Simulation for Critical Event Training in Anesthesiology

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Outline

- Part I: Intro to simulation technology and logistics
- Part II: switch gears - Intro to underlying concepts, largely from aviation industry and behavioral psychology
- Part III: Interactive sessions with video to “experience” simulation

Why Simulation?

- Offers “on demand” curriculum
- Experiential learning is indelible
- Safe environment to practice critical skills
  - Ethics: allow mistakes to evolve unchecked
  - No patients: no risk of harm
  - Also safe for learners!
- Direct observation of behaviors
- Debriefing
- ABA MOCA requirement
- Fun!

What can the simulator do?

- Capabilities:
  - Audible heart and lung sounds
  - Palpable pulses, cardioversion
  - Airway: mask ventilation, LMA, intubation, etc
  - Can “speak”
- Limitations:
  - Cannot display skin changes
  - Limited ability to move
  - Monitor displays not sophisticated (ETCO2, pO2)
  - Blood loss and “surgery” require imagination
Adult Simulator Features

- Bilateral carotid pulses
- Bilateral lung sounds
- Defibrillation sites
- Bilateral femoral pulses
- Right IV arm (no pulses)
- Left brachial pulse
- Left radial pulse

Infant/Baby Simulator Features

- Bilateral femoral pulses
- Left brachial pulse
- Fontanelle
- IO Access
- IV Foot
- IV Arm

General guidelines for participants

- Say everything out loud (allows for appropriate sim response and cues)
- Treat as you would a real patient. Anything you want to order or do, announce aloud and perform.
- Inject medications, insert needles, etc (establishes commitment)

Orientation

- Structured orientation can help maintain fidelity, avoid confusion. Not mandatory.
- Assumptions (Mandatory!):
  - We are all skilled, intelligent, and care about our patients
  - We will all probably be confused at some point during simulation – expected!
  - We are doing this to improve, not to be judged
  - Confidentiality

Resources needed

- Sim mannequin is not enough
- Props
- Operator
- Actors (AKA “Confederate”)
  - Team training: use participants instead of actors, but still need at least one actor
- Director/Debrief Facilitator
- Scenario Library (best if your own, but published case templates do exist)

What kind of scenario curriculum?

- Clinical
  - Rare or life-threatening problems
  - Physical skill practice
- Behavioral
  - Communication
  - Teamwork
  - Professionalism
  - Decision-making
Behavioral Goals

- Why? Because history and literature tell us that medical mistakes are largely due to human factors (communication, teamwork) and cognitive errors (more later)
- Quick diversion into some psychology that will help us understand the point of behavioral simulation training and debriefing…

Nontechnical skills and “Crisis Resource Management”

- Aviation link: 70% of US airliner crashes involved crews with adequate skills (not a fund of knowledge deficit) flying aircraft that could have been flown to safety (functioning technology). → training emphasis shifted towards nontechnical skills of both individuals and crews
- “Although the ability to respond with the appropriate technical actions is a critical performance skill, it may not be enough.”
  
  Gaba 2004

Crisis Resource Management Skills

- Leadership
- Communication
- Resource and personnel management (calling for help early)
- Decision-making skills
- Situation Awareness

ANTS: Anaesthetists’ Non-Technical Skills

Gaba 1994

Situation Awareness

- Shared mental model – all team members are “on the same page”
  
  1. what has happened already
  2. what is happening now
  3. what is expected to occur

Beyond CRM and ANTS

- Miscalibration
- Cognitive Errors
- Frames
Miscalibration is human nature!

- Miscalibration between one’s own sense of accuracy and actual accuracy
  - Survey of academicians, 94% rate themselves in the top half of their field (Mele 1997)
  - Only 1% of drivers rate themselves “below average” (Reason 1990)
  - Autopsy studies show doctors are often very confident in their diagnoses, even when they are wrong

Environmental Uncertainty

- Diagnostic error = incorrect diagnosis
- Rate of diagnostic error in clinical medicine is as high as 15%
- Anesthesiologists particularly vulnerable?
- Specialties that engage in “complex decision-making in settings of above-average uncertainty and stress” → higher rate of diagnostic error

Cognitive Error (AKA Cognitive Disposition to Respond):

- **Heuristics**: pattern recognition or mental shortcuts that evolve from experience, help us make the (usually correct) decision
  - Example: Hiker “common things are common”
- **Cognitive Error**: Heuristic gone wrong; faulty thought process
  - Important: different from a fund of knowledge deficit!

When heuristic becomes a “cognitive error”

- Delayed recognition of anaphylaxis after GA induction (expect hypotension, don’t investigate for rash, wheezing, etc)
- Delayed recognition of AFE shortly after placement of neuraxial blockade (expect hypotension, don’t recognize resp sx, AMS – or attributed to labor)

“Anchoring” or “Fixation”

- Perceptually lock onto salient features of the patient/situation
- Fail to consider other information simultaneously
- Fail to adjust this in light of later information

This slide serves only as a cue for the person running the system and the presenter
“Premature Closure”
- Accounts for a very high proportion of missed diagnoses!
- Tendency to close the decision-making process, accepting a diagnosis without fully verifying
  - Ex: DLT → OLV and desaturation
  - Easy to see how this is also exacerbated by anchoring and availability (DLT specific problems)

“Confirmation Bias”
- Looking for evidence to support or confirm a diagnosis you already believe to be true, rather than look for evidence to refute it
- Collecting evidence to support the idea that “everything is OK” while (unconsciously) discounting possible evidence that there is a problem
- What will you do if the repeat is 10? Check again?

“Feedback Bias”
- Complete ignorance or time-delayed information
- No immediate consequences
- Error may never be discovered or never relayed back
- Reflection is difficult months later (M&M, QI review, etc) - perhaps not very educational
- In effect, all the feedback is positive

Cognitive Error Recap
- Not a fund of knowledge deficit (disease process you’ve never heard of)
- Failure to gather, appreciate, or synthesize available data
- Subconscious processing, requires deliberate and conscious effort to avoid (could spend another hour here…)
### Importance of Cognitive Errors
- Harvard study of >30,000 records in which adverse event occurred (Kohn 1999)
  - 20% of these were direct result of misdiagnosis
- Berner et al diagnostic errors prevalence of 15%, perhaps higher in our specialty
- Simulation helps us discover why we do the wrong things even when we “know better”! We see what we actually do instead of what we think we will do.

### Debriefing and “Frames”
- Debriefing (team), or reflective practice (self)
- Ask why
  - Sometimes we do the right things for the wrong reasons, and the positive results reinforce the erroneous thought process.
  - Reveal cognitive errors and knowledge gaps
  - Are we deliberate or careless?
- Eliciting the learner’s “frame” is essential for effective feedback
  - You cannot teach if you don’t know the error
  - True for trainees, but also across specialty domains

### “Frames”
- Unique perspective shaped by:
  - Priorities (medical or personal)
  - Knowledge and experience (or lack thereof!)
  - Assumptions about how things will unfold
- Teaching and effective communication are really processes of “reframing” - changing the frame of your colleague, your trainee, or yourself

Rudolf 2007

### Movie Time!
- **Monsters Inc.**

### Monster’s Possible Frames
- He is stupid
- He is lazy
- He is distracted (personal - fight with wife)
- He is fixated on being very scary
- He is prioritizing his own escape route
- He doesn’t know what he’s supposed to do
- He thinks the open door adds an extra element of “scary”
- He might need backup from the monster world
- What else?

### Recap
- Discussed simulation capabilities and limitations
- Explored the history of simulation training and nontechnical skills
- Brief introduction into concepts of cognitive errors and metacognitive reflective practice
- Let’s play!
Demo Video Clip #1

Induction of Anesthesia

What makes a “good” anesthesiologist?
- Technical skill (are you assuming he is “bad” at intubating?)
- Ability to move along the difficult airway algorithm with timeliness (avoiding fixation, denial, etc)
- Communication (“this patient’s going to die”)
- Resource utilization – get help!

Points for debriefing – solidifies the learning
- Leadership and direction of helpers
  - Communicating urgency of situation in appropriate way
- ASA difficult airway maneuvers
  - What prevented initiation of these in timely manner? (Fixation? Denial? Simulated environment?)
  - Role of fiberoptic bronchoscopy in CICV situation
- Technical skill practice needle cricothyrotomy or perc tracheotomy

Demo Video Clip #2

Help arrives

Demo Video Clip #3

UCLA Team Training
Wrap Up

- Introduction to simulation capabilities and a taste of the experience
- Brief discussion of theories:
  - Cognitive errors
  - Situation awareness
  - CRM/ANTS
  - Debriefing and reflective practice
- Clips as illustrations of the above

Tip of the Iceberg!

- Communication techniques (SBAR, 2-Challenge Rule, Advocacy/Inquiry, etc)
- Cognitive errors and “de-biasing” strategies
- Simulation scenario scripting and design
- Instructor training
- “In-situ” simulation
- On and on…

References

- Berner ES. Overconfidence as a cause of diagnostic error in medicine. American Journal of Medicine. 2008; 121(5A) S2-23

References


References

- Michele Groves, Peter O’Rourke & Heather Alexander. The clinical reasoning characteristics of diagnostic experts. Medical Teacher, Vol. 25, No. 3, May 2003, pp. 308–313