Lesson Two

Natural Disasters

Learning Objectives

- Provide prevention and mitigation strategies for common natural disasters
- Identify the types of illnesses and injuries commonly seen in natural disasters
- Discuss actions to take to protect health, safety, and security of responders and affected populations in natural disasters
- Describe clinical management guidance for injuries and illnesses seen in common natural disasters

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Natural Disasters

Important to use an all-hazards approach

Multiple scenes are common

Multiple disasters may occur

Human systems failures often occur

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Natural disasters require:

- Workforce preparedness
- Situational awareness
- Surge capacity readiness
- Casualty management preparedness

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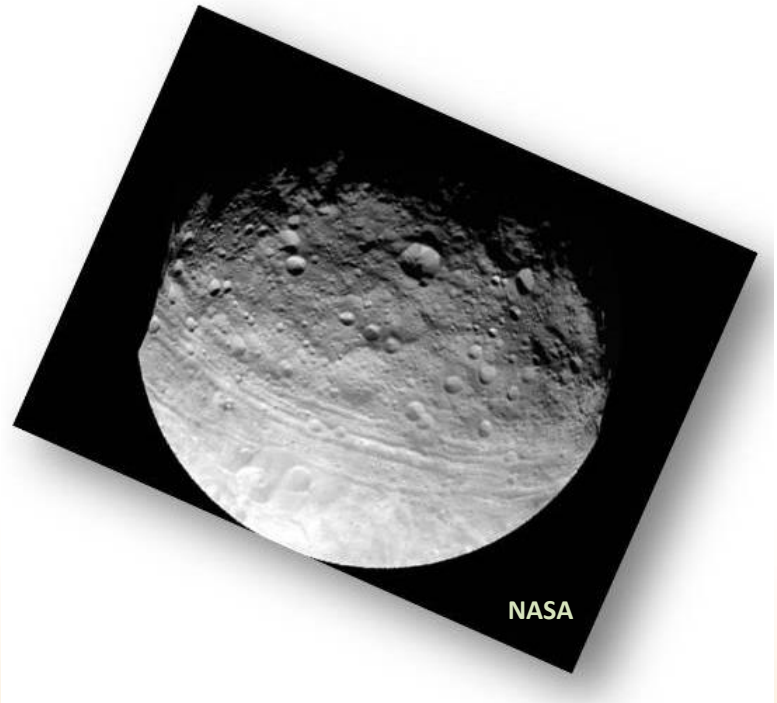
Injury and Illness Timelines

Time After Event	Injury and Disease Process	Examples
Immediate (< 48 hours)	Acute trauma Acute medical	• Multisystem injuries, burns, orthopedics, lacerations • Environmental events, drowning, inhalation, electrocution, CAD/MI
Ongoing (days)	Trauma Medical Chronic diseases	• Wound management, orthopedic and burn care • Environmental, dehydration, cold/heat, contamination • Asthma, HTN, diabetes, CHF, COPD, dialysis, psychiatric
Sustained (weeks)	Acute medical Chronic diseases Mental and behavioral	• Communicable diseases • Ongoing difficult access to care, supplies, medications • Stress, anxiety, depression, substance abuse, pre-existing

Natural Disaster Typology

- Earthquakes and tsunamis
- Floods
- Heat emergencies
- Hurricanes, cyclones, and typhoons
- Tornadoes
- Volcanic eruptions
- Wildfires
- Winter storms



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Earthquakes and Tsunamis

- Common, with over 500,000 tectonic movements annually
- Few are powerful and potentially devastating
- Tsunami: oceanic or sea floor earthquake displaces mass of water creating large waves

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Earthquakes and Tsunamis

Prevention and Mitigation

- Limited ability to provide advance warning
- Building codes and guidelines important
- At-risk population preparedness vital

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Earthquakes and Tsunamis

Casualty Management

Injuries and Illness	Clinical Care
▪ Structural collapse, resulting in complex traumatic injuries ▪ Tsunami, submersion injuries	▪ Wound management ▪ Hemorrhage control ▪ Fracture management ▪ IV fluid therapy ▪ Pain control measures ▪ Specialty trauma care

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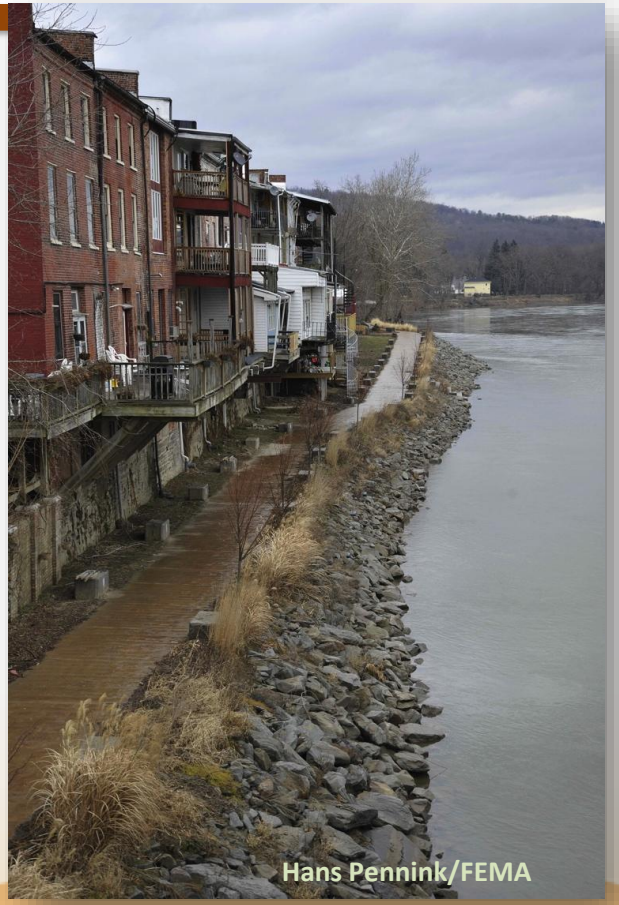
Floods

- Most common disaster worldwide
- Occurs in 90% of all US disasters
- Accounts for numerous weather-related US deaths



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Floods

Prevention and Mitigation

- Identify vulnerable locations and populations
- Building and road construction methods
- Educate communities in flood-prone areas

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Floods

Casualty Management

Injuries and Illness	Clinical Care
▪ Submersion injuries ▪ Traumatic injuries ▪ Environmental exposure illnesses and injuries	▪ Near-drowning ▪ Traumatic wounds ▪ Heat/cold injuries ▪ IV fluid therapy ▪ Pain, vomiting, and diarrhea control ▪ Antibiotic selection

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Heat Emergencies

- Leading weather-related cause of death in US
- Air temperature greatest factor affecting onset of heat-related illness
- Hydration status, degree of work-stress effort, and underlying health status
- Children and the elderly are especially vulnerable

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Heat Emergencies

Prevention and Mitigation

Identify and inform at-risk populations:

- Hydration
- Shelter
- Exposure

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Heat Emergencies

Casualty Management

Injuries and Illness	Clinical Care
▪ Heat illness progresses from mild to life-threatening ▪ As core temperature rises, onset of compensatory mechanisms failing ▪ Early sign and symptom recognition is key	▪ Remove from hot environment ▪ Cooling measures ▪ Provide hydration

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Hurricanes

- Large, rotating core that produces heavy rainfall, strong winds, and storm surge coastal flooding
- Names all describe similar events, based on location:

  Hurricane: Atlantic, Eastern Pacific Oceans

  Typhoon: Western Pacific Ocean

  Cyclone: Indian Ocean

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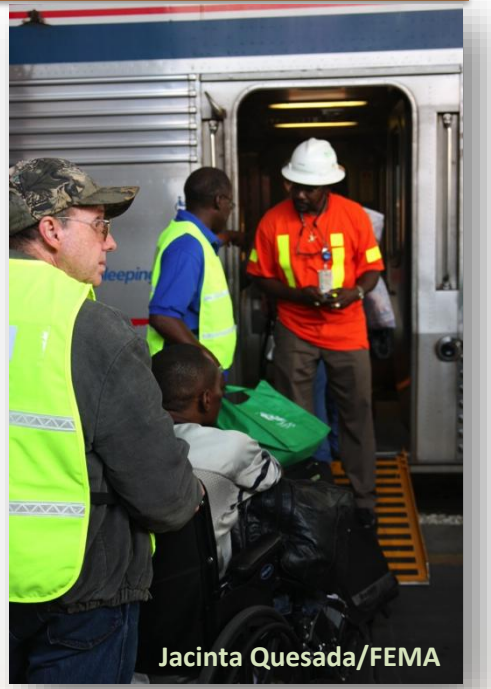
Hurricanes

Prevention and Mitigation

- National Weather Service (NWS) predictions, tracking, and warning systems
- At-risk populations heed warnings
- Evacuation methods/route access
- Ensure timely access to potable water, safe sheltering, food, sanitation, and health care



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Hurricanes

Casualty Management

Injuries and Illness	Clinical Care
▪ Wind and water surge leading to traumatic and submersion injuries ▪ Environmental exposure resulting in injury and illness	▪ Submersion injuries ▪ Traumatic wounds ▪ Fracture management ▪ Heat/cold injuries ▪ IV fluid therapy ▪ Pain control measures

Hurricanes

Casualty Management

(may occur in other incidents that effect infrastructure)

Other considerations

- Children
  - Risk of separation from families / guardians
    - Family member tracking and reunification programs
  - Risk of accidental poisoning
    - Hydrocarbon and bleach poisonings
- Elderly and institutionalized
  - Evacuation of facility or home may be delayed
  - Exacerbation of chronic illnesses is likely

Tornadoes

- Rapidly rotating funnel-shaped column of air
- Extends from thunderstorm to the ground
- Wind speed correlates best to destructive power

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Tornadoes

Prevention and Mitigation

- National Weather Service (NWS) tracking/warning systems important
- At-risk populations must seek immediate safe shelter

Survival = Warning + Shelter

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Tornadoes

Prevention and Mitigation

- Permanent structure
- Lowest level or basement
- Interior walls
- Avoid windows
- Avoid vehicles and motor homes

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Tornadoes

Casualty Management

Injuries and Illness	Clinical Care
▪ Tremendous wind and flying debris causes traumatic injuries ▪ Complex injuries from burns, electrocution, and blast injuries	▪ Traumatic wounds ▪ Fracture management ▪ IV fluid therapy ▪ Pain control measures ▪ Specialty trauma care

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Volcanoes

- Catastrophic explosion with searing heat, large volumes of incinerating hot gases, molten rock (lava), and toxic chemicals released
- Release of tremendous ash quantities causing darkness for days

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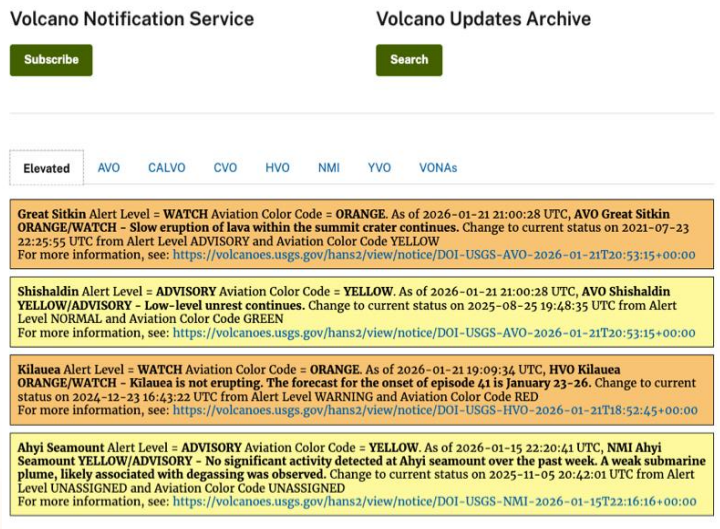
Volcanoes

Prevention and Mitigation

- Warning systems by US Geological Survey (USGS)
- At-risk population is growing
- Early evacuation, shelter access, water, food, and sanitation
- Long-term agricultural and environmental contamination



https://www.usgs.gov/programs/VHP/volcano-updates#elevated

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Volcanoes

Casualty Management

Injuries and Illness	Clinical Care
▪ Direct cause of death is pyroclastic flow and mudslides ▪ Traumatic injuries ▪ Respiratory symptoms from smoke/ash inhalation ▪ Eye injury from ash	▪ Traumatic wounds ▪ Fracture management ▪ Respiratory support ▪ IV fluid therapy ▪ Pain control measures ▪ Specialty trauma care ▪ Eye irrigation

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Wildfires

- Human causes are most common
- Common cause of home and property destruction
- High workforce mortality and morbidity

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Wildfires

Prevention and Mitigation

Prevention

- Proper handling and storage of flammable materials and fuel

Detection

- Early identification

Suppression

- Forest service wild land firefighting teams

Wildfires

Casualty Management

Injuries and Illness	Clinical Care
▪ Burn injuries ▪ Smoke inhalation ▪ Work-stress heat-related illness ▪ Extremity trauma ▪ Animal and insect bites	▪ Remove from hot environment ▪ Burn care ▪ Respiratory support ▪ Cooling measures ▪ Provide hydration

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Winter Storms

- Dangerous and damaging accumulations of snow, ice, or sleet
- Life-threatening below-freezing temperatures

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Winter Storms

Prevention and Mitigation

- Prediction is imprecise
- Preventable hazards
  - CO poisoning
  - House fires
- At-risk population preparedness key

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Winter Storms

Casualty Management

Injuries and Illness	Clinical Care
▪ Frostbite	▪ Remove from cold
▪ Hypothermia	▪ Replace wet clothing
▪ Cardiac events	▪ Appropriate re-warming
▪ CO poisoning	▪ Provide warm liquids
▪ Burn injuries	▪ Other injuries/illnesses

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Lesson Summary

- Natural disasters require an all-hazards approach
- Providing timely health and medical services requires preparedness
- Reviewing natural disaster typologies aids in prevention, mitigation, and casualty management

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Questions?

Scenario 1: Natural Disasters

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Natural Disasters

Floods, storms, earthquakes, wildfires most common

All natural disasters cause physical trauma

- Initial management per SALT, then PHTLS®/ATLS®/ABLS guidelines
- Floods and storms: drownings, lacerations, fractures most common
- Earthquakes and wildfires: crush injuries, severe burns

- Special considerations
  - Environmental: animals and insects, food and water, power outages
  - Medical: medication shortages, household fires (flame burns, carbon monoxide)
  - Behavioral: psychological trauma, potential for child and sexual abuse

Scenario 1: Natural Disasters

Your group has come together to develop your communities' response plan for natural disasters. The following sectors are represented: healthcare, EMS, fire, law enforcement, public works, emergency management and public health.

Using the DISASTER Paradigm™:

Group 1

- Develop a plan for hurricane response

Group 2

- Develop a plan for a substantial earthquake

Group 3

- Develop a plan for an uncontrolled fire

Group 4

- Develop a plan for a tsunami

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