Simulation in Critical Care Medicine

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Director – VAPHS Surgical ICU
Director – VAPHS ECLS Program
Disclosures

• NONE
Overview

- Education and Simulation
- Task Trainers
- High Fidelity Simulation
- Simulation Integration
Teaching

- Teacher Centered (Traditional approach)
  - Lecture based, dependent upon presenter
  - Learn passively, absorbing concepts / taking notes
  - Outcomes based upon essays and exams
The Teacher as a Manager of Resources

- Develops a curriculum with clear, measurable objectives
- Organizes a variety of learning experiences
- Motivates students to become self-directed learners
- Evaluates student performance
- Provides immediate feedback

Characteristics of Adult Learners

- Self-directed - the teacher acts as a facilitator guiding students to knowledge rather than supplying it.

- Goal oriented - students have predetermined goals and enjoy a curriculum that helps them attain those goals.

Bloom’s Taxonomy
Characteristics of Adult Learners

- Relevancy oriented – learning must be applicable to training them for their jobs
- Respected – in medical education this includes voicing opinions about management and defending their judgement
- Motivated
- Require feedback

Adapted from Malcolm Knowles
Create Educational Objectives

Apply Bloom’s Taxonomy

Utilize Various Teaching Techniques

Evaluate Performance

Give Appropriate and Effective Feedback

New Material

Learning Success!
Developing Educational Objectives

- An objective is a statement of purpose
- They describe specifically what the learner is to learn
- This includes three domains
  - Cognitive – intellect “brain / the knowing”
  - Affective – values “heart / the feeling”
  - Psychomotor – skills “hands / the doing”
Sample Educational Objectives

- Be able to manage unresponsive patients

OR

- Check for pulse immediately, check blood glucose, inquire about opiate use, administer 40ug narcan, provide bag-mask ventilation if airway not protected
Sample Educational Objectives

• Manages respiratory distress

OR

• Check respiratory rate, place pulse oximeter, start 100% non-rebreather, call for rapid response team
Feedback Definition

- Method of controlling a "system" by reinserting into the system the results of its performance
- Providing the learner with specific information about their performance to reinforce or change behavior
- Formative (qualitative feedback)
- Summative (educational outcomes)
Feedback Purpose

- The most powerful teaching tool an instructor has
  - Provides a basis for maintaining or improving performance
  - Provides a mechanism for assessing needs and providing learning experiences
Feedback Timing and Setting

- Established during orientation that feedback will be provided immediately following assessment
- Will be provided daily
- Should be an expected part of the learning experience
Characteristics of Effective Feedback

- Begin with clear, unambiguous, specific, achievable goals
- Inform the learner to expect feedback as part of the educational process
- Base feedback on first hand observation
- Delivered as a two way conversation soliciting the learners comments
- Must be credible to the learner
Characteristics of Effective Feedback

- Base feedback on behavior not interpretations of behavior
- Provide feedback privately
- Provide the learner with the way to succeed
- Do not give positive feedback before giving feedback that is intended to change behavior
Without Feedback

- In surveys one of the most frequently cited deficiencies of an educational program is the lack of feedback
  - Failure to effectively evaluate performance
  - Concern it will lead to an unpleasant emotional response
  - May damage learner-teacher relationship

- Mistakes go uncorrected

- Good performance goes unreinforced

- Students generate their own feedback by attacking importance to unintended clues
“I hear, and I forget
I see, and I remember
I do, and I understand”
-Confucius
Whole Body Simulators

Is an efficient means of teaching a large group of trainees

Allows trainees to experience rare, life-threatening conditions

Allows trainees to make medical errors without harmful consequences to patients

Enables faculty to provide feedback

Permits trainees to repeat performances until educational objectives are mastered
Task Trainers
Central Lines
Peripheral IV / Arterial Lines
Ultrasound Trainer

Viamedix (CAE)  
X-Porte (Sonosite)
Bronch Mentor
Sim-ECMO

Krystal Shaffer, MD
Lillian Emlet, MD
Christopher Brackney, DO
Background

• Gap Analysis
  • Fellows exposed to high volume, reputable, ECMO program
  • Pre-rotation preparation includes written manual and a 3hr on-line lecture series
  • Fellows struggle to identify and treat common ECMO complications

• Purpose
  • Serve as a training tool to educate critical care fellows on how to recognize, diagnose, and treat complications related to ECMO
Setup

Personel

- Perfusionist
- Respiratory Therapist
- Bedside Nurse
- CCM Fellow

Equipment

- Laerdal 3G SimMan
- Ventilator
- Ultrasound
- CPB Machine with tubing
  - Red food coloring
Scenario #1 - Hypovolemic

Learning Objectives

- ID low flow rates/chatter as signs of hypovolemic
- Establish DDX for hypovolemic in setting of ECMO
- Discuss risks benefits of stopping anticoagulation
Scenario #2 Recirculation

Learning Objectives

- Recognize persistant hypoxemia after VV ECMO cannulation and develop an appropriate differential diagnosis for hypoxia while on an ECMO circuit
- Recognize flash on ECMO cannulas and move femoral cannula back to prevent recirculation
- Identify PTX as a complication of ECMO cannula placement
Scenario #3 Obstructive Shock

Learning Objectives

- Correctly identify alarms on the ECMO circuit as indicative of low flow
- Formulate a differential diagnosis for causes of low ECMO flow and hemodynamic deterioration
- Reinforce concepts of diagnosis and treatment of pericardial tamponade
Assessment

- Pre/Post test which mimics CCM board questions
- Post Simulation survey
Sim-Trach

- Kavita Dedhia, MD
- Christopher Brackney, DO
- David Eibling, MD
Horror Stories
Background

- Growing number of hospitalized patients with tracheostomies
- Common procedure performed by: ENT, Thoracic surgery, general surgery, and pulmonary/critical care team
- 2009 study by McGrath: 75% of the 453 incidents associated w/tracheostomy were associated with patient harm
  - 6% required life saving care
  - 15 patients died
- Complications and death associated with laryngectomy patients
- No current training at UPMC
NHS RESOURCES

- National Tracheostomy Safety Project
- Joint NHS project
- Online resources www.tracheostomy.org.uk
  - What is tracheostomy, different types of tubes
  - Surgical procedure
  - Emergency management of tracheostomy and laryngectomy
  - Management of day-today needs of tracheostomy patients
Emergency tracheostomy management - Patent upper airway

Call for airway expert help
Look, listen & feel at the mouth and tracheostomy
A Mapleson C system (e.g. ‘Waters circuit’) may help assessment if available
Use waveform capnography when available: exhaled carbon dioxide indicates a patent or partially patent airway

Is the patient breathing?

Yes

Apply high flow oxygen to BOTH the face and the tracheostomy

No

Call Resuscitation Team
CPR if no pulse / signs of life

Assess tracheostomy patency

Remove speaking valve or cap (if present)
Remove inner tube
Some inner tubes need re-inserting to connect to breathing circuits

Can you pass a suction catheter?

Yes

The tracheostomy tube is patent
Perform tracheal suction
Consider partial obstruction
Ventilate (via tracheostomy) if not breathing
Continue ABCDE assessment

No

Deflate the cuff (if present)
Look, listen & feel at the mouth and tracheostomy
Use waveform capnography or Mapleson C if available

Is the patient stable or improving?

Yes

Tracheostomy tube partially obstructed or displaced
Continue ABCDE assessment

No

REMOVE THE TRACHEOSTOMY TUBE
Look, listen & feel at the mouth and tracheostomy. Ensure oxygen re-applied to face and stoma
Use waveform capnography or Mapleson C if available

Is the patient breathing?

Yes

Continue ABCDE assessment

No

Primary emergency oxygenation

Standard ORAL airway manoeuvres
Cover the stoma (swabs / hand). Use:
Bag-valve-mask
Oral or nasal airway adjuncts
Supraglottic airway device e.g. LMA

Secondary emergency oxygenation

Attempt ORAL intubation
Prepare for difficult intubation
Uncut tube, advanced beyond stoma

Attempt intubation of STOMA
Small tracheostomy tube / 6.0 cuffed ETT
Consider Aintree catheter and fibreoptic ‘scope / Bougie / Airway exchange catheter

Emergency laryngectomy management

Call for airway expert help
Look, listen & feel at the mouth and laryngectomy stoma
A Mapleson C system (e.g. ‘Waters circuit’) may help assessment if available
Use waveform capnography whenever available: exhaled carbon dioxide indicates a patent or partially patent airway

Is the patient breathing?

No
Call Resuscitation Team
CPR if no pulse / signs of life

Yes
Apply high flow oxygen to laryngectomy stoma
If any doubt whether patient has a laryngectomy, apply oxygen to face also*

Assess laryngectomy stoma patency
Most laryngectomy stomas will NOT have a tube in situ

Remove stoma cover (if present)
Remove inner tube (if present)
Some inner tubes need re-inserting to connect to breathing circuits
Do not remove a tracheoesophageal puncture (TEP) prosthesis

Can you pass a suction catheter?

Yes

The laryngectomy stoma is patent
Perform tracheal suction
Consider partial obstruction
Ventilate via stoma if not breathing
Continue ABCDE assessment

No
Deflate the cuff (if present)
Look, listen & feel at the laryngectomy stoma or tube
Use waveform capnography or Mapleson C if available

Is the patient stable or improving?

Yes
Continue ABCDE assessment

No

REMOVE THE TUBE FROM THE LARYNGECTOMY STOMA if present
Look, listen & feel at the laryngectomy stoma. Ensure oxygen is re-applied to stoma
Use waveform capnography or Mapleson C if available

Call Resuscitation Team
CPR if no pulse / signs of life

No

Is the patient breathing?

Yes
Continue ABCDE assessment

Secondary emergency oxygenation
Attempt intubation of laryngectomy stoma
Small tracheostomy tube / 6.0 cuffed ETT
Consider Aintree catheter and fibreoptic scope / Bougie / Airway exchange catheter

Laryngectomy stoma ventilation via either
Paediatric face mask applied to stoma
LMA applied to stoma

Primary emergency oxygenation

Laryngectomy patients have an end stoma and cannot be oxygenated via the mouth or nose
Applying oxygen to the face and stoma is the default emergency action for all patients with a tracheostomy
Targeted LEARNERS

- Critical Care Physicians and Fellows
- Other professionals involved in the care of both tracheostomy and laryngectomy patients
  - Hospitalists
  - ER physicians
  - General surgeons
  - Nurses
  - Respiratory therapists
Pre-course PowerPoint

- Viewed online on own time prior to course

Key Learning Points
- Anatomy of tracheotomy, laryngectomy
- Role of different types of trach tubes
  - Cuffed vs uncuffed
  - Inner cannula vs no inner canula
  - Fenestrated vs non fenestrated
  - Normal vs extended length
    - proximal vs distal
- Manufacturers, sizing of tubes
- Plugging, decannulation, speaking valve use
- Tracheostomy complications
- Difficult tracheostomy/laryngectomy algorithm
  - Management of trach displacement
  - DO NOT INTUBATE LARYNGECTOMY PATIENT
  - Know when to intubate!
Course Components

- Examine multiple different tracheostomy tubes
- Practice intubating using surgical laryngoscope
  - Fellows already familiar with standard scopes and Glide Scope
- High fidelity scenarios
  - Displaced tracheostomy
  - Plugged laryngectomy tube
HIGH FIDELITY Simulation Scenarios

- **Displaced Tracheostomy tube scenario**
  - Tube occluded with tape, slipped under chest flap
    - Airway blocked with tape to make reinsertion difficult
    - May leave small aperture if goal is reinsertion
  - Patient wheezing, coughing, desating
  - Goal is to recognize tube not in airway
    - Secure airway by bag-mask and intubation
  - If bag trach, sats will crash in 1 minute due to pneumothorax

- **Laryngectomy scenario**
  - Plugged laryngectomy tube (use Gorilla glue)
  - Tape over larynx, set tongue to maximum pressure
  - Patient wheezing, coughing, desating
  - Goal is to recognize and remove laryngectomy tube
  - If Attempted oral intubation will crash immediately
Scenario Video
Post-Course Survey

- Administered 8 months following course
- All respondents strongly positive
- All had encountered similar event in 8 months
  - All thought useful in addressing event
- All thought scenarios most useful part.
• Course was incredibly helpful!
• This course is very pertinent and useful.
• Understanding how to trouble shoot new trachs and why to prefer intubation in those case
• Never before knew the difference between a Shiley, Bivona, etc. tubes
• Overall, a very helpful course. Also, appropriate length/depth.
• Other comments? None... just that we need more training like this
SAVE-ME
Mechanical Ventilator Simulator

John Hotchkiss, MD
Chris Brackney, DO
SAVE-ME tool comprises

• Simulation model
  Non-linear, multicompartment mechanics and gas exchange modules
  Acid/base and hemodynamic modules

• Dynamically responsive virtual patient population
  COPD, asthma, acute lung injury, restriction, pneumonia
  Represent major categories of acute respiratory failure

• Modules providing real-time learner debriefing
  Conventional metrics
  Metrics based on practice patterns

• Algorithms providing real-time learner guidance
  “At this point in time, your patient has the following problems”
  “At this time, you should consider these changes for your patient”
Initial presentation of standardized patient case

**Mode (1=VCV, 2=PCV)**

- **Tidal volume, L**: 0.3
- **PEEP**: 10
- **Peak inspiratory flow rate, lpm**: 60
- **Frequency**: 20
- **Inspiratory pause duration, s**: 0
- **Inspired fraction of oxygen, %**: 40

**GOALS**

- **Minimum saturation**: 90
- **Minimum pH**: 7.25
- **Maximum pH**: 7.45
- **Maximum Pplateau**: 30
- **Minimum mean arterial pressure**: 65

**Outcomes from your settings**

- **Machine tidal volume**: 0.3
- **Measured minute ventilation**: 6.0
- **Peak Airway Pressure**: 31.0
- **Mean Airway Pressure**: 14.0
- **I/E ratio**: 0.3
- **Plateau pressure**: 28.0
- **End expiratory pressure**: 10.0

- **Push to run simulation with new inputs**
- **Push to administer fluid bolus**

**Push to generate new patient simulation when starting or if targeted outcomes are satisfied**

**Push to generate new patient simulation if unable to attain targeted outcomes**

**Arterial Sat, %  PaO2  pH  PaCO2  cHCO3**

- **Blood gas data**: 87  56  7.24  67  27
- **Mean arterial pressure**: 60

**YOUR PATIENTS OXYGEN SATURATION IS**

- Too low

**YOUR PATIENTS BLOOD PRESSURE IS**

- Too low

**YOUR PATIENTS PLATEAU PRESSURE IS**

- Acceptable

**YOUR PATIENTS PH IS**

- Too low

**YOUR PATIENTS MIXED VENOUS OXYGEN SATURATION IS LOW**
Oops– bad choice

**Mode** (1=VCV, 2=PCV)
1

- **Push to change ventilator mode**
  - Tidal volume, L: 0.35
  - PEEP: 10
  - Peak inspiratory flow rate, lpm: 60
  - Frequency: 40
  - Inspiratory pause duration, s: 0
  - Inspired fraction of oxygen, %: 40

**Outcomes from your settings**
- Machine tidal volume: 0.4
- Measured minute ventilation: 14.0
- Peak Airway Pressure: 26.0
- Mean Airway Pressure: 18.0
- I/E ratio: 0.9
- Plateau pressure: 25.0
- End expiratory pressure: 11.0

**Push to run simulation with new inputs**

**Push to administer fluid bolus**

**GOALS**
- Minimum saturation: 90
- Minimum pH: 7.25
- Maximum pH: 7.45
- Maximum Pplateau: 30
- Minimum mean arterial pressure: 65

**Push to completely reset tool**

- **Push to generate new patient simulation when starting or if targeted outcomes are satisfied**
  - Arterial Sat,%: 94
  - PaO2: 77
  - pH: 7.28
  - PaCO2: 44
  - cHCO3: 20

**Push to generate new patient simulation if unable to attain targeted outcomes**
- Blood gas data: Acceptable
- Mean arterial pressure: Acceptable
- Your patients oxygen saturation is: Acceptable
- Your patients blood pressure is: Acceptable
- Your patients plateau pressure is: Acceptable
- Your patients ph is: Acceptable
- Your patients mixed venous oxygen saturation is low
Interventions have corrected pH

<table>
<thead>
<tr>
<th>Mode (1 = VCV; 2 = PCV)</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push to change ventilator mode</td>
<td></td>
</tr>
<tr>
<td>Tidal volume, L</td>
<td>0.35</td>
</tr>
<tr>
<td>PEEP</td>
<td>10</td>
</tr>
<tr>
<td>Peak inspiratory flow rate, lpm</td>
<td>60</td>
</tr>
<tr>
<td>Frequency</td>
<td>20</td>
</tr>
<tr>
<td>Inspiratory pause duration, s</td>
<td>0</td>
</tr>
<tr>
<td>Inspired fraction of oxygen, %</td>
<td>40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcomes from your settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine tidal volume</td>
</tr>
<tr>
<td>Measured minute ventilation</td>
</tr>
<tr>
<td>Peak Airway Pressure</td>
</tr>
<tr>
<td>Mean Airway Pressure</td>
</tr>
<tr>
<td>I/E ratio</td>
</tr>
<tr>
<td>Plateau pressure</td>
</tr>
<tr>
<td>End expiratory pressure</td>
</tr>
</tbody>
</table>

Push to run simulation with new inputs

Push to administer fluid bolus

YOUR PATIENTS OXYGEN SATURATION IS
YOUR PATIENTS BLOOD PRESSURE IS
YOUR PATIENTS PLATEAU PRESSURE IS
YOUR PATIENTS PH IS

YOUR PATIENTS MIXED VENOUS OXYGEN SATURATION IS LOW

<table>
<thead>
<tr>
<th>GOALS</th>
</tr>
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<tbody>
<tr>
<td>Minimum saturation</td>
</tr>
<tr>
<td>Minimum pH</td>
</tr>
<tr>
<td>Maximum pH</td>
</tr>
<tr>
<td>Maximum Pplateau</td>
</tr>
<tr>
<td>Minimum mean arterial pressure</td>
</tr>
</tbody>
</table>

Push to generate new patient simulation when starting or if targeted outcomes are satisfied

Push to generate new patient simulation if unable to attain targeted outcomes

<table>
<thead>
<tr>
<th>Arterial Sat, %</th>
<th>PaO2</th>
<th>pH</th>
<th>PaCO2</th>
<th>cHCO3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood gas data</td>
<td>89</td>
<td>59</td>
<td>7.31</td>
<td>54</td>
</tr>
<tr>
<td>Mean arterial pressure</td>
<td>58</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Too low
Too low
Acceptable
Acceptable
Interventions have corrected pH and SaO2.
Acidosis, hypoxia, and hypotension repaired: Learner commits to settings

Mode (1= VCV; 2=PCV) 1
Tidal volume, L 0.35
PEEP 12
Peak inspiratory flow rate, lpm 60
Frequency 20
Inspiratory pause duration, s 0
Inspiratory fraction of oxygen, % 80

Outcomes from your settings
Machine tidal volume 0.4
Measured minute ventilation 7.0
Peak Airway Pressure 33.0
Mean Airway Pressure 17.0
I/E ratio 0.3
Plateau pressure 29.0
End expiratory pressure 12.0

GOALS
Minimum saturation 90
Minimum pH 7.25
Maximum pH 7.45
Maximum Pplateau 30
Minimum mean arterial pressure 65

Push to change ventilator mode
Push to generate new patient simulation when starting or if targeted outcomes are satisfied
Push to generate new patient simulation if unable to attain targeted outcomes
Push to run simulation with new inputs
Push to administer fluid bolus

Arterial Sat.%  PaO2  pH  PaCO2  cHCO3
Blood gas data 92  68  7.31  54  26
Mean arterial pressure 68

YOUR PATIENTS OXYGEN SATURATION IS Acceptable
YOUR PATIENTS BLOOD PRESSURE IS Acceptable
YOUR PATIENTS PLATEAU PRESSURE IS Acceptable
YOUR PATIENTS PH IS Acceptable
New virtual patient is immediately presented

**Mode** (1 = VCV, 2 = PCV)

- Tidal volume, L: 0.5
- PEEP: 5
- Peak inspiratory flow rate, lpm: 60
- Frequency: 20
- Inspiratory pause duration, s: 0
- Inspired fraction of oxygen, %: 21

**Outcomes from your settings**

- Machine tidal volume: 0.5
- Measured minute ventilation: 10.0
- Peak Airway Pressure: 18.0
- Mean Airway Pressure: 8.0
- I/E ratio: 0.5
- Plateau pressure: 11.0
- End expiratory pressure: 6.0

**Push to change ventilator mode**

**Push to run simulation with new inputs**

**Push to administer fluid bolus**

**GOALS**

- **Minimum saturation**: 90
- **Minimum pH**: 7.35
- **Maximum pH**: 7.45
- **Maximum Plateau**: 30
- **Minimum mean arterial pressure**: 65

**Push to generate new patient simulation when starting or if targeted outcomes are satisfied**

**Push to generate new patient simulation if unable to attain targeted outcomes**

**Arterial Sat, %  PaO2  pH  PaCO2  cHCO3**

- Blood gas data: 86 54 7.36 44 24
- Mean arterial pressure: 85

**YOUR PATIENTS OXYGEN SATURATION IS**

- Too low

**YOUR PATIENTS BLOOD PRESSURE IS**

- Acceptable

**YOUR PATIENTS PLATEAU PRESSURE IS**

- Acceptable

**YOUR PATIENTS PH IS**

- Acceptable

**YOUR PATIENTS MIXED VENOUS OXYGEN SATURATION IS LOW**
Freeware tool has garnered an international audience

- Simulator ranked #1 on Bing search and #2 on Google search
- Generating ~ 20 unique downloads per day spanning 98 countries; pace is accelerating
Practice patterns show statistical characteristics of spoken languages.
Evidence of cognitive conceptual clustering is readily apparent.
Your Being Sued!
When bad things happen to good doctors

Deanna Blisard, MD
Purpose

• The goal of the workshop is to offer the Critical Care fellows the opportunity to participate in a mock medical malpractice lawsuit that would provide a basic understanding of the litigation process.

• At the end of the workshop, the fellows should be able to:
  • Have a general understanding of the procedural aspects of a malpractice case
  • Recognize the pitfalls inherent in poor documentation and communication and the potential consequences of both at trial
  • Better defend their actions in litigation
  • Document more intelligently
A Longitudinal Curriculum!

**Video**
- Actual case involving previous fellow and a failed reintubation
- Video was made recreating the attempted reintubation
- The video was viewed by fellows and used for documentation exercise
- Viewed in October

**Deposition**
- Notes collected and reviewed and one fellow selected
- Fellow underwent mock deposition with real lawyers
- Co-fellows were in the audience observing
- Held in April

**Mock trial**
- Standardized Patients (SPs) played the defendant, plaintiff expert, and defense expert
- Scripted testimony and real lawyers
- Fellows acted as jury and deliberated
Documentation Video

- Recreation of the failed re-intubation using Critical Care program directors and VA Pittsburgh simulation fellows
- Key moments time-stamped with actual times documented in the patient chart
- Fellows viewed the video as part of their difficult airway workshop (embedded into their known curriculum), and asked to document what transpired
Mock Deposition

• One fellow was selected to be deposed

• Received a redacted copy of the initial complaint and a letter from the insurance company stating he was being sued

• Actual lawyers deposed the fellow using the redacted chart

• Facilitated debriefing and Q&A session after the deposition with faculty, lawyers, and the VP of Risk Management
Mock Trial

- Scripted from the actual patient chart, depositions, and expert witness summaries
- Standardized Patients (SP) used to play the part of defendant and expert witnesses
- Fellows acted as jurors, deliberated the case, and rendered a verdict
- Fellows were unable to come to a unanimous decision but favored acquittal 9-4
- Actual case settled by UPMC
Future Goals and Applications

- Documentation checklist in process: Delphi model utilizing local critical care faculty to provide feedback on key aspects of fellow documentation
- 2nd year fellows to play roles in future mock trials
  - Real-life experience being an expert witness
  - Increase fidelity and reality for fellows
- Possible affiliation/collaboration with Pitt Law School
- Mediation vs Mock Trial
  - Most are mediated and settled before getting to a trial
VAPHS
Center for Medical Product
End-user Testing

Jamie L. Estock, MA
Director
Human Factors Psychologist
Co-Director, Inter-professional Patient Safety Fellowship

David E. Eibling, MD
Associate Director
Assistant Chief of Surgery
Co-Director, Inter-professional Patient Safety Fellowship
MISSION

Facilitate the safest use of medical products in the delivery of care to Veterans
APPROACH

Conduct human factors evaluations to measure product safety in situations that mirror the real clinical practice settings

- Leverage high-fidelity simulation
- Involve a representative set of users
- Incorporate real-world scenarios
APPRAOCH

Measure the effects of **interface design** on user decisions and actions with the goal of maximizing performance and minimizing errors.
PSCI GOALS

1. Advise the purchase of the safest medical products across VHA

2. Identify and mitigate safety issues before products are used on Veterans

3. Inform the future design, development, and approval of safe medical products

USER-CENTER PRODUCTS ➔ BETTER PERFORMANCE ➔ SAFER CARE
## Completed Evaluations

<table>
<thead>
<tr>
<th>Decision</th>
<th>Completed HF Evaluations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchasing</td>
<td>Automated Chest Compression (ACC) Devices</td>
</tr>
<tr>
<td><em>Which product has the fewest use-related hazards?</em></td>
<td></td>
</tr>
<tr>
<td>Implementation/Use</td>
<td>External Defibrillators</td>
</tr>
<tr>
<td><em>How can we mitigate use-related hazards associated with the products?</em></td>
<td></td>
</tr>
<tr>
<td>Design</td>
<td>Intravenous Medication Labels</td>
</tr>
<tr>
<td><em>How can we design products to reduce/eliminate use-related hazards?</em></td>
<td></td>
</tr>
</tbody>
</table>
ACC Device Evaluation

OBJECTIVE
Identify whether an ACC device would be safe and beneficial for use at VA Pittsburgh

RESULTS
Device Application

<table>
<thead>
<tr>
<th>Device</th>
<th>Interruption Time (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AutoPulse</td>
<td>31.6</td>
</tr>
<tr>
<td>LUCAS 2</td>
<td>39.1</td>
</tr>
</tbody>
</table>

METHODS
Simulated resuscitation scenario involving an unconscious 45-year-old man in cardiac arrest

IMPACT
Prevented the purchase of an unwarranted device resulting in improved patient care and cost savings

---

American Heart Association
GUIDELINES CPR ECC 2010

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$100,000
Medication Label Evaluation

**OBJECTIVE**
Quantify the impact of label design on medication safety in a realistic, high-stress, clinical situation

**METHODS**
Operating room scenario involving an unexpected vascular injury and “incorrectly stocked” lidocaine bag

**RESULTS**
Correct Medication Selection

- Current Label: 40%
- Redesigned Label: 63%

**IMPACT**
VA Pittsburgh redesigned the labels placed on operating room medications compounded in-house