

# **Implementation of a Simulation Based Patient Safety Curriculum in a Pediatric Emergency Department**

**Mary D. Patterson, MD, MEd**

**Gary Geis, MD**

**Cincinnati Children's Hospital**

**Robert L. Wears, MD, MS**

**University of Florida &**

**Imperial College, London**



# DISCLOSURE STATEMENT

- Dr. Patterson has documented that she has nothing to disclose
- Dr. Patterson has documented that her presentation will not involve discussion of unapproved or off-label, experimental or investigational use.
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# Emergency Department Risk Factors for Patient Safety

- Providing timely coordinated medical care to multiple patients with varied acuity and complexity.
- Environment full of potential interruptions
- Pressured environment to expeditiously problem solve on limited information

# Emergency Department Errors

- Medical error rate of 18 per 100 patients
- One of three hundred patients experienced an adverse event.
  - Fordyce et al, 2003
- Failure in teamwork was a contributing factor in more than 40 percent of emergency medicine malpractice cases.
  - Croskerry and Wears, 2000

# Improving Teamwork and Communication To Improve Patient Safety

- Communication failures primary root cause in 3 of every 5 sentinel events reported to JCAHO
  - JCAHO 2003; Risser et al. 1999.
- Some data suggest teamwork behaviors can prevent or mitigate adverse events
- Crew resource management in aviation: can lessons learned be adapted to health care?

Early research in commercial aviation crashes demonstrated that failures in “leadership, communication, decision making and group awareness of the situation accounted for the majority of these disasters”

- Schenkel, 2000



# Definition: Crew Resource Management

**CRM:** The science developed in aviation as a method to maximize mission and team effectiveness and safety through the effective utilization of all available resources.



# Crew Resource Management (CRM)

In aviation, this evolved as a systematic way of ensuring clearly defined roles, responsibilities and methods of communication as well as clear algorithms for responding to critical situations







“CRM is designed to train team members how to achieve maximum mission effectiveness in a time-constrained environment under stress”

- Kern, 2001

# Specific Aims

- To implement a multidisciplinary simulation-based safety curriculum encompassing crew resource management, teamwork behaviors and critical communication skills to ED staff.
- To evaluate the effectiveness of this curriculum by assessing knowledge of and attitudes towards patient safety among ED clinical providers before and after this intervention.
- To evaluate the effectiveness of this training by assessing teamwork behaviors in a simulated setting prior to and following the intervention.

# Methods

- Multidisciplinary ED providers participate in 12 hours of simulation based teamwork and communication training including
  - Didactic lectures (3)
  - Video reviews
  - Critical simulated scenarios (8) with debriefing
- Pre and post intervention assessment of knowledge, attitude and behaviors in a simulated setting
- Review of videos by independent video reviewers

# Methods

Curriculum includes:

- Summary of CRM in aviation and medicine
- Summary of communication tools
- Summary of human factors which are obstacles to teamwork and communication
  - Authority gradient and assertive statements
    - Challenging the authority gradient
  - Mitigation and trapping of errors, team resiliency

# Results

A total of 139 subjects have been enrolled in 15 courses from July 1, 2005 through March 1, 2006

<b>ROLE</b>	<b>FREQUENCY</b>	<b>PERCENTAGE</b>
<b>NURSE</b>	<b>57</b>	<b>41</b>
<b>RESPIRATORY THERAPIST</b>	<b>5</b>	<b>3.6</b>
<b>PARAMEDIC</b>	<b>5</b>	<b>3.6</b>
<b>PATIENT CARE ASSISTANT</b>	<b>7</b>	<b>5</b>
<b>FACULTY PHYSICIAN</b>	<b>23</b>	<b>16.5</b>
<b>STAFF PHYSICIAN</b>	<b>14</b>	<b>10</b>
<b>FELLOW PHYSICIAN</b>	<b>9</b>	<b>6.5</b>
<b>RESIDENT PHYSICIAN</b>	<b>19</b>	<b>13.6</b>

# Results

## Knowledge

- The pre and post-intervention mean scores for knowledge were 85.5 (SD:8.9) and 96.3 (SD: 5.1) respectively
- The paired samples t test had a p value of  $< 0.001$

# Results

## Attitude

- The Safety Attitudes Questionnaire was also administered at before and after the intervention
- The Z values for teamwork, climate and overall score were -3.6, -5.6 and -4.5 respectively. The p values for all categories were  $< 0.001$ . (Wilcoxon signed ranks test)
- This indicates a significant improvement in the participants' subjective assessment of safety attitudes.

# Results

## Behavior

- The results of the teamwork and communication behaviors were assessed by using a standardized behavioral markers scale
- Six independent video reviewers assessed baseline and post-intervention simulations.
- The reviewers were blinded as to whether the simulation was pre or post-intervention.



# Results

## Behavior

- The video review of six courses is included in this report.
- The results demonstrate a z value of -0.769 (Wilcoxon signed ranks test)
- The blinded reviewers rated the performance of the participants higher following the intervention, not reaching statistical significance.



# Results

- Eighteen safety issues/latent threats were identified in our PED during that time period, with medication issues being the most prevalent
- Neither physicians nor administration previously recognized any of the safety issues identified by nursing staff during these debriefings.

# Results

**Table 1: Latent Safety Threats (n=18)**

Medication  
Issues  
(n=8)

Medicine dose not in codebook (3)

- intramuscular medicines for RSI
- lorazepam
- thiopental

Medicine not in the Pyxis (1)

- terbutaline

Similar medicines in same pyxis drawer (1)

- high and low dose epinephrine

Improper use of code drugs (1)

Difficulty with new technology (1)

Improper interpretation of pharmacy policy (1)

# Results

## Equipment/ Resource Issues (n=7)

Lack of needed equipment for emergencies (3)

- Non-safety style angiocaths
- Jet ventilator
- Stryker needle and manometer kits

Consistency of equipment throughout hospital  
(1)

- code books with medication dosing

Maintenance of equipment (2)

- badge readers to enter resuscitation bay
- code buttons in PED rooms

Lack of ACLS algorithms in code book, despite  
increasing adult census (1)

# Results

## Personnel issues (n=3)

- Need for second nurse during medical resuscitations to provide independent double checks on high-risk medicines (1)
- Need for ESI (supply) staff to consistently attend resuscitations (1)
- Need for child life and chaplain providers to attend this course (1)

# Results

## Practice Changes:

As a result of these concerns, a number of changes have been made and additional resources are being developed

# Results

Table 2: Outcome from recognition of latent safety threats

Latent Safety Threats	Changes made in PED
High and low-dose epinephrine in same drawer of Pyxis	Safety labels placed, drawers changed and strengths separated, made high alert medication
Difficulty in mixing of inotrope infusions: 1. paper slips in new kits confusing 2. New institution of guardrail procedure on IV pumps confusing	Has become a quarterly nursing core competency
Stryker needle and manometer set for compartment pressures not available in resuscitation bay and requires lengthy retrieval time from OR	Stryker kits placed in Pyxis and monitor supply kit kept in ESI
Two nurses not available to perform independent double checks of high-risk medications during medical resuscitations	Patient safety committee discussed issue with nursing management, plan to trial SRU nurses as “second nurse”



# Results

**Table 2: Outcome from recognition of latent safety threats**

<b>Latent Safety Threats</b>	<b>Changes made in PED</b>
<b>Nurses understood they could no longer mix antibiotics in resuscitation bay; felt they must send to pharmacy for medications</b>	<b>Clarified with pharmacy lack of this policy and demonstrated presence of antibiotics in Pyxis</b>
<b>Safety style angiocaths not compatible for needle cricothyrotomy, needle thoracentesis or pericardiocentesis</b>	<b>Developed supply of non-safety style angiocaths in ESI; education of ESI personnel; insured presence of larger gauge (14, 16) catheters</b>
<b>Two nurses not available to perform independent double checks of high-risk medications during medical resuscitations</b>	<b>Patient safety committee discussed issue with nursing management, plan to trial SRU nurses as “second nurse”</b>

# Results

## Evaluation

- A seven question evaluation tool that incorporates a 5 point Likert scale is completed on both days of the curriculum
- The day one evaluations had a mean score of 4.6 (SD 0.4) and the day two evaluations had a mean score of 4.8 (SD 0.4)

# Discussion and Conclusion

- In the short term, this project has demonstrated that simulation-based safety and teamwork training is feasible across a wide range of experience and education levels
- There are demonstrable immediate gains in knowledge and attitude across all disciplines
- There is limited objective data on the success of translating these gains into behavioral changes in the simulation lab and the emergency department

# Discussion and Conclusion

- The identification of latent safety threats is a previously unreported but extremely valuable benefit of multidisciplinary simulation training.
- The identification latent threats should be should be considered in determining cost/benefit ratios of simulation training.
- Identification of these latent safety threats was not one of the anticipated outcomes of this intervention.

# Discussion and Conclusion

- “We should be doing this every six months”- **MD**
- “ Now I see the doctors that have done this training thinking out loud in the trauma bay and making sure everyone is on the same page”-**RN**
- “Now when I do something-I know that I need to make sure everybody on the team knows that I have given the epinephrine, etc “ -**RN**
- “This is the best training I have done in my whole medical career” **Faculty MD**

# Thank you for your attention

## Questions?

