Large-Scale Disaster Simulations:
Advancing Pediatric Disaster Preparedness and Safety Through Whole-Hospital, Inter-Professional Learning

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Potential conflict of interests disclosure
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We do not declare any potential conflict of interest
Overview

• Context:
  • Pediatric disaster preparedness in Canada
  • Simulation as a teaching modality in disaster education
  • The MCH experience
• Orangina: trauma simulation-2012
• Decontamination simulation-2015
• Conclusions
CBRNe

- Chemical
- Bacteriologic
- Radiologic
- Nuclear
- Explosive
Literature Review


• Kollek D. Canadian emergency department preparedness for a nuclear, biological or chemical event. CJEM 2003;5:18-26.

• AlHumaidan M, Khalil E. Caring for Canada’s Children: are we ready for the worst case scenario? (In progress)
Pediatric Disaster Preparedness Program
Disasters Involving Children

• Pediatric vulnerabilities in disasters
  • Anatomical
  • Physiological
  • Psychological
  • Developmental
Simulation
The role of Simulation

• Opportunity to practice the rare but high stakes situations
• Simulation for disaster
  • Little experience in North America
  • Mostly in the military
• Increased retention over didactic learning
• Provides long term self perceived ability and confidence
  • Bank & Khalil, Prehospital Disaster Medicine 2016; 31(5): 1-6
Progression of Disaster Simulation at MCH
MCH Experience

• Robust simulation-based medical-education
2011

- Moderate size trauma based disaster simulation
- Off-site sim center
- 30 triage, 6 red, 9 yellow
- MD’s
2012

- Orangina
- Large, in situ, unannounced, high fidelity trauma based disaster
- 42 simulated patients
- 124 participants
- City wide:
  - ASSS, Canadian Armed Forces, SPVM, STM, SIM, Urgences Santé
2013

• Ethics session
• Review principles of disaster triage
  • Discuss “unsalvageable” category
• Plenary followed by case discussion with panel of experts
2014

- Moderate size CBRNe based disaster simulation
- MD, nurses, RTs, Clerks
  - Triage, Red, PPE station
- Medical Management in a PPE vs non PPE
September 10^{th}, 2015

• Pediatric Code Orange + Decontamination Simulation

• Large in situ, real time, CBRNe disaster
Orangina

October 2012
Objectives
Overarching Goal of Disaster Simulation in Hospital Preparedness

• Improving population outcome by improving response to a high impact event
Orangina: Objectives

- **ASSS**: educational tool, communication department of the agence – information management and dissemination in the age of social media, patient tracking
- **Public Health**: educational tool, information transfer, provide expertise
- **Urgences Santé**: transfer of patient and information from prehospital to hospital
- **STM**: Patient transport by city bus, transfer of patients to ER
- **Police**: crowd control and support of hospital activities
- **Canadian Armed Forces**: evaluate Civil- military cooperation, provide simulation expertise
MCH Objectives

• Educational/ Training
• Continuous Quality Improvement
• Research

• CLINICAL
The Making of Orangina: Timeline of an In-Situ Simulation

- **Jan 2012:**
  - Memo from upper administration
  - Development of objectives
  - Determination of modality, fidelity and extent

- **Feb - Sept 2012:**
  - Area-specific and case-specific objectives and evaluation grids
  - Creation of case scenarios, scripts, required materials

- **March 2012:**
  - IRB approval for research (tool selection and development)
  - Grant from Collège des Médecins du Quebec received
Preparation of an Institution

- **May- Oct 2012:** Hospital-wide teaching
  - PICU (mini sim)
  - Medical wards (mini sim)
  - Surgical wards (mini sim)
  - Surgical grand rounds
  - Pediatric protected teaching time
  - Laboratory
  - Radiology (mini sim)
  - Volunteers
  - Social services/pastoral services
  - Registration/Admission
Final Details

• **Aug 2012:**
  • Evaluator determination

• **Sept-Oct 2012:**
  • Evaluator training
  • Logistic preparation of parallel ER
  • Communication plan developed for patients and families
Buy in from the MCH Community

• Directive from upper administration
• Meeting with each department manager
• Teaching for each department
• Looming simulation
Constraints of Pediatric Simulations

• Unable to use child actors for simulation
• Mannequins for children/infants, drama students for teenaged “victims”
• Issues of consent
• Concern re: exposure of young actors to HIFI simulation provoking an emotional response
• Psychosocial support in place to debrief actors
Players:

• 32 actors
• 11 mannequins
• Evaluators: 26
• Controllers: 23
• Research assistants: 3
• Volunteers: 12
• Participants: 93
Summary

• Large scale
• Macro simulation
• High/ low fidelity
• Interdisciplinary
• Inter-specialty
• In situ
• Unannounced
• Real time
Research Methods

• Mixed methods

  • Qualitative: audio recording and transcription of debriefs

  • Quantitative: retrospective pre-post surveys (93 participants)
Results: Qualitative

4 macro-level themes all relating to communication problems

Communication problems/obstacles/tensions that arise from...
1. A lack of understanding / clarity among participants of the processes that were to be followed during the code.

• Clarity of Code Orange protocols (excluding declaration)
  “We had no idea of the situation and what I needed to do, who I needed to call”

• Accessibility to patient information
  “We had absolutely no information on what had happened to the patients”

• Difficulty ensuring closed loop from the bedside team to the MD in charge or central control desk
  “We knew that’s what we had to get and we couldn’t get it. We didn’t know who to ask to get blood work, and so we were kind of like yelling it in the air.”
2. Issues related to language

• Lack of commonly shared terminology
  “I would never in my life remember to call it a step stool since I don’t call it a step stool... If I said that, it would have been clear right away. So at first someone brought me that high stool.”

• Communication style / approach
  “I asked for help four times and I got suggestions but no one came over to actually help me.”
3. Missing or ineffective *physical tools*

• Insufficient resources
  
  “One of the things that didn’t go as well, it was the communication with the phones. That was the main thing. There was not enough phones.”

• Insufficient succinct and accurate documentation
  
  “I don’t know if we’re expected to do the charting during Code Oranges, but there’s zero way that I can chart during a Code Orange.”
4. Issues related to *human resources*

• Lack of personnel
  • “Hard to get more people when you need extra hands.”

• Inability to Identify Personnel
  • “It took a bit of time to find out who was the nurse in charge, who was the physician in charge, and a little bit like what she’s saying, people who arrived to help didn’t know who to report to.”

• Lack of specific personnel
  “It would have been easier to have had an assigned PCA for trauma bed so that if you needed to ask for blood, find out if blood bank got called, how many units had, who’s going to check to make sure that OR’s been advised.”
Quantitative

- The retrospective pre/post survey contained medically relevant and disaster-plan relevant items.

- Not all survey items were relevant to all participants, therefore medically (e.g. procedural skill related) and non-medically focused items (e.g. disaster plan related) were analyzed separately.

- Post simulation ratings were significantly higher and consistent across participant groups.
Pre and Post rating for medically focused items (13 items)

(n=53; F(1,642)=44.1, p<0.0001)
Pre and Post rating for non-medically focused items (4 items)

\( (n=83; F(1,228)=29.7, p<0.0001) \)
• The simulation was found to be valuable to their learning 5.7/6 and practice 5.7/6 (6=strongly agree).
September 10th, 2015

• Pediatric Code Orange
  +Decontamination Simulation

• Large in situ, real time,
  CBRNe disaster
Simulation Objectives:

- Continuous quality improvement
- Education / training
- Research
- CLINICAL
The Making...
Preparatory Work

• Creation of a team
  • CO executive
  • Psychosocial
  • Nursing
  • Housekeeping
  • Respiratory Therapy
  • Volunteers
  • Adult team
  • PR team
  • Emergency Measures

• Team meetings + Decon plan creation
2013-2014
Stepped Approach

• Acquisition of mass decon material
• Development of Hospital Mass Decon Plan
• Introduction to CBRNe and mass decontamination principles
• Introduction to the technical aspects of decontamination and PPE
Decon sim development

• Scenario
• Simulated patients
• Making it real
• Assessing the team
• Keeping it safe for real patients
Large scale decontamination simulation

• Sept 10, 2015
• 64 simulated patients
• 97 participants
• In-situ / New environment
• High Fidelity
• Hospital-wide
## Whole-hospital learning

<table>
<thead>
<tr>
<th>Inter-professional</th>
<th>Inter-disciplinary</th>
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</thead>
<tbody>
<tr>
<td>15 Physicians</td>
<td>ER</td>
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<tr>
<td>14 Nurses</td>
<td>ICU</td>
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<tr>
<td>11 Social Workers</td>
<td>Anesthesia</td>
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<tr>
<td>11 Volunteers</td>
<td>Trauma team/Surgery</td>
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<tr>
<td>9 Medical Residents</td>
<td>Radiology</td>
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<td>8 Psychologists</td>
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<tr>
<td>6 Respiratory therapists</td>
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<tr>
<td>4 Clerical staff</td>
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<td>2 Radiology technicians</td>
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<td>1 Patient Care Attending</td>
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<td>1 Neuropsychologist</td>
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How did we do?

• Debriefing
  • ‘Hot’ debrief
  • ‘Cold’ debrief

• Code Orange Decontamination report & recommendations
Education

• Interprofessional learning and organization
• Creation of the simulation educational objectives
  • Nursing, RT, Clerks, PAB, MD’s, Social services…
• Trainees as actors
  • Provide insight and exposure to trainees
Findings: DATA

• Retrospective pre-post survey
I feel confident in the MCH’s ability to respond to a multiple/mass casualty involving CBRNe
I feel confident in my emergency department’s ability to respond to a CBRNe multiple/mass casualty incident
I feel confident in my ability to respond to a CBRNe multiple/mass casualty incident
I can determine when a patient is “clean” or contaminated in a CBRNe disaster
I can describe the physical location of the various CO treatment areas of the MCH ER
I can decide when it is indicated to declare a CO CBRNe at the MCH

* indicates $P < 0.0001$
CQI data

• Ability to control access (lock down)
  • 4.5% (2/44 contaminated)
  • 28.5% (6/21 non contaminated)
• Embed “fake” media /parents
Continuous Quality Improvement

- Inter-rater reliability was high (.92)
- 86% of contaminants were removed (from 61% body area contaminated to 9.1%).
Conclusion:
Thank you!

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