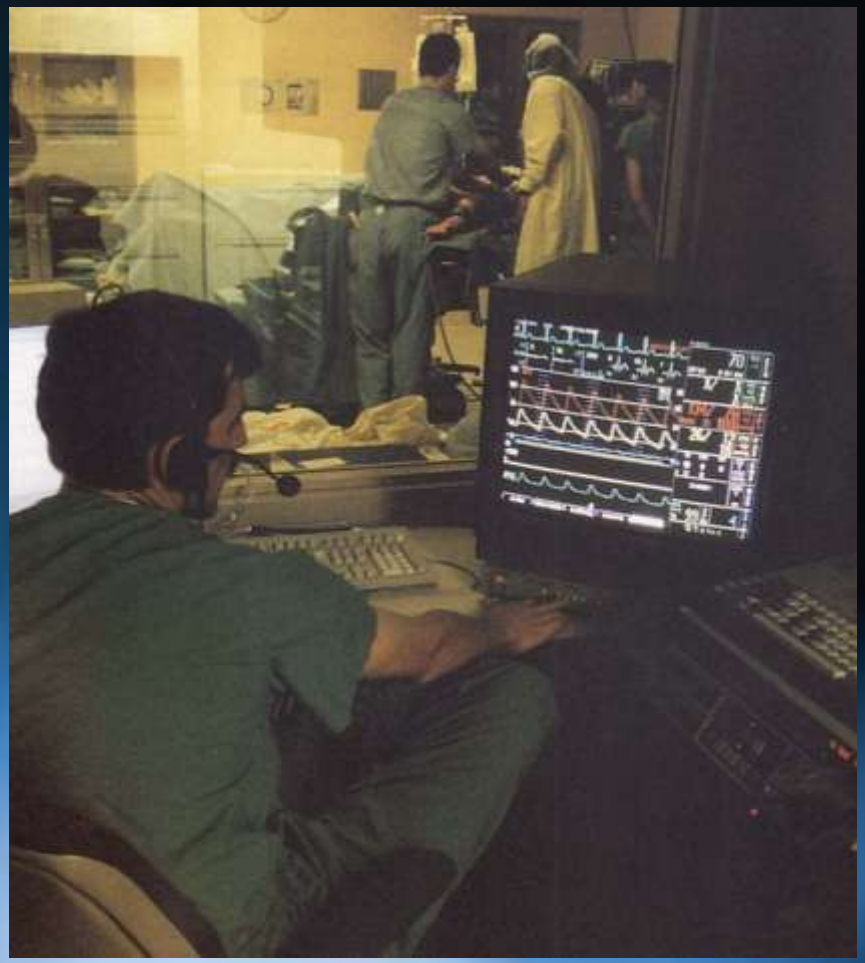
- At the conclusion of this lecture participants will have learned how to develop simulation scenarios for pediatric anesthesia. Participants will also learn of specific scenarios that can be used in their setting.

Pediatric Simulation; Scenarios & Principles

- Simulation Modalities for Pediatric Practice
  - Task Training Devises and Pediatric Mannequins
- Simulation Curriculum Competence Domains
  - Psychomotor Skills
  - Decision-making Skills
  - Teamwork Skills
- Scenario Content and Constructs for Pediatric Anesthesia
- Curriculum Efficacy Measures for Pediatric Practice

Pediatric Simulation; Curriculum Requirements for Practice

- Psychomotor Skills
- Clinical Judgments (Recognition, Diagnosis and Treatment)
- Behavioral, Communication and Teamwork Skills



Psychomotor Skill Acquisition

- Deconstructing tasks to develop an expert approach,
- Step-by-step guide and provides a map and milestones to develop the skills
- Method to accelerate acquisition of psychomotor skills and improve their skill retention

Pediatric Practice: Psychomotor Skill Acquisition

Deconstructing tasks to accelerate acquisition and improve skill retention

- Pediatric Airway (Basic)
- Pediatric Airway (Advanced)
  - Difficult and emergency airway management in children
    - Airway devises in children
    - Alternatives to direct laryngoscopy
    - Fiberoptic laryngoscopy
  - Lung separation techniques in children (Approaches and age-related considerations and Devises)
  - Ventilation Techniques (Jet ventilation, ventilators and oscillation)
- Vascular access methods
  - interosseus access
  - Central venous access considerations in children (approaches, equipment and age-related considerations)
- Central neuraxial techniques in children (caudal, caudal catheter techniques, spinal anesthesia, infant epidural)
- Regional anesthetic techniques in children

Performance in Practice: Simulation and Task Training for Pediatric Anesthesia

What preparation is appropriate prior to conducting a supervised procedure?
What are the steps required to effectively accomplish each procedure?
Are there technical milestones that could be measured for each step?
Are there common misadventures in performing this procedure? What are these failure modes? Can these errors be programmed in a simulated environment?
What is the range of resident skill prior to and following simulation training? Can the ‘learning curve’ be predicted from simulation training?
How many ‘mentored’ or training procedures are needed before a trainee possesses the expertise to function independently?
How can proficiency be measured for the procedure?
In order to meet minimum qualifications, how many procedures are needed? How many procedures are needed to maintain requisite skill?
How are skills evaluated to assure practice ‘readiness’ or maintenance of competence?

Failure Modes and Failure Mode Analysis:

Are there common misadventures in performing this procedure? What are these failure modes? Can these errors be prevented by training? programmed in a simulated environment?

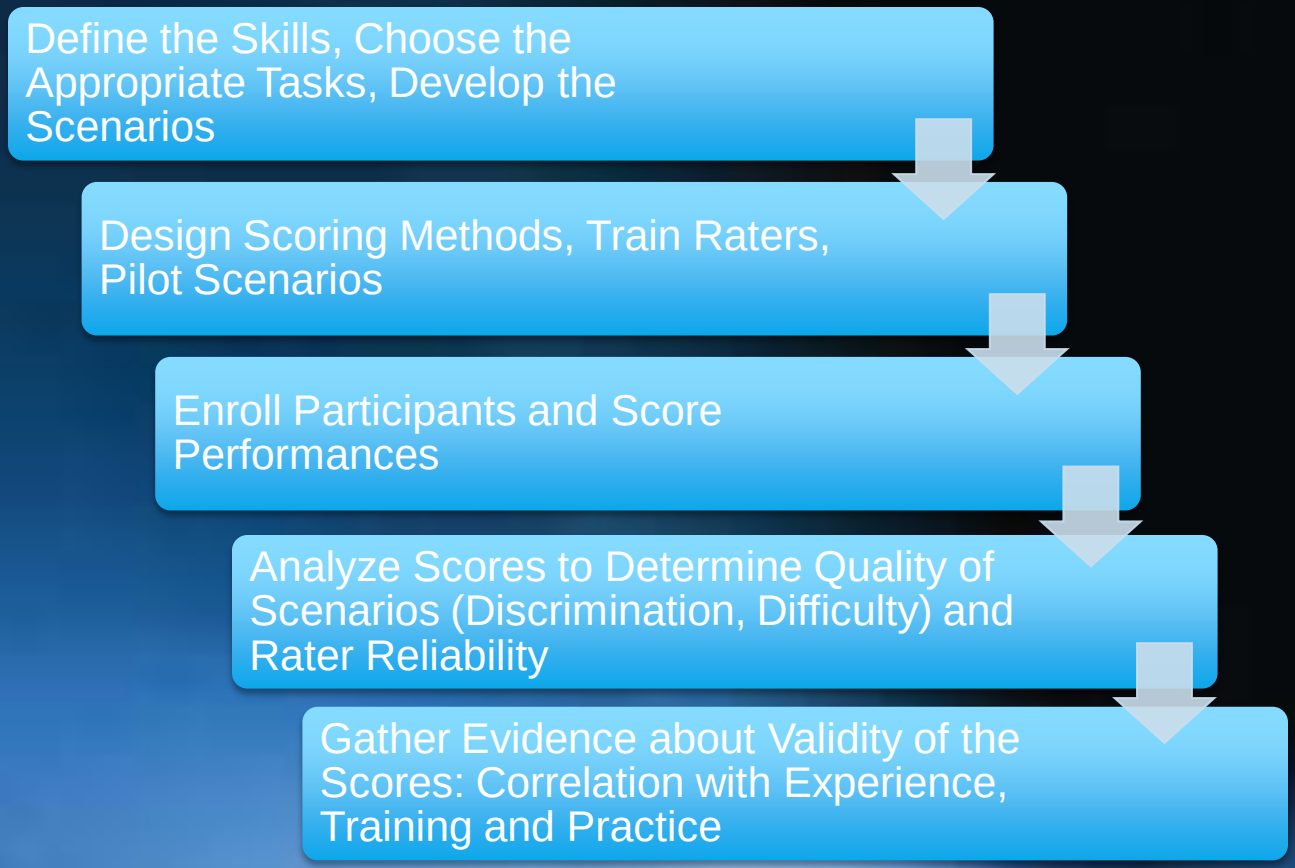
Simulation Curriculum: Decision-making and Teamwork Skills

Defining the Skills and Choosing the Appropriate Simulation Tasks

Scenario is the fundamental building block of the simulation-based assessment.

- Selecting competence domains that are amenable to a simulation environment,
- Defining the expected skills that are needed to diagnose and manage the crisis
- Designing a scenario that has the skills required embedded into the framework
- Establish instruments and metrics to conduct the assessment

Building the Simulation Assessment



Simulation-based Curriculum: Problem-based (scenario or events)

Common Skill Deficits:

- *setting priorities,*
- *generating hypothesis,*
- *processing knowledge,*
- *assigning probabilities,*
- *recognizing important, from unimport*
- *integrating competing issues,*
- *recognizing limits,*
- *learning when to call for assistance*

The transition out of medical school-a qualitative study of descriptions of borderline trainee interns.
Wilkinson TJ, Harris P. Medical Education 2002; 36: 466-72

Simulation-based Training: Scenario Selection

- *Acute-care events are often associated with an adverse patient outcome, so improving this practice domain will result in increased patient safety*
- *Skill deficits in a logical, sequential and timely decision and management*
- *Definition of Crisis*
  - *Critical moment that can be resolved by prompt recognition and management (Failure to recognize potential for adverse outcome)*
- *Compressed timeline of a 'crisis' offers an opportunity to study skills and behaviors*

Pediatric Anesthesia Content Resources: e.g. 'Wake Up Safe'

- Wake Up Safe® pediatric quality initiative includes a statement about the risks of hyperkalemia associated with the rapid transfusion of blood.
- Scenario Content and Constructs
  - Rapid Blood Loss
  - Hypoovolemia
  - Hypocalcemia
  - Hyperkalemia
  - Pulseless Electrical Activity
  - Resuscitation

Malignant Hyperthermia

- *Heart rate increases, unresponsive to intervention,*
- *Arrhythmia, T wave changes (K^+ 6.8 meq),*
- *Progressive □CO2 and □ tachycardia throughout (e.g. scenario 5 minutes)*
- *Key Scoring: Recognition of MH and Declaration of Emergency*

Simulation-Based Assessment : Why not just Train, rather than Score?

Scores require faculty to define expectations and commit to the required and essential clinical management

Participants' scores used to analyze quality of scenarios (difficulty, content, construct and scoring)

Ability measure provide curriculum affirmation (or reproof) (Validation)

Potential to direct curriculum effort to performance deficits, the need for an adaptive curriculum

Individual score assures feedback directed to strengths and weaknesses

Motivation to acquire and exceed performance expectations (the secondary learning outcome; standardized patient examination and the USMLE Clinical Skills Examination)

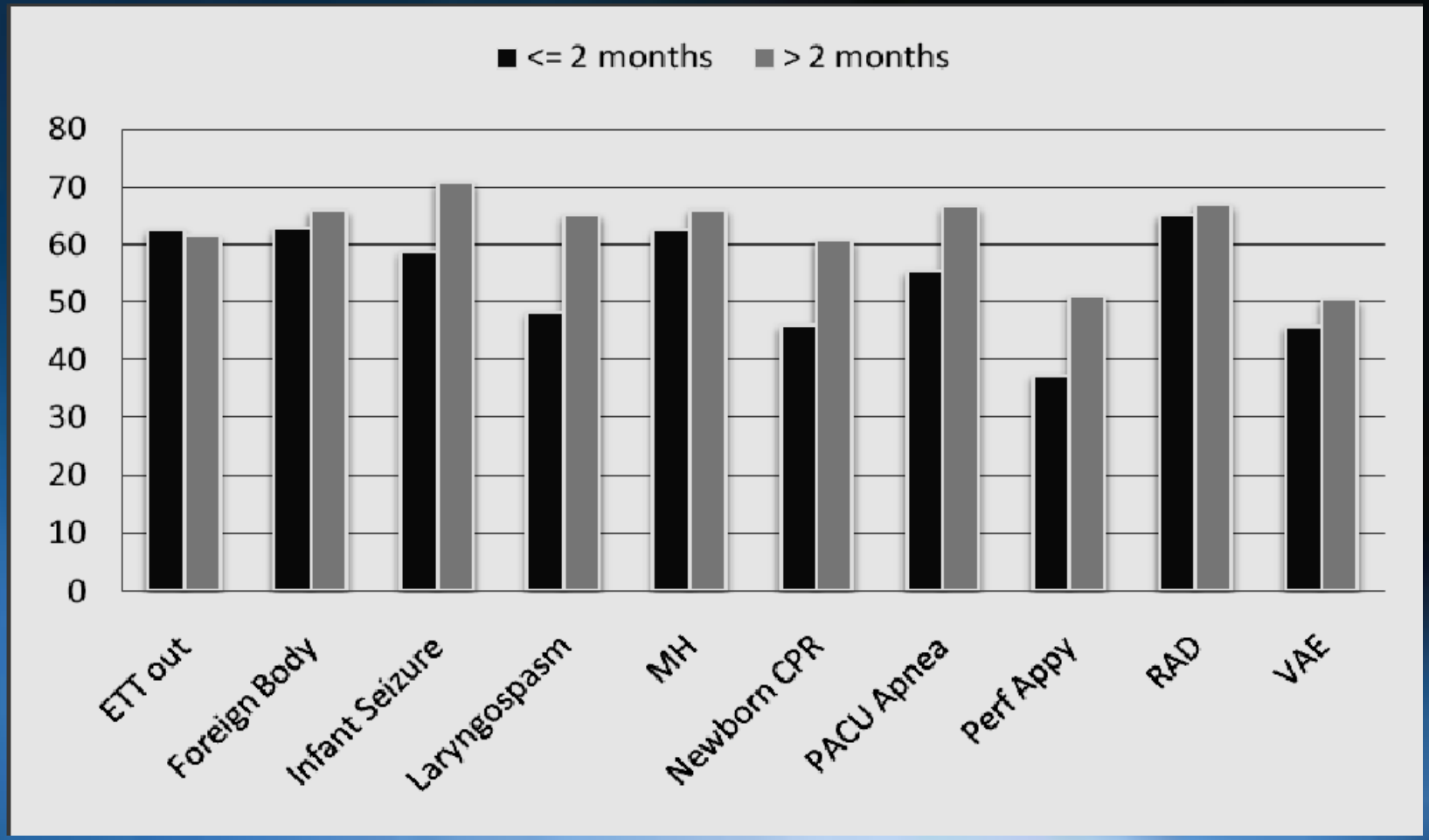
No assessment, no learning (Assessment more effective than training in skill/knowledge transfer)

Murray, 2009

Simulation-Based Assessment of Pediatric Anesthesia Skills

James J. Fehr, MD, FAAP[1,2], John R. Boulet PhD[3], William B. Waldrop MD[1,2], Rebecca Snider, MHS, RN[1], Megan Brockel, MD[1], David J Murray MD[1]

Anesthesiology 2011; 115: 1308-15.



Anesthesiology Residents' Performance of Pediatric Resuscitation during a Simulated Hyperkalemic Cardiac Arrest

Kimberly J. Howard-Quijano, M.D.,* Marjorie A. Stiegler, M.D.,† Yue Ming Huang, Ed.D., M.H.S.,‡
Cecilia Canales, M.P.H., § Randolph H. Steadman, M.D.
Anesthesiology 2010; 112:993–7

- Twenty anesthesia residents managing an infant who experiences hemorrhage during craniotomy.
- Pediatric cardiac arrest with pulseless electrical activity,
- CPR protocols initiated effectively
  - 88%(15/17) of participants palpated for the presence of a pulse.
  - 79% (15/19) initiated CPR within 1 min of recognition of pulselessness
- Subset of skills, primarily related to patient age and weight, including doses of epinephrine and intravenous fluids and rate of chest compression, were performed incorrectly by a majority of residents

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Anesthesiology 2010; 112:993–7

- Only one fourth of the residents considered hyperkalemia as a cause of pulseless electrical activity.
- Epinephrine was administered by 95% of residents, but only one third used the correct pediatric dose.
- For the treatment of PEA, 95% (18/19) of participants administered epinephrine; 33% (6/18) administered the correct pediatric dose (0.01 mg/kg or 10g/kg).

Teamwork and Communication : Implications for Curriculum Development

- *Roles and responsibilities are not understood by team members both by profession and discipline (nursing, physician) and specialty (surgeon, anesthesiologist, internist).*
- *Few contingency plans are in place when a critical event occurs*
- *Team members unable or unwilling to support or crossover to help other team members when a workload overload exists.*
- *Team members fail to recognize crisis or adapt to a changing situation*
- *Changing expectations about performance exist among team members, and many of the actions are not clearly designated to individual members of the team (e.g. Situation/Background to Neonatal team in OB emergency),*

The relationship between competence and performance: implications for assessing practice performance.

Rethans JJ, Norcini JJ, Baro´n-Maldonado M, Blackmore D, Jolly BC, LaDuca T, Lew S, Page GG, Southgate LH. Med Educ 2002;36:901–9

Performance (what we do in clinical practice) is a product of competence (what we demonstrate under controlled conditions), systems factors (resources, organizational factors), and individual (fatigue, mood) factors.

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