Emergency Management for Advanced Practice IPs

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I have no relevant financial relationships to disclose.

Objectives

• Infectious diseases during disasters
• Emergency management plan assessment
• Evidence-based EM interventions
• Resources available to help you
Infectious Diseases & Disasters

- Fear of disease after disaster
- Natural disasters: outbreaks are rare
  - Skin, GI, respiratory infections
  - Endemic illnesses (measles, diarrhea, etc)
- Refugees at risk from endemic diseases

Hurricane Katrina

Photo courtesy of FEMA/Win Henderson

Infectious Disease Disasters

- Bioterrorism, emerging infectious disease, pandemic
- Largest potential impact from communicable diseases
Potential Impact of an Infectious Disease Disaster

- Depends on the event
  - Size of the event
  - How soon event is recognized
  - Contagious vs non-contagious disease
  - Anti-infective therapy and/or vaccine
  - Immunity of population
  - Interventions implementation

2001 Anthrax Bioterrorism Attack

- 22 cases of illness
- 5 deaths
- > 40,000 doses of PEP
- Cost: > $1.2 million

Photo courtesy of FBI

Potential Impact of Bioterrorism

- 50 kg of anthrax = tens to hundreds of thousands of death
- 50 kg of *F. tularensis* = 250,000 illnesses, 19,000 deaths
- $477.7 million/100,000 people - $26.2 billion/100,000 people
Potential impact of BT
5 Gram Anthrax Release over St Louis

- Single point release: NE corner of Bell Building
- Particle Size: 4.85 - 5.12 µ
- Date: 8 Nov 2000
- Historical Weather Models employed
- Fixed winds: 12 mph

Population Affected (Census Data)
DEATHS = 3,027

Total inventory mass = .0127 Kg
Total mass expelled = .00508 Kg

5 lb (2.27 Kg) Anthrax Release over St Louis

- Single point release: NE corner of Bell Building
- Particle Size: 4.85 - 5.12 µ
- Date: 8 Nov 2000
- Historical Weather Models employed
- Fixed winds: 12 mph

Population Affected (Census Data)
DEATHS = 62,503

Total inventory mass = 5.67 Kg
Total mass expelled = 2.27 Kg

Pandemic

- Global event
  - Difficult to get outside help
- Longer event than other disasters
  - Wave: 6 – 12 weeks
- High absenteeism rate (>40%)

Sick HCWs may contribute to the outbreak
Impact of SARS & H1N1

- **SARS**
  - 8,096 cases
  - 774 deaths
  - 9.6% mortality
  - 44% of cases occurred in HCWs

- **H1N1**
  - 214 countries
  - < 1% mortality
  - 43 – 89 million U.S. cases
  - 8,900 – 18,300 deaths in U.S.

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1918 Spanish Influenza Pandemic

- Very virulent disease
- No vaccine
- 40 – 50 million deaths worldwide
- > 500,000 excess U.S. deaths
Why IP Involvement? Where do IPs fit in emergency management?

Healthcare Emergency Management
- Member of facility/agency planning team
  - All healthcare settings
- Community-based plans
  - Schools, PODs, etc
- Consultant

Evidence-Based Interventions for Disaster Preparedness
- Healthcare agencies need EM plan
- Most hospitals have a plan
  - U.S.: 100% have plan (Niska, 2011)
  - Canada: 92% have plan (Zoutman, 2010)
  - China: 93% have plan (Hui, 2007)
- Fewer plans in non-acute care settings
  - 87% of U.S. home health agencies have pandemic plan (Rebmann, 2011)
Need to Move Beyond Having a Plan: Assess the Plan

- Checklists for hospitals and home health

<table>
<thead>
<tr>
<th>Table 1. Infection prevention components of a hospital emergency management plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property and personal protective equipment (PPE) management plan</td>
</tr>
<tr>
<td>Staffing strategies and the use of personal protective equipment (PPE)</td>
</tr>
<tr>
<td>Administrative strategies to expedite patient care</td>
</tr>
<tr>
<td>Operational strategies for emergency management</td>
</tr>
<tr>
<td>Staffing strategies and the use of personal protective equipment (PPE)</td>
</tr>
</tbody>
</table>

Example of How to use the Hospital Checklist

- Compare each item to the hospital plan
  - Has prioritization plans/algorithms for allocating limited PPE, hand hygiene products, ventilators, anti-infective therapy or vaccination, and other supplies/products that affect infection transmission during a biological event

Other Plan Assessment Tools

- CDC Pandemic Planning Checklists
  - Available for all healthcare settings
Non-Healthcare Setting Plan
Assessment Tools

Need to Move Beyond
Having a Plan: Exercises/Drills

- Only 58.5% of US hospitals use IDD scenarios in drills (Niska, 2011)
  - 30% test med distribution to staff
- 50% of HH agencies test their plan
- 16% of Canadian hospitals tested pan flu plan (Zoutman, 2010)

Moulaged smallpox patient to test hospital bioterrorism plans

Survey

- Routine surveillance
  - May need to drop during disasters
  - Assess burden vs impact of each indicator
- Syndromic surveillance
- Event-specific surveillance
  - Usually disease-specific
### Surveillance Matrix

![Surveillance Matrix Diagram]

### Surveillance Prioritization

![Surveillance Prioritization Diagram]

### Epidemiological Clues of a Possible Biological Event

- Occurrence of a disease that is not seen in a population
  - Hemorrhagic fever outside Africa or one case of smallpox
- Simultaneous outbreaks of more than one agent (bio-cocktail)
- Occurrence of an illness that requires a vector where the vector does not exist
Epidemiological Clues of a Possible Biological Event

- Increase in respiratory illnesses, severe morbidity, or mortality
- Sudden animal deaths
  - Cattle: anthrax
  - Rodents: plague
  - Birds: WNV

Syndromic Surveillance

- Non-traditional indicators
- Goal: early detection of biological event
  - Rapid turnaround
  - Sensitivity and specificity

*How can you tell when it's a false alarm?*

<table>
<thead>
<tr>
<th>Disease</th>
<th>Associated Syndrome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthrax</td>
<td>Respiratory/flu-like illness, GI: vomiting, diarrhea</td>
</tr>
<tr>
<td>Botulism</td>
<td>Neurological: meningitis-like</td>
</tr>
<tr>
<td>Plague</td>
<td>Respiratory/flu-like illness: cough, pneumonia, ILI, URI</td>
</tr>
<tr>
<td>Smallpox</td>
<td>Dermatologic: vesicular rash</td>
</tr>
<tr>
<td>Tularemia</td>
<td>Flu-like illness</td>
</tr>
<tr>
<td>VHF s</td>
<td>Bleeding disorder</td>
</tr>
</tbody>
</table>
Syndromic Surveillance Data Sources

- ED or clinic patient volume
- ED triage chief complaint
- ED or clinic diagnosis
- Unexplained deaths
- Insurance/billing data
- Lab/radiology ordering volume
- Work absenteeism
- Anti-infective therapy prescribing/pharmacy

*Needs to be coordinated within region*

Screening & Triage Best Practices

- Need screening and triage plan
  - 65% of U.S. hospitals have plan (Morton, 2009)
- Best to use HCW or train well

*Student screeners used during SARS outbreak in Canada*

Screening

- Set up outside, if possible
  - Otherwise, right inside entrance
- Limit the number of entrances
  - Lock off other entrances

*Screening outside of healthcare facility*

Picture source: Jennie Mayfield
Staff Screening

- Frequency during infectious disease disaster:
  - Formal screening before each shift
  - Report symptoms between shifts
  - Consider separate entrances
  - Medically eval sick staff or send home

Picture source: Jennie Mayfield

Formal Screening

- Most likely IDDs only
- Disease/event specific
  - Add avian flu symptoms during pandemic

APPENDIX C

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>&quot;No disease. Potentially&quot;</th>
<th>Yes or no</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cough</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Runny nose</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irritability</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lethargy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Headache</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muscle pain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fatigue</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shortness of breath</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Date: [ ]
Screening in On-Site Child-Care

- Existing daycare centers & schools
  - May be closed by CDC or public health
- Aid in employee retention during event
  - Screen staff/volunteers & children at start of each shift/on arrival

Plan Should Include Disease-Specific Information

- EM plans should address:
  - Category A bioterrorism agents
  - SARS
  - Avian & H1N1 influenza
  - Other emerging infections
- Pre-event educational materials
  - Does not require internet for access

Surge Capacity versus Capability

- Capacity: Increasing **volume** of patients
- Capability: Increasing volume of patients with **specialized medical needs**

| More beds | More specialized beds: isolation or ventilators |
Surge Capacity

• Surge capacity is lacking:
  – 74% of U.S. hospitals have surge capacity plan (Niska, 2011)
  • Amount of surge capacity not specified
  – 65% of home health agencies have surge capacity (Rebmann, et al., 2011)
• Need U.S. standards regarding min. surge capacity
  – Israeli hospitals: 20% surge capacity

Planning for Surge

• Internal and external planning

  Internal plan

  External plan

Planning for Surge: 50 Patient Pod

Head to toe sleeping configuration & 3 feet between cots/beds
Supply Surge Capacity

- Lack of PPE during H1N1 pandemic
  - 1/3 of U.S. hospitals ran out of N-95s
  - Early in the pandemic
- Hospitals received insufficient or wrong type of supplies from stockpiles
  - All size small
  - Wrong brand
    - More fit-testing

![Photo courtesy of Institute for Biosecurity, Saint Louis University](image)

PPE Estimates for Planning & Stockpiling

<table>
<thead>
<tr>
<th>Category of Staff</th>
<th>Respirator</th>
<th>Gown (disposable)</th>
<th>Gloves (disposable)</th>
<th>Goggles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Little to no exposure</td>
<td>1 disposable per contact/exposure</td>
<td>1 per exposure</td>
<td>1 per contact</td>
<td>None</td>
</tr>
<tr>
<td>Prolonged exposure</td>
<td>1 reusable per outbreak (plus 2 cartridges/month*)</td>
<td>1 per exposure</td>
<td>1 per contact</td>
<td>1 per outbreak</td>
</tr>
<tr>
<td>Infrequent exposure(s)</td>
<td>1 reusable per outbreak (plus 2 cartridges/month*)</td>
<td>1 per shift</td>
<td>1 per contact</td>
<td>1 per outbreak</td>
</tr>
</tbody>
</table>

*Disposable respiratory cartridges are needed for reusable respirators. Estimates provided for masks and other supplies in Radonovich et al. (2009)
Re-Use of Respiratory Protection

- Conserve supplies – PAPRs
- Extend the use
- Re-use
- Use lower levels
- Prioritize allocation

Free of charge on APIC Website: www.apic.org

Respirator Decontamination

- Decontamination of N95s would allow longer-term & safe use
- Many decon strategies being tested
- Some strategies make N95s unusable (Viscusi, 2009)

- Microwave-generated steam (MGS) [2 min]
  - Causes slight separation of nose foam from N95
  - Left trace amounts of viable virus
- Warm moist heat (WMH) [30 min]
  - Virus below detection limit
- Ultraviolet germicidal irradiation (UVGI) [15 min]
  - Left trace amounts of viable virus
  
Heimbach, et al. (2011)
Teach & observe staff for PPE compliance

Photos courtesy of Institute for Biosecurity, Saint Louis University

Incorrect respirator removal

Correct

Difficult to wear respiratory protection for long periods of time

Headaches, difficulty breathing, and facial heat discomfort are commonly reported in research studies examining long-term respirator usage.

Respirator Compliance/Tolerance

- Data is conflicting:
  - 68 – 76% compliance over 4-wk period – China
  - 30% compliance by 4th wk of study – Australia
  - 87% reported expected intolerance to N95 for 8 hr shift – Florida
    - 30% report difficulty breathing when wearing N95
    - 56% report increased facial heat
- Studies from NIOSH indicate that CO₂ & O₂ are not negatively affected

Discomfort is not the primary driver of mask/respirator adherence; cultural acceptability & other behavioral factors (perceived susceptibility) are important.
Medication & Vaccine Surge Capacity

- Insufficient amount of medication
  - 31% U.S. hospitals reported shortage in antivirals during H1N1 (Lautenbach, et al, 2010)
  - Only 11% of home health agencies have med stockpile (Rebmann, et al., 2011)
- Not enough pediatric doses
- Vaccine not available for months

Pre-Exposure Prophylaxis for HCWs

- US DHHS recommendation
- Provide pre-exp prophylaxis throughout each pandemic wave
  - High risk HCWs & emergency responders
  - PEP: 1 per day X 10 days = 10 tablets/doses per worker
  - Pre: 1 per day X 12 weeks = 84 tablets/doses per worker
- Not enough to go around

*Have prioritization plan for limited doses of medication & vaccine*

Isolation is critical

- Better to over-isolate

Infected person not on isolation

10 HCW’s infected per day that infected case was not identified & isolated
H1N1 in NYC*  
26 H1N1 pts associated with 277 unprotected staff exposures  
*Banach, et al., 2011

Isolation During Disasters

- Disease known: Follow HICPAC
- Undiagnosed: transmission based precautions

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Isolation Precautions Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cough, runny nose, watery eyes</td>
<td>Standard</td>
</tr>
<tr>
<td>Fever &amp; cough (adults)</td>
<td>Droplet</td>
</tr>
<tr>
<td>Fever &amp; cough (kids)</td>
<td>Droplet &amp; Contact</td>
</tr>
<tr>
<td>Fever, cough, bloody sputum, &amp; wt loss</td>
<td>Airborne</td>
</tr>
<tr>
<td>Eye infection or drainage</td>
<td>Standard</td>
</tr>
</tbody>
</table>

Isolation Precautions for Biological Agents

<table>
<thead>
<tr>
<th>Disease</th>
<th>Isolation Precautions Needed</th>
</tr>
</thead>
</table>
| Anthrax:  
  Cutaneous = Contact       |                             |
  Inhalational = Standard    |                             |
| Smallpox:                   | Airborne & Contact          |
| Plague:                     | Bubonic & Septicemia = Standard |
  Pneumonic = Droplet        |                             |
| Tularemia:                   | Standard                     |
| Botulism:                   | Standard                     |
### Isolation Precautions for Biological Agents

<table>
<thead>
<tr>
<th>Disease</th>
<th>Isolation Precautions Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>VHF:</td>
<td>Standard &amp; Contact</td>
</tr>
<tr>
<td></td>
<td>[eyewear &amp; mask if projectile vomiting; N95 for aerosolizing procedures]</td>
</tr>
<tr>
<td>SARS:</td>
<td>Airborne &amp; Contact</td>
</tr>
<tr>
<td>Avian Influenza*:</td>
<td>Airborne, Contact, &amp; eye protection</td>
</tr>
</tbody>
</table>

*Note: CDC’s recommendation for avian influenza isolation precautions is interim and subject to change

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### Improvised Isolation Area (non-neg pressure)

- Improvising isolation area
  - Physically separate the pt
  - Building or area outside can be used
  - Best if room/area has walls & a door
  - Makeshift walls/doors
    - Plastic or other barrier material
    - Hang isolation sign near entrance
    - Portable HEPA filter unit

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### Improvised PPE cart

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### Need Negative Pressure Surge Capacity

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Airborne Isolation in Ambulatory Care Center

- Hospital better
- Bronchoscopy room may be AIIR
- Improvise negative pressure

Temporary negative pressure rooms/areas used in Toronto during SARS

Picture source: Jennie Mayfield

Patient Management and Placement for Airborne Precautions During Disasters (Negative Pressure Surge Capacity)

1) Bleed air* from the room through a fixed room-air recirculation system
2) Bleed air* from the room through a portable room-air recirculation system
3) Use a centrifugal blower to exhaust air outside from the patient's room
4) Use a specifically designed air cleaner to exhaust air outside from the patient's room
5) Use floor and/or window fans to exhaust air outside the patient's room

* Remove appropriate amount of air volume to achieve negative pressure (to remove more air than flows into the room)

¶ The window must be > 25 feet away from air intakes, other open windows, or be more than 100 yards from another occupied building or high-risk area.
§ Place a floor or table fan near the doorway pointing toward the window fan. Never point a fan towards the patient's door. A second fan must be utilized to help draw contaminated air from the room at the same rate at which the fan at the door is drawing air into the room. The fan in the window must be facing the outside of the building to direct air outward and the window must be open. If the room's windows do not open, this fan system must not be utilized.
Occupational Health Policies

- Employee health info lacking during H1N1 pandemic (Rebmann, 2009)
- Need “return to work” policy
  - H1N1: Initially 7 days, then 24 hrs after fever
  - Doctor’s note or medical exam
    - Not advised due to time and cost involved
    - May not be feasible during a pandemic

Occupational Health Issues

- Need annual influenza vaccination
  - Consider mandating
- Prioritized for anti-infective therapy or vaccination when limited doses
  - Consider prioritizing family members
- Prioritized for PPE

Sick Leave Policies

- < 1/2 of U.S. hospitals have emp health plan r/t working when ill (Morton, 2009)
- Consider flexible sick leave policy
  - Sick employee or employee’s child
- Don’t want sick staff working, even during staffing shortages
SARS Outbreak in Taiwan

- Infected laundry worker
- 137 Secondary Cases

Cohort Staff

- Assign dedicated staff during infectious disease disaster
- Minimizes number of staff exposed
- Use vaccinated staff when possible
  - Disease/event specific guidelines

Communication During H1N1

- More information/communication was requested……and received
- Like drinking from a firehouse
- Filter through tons of information
- > 3 hrs a day on phone
People showing up at the hospital when they don’t need to is a problem

Coordinated communication

Effective communication

Mutual Aid Agreements

• Foundation of disaster planning
• Useless during H1N1

Talk to Staff about Having a Personal/Family Disaster Plan

• Only half of U.S. IPs have plan (Rebmann 2009)

Websites:
FEMA
Red Cross
CDC
“Ready in 3”
“Do1Thing”
Respiratory Protection for Public

- New recommendations for public
  - Purchase 20 – 100 masks/respirators per family
- Should be part of staff’s personal/family plan

Animal Management

- Only service animals allowed in
- Coordinate with community disaster planners for emergency pet kennels
- Encourage staff to have disaster plan that includes pet care

Crisis Standards of Care

- Allocating limited resources
  - Need professional liability coverage
  - PPE, medication, & vaccine prioritization
- 50% of U.S. hospitals have some CSCs in place (Niska, 2011)
- Example: Ventilator use
  - 50% of U.S. hospitals have ≤ 10 surge vents (Rebmann, 2009)
  - 21% of U.S. hospitals have vent triage plan (Morton, 2009)
Crisis Standards of Care

- Do in advance
- Communicate to staff
  - Decreases risk of confusion or perceived discrimination
- Involve ethics committee

Setting-Specific Guidelines

Infection Prevention for Alternate Care Sites

Infection Prevention for Ambulatory Care Centers During Disasters

Setting-Specific Guidelines

Infection Prevention and Control for Shelters During Disasters
Every Event is a Little Different…

- Need event-specific guidelines
- Example: 2010 Haiti earthquake
- Hundreds of victims flown to U.S. for medical care
- Usual infectious disease implications of earthquakes:
  - Wound infection
  - Endemic disease spread
  - GI illness d/t food or water safety

Impact of Haitian Earthquake on U.S. Healthcare: Endemic Diseases

- Infectious disease epidemiology of Haiti is different
- ID most common cause of mortality in Haiti
- Anthrax
- Dengue
- Diphtheria
- Hepatitis
- HIV/AIDS
- Leprosy
- Malaria
- Parasites
- Tetanus
- TB
- Typhoid

Specialized/focused patient screening needed for Haitian earthquake victims upon arrival at U.S. healthcare facilities
- Syndrome-based isolation necessary

APIC Created Event-Specific Guidelines

Infection Prevention Implications of Managing Haitian 2010 Earthquake Patients in U.S. Hospitals

Prepared by:
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February 2010
**Major Gaps in Preparedness**

- Crisis standards of care
- Occupational health policies
- Supply & bed surge capacity
- Preparedness for non-acute care settings

**Conclusion**

- Get involved in your facility & community
  - Your expertise is unique
- Use planning tools available to you

**Contact Me**

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