Application of Simulation to Improve Clinical Efficiency – Systems Integration

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Disclosures

• None
Experiential Learning

Patient Safety

Competency Credential

Feedback Debriefing

Reflective Learning

Experiential Learning

Repetition Excellence
Simulation for Practicing Professional?

- Education
  - Entering Student
  - Program Objectives Met (Graduation)
- Practice Gap
- Clinical Functionality
  - New Hire
  - Independent Clinician
Simulation Center

Clinical Area
Simulation Center

Clinical Area

Assess

Proprietor: Soma, Inc.
Public demands assurance that practitioners are competent
Assessment of core knowledge, skills, attitudes

Public demands assurance that competent learners can be entrusted
Entrustable Professional Activities
SSH Accreditation

Areas of Accreditation

- Assessment Standards
- Core Standards
- Research Standards
- Teaching/ Education Standards
- System Integration & Patient Safety Standards
Programs

Undergraduate Training
Postgraduate Training
Hospital Wide Projects
Collaboration Training
Supports other
Undergraduate Training

- Basic skills for 1\textsuperscript{st} and 2\textsuperscript{nd} year
- Elective courses for 1\textsuperscript{st} and 2\textsuperscript{nd} year
- Core clinical examination for 2\textsuperscript{nd} year
- Clinical skills examination for 3\textsuperscript{rd} and 4\textsuperscript{th} year
- Clinical clerkship for 3\textsuperscript{rd} and 4\textsuperscript{th} year
- Preparation for Medical License Examination
Postgraduate Training

- Essential Skills Set
- EM Block Activity
- Pediatric Emergency & Critical Care
- Obstetrics Resuscitation
- Anesthesia Critical Care
- GS Laparoscopic Surgery
- Trauma Care
- Clinical Nursing Care
- Disaster Training
Hospital Wide Projects

- Cardiopulmonary Resuscitation
- Disaster Preparedness
- Personal Protective Equipment
Collaboration Training

- Nursing Department
  - PA Nurse Competency Training
- Quality Improvement Department
  - Time out (outside OR)
  - Communication (SBAR)
- Emergency Department
  - *in situ* System Integration
Use of simulation-based mastery learning to improve the quality of central venous catheter placement in a medical intensive care unit.
Barsuk JH\textsuperscript{1}, McGaghie WC, Cohen ER, Balachandran JS, Wayne DB.

Simulation-based mastery learning reduces complications during central venous catheter insertion in a medical intensive care unit.
Barsuk JH\textsuperscript{1}, McGaghie WC, Cohen ER, O'Leary KJ, Wayne DB.

Use of simulation-based education to reduce catheter-related bloodstream infections.
Barsuk JH\textsuperscript{1}, Cohen ER, Feinglass J, McGaghie WC, Wayne DB.

Dissemination of a simulation-based mastery learning intervention reduces central line-associated bloodstream infections.
Barsuk JH\textsuperscript{1}, Cohen ER, Potts S, Demo H, Gupta S, Feinglass J, McGaghie WC, Wayne DB.
Root Cause Analysis
Shock Management

• Shock treatment was not standardized
• Airway and central line insertion complication ↑
• Communication not efficient
• Respiratory failure management suboptimal/overtreatment
• No formal education in shock (except from clinical rounding)
Shock Management

- Quality Improvement Office
- Nursing Division
- Emergency Medicine
- Internal Medicine
- General Surgery
- Chest surgery
- Obstetric
- Pediatric
- Anesthesiology
“SimShock” Program

• To enhance competency in shock management
• To build competency in airway management
• To build competency in central line insertion
• To standardize shock management

• All incoming new residents from the 7 clinical department
Program

Warming up simulation
• Obstructive shock

Lecture
• Introduction to shock

Skills Station
• CVP catheter insertion
• Endotracheal intubation
• Rescue airway
Program

Simulation session with 4 scenarios

• Anaphylactic shock
• Cardiogenic shock
• Septic shock
• Hemorrhagic shock
## Face and Content Validation

<table>
<thead>
<tr>
<th>Face &amp; Content Validity Questionnaire</th>
<th>Out of 10</th>
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<tbody>
<tr>
<td>I was fully immersed in the simulation</td>
<td>9.3</td>
</tr>
<tr>
<td>I behaved in the same way that I do in the real world</td>
<td>8.7</td>
</tr>
<tr>
<td>The scenario allows me to adequately demonstrate my technical skills</td>
<td>9.0</td>
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<tr>
<td>The scenario allows me to adequately demonstrate my clinical knowledge</td>
<td>9.1</td>
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<tr>
<td>The scenario allows me to adequately demonstrate my decision-making</td>
<td>9.2</td>
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<tr>
<td>The scenario allows me to adequately demonstrate my teamwork skills</td>
<td>9.3</td>
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<tr>
<td>The scenario allows me to adequately demonstrate situation awareness</td>
<td>9.3</td>
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Competency Improvement

<table>
<thead>
<tr>
<th>Category</th>
<th>Before</th>
<th>After</th>
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</thead>
<tbody>
<tr>
<td>Recognition</td>
<td>5.75</td>
<td>8.25</td>
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<tr>
<td>DDx</td>
<td>4.67</td>
<td>7.83</td>
</tr>
<tr>
<td>Stabilization</td>
<td>4.92</td>
<td>7.00</td>
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<tr>
<td>Treatment</td>
<td>4.58</td>
<td>7.25</td>
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<tr>
<td>Skills</td>
<td>5.42</td>
<td>7.58</td>
</tr>
<tr>
<td>Resuscitation</td>
<td>5.25</td>
<td>7.33</td>
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</table>
Currently...

• Collecting data to compare changes in shock patient management before and after the course
• Scenarios are developed from actual shock cases from that department
• Expanded program to Neurology and Neurosurgery Department
“SBAR-SIM” Program

• Adverse patient occurrences are an extremely common outcome of communication failures.
• The Joint Commission (US) reported 70% of RCA were due to communication failures, and approximately 75% of the patients involved died.
• 63% of sentinel events are due to communication failures.
• SBAR tool is widely used to enhance patient safety.
  (Situation-Background-Assessment-Recommendation)
“SBAR-SIM” Program

• To standardize handover communication of critical patients
• To recognize the importance of proper communication for patient safety
• To reduce medical errors resulting from communication failure

• Incoming new registered nurses
<table>
<thead>
<tr>
<th></th>
<th>Before</th>
<th>After</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>B</td>
<td>5</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>C</td>
<td>3</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>D</td>
<td>5</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td>E</td>
<td>3</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>F</td>
<td>2</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>G</td>
<td>7</td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td>H</td>
<td>3</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>Average</td>
<td>3.88</td>
<td>10.13</td>
<td>6.25</td>
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### Perception

<table>
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<tr>
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<th>After</th>
<th>3 months</th>
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<tbody>
<tr>
<td>Perception</td>
<td>6.91(±1.8)</td>
<td>8.34(±1.5)</td>
<td>8.95(±1.8)</td>
</tr>
<tr>
<td>Behavior</td>
<td>5.21(±1.3)</td>
<td>7.87(±1.4)</td>
<td>7.93(±1.9)</td>
</tr>
</tbody>
</table>
Management of respiratory difficulty

- Asthma, COPD, CHF patients in respiratory difficulty
- Tendency to intubate with ventilator care
- High flow oxygen therapy
“HiO₂-SIM” Program

• To recognize the benefits of high flow oxygen therapy
• To improve adherence of the high flow oxygen therapy protocol
• To improve care of patients in respiratory distress
• All emergency residents at our institution
“Time-Out” Protocol

• Wrong site surgery is a major threat in OR
• Invasive procedures are also performed outside OR
• Time out is not performed according to accurate process in the Ward or ER
• Sentinel events are reported
“Time-Out” Simulation

- To recognize the importance of time-out protocol
- To improve adherence of the time-out protocol
- To reduce errors related to wrong-site invasive procedures

- All ward nurses involved in invasive procedures

<table>
<thead>
<tr>
<th></th>
<th>Before</th>
<th>After</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adherence to protocol</td>
<td>1.70±2.22</td>
<td>9.79±0.68</td>
<td>&lt;0.01</td>
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“In Situ” Simulation

• **In Situ**
  • “in the natural or original position or place”
  • Latin for “in place”

• **In Situ** Simulation
  • Simulation that occurs in the physical environment of the target audience.
  • A way to practice and plan for low volume but high risk patient scenarios
<table>
<thead>
<tr>
<th></th>
<th>SimLab</th>
<th>In Situ</th>
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</thead>
<tbody>
<tr>
<td>Environmental Fidelity</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Control of Scenario</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Less Stress on Educators &amp; Learners</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Logistical Control</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Team &amp; Systems Evaluation</td>
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<td>✔️</td>
</tr>
<tr>
<td>Realism</td>
<td></td>
<td>✔️</td>
</tr>
<tr>
<td>Time</td>
<td>✔️</td>
<td></td>
</tr>
</tbody>
</table>
• Training based at a simulation center is often related to a curriculum or course and has objectives related to both technical and non-technical proficiencies.

• *In situ* simulation allows teams to review and reinforce their skills and to problem-solve in the clinical environment.

• Opportunities to identify hazards and deficiencies in the clinical systems, the environment, and the provider team.
• **Patient Safety Perspective**

- Most valuable benefits of *in situ* are related to identification of:
  - Latent hazards
  - Knowledge or skill gaps
  - Resource limitations- issues related to personnel, medications, equipment

- *In situ* simulation can identify and mitigate hazards and defects before patient harm occurs
• Challenges
  ➢ Technical issues
    ✔ Transport of simulator
    ✔ Use of medical supplies
    ✔ Infection
  ➢ Logistics
    ✔ High-acuity, high-census areas (15% cancelled)
    ✔ Time limitation
    ✔ Delay in actual patient care
  ➢ Culture
    ✔ Patient and family perceptions
    ✔ Study subjects
• Outcomes
  ➢ Individual participant technical proficiency is improved.
  ➢ Desirable individual and team behaviors are reinforced.
  ➢ Active and latent systems issues are readily identified.
  ➢ *In situ* simulation can be a catalyst for change in clinical care systems and improved clinical outcomes.
Study protocol for a framework analysis using video review to identify latent safety threats: trauma resuscitation using in situ simulation team training (TRUST).

Fan M1,2, Petrosoniak A3,4, Pinkney S2, Hicks C3,4, White K5, Almeida AP6, Campbell D5,7, McGowan M3, Gray A3, Trbovich P1,2,8.

Simulation for Operational Readiness in a New Freestanding Emergency Department: Strategy and Tactics.

Kerner RL Jr1, Gallo K, Cassara M, D'Angelo J, Egan A, Simmons JG.

Inter-professional in-situ simulated team and resuscitation training for patient safety: Description and impact of a programmatic approach.

Zimmermann K1, Holzinger IB2, Ganassi L3, Esslinger P4, Pilgrim S5, Allen M6, Burmester M7, Stocker M8.

Simulation-based multiprofessional obstetric anaesthesia training conducted in situ versus off-site leads to similar individual and team outcomes: a randomised educational trial.


In situ simulated cardiac arrest exercises to detect system vulnerabilities.

New Emergency Department

• MERS crisis – infection control
• Overcrowding
• Recently started construction, lasting until this August
• Major changes
  ➢ Infection Room
  ➢ Single unit cubicle
  ➢ Fast track
  ➢ New resuscitation room
• Test resuscitation room setting for pediatric patients
• Two separate resuscitation rooms for pediatrics: medical and trauma
• Monday early morning – least patient burden
• Cooperation from Pediatric Department & Nursing Division
• “Ready-to-move” in case of actual patient coming in
• Developed checklist and had the head and charge of department assess
• Debriefing after the session
• Findings

- Able to find out the actual performance competency for pediatric resuscitation
- Able to find out teamwork factors that needed improvement
- Able to find out setting problems that influenced patient management
- Able to motivate participants in being proactive to making changes for the better care for the patients
Adult Resuscitation Room (Temporary)
Pediatric Resuscitation Room

Before

After
Conclusion

• Simulation can be utilized to improve care in the clinical setting, but the curriculum should be integrated with clinical practice.

• *In situ* simulation and system integration is a relatively new and rapidly evolving tool with the potential to improve patient safety.

• It identifies latent hazards and knowledge gaps and strengthens communication, teamwork, and technical skills that are critical to high-functioning health care teams.

• Overcoming challenges will yield a rich return in benefits for improved patient safety.
Thank You