

# Climate and Health Responder Course for Health Professionals

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# Learning Objectives

1. Describe the impacts of heat stress on physiology.
2. Explore the role of heat early warning systems and other measures in preventing negative health outcomes.
3. Describe how certain medications might aggravate climate-related exposures, such as extreme heat and proper handling of medications in heat waves.
4. Explain the roles and responsibilities of various members of the care team in providing care, especially in a post disaster setting (high volume of patients during a heat wave).



# Patient Case



# Patient Case Summary

## HPI:

- 45 y/o M brought in by medics confused, sweating, and found outside his apartment

## PMHx:

- DM, HTN, HLD

Social Hx: smoker 1PPD, lives alone (top story)

Allergies: Penicillin (rash)

## Medications:

- Zestoretic (lisinopril/HCTZ) 20/25mg QD
- Metformin 1000mg BID
- Lantus 20 U QHS
- Metoprolol 25mg BID
- Gabapentin 300mg TID
- Seroquel 50mg nightly

## Physical Exam:

- Vital signs: HR 132, BP 85/54, RR 32, O2 sat 97% room air, blood glucose 250

General: mildly obese male, ill appearing, moaning incomprehensibly

HEENT: Normocephalic, atraumatic, dry mucous membranes, PERRL

Neck: Supple, trachea midline, no JVD

Heart: tachycardic, irregularly irregular, no murmurs

Resp: Breathing spontaneously, tachypnic, clear lungs

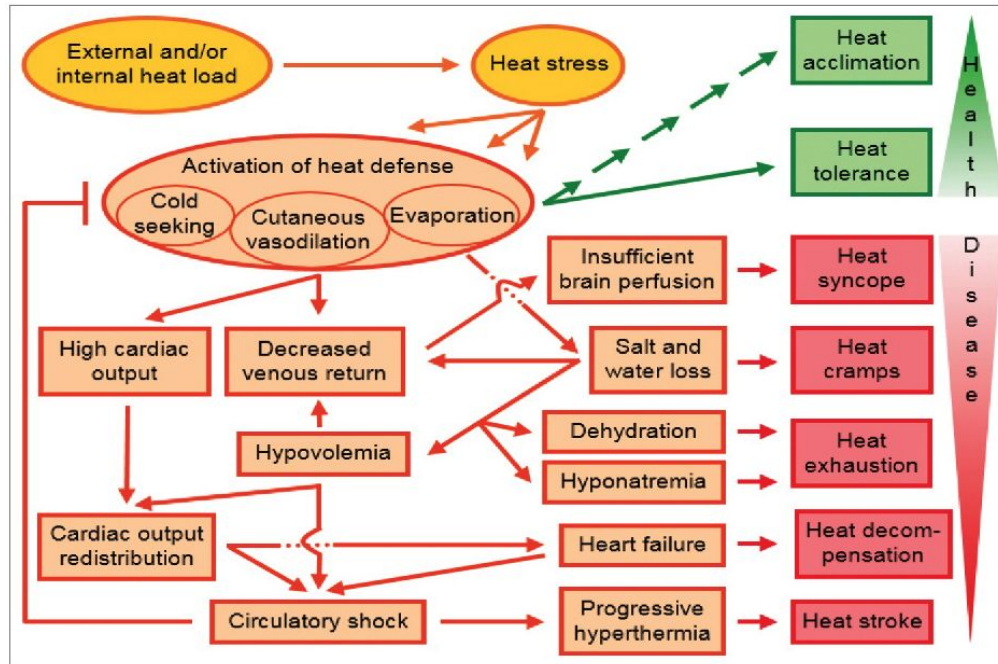
Abdomen: Soft, nontender, hypoactive bowel sounds

Extremities: No deformities. 1+ pitting edema B/L.

Distal pulses diminished throughout

Neuro: Mildly confused, oriented to person and place but not time, CN intact, able to follow commands, moving all extremities but has global weakness

# Pathophysiology of heat stress





# Care team

- EMS
- Emergency Department
  - Nurses
  - Techs
  - Respiratory therapist
  - Pharmacist
  - Doctor
  - Social worker

***Disposition?***



# Extreme Heat – Pharmacy Considerations

- **Medication-induced heat intolerance**
  - Altered central thermoregulation
  - Impaired sweating
  - Changes in peripheral vasodilation
  - Sedation & cognitive impairment impairing judgment, avoidance behaviors
  - Dehydration & hypovolemia
  - Changes in cardiac output
  
- **Heat & pharmacokinetic changes**
  - Altered transdermal/subcutaneous absorption due to changes in perfusion (e.g., fentanyl patches, SQ injections)
  - Effects of sweating on absorption of topical medications
  - Changes in distribution and clearance of medications in dehydrated patients → drug toxicity (e.g., lithium)



# Medications & Heat-Related Illness

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## Common medication classes associated with increased risk of heat-related illness:

- Anticholinergics (e.g., diphenhydramine, scopolamine)
- Antipsychotics
- Antidepressants
- Anxiolytics
- Diuretics
- ACE inhibitors/ARBs
- Beta-blockers
- Calcium-channel blockers
- Antiparkinson medications
- Amphetamines/stimulants
- Opioids
- Alcohol



# Extreme Heat – Pharmacy Considerations

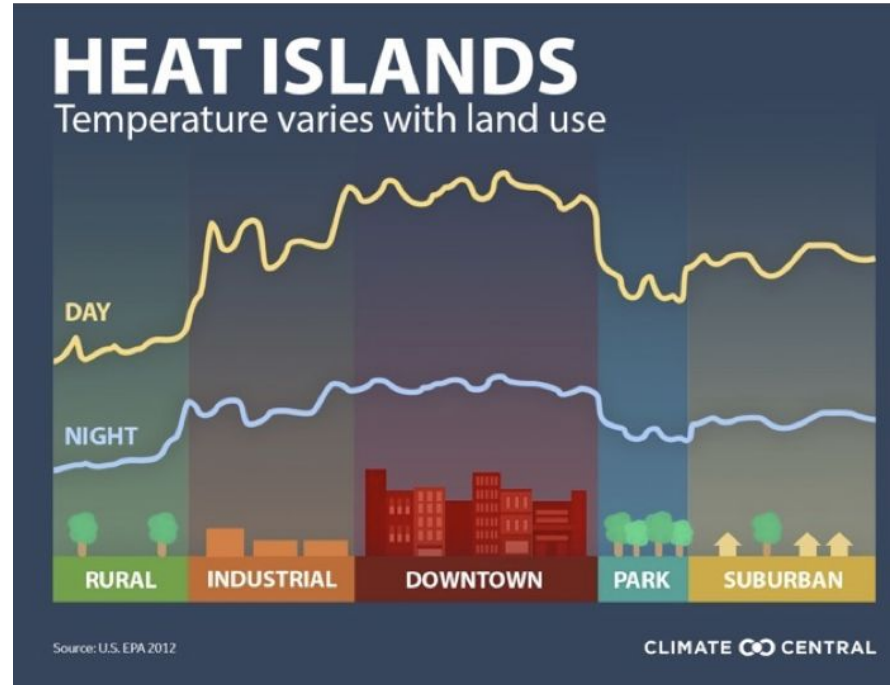
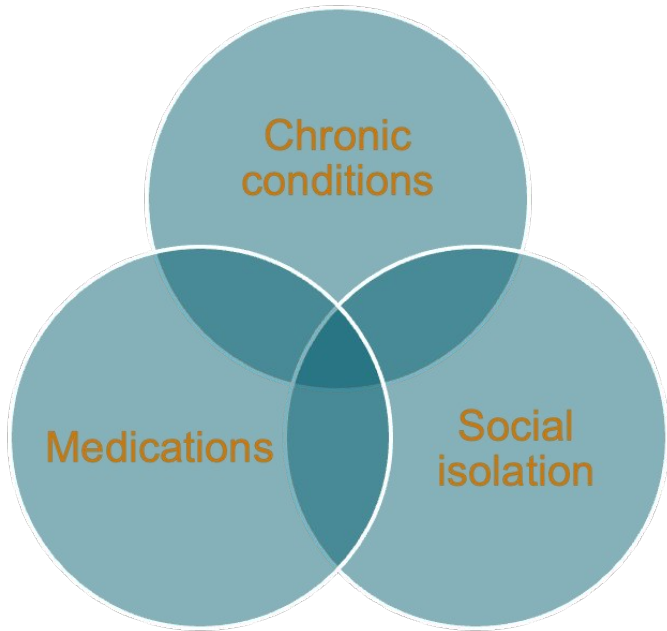
## Medication storage:

- Insulin: max 86 °F per package, but recent data show no significant impacts on stability when stored at 98.6 °F or in cycling temps from 77-98.6 °F for up to 28 days)<sup>1,2</sup>
- Glucagon (up to 86 °F)
- GLP-1 RA (up to 77 °F)
  
- Other diabetes-specific considerations: sweating & insulin pumps or CGMs; accuracy of meters & test strips in extreme temps; walking on hot surfaces with peripheral neuropathy

**General stability concerns in extreme heat:** EpiPen, naloxone, hormonal contraceptives, hormones, biologics, antibiotics

1. Exp Clin Endocrinol Diabetes. 2021 Sep;129(9):683-688.  
2. PLoS One. 2021 Feb 3;16(2):e0245372.

# Extreme Heat & Patient Risk Factors





# Discussion

# Key Resources

- CDC “Keep Your Cool in Hot Weather”
  - <https://www.cdc.gov/nceh/features/extremeheat/index.html>
- [CDC Heat Tracker](#)
- [NIHHS Heat Resources](#)
- Health Care Without Harm Climate Council Extreme Heat Brochure
  - <https://practicegreenhealthgc.wufoo.com/forms/z1mbygg10hcq0zu/>



## OSHA-NIOSH Heat Safety Tool 12+

Centers For Disease Control and Prevention

#124 in Weather

★★★★☆ 2.8 • 94 Ratings

Free



## EPA AIRNow 12+

United States Environmental Protection Agency (USEPA)

Designed for iPad

★★★★☆ 3.0 • 324 Ratings

Free

[View in Mac App Store](#)