






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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Workforce preparedness

Situational awareness

Natural disasters require:

Surge capacity readiness

Casualty management preparedness

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Injury and Illness Timelines

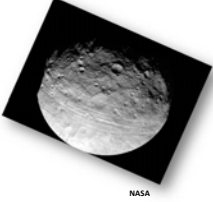
Time After Event	Injury and Disease Process	Examples
Immediate (< 48 hours)	Acute trauma Acute medical	<ul style="list-style-type: none"> Multisystem injuries, burns, orthopedics, lacerations Environmental events, drowning, inhalation, electrocution, CAD/MI
Ongoing (days)	Trauma Medical Chronic diseases	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Communicable diseases Ongoing difficult access to care, supplies, medications Stress, anxiety, depression, substance abuse, pre-existing

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Natural Disaster Typology

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




NASA

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Earthquakes and Tsunamis



Toshiharu Kato/Japanese Red Cross


- 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



Japanese Red Cross

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Earthquakes and Tsunamis Casualty Management

Injuries and Illness	Clinical Care
<ul style="list-style-type: none">▪ Structural collapse, resulting in complex traumatic injuries▪ Tsunami, submersion injuries	<ul style="list-style-type: none">▪ 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




Hans Pennink/FEMA

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Floods Prevention and Mitigation

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



Jace Anderson/FEMA

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Floods
Casualty Management

Injuries and Illness	Clinical Care
<ul style="list-style-type: none">▪ Submersion injuries▪ Traumatic injuries▪ Environmental exposure illnesses and injuries	<ul style="list-style-type: none">▪ 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 important
- Children and the elderly are especially vulnerable




Greg Pierot/U.S. Navy

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Heat Emergencies
Prevention and Mitigation

Identify and inform at-risk populations:



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Heat Emergencies
Casualty Management

Injuries and Illness	Clinical Care
<ul style="list-style-type: none">Heat illness progresses from mild to life-threateningAs core temperature rises, onset of compensatory mechanisms failingEarly sign and symptom recognition is key	<ul style="list-style-type: none">Remove from hot environmentCooling measuresProvide 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




NOAA

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Hurricanes
Prevention and Mitigation

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



Jacinta Quesada/FEMA

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Hurricanes
Casualty Management

Injuries and Illness	Clinical Care
<ul style="list-style-type: none">▪ Wind and water surge leading to traumatic and submersion injuries▪ Environmental exposure resulting in injury and illness	<ul style="list-style-type: none">▪ Submersion injuries▪ Traumatic wounds▪ Fracture management▪ Heat/cold injuries▪ IV fluid therapy▪ Pain control measures

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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

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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



Mark Wolfe/FEMA

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Tornadoes
Casualty Management

Injuries and Illness	Clinical Care
<ul style="list-style-type: none">▪ Tremendous wind and flying debris causes traumatic injuries▪ Complex injuries from burns, electrocution, and blast injuries	<ul style="list-style-type: none">▪ 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



U.S. Navy

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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

Alert	Alert	Alert	Alert	Alert
AV	AVD	CAWS	CAW	HW
Cleveland	Watch	Orange	2015-09-10	2015-09-10
Kilauea	Watch	Orange	2015-09-10	2015-09-10
Iliamna	Advisory	Yellow	2015-09-10	2015-09-10
Pagan	Advisory	Yellow	2015-09-10	2015-09-10
Mauna Loa	Normal	Green	2015-09-10	2015-09-10
Hualalai	Normal	Green	2015-09-10	2015-09-10
Haleakala	Normal	Green	2015-09-10	2015-09-10
Mauna Kea	Normal	Green	2015-09-10	2015-09-10
Yellowstone	Normal	Green	2015-09-10	2015-09-10
La'ibi	Unassigned	Unassigned	2015-09-10	2015-09-10

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Volcanoes Casualty Management

Injuries and Illness

- Direct cause of death is pyroclastic flow and mudslides
- Traumatic injuries
- Respiratory symptoms from smoke/ash inhalation
- Eye injury from ash

Clinical Care


- 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



Patty Lynch/FEMA

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Wildfires Prevention and Mitigation

Prevention <ul style="list-style-type: none">• Proper handling and storage of flammable materials and fuel
Detection <ul style="list-style-type: none">• Early identification
Suppression <ul style="list-style-type: none">• Forest service wild land firefighting teams

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Wildfires Casualty Management

Injuries and Illness	Clinical Care
<ul style="list-style-type: none">▪ Burn injuries▪ Smoke inhalation▪ Work-stress heat-related illness▪ Extremity trauma▪ Animal and insect bites	<ul style="list-style-type: none">▪ 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



Aaron Skolnik/FEMA

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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
<ul style="list-style-type: none"> ▪ Frostbite ▪ Hypothermia ▪ Cardiac events ▪ CO poisoning ▪ Burn injuries 	<ul style="list-style-type: none"> ▪ Remove from cold ▪ Replace wet clothing ▪ Appropriate re-warming ▪ Provide warm liquids ▪ 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?