Multidisciplinary Simulation-based Healthcare Education

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Session aims

• Discuss relevant opportunities for multidisciplinary training
• Discuss components necessary to plan and facilitate multidisciplinary training using simulation
• Discuss obstacles for multidisciplinary training and solutions to overcome these obstacles

What do we mean by “multidisciplinary”

“A mixed cohort of learners in a common program?”
or...
“A team of healthcare providers that commonly work together?”
Team structure

- Multiple team system for patient care

Food for thought... and discussion

- Exercise 1:
- Lets take a few minutes and discuss some relevant examples that are well suited to multidisciplinary simulation-based healthcare education for teams of healthcare providers.

Multidisciplinary simulation opportunities

- Examples
  - Code teams
  - Rapid response teams
  - Surgical cases
  - Crisis resource management
  - Patient safety problems
  - Airway management
  - Flight team training
"Any road will get you there, when you don’t know where you are going"

Multidisciplinary simulation-based healthcare education: The planning process

Formula for the effective use of simulation

\[
\text{Training Resources} \times \text{Trained Educators} \times \text{Curricular Institutionalization} = \text{Effective Simulation-based Healthcare Education}
\]

Multidisciplinary simulation development

- Analysis
  - Define expected outcomes
- Design
- Development (new or mod of existing simulation)
- Implementation
- Evaluation

1 - Analysis

- What and why should this be undertaken?
- Determine through:
  - Needs assessments
  - Quality assurance/quality management data
  - Curricular requirements
  - Focus groups, evaluations

Defining outcomes

- Learners are more likely to achieve competency and mastery of skills if the outcomes are well defined and appropriate for the level of skill training
- Define clear benchmarks for learners to achieve
- Plain goals with tangible, measurable objectives
- Start with the end-goal in mind and the assessment metrics, then the content will begin to develop itself
Possible outcome competencies

- Patient care
- Medical knowledge
- Practice-based learning and improvement
- Interpersonal and communication skills
- Professionalism
- Systems-Based Practice

Miller’s Pyramid of Competence

- Learner:
  - "Knows" – learns information
  - "Knows How" - to use learned information
  - "Shows" - how to use the information
  - "Does" – performs in practice

- Instructor:
  - “Knows” – content to be taught
  - “Knows how” – to teach
  - “Shows” – teaching is delivered
  - “Does” – teaches effectively

2 – Design: “agree on content”

- Choose curriculum content to ensure it address the learning outcomes.
  - This will enable one to describe which core learning outcomes are addressed by specific content.
  - Redundancies and omissions of content that address core competencies should be noted and modified.
2 – Design: “organize the content”

- Develop the curriculum design to ensure a vertically integrated curriculum. There should be:
  - a repetition of core topics,
  - topics should be revisited at numerous levels of difficulty,
  - new learning should be related to previous learning, and
  - the competence of learners should increase with each exposure to a topic.
- When developing assessment it is important to ensure that learners are assessed based on the same schema or organization that is presented during their learning opportunities.

2 – Design: “decide on the educational strategy”

- These include:
  - student-centered vs. teacher-centered learning;
  - problem-based / task-based learning vs. information oriented learning;
  - integrated/interprofessional vs. subject / discipline-based;
  - community-based vs. hospital-based learning;
  - systematic vs. opportunistic

2 – Design: “decide the appropriate teaching methods”

- An effective curriculum makes effective use of a range of teaching methods applying each method for the use to which it is most appropriate.
- These include:
  - lectures;
  - small-group sessions;
  - independent study;
  - clinical skills exercises.
  - NOTE: simulations can be integrated into each of these areas.
Ranges of difficulty

- Learning is enhanced when a wide range of difficulty levels is employed
- Learners will have different “learning curves”
- Begin at the basic level, allow learner to demonstrate mastery, then proceed to progressively higher levels of difficulty

Effect of realism and initial learning

Tips for developing ranges of case difficulty

- Determine case/skill difficulty that is appropriate for the level level of the team
- Develop simulations that draw on prior learning and add additional knowledge and skill elements
- Example:
  - Routine cardiac arrest management with “Code Team”
  - Complicated cardiac arrest management problem
  - Complicated problem with programmed challenges to team (i.e. equipment failure(s), expired meds on cart, etc.)
Validity

- In this case, validity means the degree of fidelity or “realism” the simulation provides as an approximation to complex clinical situations, principles or tasks.
- High validity is essential for learners to increase their visuospatial perceptual skills and sharpen their response to critical incidents.
- “Face validity” relates to the “generalizability” of the simulation-based setting to the real patient setting.

Tips for improving simulation validity

- Determine the appropriate level of “simulator” technology to accomplish the desired outcome.
- Develop the appropriate levels of “simulation” fidelity around the simulator.

3 – Development: “prepare the assessment”

- What should be assessed?
  - Every aspect of the curriculum that is considered essential and/or has had significant teaching time designated to it.
  - Should be consistent with the learning outcomes that have been established as they are the competencies students should master at the end of the course/phase of study.
Assessments

- Should include assessment of:
  - **Knowledge** – not only factual recall, but comprehension, application, analysis, synthesis and evaluation of cognitive knowledge
  - **Skills** – communication, physical exam, informatics, self-learning, time management, problem-solving
  - **Attitudes** – behavior, teamwork – key personal qualities thought necessary of a professional

Assessing team performance

<table>
<thead>
<tr>
<th>Team Structure</th>
<th>Leadership</th>
<th>Situation Monitoring</th>
<th>Mutual Support</th>
<th>Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ Choose team</td>
<td>+ Establish leader</td>
<td>+ Includes patients/family in communication</td>
<td>+ Provides task-related support</td>
<td>+ Coaches feedback routinely provided to team members when appropriate</td>
</tr>
<tr>
<td>+ Focus team</td>
<td>+ Identify team goals and vision</td>
<td>+ Balances workload within the team</td>
<td>+ Provides brief, clear, specific, and timely feedback</td>
<td>+ Provides brief, clear, specific, and timely information</td>
</tr>
<tr>
<td>+ Assign roles and responsibilities</td>
<td>+ Delegates tasks or assignments, as appropriate</td>
<td>+ Cross monitors team members</td>
<td>+ Effectively advocates for the patient</td>
<td>+ Seeks information from all available sources</td>
</tr>
<tr>
<td>+ Hold teams accountable</td>
<td>+ Conducts briefs, huddles, and debriefs</td>
<td>+ Applies the STEP process</td>
<td>+ Uses the &quot;two-challenge&quot; rule, CUS, DESC to resolve conflict</td>
<td>+ Verifies information that is communicated</td>
</tr>
<tr>
<td>+ Activity shares information</td>
<td>+ Empowers team to speak freely and ask questions</td>
<td>+ Fosters communication to ensure a shared mental model</td>
<td>+ Collaborates with team</td>
<td></td>
</tr>
</tbody>
</table>

Assessments

- Choose the appropriate assessment method:
  - Formative
  - Summative
  - Self
  - Peer
4 – Implementation: “define the teaching team”

NOTE: Multidisciplinary learner groups = multidisciplinary instructor groups

4 – Implementation: “provide communication about the curriculum”

• Teachers have the responsibility to ensure that students have a clear understanding of:
  – What they should be learning – the learning outcomes;
  – The range of learning experiences and opportunities available;
  – How and when they can access these most efficiently and effectively;
  – How they can match the available learning experiences to their own needs;
  – Whether they have mastered the topic or not, and if not, what further studies and experience are required.
4 – Implementation: “promote appropriate educational environment”
• The educational environment or ‘climate’ is a key aspect of the curriculum
  – Although it is less tangible than the content studied, or the teaching methods used or the examinations, it is just as important
  – For example:
    • there is little point in developing a curriculum whose aim is to orient a student to prehospital disaster preparedness, if the students perceive that what is valued by the faculty is routine prehospital healthcare rather than disaster preparedness.

4 – Implementation: “provide effective curriculum management”
• This will ensure proper communication at multiple levels regarding different aspects of the curriculum
• Communication should occur between:
  – faculty and the learners, so they are apprised of their performance in the course or assessment,
  – between faculty members to evaluate the effectiveness of the learning opportunities or assessments

5. Evaluation: “measure effectiveness”
• Evaluate
  – Course
  – Learners
  – Instructors
  – Effect on practice
Case study – Practical issues for integrating multidisciplinary terrorism response education into a disaster preparedness curriculum

ERT Subject matter experts

• Fire and emergency services providers
• Law enforcement agencies
• Hospital-based providers
• Emergency Medicine, Toxicologists, Trauma care experts
• State and Federal departments
• Army:
  – Trauma Training Center (ATTC)
  – Medical Research Institute for Chemical Defense (USAMRICD)
  – Medical Department Center and School (AMEDDC&S)
• CRME faculty and the M.I.A.M.I. group

Model Program

• Emergency Response to Terrorism Training
  – Multiple healthcare professionals
  – Many learner levels
  – Methods of delivery
    • Lecture – case based
    • Psychomotor skill exercises
      – Small group
    – Individual / independent learner
    • Large group exercises
    • Integration exercises – OSCEs
**UM Course Design**

- Day 1
  - Didactic
    - Response Concepts
    - Operations
    - PPE
    - Decontamination
    - ICS / IMS
  - Psychomotor
    - PPE
    - Medical Management
    - Ambulatory DECON
    - Incapacitated DECON

- Day 2
  - Didactic
    - Chemical Agents
    - Biological Agents
    - Radiological and Explosive Agents
  - Large Group Exercises
    - Triage – computer-based
    - Tabletop
  - Integration Exercises
    - OSCEs

**Blueprinting**

<table>
<thead>
<tr>
<th>Global Objective</th>
<th>Recognize a potential terrorist incident and initiate incident operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>UM-ERT Module Obj.</td>
<td>2.3 Recognize and describe scene hazards and appropriate personal protective measures</td>
</tr>
<tr>
<td>Florida Objective(s)</td>
<td>Tier 1: (L), III (D), (F), (N), IV (J), V (A), (D), VI (B)</td>
</tr>
<tr>
<td>Learning Opportunity</td>
<td>Lecture Tabletop Video Exercise Skill OSCE</td>
</tr>
<tr>
<td>Assessment</td>
<td>Pre MCQ Post MCQ Skill OSCE</td>
</tr>
<tr>
<td>5, 23</td>
<td>6, 19, 20</td>
</tr>
</tbody>
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**Case –Based Lecture**

- Open-air concert
- 18,000 people
- Temp: 84°F
- Wind: ENE 12 knots
- Chemical weapon from a boat on shoreline
Multidisciplinary Simulation-based Healthcare Education – Laerdal SUN Meeting, Baltimore MD

Case-Based Lecture

- Plume throughout concert area
- Initially mistaken as smoke machine (part of show)
- Hundreds with symptoms within minutes

Individual Self-learning

Small group instructor teaching
Large group exercise

36-year-old male firefighter

- Pulse: 64
- Respirations: 36
- B/P: 80/90
- S/Sx:
  - Short of breath
  - Dim vision
  - Constricted pupils
  - Excessive secretions
  - No medical history
  - No allergies
  - No medications

Click on picture to start video
Computer-based learning

Assessment and feedback

“the pointer-outer”

Measuring Effectiveness
Course effectiveness and cognitive improvement

Development, Implementation and Outcomes of a Training Program for Responders to Acts of Terrorism

Geoffrey T. Miller, NREMT-P, Joseph A. Scott, MD. J. Barry Isenberg, MD, Emil R. Petrosa, PMD, Angel A. Bistline, FNP-C, David Lee Gooden, MD, William C. McGugin, PhD. Michael H. Gensler, MD. FACS

Prehospital Emergency Care 2006;10:239-246

Cognitive improvement

Pretest: 34.3%
Posttest: 54.2%
n= 264, p < 0.0005

Self-assessment

n= 264, p < 0.0005

15% 18%
86% 93%

18% 15%
Individual and team skills

**EDUCATION AND PRACTICE**

**Skill Improvement During Emergency Response to Terrorist Training**
Joseph A. Scott, MD, Geoffrey T. Miller, NREMT-P, S. Barry Rosenberg, MD, Angela A. Brotos, EMT-CC, David Law Gordon, MD, Michael S. Gordon, MD, PhD, William C. McGuire, PhD

PREHOSPITAL EMERGENCY CARE 2006;10:507–514

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**Results**

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**Future concerns**

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Some final thoughts

• Approach the development in a step-wise process that incorporates the ADDIE design elements
• Keep in mind the sometimes too much is “really” too much. Make sure that what you are doing is:
  – Practical
  – Feasible
  – Standardized
  – Reliable

Questions and discussion

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