NHCPC25
NATIONAL HEALTHCARE COALITION PREPAREDNESS CONFERENCE

Strengthening Coalitions Lies Deep in the Heart of Collaboration

Presented By:
MESH

Impact of Hurricanes Helene and Milton on local community and children's hospital functions

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Pediatric Emergency Medicine Physician
Physician Disaster Management Liaison

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PGY 15

Disclosures:

- I have no relevant financial disclosures

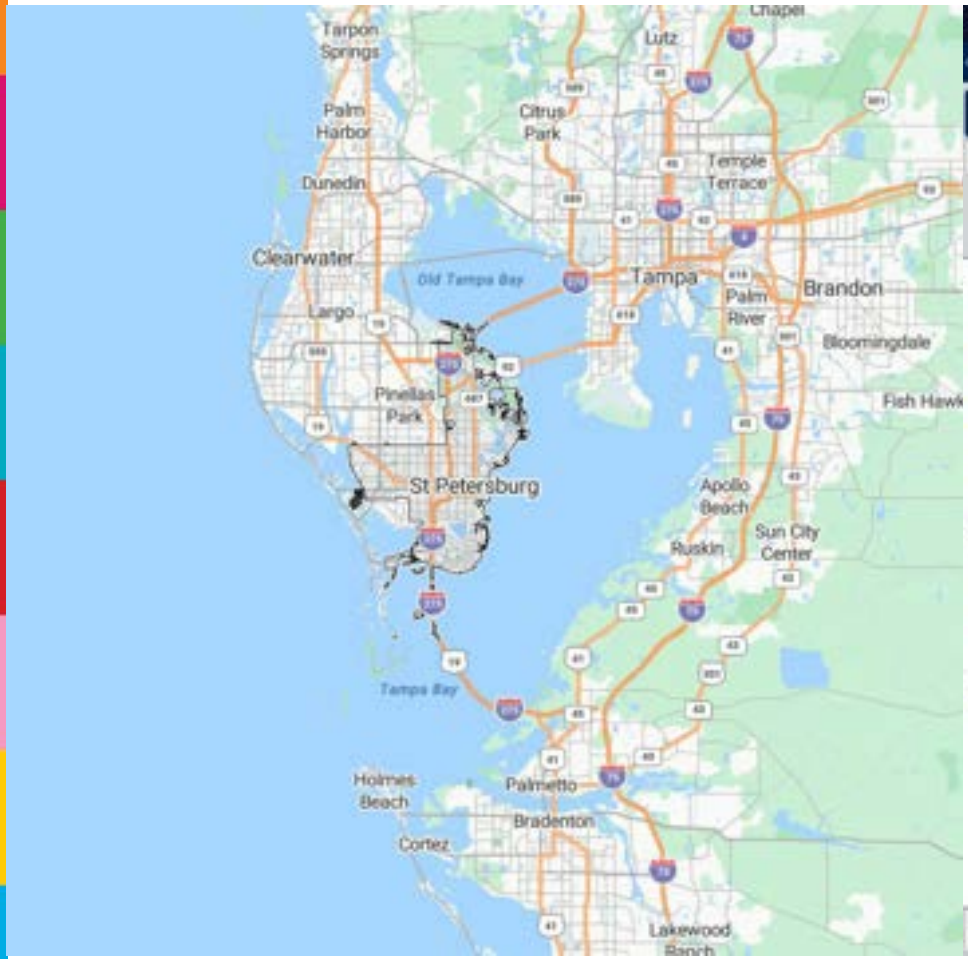
Irrelevant disclosure?

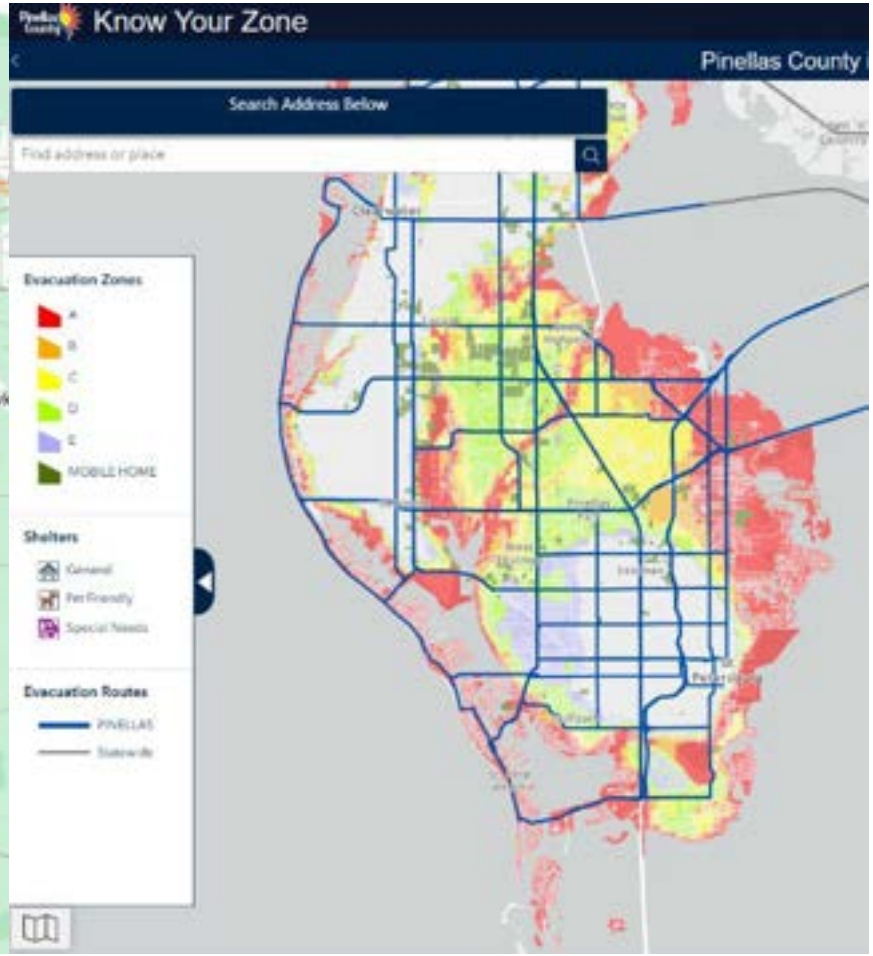
- I am on social media as Dr. Beachgem
  - Over 7 million followers across platforms
  - That's why I look familiar...

Objectives

- Discuss ways that hurricanes impact communities and how that can impact healthcare staff in that community
- Discuss ways that healthcare organizations can harden themselves against large storms
- Compare the impacts of hurricanes Debby, Helene and Milton on the local area

Johns Hopkins Florida Footprint


Tarpon Springs
Lutz
Palm Harbor
Citrus Park
Dunedin
Temple Terrace
Clearwater
Old Tampa Bay
Tampa
Palm River
Brandon
Largo
Bloomingdale
Pinellas Park
Fish Hawk
St Petersburg
Apollo Beach
Ruskin
Sun City Center
Tampa Bay
Holmes Beach
Palmetto
Bradenton
Cortez
Lakewood Ranch


Know Your Zone
Pinellas County
Search Address Below
Find address or place
Evacuation Zones
A
B
C
D
E
MOBILE HOME
Shelters
General
Pet Friendly
Special Needs
Evacuation Routes
PINELLAS
Statewide

Hospital Hardening and Sustainability

- **Central Energy Plant (CEP)**
  - Two (2) separate emergency power systems
  - Each with three (3) 2000 KW Generators = 12MW
    - Upgraded for continuous duty operation
    - Provide N+1 redundancy today
    - Expandable to 24 MW
    - 5 KV medium voltage switchgear
    - Offset Generation with Duke Energy (reduce demand on utilities)

- **Diesel Fuel Storage**
  - Three (3) 40,000 gal. underground storage tanks for generators
  - Six (6) 400 gal. day tanks (1 per generator)
  - One (1) 30,000 gal underground storage tank for boilers
  - Sustainment – **27 days at full load before refueling**

  - **Fuel Polishing:** designed to mitigate the risk of any contaminates of the underground diesel storage tanks if flooding were to occur.

Central Energy Plant - CEP

- CEP **supplies emergency power, steam, and chilled water** to Hospital and OCC.
- Entire structure is **raised above flood level**
  - Lower level for Storage. Precast Exterior Panels with no windows.
- Cooling Towers protected by **Hurricane Shutters**
- Ability to expand without building modification
  - 2 generators, 1 boiler, 1 chiller, and 1 cooling tower

(6) 2000 KW Each Generators

12 Mega Watts Of Power!

Sustainability: Power and Water

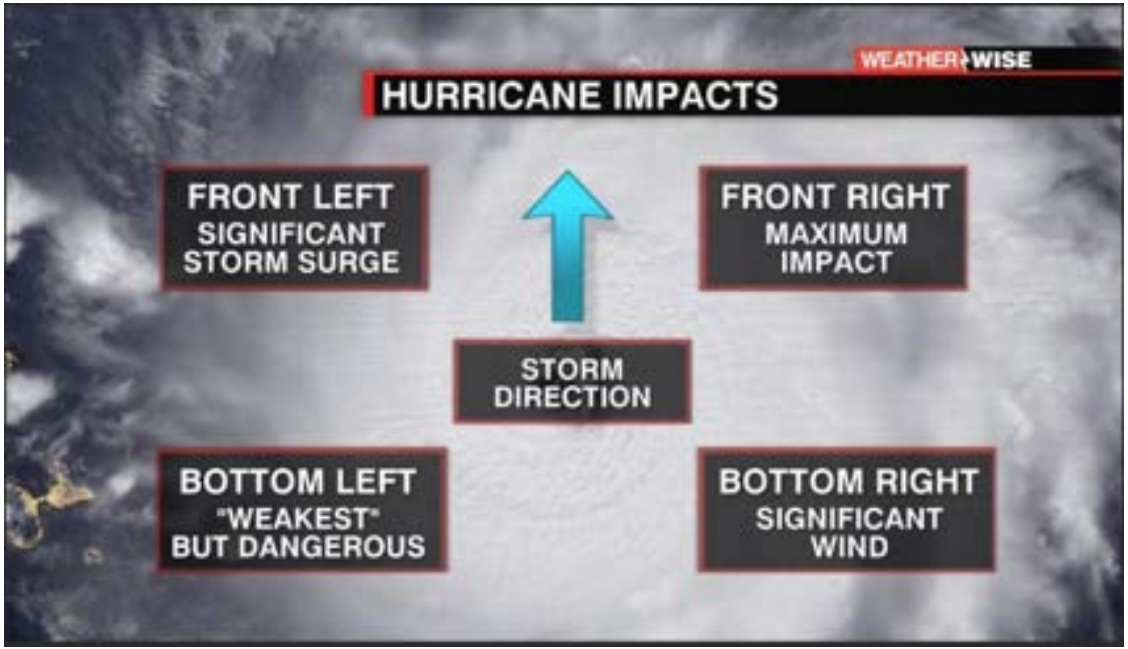
- Emergency Power System Supports:
  - Redundant power for hospital, especially cooling
  - Select Areas of Outpatient Care Center, including Reference Lab
- Emergency Water Wells
  - Separate Wells at Hospital & Central Energy Plant feed reverse osmosis (R/O) Systems, Hospital receives potable water from system
  - Treatment on site for domestic water
  - Water Quality- certified quarterly by Pinellas County Health Dept, as well as well head. Even if the R/O system fails, the water is potable
  - Both Hospital and CEP can completely divorce themselves from City Water System
  - **Storage Capacity – 5500 gals**

Flood Protection

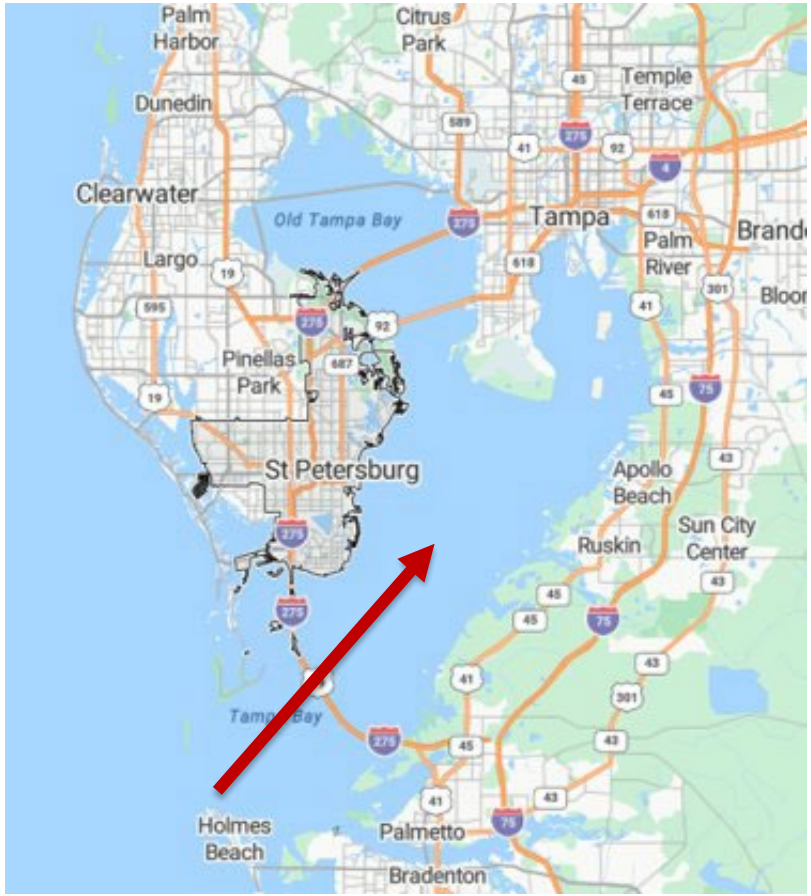
- The hospital sits at 32 feet above sea level
- All openings are protected with a lightweight aluminum flood barrier that is incrementally deployed throughout the week of the storm as buildings are systematically buttoned up

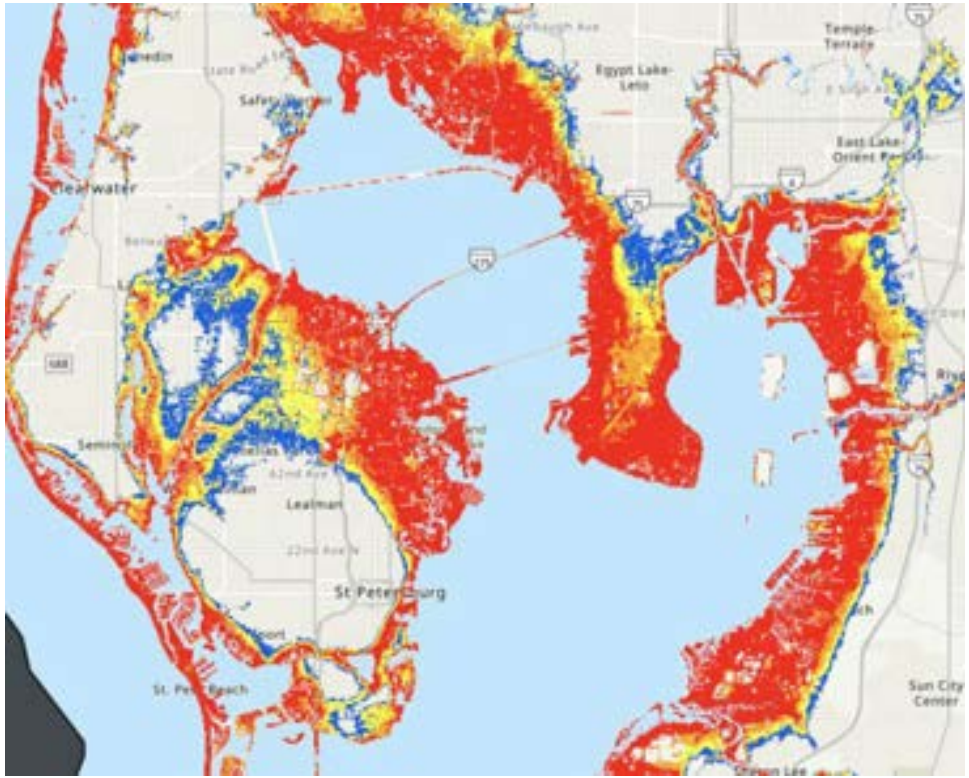
Hurricanes pick sides

- Rotate counterclockwise
- Strong side brings more wind, storm surge
  - Wind pushing onshore brings water
- "Weak side" wind moves away from the shore



Strong side of the storm





"Reverse storm surge" during Hurricane Ian

https://www.independent.co.uk/

Tornado Threat

Tornadoes

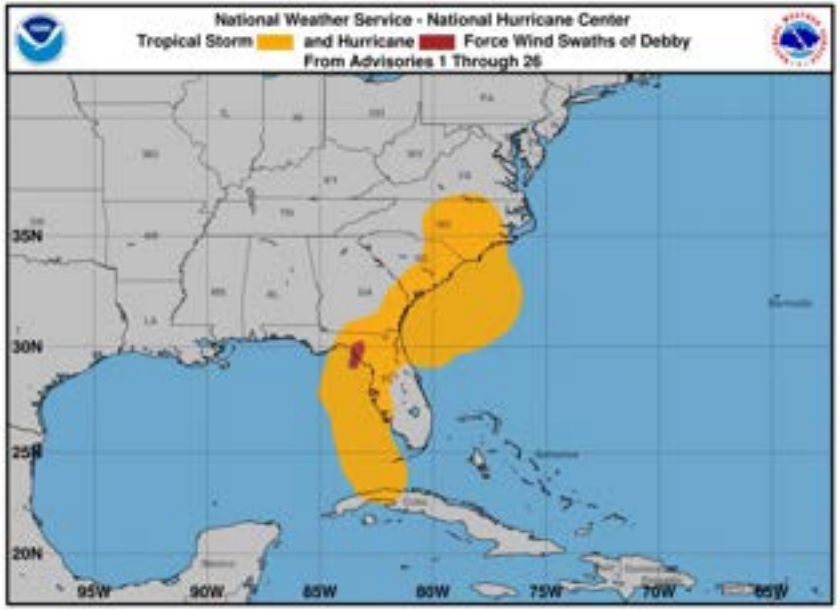
- Nearly 70% of landfalling hurricanes (1948-2000) spawned at least 1 tornado.
- 40% of landfalling hurricanes spawn more than 3 tornadoes.
- More than 90% of all tornadoes occur in the right front quadrant of the storm relative to the storm motion.
- Most develop more than 100 miles away from the center of the storm.

Timeline:

- Hurricane Debby
  - August 5-9th 2024
    - Heavy rainfall and flooding
- Hurricane Helene
  - September 24-27th 2024
    - Storm surge and flooding
    - Staff and outlying facilities impacted
- Hurricane Milton
  - October 5-10th 2024
    - Wind
    - Impacts to local and hospital infrastructure

Hurricane Debby

- August 5-9th 2024
- Significant flooding to the Bradenton, Sarasota, Venice area
- Strong side of the storm brought storm surge and heavy rainfall
- Storm surge in Tampa Bay area of 2-4 feet
- Rainfall around 20 inches
- Dike breech in Sarasota causing flooding in Laurel Meadows neighborhood



https://www.weather.gov/ilm/TropicalStormDebby2024

Hurricane Debby

- Partially stood up the Emergency operations center (EOC)
- No significant impact on hospital operations or St. Petersburg
- A few staff call outs for flooding

Local flooding in St. Petersburg

HURRICANE DEBBY
AUGUST 2024

PROTECTIVE ACTIONS

Evacuation Zones Ordered

None

Shelters Opened

2

Population in Shelter

13

Pets in Shelter

0

Closest Point Offshore Pinellas (West)

77 Miles

Strength When Offshore Pinellas

Strong TS

WEATHER DATA

Highest Wind Gust

63 MPH

Highest Rainfall Total

10.33”

Highest Storm Surge Value

2.62’

Confirmed Tornado Touchdowns

1

DAMAGES

Residences Damaged

330

Businesses Damaged

49

Pinellas County

LIFE SAFETY

9-1-1 Water Rescue Incidents

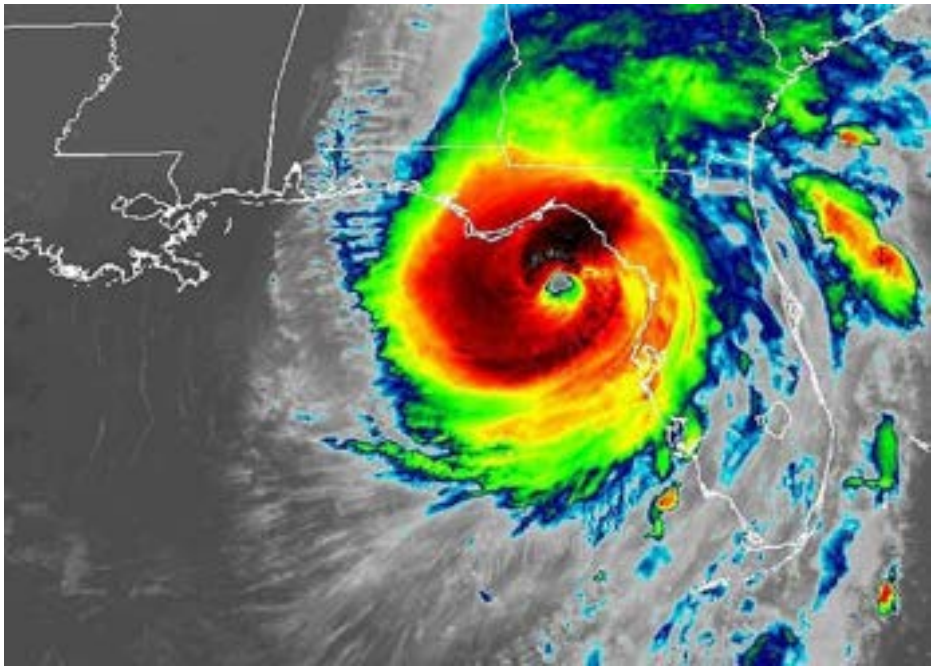
36

Confirmed Fatalities

0

Hurricane Helene

- September 24-27, 2024
- Helene made landfall as a **category 4 hurricane**
- Catastrophic inland flooding, extreme winds, deadly storm surge, and numerous tornadoes
- Impacted Florida and the southeastern United States
- Helene was over **800 miles wide** & 1114 miles long
- Tropical storm forced winds stretched 370 miles wide
- Helene is responsible for at least **250 fatalities** in the United States



https://www.nhc.noaa.gov

Hurricane Helene Hospital Operations

- DART team activation brought the 'Ride out team' in house 9/25
- Stood up the Emergency Operations Center (EOC)
  - 9th Floor of the main hospital
- Storm impact locally 9/26
- Initiated Recovery phase 9/27
  - Many homes damages or destroyed
  - Bridges remained closed
  - Maintained sleeping arrangements
- No significant hospital issues with utilities or resources
  - ~200 patients in house

Helene Storm Surge

- Within Tampa Bay, maximum storm surge inundation of 5 to 7 ft
- 6.31 ft at St. Petersburg
- The St. Petersburg tide station has the longest record in Tampa Bay, dating back to 1947
- The maximum water level of 6.31 ft above MHHW during Helene surpassed the previous record of 3.97 ft during Hurricane Elena (1985)

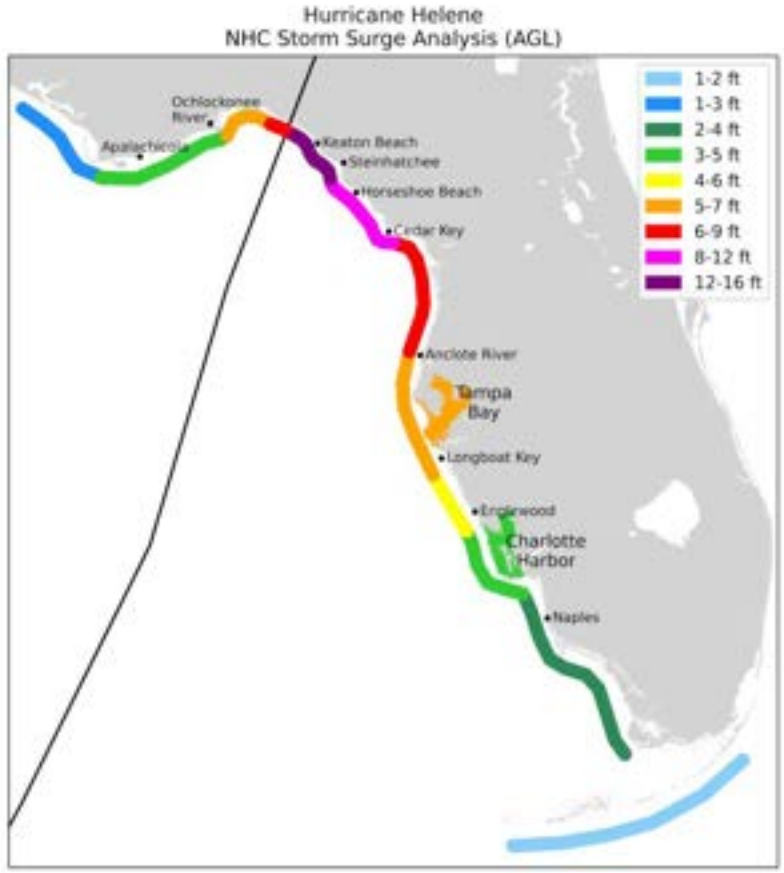
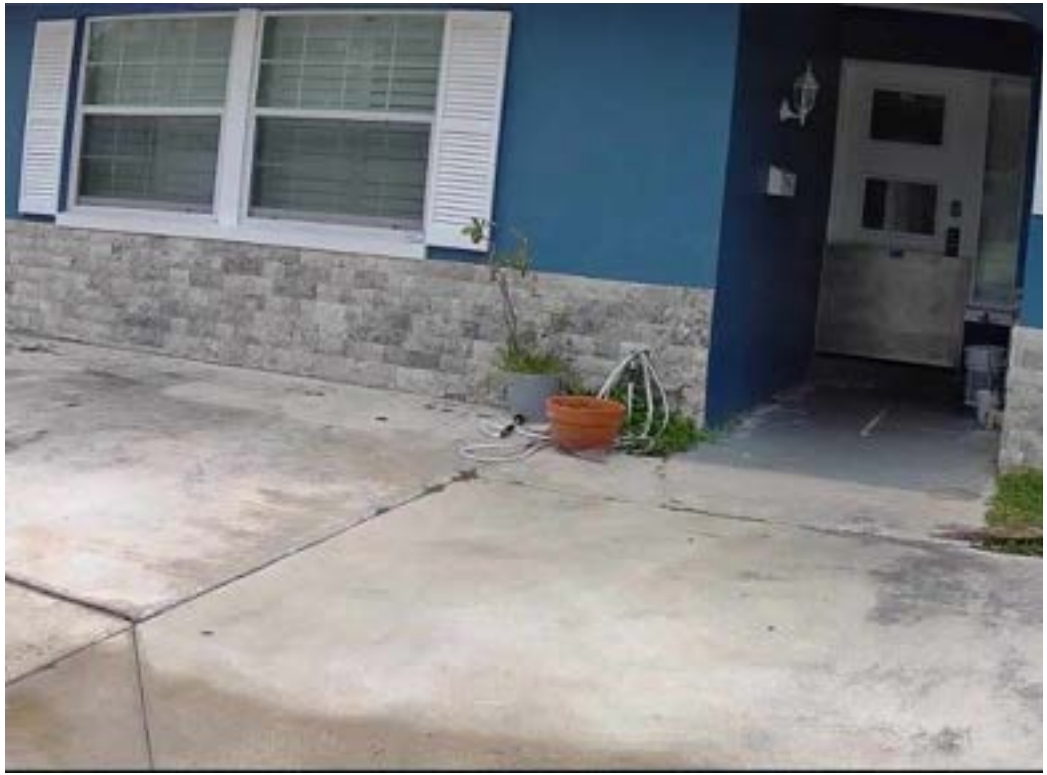
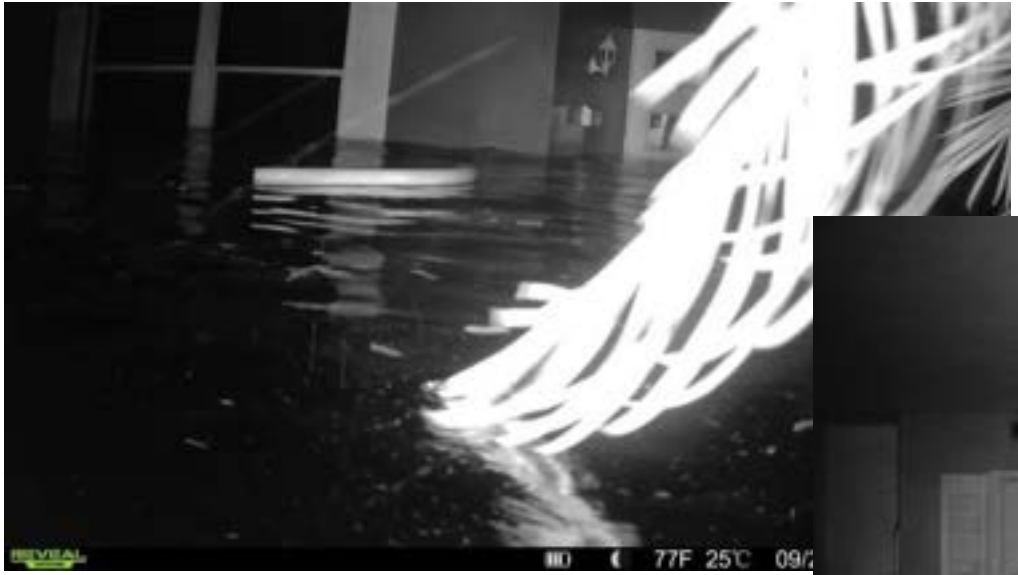


Figure 10. Analyzed storm surge inundation (feet above ground level) along the coast of Florida from Hurricane Helene. Helene's track is overlaid (black line).

https://www.nhc.noaa.gov/




77F 25C


REVEAL
80F 27C 09/27/2024 00:43:21

Side comment...

Water + electricity = Fire

Turn your power off before you evacuate

- *Including Tesla/Electric car chargers

Storm toll locally

- In Pinellas County, 12 people drowned in the surge
  - 2 in Hillsborough County
- Helene destroyed:
  - 419+ homes in Pinellas and Hillsborough Counties combined
  - 18,512+ structures suffered major damage
  - 13,909+ others reporting minor or moderate damage

Figure 2. Best track positions for Hurricane Helene, 24–27 September 2024. Tracks over the United States and during the post-tropical stage are partially based on analyses from the NOAA Weather Prediction Center.

Water is destructive

Community challenges

- Primarily storm surge impacts to large number in the community
- Cleaning supplies and plastic bins in short supply
- High temperatures and humidity levels during clean up
- Roads lined with debris
- Remediation teams price gouging and in limited supply

Community Challenges

- Those with significant flood damage were unable to live in homes
- Vacation rental prices skyrocketed and became scarce
- Home and apartment rentals became expensive and in short supply
- FEMA hotel space was in lower quality establishments
- Storage units in front of most houses

Schools impacted

- Gulf Beaches Elementary School and Madeira Beach Fundamental K-8 experienced flooding and unable to reopen
  - A few private schools and daycares also impacted
- All other schools resumed Monday 9/30
- Many schools were used as shelters
- Quick turn around

Hospital Staff Impact

- 786 emergency grants given from hospital funds
  - Total $896,000
  - At least double (likely 3x or more) impacted

Hospital Support to team members

- Updated website with resources
  - Step by step instructions for flood management created by a nurse who flooded during Hurricane Debby
- Employees Helping Employees fund
- Food assistance
- Matching people with trucks/supplies to those in need
- Check list for flood victims
- Storm recovery Town Halls

HURRICANE HELENE
SEPTEMBER 2024

PROTECTIVE ACTIONS

Evacuation Zones Ordered

A

Shelters Opened

6

Population in Shelter

1,700

Pets in Shelter

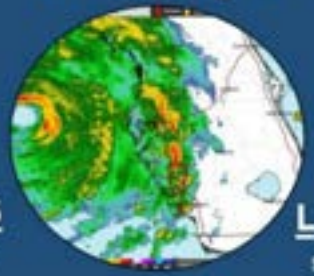
97

Closest Point Offshore Pinellas (West)

105 Miles

Strength When Offshore Pinellas

Category 3



WEATHER DATA

Highest Wind Gust

82 MPH

Highest Rainfall Total

3.06”

Highest Storm Surge Value

6.67’

Confirmed Tornado Touchdowns

0

DAMAGES

Residences Damaged

33,566

Businesses Damaged

689

Pinellas County

LIFE SAFETY

9-1-1 Calls for Water Rescue

1,400

Confirmed Fatalities

12

What a great time for another storm...

- Debris piles scattered through coastal areas
- Thousands of families displaced
  - Vacation rentals, RVs in driveways, hotels, storage units in driveways
- Emergency management personal also impacted
- Money is tight!

www.abcactionnews.com

Hurricane Milton

- October 5-10th 2024
- Milton was one of the strongest hurricanes of record in the Atlantic basin, reaching category 5 intensity
- It made landfall on the west coast of the Florida peninsula as a category 3 hurricane, causing major damage in the Sarasota and Tampa Bay areas

Hurricane Milton

- Response to evacuation orders were positive
  - People moved inland and many left the area
- Gasoline became scarce quickly
  - Stations closed
- Stores quickly ran out of water
  - Supply was low to start
- Preparation supplies very limited

Hospital considerations

- Hospital built in "non flood zone" initially, but now **Zone E**
- Central energy plant now in a **Zone C**
  - Generators located on the second floor
- Helipad can hold a black hawk helicopter/Coast Guard
- Well water available

Red Flags are everywhere...

Description

Jim Cantore in Tampa as Hurricane Milton Continues to Grow

you know we're about to get absolutely whacked if denis phillips is live on air drinking diet dr pepper, wearing a hoodie and looking like he hasn't slept in 4 days

My ride out crew...

We're not a shelter, but...

- On October 6, 2024, **Pinellas County issued an evacuation order** for hospitals and long-term care facilities in zones A, B, and C, with a follow-up order on October 7, 2024, expanding the evacuation to mobile home residents. In response to this, JHACH **received three community-based evacuees** who were sheltered in the SECU during the storm
- Due to the displacement caused by Hurricane Helene, more patient family exceptions than normal were granted to help families who were affected by the storm
- At approximately 5 P.M., the hospital EOC was informed of the **potential to receive an additional 15 evacuees** from Sabal Palms nursing home due to utility issues at that facility. This evacuation was averted once the situation at Sabal Palms was resolved

Hurricane Milton

- 10/5-10/7
  - **Partial activation of EOC**
  - Daily calls within facility, Pinellas county, Florida Hospital Association
  - Hospital preparations ongoing
- Tuesday 10/8
  - **DART Team activated**
    - No later than 2 p.m. – Rideout check-in for swing shift
    - No later than 6 p.m. – Rideout check-in for the night shift
    - No later than 8 p.m. – Rideout check-in for the day shift
    - Access between buildings remains available (bridges rated up to Category 3 winds)
  - 2015: Phone call with St. Petersburg water resources leadership referencing the **potential sewer line shutdown**

Previously impacted neighborhoods with tall debris piles in front of homes creating potential projectiles in a high wind storm

Hurricane Milton: Day of Impact

- **WEDNESDAY, OCTOBER 9, 2024:**
  - 0600: EOC fully activated and staffed.
  - 0700: Campus lock down issued; ride-out team on-site.
  - 0830-1230: JHACH internal update call, coordination call with PCEM, FHA hospital coordination call.
  - 1630: **Steam line** registers over pressurization
  - 1645: Switched to **generator power** due to power surges

Updated #7: Hurricane Milton Makes Landfall in St. Pete

- Residents should also be aware that the **Northeast and Southwest Sewer Treatment plants have been taken offline**. This decision was made to protect City employees and the facilities from storm damage.
- While the plants are offline, residents in the impacted areas should **limit the flushing of toilets, taking showers, or doing laundry.**
- Please note, this does NOT affect drinking water.
- We will work to bring the plants online as quickly as possible, but we all need to be patient as we start to feel the storm's impacts.

Hurricane Milton: Day of Impact

- 1738: Notified Chief of Staff for the City of St. Petersburg Mayor, that hospitals seek clarification regarding notification of water conservation efforts
  - Despite standard EOC calls between the city and county, JHACH was notified of the sewer shut down the same time residents were. **No advanced notice was given.**
- 1749: Confirmation from the city to **stop all non-essential water** due to the impending sewer line shut down. On site staff notified via the RAVE alert system
- 2030: **Briefly lost local internet connection** (less than 10 seconds). The system automatically moved to a redundant circuit between Baltimore and St. Pete
- 2203: Steam line over-pressurized due to power surges, causing **pressure relief valves to vent** into the hospital basement

Steam line is essential at JHACH

- Fluctuating power caused **volatility in the regulator valve**, leading to an over pressurization
  - Triggered the pressure relief valves to open, resulting in a significant steam leak in the hospital's basement
  - **Fire Alarm System Activation:** The high temperature from the steam leak **triggered the fire alarm system**
    - Unhappy day shift workers and patients
  - Steam System Disruption: Without the necessary pressure and flow of steam, **essential hospital processes, such as sterilization of surgical instruments and temperature/humidity control** in the operating rooms, were compromised

Hurricane Milton: Day of Impact

- 2230: Hospital EOC made aware of a **water main break that will result in the municipal supply to be shut off indefinitely.**
- 2245: Shut down municipal supply lines to the hospital and **turned on well water** supply lines.
- 2258: Incident Command consultation with Infection Prevention in reference to using well water.
- 2259: **Bottled water only notice for all staff** for drinking and hygiene until the DOH potability certificate can be verified by IP.
- 2355: Mission request for five pallets of bottled water sent to PCEM


who thought that was a
good idea


Gulf of Mexico
Jacksonville
Wind forecast
Wind speed at surface
Orlando
Clearwater
Tampa
Saint Petersburg
Fort Myers
Naples
Milton, Hurricane
View >
Mon, Oct 7
Tue, Oct 8
Wed, Oct 9
11 AM
12 PM
1 PM
2 PM
3 PM
4 PM
5 PM

Hurricane Milton: Night of Impact

- THURSDAY OCTOBER 10, 2024
- 0000: **Fire watch initiated** due to the loss of municipal water supply
- 0021: **City of St. Petersburg coordinated a joint call** with the city and impacted hospitals
- 0030: Call between Johns Hopkins All Children's Hospital, Orlando Health-Bayfront Hospital, and Baycare-St. Anthony's Hospital to discuss concerns and implications for the water shutdown and significant impacts on patient care
- 0045: Additional bottled water distributed to staff and patient families
- 0050: **Phone call with ACHA** Secretary Jason Weida and Deputy Secretary Kim Smoak, to apprise them of the possible evacuations stemming from loss of fire suppression linked to loss of municipal water supply
- 0130: Unified Incident Command call to discuss a **possible evacuation**

JHACH Well Water

- Two well system: Potable and non-potable
  - Potable tested quarterly by the Dept of Health
  - Able to avoid the citywide boil water notice
- Failure of the non-potable water
  - Supplies the chillers (air conditioning)
  - Supplies water for steam line...
  - Supplies water suppression system
  - State sent 3 truckloads of water (25,000 gallons) to fill chillers
- Between steam line issue and chillers down, struggling with temperature management

Roof of Tropicana Field

Hurricane Milton: Night of Impact

- 0223: **Failure of a flange on the well** supplying JHACH HVAC chillers
- 0245: Unified Incident Command call requesting the state's assistance in fixing the flange
- 0334: Hospital placed on **trauma divert**
- 0430: Unified Incident Command call referencing the **possible evacuation**
- 0600: **DOH potability certificate is verified by IP**. RAVE alert sent to staff that the well water is safe to consume. **Patients stayed on bottled water**
- 0602: State Mission Request submitted for **three water tankers** and a pump to supply 25,000 gallons of water to the AC chillers' towers
- 0648: Clearwater Utility employees arrived to assist with fixing the well water flange
- 0700: Unified Incident Command call related to fire suppression. Pinellas County EM dispatched a fire engine to charge and pump the sprinkler system until a water tanker with a pump could arrive to supply the fire suppression system until municipal water supply could be reestablished. JHACH maintained fire watch until the units arrived on scene

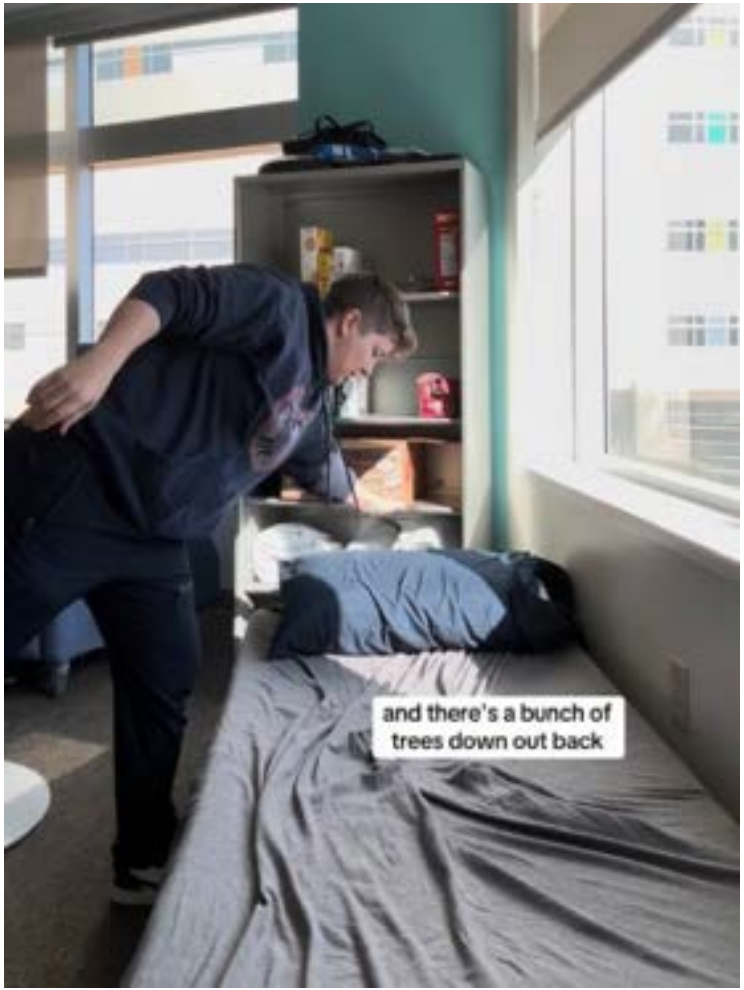
Hurricane Milton: Day after impact

- 0725: FAA Inspector arrived, **inspected the helipad**, and confirmed it safe to resume operations; weather pending.
- 0730: **Ten pallets of bottled water** received.
- 0807: The city advised that the **sewer system had been restored.**
- 0810: Notified by Secretary Jason Weida, AHCA, that the **state sent a "water cube" unit** that generates 1,500 gallons of pharmaceutical grade water daily.
- 0952: Municipal water supply re-established. Boil water order issued.
- 0954: AC chillers re-filled – **Restoring air conditioning** to the main hospital.
- 1030: FHA/AHCA/Dept of Health Meeting, dispatched tanker and team to operationalize internal Johns Hopkins All Children's Hospital fire suppression.
- 1130: Hurricane Milton JHACH internal update call.
- 1300: **Water tanker for the fire suppression supplementation** arrived.

Water Cube

Hurricane Milton: Day after impact

- 1300: EOC recovery coordination call.
- 1330: AHCA Life Safety Inspector arrived to inspect the temporary fire suppression system.
- 1335: Returned to normal bed status **(off diversion)**.
- 1433: Internet returned to local connection.
- 1500: **Transition to the municipal water supply, for fire suppression** only, complete.
- 1730: Hurricane Milton JHACH internal update call


and there's a bunch of
trees down out back


St. Petersburg, FL
8:58 PM ET
LIVE
BREAKING NEWS
DEATH TOLL RISES TO 14 AFTER MILTON'S DESTRUCTIVE STRIKE ON FLORIDA
CNN
AC360°

Hurricane Milton: Getting back on track

- FRIDAY, OCTOBER 11, 2024
  - 0800: Ride out EOC team handoff to recovery EOC team
- Terminal cleaning of all operating rooms
  - Following temperature and humidity changes with steam line disruptions
- Inspection and eventual reopening of Satellite OCC locations
  - Closed for one day following the storm

Summary: Management of Utility Loss

- Sewage
  - Limited showers/flushing
  - Encouraged hand sanitizer use
- Power
  - Switched to generator power
- Internet (briefly)
  - Redundancy within the system
- Municipal water
  - Well water/Bottled water
- Steam line/Chillers
  - Repairs/Tanker delivery
- Fire suppression systems
  - Fire watch initiated
  - SPFD

HURRICANE MILTON
OCTOBER 2024

PROTECTIVE ACTIONS

Evacuations Zones Ordered

A, B, C

Shelters Opened

14

Population in Shelter

12,000

Pets in Shelter

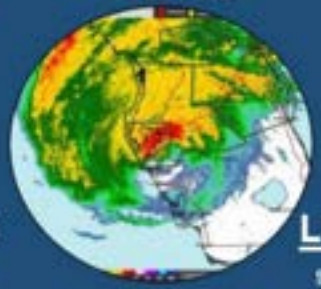
1,386

Closest Point Offshore Pinellas (South)

28 Miles

Strength When Offshore Pinellas

Category 3



WEATHER DATA

Highest Wind Gust

101 MPH

Highest Rainfall Total

20.40”

Highest Storm Surge Value

1.3’

Confirmed Tornado Touchdowns

0

DAMAGES

Residences Damaged

12,832

Businesses Damaged

430

Pinellas County

LIFE SAFETY

9-1-1 Calls for Water Rescue

237

Confirmed Fatalities

2

Community Impacts

- Significant wind damage:
  - Bridge re-opening slightly delayed
  - Trees down/roads blocked
  - Roadway signs/Signals damaged
  - Powerlines down/No electricity ~ 1 week
    - October in Florida still very hot
  - No home internet ~2 weeks
  - Gas stations closed/Gasoline not available
  - Boil water notice
  - Homes damaged

Tampa Bay Health and Medical Preparedness Coalition

- Coordination and deployment of resources locally
  - Cots, generators, supplies
  - Warehouse with multiple Mission ready packs
- Coordination of three fuel depots for local healthcare workers for 4 days

Lessons Learned

- Find ways to harden healthcare systems
  - Well, septic/sewage systems, build on high ground, generators, satellite phones/Starlink
- Build in redundancy
  - Add water hook ups to the outside of the hospital
  - Ensure you have contracts or MOU's with multiple vendors
- Coordinate with other hospitals, Coalitions, State and local resources
  - Fuel depot played large role in maintaining staffing
  - Preplanning logistics, such as security, is paramount to a quick deployment. Neighboring facilities not able to provide consistent coverage despite receiving the benefit. Staffing for the event would have helped tremendously.
    - JHACH has met with multiple hospitals throughout Florida to work out the logistics surrounding hosting a fuel depot

Take Evacuation Seriously… seriously

- Evacuation is incredibly complex.
- Does your plan work?
  - Does it really?
- What transport resources are available in your region?
- How do you move patients (supplies, chart, belongings)?
- How do you get them back?
  - Patient tracking software
- Do you have specialty patients that will require a specialty hospital?
  - Are there any close to you?
- Does the state manage this process? Do they really?
- Who goes first? Does it matter?
- Do you have MOU’s or transfer agreements in place?

Evacuation Tracking

Pulsara

www.pulsara.com

- Pulsara is a communication and logistics platform designed to unite distributed care teams across organizations—especially in time-sensitive, high-acuity scenarios.
- It creates a dedicated “patient channel” for each patient event so all team members (EMS, hospital, specialists, transfer, etc.) can join and see the same information.
- It's mobile-first (smartphones/tablets), web-enabled, HIPAA-compliant, and built to replace fragmented systems (radios, faxes, pagers) with a unified workflow.
- Scalable from routine transfers to mass-casualty incidents (MCIs) and disaster response.

MERRGE

www.emergencymanagementcollaborations.com

- Emergency Management Collaborations (EMC) was created to close long-standing gaps in victim tracking and reunification.
- Streamlines victim tracking and family reunification during mass casualty or planned incidents.
- AI Matching: Uses photo, identifying marks, and name recognition for rapid, accurate victim identification.
- Real-Time Updates: Displays live mapping and victim distribution across incident sites.
- Data Integration: Supports coordinated information sharing among hospitals and agencies.
- After-Action Analytics: Generates data reports for training, evaluation, and improvement.

Looking back…

- Staff was incredibly resilient
  - People showed up for ride out
  - Flexible
  - Positive environment
- Hospital had multidisciplinary support available
  - Advice from Idalia/Debby floods
  - Financial support
  - Food assistance
  - Holiday gift was gift card

Important Acknowledgements

- Travis Witt
  - Director of Safety/Emergency Management
  - Sharing our lessons learned for other hospitals and systems
- Entire Incident Command team
- Tampa Bay Health and Medical Preparedness Coalition
  - Franklin Riddle, Hunter Zager, Bill Howe

Not discussed, but not forgotten

- Today I discussed the very limited impact of these hurricanes on the St. Petersburg and Tampa bay area as well as my hospital, but I want to acknowledge the significant and deadly impacts up the east coast into Georgia and the mountains in North Carolina

References

- https://www.accuweather.com/en/hurricane/deadly-debby-leaves-5-dead-spreads-flooding-inland-into-southeast/1675997
- https://www.nhc.noaa.gov/data/tcr/AL092024_Helene.pdf
- Update #10: St. Petersburg Beginning to Feel Impacts of Hurricane Helene
- Pinellas County 2024 Hurricane Season Hurricanes Debby, Helene, and Milton After-Action Report Overview
- Witt, T. (2024, October). *Hurricane Milton Post-Incident Analysis (PIA): A comprehensive review of hospital response and recovery efforts during Hurricane Milton* [Unpublished internal report]. Johns Hopkins All Children's Hospital, Safety & Emergency Management Department.

JOHNS HOPKINS
All Children's Hospital

all we do. all for kids.™

NHCPC25
NATIONAL HEALTHCARE COALITION PREPAREDNESS CONFERENCE

Strengthening Coalitions Lies Deep in the Heart of Collaboration

Presented By:
MESH

Surge

Managing Multi-Patient Incidents

Chris Chiara
Section Chief, EMS
Dallas Fire-Rescue

Overview

- Definitions
- System Overview
- Watershed Incidents
- Preparedness
- Case Studies
- Lessons Learned

Definitions

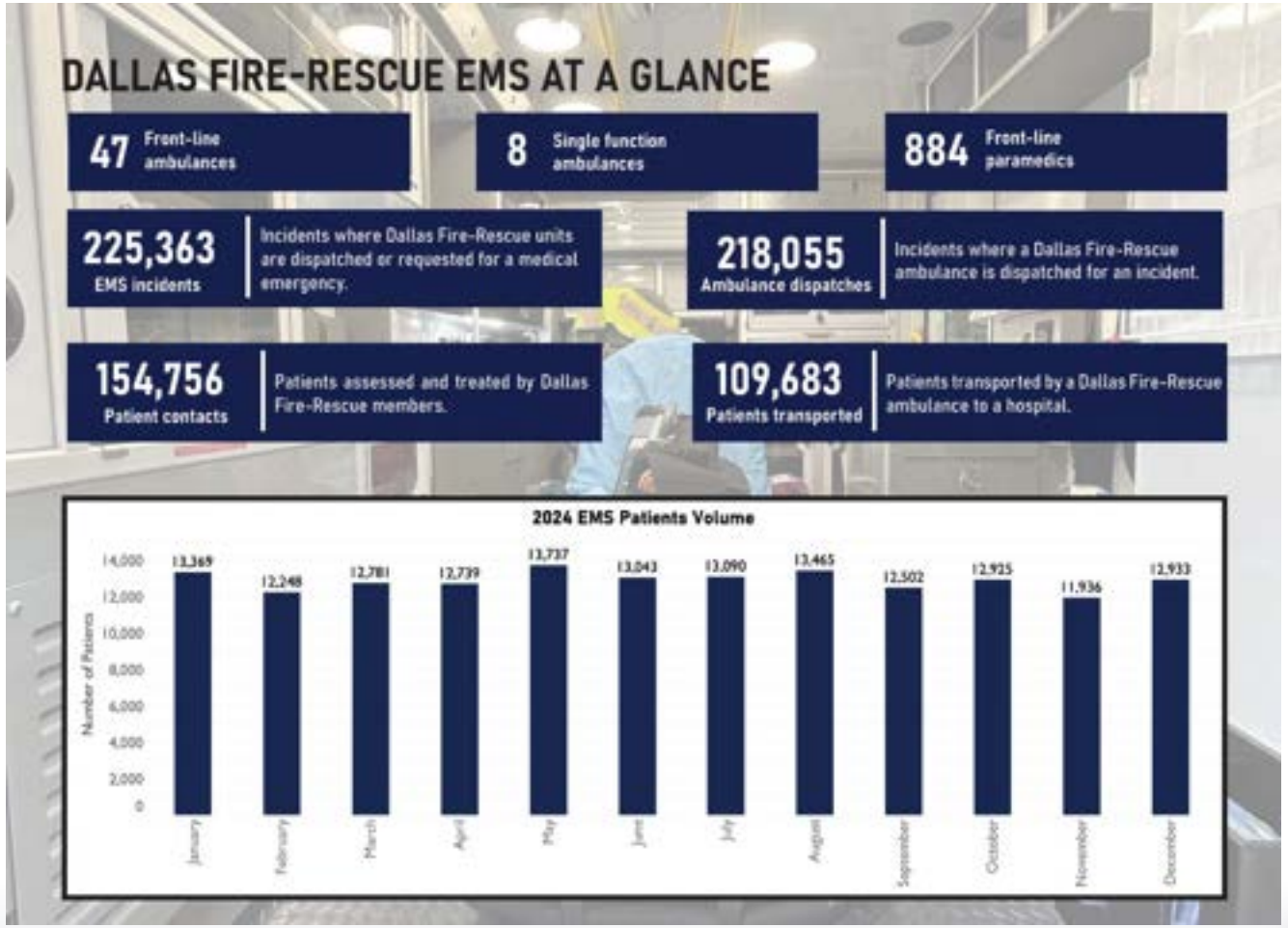
- Planned Event vs. Unplanned Incident
- Incident vs. Incident After the Incident
- Multi Patient vs. Muti Casualty Incident

City of Dallas

- Population 1.3 Million
- 386 square miles
- Covering 4 counties
- 9th largest city in the U.S.

Dallas Fire-Rescue

- Paid, full-time
- Fire-based ALS EMS system
- 59 Stations
  - 58 Engines
  - 23 Trucks
  - 10 Battalions
  - 47 full-time ambulances
  - 8 “peak” hour ambulances
  - 8 EMS Supervisors
- Medical Direction
  - Anchored by Parkland & UTSW
  - Shared across 13 agencies



#NHCPC25

June 20, 2011

- 10-hour “music festival” in Fair Park
- Approximately 22,000 attendees
- Drug, alcohol & heat emergencies
  - 1 fatality
  - 30 transports
  - 10 ambulances

tetradtx on Flickr

June 20, 2011

Shortfalls:

- Inadequate resources on-scene
- Event did not require MCI response
- Lacked “extended” care plan

Solutions:

- “Galvanized” the Special Events Group
- Forward Dispatching
- Partnered with nurse teams & medical directions

July 7, 2016


NIGHT OF TERROR

Peaceful protest suddenly became a scene of death

Patients

- 2 civilian GSWs
- 12 PD GSWs
- 5 police fatalities

Response

- 10 Ambulances
- 6 Engines
- 4 Trucks
- 4 EMS Supervisors
- 481 notes added in CAD

July 7, 2016

Challenges:

- Shifting perimeter

Shortfalls:

- No ballistic equipment implementation
- No Active Shooter SOP implemented

Active Shooter SOP – 7 Year Itch

Major takeaways:

- Delays in UC
- Delays in establishing Rescue Task Forces (RTF)
- Definitive care lies outside the Hot Zone
- Maintaining readiness after the initial “incident”

Intentional Mass Casualty Incident

Incident formerly know as “Active Shooter”

- SOP rewrite
  - Aligned terminology
  - Expedited extraction
- New equipment
  - Patient Litters
  - Bleed kits
- Updated Response Model
  - Mirrors fire alarm escalation
  - Ambulances: transport
  - Fire crews: extract / treat

IMCI: Three-Phase Training

1. Online CE: SOP
2. Hands-on: SOP & equipment training
3. Hands-on: full scale drill

KBHCCD – Cheer Competition

9 Patients Transported by EMS

Response

- 11 Ambulances
- 3 Engines
- 1 Truck
- 2 Battalion Chiefs + 2 Staff Chiefs
- 2 EMS Supervisors
- 324 notes added in CAD

ICS Functions

- Ops Branch
- EMS Branch
- Safety

KBHCCD – Cheer Competition

Yfat Yossifor/KERA News

Challenges:

- Setting a perimeter
- Widespread incident – precluded transport consolidation

Takeaways:

- “Forward” dispatching from ICP
- Casualty Collection Points
- Dedicated Med Channel

Wilmer-Hutchins HS

5 Patients Transported by EMS

Response

- 11 Ambulances
- 6 Engines
- 4 Trucks
- 4 Battalion Chiefs + EMS Chief + Deputy Chief
- 4 EMS Supervisors
- 190 notes added in CAD

ICS Functions

- Ops Branch
- EMS Branch
- Safety
- Remote Staging Location
- Reunification Site

CBS

Wilmer-Hutchins HS

Challenges:

- Delayed UC – multi-agency

Takeaways:

- Dedicated Med Channel
- Remote Staging
- Over “resourcing”

CBS

Lessons Learned

UC is Hard

- Adding Command Vehicle

Over “Resource”

- Maintain readiness for the next incident

Forward Dispatch / Med Channel

- Enhances Tracking & Accountability

Remote Staging

CBS

NHCPC25
NATIONAL HEALTHCARE COALITION PREPAREDNESS CONFERENCE

Strengthening Coalitions Lies Deep in the Heart of Collaboration

Presented By:
MESH

Coalitions Response to the Maui Wildfire

Marc Moriguchi

#NHCPC25

The Numbers- Why scale matters

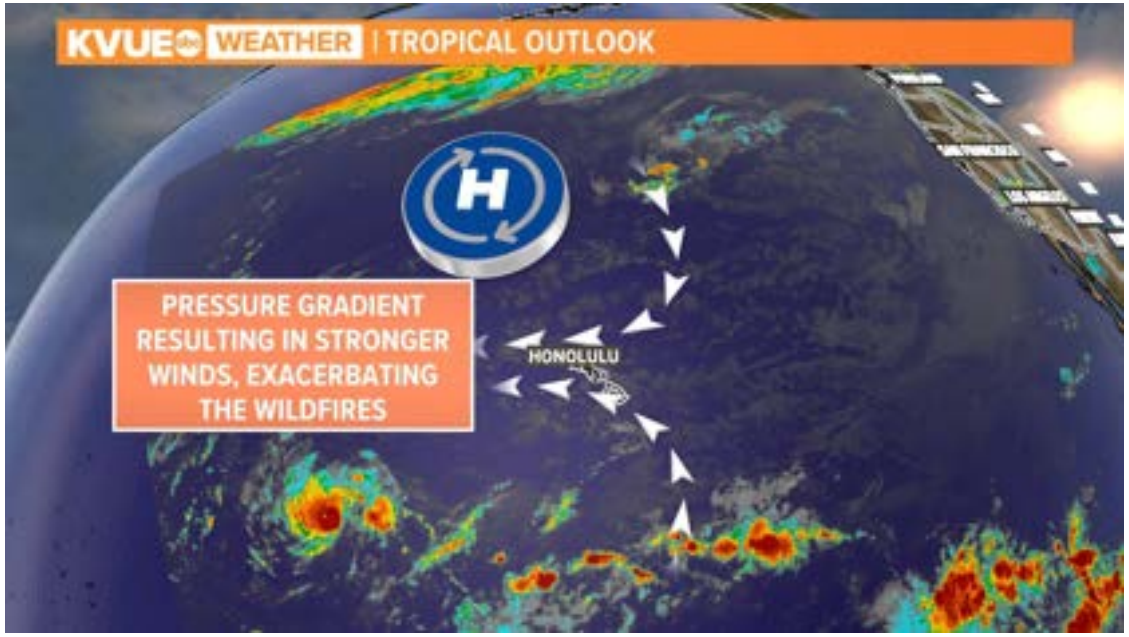
- 9,644,519 visitors in 2023
  - 860,831 in December 2023
  - Approx: 213,312 visitors in the state on a given day
- Average daily census on Maui: 23,633 in September 2023
  - 56,307 visitors in September 2022 (-58%)
  - Maui county population is approximately 164,835 (July 2023)
  - Population of Lahaina 12,900 (2022)
- Average monthly visitors 797,791 with an average stay of 9.86 days

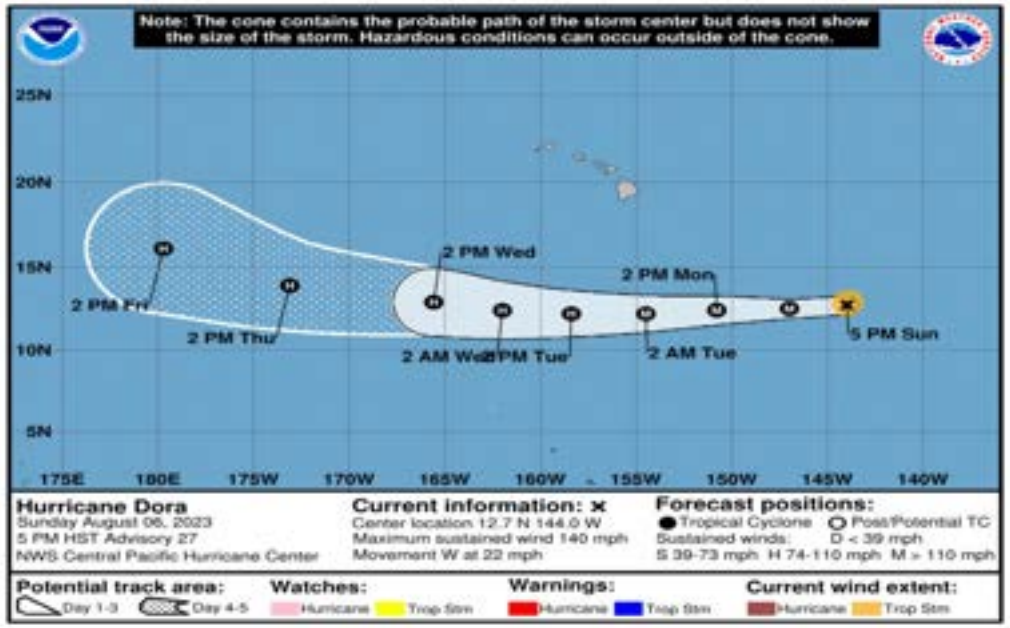
Hawaii & sharing part of the culture

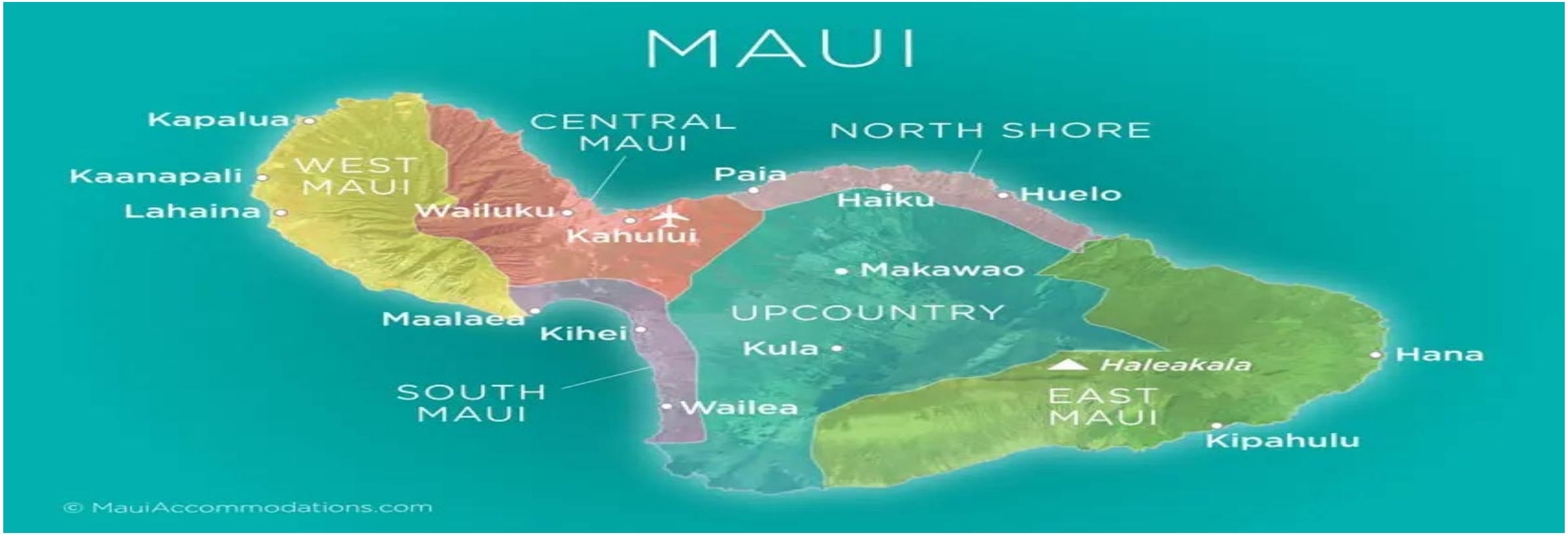
- Double and triple decker Kau Kau (eat) tin or Plantation workers lunch pale

Hurrican Dora:

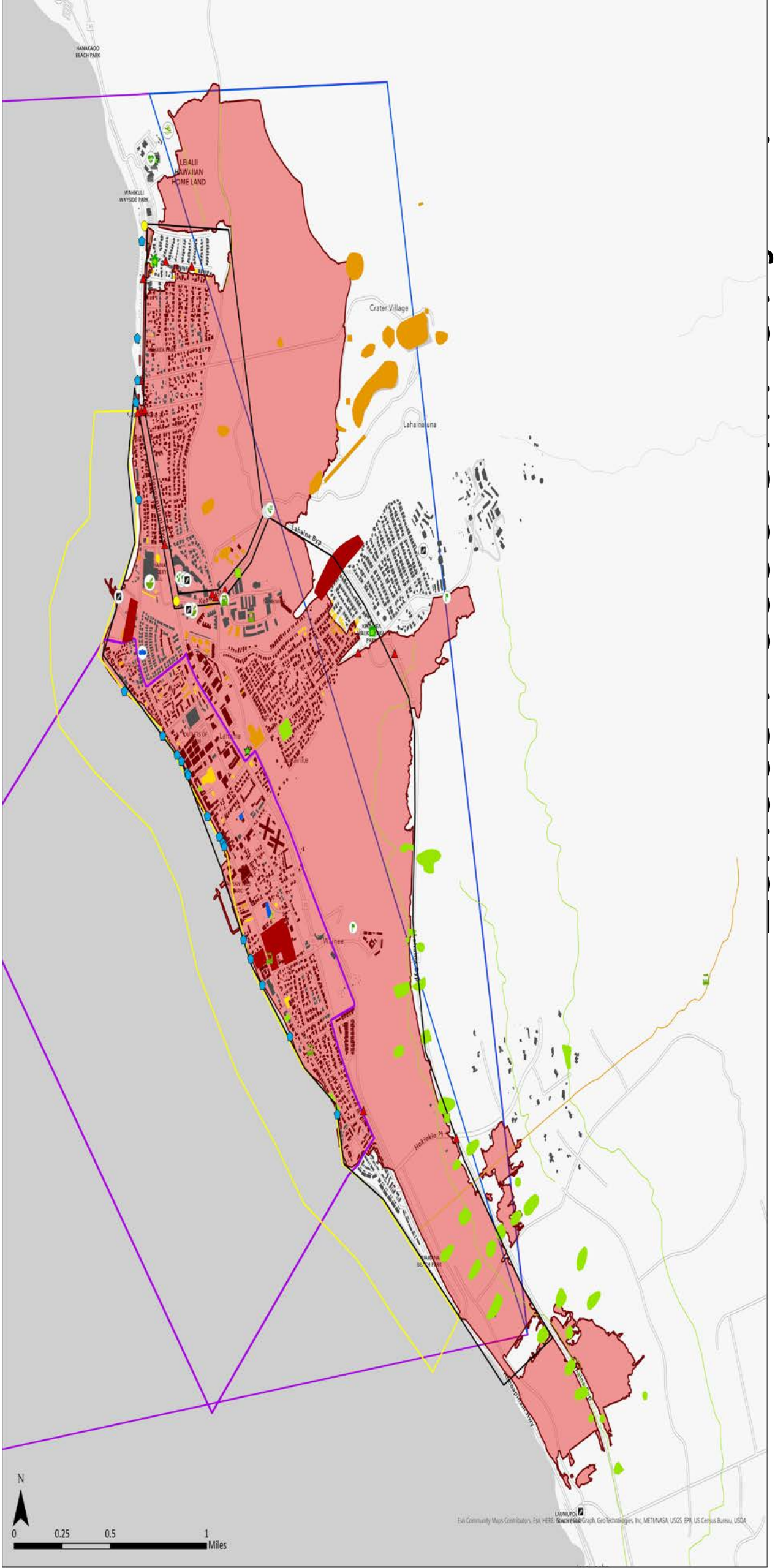
- A small, long-lived hurricane.
- Played an indirect meteorological role in the Maui wildfires







- Haleakala- 10,000 ft
- West Maui Mountains- 5,700 ft
- Kula- 1,200-2,800 ft


HANAKAOO BEACH PARK
LEIALII HAWAIIAN HOME LAND
WAHIKULI WAYSIDE PARK
Crater Village
Lahainaluna
Lahaina Byp
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Miles

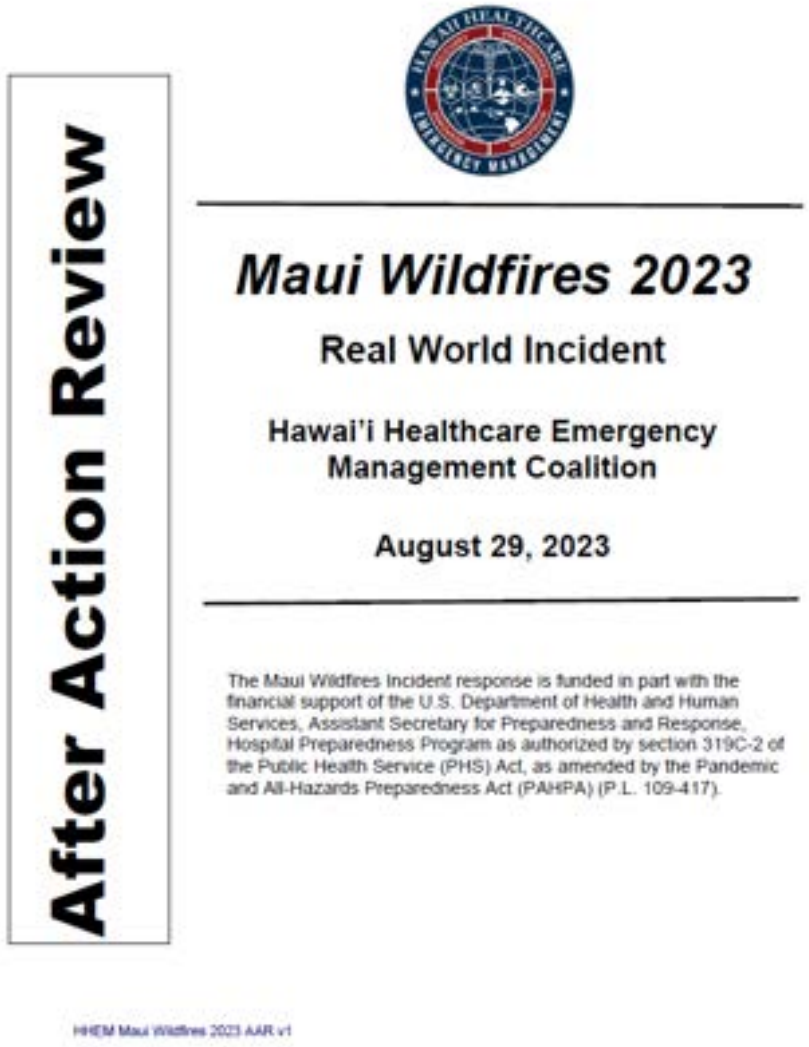
Coalition response to Maui Wildfire

- HHEM was in the Maui EOC within 24 hrs of the incident
- Continuity of Health Care Service
  - Staffing issues, X-ray tech
  - Logistical support
  - Kula hospital water issues
- Surge response
  - Dialysis redistribute patients to other clinics
  - Helped dialysis find missing patients
    - Red Cross shelters.
  - Coordinated transport though roadblocks
-

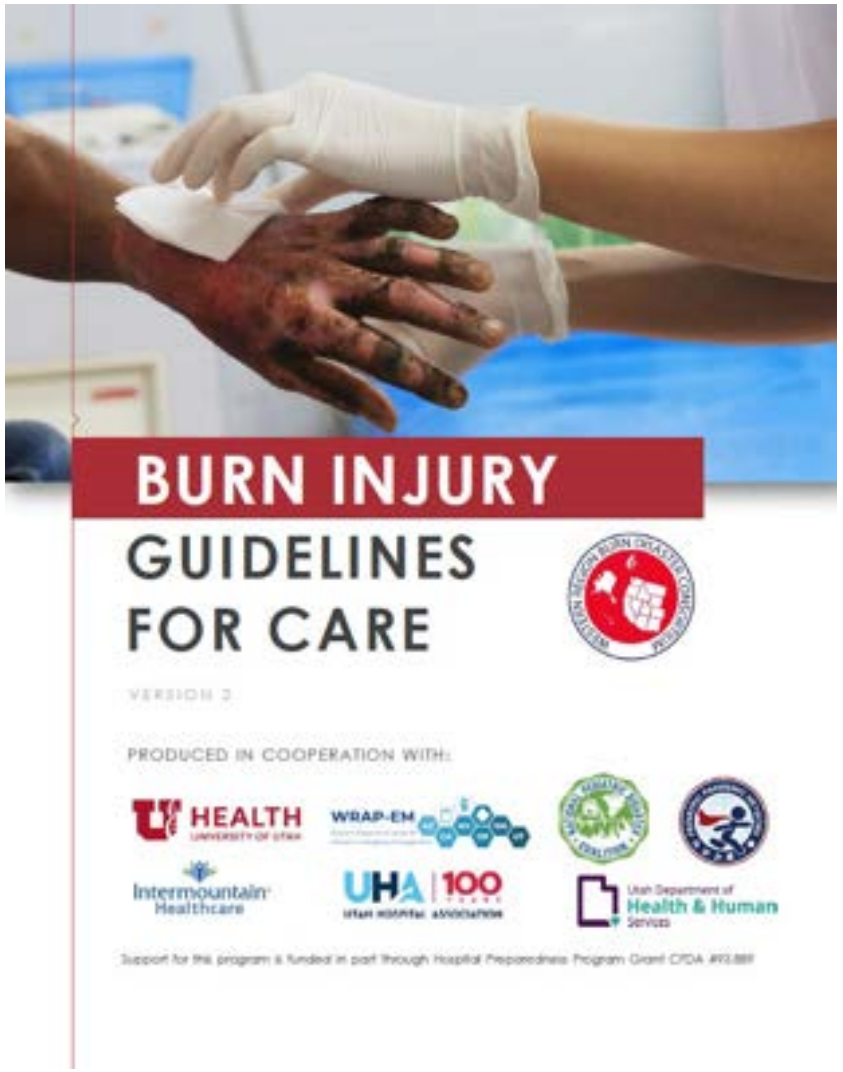
After Action Report:

- **Major Strengths:**
  - Maui Memorial Medical Center response to medical surge and coordination with Oahu hospitals.
  - HHEM deployed staff to MEMA's EOC within 24 hours of the incident
  - Logistical and resource coordination to members
    - Kaiser mobile clinic
    - Supplies for Dialysis and AMR
  - Oahu hospitals prepared for and received patients.
  - Hospitals willing to release staff to MMMC to help.

- **Areas for improvement:**
  - Availability of DHO at MEMA
  - Volunteer Management & coordination



Surge strategies



Reference for hospitals

- Western Region Burn Disaster consortium
- What hospitals are designated trauma centers
- Hospital Burn Triage flowcharts
- Exercises

Family Reunification:

- Maui county put up a number to call to report missing people
  - List grew to over 1,000 people. This diverted calls from 911 and the hospitals.
- Family reunification center was done by FEMA and AG office

Family Assistance Center @ Lahaina Civic Center

Missing person signage

Caring for the Caregivers

Credit: BCFirst Responders MentalHealth.com

Key takeaways:

1. Relationships are key to any disaster and is essential for organizations that serve the public.
2. Understanding work language/culture
    1. Military vs civilian
3. Information sharing and resource sharing
4. Volunteer and donations management
5. Set up a hotline (211) as soon as possible
6. Include social media as part of your response.
7. Government traditionally moves slow
    1. What other agencies/organizations can move faster and mobilize?


Mahalo

U.S. Department of Health and Human Services

ASPR
Administration for Strategic Preparedness and Response

BARDA

Emergency Mass Casualty Decontamination

A New Paradigm Based on Science

Efrain Garcia, PhD, Project Officer, Health Scientist

Gregg Lord, MS, NRP, Subject Matter Expert, Contractor in Support of BARDA

Division of Chemical, Biological, Radiological, and Nuclear (CBRN) Medical Countermeasures, Biomedical Advanced Research and Development Authority (BARDA), Administration for Strategic Preparedness and Response (ASPR), U.S. Department of Health and Human Services

National Healthcare Coalition Preparedness Conference

December 3, 2025

The BARDA Model

BARDA develops and makes available medical countermeasures (MCMs) by forming unique public-private partnerships to drive innovation off the bench to the patient to save lives.

- Flexible, nimble authorities
- Multi-year funding
- Cutting edge expertise
- Facilitate partnerships
- Promote innovation

Why Decontamination Matters

The Studies

The Process

Take Aways

Contact Us

Learning Objectives

- Learn a simple, optimized, and common-sense mass-casualty decontamination procedure for chemical exposure
- Gain understanding of why water is NOT always required (or recommended) to decontaminate
- Learn strategies to address risks associated with decontamination, particularly for special populations
- Find ways to incorporate findings of research into your own decontamination SOPs

Importance of Decontamination

Challenges for Chemical Response

- Chemical **injury** happens **QUICKLY**
- **Information is limited** during an emergency
- No diagnostics
- Medical **intervention** must occur **RAPIDLY**
- **Thousands of chemicals, few antidotes**

Rapid treatment saves lives!

Emergency responders need tools to facilitate rapid treatment of chemical injury

Decontamination is the only generic countermeasure for chemical dermal injury

Decontamination Saves Lives

A "Prank" with Deadly consequences

The Location

- Kuala Lumpur's airport
- 13 February 2017

Kin Jong-Nam

Baby oil "prank"

- Two women hired to conduct airport
- Smear "oil" on passenger's fac
- Flee separately once do

The consequence

- Feels groggy and has d culty seeing
- Goes to airport personnel, collapses and becomes unresponsive
- Pronounced dead shortly after

DECONTAMINATION SAVES LIVES!

Same chemical, very different outcomes

The cause

VX N ent

(High ail doses)

Th

- Exposed hands
- **Rushed to bathroom to <u>wash hands</u>**
- Left airport unharmed

VS

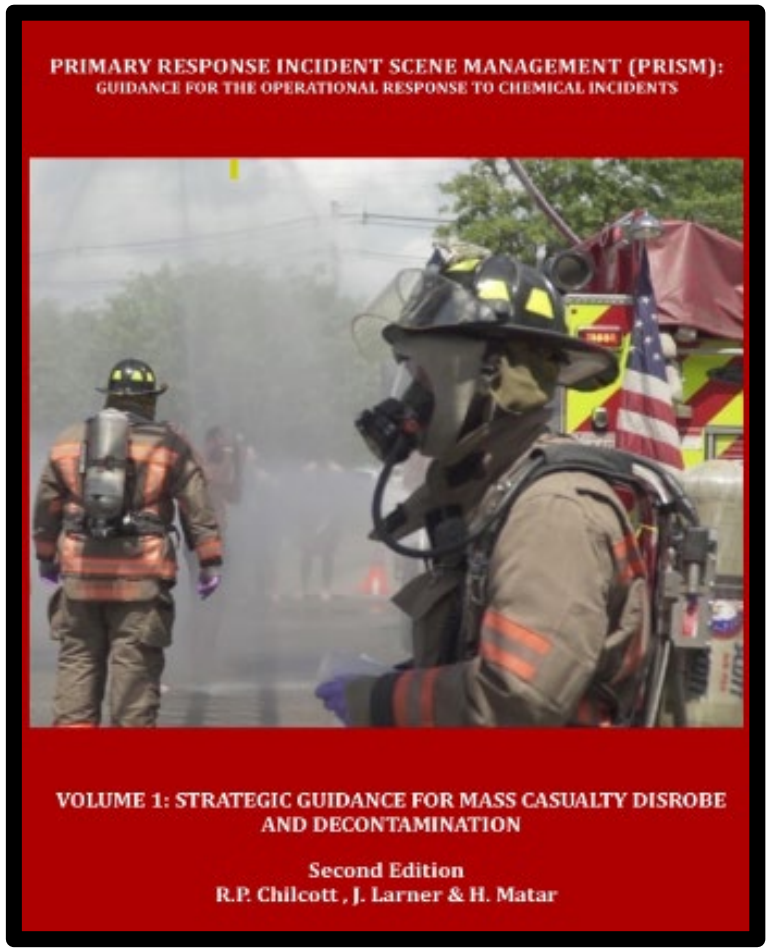
- Exposed face, eyes, nose
- **No immediate medical intervention**
- Dies on way to hospital

THEN…

Until recently, **decontamination** procedures were **based on perceived best practice**...

That is, until…

NOW



PRISM

Primary Response Incident Scene Management

A Science-Based Approach

- Released in 2018
- Research by University of Hertfordshire
- Development funded by ASPR/BARDA

Medical Countermeasures | Primary Response Incident Scene Management (PRISM)

PRISM: Primary Response Incident Scene Management

Mass Casualty Decontamination Guidance

Over 10 years of studies

Data from **three major Research Studies** funded by UK and US Governments

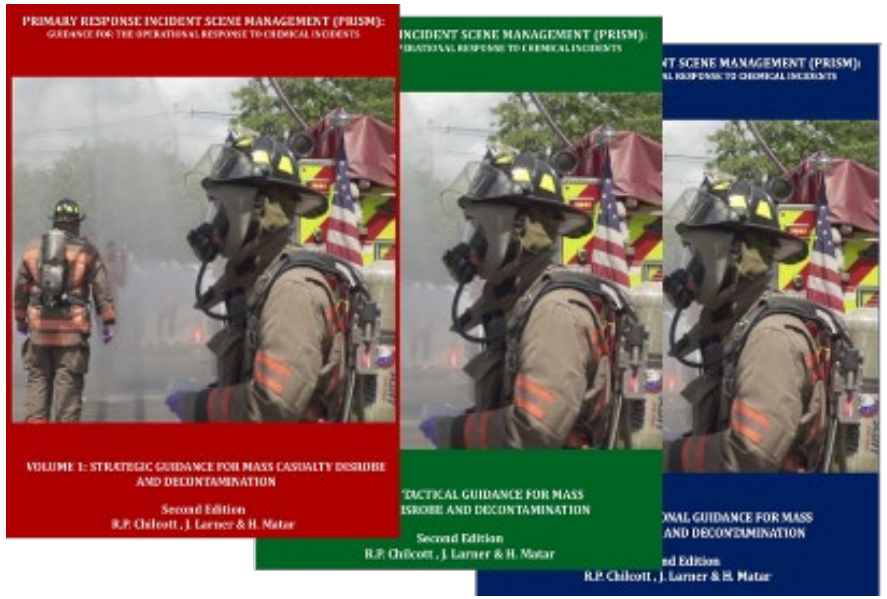
Real-life Exercises

Large-scale **exercises** with responders

- FEMA Center for Domestic Preparedness
- Kingston, RI (Operation Downpour - URI)

Community Engagement

Collaborated with responders from **35 municipalities** in **22 states**



PRISM: Three Volumes

1. Strategic Guidance How? Why? Evidence base? Rationale?	**Incident Commanders and Emergency Planners**
2. Tactical Guidance How? Why?	**First Responders and preparedness and response Officials**
3. Operational Guidance How?	**Federal, state, tribal and local First Responders**

How Would You Clean It?

Would you clean an oil spill by dousing it with water?

How about Fido's "accident"?

Same goes for skin contamination!!

(Water may not always be the answer.)

Shift in Mass Decontamination Protocol

Previous Paradigm

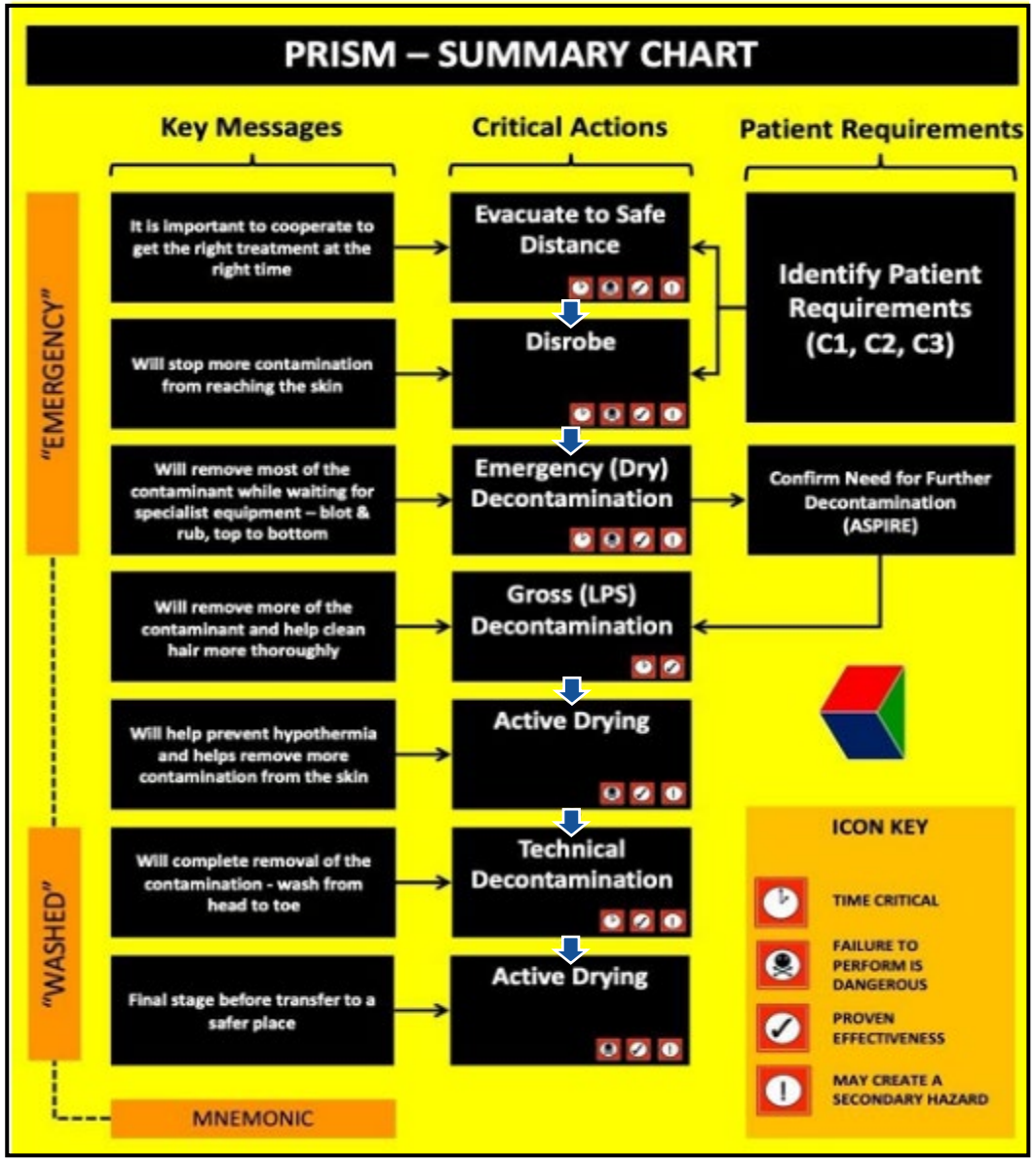
"Surround and Drown"

- Immediately spray patients with water
- All action taken by first responders

New Paradigm

"Blot and Rub"

- Water used only in certain circumstances
- Patients disrobe, "blot and rub" skin with absorbent material guided by emergency responders



TRIPLE PROTOCOL

Three steps to save lives

DRY
Decontamination

DISROBE

SELF DECON

RUB

GROSS
Decontaminati

IPE SYSTEM

ACTIVE DRYING

NICAL
(if Needed)

SPECIALIST-ASSISTED

ACTIVE DRYING

REMOVES UP TO 99.9% OF CONTAMINANT!

Don't Wait! Seconds Save Lives

TRADITIONAL Response

- Patients **wait** whi… …p
- Chemical re… …es/skin
- **Efficac**… …ination **decreases** by the minute

TRIPLE PROTOCOL

- **Can be done by exposed individual as soon as possible**
- Saves time and resources for emergency response teams
- Disrobing + Dry Decon remove up to **99%** of contaminant
  Further decontamination may be unnecessary

The First Few Minutes are Critical! - USE THEM WISELY!

Early self-decontamination is life-saving and can start before responders arrive

PRISM

Award-winning work funded by:

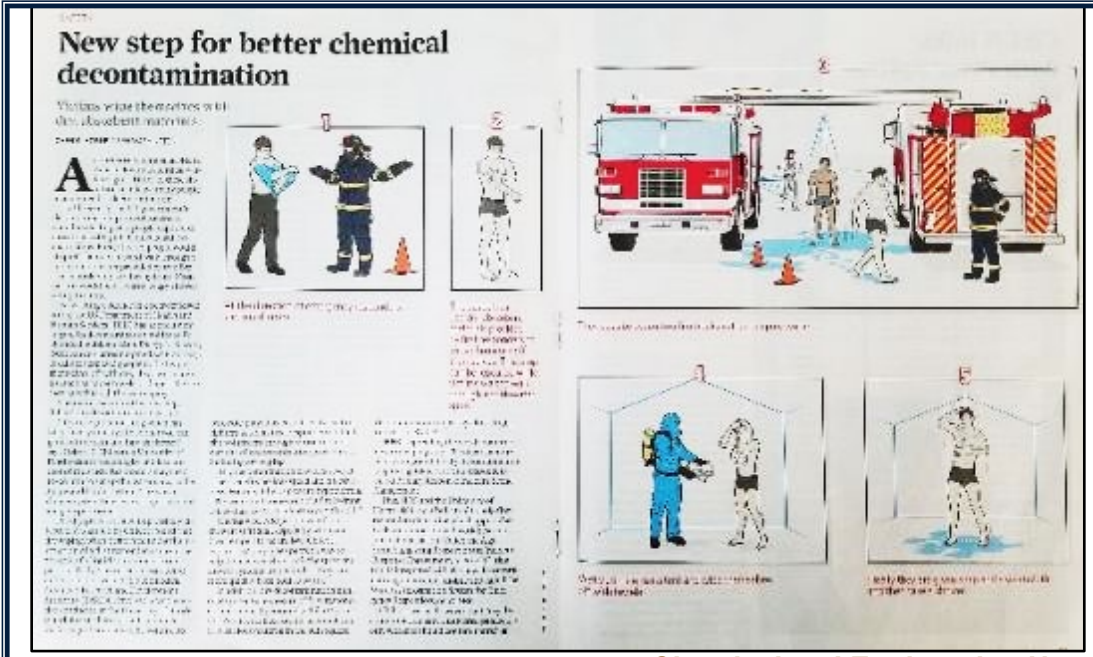
Best Research Project of 2018

2018 Times Higher Education

DOWNPOUR / PRISM publication **ranked in the TOP 25%** of research papers in 2018

Evaluation of US Federal Guidelines (Primary Response Incident Scene Management [PRISM]) for Mass Decontamination of Casualties During the Initial Operational Response to a Chemical Incident

Annals of Emergency Medicine


New step for better chemical decontamination

Chemical and Engineering News


nature

US adopts science-based guidance for chemical-attack response

Nature

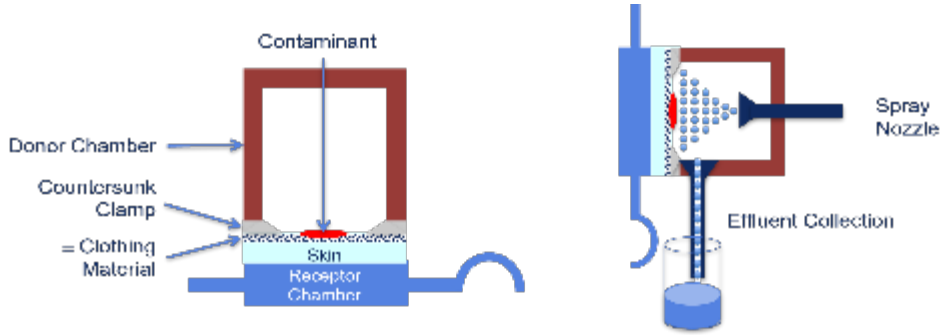
THE STUDIES

Laboratory Studies

In-vitro studies – Model for Human Skin

Skin Diffusion Cell System

Measures dermal absorption of chemicals in model



Pig skin as human skin model

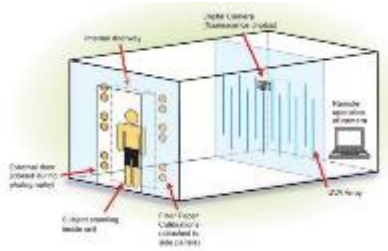
- Similar to human skin
- Large amount of skin

Chemicals Evaluated

- Potassium Cyanide
- Sodium Fluoroacetate
- Methyl Salicylate
- Phorate
- Nerve agents
- Sulfur mustard

Human Volunteer Studies

Determine decontamination parameters in humans using a fluorescent chemical simulant (Curcumin and Methyl Salicylate)



Evaluated

- **Benefits**/importance of **disrobing and dry decon**
- **Hair** protection and **decontamination**
- Effectiveness against **Chemical Warfare agents**
- Effectiveness and **gaps of LPS**
- Effectiveness of washing aids and **soap**
- Ideal **pressure, temperature,** and **flow rate** for LPS

Real World Exercises

FEMA Center for Domestic Preparedness (CDP)

Anniston, AL – May 2015

- **Study**: Human Volunteer Clinical Trial conducted by Anniston, AL Fire Department
- **Scenario:** Shopping mall spray release of a non-volatile organophosphate (OP) pesticide
- **Measurement:** Residual skin contamination post-ladder pipe system (LPS) Anniston SOP vs PRISM SOP

PRISM Guidance was as easy to learn, **twice as fast, and as effective** as CDP SOP

Ryan Center - University of Rhode Island

Kingston, RI – July 2018

- **Study**: Human Volunteer Clinical Trial conducted by first responders from Kingston, RI and surrounding jurisdictions
- **Scenario:** University Arena spray release of a non-volatile OP pesticide
- **Measurement:** Residual skin contamination following steps from Triple Protocol

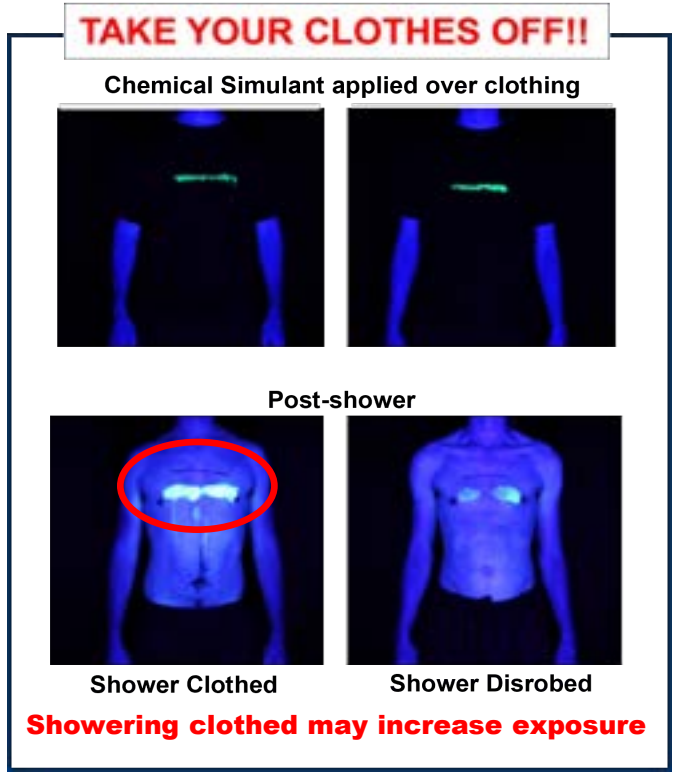
Responders were able to decontaminate 94 volunteers in 30 min

Findings from Field Exercises

- **PRISM** Guidance was as easy to learn, **twice as fast, and as effective** as CDP SOP
- In Operation Downpour, responders were able to **decontaminate 94 volunteers in 30 min**
- **Adding** new **DRY** decon and **ACTIVE DRYING** had **little impact** in operations – does **NOT** delay gross decon

IMPACT on Effectiveness – Ladder-Pipe System (LPS)

Temperature – NO effect	(Use lukewarm)
Water flow – NO effect	(High flow/low pressure)
Detergents – NO significant effect	(Use for technical decon)
Delays – DECREASE effectiveness	(Time dependent)
Clothing – DECREASE effectiveness	(Disrobe before showering)



Research Caveats

- **Laboratory studies used a model of human skin**
  - Pig skin model shown to have similar absorptions as human skin
- **Human studies used non-toxic chemicals**
  - Safe chemicals were used to simulate CWAs
  - Methyl Salicylate and Curcumin used for real-life exercises(fluorescent)
  - Similar absorption and consistency as chemical threat agents, like sulfur mustard
- **Some chemicals are very difficult to decontaminate (e.g., VX)**
  - Many chemicals have very rapid absorption
  - Must be rapidly decontaminated to avoid further damage
  - **Speed is of the essence!**

Take Home Points

Disrobing is critical – Take your clothes off!

- Removes up to **90%** of contaminants
- Showering clothed may spread chemicals to skin

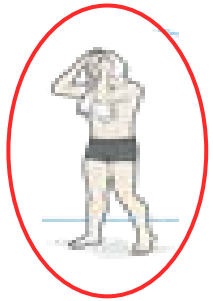
Use the first few minutes wisely!

DISROBE + DRY DECON

- Together remove up to **99%** of contaminant
- Can be done by the affected individuals themselves!

Active drying increases effectiveness

Gross "Wet" Decon



- Further removes contaminants
- Decreases risk of hypothermia

Hair is protective at first, harmful later

- Retains contaminants up to **36X** more than skin
- Difficult to decontaminate (oily)
- Chemicals off-gassing – Secondary threat

Removal recommended

The Process

EVACUATE

Initial Action: Leave contaminated zone ASAP!

Hot (Exclusion) Zone

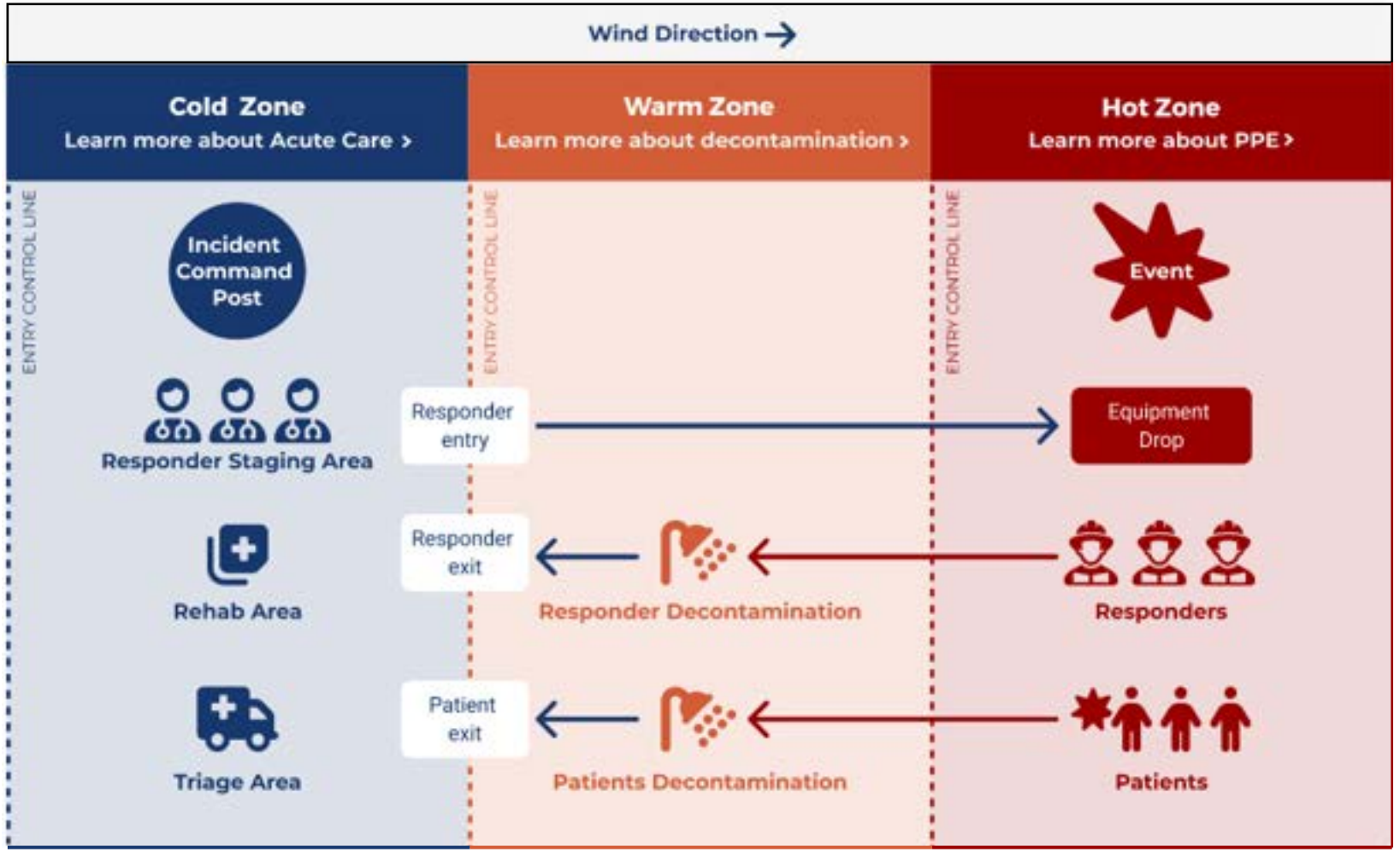
Highest contamination
Prioritize evacuation

Warm (Contamination Reduction) Zone

(Evacuation Zone)
Disrobe and Decon

Cold (Support) Zone

Nominal contamination
Casualty Clearing




Disrobe

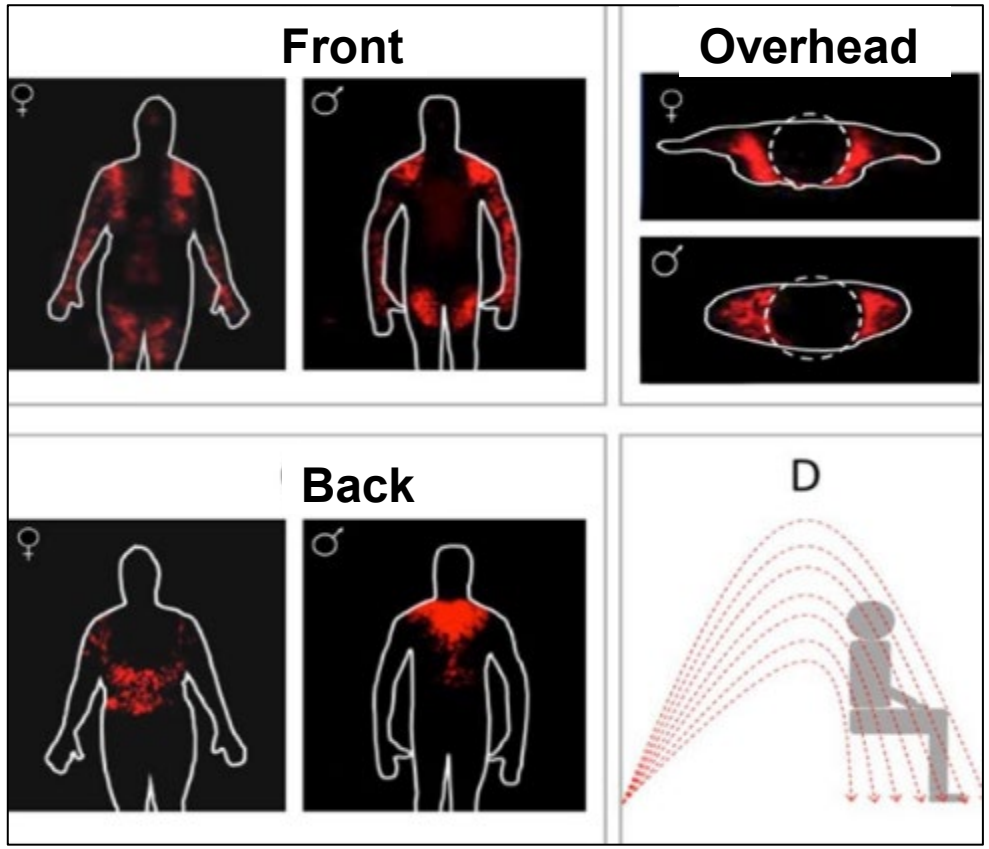
Take Your Clothes Off!

DISROBING IS CRITICAL

- Clothing retains most of the contaminant
- Disrobing makes all steps of decontamination more effective.

Disrobing requires effective communication to facilitate patient compliance

Key Messaging: *"Disrobing will prevent further contamination from reaching your skin"*



Retention of Chemicals in Clothing

- Overhead: ~ 50%
- Horizontal: ~ 70% - 90%

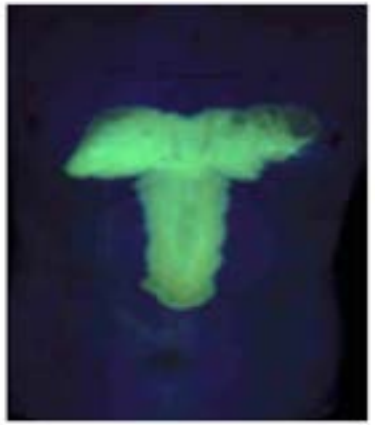
Disrobing: Time is of the Essence!

TAKE YOUR CLOTHES OFF!

Fluorescent chemical applied over clothes

Shower Unclothed

Shower Clothed



Showering clothed traps chemical between clothes and skin

DISROBE BEFORE SHOWERING

Data represents average effect of disrobing against four chemicals; soman (GD), sulfur mustard, VX and methylsalycylate.

Act within 5 min — effectiveness drops after 30 min

Disrobing – The Procedure

Start at the top…

… and carefully step out

Keep shoes on

Avoid the face!

Exposure to eyes, nose, and mouth can increase/accelerate chemicals effects

Bag and Tag Personal Belongings

After removal of all personal items and clothing, place them in a **Personal Property Decontamination bag**:

- **Footwear and clothing** first
- **Valuable items and personal belongings** on top
- **Owner details** are written outside of bag

Ensure an ample supply of bags and water-resistant markers to label bags

Disrobe – Special Considerations

Privacy

Lack of privacy may reduce compliance with decontamination procedures

To **protect privacy** & **increase compliance**, responders should:

- Provide casualties with **disrobe and re-robe suits**
- Conduct decontamination **out of sight of passers-by** or the **media**
- Effectively **communicate the dangers** of showering clothed

Find ways to provide casualties with covers/clean clothing

Children

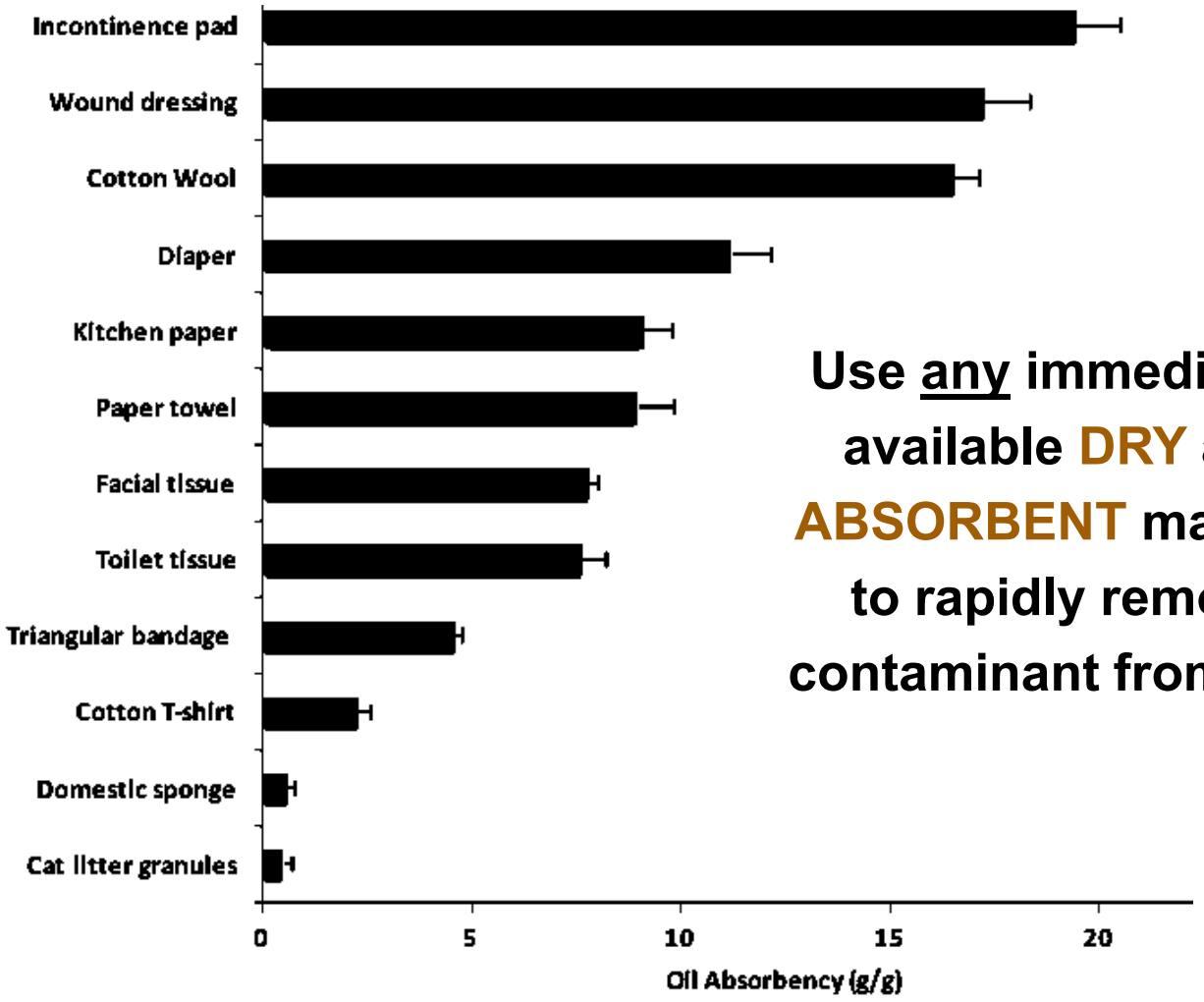
May take longer to disrobe or be uncooperative due to embarrassment/anxiety

If possible:

- **Group** children **by gender**
- Children should be **assisted by a responder** of the same gender
- Consider possibilities for **increased privacy** (such as providing blankets)

Dry Decontamination

Dry Decontamination



Use <u>any</u> immediately available **DRY** and **ABSORBENT** material to rapidly remove contaminant from skin

What about wet wipes?

Hint: It's in the name…

DO NOT USE

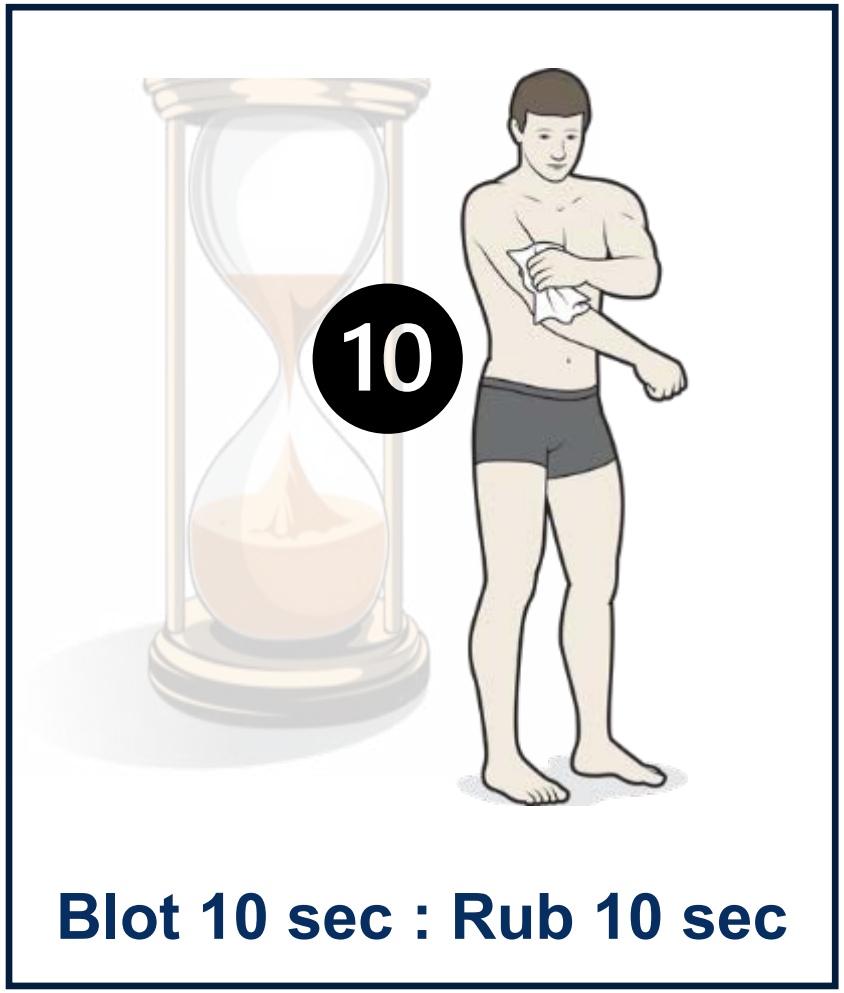
especially if identity of the chemical is unknown

Wet products may enhance dermal absorption of many chemicals

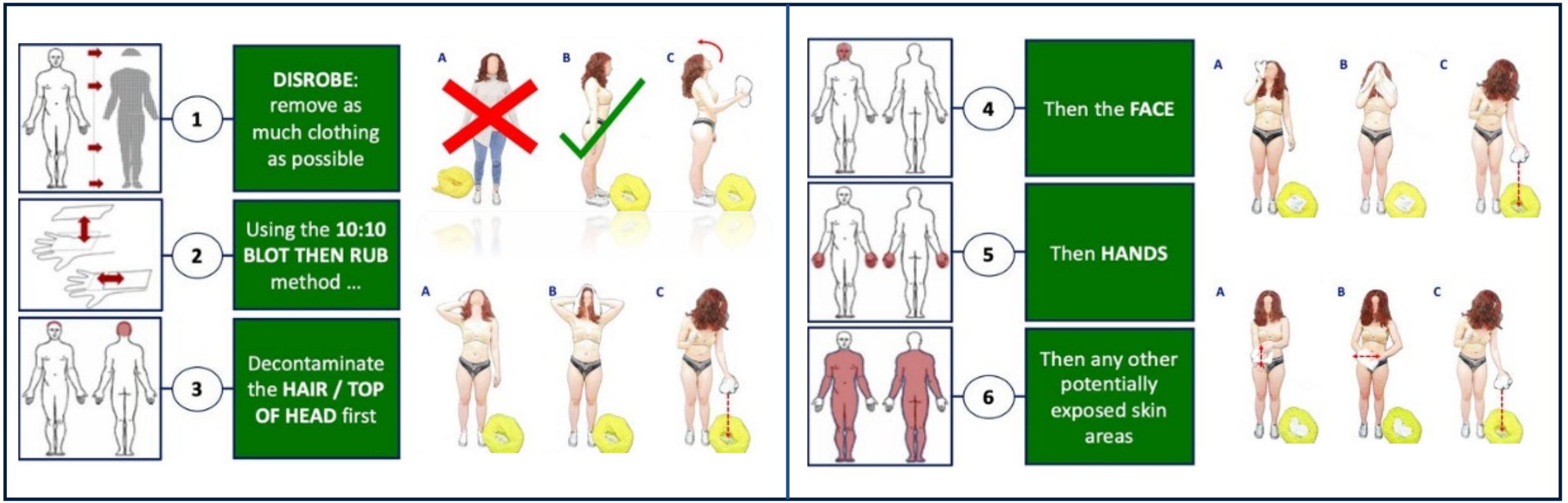
DRY Decontamination – HOW

The 10:10 Method

- The most effective way to ensure removal of contaminants is to:
  - **BLOT** area with an absorbent material (towel, burn dressing, clean clothing, etc.) for **10 seconds**
  - **RUB** same area for another **10 seconds**
  - **REPEAT** all over exposed areas



Dry Decontamination – The PROCEDURE



Ensure you have enough absorbent material for all patients to thoroughly blot/rub their entire bodies

Dry Decontamination – Supply Considerations

Ensure you have **plenty** of:

- **Bags** for personal belongings
- **Waste bags** for proper disposal of contaminated material
- **Absorbent material** on hand for responding to large events

Discarded clothing and supplies after DOWNPOUR exercise

Make a plan for clearing the decontamination site

Assisted Decontamination

Disrobe: May need physical support

- Remove clothing safely/use cutting shears
- Use stability devices for balance issues (walker, traffic delineator, stool, chair, etc.)

Dry Decon: Incapacitated/injured patients require additional assistance:

- Additional personnel in appropriate PPE
- Additional resources (i.e. backboards)

Example of non-ambulatory dry decontamination set-up with three responders (waste receptable circled in red)

What if it Burns?

If the chemical is a **powder** or **caustic**, **dry decontamination can be dangerous**

use **EMERGENCY WET Decontamination**

There is **no specific recommended protocol** for Emergency Wet Decontamination, but the following materials are needed:

- **Any** on-hand **lukewarm or cold water** source to rinse (including soft drinks and other beverages)
- **Absorbent material** to remove contaminated liquid/prevent run-off

Should I begin Gross Decontamination?

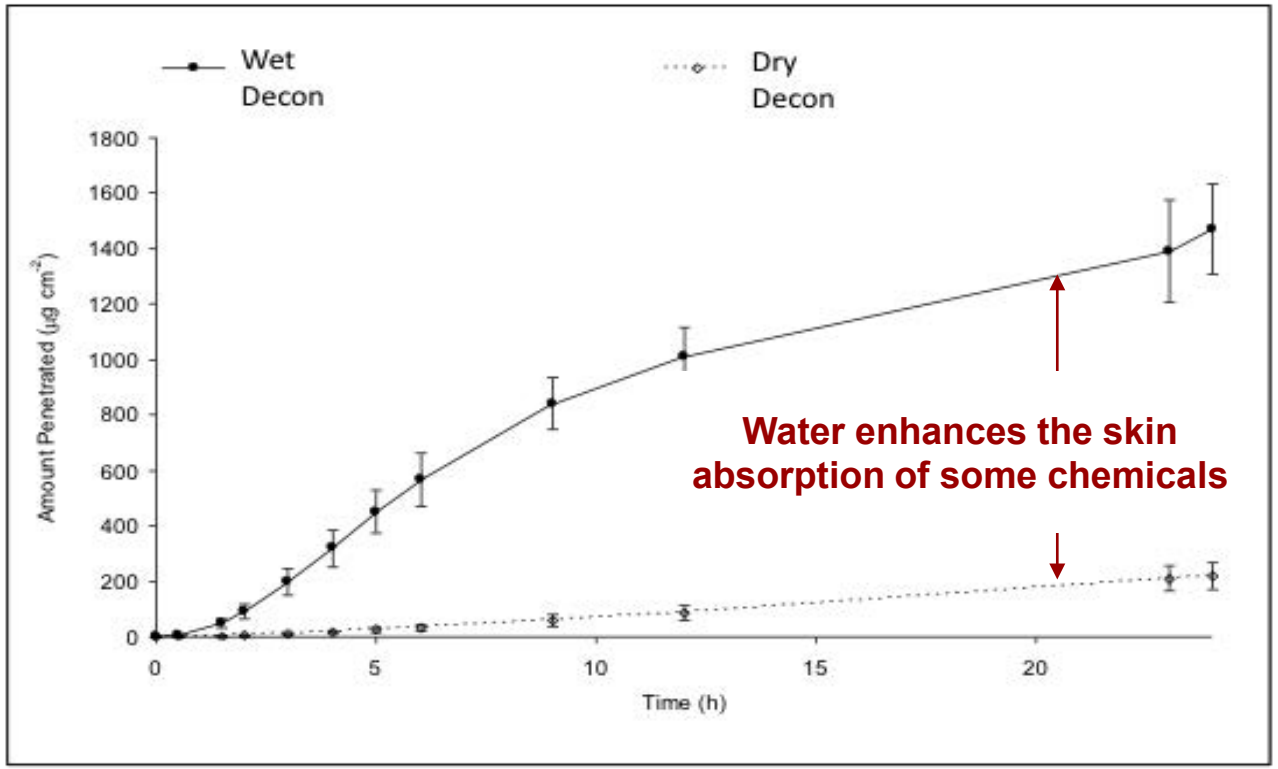
Decision should be based on **RISK ASSESSMENT** by responders at the scene

Factors to consider include:

- Climate conditions
- Nature of the contaminant
- Availability of resources
- Extent of initial contamination
- Continued/worsening signs and symptoms
- Request from casualties for further decontamination
- ***Wash-in effect chemical?***

Beware of the Wash-In Effect

Decontamination with water ***increases*** **dermal absorption of some chemicals**



Skin Absorption (DRY vs WET Decon) - Volatile CWA with acute toxicity

Water can do more harm than good

- Water causes increased absorption of:
  - *DEET*
  - *DDT*
  - *Paraoxon*
  - *VX nerve agent*

Wash-in Effect can also be caused by:

- **Use of detergents**
- **Vigorous rubbing**

What if I am Still Unsure?

ASPIRE Decision aid tool for Gross Decontamination (GD)

Find it on:

CHEMM CHEMICAL HAZARDS EMERGENCY MEDICAL MANAGEMENT
RAPID RESPONSE READY

A Algorithm
S Suggesting
P Proportionate
I Incident
R Response
E Engagement

User INPUT

- Enter **time** since exposure
- Enter **chemical** (if known) or
- Estimate **volatility** from observations

OUTPUT

Calculates **utility of wet decontamination** based on:

- **Viscosity** of chemical
- Estimated **residual** skin **contamination**

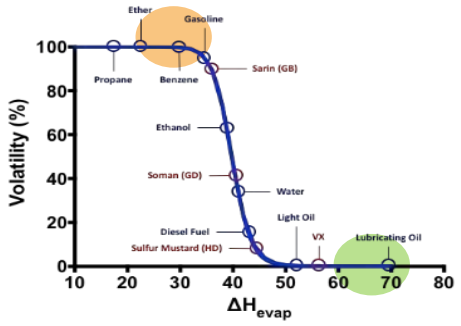
EXAMPLE

INPUT

- **Time**: 20 min
- **Identify** of chemical: Unknown
- **Volatility** of chemical:

Viscous

Volatile



INPUT

LONG Decon time window (22h)
@20 min: Proceed with GD:

SHORT(ER) Decon time window (42 min)
@20 min: Judgement Call for GD

Gross Decontamination

Gross (WET) Decontamination

Removal of chemical contaminants with large amounts of water

The Ladder Pipe System (LPS)

The most common method of Gross Decontamination

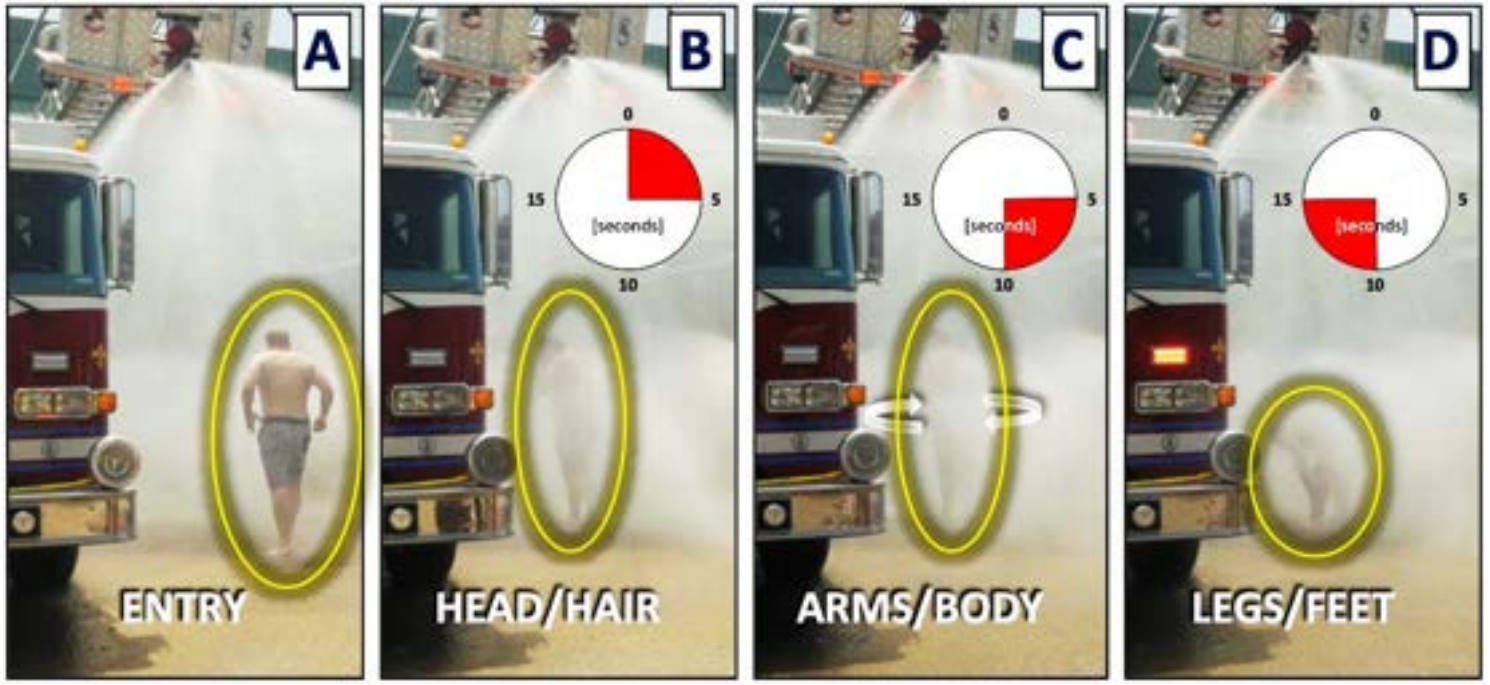
LPS with Fire Trucks

- Two parallel fire engines' side pumps and a hose attached to a ladder between them spraying a heavy shower
  - High flow rate, low pressure mist
  - Takes 15 – 30 second per person

Most effective when paired with Disrobing + Dry Decon

LPS takes 10-20 minutes to set up – Use this time for dry decontamination!

Gross Decontamination – THE PROCEDURE



1. Patients walk between the two firetrucks, into the mist
2. Stop in the middle
3. Rub each section of the body, at least 5 seconds
   - Head/hair, arms/body, legs/feet
   - Use washing aid, if available
4. Exit and active drying

Short showers reduce risk of chemical "wash-in" effect

15 seconds minimum to 30 seconds max, that's all it takes

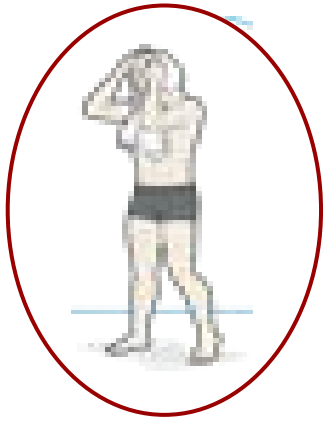
Active Drying

The last step is the most important!

- **Active drying** is the **most effective** step in the gross decontamination process
- **Removes up to 50%** of remaining contaminants
- Prevents recontamination and secondary exposure
- Towels will be contaminated and must be disposed of accordingly.

LPS

+



ACTIVE DRYING

If showers make you totally clean, why do your towels get dirty?

Optimizing Gross Decontamination

HOW LONG TO SHOWER?

Min 15 seconds, max 30 seconds

Watch for: <u>"Wash-In" Effect</u>

- Minimize with disrobing and short showers

DOES FLOW RATE/ PRESSURE MATTER?

Yes, high flow, low-pressure (**~50 –60 psi)**

Watch for: <u>High pressure</u>

- Increases "Wash-In"
- May cause patient discomfort/injury

DOES TEMPERATURE MATTER?

Yes, warm or tepid water **(95-104ºF)**

Watch for: <u>Hypothermia</u>

- Still possible in warmer temperatures/water
- Determine if needed in cold weather

DO WE NEED DETERGENT?

Not necessary

- May be used, doesn't significantly improve effectiveness
- Don't wait for detergent

Special Considerations: Gross Decontamination

Non-ambulatory patients

- Can **take up to 10x longer** (16.8 minutes vs. 1.6 minutes)
- Increased **risk of hypothermia** (prolonged exposure)

Children

- Consider **resources for infants** (backboard, laundry basket, etc.) to carry them through LPS
- Can be **distracted/slow in LPS** corridor, impeding flow

Communication-challenged patients

- May have trouble understanding directions/communicating, especially due to fire truck/water noises and distractions
- Consider the use of signs and loud horns

Technical Decontamination

Technical Decontamination – When to Use

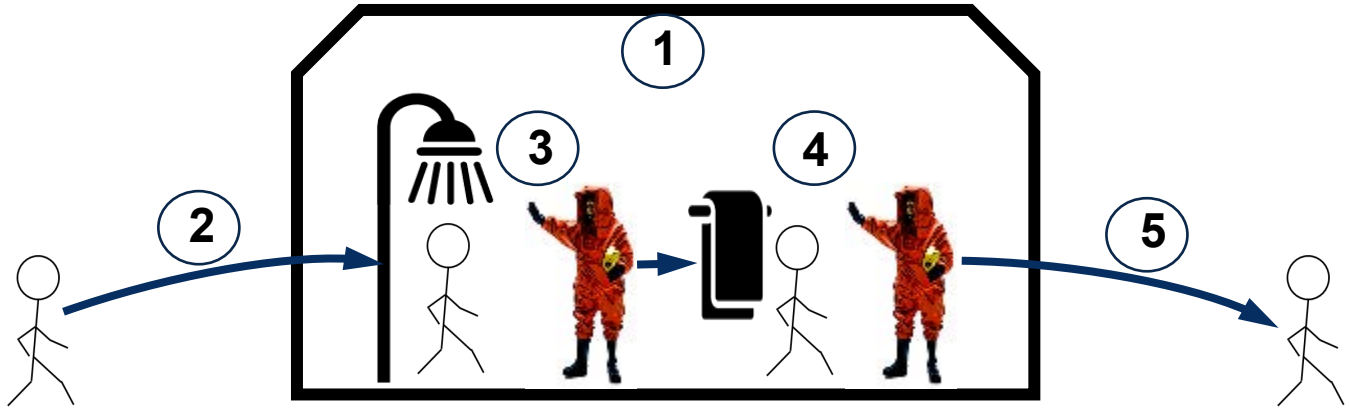
ONLY USE TECHNICAL DECONTAMINATION IF SYMPTOMS PERSIST AFTER GROSS DECON!

The most in-depth method and most labor-intensive

- Lots of specialty resources and decontamination units
- Must use appropriate PPE
- Long set up - **Use this time for dry and gross decontamination**

Technical Decontamination – The Procedure

1. Set up enclosure
2. Patient enters enclosure
3. Wash patient
4. Active drying
5. Patient exits enclosure



Responders must wear PPE to conduct Technical Decontamination!

Parameters		
Water temperature	95-105°F	Hypothermia risk
Detergent	Head-to-toe	Oily chemicals, hair
Wash time	90 seconds	Avoid “wash-in effect”
Wash aid	Washcloths, etc.	• Effectiveness +20% • Dispose after use

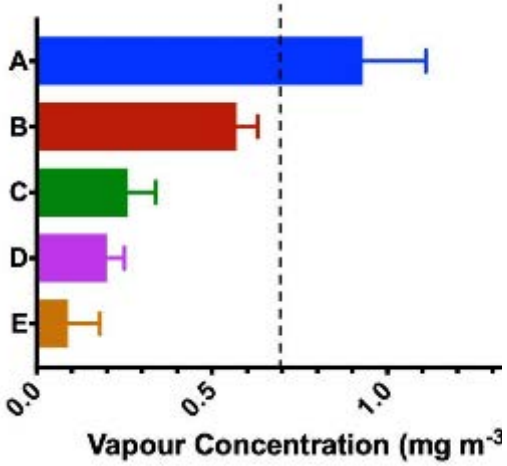
Avoid Risks: Vapors and Hypothermia

Enclosed spaces

- Concentrated vapors, risk to patients/responders
- Can be mitigated by dry/wet decontamination first

TECHNICAL DECON ALONE CAN BE DANGEROUS

Off-gassing within a Technical Decontamination unit



A: Technical Decon Only

B: Dry + Technical

C: Triple Protocol (no Active Drying)

D: Wet + Technical (Active Drying)

E: Triple Protocol + Active Drying

Outdoors

- Hypothermia
- Patient compliance (exposed)
- Environmental factors

Following decontamination, move indoors to reduce Hypothermia (if possible)

What about hair?

Hair protects at first…

More contaminant remained on hair vs. scalp skin

- Hair protects scalp and neck against chemicals
- Catches **~36x more chemicals** than scalp skin

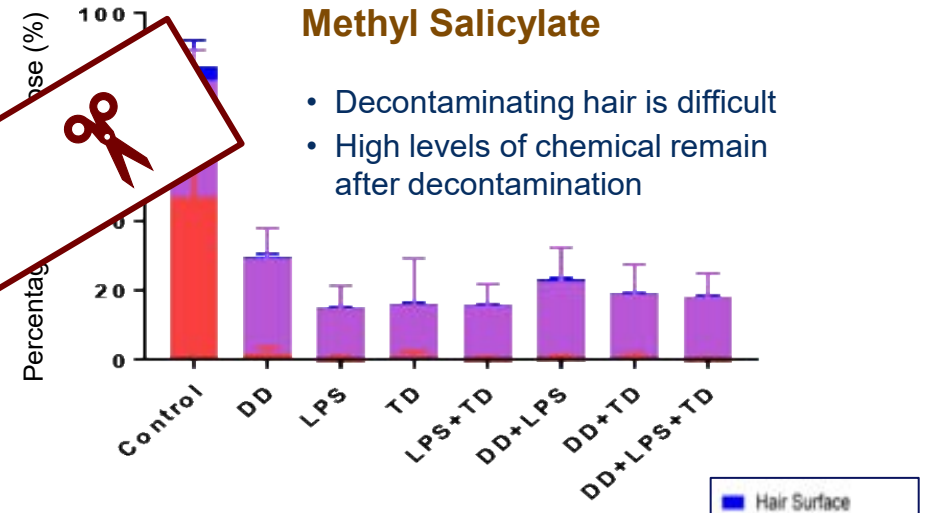
...But it can be dangerou

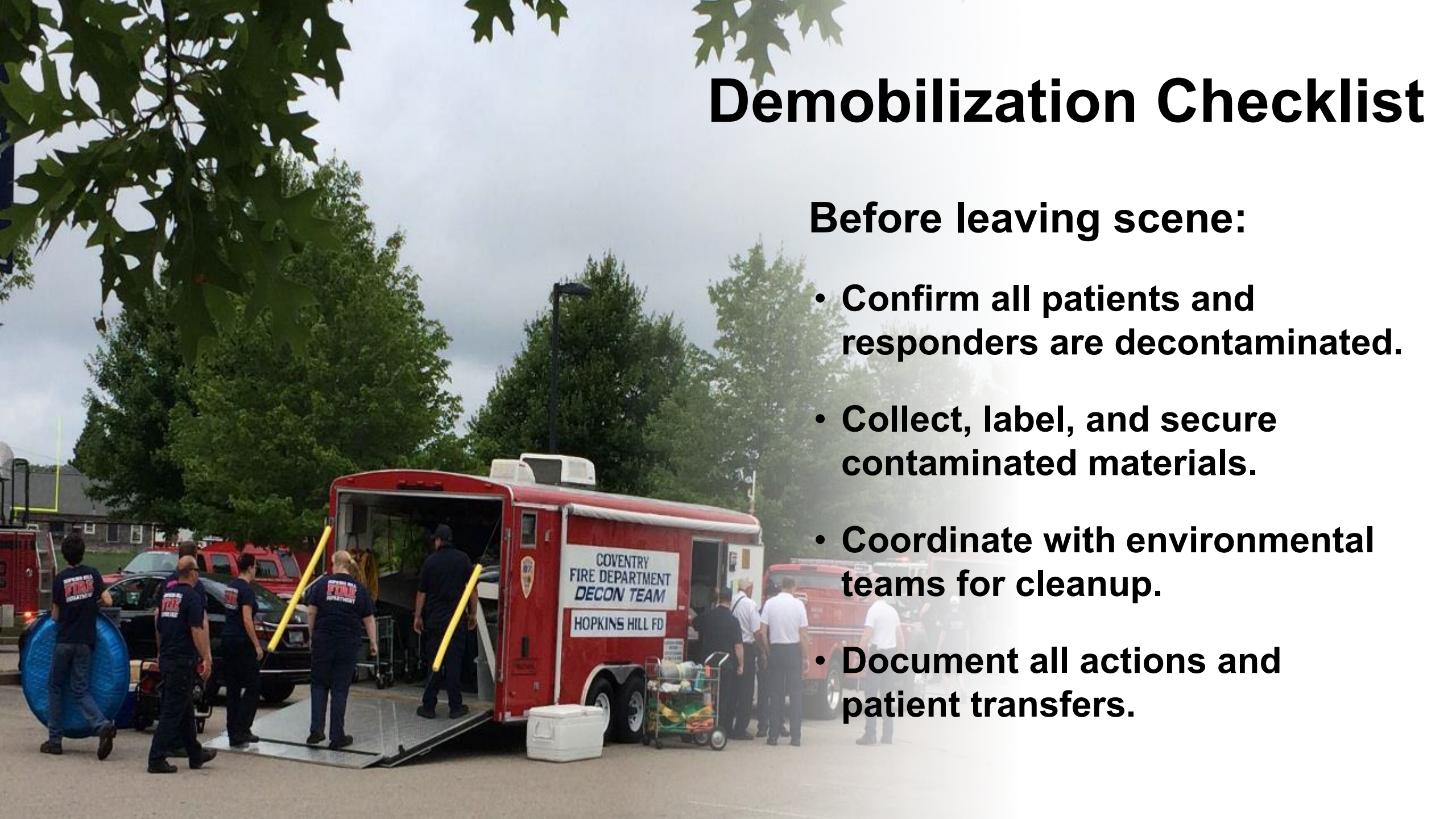
Oily contaminants can't [illegible]emoved from hair

- >30% left after Triple Protocol
- Harder to remove if decontamination is delayed
- Can continue off-gassing for up to 5 days

CONSIDER REMOVAL

H R DECON





Demobilization Checklist

Before leaving scene:

- Confirm all patients and responders are decontaminated.
- Collect, label, and secure contaminated materials.
- Coordinate with environmental teams for cleanup.
- Document all actions and patient transfers.

SPECIAL CONSIDERATIONS

SUMMARY

Supporting Vulnerable Populations

Functional Needs

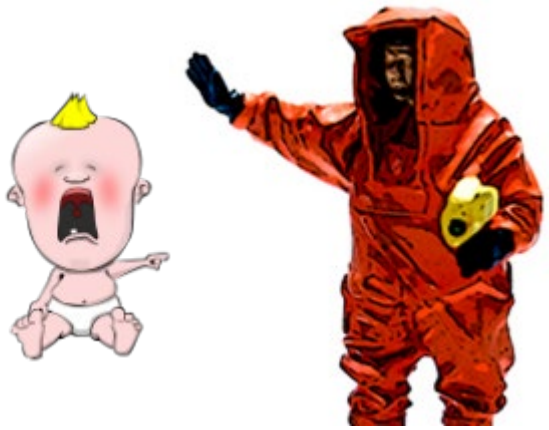
Increased staffing & resources

Specialized equipment

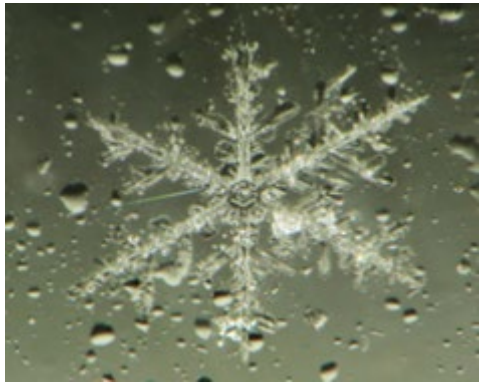
Service animals stay with their handler throughout decontamination

Consider how to incorporate assistive devices/service animals into decontamination

Children and Families



Fear and anxiety from PPE and decontamination



Increased Hypothermia
Supplies for warming and drying

- Try to keep families together
- Unattended children require a dedicated chaperone!

Extra attention =
More resources/staffing

Auditory/Language Challenges

PPE and water make it harder to understand

For communication impaired or non-English speaking patients:

Use a speaker or headset if possible

Use hand gestures, visual aids, pictographs

Group people and use interpreter

Pre-record messages and create signage/written directions in locally prevalent languages, large print, and braille

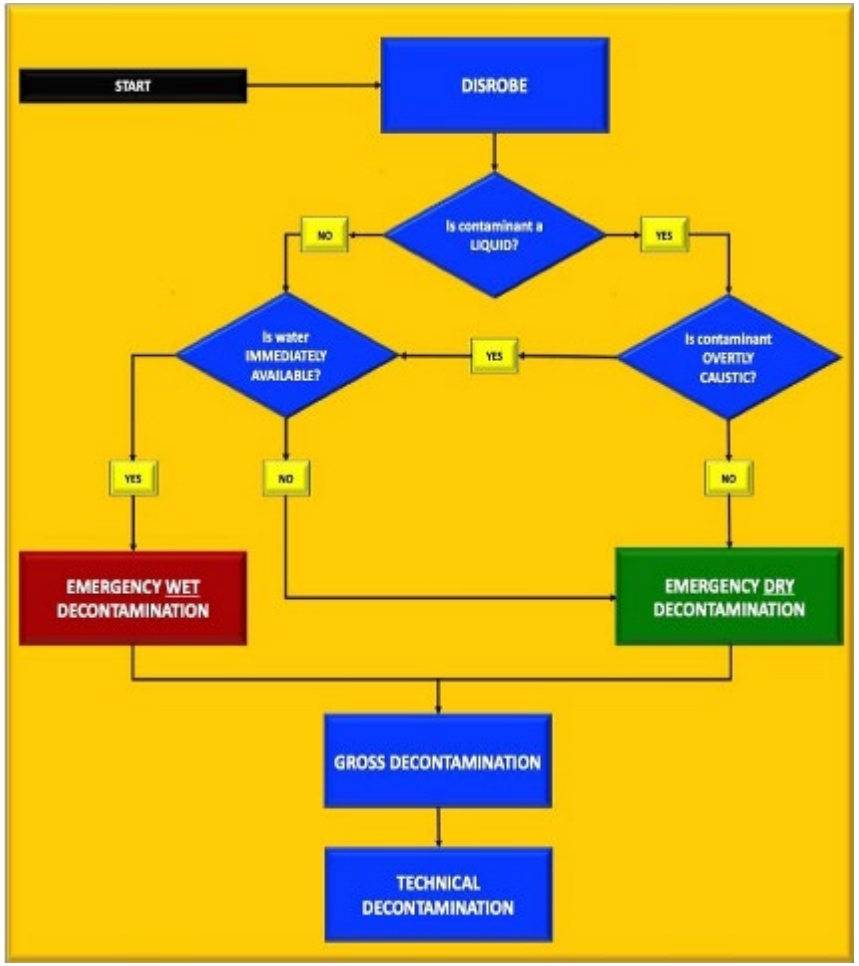
Build Trust, Gain Cooperation

- Communication is vitally important throughout the decontamination process.
- Patients may feel uncomfortable due to privacy concerns.
- Focus on compliant patients first, avoid forcing patients to follow instructions

Establishing an immediate foundation of trust and credibility increases patient compliance and outcomes for responders

Final Key Takeaways

- **Speed is critical –** Act in minutes
- **Don't wait!** – Evacuate – Disrobe – DRY Decon (before H_2O)
- **Short, low-pressure showers** only when needed
- **Multiple pathways may be required**
  (families, men, women, non-ambulatory, etc.)
- **If liquid is used for decon, add active drying**
- **Hair can trap chemicals, consider removal**



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