Healthcare Surge Capacity in Disasters

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Adapted from a presentation by John L. Hick, MD. Used with permission
Overview

- **Section 1** – Incidents and Incident Management
- **Section 2** – Healthcare Facility and Community Surge
- **Section 3** – Selected Surge Situations and Special Topics
Section 1: Incidents and Incident Management
Overview

- Define disaster
- Incident management and its importance in surge capacity
- The CST of surge
- Getting all C’s – Command, control, communications and coordination
What is a disaster?

- Demand for resources acutely outstrips supply
- May depend on day / time / facility
- Internal / External events
- Static vs. dynamic - timeline
  - Contagious events special sub-category
- ‘Complex Incidents’
Key goal of planning and incident management:

Get the…

- Right *resources*…to the
- Right *place*…at the
- Right *time*…to prevent
- A ‘special incident’ from becoming a…

**DISASTER**
Disasters – Reality Check

- Only 7 disasters in U.S. history have resulted in > 1000 fatalities
- Only 10-15 incidents per year result in more than 40 injured victims
<table>
<thead>
<tr>
<th>Year</th>
<th>Event Description</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>1865</td>
<td>Steamship explosion</td>
<td>1,547</td>
</tr>
<tr>
<td>1871</td>
<td>Peshtigo, WI fire</td>
<td>1,182</td>
</tr>
<tr>
<td>1889</td>
<td>Jonestown, PA flood</td>
<td>&gt; 2,200</td>
</tr>
<tr>
<td>1904</td>
<td>Steamship fire, NYC</td>
<td>1,021</td>
</tr>
<tr>
<td>1928</td>
<td>FL Okeechobee Hurricane</td>
<td>2,000</td>
</tr>
<tr>
<td>2001</td>
<td>NYC WTC disaster</td>
<td>2,795</td>
</tr>
<tr>
<td>2005</td>
<td>Hurricane Katrina</td>
<td>1,697</td>
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</table>
Tiered Response Strategy

- Federal Response
- Regional / Mutual Response Systems
- State Response
- Local Response, Municipal and County

Capabilities and Resources

Mineral | Low | Medium | High | Catastrophic

Increasing magnitude and severity
Now, let’s think about Planning
What is most likely?

- Moderate sized disaster
- > 120 injured is threshold for chaos
- Plan for 50-150 victims
- Tie planning to Hazard Vulnerability Analysis
Planning Documents

- Hazard Vulnerability Analysis
- Emergency Management Plan
- Emergency Operations Plan
- Departmental Plans
# HAZARD AND VULNERABILITY ASSESSMENT TOOL

## EVENTS INVOLVING HAZARDOUS MATERIALS

<table>
<thead>
<tr>
<th>EVENT</th>
<th>PROBABILITY</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Likelihood this will occur</td>
<td>Possibility of death or injury</td>
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<tr>
<td>SCORE</td>
<td>0 = N/A</td>
<td>0 = N/A</td>
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<tr>
<td></td>
<td>1 = Low</td>
<td>1 = Low</td>
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<tr>
<td></td>
<td>2 = Moderate</td>
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<tr>
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<td>3 = High</td>
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### Mass Casualty Hazmat Incident
*(From historic events at your MC with >= 5 victims)*

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### Small Casualty Hazmat Incident
*(From historic events at your MC with < 5 victims)*

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<thead>
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### Chemical Exposure, External

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### Small-Medium Sized Internal Spill

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### Large Internal Spill

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### Terrorism, Chemical

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<tr>
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### Radiologic Exposure, Internal

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### Radiologic Exposure, External

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### Terrorism, Radiologic

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### AVERAGE

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<tr>
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*Threat increases with percentage.

\[
RISK = PROBABILITY \times SEVERITY
\]

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What is Surge Capacity?
Surge Capacity C S T

- The 4 C’s
  - Command
  - Control
  - Communications
  - Coordination

* Surge capacity CANNOT occur if you don’t ‘get all C’s’

- The 4 S’s
  - Space
  - Staff
  - Stuff
  - Special

- The 3 T’s
  - Triage
  - Treat
  - Transport
Command

- What is Incident Command?
  - Incident Management System
  - Multi-agency Coordination System
  - Public Information Systems

- Standard language
- Standardized job duties
- Scalable and flexible
Basic HICS Structure

INCIDENT COMMANDER

LIAISON OFFICER

PUBLIC INFORMATION OFFICER

SAFETY OFFICER

MEDICAL TECHNICAL SPECIALIST

LOGISTICS SECTION

PLANNING SECTION

FINANCE SECTION

OPERATIONS SECTION
Tools in the new HICS

- Job action sheets
- Position recommendations
- Incident Planning Guides
- Incident Response Guides
- Forms – consistent with FEMA requirements
- NIMS (compliance activities)
Use it often

- Incident Command must be used as frequently as possible (daily responses)
- Employee familiarity and comfort with system is dependent on exposure / practice
Surge Capacity Partners

- EMS
- Emergency Management
- Public Health
- Public Safety/Law enforcement
- Hospitals and Healthcare Systems
- American Red Cross
- Behavioral health
- Jurisdictional legal authorities
Regional Coordination

- Medical Response Systems
- Trauma System
- Public Health Districts
- Regional Hospital Resource Center (RHRC)
- Multi-Agency Coordination
Federal Assets

- National Disaster Medical System (NDMS)
- Urban Search and Rescue (eg: Nebraska TF-1)
- Commissioned Corps Readiness Force
- Military (NORTHCOM)
- Federal Medical Stations
- CDC SNS and VMI
Section 2: Healthcare Facility and Community Surge
Overview

- Initial Actions
- Facility-based surge
  - Space, staff, stuff, special
  - Triage, treatment, and transport
- Community-based surge capacity
  - Partners and players
  - Alternate care sites
Capacity vs. Capability

- Surge Capacity – ‘the ability to manage increased patient care volume that otherwise would severely challenge or exceed the existing medical infrastructure’

- Surge Capability – ‘the ability to manage patients requiring unusual or very specialized medical evaluation and intervention, often for uncommon medical conditions’

Barbera and Macintyre
Initial Actions – Notification and Communication

- Facility notified of event / recognizes event
  - Advisory
  - Alert

- Declaring an emergency –
  - Activation
    - Mobilize adequate resources based on intel
    - Plan for next operational period (action planning cycles)

- Notifying
  - Staff
  - Patients and their families
  - General public

- Ongoing communications / information cycle
Different types of ‘surge’

- Pre-event surge (e.g.: pandemic, hurricane)
- Healthcare facility-based
  - Discharges
  - Admissions
- Community-based
  - Ambulatory care
    - Existing sites
    - Field treatment sites
  - Non-ambulatory care (acute care center / off-site)
  - EMS
Pre-event surge /actions

- If short warning time present:
  - Determine what service lines will be maintained
  - Mobilize staff and resources

- If longer warning time:
  - Consider expanding services to take care of as much elective business as possible (e.g., evening operative cases, expanded clinic hours)
Facility-based Surge

- Hospitals may use HRSA dollars to purchase cots, lab equipment, and other supplies
- Nearly always preferred to off-site
  - Comfort of staff
  - Expertise
- Off-site: designate what equipment can be taken and who can operate it
Reality Check

- Very rare to be overwhelmed in a disaster
- Only 6% of hospitals in 29 disasters experienced supply issues, and 2% had staffing shortages . . .
- Most had too many!
In the Real World . . .

- At least 50% arrive self-referred
- ‘Upside down triage’ – least wounded arrive first
- On average, 67% of patients in any given disaster are cared for at the hospital nearest the event (range 41-97%)
Rule of Thumb

- Per 100 patients injured:
  - 25 dead at scene
  - 75 seek medical care
    - 63 minor
    - 12 serious
- ‘Rule of 85/15%’ has applied to all disasters thus far inc NYC 9-11 (minor vs. serious)
- In every catastrophic disaster, sustained pressure on the healthcare system is seen following the incident
Critical Hospital Resources

- Physical Plant
- Personnel
- Supervision
- Supplies and Equipment
- Communication
- Transportation

- Koenig K et al. Acad Emerg Med 1996:3;723-7
Surge Capacity C S T

■ The 4 C’s
  ■ Command
  ■ Control
  ■ Communications
  ■ Coordination

■ The 4 S’s
  ■ Space
  ■ Staff
  ■ Stuff
  ■ Special

■ The 3 T’s
  ■ Triage
  ■ Treat
  ■ Transport

* Surge capacity CANNOT occur if you don’t ‘get all C’s’
The “Space”
Space

- ED and clinic triage protocols (evolve with event)
- Discharges and transfers (eg: nursing home)
  - Discharge holding area
- Treat patients in halls / flat space areas (cots)
- Cancel elective procedures
- Convert procedure/OR/PACU areas to ICU space
- Accommodate vents on floor
- Alternative ambulatory care areas / triage areas
Space

- Don’t forget surge space for:
  - Family members / Family support center
    - Tracking system (badge)
  - Media in separate space
    - Consider traffic patterns and satellite space
  - Behavioral health area
  - Staff respite
  - Labor pool
  - Staff housing / sleeping (family members?)
Example of Surge Windswept Hospital
The "Staff"
Staff

- Different events = different staff needs
  - Eg: HAZMAT vs. trauma vs. monkeypox
  - Appropriate specialties
- Scope of event = scope of staff call-in
  - Mechanism to reach staff
  - Obligations of the staff
- Contract staff
  - What are they required to do?
Staff

- Assign staff to specific areas when possible
- Don’t forget the support staff
- Nursing staff often limiting factor
  - Team nursing
  - Involve family in care
- What do specialists “have” to do?
- Staff extenders / Staff roles
  - Mentoring and supervision of extra staff
  - Just in time training
Staff Augmentation

- Hospital personnel
- Clinic personnel
- Medical Reserve Corps
- Non-clinical practice professionals
- Retired professionals (e.g., via Medical Society)
- Trainees in health professions
- Civil Support Team, Civil Air Patrol
- Lay public (CERT teams, etc)
- Federal / interstate personnel
The "Stuff"
Stuff

- Provider protection
- General patient care supplies
- Specialty patient care supplies
- Support supplies
Stuff – Provider Protection

- Personal Protective Equipment
- Medications – antidotes?, anti-virals?
- Consider:
  - re-use
  - duration of use
  - other risk-reducing strategies (UV light, ventilation, etc)
Stuff – General Patient Care

- **Airway** – disposable intubation blades, bag/masks
- **Surgical** – chest tube trays
- **Medications** – Morphine, Valium, Atropine
- **Other disposables** – catheters, dressings, linens
- **Durable** – beds, vents, IV pumps, BP cuffs
Stuff – Specialty Patient Care

- Example – burn
  - Adaptic dressings
  - Bacitracin
  - Kerlix dressings

- 50% BSA burn needs 14 liters LR/NS in 1st 24h, MS 250mg/24h)
<table>
<thead>
<tr>
<th>Condition</th>
<th>Prognosis</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persistent SBP &lt; 90mmHg or age-appropriate hypotension unresponsive to fluids</td>
<td>Occasional hypotension or other signs of poor perfusion</td>
<td>No signs of shock</td>
</tr>
<tr>
<td>Laboratory or clinical evidence of multiple (≥ 4) organ system failure*</td>
<td>Laboratory evidence of 2-3 organ system failure</td>
<td>Respiratory failure only</td>
</tr>
<tr>
<td>Severe underlying disease with poor short-term prognosis**</td>
<td>Severe underlying disease with poor long-term prognosis and/or ongoing resource demand</td>
<td>No severe underlying disease</td>
</tr>
<tr>
<td>Long duration – ARDS, infectious causes of respiratory failure, (estimate &gt; 7 days on ventilator)</td>
<td>Moderate duration – ARDS or infectious cause in healthy patient (estimate 3-7 days on ventilator)</td>
<td>Short duration – flash pulmonary edema, chest trauma, other anticipating &lt; 3 days on ventilator</td>
</tr>
<tr>
<td>Worsening oxygenation index***</td>
<td>Stable oxygenation index over time (failure to improve after adequate disease-specific trial of mechanical ventilation)</td>
<td>Improving oxygenation index</td>
</tr>
<tr>
<td>Poor prognosis based upon epidemiology of specific disease (eg; pandemic influenza) for patient group.</td>
<td>Indeterminate / intermediate prognosis based upon epidemiology of specific disease process</td>
<td>Good prognosis based upon epidemiology of specific disease</td>
</tr>
<tr>
<td>High potential for death according to predictive model</td>
<td>Intermediate potential for death according to predictive model</td>
<td>Low potential for death according to predictive model</td>
</tr>
</tbody>
</table>
Stuff – Support Supplies

- Food
- Water
- Office supplies
- Utilities
- Communications
- Oxygen supply
"Special Areas"
Surge Capability / Specialty

- Burn
- Chemical / Decontamination
- Isolation
- Pediatric
- Blast injury / mass trauma
- Behavioral Health
Surge Capacity C S T

■ The 4 C’s
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■ The 3 T’s
  ■ Triage
  ■ Treat
  ■ Transport

* Surge capacity CANNOT occur if you don’t ‘get all C’s’
‘T’ - Operations

- Triage
- Treatment
- Transport
Triage

- Hospital triage: The most critical patients first

- Mass Casualty triage: The greatest amount of good for the largest number of people. Resources used on the victims that have the best chance of survival
Triage

- Location?
- Triage officer
- Triage tags / initial registration or tracking
- Locations of care – where are patients triaged TO?
- Key bottlenecks – decontamination, radiology (eg: CT), transportation, OR, ICU
Treatment

- What patients may be safely treated in what areas:
  - ED, clinics, lobby areas, etc
- Deal with life-threats only initially
- Defer definitive wound closures, fracture reductions
- Defer most x-rays and labs until demand eases
- Use your clinical skills!
- What is the expectation for documentation / nursing orders during disaster?
Transport

- Internal
  - Transportation from ED to other in-hospital locations (CT, OR, etc)
  - Personnel and resources (beds and wheelchairs, etc)
- External
  - Transport resources – ground, rotor and fixed wing, alternative ground (WC vans, etc)
  - Referral centers – what’s your backup when usual partners are full / unable to receive?
Transport

- EMS issues
  - Few communities have adequate EMS resources
  - Many EMS personnel have competing demands during disaster (fire department, hospital, family) and may not be available
  - Few communities have process for allocation of scarce EMS resources
Surge Capacity Coordination

- Home
  - In-Home Family Care
  - Homecare

- Neighborhood Emergency Help Centers
  - Mass Dispensing Clinics
  - Screening Centers

- Clinics and/or Private MDs
  - Treatment/Triage

- Urgent Care Centers

- LTC Facilities

- Off-Site Care Facilities
  - e.g., Procedure Centers, Churches, Hotels, Community/Recreation Centers, Warehouses

- Hospitals
Community-Based Surge

- Clinics
- Procedure centers (i.e. dialysis centers)
- Long Term Care Facilities (LTCFs)
- Homecare
- Family-based care
- Alternative care sites
- Local / Regional referral / NDMS
Clinic surge capacity

- Rural – scant ability to increase capacity
- Urban – larger ability to increase capacity
  - Sub-specialty clinics
  - Surgical centers
- Cancellation of elective appointments
- Changes in hours / staffing
- Receiving referrals from hospital?
  - Criteria
  - Supplies
Professional Homecare

- Homecare agencies
- Social workers
- Durable equipment suppliers
- Are agencies prepared to prioritize services to accommodate increased demands?
- Do homecare nurses have other commitments?
Family-based care

- Will be focus of most care in pandemics and
- General emergency preparedness critical
- Specific information
Alternate Care Sites / Community Action

- **Neighborhood Emergency Help Center**
  - Screening and minimal care (for example – early pandemic symptoms requiring anti-virals)
  - Population-based interventions

- **Acute Care Center / Off-site care facility**
  - Non-ambulatory care (may also have role as special needs shelter – NH fire, widespread disaster)
  - Hospital overflow – allows hospitals to focus on critical care
  - Many models – adjacent hospital, regional, self-supporting infrastructure vs. existing
Potential Alternative Care Sites

- Aircraft hangers
- Military facilities
- Churches
- National Guard armories
- Community/recreation centers
- Surgical centers / medical clinics
- Convalescent care facilities
- Sports facilities / stadiums
- Fairgrounds
- Trailers
- Government buildings
- Tents
- Hotels/motels
- Warehouses
- Meeting halls
Factors to consider

- Ability to lock down/Security
- HVAC
- Lab/specimen handling
- Lighting
- Laundry
- Loading Dock
- Equipment storage
- Oxygen delivery capability
- Waste disposal
- Parking
- Communications capability
- Patient decon
- Door size
- Pharmacy areas
- Electrical power with backup
- Proximity to hospital
- Family areas
- Toilets/showers/waste
- Food supply / prep area
- Water supply
- Wired for IT/Internet access
- Primary and Secondary sites
- Controlled access
# Kansas Alternative Care Site Selection Matrix

<table>
<thead>
<tr>
<th>Infrastructure</th>
<th>Aircraft Hangers</th>
<th>Churches</th>
<th>Community/Recreation Centers</th>
<th>Convalescent Care Facilities</th>
<th>Fairgrounds</th>
<th>Government Buildings</th>
<th>Hotels/Motels</th>
<th>Meeting Halls</th>
<th>Military Facilities</th>
<th>National Guard Armories</th>
<th>Same Day Surgical Centers/Clinics</th>
<th>Schools</th>
<th>Sports Facilities/Stadiums</th>
<th>Trainers/Tents (Military/Other)</th>
<th>USAF</th>
<th>Other</th>
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What will Happen at the Acute Care Alternate Sites?

- Triage / admission criteria
- Level of care – basic nursing, drip meds, IVs, NG feeds
- Medications
- Documentation / order management
- Laboratory
- Food / water / sanitary
- Linen and medical waste handling
- Oxygen?
Sample Site
Sample Site

- Food
- Restrooms
- Staff rehab areas
- Secure
- HVAC system specs
- Paging /messaging /radio
- Power
- Phone, T1 lines, etc.
- City owned!
- 2x2 zip-tied to folding chairs, shim across top
- Nails for chart, IV bag
- Cards show team color/letter (e.g., green A)
- Other cards show pending orders (red = stat)
- Clothespins/rubber bands hold cards
Ongoing Issues

- Clinic / outpatient care roles
- Legal and Regulatory
- Reimbursement
- Workforce coordination with public health
- Credentials / HR issues
Section 3: Selected Surge Situations and Special Topics
Overview – Section 3

- Event-specific
- Behavioral health
- Security
- Education and training
Scenario

- 23 year old presents to ED – just arrived from Africa
- Bleeding from everywhere – sclera, gums, GI tract, genitourinary tract, bruising skin noted
- Febrile to 101
- Sister who traveled with her is also feeling ill but has no signs yet of her sister’s illness
- What do you do?
Isolation

- **Space**
  - Triage and screening – location, process
  - Treatment areas – iso rooms, cohorting
- **Staff** - training, call-in, monitor compliance with PPE, communications
- **Stuff** – antibiotics, anti-virals, analgesia / sedation, ventilators, PPE supplies
- **Special** – security, communications, family issues
- **Transport** – internal and external issues - *process*
Scenario

- Workers at construction site unearth large jar of clear liquid – they pick the jar up and it shatters.
- Both workers are splashed and have immediate respiratory distress as well. Much of the liquid vaporizes.
- EMS removes clothing and transports as no decon available and respiratory distress.
- What do you do?
Chemical

- **Space** – decontamination, triage, treatment space
- **Staff** – trained for decontamination, ED staff, ICU (if applicable), monitoring of PPE use / duties
- **Stuff** – antidotes (particularly atropine and 2PAM), analgesia, sedation, PPE, vents / ICU
- **Special** – decontamination equipment, runoff issues
Scenario

- Tornado watch issued at noon for your city
- Tornado warning at 4pm – staff and patients shelter in place
- Severe damage to large neighborhood in community, hospital multiple windows broken, reports of leaking roof in one unit, electricity out except emergency power
- What do you do?
Tornado

- **Command** – assess impact on facility / staff
- **Space** – triage areas, treatment areas – expand capacity especially outpatient
- **Staff** – shift staffing
- **Stuff** – Tdap boosters, analgesia, sedation, local anesthetics, suture trays
- **Special** – debris removal, utilities support, staff transportation
- **Transportation** – EMS resources
Scenario

- Office building explodes
- Several persons trapped in rubble, at least 2 fatalities – 2 of injured dragged out and brought by private car to hospital
- Multiple walking wounded including some people walking on the street / in cars and hit by debris
- Few windows broken in hospital complex
Bomb / Blast injury

- Command – facility assessment?
- Space – triage area, treatment, OR
- Staff – including specialty – ENT, eye, surgery
- Stuff – analgesia, sedation, Tdap, burn supplies (adaptic, narcotics, ibuprofen, bacitracin), surgical supplies (suture trays, chest tube)
- Special – security, behavioral health, family
Other Surge Challenges

- ‘Upside down triage’
- Family members
- Communications / information
- Media
- Psychological casualties
Behavioral Health Surge Demands

- **EMS-Processed Medical Casualties**
- **Self-Transported Medical Casualties**
- **Bystanders or Family Members, Friends, Co-workers of Incoming Casualties**
- **Family Members Searching for Missing Loved Ones**
- **Injured, Exposed, Distressed Disaster/Emergency Workers**

- **Psychological Casualties**
- **Media**
- **Volunteers**
- **Onlookers**
- **Distressed Inpatients**
- **Family Members of Inpatients**
- **Distressed Staff**
Behavioral Health Surge

- **Sorting**
  - Triage psychological (or likely) to observation area

- **Supporting**
  - Quiet area
  - Food and liquids
  - Family support area as well

- **Services**
  - Chaplaincy, social work, psychology/psychiatry, CISM, psychological first aid
  - Observe, screen, refer as needed
Aftereffects

- Continued high ER and clinic volumes
- Psychological stressors
- Unique hazards may affect health after the event
NYC post 9-11-01

- 22.5% increase in asthma over 5-9 weeks younger patients, 44% > 54 yrs
- 75% in random phone survey reported adverse psychological effects
  - MMWR Sept. 6, 2002
Security

- Lockdown
- Ingress / egress control
- Staff:
  - Hospital
  - Contract
  - Public Safety
  - Community sources
- Policies and procedures – weapons, crowd control, use of force
Education and Training

- Hospital Incident Command Training
- Just-in-Time Training
- Drills
  - Tabletop
  - Functional
What do I do now?

Next Steps

- **Review**
  - Your Emergency Operations Plan
    - Incorporate Incident Command
    - Clearly define what a hospital employee will DO
    - Have current job actions sheets and reporting forms
    - Request more training in Incident Command if needed
    - Imbed Incident Command in daily operations
Next Steps to Surge

- Define your Surge Capacity Partners
  - Make sure they know what you expect of them.
- Identify federal assets
- Acquire the needed bed-tracking program & training
- Create a Pre-surge plan
  - If time allows:
Surge “Capacity”

- **Space**
  - Evaluate your physical facility
    - Space for cots, family, media, staff respite BH …
  - Evaluate near-by external facilities
  - Create guidelines for early dismissals
Surging Personnel

- **Staff**
  - Determine ways to reallocate internal staff roles
  - Determine external staffing options
    - Determine process for assigning mentors/preceptors
  - Plan Staff Extenders
  - Just-In-Time Training
Considering Supplies

**Stuff**

- Create a plan for a quick inventory
  - PPE
  - General Patient Care Supplies – include medications
  - Specialty Patient Supplies
  - Support Supplies
    - Food, water, office, communication
- Create a plan to begin stockpiling
Planning for the T’s

- Triage
  - Train in Mass-Casualty Triage
  - Plan triage areas, internal and external
  - Locate Vests and Tags

- Treatment
  - Discuss and plan for temporary treatment of non-life-threatening injuries.
  - Discuss alternative record-keeping
Transportation

- Internal
  - Determine number and location of wheelchairs/gurneys
  - Plan for alternate modes of transportation

- External
  - Know your local transport resources
  - Plan for alternate modes of transportation
Community Based Surge

- Coordinate with local Public Health
  - Determine your role
  - Identify existing plans
Revisit Parking Lot Issues
Please fill out your evaluations and Self Assessment

Thank you for Coming!