

To Error is  
Human...

# Improving Patient Safety Through Use of Medical Simulation

Kyla Carney, MS, DO

William Case, MPAS, PA-C

Greg Kolbinger, MPAS, PA-C

# Objectives

- (1) Discuss the history of human simulation and its use in medical curriculums
- (2) Discuss The Iowa Simulation Center for Patient Safety and Clinical Skills at Des Moines University and the current program for students
- (3) Provide opportunity to discuss simulation and patient safety in small and large groups
  - (1) Starting a program
  - (2) Task/procedure training
  - (3) Competency training
  - (4) Teamwork training
  - (5) Barriers to Patient safety
  - (6) Debriefing
  - (7) Future areas of research
- (4) Provide an opportunity for participants to explore the use of a simulator

# Why simulation

- Simulation based training is a prerequisite for all high-reliability organizations

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- Remains a niche player in medical education

BMJ 336 May 2008

# The argument for simulation

- Utilize the time we have wisely
- Learning needs of trainee are subordinate to clinical needs of the patient

# Types of simulation technology

- (1) Mannequin based
- (2) Partial or complex task trainers
- (3) Screen-based computer simulators
- (4) Standardized patients
- (5) Virtual reality

# History of Simulation

- 1959-Marx et. al. described use of a cardiovascular simulator
- 1960's Resusci-Anne is used for training in mouth to mouth ventilation
- 1960's Denson and Abrahamson develop the first mannequin-based system called Sim One

# History of Simulation

- 1968 Harvey cardiology mannequin
- 1980's Gaba and DeAnda create an anesthesia simulation
- Late 1980's procedure simulators gain recognition
- Significant growth has been seen

# Iowa Simulation Center for Patient Safety and Clinical Skills

- Consists of 3 programs
  - Des Moines University Simulation Lab
  - Standardized Performance Assessment Lab
  - Des Moines University Surgery Skills Center

# Des Moines University Surgery Skills Center

- The Basic Surgical Skills Course
  - 2<sup>nd</sup> year class
  - Emphasizes the fundamentals of basic aseptic technique theory and applications of clinical practice.
  - students are introduced to
    - suturing
    - knot-tying
    - surgical instrumentation
    - donning surgical gown and gloves
    - dissection
    - intravenous insertion practice
    - other clinical/surgical procedures and equipment.



# Des Moines University Surgery Skills Center

- Facility
  - 2 large simulated operating room suites with multiple stations and laparoscopic equipment
  - 8 scrub sinks
  - men's and women's locker rooms
  - physician lounge
  - two large didactic rooms with surgical models
  - a computer lab
  - a conference room

# SPAL

- The Standardized Performance Assessment Lab ( SPAL)
  - Simulated clinical setting
  - Allows students to develop and refine their communication skills
  - Work with actors trained to portray actual medical cases.
  - Students gain valuable feedback from self appraisal, clinicians, and standardized patients

# SPAL

- Facility:
  - 12 examination rooms with video and audio capabilities
  - Direct observation through one-way glass
- Computer room for computer based exams
- 2 conference rooms
- Currently SPAL provides:
  - 4 First Year DO SPAL encounters
  - 10 Second Year DO SPAL
  - 3 Third Year DO SPAL encounters
- Faculty either directly observe the student or grade their handwritten notes



# Des Moines University Simulation Lab

- A group of human medical simulators help students learn to care for more critically ill "patients."
- These life-like mannequins have heart, lung, and bowel sounds which can be programmed to be normal or abnormal.
- Students can do various procedures

# Des Moines University Simulation Lab

- Facility
  - Three Simulation Rooms equipped with video and sound capability
  - Simulation rooms are set up similar to emergency rooms
  - 2 Debriefing rooms
  - 5 Sophisticated full body human simulators including:
    - 2 adult
    - 1 child
    - 1 infant
    - 1 obstetric model
  - Multiple small task simulators



# Simulation Lab

1<sup>st</sup> year DO elective Simulation

2<sup>nd</sup> year DO 8 two hour full simulation labs

1 Normal labor and Delivery and Newborn  
resuscitation procedure lab

Staff- tech support, nursing, physician  
assistants, primary care physicians, and  
subspecialty care physicians

# Types of Scenerios

- Simple to complex
  - OB/GYN, Pediatrics, Internal Medicine, Surgical
  - Office and Emergency Setting
  - Introduction
  - Teams of 5 students are set up
  - Scenerio
  - In room tech support
  - Attending and consultants present
  - SP's may be utilized to teach compassionate care
  - Debriefing

# DISCUSSION: Getting Started

- Where is your organization at with use of simulation as a teaching tool?
- What barriers do you see in implementing a simulation program?
- Where do you feel simulation best fits into the medical school curriculum?

# Patient Safety

# Patient Safety

- National Patient Safety Foundation
- Patient Safety Defined: “the avoidance, prevention, amelioration of adverse outcomes or injuries stemming from the processes of healthcare”.
  - Errors
  - Deviations
  - Accidents
  - Safety emerges from the interaction of the components of the system; it does not reside in a person, device, or department. Improving safety depends on learning how safety emerges from interactions of the components.

# Should we teach about patient safety?

- In an article in *Academic Medicine* Halbach et al. addresses the need for medical schools to integrate patient safety issues into their curriculum
- Their 4 hour curriculum run by family doctors and required by 3<sup>rd</sup> and 4<sup>th</sup> year students resulted in a reported increase in confidence in dealing with errors

# An argument for early training

- Gastroenterology fellows
- Randomized, controlled, blinded
- 10 hours of colonoscopy simulator training vs 0
- Simulator trained fellows had greater objective competency in the first 80 procedures than those without training.
- Only seen in early phase of training – both groups needed to do about 160 procedures to reach 90% competence

# Patient Safety: Task Training

# Procedural skills and patient safety

- Changes in resident hour restrictions
- Simulation may help
- Two prospective trials demonstrated that residents who were trained on low-fidelity models make fewer intraoperative errors when performing a laparoscopic cholecystectomy than do residents who have not had the benefit of simulation training.

# Procedural skills

- A randomized controlled double blind trial found that residents trained using a virtual reality trainer were 29% faster in gallbladder dissection.
- 5x less likely to injure the gallbladder or burn nontarget tissue than residents trained using standard methods.

# The argument for safety

- An evidence based approach
  - One study showed paramedic students trained on simulator vs those trained in operating room- equally able to intubate
  - Another showed improved adherence to safety concerns in pediatric sedation
  - A study showed 4<sup>th</sup> years students perform better in simulated scenarios after training on a simulator than students who participated in problem-based learning sessions
  - Simulation experience was also shown to dramatically increased the skills of residents in ACLS scenerios.

# Procedural Skills

- High fidelity endovascular procedure simulators are now available
- Early research experience shows
  - Simulation is well accepted by trainees
  - Performance improves with practice
  - Simulation prior to first performing procedures can improve clinical performance
- FDA recently recommended virtual reality simulation as an integral part of a training package for carotid artery stenting.

# Patient Safety and task training

- What ways are you currently using simulation to task train?
- How are students assessed for their expertise in the task?
- How/should students be tested for retention?

# Patient Safety and Competence

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# Competence in Medicine

- Competence: The state or quality of being adequately or well qualified
- How do we test it and what methods are best?
- Van der Vleuten describes criteria for determining usefulness of a method of assessment
  - Reliability
  - Validity
  - Impact on future learning and practice
  - Acceptability
  - Costs

# Methods for testing competence

- Written exercises
- Assessments by supervising clinicians
- Multisource assessments- peer, patient, self
- Clinical Simulations
  - Standardized patients
  - High technology simulations
    - Benefits:
    - Drawbacks:

# Competencies

- Both the American Osteopathic Association (AOA) and the Accreditation Council for Graduate Medical Education (ACGME) developed core competencies for medical education
- Shifts medical education away from process oriented focus to outcome oriented measures

# Competencies

## ACGME

1. Medical knowledge
2. Patient care
3. Professionalism
4. Communication and interpersonal skills
5. Practice-based learning and improvement
6. Systems-based practice

## AOA

- Medical knowledge
  - Patient care
  - Professionalism
  - Interpersonal or communication skills
  - Practice-based learning
  - Systems-based practice
  - osteopathic philosophy and osteopathic manipulative medicine
- Health Aff 21:5 2002  
JAOA 105: 9 September 2005

# Discussion: Competencies

- Reviewing the AOA, ACGME competencies
  1. Medical knowledge
  2. Patient care
  3. Professionalism
  4. Communication and interpersonal skills
  5. Practice-based learning and improvement
  6. Systems-based practice
  7. Osteopathic Philosophy
- How can simulation help identify competent behavior?
- Can we use simulation to produce more competent physicians?
- What competencies are best assessed during simulation-based assessment?
- Can simulation be used to diagnose performance problems in task training and otherwise?
- Can simulation be an effective tool in remediating students?

Acad Emerg Med 15:971-977 2008

Health Aff 21:5 2002

JAOA 105: 9 September 2005

**Medicine is a Team Sport**

# A Team Approach

- Teamwork failure is a primary threat to patient safety
- A recent joint commission report indicates that communication (a central component of teamwork) is the root cause or nearly 70% of sentinel events
- Important to identify competencies and areas that need improvement in order to address those issues

# Discussion: Teamwork

- What can simulation teach students about teamwork?
- What can simulation teach students about team based strengths and weaknesses?
- What role does simulation have in leadership training?
- How do you measure leadership behaviors?

# Barriers in Medical Care to Patient Safety

# Barriers in medical care to patient safety

- Barriers to patient safety in an acute care unit:
  - Unclear values
  - Fear of punishment for errors
  - Lack of systematic analysis of mistakes
  - Complexity of the work - patients are more acutely ill and stays are short.
  - Poor teamwork

# Review of high risk situations

- Residents in a study participated in a scenerio where an error occurred
- Later they watched one of their fellow team members give a deposition to a lawyer

# Barriers to patient safety

- Consider the barriers to improving patient safety
- How do you view simulation as addressing each issue?
  - Unclear values
  - Fear of punishment for errors
  - Lack of systematic analysis of mistakes
  - Complexity of the work
  - Poor teamwork.

**How do we solidify the patient safety message to our students?**

# Debriefing

- After- action review
- Reflect on individual, team performance
- Usually includes at least 3 stages
  - (1) reactions phase
  - (2) analysis phase
  - (3) summary phase

# Discussion: Debriefing

- What is the optimal teaching/debriefing strategy for simulation cases?
- What makes a good facilitator?
- How do we train facilitators?

# Where can we go from here?

- Possibilities are only limited by us.
- Surgical application- we learn by practice

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- Research Application

Anesth Analg 99:521-7

- Practicing Clinician Training

Academic Emergency Medicine 15:984-987 2008

- On site simulation

Academic emergency medicine 15:1166-1174 2008

# What do you think about.....?

- Does performance on simulated patients accurately reflect care provided to actual patients- how can we research this further?
- How often should practicing physicians be evaluated?
- Should simulation have a role in credentialings?
- What objective methods and measures may be used to demonstrate that simulator training actually improves patient safety?
- Can we use information from error reporting systems to improve simulation training and therefore patient safety?

Questions???

# Simulator – Hands on Practice

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