Lessons Learned from a Structural Collapse

Medical Response

Jeffrey Franc
MD, MSc, FCFP(EM), D Sport Med, EMDM

Associate Clinical Professor of Emergency Medicine – University of Alberta

Visiting Professor in Disaster Medicine - Università del Piemonte Orientale
Faculty/Presenter Disclosure

Faculty: Jeffrey Franc

- Relationships with commercial interests:
  - Grants/Research Support
  - Speakers Bureau/Honoraria:
  - Consulting Fees: Other:
Disclosure of Commercial Support

- This program has received financial support from in the form of
- This program has received in-kind support from in the form of
- Potential for conflict(s) of interest:
- has received payment/funding, etc. from
- Jeffrey Franc / MedStatStudio developed/licenses/distributes/benefits from the sale of a product that will be discussed in this program: SurgeSim Simulation Software.
Mitigating Potential Bias

- Other simulation products are discussed
- Simulation software is presented as only one possible option
- No intent to sell product to the participants
19:05 Skywalks Collapse

- 40 people on second level skywalk
- 16-20 on fourth level skywalk
- Fourth floor skywalk collapses onto second floor skywalk
- 113 Dead
- 188 Injured
19:08 EMS Activation

- First call from public is to fire alarm headquarters
- Message relayed to EMS dispatch
- 16 on-duty ambulances
- 15 Mutual aid responders
19:12 First Ambulance Arrives

- Set up triage outside of building on street
- Physician doing triage
In an ambulance on the street

“A smoothly functioning, high-performance organization was developed on the spot. Leaders emerged, and were recognized and allowed to lead because they were capable, willing, and because it was necessary....”

“People ... formed an organization, almost departmentalized, with managers, assistant managers, and a work force (sic) .... These 'department heads' worked together almost as though the organization had evolved formally and over a period of years.”
Taxis are used to transport ambulatory patient to distant hospitals.

Extrication in two phases:
- From scene to triage:
  - Initially extrication by bystanders
  - EMS applies splints
  - Long Backboards
- Triage to Hospital
  - Priority dictated by triage
  - 2-3 patients per ambulance
22:00 Hospital Response

- 29 Surgical procedures required in total (in the following 3 days)
- Busiest hospital performs 6 procedures that night
04:30 Last Survivor Extricated

- Long pause between early evacuation and delayed due to difficulty in extrication
- In total 12 delayed extrications approx. 7 hours after the collapse
- 113 Dead
- 188 Injured
04:30 Triage Post Dismantled

- Single rescue worker left on site to care for wounded rescuers
What did we Learn?
“Although arm bands with identification titles are part of the Kansas City disaster plan, these were not available at the time of the Hyatt Regency collapse”

Triage tagging using the METTAG system has been proposed for multiple casualty triaging. Although called for in the Kansas City disaster plan, these tags were not available on the night of the Hyatt Regency collapse.
In a study of 29 major disasters:

- Only 10-15% of the casualties were injured seriously enough to require overnight admission to the hospital
- Only 6% of the hospitals suffered supply shortages
- Only 2% had personnel shortages.
Use of the “Plan”

“With all that we had to do we didn’t have time to also look at the disaster plan”

Even in simulation situations, the disaster plan is often not used.

The Plan

narrative | planning assumptions | accountability | simulation
Problem: Planning Assumptions

- “No plan survives first contact with the enemy.”
- Helmuth von Moltke (1800 - 1891)
- Plan with what supplies will actually be there
- Plan for what people WILL do, not for what you want them to do.
Solution: Plan for Expected Behavior

Simplified Plans

- The completed disaster manual will above all be simple. (HEICS, third edition, 1998, p1-7)

- Job action sheets

- Simplified checklists

Job Action Sheets

<table>
<thead>
<tr>
<th>INCIDENT COMMANDER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mission: Organize and direct the Hospital Command Center (HCC). Give overall strategic direction for hospital incident management and support activities, including emergency response and recovery. Approve the Incident Action Plan (IAP) for each operational period.</td>
</tr>
</tbody>
</table>

Position Reports to: Executive Administration  Command Location: ______ |
Position Contact Information: Phone: [____], Radio Channel: ______ |
Hospital Command Center (HCC): Phone: [____], Fax: [____] |

| Position Assigned to: | Date: / / | Start: _____ hrs. |
| Signature: | Initial: | End: _____ hrs. |
| Position Assigned to: | Date: / / | Start: _____ hrs. |
| Signature: | Initial: | End: _____ hrs. |
| Position Assigned to: | Date: / / | Start: _____ hrs. |
| Signature: | Initial: | End: _____ hrs. |

Immediate Response (0 - 2 hours) | Time | Initial |
|-------------------------------|------|--------|
Receive assignment: Gather intelligence, information and likely impact from the sources providing event verification. |
Assume the role of Incident Commander and activate the Hospital Incident Command System (HICS). |
Complete the Incident Action Sheet. |
Put on position identification (e.g., position vest). |
Notify your local emergency and the Hospital Incident Support Officer (HISO) of the incident, activation of the Hospital Command Center (HCC), and your assignment. |
Access the operational situation: Activate the Hospital Incident Operations Plan (IOP) and applicable Incident Specific Plans or Annexes. |
Solution: Plan for Expected Behaviors

Simplified Plans

- Assume that nobody reads the plan in advance
- Directs responders directly to the Job Action Sheets
- Checklists for tasks that are unique to disaster response
- Simple forms for data recording
Solution: Plan for Expected Behaviors

Current Plans

Plans of the Future?

narrative | planning assumptions | accountability | simulation
“Another problem encountered, and one identified frequently in the literature of disaster planning and response, was the organization of on-site volunteer physicians."

“Although fire, police, and ambulance personnel are easily identified by their uniforms and have an established hierarchy of command, physicians do not.”
Problem: Accountability

- Lack of accountability, including unclear chains of command and supervision.
- Poor communication due to both inefficient uses of available communications systems and conflicting codes and terminology.
- Lack of an orderly, systematic planning process.
- No predefined methods to integrate inter-agency requirements into the management structure and planning process effectively.
- Freelancing by individuals with specialized skills during an incident without coordination with other first responders.
- Lack of knowledge with common terminology during an incident.
Problem: Accountability

New jobs often appear, with no clear responsibility.

Who registers and places patients in rooms after triage?

MCI Two-step ED Triage Study

Title: The Impact of a Two-step Emergency Department Triage Model with START, then CTAS on Patient Flow During a Simulated Mass Casualty Incident

Authors: James S. Lee MD¹, Jeffrey M. Franc MD, MSc, EMDM¹²

Affiliations: ¹Department of Emergency Medicine, University of Alberta, Edmonton Alberta Canada; ²Università degli Studi del Piemonte Orientale “Amedeo Avogadro”, Novara, Italy
Solution: Incident Command System

- "a systematic tool used for the command, control, and coordination of emergency response"

- Developed in 1970's in response to California Wildfires
Solution: Incident Command System

1. Five Primary Management Functions
2. Establish / Transfer Command
3. Single or Unified Command
4. Management by Objectives
5. Consolidated Action Plans
6. Comprehensive Resource Management
7. Unity and Chain of Command
8. Manageable Span of Control
9. Modular Organization
10. Personnel Accountability
11. Common Terminology
12. Integrated Communications

narrative | planning assumptions | accountability | simulation
Solution: Incident Command System

- Hospital Incident Command System
- An implementation of ICS for hospital use
- Lessons learned from previous disasters
- Implementable for hospitals of any size
- Follows all basic rules of ICS
ICED Tool

Solution: Incident Command System

Satisfaction Survey

- 103 participants of simulation using ICED
- 91% agreed some command-and-control system is necessary
- 88% felt ICED helped the group manage the disaster
- 73% Agreed would be comfortable using ICED in a real disaster
Solution: Incident Command System

Future of ICS?
- System is robust, but very complicated
- Improvement in education needed
- How can the system be simplified for the user?
Kansas City's ambulance crews all work for a private ambulance company, they are quartered at city fire stations. It was felt that because the ambulance and fire personnel work together daily and share the same facilities, this contributed to the ease with which they worked together during the disaster (Stout, 1981:36).
Problem: Rehearsal

**Lack of Cooperation**

“...other Firefighters appear to have been using one radio channel while evacuation orders went out over another”

FDNY Suffered 343 Deaths

**Sept. 11, 2001**
Problem: Rehearsal

- Live Simulation Exercise
- Novara Italy, 2013
As emergency response advances, our roles have become more and more specialized.

We seldom work in collaboration with other specialties.

Without rehearsal, it may be unclear how the parts of the system will finally fit together.

narrative | planning assumptions | accountability | simulation
Solution: Simulation

- Allow diverse agencies to work together to rehearse a situation
- “When organizations have interacted and coordinated with each other before-hand, they have had fewer problems doing so in a disaster”
Solution: Simulation

- Exercises allow rehearsal of cooperative efforts
- Live exercises may:
  - Be Costly
  - Difficult to implement
  - Require suspending regular services
Computer Simulation

- Allows responders to “play” together as a team
- Reproducible
- Reusable (can quantify results as response is changed)
- Inexpensive
- Portable

SurgeSim

narrative | planning assumptions | accountability | simulation
Solution: Simulation

Virtual Reality

Enhanced Live Simulations
1. Recognize how planning assumptions can lead to missed opportunities
2. Describe the necessity of accountability
3. Understand the changing role of simulation
Lessons Learned from a Structural Collapse
Can Engineers and Physicians Learn from One Another?

Cameron Franchuk
M.Sc., P.Eng.
Associate, Structural Engineer – DIALOG
Sessional Lecturer, Department of Civil and Environmental Engineering – University of Alberta

Jeffrey Franc
MD, MSc, FCFP(EM), D Sport Med, EMDM
Associate Clinical Professor of Emergency Medicine – University of Alberta
Visiting Professor in Disaster Medicine - Università del Piemonte Orientale

The Hyatt Regency Skywalk