The Intersection of Ethics, Education, and Simulation: Exploring Difficult Issues

Aaron W. Calhoun, MD
Chair, SSIH Research Committee
Associate Editor, Simulation in Healthcare
Director, SPARC Program
An Invitation to a Nerd Fight...
Outline

• Emerging Ethical Issues in Simulation
• Death of a Simulator: Help or Hindrance to Learning
• Deception as an Educational Methodology: Is It Always (or Ever) Wrong?
Disclosures

• Aaron W. Calhoun- Co-investigator on Health Resources and Services Administration (HRSA) targeted issues grant
“In simulation, you get to play with people’s minds for a good cause...”

– Are there limits?
– What are they?
– How do we make good decisions?

Currently facing several ethical issues without clear answer
• Death in Simulation?
  – Is it appropriate?
  – If so, when and with whom?
• Deception in Simulation?
  – Is it appropriate?
  – If so, when and with whom?
• These questions are currently generating a great deal of discussion in the simulation community
Death in Simulation, an Ongoing Debate
What is Death, Exactly?

• Sounds like an odd question, but there are many ways a mannequin can die...

• Leighton’s Taxonomy
  – **Expected Death**- Both facilitators and learners are aware the mannequin will die
  – **Unexpected Death** - Facilitators know but learners do not
  – **Death due to Action or Inaction**- Completely unplanned. Facilitators decide to let mannequin die based on learner actions

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Simulated Death: What We Know

• Adding Emotional Stressors to Training in Simulated Cardiopulmonary Arrest Enhances Participant Performance.
  – 25 student volunteers randomly assigned to control vs intervention
  – Actors scripted to add stress to cardiac arrest scenario for “intervention” group
  – Adding emotional stressors to simulation enhanced learner anxiety (measured by max heart rate [120 vs 95] and State Anxiety Inventory scores [35 vs 28], tool range 20-80)
  – Added stress also improved practical competency scores (32.5/40 vs 25/40) six months later

Simulated Death: What We Know

- The Impact of Simulated Patient Death on Medical Students’ Stress Response and Learning of ACLS
  - 26 students participating in an AHA ACLS course
  - Students then engaged in a high-fidelity simulation scenario randomized to death vs survival conditions
  - 6 month follow-up simulation in which ACLS skills were assessed
  - All participants had higher heart rate (32 bpm diff), DHEA (97 pg/ml diff), and salivary cortisol (0.115 ug/ml diff)
  - Heart rate significantly higher in death group (29.2 bpm diff)
  - No difference in skill at 6 months

• Death During Simulation Training: Feedback from Trainees
  – 63 physicians and 175 air medical team members completed QI surveys regarding their perceptions of death in the simulated environment
  – Participants in simulations with unexpected death did not find it distracting
  – Participants expected the simulator to die if this was an appropriate outcome
  – Participants strongly disagreed that students should be exempt from simulated death
  – Participants did not feel that it would generate reluctance to engage in future activities

Trainee Perspectives on Manikin Death During Mock Codes

- 62 pediatric trainees surveyed regarding mock code participation
- 59 (95%) survey return rate, 42% of which had witnessed a death during a simulation
- Trainees found it rare and unexpected when the mannequin died, equating it with inadequate resuscitation
- Trainees found mannequin death to be a significant stressor, but thought it beneficial
- Trainees did not think a “death disclosure” prior to the sim as needed

Simulated Death: What We Know

- Death of a Manikin: Adverse Effect on Learning and Mechanisms
  - Prospective intervention on 116 medical students
  - Random allocation to “death” or “no death” groups
  - More emotional stress and sadness measured immediately after the session
  - Higher cognitive load measured immediately after the session (7.63/9 vs 7.25/9)
  - 3 months later, students in the “death” group were less likely to navigate a similar situation successfully (70.9% vs 86.9%)

Simulated Death: What We Know

- The Emotional and Cognitive Impact of Unexpected Simulated Patient Death
  - Further data derived from same study
  - Odds ratio of 0.37 (95% CI, 0.14-0.95) of being rated “competent” at the follow-up simulation for those exposed to mannequin death

Simulated Death: What we know

• First, Do No Harm: Using Simulated Patient Death to Enhance Learning
  – Letter to the editor regarding DeMaria study
  – Concerned that some of the data from that study (particularly comments from nurses referring blame for the “death” to the physicians) indicated erosion of the collaborative environment
  – Expresses concern that simulated death is often not grounded in sound ethical principles that promote non-punitive educational cultures and inter-professional collaboration
  – Advised that simulated death only occur when it is an explicit part of the learning goals

Simulated Death

- Studies address different (perhaps unrelated) questions
- Results not easy to correlate
- What needs to be done to unify our approach?
The Importance of Theoretical Frameworks

• Not only is there limited data, there is no uniformly accepted way to approach the issue
• Theoretical frameworks help us organize our data and our questions about the data, allowing us to arrive at more consistent answers
A Qualitative Research Study...

Focus groups composed of fellows, residents, and nurses that had experienced simulated death

Transcripts were analyzed by 3 coders

Triangulated using a grounded theory approach to generate a list of relevant themes

Survey electronically distributed to all fellows, residents, nurses, and RTs

Survey was generated using framework

Themes organized into a framework depicting relationships

Survey analyzed using mixed methods approach

Results used to modify the theoretical framework

Results used to modify the theoretical framework
Themes from Our Learners

1. Learner preparation and suspension of disbelief during simulation
2. Differences in emotional response between real and simulated death
3. Effects of simulated death on future emotional engagement with learning activities
4. Learner self-perception and perception by team regarding deficits
5. Impact of debriefing on emotive response to the simulation
6. Impact of debriefing on learner knowledge and skills
7. Knowledge retention and practice changes caused by mannequin death
A Pilot Model of the Effect of Mannequin Death Due to Learner Action or Inaction on the Learner’s Educational Experience

1: Learner Preparation and Suspension of Disbelief
2: Differences in Emotional Response between Real and Simulated Death
3: Effect of Simulated Death on Future Emotional Engagement in Learning Activities
4: Learner Self-perception and Perception by Team Regarding Knowledge and Skill Deficits
5: Impact of Debriefing on Emotive Response to the Simulation
6: Impact of Debriefing the Knowledge and Skills Learned During the Simulation
7: Effect of Mannequin Death on Knowledge Retention and Practice Change

<table>
<thead>
<tr>
<th>Theme:</th>
<th>Study:</th>
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<tbody>
<tr>
<td>2: Differences in Emotional Response Between Real and Simulated Death</td>
<td>• Nickerson M, et al. Simulation Philosophy and Practice: Simulator Patient Death vs Survival</td>
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<td>• Phrampus P, et al. Perceptions of Experiencing Simulated Death</td>
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<td>7: Perceived Effect of Mannequin Death in Knowledge Retention and Practice Changes</td>
<td>• Fraser K, et al. Death of a Manikin: Adverse Effect on Learning and Mechanisms</td>
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<td>• De Maria S, et al. Adding emotional stressors to training in simulated cardiopulmonary arrest enhances participant performance</td>
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• Parallel study conducted at Lurie Children’s Hospital
• Educational philosophy excluding mannequin death due to action or inaction
• External rescue provided in all cases where this otherwise would occur
• After a friendly debate at the simulation conference...
• Similar qualitative methodology
• 3 physician and 3 nurse focus groups
• Essentially confirmed themes
• Additional theme noted...
  – Effect of actions used to mitigate death on perceptions of fidelity
• This theme could only have arisen at a center where mannequin death is prevented
• Model modified to include additional theme as well as implied decision point
Final Model of the Effect of Mannequin Death Due to Learner Action or Inaction on the Learner’s Educational Experience

1: Learner Preparation and Suspension of Disbelief
2: Differences in Emotional Response between Real and Simulated Death
3: Effect of Simulated Death on Future Emotional Engagement in Learning Activities
4A: Learner Self-perception and Perception by Team Regarding Knowledge and Skill Deficits
4B: Effect of Actions Used to Mitigate Death on Perceptions of Fidelity
5: Impact of Debriefing on Emotive Response to the Simulation
6: Impact of Debriefing the Knowledge and Skills Learned During the Simulation
7: Effect of Mannequin Death on Knowledge Retention and Practice Change

Learner Experience and Knowledge from Previous Simulation Sessions
Learner Reaction to Subsequent Simulation Sessions
Mannequin Death: Contributing Factors

- Effect of stress on learning
- Effect of fidelity on learning
- Effect of fidelity on future expectations
- Role of learner experience
Stress: The Yerkes-Dodd Relationship

Yerkes et al. The Relation of Strength of Stimulus to Rapidity of Habit Formation. Journal of Comparative Neurology and Psychology. 18:459–482
Fidelity

High Performance

Low Performance

No Cases End in Death

1:1 Correlation with Learner Action

All Cases End in Death
Effect on Future Expectations

- In practice, our actions (even when technically correct) do not always result in survival.
- Does a 1:1 correlation between student actions and survival give a false impression to students?
- Does a 1:1 correlation augment future psychological stress by causing learners to invariably equate death and failure?

Some Current Data

- SPARC Simulation Program routinely allows for mannequin death due to action or inaction
- International Simulation Data Registry (ISDR) queried for all SPARC Program deaths
- 41/242 (17%) simulated cardiac arrests in SPARC Program end in death
- 30% average rate of death during pediatric resuscitation (1.7x greater)

Effect on Future Expectations

Is a more “realistic” death rate better long term?

- No Cases End in Death
- 1:1 Correlation with Learner Action
- All Cases End in Death
• Experience level of the learner/learner group may have opposite effect
• While the data is mixed, many suggest that death due to action or inaction should be avoided at the undergraduate level

Effect of Experience

Is a more “forgiving” approach needed for the less experienced?

High Performance

Low Performance

No Cases End in Death

1:1 Correlation with Learner Action

All Cases End in Death
The Final Equation...

\[(Stress) + \int (Experience)(Fidelity) = ?\]

– In the end, the decision is a complex relational calculus

– Like so many things in medicine, the correct answer is probably “it depends...”
• Learner experience and potential psychological after-effects matter when approaching emotionally difficult simulations
• Learners also seem to want to experience the outcome of their actions, especially in a safe environment
• Future Questions:
  – What level of training is appropriate for certain experiences?
  – Is our current global educational culture too protective?
  – What are the long-term positive and negative effects of different types of mannequin death
Deception: Is it Always Wrong?
• Laser Interferometer Gravitational Wave Observatory (LIGO)
• The goal: To detect evidence of gravitational waves
• “False positive” signals routinely inserted into system to test instrument and scientists
• Done to mitigate the bias toward confirming a positive signal
• Scientists being “deceived”...

Collins H.  Gravity’s Kiss. MIT Press 2017
• Las Vegas Police investigation of the killing of 2 homeless men
• Mannequin placed at location of murders as decoy
• Feb 23 at 3am: Suspect approached the scene and struck mannequin’s head repeatedly with a hammer concealed within a pizza box
• Subsequently arrested for carrying a concealed weapon
• Cannot, of course, make murder accusation

http://ktla.com/2017/03/07/to-catch-thrill-killer-vegas-cops-set-up-sleeping-mannequin/
A simulated six year old patient with a history of renal failure by the name of Rodney Smith is admitted to the ICU for frequent PVC’s.

He was initially brought to the ED with a new complaint of chest pain and “racing heart” that began four hours ago.

According to the family he has missed his last several peritoneal dialysis passes due to equipment malfunction.

Suddenly the patient develops pulseless ventricular tachycardia and CPR is initiated.

Call from ED to learner group immediately thereafter revealing a serum potassium of 12.
The Confederate

- Dr. Mark McDonald arrives
- Intensivist, Norton Children’s Hospital Medical Director
- Double agent!
- Dr. McDonald orders a potassium phosphate bolus
- Resident and nurse confirm and administer it
- Patient becomes asystolic...
The Double Agent...

? =

The Mastermind...
Is This Unethical?

• Goal of the case laudable: teaching how to appropriately challenge hierarchy
• A legitimate clinical issue
• The deception was needed to create realism
• But was it really?
• Though this may seem self-evident, some medical ethicists disagree
• Currently the focus of an ongoing debate in the simulation community
What Constitutes Deception?

Examples of Deception in Simulation

- Simulation faculty intentionally place faulty equipment within the simulated environment in a way that would be unexpected to learners.
- A confederate from outside the learner group joins the team during a simulation and intentionally makes inappropriate medical decisions during the case.
- The outcome of the simulated case is intentionally decoupled from the actions of the learner group in a way that is inconsistent with the ground rules of the case.
Simulation faculty intentionally place faulty equipment within the simulated environment in a way that would be unexpected to learners.

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Deception in Simulation: What Do We Know?
Deception in Simulation: What Do We Know?

- Very little literature arising from the medical education community
- Most valuable information comes from the field of psychology
- Significant focus on the role that deception has played in past psychological research
  - The “infamous” Milgram Experiment
  - The Stanford Prison Experiment
The Milgram Experiment

- 1961- Yale psychologist Stanley Milgram began a “study” of the effects of pain on memory
- Recruited volunteers who then were asked to administer electric shocks to learners when told by a proctor
- Shocks quickly escalated by proctor to potentially lethal voltages
- In reality, Milgram was studying volunteer obedience...

Distinctions in Deception

- Deception “Within” vs Deception “About

Mutually Acceptable Educational Purpose

Deception Within

Another, Undisclosed Purpose

• Deception “Within” vs Deception “About"

Mutually Acceptable Educational Purpose

Deception Within

Another, Undisclosed Purpose

An Approach...

- Answer to the question is multifactorial
- Learner, Faculty, Educational Material, and Institutional Environment are all potential factors
- Perhaps more significantly, the relationship between these factors is also important...
An Example

- A resident learner enters a simulation in which deception is employed
- Both the resident and the session faculty have adequate experience to engage in the emotionally challenging situation
- But... the resident and faculty also just had a particularly negative interaction on rounds that morning
- The use of deception may not be wise in this circumstance
A Framework For Emotionally Difficult Simulations

Practical Implications

• Again, learner experience matters, as do the potential psychological after-effects

• No man or woman is an island

• Education is fundamentally relational, and our relationships with our learners is a significant factor in the effectiveness of our training

• The ultimate answer on the question of deception’s legitimacy is likely to be “it depends”
• Currently designing a mixed methods study intended to explore the usage of deception within the simulation community
  – Range of definitions
  – Spectrum of approaches
  – Decision making process regarding use

• Ultimate goal is to create a more robust foundation for future research
Summary

• Mannequin Death due to Action or Inaction and the role of deceptive techniques are current areas of ethical debate in the simulation community

• While some data exists regarding mannequin death, there is little published regarding deception

• Answers will not be simple, and likely depend on individual learner and faculty experience and relationships

• More work is needed...
Questions