Digital Technology and Disaster Response - EHRs, Satellites, and RHIOs: Lessons from Tulane University Hospital During Katrina

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Welcome to Florida

We are here
Seminar Objectives

- To assess the current Emergency Disaster Response environment.
- To explore how information technology and wireless technology could have improved Disaster Response at Tulane University Hospital.
- To discuss Regional Health Information Organizations (RHIO’s) as a mechanism to enhance disaster response.
- To develop a checklist of information technology initiatives that can promote process improvement in Disaster Response.
J. Scheuren, O. le Polain de Waroux, R. Below, D. Guha-Sapir, S. Ponsere

### Table 2: Top 10 most important disaster by victims

<table>
<thead>
<tr>
<th>Event</th>
<th>Country</th>
<th>Victims</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flood, June-July</td>
<td>China P. Rep.</td>
<td>105004535</td>
</tr>
<tr>
<td>Flood, July</td>
<td>India</td>
<td>18701103</td>
</tr>
<tr>
<td>Flood, July-August</td>
<td>Bangladesh</td>
<td>13772490</td>
</tr>
<tr>
<td>Flood, July</td>
<td>India</td>
<td>11100096</td>
</tr>
<tr>
<td>Cyclone Sidr, November</td>
<td>Bangladesh</td>
<td>8982775</td>
</tr>
<tr>
<td>Typhoon Sepat, August</td>
<td>China P. Rep., Philippines, Taiwan*</td>
<td>8381854</td>
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<tr>
<td>Flood, September</td>
<td>India</td>
<td>7200080</td>
</tr>
<tr>
<td>Flood, August</td>
<td>China P. Rep.</td>
<td>2430026</td>
</tr>
<tr>
<td>Flood, May</td>
<td>China P. Rep.</td>
<td>2300093</td>
</tr>
<tr>
<td>Drought, January</td>
<td>Zimbabwe</td>
<td>2100000</td>
</tr>
</tbody>
</table>

* China P Rep (8 000 003), Philippines (390 003), Taiwan (1812)

Total: 179973052
Factors Contributing to Disaster Severity

- Human vulnerability due to poverty & social inequality
- Environmental degradation
- Rapid population growth especially among the poor
- Urban Growth

Sources: CDC & EK Noji, The Public Health Consequences of Disaster
Influence of Urban Growth

Urban population:
- 1920: 100 million
- 1980: 1 billion
- 2004: 2 billion

Source: CDC & EK Noji, *The Public Health Consequences of Disaster*

![Table showing urban population projections and changes](http://www.demographia.com/db-worldua2015.pdf) accessed February 4, 2008
## Worlds Largest Cities

<table>
<thead>
<tr>
<th>Rank</th>
<th>Metropolitan Area</th>
<th>Nation</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tokyo-Yokohama</td>
<td>Japan</td>
<td>33,190,000</td>
</tr>
<tr>
<td>2</td>
<td>New York</td>
<td>United States</td>
<td>21,362,000</td>
</tr>
<tr>
<td>3</td>
<td>Seoul-Inchon</td>
<td>South Korea</td>
<td>19,920,000</td>
</tr>
<tr>
<td>4</td>
<td>Mexico City</td>
<td>Mexico</td>
<td>19,620,000</td>
</tr>
<tr>
<td>5</td>
<td>Sao Paulo</td>
<td>Brazil</td>
<td>17,720,000</td>
</tr>
<tr>
<td>6</td>
<td>Mumbai (Bombay)</td>
<td>India</td>
<td>17,580,000</td>
</tr>
<tr>
<td>7</td>
<td>Osaka-Kobe-Kyoto</td>
<td>Japan</td>
<td>16,930,000</td>
</tr>
<tr>
<td>8</td>
<td>Los Angeles</td>
<td>United States</td>
<td>16,374,000</td>
</tr>
<tr>
<td>9</td>
<td>Manila</td>
<td>Phillipines</td>
<td>14,140,000</td>
</tr>
<tr>
<td>10</td>
<td>Cairo</td>
<td>Egypt</td>
<td>14,000,000</td>
</tr>
<tr>
<td>11</td>
<td>Calcutta</td>
<td>India</td>
<td>13,940,000</td>
</tr>
<tr>
<td>12</td>
<td>Delhi</td>
<td>India</td>
<td>13,720,000</td>
</tr>
<tr>
<td>13</td>
<td>Shanghai</td>
<td>China</td>
<td>13,580,000</td>
</tr>
<tr>
<td>14</td>
<td>Buenos Aires</td>
<td>Argentina</td>
<td>13,390,000</td>
</tr>
<tr>
<td>15</td>
<td>Jakarta</td>
<td>Indonesia</td>
<td>13,330,000</td>
</tr>
<tr>
<td>16</td>
<td>Beijing</td>
<td>China</td>
<td>13,160,000</td>
</tr>
<tr>
<td>17</td>
<td>Moscow</td>
<td>Russia</td>
<td>13,100,000</td>
</tr>
<tr>
<td>18</td>
<td>London</td>
<td>United Kingdom</td>
<td>12,130,000</td>
</tr>
<tr>
<td>19</td>
<td>Karachi</td>
<td>Pakistan</td>
<td>11,020,000</td>
</tr>
<tr>
<td>20</td>
<td>Rio de Janeiro</td>
<td>Brazil</td>
<td>10,810,000</td>
</tr>
</tbody>
</table>

Mass Casualty Incidents

- Mass Casualty Incidents (MCI) represent one of the greatest challenges to a community’s emergency response system due to their magnitude and intensity.
- International disasters have claimed 3 million lives and have adversely affected 800 million over the past 20 years (1).
- These are in response to such events as:
  - Tsunami-Indonesia
  - Hurricane Katrina- New Orleans
  - May 2008, Cyclone Nargis hit Myanmar resulting in a death toll of 78,000


Emergency Management

- Emergency management is the application of science, technology, planning and management to deal with extreme events that can injure or kill large numbers of people or create extensive property damage (1).
- The challenge in emergency medical response is to insure that adequate personnel, supplies, equipment and protocols are in place to deal with potential threats.
- Emergency medical response requires a plan that is scalable to the threat and coordinates the use of local, regional, and national resources.

Components of Medical Disaster Response

While no two disasters are identical, the medical, physical, psychological and public health impacts are similar.

Disaster medical response consists of mass casualty response, incident control, decontamination, comprehensive medical treatment, and public health initiatives (1).

A key factor is the development of a unified command and control structure linked by a robust informatics network that allows for a clear assessment of the event and the efficient utilization of health care resources.

Problems in Disaster Response

- Limited Resources
- Inadequate Communication
- Inadequate Data
- Misinformation
- Damaged Infrastructure
- Great Personal Risk
Disaster Informatics

- In the U.S., disaster medical response requires the coordinated efforts of local, state and federal resources.
- International disasters require the involvement of organizations such as the United Nations and the International Committee of the Red Cross along with the host nation in the planning process.
- The application of new communication systems can assist in planning within the chaotic environment of disaster response. Such disaster informatics will enhance mass casualty triage, improve the safety of first responders, facilitate command and control as well as improve overall resource utilization.

Patient Tracking and Medical Care

- Primary means of information and documentation utilizes paper tags to identify patients from the field to the hospitals.
- These tags have many limitations:
  - Limited space to record medical data
  - Non-weather resistant
  - Can be easily marred or destroyed
Casualty, Patient and Population Tracking

- Scanning patient wristbands at the disaster site and uploading this data via a wireless LAN, disaster planners can identify the number and location of casualties in order to determine transport to trauma centers and other medical facilities.
- Bar coding will enhance patient tracking, improve patient care and coordinate the efforts of first responders, trauma centers and hospital. More importantly, electronic data then becomes the information necessary for disaster planning, casualty estimation, family notification, etc.
- Collection of DNA provides information and documentation on casualties, patients and humanitarian population.
- Opportunities for identification include:
  - Digital Photographs
  - DNA Hair Samples
  - DNA Skin Samples
  - DNA Tooth

Critical problems involved public sanitation, water safety, infection control, environmental health and access to care (1).

The future of disaster medical response

- Effective use of multiple data sources
- New informatics technologies including remote sensors, wireless LANs, GPS technology, patient tracking systems and online medical resource databases will improve disaster medical response
- Informatics technologies will improve patient care, enhance provider safety and provide better command and control in a Disaster situation

Tulane University Hospital and Clinic
Tulane University Hospital & Clinic

- Ownership – JV Tulane University/HCA
- Academic Medical Center
- Faculty – 400
- Tulane is the #1 employer in New Orleans
- Part of New Orleans Medical Complex with Charity System and VA system
- 3 Campuses
  - TUHC Downtown – 235 beds
  - Tulane Lakeside – 119 beds
  - DePaul Tulane Behavioral Health Center – 110 beds

Source: Presentation by Stephen Baldwin, Associate Vice-President of Tulane University Hospital and Clinic Titled “BMT Programs and Disaster Management: Case Study from Hurricane Katrina”
Statistics at Landfall

- **178 patients** (120 Tulane + 58 from Superdome)
  - 35 discharged before storm
  - 11 patients on ventilators
  - 11 pediatric and neonates
  - Two biventricular assist device (*BiVAD*) patients
  - 3 - 450+ lb. patients
  - 3 Bone marrow transplant (BMT) patients

- **60 Superdome evacuees** (Arrived with 58 Superdome patients)

- **450 staff and families** (At hospital and local hotels)

- **500 Medical School personnel and families**

- **25-member University Police force**

- **79 dogs, cats and birds**

Source: Presentation by Stephen Baldwin, Associate Vice-President of Tulane University Hospital and Clinic Titled “BMT Programs and Disaster Management: Case Study from Hurricane Katrina”
12 hours Post-Landfall

- Water begins rising in the power plant
  - 1 inch every 5-10 minutes
- Office of Emergency Preparedness recommend that we relocate 1st floor departments to higher ground........AGAIN!
- Received word that levees are breached
- Decision to evacuate
  - How to accomplish
  - Create helipad on garage roof

Source: Presentation by Stephen Baldwin, Associate Vice-President of Tulane University Hospital and Clinic Titled “BMT Programs and Disaster Management: Case Study from Hurricane Katrina”
18 hours Post-Landfall

- Flood waters continue to rise
- Medical Staff triages patients for evacuation
- Helicopters arrive and evacuation begins
- Families separated
- Utilities begin to fail
  - Electricity, elevators, air conditioning, water, telephones
  - Complete loss of emergency power just before dark
  - Liquid Nitrogen levels high to sustain BMT products for 3 weeks
72 hours Post-Landfall

- Evacuation continues
  - Delayed due to rain and fog
- Forty additional Charity Hospital patients arrive and are evacuated
- CNN arrives….files story….and leaves
- Completion of patient/family evacuation

Source: Presentation by Stephen Baldwin, Associate Vice-President of Tulane University Hospital and Clinic Titled “BMT Programs and Disaster Management: Case Study from Hurricane Katrina”
72 hours Post-Landfall

- FEMA arrives
- US Marines arrive
- Governor’s story – “Tulane is evacuated!”
  - …………… not quite
- Building locked down
- 400+ staff slept in garage
- 4AM Warehouse Explosion

Source: Presentation by Stephen Baldwin, Associate Vice-President of Tulane University Hospital and Clinic Titled “BMT Programs and Disaster Management: Case Study from Hurricane Katrina”
The unsung heroes of Tulane!!
96 hours Post-Landfall

- Final staff evacuation
- Transportation of employees
  - Helicopters to the Airport
  - Buses to Lafayette
  - Decontamination
  - Shelter
  - Final destination

Source: Presentation by Stephen Baldwin, Associate Vice-President of Tulane University Hospital and Clinic Titled “BMT Programs and Disaster Management: Case Study from Hurricane Katrina”
Cleanup and Rebuild

- Remediation - $20-23 million
- Equipment and Supplies - $25-30 million
- Construction - $30-35 million

Timeline
- Hospital shutdown – September 1, 2005
- Remediation begins – September 17, 2005
- Hospital reopens February 14, 2006
- Cancer Center and BMT unit open September 2006
- Complete Reopen – March 1, 2007

Source: Presentation by Stephen Baldwin, Associate Vice-President of Tulane University Hospital and Clinic Titled “BMT Programs and Disaster Management: Case Study from Hurricane Katrina”
Lessons Learned

- Communications – be sure they are effective
- Refine and practice emergency preparedness plans
- Don’t rely on anyone to “rescue you”
- Plan for a total loss of emergency power
- Redefine emergency supply inventory
- Reduce essential personnel to minimum
- Building & Equipment Salvage

Source: Presentation by Stephen Baldwin, Associate Vice-President of Tulane University Hospital and Clinic Titled “BMT Programs and Disaster Management: Case Study from Hurricane Katrina”
On the morning of August 29, 2005 Hurricane Katrina came ashore in the Gulf Coast of MS and Louisiana causing a 20 foot storm surge and severe wind damage.

The NPS-led team deployed on 3 September 2005 to Bay St. Louis and Waveland, MS, which was ground zero for Hurricane Katrina. NPS, OASD Information Integration office and several vendors (Cisco, Microsoft, Redline, and Mercury Data Systems) to create the first and only official communication network.

The network solution provided a publicly accessible set of broadband wireless hotspot clouds in an area that suffered virtually 100% disruption of all communications capabilities.

NPGS Monterey, California (CA) assisted the Hancock County Operations Center (EOC) by providing them with SATCOM-enabled wireless Internet connectivity to the county hospital, local government offices, police stations, emergency services locations, and the general public.
Global Star GSP 7100
(Source: GlobalStar website)
The Voltaic solar daypack shown worked well in the area. While it is not designed to charge laptops, it does charge cell phones, satellite phones, PDAs, GPSs, cameras etc. With almost 2,000 cubic inches of storage, it is still a bit small. A 4,000 cubic inch bag would handle more communication equipment.
HASTILY FORMED NETWORKS AFTER ACTION REPORT AND LESSONS LEARNED FROM THE NAVAL POSTGRADUATE SCHOOL’S RESPONSE TO HURRICANE KATRINA 1 - 30 September 2005 Authors Brian Steckler (NPS Faculty) Bryan L. Bradford, Maj, USAF (NPS Student) Steve Urrea, Capt, USMC (NPS Student)
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"HFN Katrina" Presentation:

Civil-Military ICT Baseline

Internet is the "default" civil-military collaborative information network and commercial SATCOM the primary remote access communications means.

Source: Naval Post Graduate School, Hastily Formed Networks [http://faculty.nps.edu/dl/HFN/index.htm](http://faculty.nps.edu/dl/HFN/index.htm) retrieved Jan 29, 2009
Common ICT Response Architecture

- Portals, Hubs, & Virtual Workspaces
  - Host Country Details
  - Situation Awareness
  - Who’s doing what, where, S:
- Maps, Assessments, Web portals
- Phonebook/Email address books
- Radio Nets (Security, 1st Responders, ...)

- Metadata Registry and Catalog and Shared Workspace

- Information/Knowledge Mgt
  - Information Assurance

- Services
  - Voice, Fax, Data
  - Email, Internet
  - VTC, Video, Imagery

- Internet (Email, VoIP, GIS, Collaboration Tools, VTC, Video, Imagery, ...)

- IT
  - ISP
  - SATPHONE
  - GSM/PSTN
  - Teleport/Hub
  - VSAT

- Military
  - Crisis ICT
  - System Control
  - Net Mgt & Admin Frequency Mgt

- Comms
  - VSAT, GSM, SATPHONES, PSTN, AM/FM, HF, VHF, UHF, TV Networks

- Civilian Gov’t
  - Crisis ICT
  - CMOC
  - CIMIC
  - IMC
  - HIC/HAC

- IO, IGO, NGO
  - Crisis ICT

- Host Nation
  - Kiosks: Call Centers
  - Internet Café
  - HIC
  - Enable Capacity Building

Source: Naval Post Graduate School, Hastily Formed Networks [http://faculty.nps.edu/dl/HFN/index.htm](http://faculty.nps.edu/dl/HFN/index.htm) retrieved Jan 29, 2009
Estimates on Network Costs

- Hardware Cost for Similarly Configured System: $50,000 to $75,000
- Very Small Aperture Terminal (VSAT) with Large Dish $4,000 per month provides T1 line speed. Tachyon
- Broad Band Local Area Network (BGAN) small teams, 15 minute set up, cost $2 to $7 per megabyte transmitted. INMARSAT BGAN Satellite Services
- Personnel for Setup and Operation
The Nine Element HFN Puzzle

Surrounded by the Civil-Military Boundary and Enabled by Improvisation

Power Sources
- Generators
- Wind
- Solar
- Crank, etc.

Applications/Communications
- Web access
- Email
- Cell phones
- VTC, etc.

Environmental Needs Support
- Shelter
- Water purification
- RVs and trailers, etc.

WiMAX
- 802.16 or OFDM
- Spoke and hub net
- Point to point links
- Inexpensive & easy to deploy

SATCOM/Internet
- VSAT
- BGAN
- Rapid deployment
- Require clear line of sight

WiFi Mesh (WLAN 802.11 Cloud)
- 10 mbps
- Wireless mesh
- Mobile operations

Voice Comms
- Voice over IP
- Skype
- Land Mobile Radio over IP
- Cellular systems, etc.

NOC, Security & System Mgmt.
- Link to EOC
- Mobile facilities
- Network management
- Virtual/physical security

Personnel Skill Sets
- Network engineers
- Climbers
- Help Desk
- Management, etc.

HFNs Defined: Introduction
Disaster responders must communicate. They must pool their knowledge and interpretations of the situation, understand what resources are available, assess options, plan responses, then decide, commit, act, and coordinate.

This interactive learning module will help you better understand the tools, configurations and human skills necessary to set up an effective and efficient, on-location, communications network in response to emergency situations.

Use your mouse to select a topic on the HFN puzzle to begin.

Printable (HTML) version of puzzle.

Source: Naval Post Graduate School, Hastily Formed Networks http://faculty.nps.edu/dl/HFN/index.htm retrieved January 29, 2009
Power Sources

- Solar
- Wind
- **Crank** (bicycle or hand cranking systems provide a small capacity)
- **Hydrogen Fuel Cell (HFC)** (requires delivery via heavy gas bottles)
- **Modified automobile alternator/generator technologies** (using the natural power generation capabilities of automobiles on station to generate power—but again requires fossil fuel delivery or availability).

Given that each of these power sources have different dependencies (sunlight, wind, physical labor, hydrogen/petroleum fuel, etc.) it is highly advisable to have multiple power generation options available. Typically, there is never sufficient power generation capacity to meet demand.

HASTILY FORMED NETWORK CASE STUDY, USNS Comfort (TAH-20) Humanitarian Outreach Mission to The Caribbean and Central / South America (Summer 2007), Brian Steckler, Scott McKenzie, A Cebrowski Institute Hastily Formed Network Study
Impact on Humanitarian Assistance

- New information systems, sensors, and extended connectivity enhanced the effectiveness of Humanitarian operations.
- Increased connectivity and the flow of information provided an “untethered” ability to collaborate, regardless of location.
- Data communications were the primary means of gaining situational understanding and ensuring coordination at all levels.
- Even limited information systems and connectivity provided value, allowed leveraging systems to maximize performance.
- Information systems increase the need for reliable stable power sources and greater connectivity (bandwidth).

HASTILY FORMED NETWORK CASE STUDY, USNS Comfort (TAH-20) Humanitarian Outreach Mission to The Caribbean and Central / South America (Summer 2007), Brian Steckler, Scott McKenzie, A Cebrowski Institute Hastily Formed Network Study
Applications and Communications

Assuming Responders have computers, Internet access, or cellular service, there will be several critical user applications available such as basic email, web access, file transfer capabilities via File Transfer Protocol (FTP,) and simple messaging systems (SMS) for text-based chat. Other critical user applications include collaboration and online communication tools.

- Video-teleconferencing
- Voice over IP
- Websites specializing in Humanitarian Assistance and Disaster Response
- GIS mapping tools

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Satellite communications (SATCOM) provides options for Internet when the normal infrastructure copper or fiber optics from the telecommunications companies is destroyed or damaged. SATCOM can be rapidly deployed (less than an hour usually) and while it is a costly way to get Internet access versus normal wired internet access technologies, it is often the only option in disaster regions.

- Internet access speeds will range from 128 kbps to 20-30 mbps
- Very Small Aperture Terminal (VSAT) systems range from the size of a large laptop to 1-3 meter dishes. They can be set up on the ground, building rooftops, tops of RVs, but require clear line of sight to the satellite service provider’s transponders on specific satellites.

HASTILY FORMED NETWORK CASE STUDY, USNS Comfort (TAH-20) Humanitarian Outreach Mission to The Caribbean and Central / South America (Summer 2007), Brian Steckler, Scott McKenzie, A Cebrowski Institute Hastily Formed Network Study
Wireless Local Area Network (WLAN)

- WiFi creates “wireless clouds” at Internet access speeds of 1-10 mbps or more in large areas (up to several square miles) with a number of strategically positioned meshed wireless access points (WAPs). This same technology is used in airports, coffee shops, etc, for public wireless access to the Internet.

- WiFi enables:

  - Mobile operations for laptops, PDA, hand held VoIP phones, remote sensors for situational awareness, etc.

  - Multiple WAPs can be integrated in an area, thereby increasing the footprint of the wireless cloud by using technology known as “wireless mesh.”

- Once you have established a wireless mesh, all Internet applications can be used.

HASTILY FORMED NETWORK CASE STUDY, USNS Comfort (TAH-20) Humanitarian Outreach Mission to The Caribbean and Central / South America (Summer 2007), Brian Steckler, Scott McKenzie, A Cebrowski Institute Hastily Formed Network Study
Command and Control

- Handheld PDAs currently being tested within DOD record medical care provided at the disaster site and transfer this data via wireless technology to the disaster response center.

- Many of the logistical problems faced in disasters are not caused by shortages of medical resources, but rather from failures to coordinate their distribution.

- Such data could be recorded on real time electronic status boards providing up to date information on patients, personnel and available resources.

Challenges in Disaster Response

- The challenge is to identify those programs with the greatest potential benefit and prioritize future expenditures in a manner that will best meet the emerging threat.
- Rural communities lack the staff, equipment and training to respond to NBC threats, it is essential that specialized teams be developed and funded to provide disaster response.
- Such teams could be maintained as national assets and be made available to other nations as a deployable disaster response unit. By equipping these deployable units with the best technology and disaster informatics available, a high standard of international disaster medical response could be maintained in a fiscally responsible manner.

Disaster Medical IT for Planning

- HAveBED system – national real-time hospital bed tracking system to determine the number of available beds in different locations
- Emergency Preparedness Resource Inventory (EPRI) Web-based tool
  - Assess regional supply of critical resources, prepare for incident response, estimate gaps
  - Includes inventory checklist to record where equipment and medicines are located, amount available and how to locate them
- Bioterrorism and Epidemic Outbreak Response Model
  - Predicts staff needed to respond to major disease outbreak or attack

Tracking Tools

- **GIS (Geographical Information System)**
  - Real-time tracking materials and people
  - Coordinate patient care as they are moved from location to location
  - Help first-responders find fastest route

- **RFID (Radio frequency identification technology)**
  - Track equipment and patients
  - Battery-operated wireless tags
  - Alternative to bar coding

IT Systems and Software for Disaster Management

- Incident management system – direct, control and coordinate response and recovery operations
  - 86% of hospitals report using an incident management system
  - FEMA developed National Incident Management System after 9/11
- Web-based health information management solution
  - EMSystem software – aids emergency preparedness by optimizing real-time communications, inventory resource allocation, volunteer registry management, patient tracking
- System back-up
  - Evault, Inc.
  - Double-Take for Windows servers

Regional Health Information Organization (RHIO)

**Definition** – A Regional Health Information Organization (RHIO) is a multi-stakeholder organization that enables the exchange and use of health information, in a secure manner, for the purpose of promoting the improvement of health quality, safety and efficiency. (1)

Experts maintain that RHIOs will help eliminate some administrative costs associated with paper-based patient records, provide quick access to automated test results and offer a consolidated view of a patient’s history. (1)

RHIO’s can provide the legal and technological framework to share patient data within local communities and across wide geographic areas.

(1) Source: HIMSS RHIO Definition, 2005
RHIO: Key Concepts for Success

- Decentralized architecture built using Internet as communication link.
- Joint governance composed of public and private stakeholders.
- Patient-centric focus with safeguards to protect the privacy of health information.
- Leverage existing technology, expansion of EHRs and federal initiatives as critical enablers.

Source: Sutherland, J (2005). Regional Health Information Organization (RHIO): Opportunities and Risks, White paper CTO PatientKeeper, Inc
**BREAST MASS**

**Initial Onset:** 2 mos ago

**Location:** Lt. lower outer

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**REVIEW OF SYSTEMS**

- Do you perform regular self breast exams? — Yes ☐ No ☐
- Any change since onset? — Yes ☐ No ☐
- Have you had a recent breast injury? — Yes ☐ No ☐
- Are you taking hormones? — Yes ☐ No ☐
- Are you taking supplements? — Yes ☐ No ☐
- Have you had any breast pain? — Yes ☐ No ☐
- Have you had nipple discharge? — Yes ☐ No ☐
- Have you had fever? — Yes ☐ No ☐
- Hx of lumps? — Yes ☐ No ☐
- Any family hx of breast problems? — Yes ☐ No ☐
- Have you been told of any genetic predisposition for breast problems in your family? — Yes ☐ No ☐

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**CONDITIONS THAT REQUIRE FURTHER MONITORING**

- [ ] 610.1 Cystic Mastopathy
- [x] 611.79 Symptoms in Breast Not
- [ ] 611.72 Lump Or Mass In Breast
- [ ] 239.3 Breast Neoplasm Not

---

**Additional Comments:**

---

**Visit:**
- [ ] 11/03/2004 09:33 A
- [ ] Breast Mass
- [ ] Mast Im
- [ ] IM Assessment
- [ ] 09/30/2004 11:30 A
- [ ] 06/04/2004 03:32 P
- [ ] 04/06/2004 01:04 P
- [ ] 03/04/2004 11:53 A
- [ ] 03/24/2004 11:53 A
- [ ] 10/08/2003 03:15 A
- [ ] 10/08/2003 03:14 P
- [ ] 10/03/2003 12:00 A
Management Implications

- Increased threat leads to investment in Disaster IT and provides opportunities for collaboration across wide geographic areas.
- Continued access to capital is necessary to improve Disaster Response systems.
- Analysis of historic data allows for focused investments in IT to improve efficiency and quality of Disaster Response.
- Disaster Planners are challenged to expand the use of IT in order to improve disaster preparedness, mitigation and prevention.
- Rural communities have minimal resources and require the support of mobile disaster response teams.

Policy Implications

- As was documented during the Tsunami of December 26, 2004, the ability of communities to respond to cataclysmic events is limited by the availability of local resources. The only realistic approach is to develop a coordinated plan to meet local needs through the timely integration of local, state, federal and in some cases multinational resources.

- Recent events clearly support the development of specialized disaster response teams within the international community. These disaster response teams should be funded sufficiently to operate with state of the art technology and be trained for rapid deployment.

- Additional research in the development of new technology and improved medical treatments combined with strategic stockpiles of antibiotics and vaccines are appropriate.

- Due to the international nature of the threat and the significant expenditures required, a partnership of governmental, educational and research foundations may be appropriate.

Influenza Pandemic

“In the past few months, the media buzz around ‘bird flu’ has died down, but the H5N1 strain of avian influenza has not. It remains a serious danger that we must all face together.”

Secretary Mike Leavitt, HHS
May 15, 2007
## Pandemic Influenza in the United States

http://www.hhs.gov/pandemicflu/plan/

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Moderate (1958/68 like)</th>
<th>Severe (1918 Like)</th>
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</thead>
<tbody>
<tr>
<td>Illness</td>
<td>90 Mil. (30%)</td>
<td>90 Mil. (30%)</td>
</tr>
<tr>
<td>Outpatient Care</td>
<td>45 Mil. (50%)</td>
<td>45 Mil. (50%)</td>
</tr>
<tr>
<td>Hospitalization</td>
<td>865,000</td>
<td>9,900,000</td>
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<tr>
<td>ICU care</td>
<td>128,750</td>
<td>1,485,000</td>
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<tr>
<td>Mechanical Ventilator</td>
<td>64,875</td>
<td>742,500</td>
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<tr>
<td>Deaths</td>
<td>209,000</td>
<td>1,903,000</td>
</tr>
<tr>
<td>Bed Size</td>
<td>Hospitals with Airborne Infectious Isolation Rooms</td>
<td>Hospitals without Airborne Infectious Isolation Rooms</td>
</tr>
<tr>
<td>--------------</td>
<td>--------------------------------------------------</td>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>0-24 Beds</td>
<td>194</td>
<td>218</td>
</tr>
<tr>
<td>25-49 Beds</td>
<td>639</td>
<td>402</td>
</tr>
<tr>
<td>50-99 Beds</td>
<td>608</td>
<td>396</td>
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<tr>
<td>100-199 Beds</td>
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<tr>
<td>200-299 Beds</td>
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<td>300-399 Beds</td>
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<td>400-499 Beds</td>
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<td>19</td>
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<tr>
<td>500+ Beds</td>
<td>214</td>
<td>32</td>
</tr>
<tr>
<td>Total</td>
<td>3341</td>
<td>1517</td>
</tr>
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</table>
Global Positioning Systems

GPS technology and patient tracking can assist in planning for coordinated patient movement throughout the disaster area. While still under development, miniature CBN threat sensors can document those areas affected by contamination and facilitate the safe movement of patients along the continuum of care.

Potential drawbacks that are being investigated:
- Level of location resolution
- Level of location accuracy
- Ability to work within structures
- Signal response delays
- Acoustic ranging
- Signal strengths
Figure 1: Airborne Isolation Rooms by Population

Legend
- Location of Airborne Isolation Room

U.S. Census Bureau County Population Estimates for 2007
- 55 - 199,295
- 199,296 - 676,898
- 676,899 - 1,859,284
- 1,859,285 - 5,285,107
- 5,285,108 - 9,878,554

Created with ArcMap, ESRI Inc.
Population data from U.S. Census Bureau, Population Division, December 2008
A Comprehensive Strategy for Disaster Response

- Embrace information technology in Disaster Response?
- Cost versus Benefit
- Local, State, National and International Focus?
- Advance or retreat?
Disaster Response IT Dashboard

- Shared Vision of IT in Disaster Response
- Acquire Disaster Hardware and Software (commercial off shelf)
- Application Architecture with Internet for wide area coverage
- Integration of Disaster Response IT systems
- Contract with Vendors for Disaster Services (People, Uplink)
- Use of Wireless Technology
- Mobile Users and Electronic Linkage to Disaster data
- Integration of Global Positioning System (GPS)
- Disaster Data Warehouse with Real Time Access
- Use of Pre-positioned/remote Bio Medical Sensors
- Use of IT Systems in Disaster Exercise
- Capital investment in Disaster IT
- Deployable Disaster Response IT Teams
- Ensure System Redundancy for Infrastructure, Staff, Network
- Ongoing Research & Investment in Disaster IT
Questions

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