Disclosures

Bisni Narayanan has no real or potential conflicts of interest or financial disclosures related to the subject matter in this presentation.
Pharmacist Andrea Cusack delivers medications

Bhopal Gas tragedy (1984)

- Union Carbide Corporation's chemical plant in Bhopal
- 40 tons of methyl isocyanate gas
- Estimates of deaths range from 3,800-16,000, with >600,000 exposed
- The average compensation to families of the dead was $2,200
- The plant continues to leak several toxic chemicals and heavy metals into local aquifers
Learning Objectives - Pharmacists

1. Review the pulmonary effects of natural disasters
2. Discuss secondary surge for chronic respiratory diseases following natural disasters
3. Describe preventive clinical management strategies for common respiratory diseases during disasters

Learning Objectives - Pharmacy Technicians

1. Review the pulmonary effects of natural disasters
2. Discuss secondary surge for chronic respiratory diseases following natural disasters
3. Describe the technician's role in triage during disasters that may exacerbate respiratory illness
WHEN WAS NATIONAL PREPAREDNESS MONTH IN 2020?


Natural Disasters - Usual Preparation

<table>
<thead>
<tr>
<th>Evacuate</th>
<th>Provide</th>
<th>Prevent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evacuate people from affected areas</td>
<td>Provide transportation, shelter, food, and water</td>
<td>Prevent injury and infectious diseases that may develop in crowded living situations after disasters</td>
</tr>
</tbody>
</table>

10

- Disaster conditions exacerbate chronic illnesses
- Lack of access to routine health care is a leading cause of mortality after disasters
- Problems of vulnerable populations with chronic illness are inadequately addressed

11

Great East Japan Earthquake in 2011
- Hospital visits for patients receiving oxygen therapy
- Significant increase in hospitalizations due to COPD exacerbations in the subacute phase (from the third to the fifth week)
- Increase in admissions for pneumonia and exacerbation of COPD in the elderly

Associations of wildfire smoke PM$_{2.5}$ exposure with cardiorespiratory events in Colorado 2011-2014

- Children displayed significant associations between smoke exposure and asthma
- Wildfire PM$_{2.5}$ associated with asthma, bronchitis, combined respiratory diseases in adults

Sustained Effects on Lung Function in Community Members Following Exposure to Hazardous PM$_{2.5}$ Levels from Wildfire Smoke

- Spirometry testing showed significant decreases in lung function parameters up to two years post exposure

Adverse Health Outcomes after Hurricane Katrina among Children and Adolescents with Chronic Conditions

- During the first three months post hurricane, of 102 children who reported having asthma, 80 (78.4%) reported that they required more asthma medication or inhalers
- Of these, 36 (35.3%) reported that their asthma had worsened since September 2005

Chronic Disease and Related Conditions at Emergency Treatment Facilities in the New Orleans area after Hurricane Katrina

- Of 21,673 health care visits, about 12% was for chronic lower respiratory disease, 7.2% for medication refills, and 5.7% for routine or follow-up care
Pulmonary effects of wildfires

Satellite images from the National Oceanic and Atmospheric Administration

Particulate Matter (PM)

- A complex mixture of extremely small particles and liquid droplets, made up of acids, organic chemicals, metals, and soil or dust particles
- Particulate pollution is divided into several categories based on its size. E.g. PM_{10}, PM_{2.5}
- Direct link between the size of PM and potential for health problems. PM_{2.5} is the component in wildfire smoke of most concern for health

In the US, the daily average National Ambient Air Quality Standard for PM_{2.5} is 35 μg/m^3, however the World Health Organization recommends that daily PM_{2.5} not exceed 25 μg/m^3

**PM$_{2.5}$ and respiratory system**

**Inflammatory injury**
- PM can interact with the alveolar-capillary cells causing oxidative stress reactions and local and systemic inflammatory responses
- Structural damage to the lungs and functional deficits in chronic respiratory illness
- Increases airway hyper responsiveness

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**PM$_{2.5}$ can penetrate deep into the lungs. It can travel all the way to the alveoli, causing lung and heart problems, and delivering harmful chemicals into the bloodstream.**

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Air Quality Index (AQI): ground-level ozone, PM, carbon monoxide, sulfur dioxide, and nitrogen dioxide

Wildland fires: PM, carbon monoxide, methane, nitrous oxide, nitrogen oxides, volatile organic carbon etc.

Carbon monoxide and hydrogen cyanide impaired oxygen delivery and cellular respiration

Air Quality Index (AQI)

A nationally uniform color-coded index reporting and forecasting daily air quality

Focuses on health effects that may be experienced within hours or days

Reports air pollutants that are regulated under the Clean Air Act
Hospitalizations, ED, or restricted activity days
Respiratory, cardiovascular, or other symptoms AND/OR Medication Use
Subclinical effects with no symptoms

EXCESS DEATHS
HOSPITALIZATIONS
ED VISITS

Aspiration
- Infection
- Loss of alveolar surfactant
- Pulmonary edema
- ARDS

Mold
- Ideal conditions
- Opportunists

β-D-glucan
- Cough
- Airway hyperreactivity
- Influenza-like symptoms
- Ear, nose, and throat irritation
- Decreased lung function

Size of population affected by exposure to wildfire

TOTAL PUBLIC HEALTH IMPACT

Respiratory symptoms associated with mold exposure

- Headaches
- Runny nose
- Sore throat or hoarseness
- Cough, chest tightness, shortness of breath, wheezing
- Skin and mucous membrane irritation
- Severe fatigue and exhaustion
- Nausea and GI problems
- Flu-like symptoms
- Joint and muscle aches
- Cognitive dysfunction
- Unusual nosebleeds and coughing up of blood (rare)
- People are more vulnerable in emergencies and disasters
- Emergencies exacerbate chronic conditions leading to acute complications
- Long-term implications resulting from emergencies and their management

Question

Schools had to be shut in Nov 2019 in this Indian city due to AQI of 472
a. New Delhi
b. Bangalore
c. Mumbai
Learning Objectives

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The Agency for Healthcare Research and Quality (AHRQ) defines surge capacity as a “health care system’s ability to expand quickly beyond normal services to meet an increased demand for medical care in the event of bioterrorism or other large-scale public health emergencies.”
Benchmarks for surge capacity

- Hospital bed capacity
- Medical equipment and supplies
- Population to provider ratios
- Personnel availability
- Prescription medication refills
- Portable triage and decontamination centers
- The ability to legally deliver health services under situations that exceed authorized capacity


Disaster

SECONDARY SURGE

ACUTE RESPONSE PHASE I

PHASE II

PRE-DISASTER

Disaster

96 hours

weeks

months

Primary care need

DMAT in Gulfport, MS and New Orleans, LA

Expectation: Acute Illness

Study results: More than 40% of the health problems treated at the two sites were related to chronic conditions and the lack of access to routine care

The most common presentation overall was for chronic health conditions:
- medication refills (20.6%)
- immunizations (11%)
- obtaining community resources (6%)


Which of the following is a benchmark for surge capacity?

A. Immunization availability
B. Prescription medication refills
C. Ability to close schools quickly
Learning Objectives

1. Review the pulmonary effects of natural disasters

2. Discuss secondary surge for chronic respiratory diseases following natural disasters

3. Describe the technician's role in triage during disasters that may exacerbate respiratory illness

What's our role in disaster management?
We often hear about doctors and nurses in disaster management

Where are our pharmacists and pharmacy technicians?

DRUGS, VACCINATIONS, COUNSELING

Pharmacists should have a key role in the
- planning and execution of pharmaceutical distribution
- control drug therapy management of patients during disasters
Pharmacists should aid in the following:
- Develop guidelines for the diagnosis and treatment of casualties and exposed individuals
- Select pharmaceuticals and related supplies for national and regional stockpiles and local emergency inventories in emergency preparedness programs
- Ensure proper packaging, storage, handling, labeling, and dispensing of emergency supplies of pharmaceuticals
- Ensure appropriate deployment of emergency supplies of pharmaceuticals
- Ensure appropriate education and counseling of individuals who receive pharmaceuticals from an emergency supply in response to a disaster
Pharmacists should advise public health officials on appropriate messages to convey to the public about the use of essential pharmaceuticals in response to disasters
Pharmacists should collaborate with physicians in managing the drug therapy of individual victims

National Pharmacy Response Team (NPRT)

Pharmacists, Pharmacy technicians & Pharmacy students
Temporary federal employee
Deployed for 2 weeks

GOAL
Chemoprophylaxis
Mass Vaccinations

National Disaster Medical System (NDMS)

National Pharmacy Response Team (NPRT)

Medical Reserve Corps (MRC)

Department of Health and Human Services (HHS)

Mass dispersing efforts
Vaccination clinics
Health screenings
Health promotion & Education
Outreach to underserved communities

The MRC network comprises approximately 175,000 volunteers in more than 800 community-based units.
Which of the following is a health system Pharmacist's role?

A. Maintain appropriate pharmacist to technician ratios mandated by states

B. Ensure appropriate deployment of emergency supplies of pharmaceuticals

C. Report to work on time, even if you are experiencing viral symptoms

Utilization of skills, knowledge and expertise is warranted!

- Medication history
- Triage patients
- Vaccinate in some states
- Restock carts
- First receivers in a community setting
- Volunteer in MRC or other organizations
Which of the following is a Technician's role?

A. Take medication histories and triage patients to streamline care

B. Report to work on time, even if you are experiencing cough and fever

C. Assume responsibilities usually only allowed for pharmacists

Learning Objectives

1. Review the pulmonary effects of natural disasters

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3. Describe preventive clinical management strategies for common respiratory diseases during disasters
Preventive strategies for common respiratory diseases during disasters

Planning

During disaster

After disaster

Medications
- At least 2-week supply
- Maximum frequency of inhaler use
- Antibiotic prescription
- Prescription for metered dose inhaler in addition to nebulizer medications

Lung Function
- Access lung function with peak flow meter

Hospitalization?
- Should the patient be admitted to the hospital as precautionary measure?
- Identify hospital that has available physician

http://lungcare.net/lung-care-services/lung-diseases/hurricane-preparedness/
**Oxygen Medical Supply**
- Backup cylinder and how many hours will the cylinder last?
- If backup cylinder is used, will they deliver additional oxygen cylinder?
- Emergency contact information and physical address?
- Additional supplies needed to keep the equipment clean for at least two weeks?
- How soon will oxygen supply will be replenished after disaster?

**Nebulizer Supplies**

**Notify electric company of life-sustaining medical equipment use that requires electricity.**
- They may put the area in their priority list after the disaster
Build A Kit
Have enough food, water and other supplies to support your needs for several days.

Breathe Easy Hurricane Survival Kit

- 14-day supply of inhalers, nebulizer and other medications
- Back up oxygen cylinder including cleaning supplies
- Portable battery-operated nebulizer machine
- A DC adapter to operate a nebulizer from a car cigarette outlet
- Water and non-perishable foods for 2 weeks
- A small cooler with frozen gel packs
- Flashlight, radio and extra batteries
- Blanket and pillows
- Keep important papers

ASThma ACTION PLAN

Refer to the attached sheet for additional information on your personal care plan. Record important information on this sheet and keep it on hand during the hurricane emergency.

- Medications
  - Inhalers
  - Nebulizer
  - Other medications

- Oxygen Cylinder

- Battery-powered Nebulizer Machine

- Portable Battery Operated Nebulizer Machine

- DC Adapter to operate a nebulizer from a car cigarette outlet

- Water and non-perishable foods for 2 weeks

- A small cooler with frozen gel packs

- Flashlight, radio and extra batteries

- Blanket and pillows

- Keep important papers
MY COPD ACTION PLAN

It is important for you to know what to do during an exacerbation. This plan should be followed as an action plan and not just as guidelines.

An increase in symptoms that may indicate a COPD exacerbation includes:
- Increased shortness of breath
- Increased cough
- Increased amount of sputum
- Increased sputum color
- Fatigue
- Increased heart rate
- Increased blood pressure
- Increased use of bronchodilators

Your action plan is written using a "3-step approach" for COPD exacerbations:

Step 1: Action when feeling well

- Increase physical activity
- Increase fluid intake
- Use medications as prescribed
- Attend regular check-ups
- Control risk factors

Step 2: Action when feeling a little ill

- Avoidance of triggers
- Increased use of home monitoring
- Increased bronchodilator use
- Increased use of inhaled steroids

Step 3: Action during a COPD exacerbation

- Call your provider
- Call 911 if symptoms worsen
- Follow your provider's recommendations
- Avoid triggers
- Use your rescue inhaler

This action plan may be modified based on your individual needs or the recommendations of your doctor.

Stay Calm
- Emotional stress increases heart rate, quickens breathing, makes breathing more difficult and demands more oxygen from the body.

Practice breathing
- Practice pursed lip breathing, diaphragmatic breathing, and conditioning exercises to breathe easier.

Use battery powered lights
- Use battery powered lights only, away from open sources of flame.

Increase frequency of inhalers
- If symptoms worsen, increase the dose or frequency of inhalers or nebulizer or other respiratory medications.

Call 911
- Call 911, only for an actual or impending life-threatening emergency.
After the disaster:

• An unopened refrigerator will keep food cold for about 4 hours
• An unopened full freezer will remain frozen for approximately 48 hours

POWER OUTAGES OR FLOODS

MOLD AND MILDEW

• Remove wet items from the house immediately
• Mold worsens asthma

CLEANING DEBRIS

• Asthma symptoms manifests within 30-120 minutes after the exposure

People with chronic respiratory disorders are more susceptible to CO poisoning

Prepare for the fire season

Know where to find alerts
Follow the asthma/COPD action plan
Maintain a 7-10 day supply of medication
Check the heating, ventilation, and air conditioning (HVAC) system
Stay indoors with doors and windows closed
Use a portable air cleaner
Wear an N-95 mask
Make an evacuation or relocation plan

BE PREPARED FOR A WILDFIRE

Wildfires can ruin homes and cause injuries or death to people and animals.
Where to find Air Quality Reports

- AirNow.gov has current and forecast air quality data and maps
- Residents can sign up for email notices about air quality through a free service called EnviroFlash
- Weather forecasts in local news
- Keep smoke out
- Run a/c with the fresh-air intake closed ("recirculate mode")
- Clean room
- Do not add to indoor air pollution
- Monitor local air quality reports and health warnings
- Avoid ash exposure after wildfire
  - Wear gloves, long-sleeved shirts, long pants, shoes and socks to avoid skin contact
  - Select a respirator that has been tested and approved by NIOSH

### Stability of biologics at room temperature

<table>
<thead>
<tr>
<th>Injectable for Asthma</th>
<th>Stability at room temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mepolizumab (NUCALA®)</td>
<td>Unopened carton can be stored outside the refrigerator at up to 86°F (30°C) for up to 7 days.</td>
</tr>
<tr>
<td>Dupilumab (DUPIXENT®)</td>
<td>Syringes can be stored at room temperature up to 77°F (25°C) up to 14 days</td>
</tr>
<tr>
<td>Benralizumab (FASENRA®)</td>
<td>May be kept at room temperature between 68°F to 77°F (20°C to 25°C) for a maximum of 14 days</td>
</tr>
<tr>
<td>Reslizumab (CINQAIR®)</td>
<td>Store diluted solutions at room temperature up to 25°C (77°F), protected from light, for up to 16 hours</td>
</tr>
<tr>
<td>Omalizumab (XOLAIR®)</td>
<td>Reconstituted vials good for 4 hours at room temperature</td>
</tr>
</tbody>
</table>

*Stability of Refrigerated medications 2015 (hspm.org)*
Question

The expert panel of key opinion leaders within the field of disaster health recommended pharmacists could undertake several number of roles in a disaster.

a. 13
b. 23
c. 43

- Check for open pharmacies [https://rxopen.org](https://rxopen.org)
- Receive care at community health centers [https://www.directrelief.org](https://www.directrelief.org)
- Free prescription drugs and medical supplies for low-income individuals at community health centers of clinics
- Contact Medicare
  - Medicare-insured patients contact the plan to determine the closest network pharmacy that is open.
  - If none are open, Medicare will be able to connect patients with another pharmacy
- Insurance overrides “Refill Too Soon” Edit Override to allow for 30-day supply of medications
- State boards may authorize Emergency Dispensing of Prescription Medications
• Must be activated by the federal government
• Only for uninsured patients
• Provides 30-day coverage for prescription medications and DME to those in federally-identified disaster areas
• 72,000 pharmacies enrolled
• Covers vaccines

Get involved!

National Disaster Medical System (NDMS)
publichealthemergency.hhs.gov/ndms/
Medical Reserve Corps
https://mrc.hhs.gov
Citizen Corps
www.citizencorps.gov
American Red Cross
www.redcross.org
Community Emergency Response Team (CERT), also TEEN-CERT
https://community.fema.gov/Preparedness/Certivate/WelcomeToCERT
You Are the Help Until Help Arrives
https://community.fema.gov/until-help-arrives
National Voluntary Organizations Active in Disasters
https://www.nvoad.org/volunteer/