

# Simulation Teaching: pros and cons

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# Disclosures



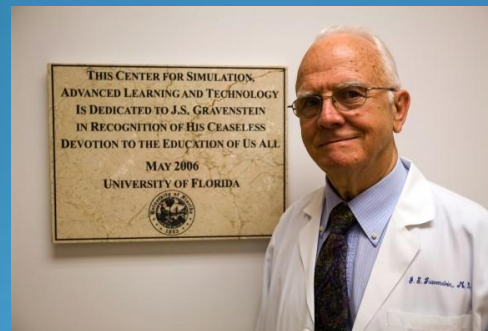
- Wish I had something to disclose

# Objectives:

- History of simulation in medicine
- Review of simulation use in medicine
- What works
- What doesn't work
- How to use it
- Future

# History

- Airway and CPR simulator by Safar and Lind in 1950
- Computer controlled simulator by Abrahamson 1960s
- Realistic mannequin simulation in 1980s (U Florida – Good and Gravenstein, Stanford – Gaba)



- Full scale simulators for crisis resource training of OR team by Schaefer in 1980s

# Types of Simulators

- **Demonstration**
- **Screen based video game**
- **Partial-task trainer**
- **Full environment simulators**

# Demonstration



# Screen based video game



The screenshot shows a medical simulation software interface titled "Body Simulation for Arrhythmia". The main window displays a patient's chest with an ECG monitor showing a heart rate of 71. The interface includes various panels for patient information, drug selection, and vital signs.

**ECG Monitor:**

- Heart Rate: 71
- BP: 105 / 74
- SpO2: 106 / 74 (83)
- Respiratory Rate: 18 / 7 (11)

**Drug Selection Dialog:**

Select Drug from Desired Category:

Neurovascular Blocking Cardiovascular A	Heterogeneous Cardiovascular B	Test Drugs Induction	Bronchodilation Narcotic
ADENOSINE	BRETYLIUM	CALCIUM CHLORIDE	DIGOXIN
BETAZOLAN	EPINEPHRINE	EPINEPHRINE	ESMOLOL
LISETILOL	LIDOCAINE	METOPROLOL	NEBUPROLOL
PHENYLEPHRINE	PHENYLEPHRINE	PROPRANOLOL	PROPRANOLOL
SOEVA BILORONAZI	VERAPAMIL		

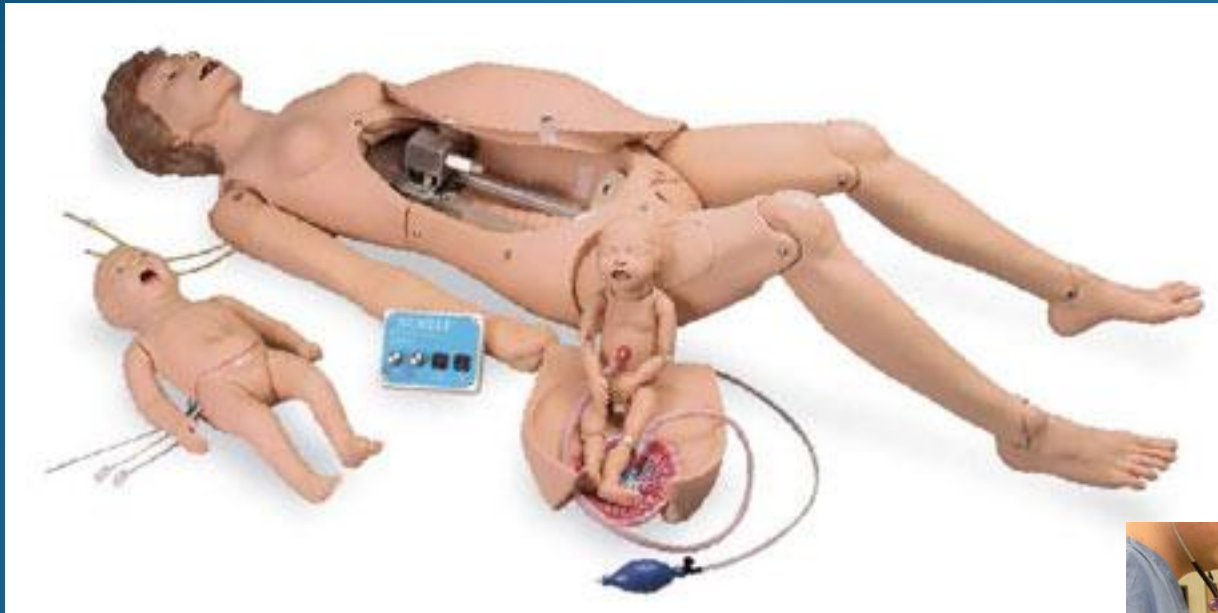
**Vital Signs and Settings:**

- Total Volume (liters): 0.4
- Resp Rate (bpm): 12
- PEEP (cmH2O): 5
- PopOff Pres (cmH2O): 0
- I:E Ratio: 1:3
- Control Pressure (cmH2O): 0
- Ventilator status: OFF

# Partial task trainer



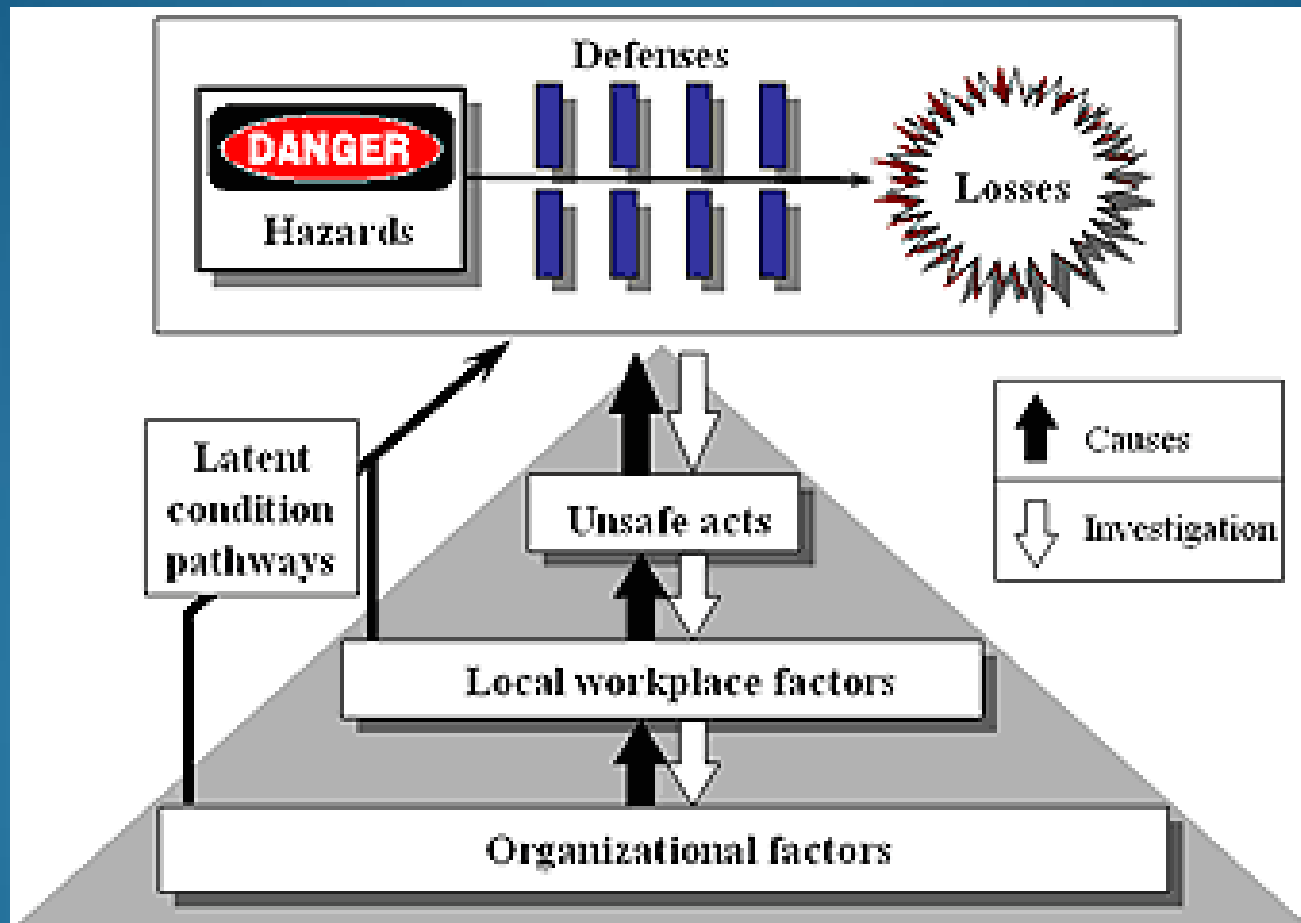
# Full environment simulator



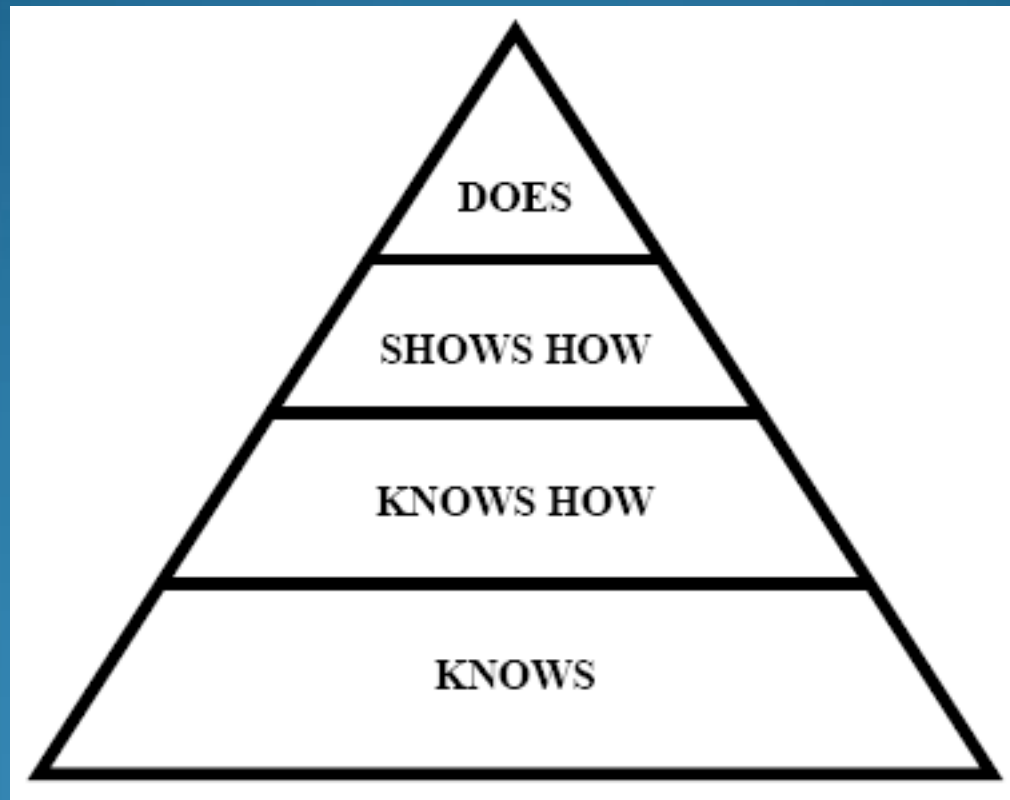
# What does simulation offer

- Medium for skill instruction
- Relevant, active learning and feedback
- Safe environment
- Ideal for promoting teamwork and communication
- Works for assessment of interpersonal communication and task manager
- Works for consolidation of knowledge

# Swiss cheese model



# Miller Pyramid



# Domains of Learning

- Cognitive (knowledge, comprehension, application, analysis, synthesis, evaluation)
- Psychomotor (perception, set, guided response, mechanism, complex overt response, adaptation, origination)
- Attitude (receiving, responding, valuing, organizing, internalizing)

# Type of learner

## ADULTS:

- Need to know why they are learning
- Problem solving
- Consider background
- Active participation

# Clinical skill learning

## Integration of:

Problem solving

Communication skills

Technical skills

Complex medical context

**E**

**X**

**P**

**E**

**R**

**T**

## 4 conditions:

Repetition

Assessment

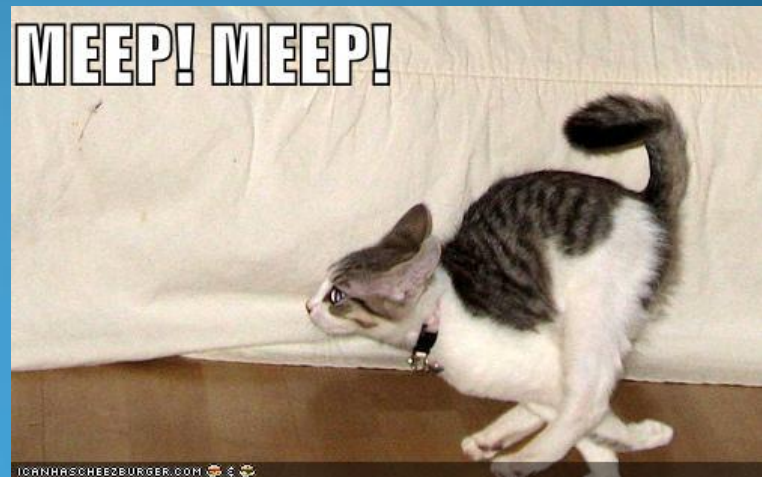
Feedback

↑ Performance

**REQUIRES PRACTICE**

# Pros

- Increases self-efficacy
- Increases competency
- Improves operational performance

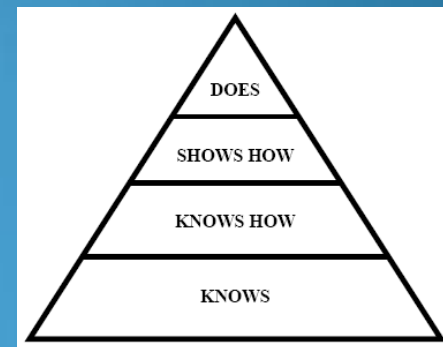


# How does it work

- Concrete experience
- Observation and reflection
- Abstract concept formation
- Active experimentation (generalizations tested, new hypothesis formed)



- Simulation
- Debriefing
- Time to think
- Practice



# Use

- Training of emergencies
- Teamwork
- Skill training for novices
- Error discussion without punishment
- New procedure testing, new device testing
- Evaluation of competence
- Investigation of human performance

# Two sides to the story

**kittehs help wif science**

**convex kitteh**

**concave kitteh**

# Cons

- Costly
- Need educators who now how to use simulation

**GOAL – IMPROVE PATIENT SAFETY !!!**



- For now no evidence of improved patient safety

# Example of simulation

1. Choose a topic
2. Determine the learner **need**, department need, hospital need
3. Define **goals and objectives**
4. Design a learning experience
5. Define how **feedback** will be provided
6. Define learner **assessment**
7. Define program evaluation process
8. Use program feedback to redesign learning experience

# Topic

- Citrate toxicity during apheresis platelet donation

# Define the need

- Donors are volunteers – safety needs to be assured
- Who – residents have limited clinical experience with citrate toxicity; citrate toxicity can cause life-threatening complications
- When – during their introductory lecture series
- How – high fidelity simulation
- Why – residents have to be able to manage citrate toxicity

# G/O

- **Goals – management of citrate toxicity**
- **Objectives: (at the end of the learning experience the learner will be able to...)**

**ACGME competency based**

# Objectives

- Medical Knowledge
- Patient Care
- Professionalism
- ICS
- PBLI
- SBP

# Learning experience

- Patient description (H&P, what happens, scenario narrative)
- Equipment description (all necessary material)
- Personnel equipment (define what different participants/helpers will do)

# Feedback

- **Formative** – intended to modify learner thinking/behavior; should be nonevaluative, supportive, timely, specific
- **Summative** – evaluation of student learning over a longer period of time (overall picture)

# Learner Assessment

- **Formative** – ongoing process to monitor student's progress
- **Summative** – at the end of an instructional unit the student's learning is evaluated (a midterm exam, a final project, a paper)

# Course Assessment

- To improve
- To inform
- To prove
- To support
  
- Survey

# Conclusions

- Variety of simulation options available
- Useful for clinical skills training, communication training, crisis resource management
- Safe environment
- Repetition
- Increases self-efficacy, competency, operational performance
- Waiting for studies that show transfer to patient safety

# Correction to disclosures

I like cats!

# Thank you!

