

The Phoenix Inferno: Prehospital Heat Stroke

**Charles Finch, DO, FACOEP
Medical Director
Phoenix Fire Department**

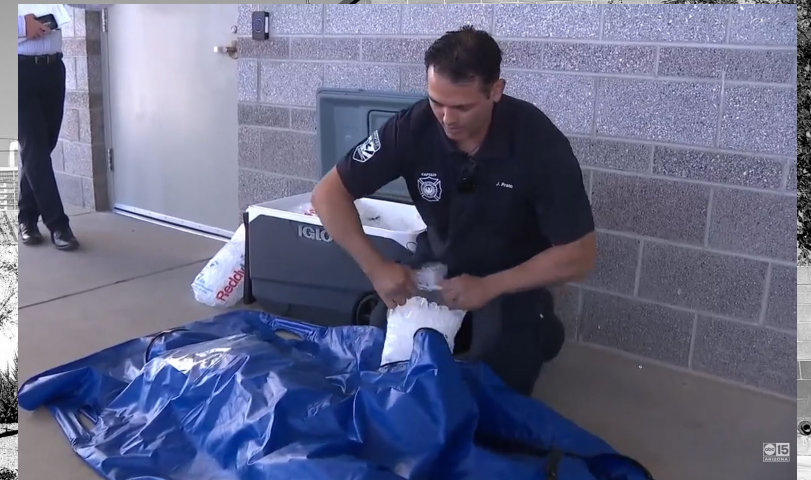




**No
Disclosures**



PFD Media Attention



25th Anniversary

"Heat Stroke"

EMS Odyssey
June 2025

SEY CONFERENCE
June 12, 2025

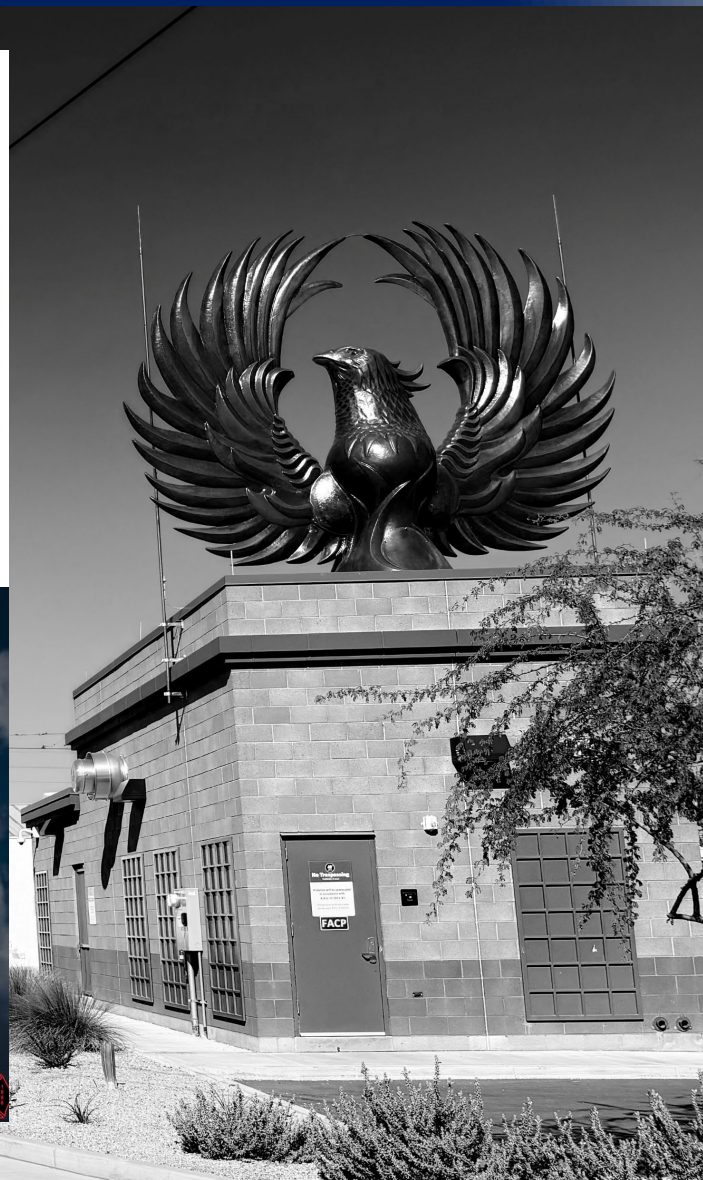
- Charles Finch, DO, FACP
- Assistant Medical Director
- Phoenix Fire Department
- Maki Lloyd, BA, EMT-P
- Deputy Chief of EMS
- Phoenix Fire Department

Ice and Cold-Water Immersion
Treatment for Hyperthermic
Patients in the Prehospital Setting

EMS World EXPO October 2025

Charles Finch, DO, FACP
Assistant Medical Director, Phoenix Fire Department

Maki Lloyd, EMT-P
Deputy Chief of EMS, Phoenix Fire Department



PFD Presentations



Published Article



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Fighting Fire with Ice: A Multisite Collaboration to Evaluate the Impact of Prehospital Cold Water Immersion on Heat Stroke Patients

Geoffrey Comp^a, Charles Finch^b, Kristina Kupanoff^c, Matthew Sandoval^d, Maki Lloyd^e, Narda Aldaco^e, David Kirk^e, Paul Pugsley^a, Lora Nordstrom^f, B. Witkind Koenig^g, Aneesh Narang^h, Jerry Snowⁱ, Matthew Kamer^j, Alexandria Foster^k, Grace Patel^l, and Jeffrey R Stowell^a

^a Department of Emergency Medicine, Valleywise Health Medical Center. Department of Emergency Medicine, Creighton University School of Medicine-Phoenix. Department of Emergency Medicine, University of Arizona College of Medicine-Phoenix. 2601 E Roosevelt St, Phoenix, AZ 85008 ^b Training and Education, Phoenix Fire Department. 150 S 12th St, Phoenix, AZ 85034 ^c Department of Surgery, Creighton University School of Medicine-Phoenix. Department of Surgery, University of Arizona College of Medicine-Phoenix. Department of Trauma/Acute and General Surgery, St. Joseph's Hospital and Medical Center. 350 W Thomas Rd, Phoenix, AZ 85013 ^d University of Arizona College of Medicine-Phoenix. 475 N 5th St, Phoenix, AZ 85004 ^e Phoenix Fire Department. 150 S 12th St, Phoenix, AZ 85034 ^f Department of Research, Valleywise Health Medical Center. 2601 E Roosevelt St, Phoenix, AZ 85008 ^g Department of Emergency Medicine, St. Joseph's Hospital and Medical Center. Department of Emergency Medicine, Valleywise Health Medical Center. Department of Emergency Medicine, Creighton University School of Medicine-Phoenix. Department of Emergency Medicine, University of Arizona College of Medicine-Phoenix. 350 W Thomas Rd, Phoenix, AZ 85013 ^h Department of Emergency Medicine, Banner University Medical Center. Department of Emergency Medicine, University of Arizona College of Medicine-Phoenix. 1111 E McDowell Rd, Phoenix, AZ 85006 ⁱ Department of Medical Toxicology, Banner Poison and Drug Information Center, Banner University Medical Center. Departments of Emergency Medicine and Internal Medicine, University of Arizona College of Medicine-Phoenix. 1111 E McDowell Rd, Phoenix, AZ 85006 ^j Department of Emergency Medicine, Abrazo Health Network. 2000 W Bethany Home Rd, Phoenix, AZ 85015 ^k Department of Emergency Medicine, Naval Medical Center, San Diego. 34800 Bob Wilson Dr, San Diego, CA 92134 ^l Department of Emergency Medicine, Abrazo Health Network. Wake Forest Emergency Providers, Atrium Health. 1 Medical Center Blvd, Winston-Salem, NC 27157

OBJECTIVES Heat stroke is a life-threatening condition requiring rapid recognition and immediate cooling. Cold water immersion (CWI) is the most effective cooling modality; however, its adoption and use by emergency medical services (EMS) agencies has been limited and described primarily in case reports. In 2024, the Phoenix Fire Department (PFD) implemented a novel rapid-cooling bag and protocol for prehospital CWI across a large urban area. This study describes the implementation, patient characteristics, cooling effectiveness, and clinical outcomes of the program.



1

Define heat stroke and describe its hallmark clinical manifestation

2

Explain the epidemiology and increasing burden of heat-related illness in Maricopa County

3

Describe the Phoenix Fire Department's development and implementation of rapid cooling practices

4

Identify operational challenges and limitations related to rapid cooling interventions

5

Discuss the impact of rapid cooling on patient mortality

6

Summarize the importance of rapid-cold water immersion as the most effective prehospital heat-stroke management

Objectives



Which of the following is considered a hallmark sign of heat stroke?

A

Markedly elevated, dry, or markedly altered skin temperature with altered mental status

B

Elevated heart rate and muscle cramps

C

Hot, pale, and clammy skin with profuse sweating

D

Elevated body temperature with sound decision making capacity



Hyperthermia

HEAT STROKE

Heat stroke occurs when thermoregulation fails, leading to dangerously high core temperature and **neurological impairment**. Skin is typically hot and dry, and mental status changes are a key indicator



National Weather Service:
July 2023 Climate Summary in Phoenix



Did You Know?

Average High Temperature: 114.7° F

Normal (1991 – 2020): 106.5° F

Mean Temperature: 102.7° F

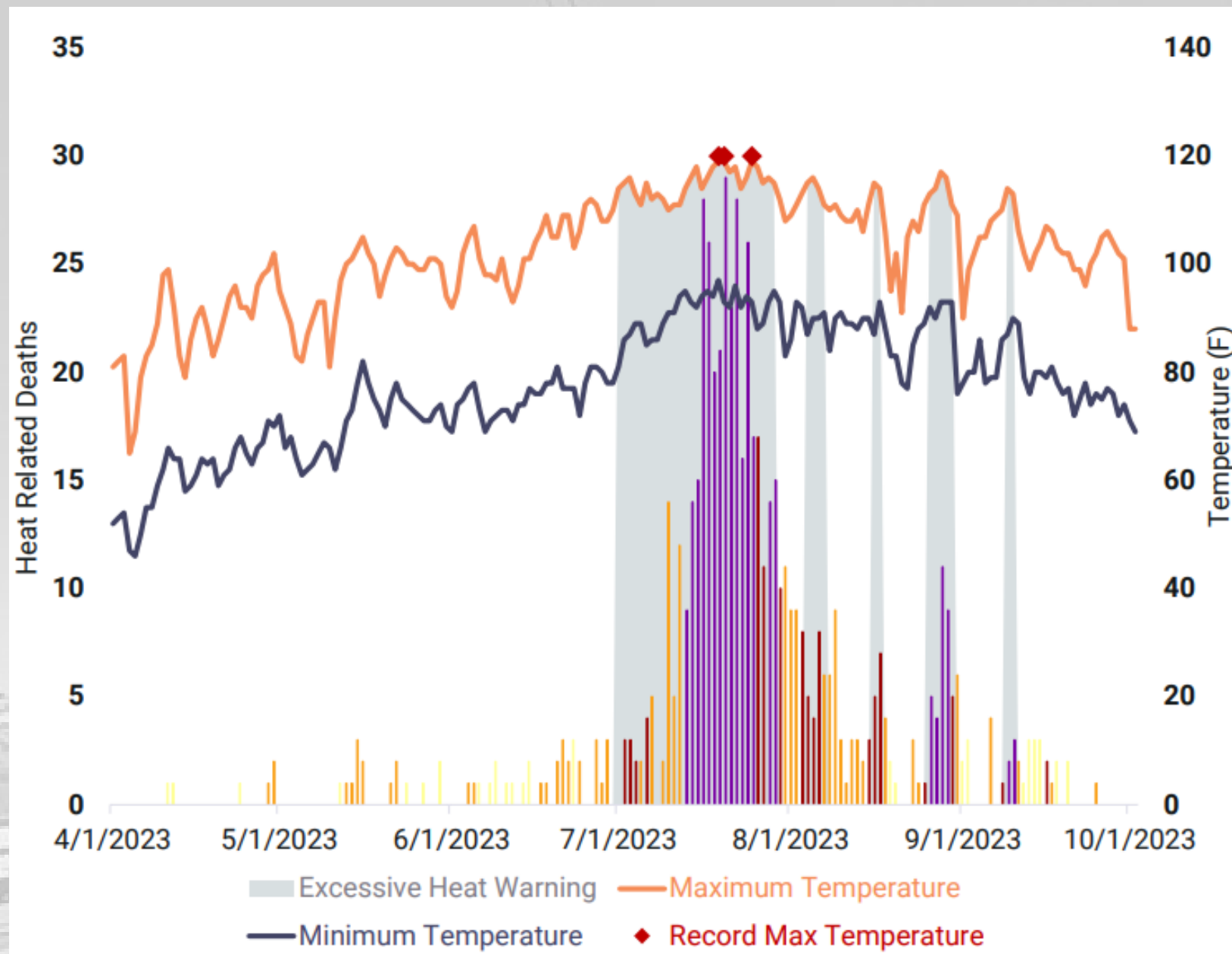
Normal (1991 – 2020): 95.5° F

Average Low Temperature: 90.8° F

Normal (1991 – 2020): 84.5° F

Summer of 2023 had 55 days > 110° F





Maricopa County 2023 Heat Related Report

July 10th – July 25th, lows > 91°F

303 deaths occurred

Record-breaking
temperatures of 119°F

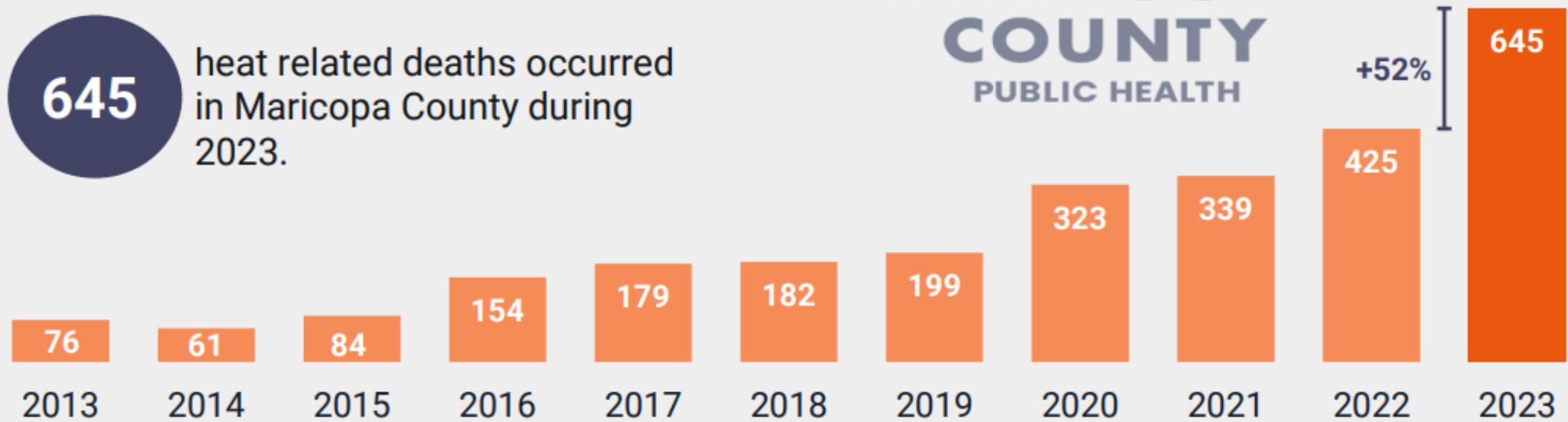
July 19th, 20th, and 25th



2023 Heat Related Deaths



645 heat related deaths occurred in Maricopa County during 2023.



More than **3 out of 4** heat related deaths were **male**.



Almost **2 out of 3** heat related deaths were **age 50 years or older**

What has been the best management of heat stroke patients in the prehospital setting?

A	Evaporative cooling, such as misting the patient and applying fans
B	Ice packs to the high-flow vascular areas (neck, axillae, groin, etc)
C	Cold IV fluids (if available)
D	All the above





What We Did

PFD Paramedic Captains

Consulted with local physicians
and PFD medical directors

Implemented ice & tarps

Contaminated water slurry

Human Resource Management Thru RBO

Program **developed by members** to protect firefighters and community during heat extremes

Entire process from design to deployment was part of labor management **RBO process**

RBO is the Phoenix Fire Department's way to ensuring **clear development, deployment, and management** of our most important resource – our membership

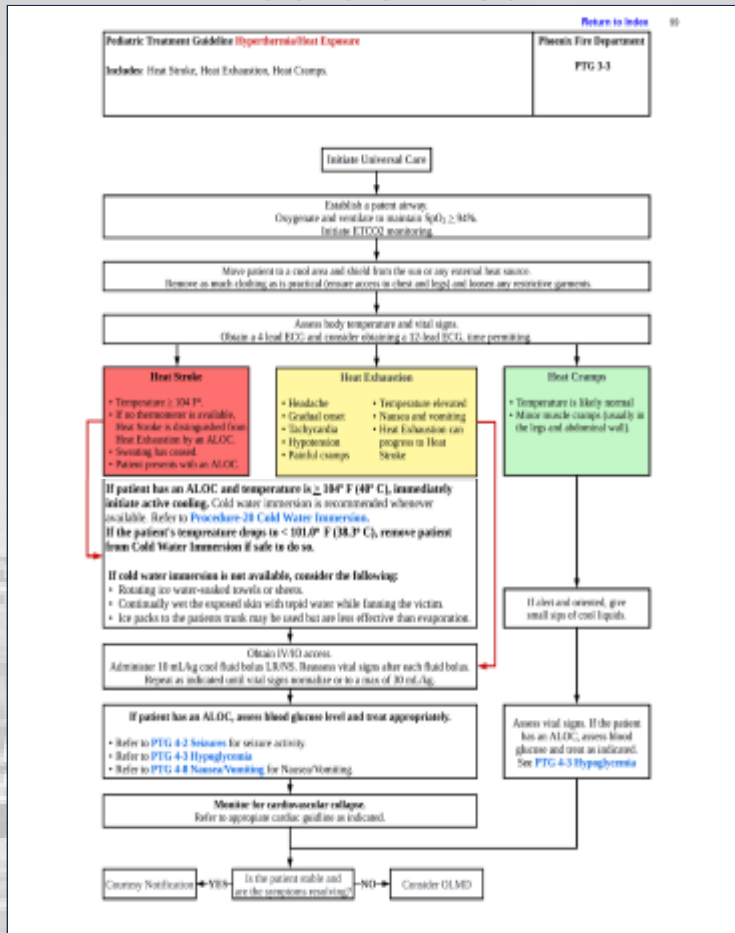
Our Medical Direction Team is motivated **to ensure best practices** for membership health and wellness during hot-zone operations

This program ensures if a member suffers a hyperthermic insult, **all medically-necessary tools are available** for on-scene care



Cold Water Immersion Development

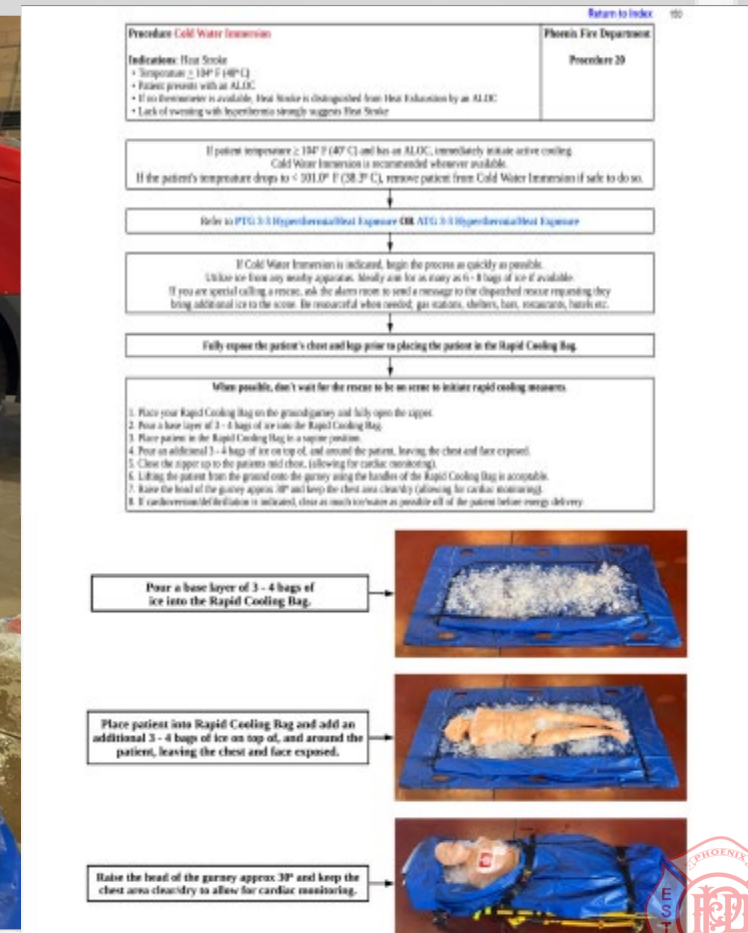
Guidelines



Rapid Cooling Bag



Procedure



National Weather Service:
July 2024 Climate Summary in Phoenix



Did You Know?

Average High Temperature: 112.3° F

Normal (1991 – 2020): 106.5° F

Mean Temperature: 101.1° F

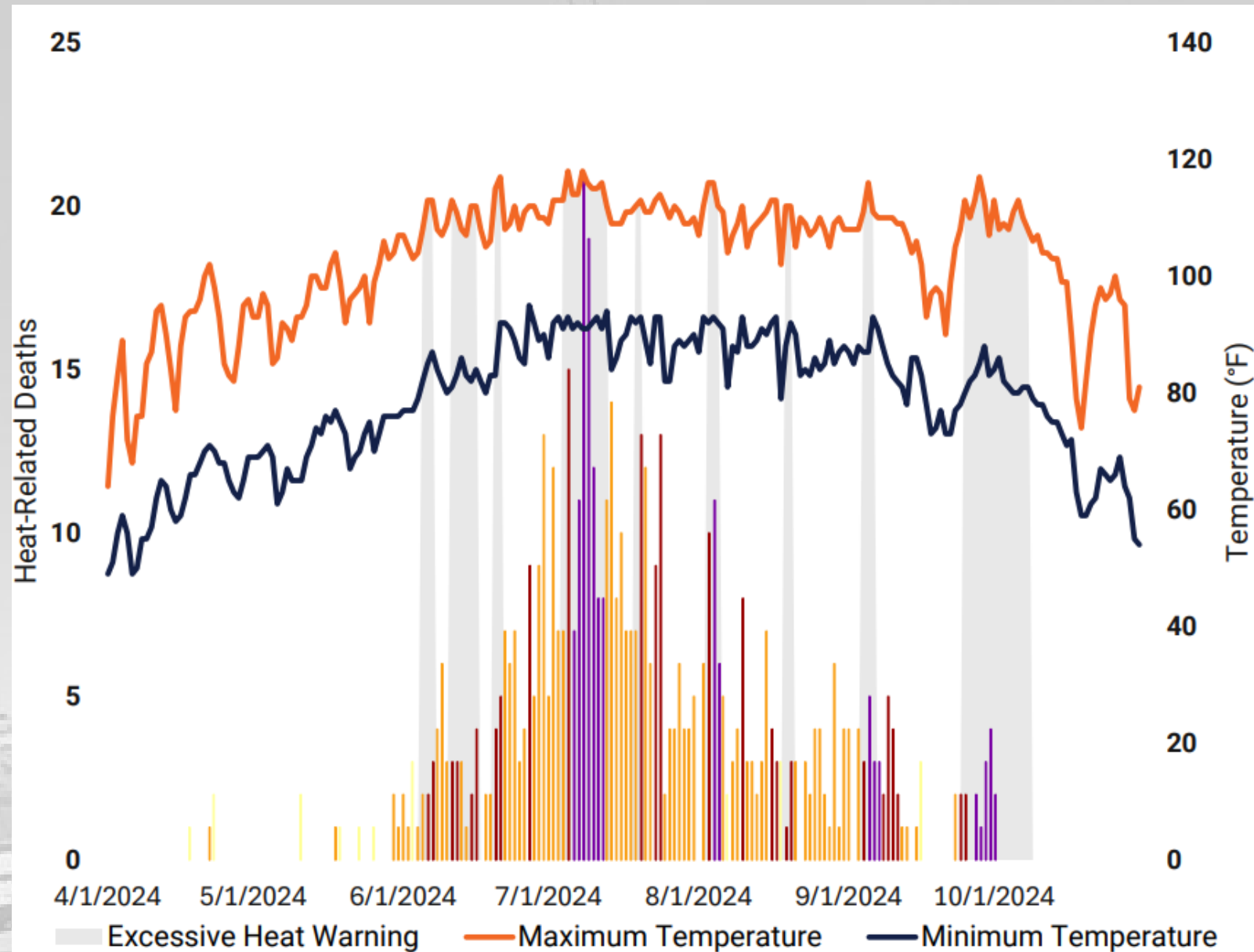
Normal (1991 – 2020): 95.5° F

Average Low Temperature: 89.8° F

Normal (1991 – 2020): 84.5° F

*Phoenix had 188 days of 90° weather, 143 days of 100° and 70 day – **a new record** – of 110° heat*





Maricopa County 2024 Heat Related Report

A heat related death
occurred every day

From June 18th to July 31st

355 heat-related deaths

14 excessive heat warning
days issued

Broke 14 high temperature
records



Rapid Cooling Bag / Ice and Cold-Water Immersion

[SJE] ST JOES HOSPITAL ER ADULT	78
[GSE] BANNER UNIV MED PHX EMER	69
[CHEA] VALLEYWISE HEALTH MEDICAL CENTER	45
[JCE] HONOR JCL MED CTR EMERGENCY	27
[ES] BANNER ESTRELLA HOSPITAL	22
[BP] ABRAZO CENTRAL CAMPUS	17
[GBE] HONOR DEER VALLEY EMER	15
[DV] ABRAZO SCT CAMPUS	9
[MS] MARYVALE HOSPITAL	6
[AG] AZ GENERAL HOSPITAL	4
[TSE] BANNER THUNDERBIRD	4
[CCE] CHA REGIONAL HOSP EMER	2

Monthly	May	June	July	Aug.	Sept.
Heat Related Calls *(as of 05.01.24)	60	341	539	279	100
Cold Water Immersion Uses	5	66	151	70	12
Heat Exhaustion	17	73	110	46	18

How do you think we did to reduce overall mortality?

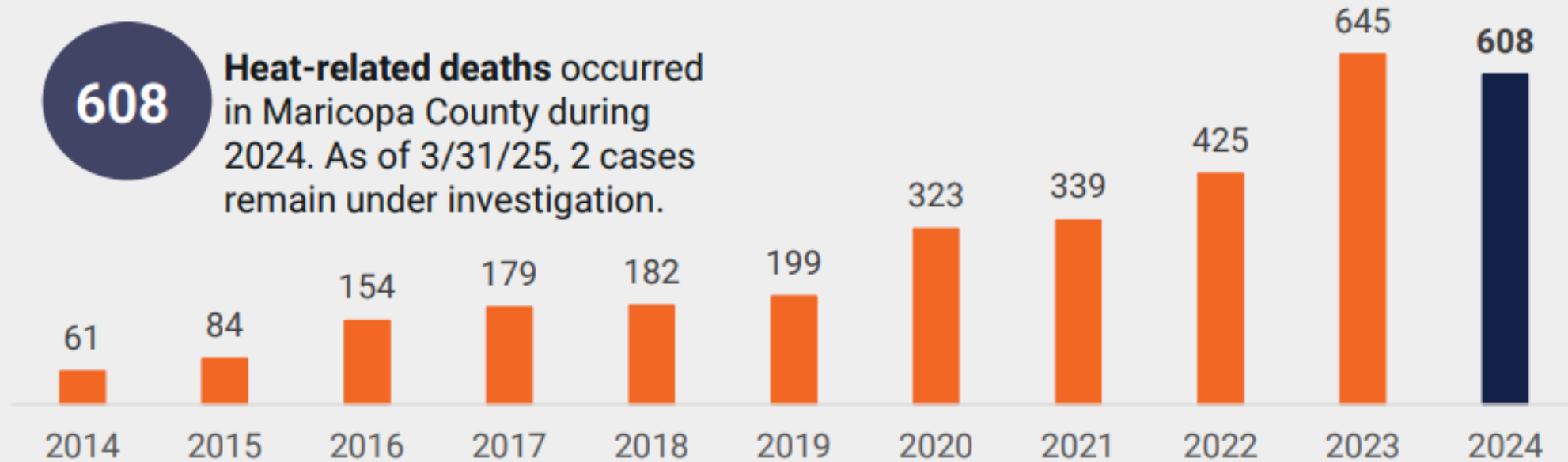
A	Excellent
B	Good
C	Fair
D	Poor
E	Very Poor



2024 Heat-Related Deaths Overview

608

Heat-related deaths occurred in Maricopa County during 2024. As of 3/31/25, 2 cases remain under investigation.



More than **3 out of 4** heat-related deaths were **male**.



Approximately 60% of heat-related deaths were among those **age 50 or older**.



Results

196 cold water immersed patients

Removed 13 for GCS at arrival = 15.

N = 183

Transported to

Banner: 45 (24.6%)

St. Joseph's: 73 (39.9%)

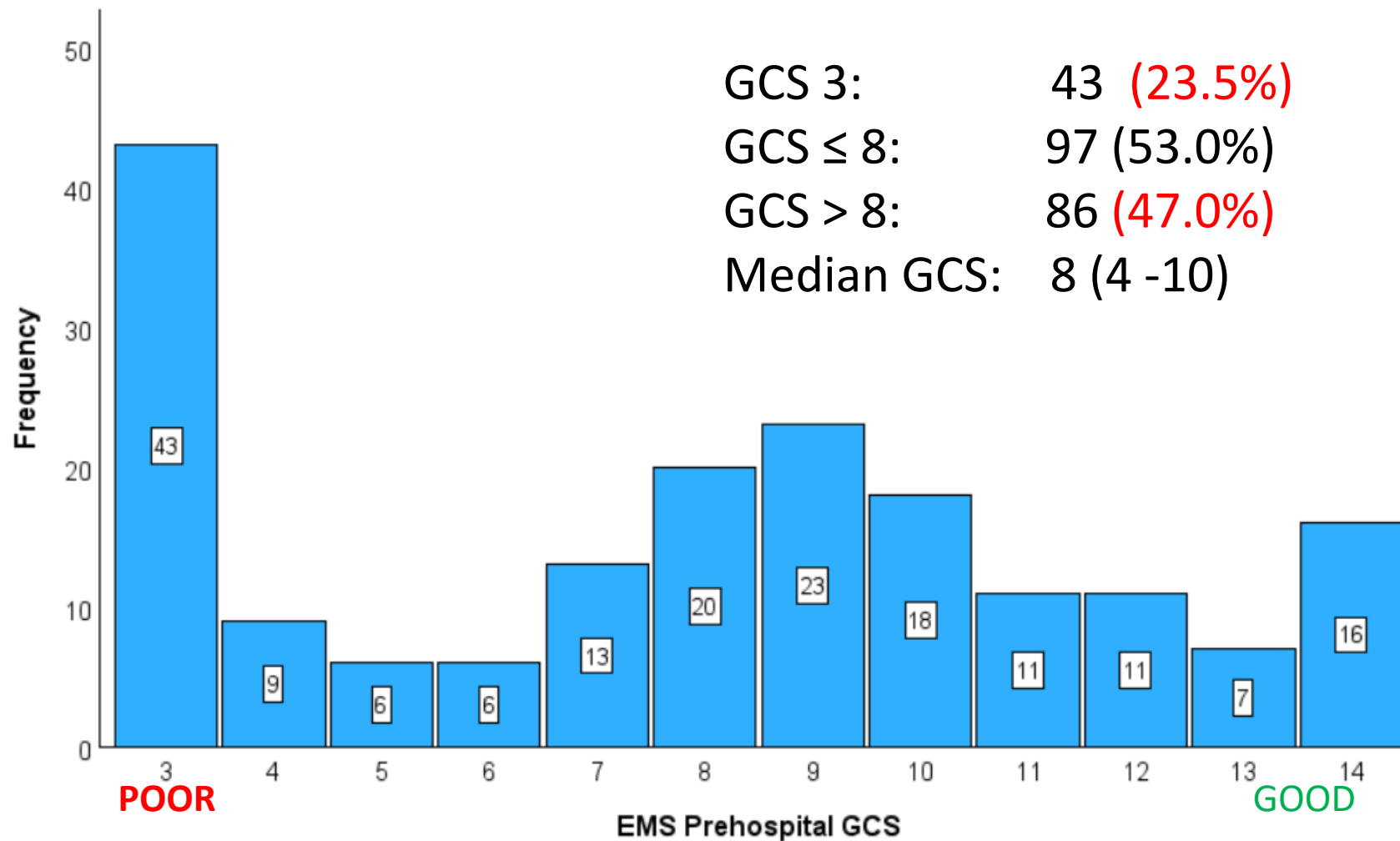
Valleywise: 48 (26.2%)

Abrazo: 17 (9.3%)



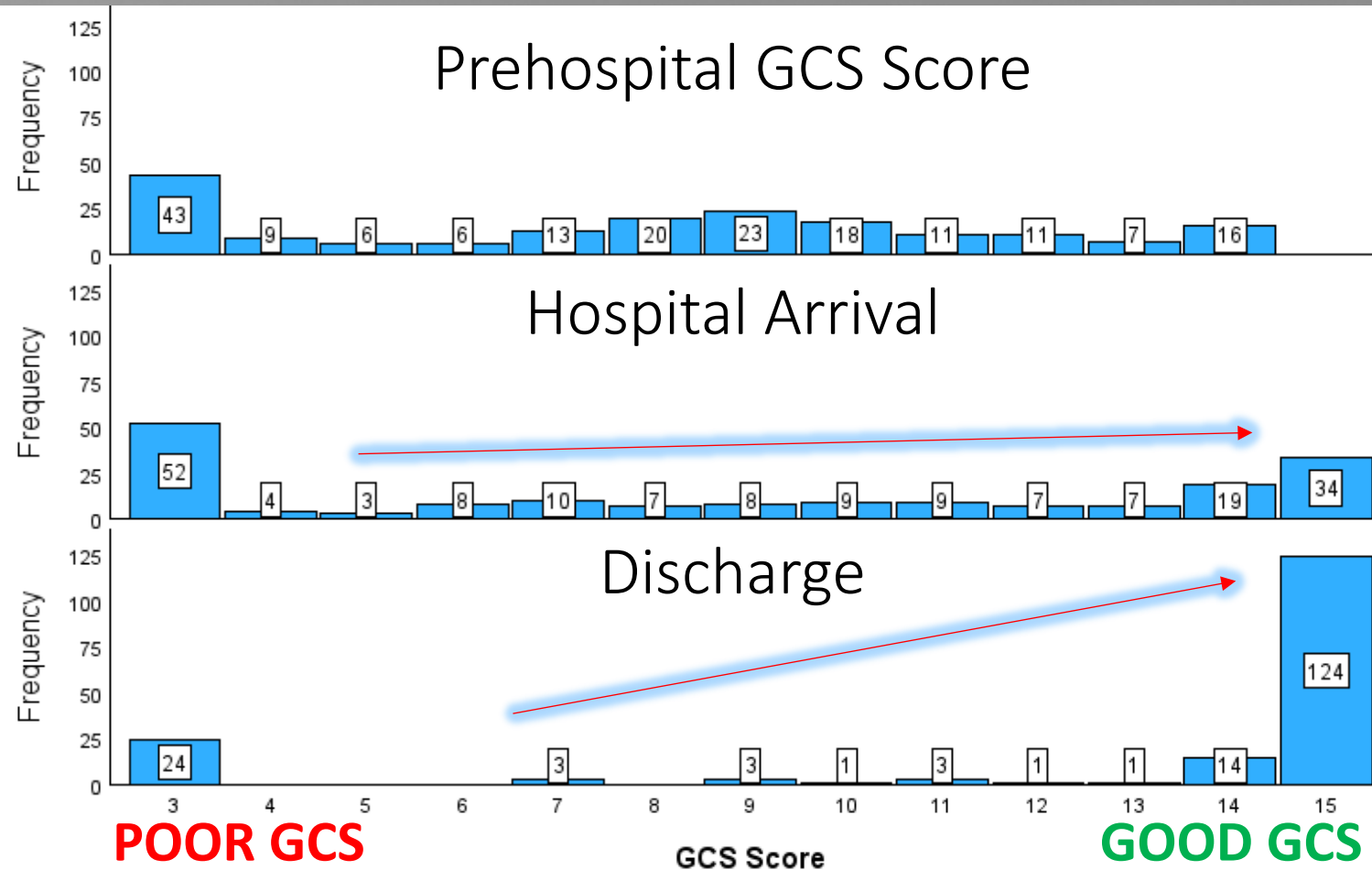
WELCOME TO
PHOENIX

Field GCS Score



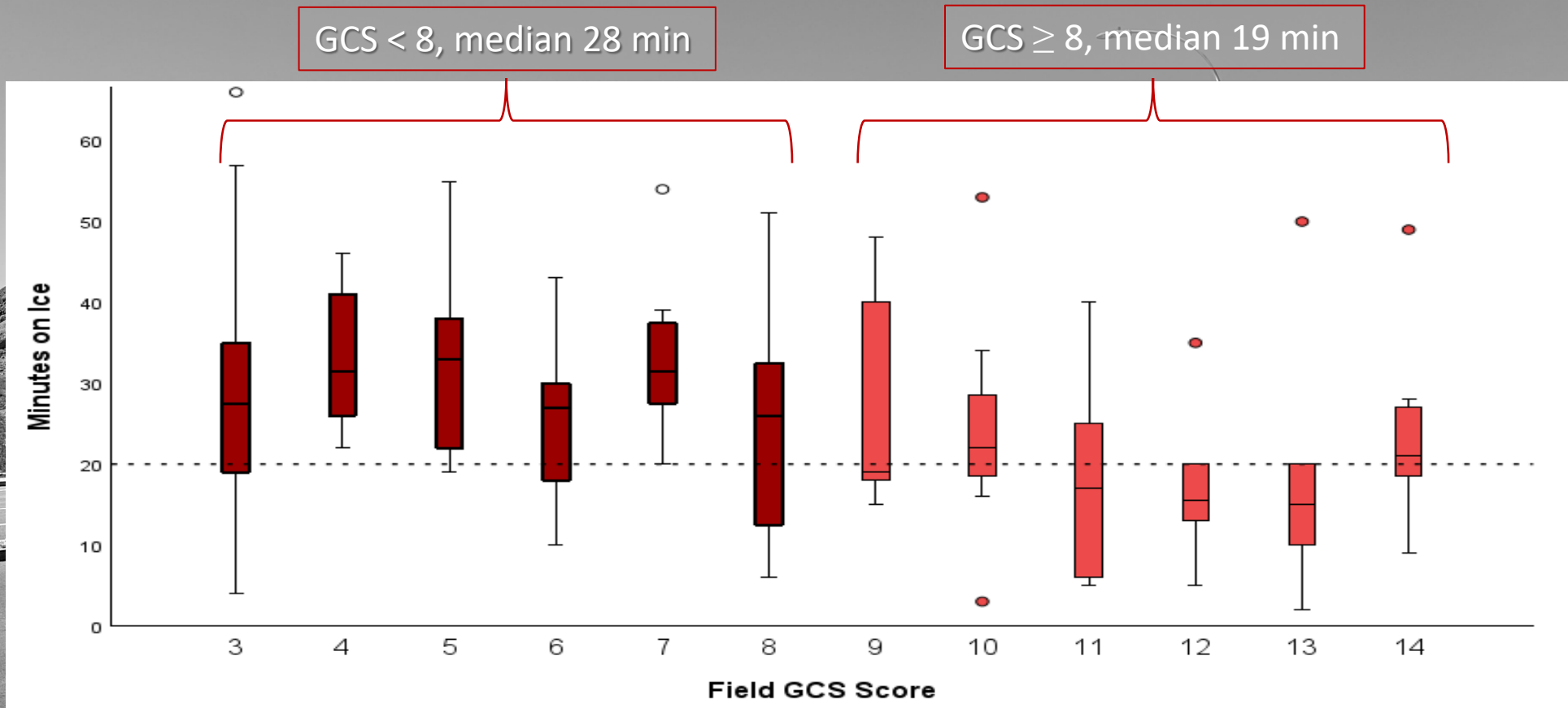
Distribution of GCS Scores

Scores shift to the **right** reflecting patient improvement

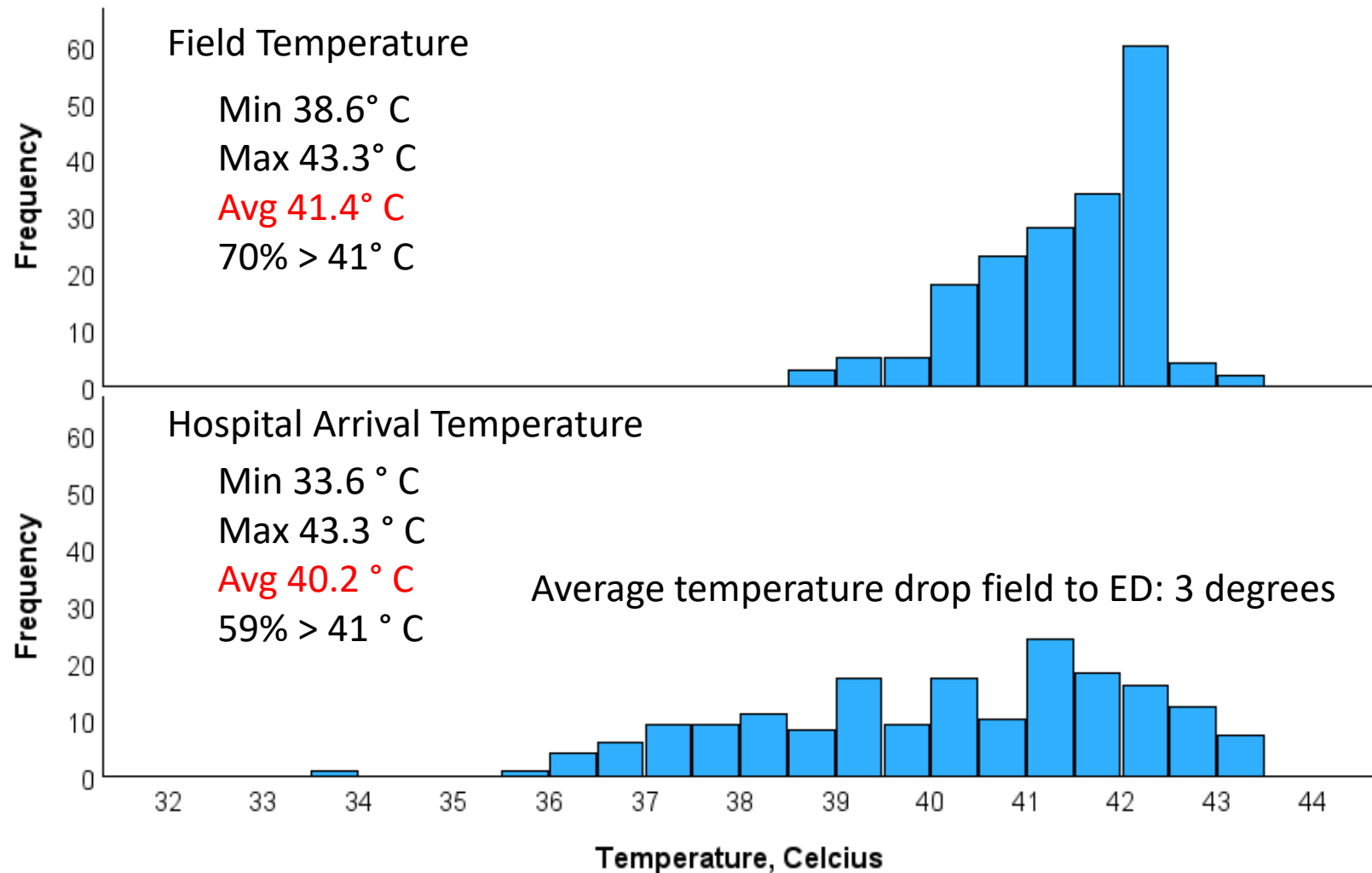


Total Time on ICE

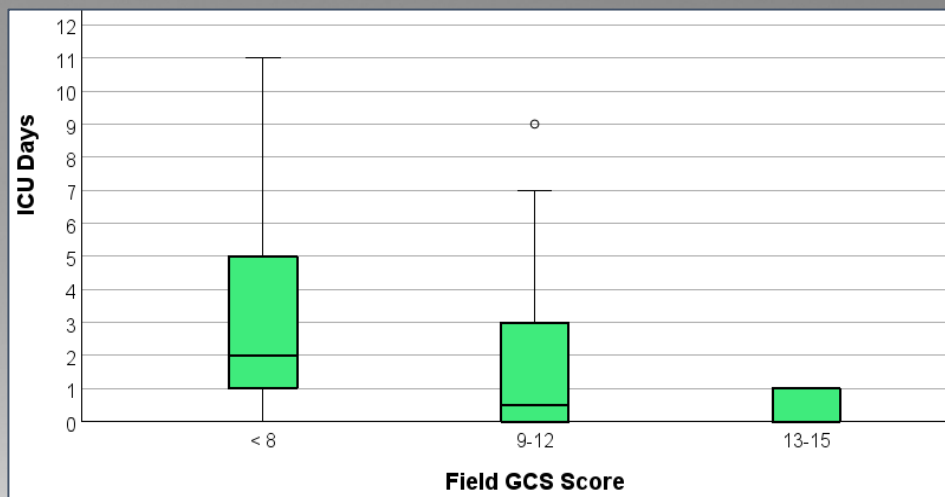
- Median time- middle black horizontal line in the box.
- Median time generally dips when Field GCS is > 8 .



Field to Hospital Temperature



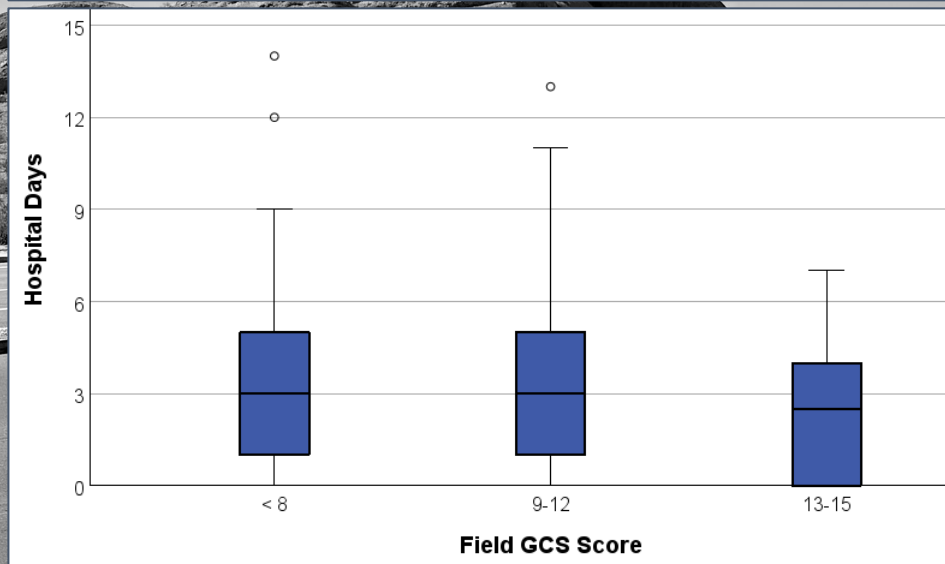
Hospital Length of Stay



Lower GCS associate with higher ICU LOS

Median 3 day stay with 2 ICU day

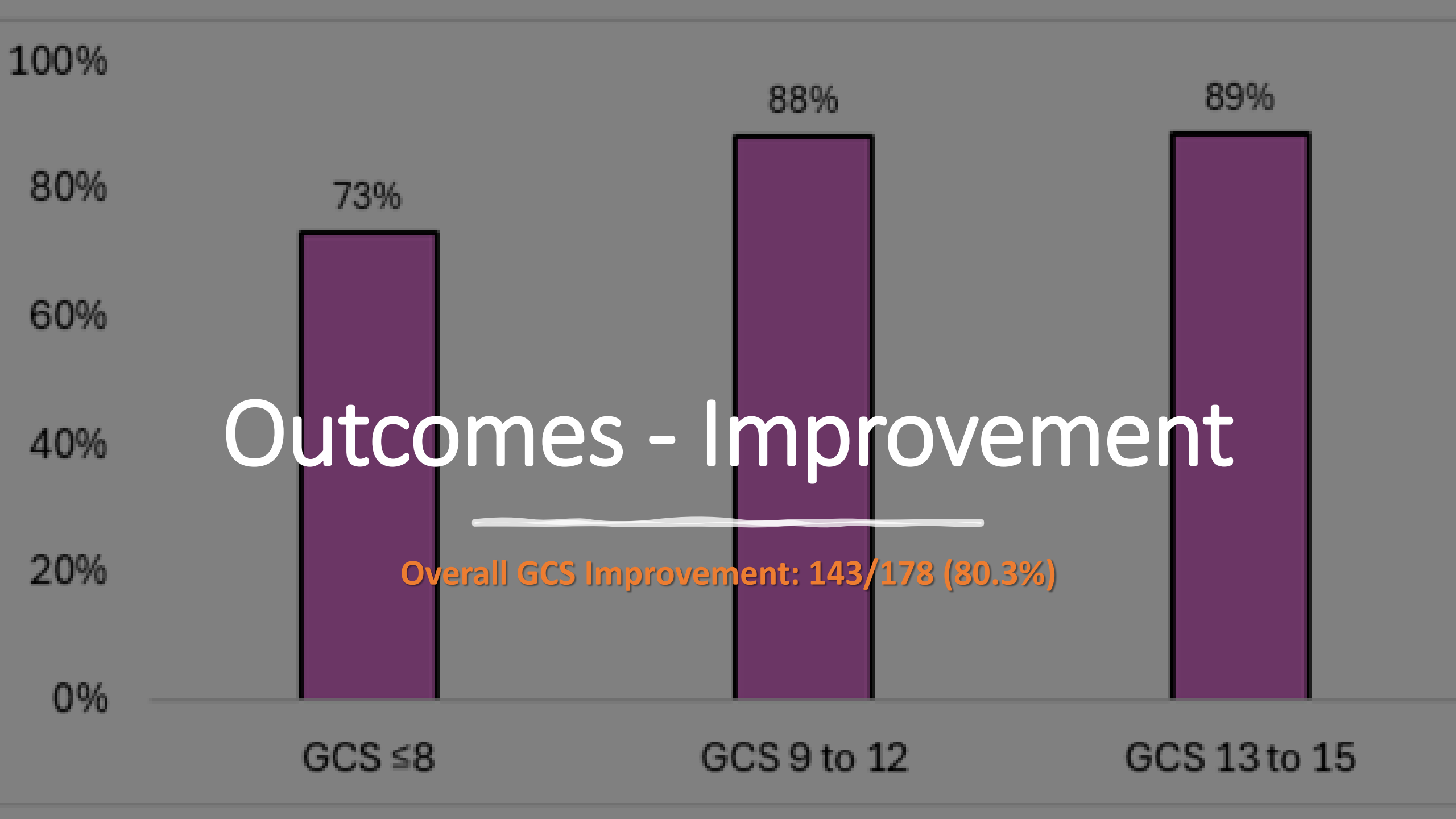
Under 3 days for GCS 13-15



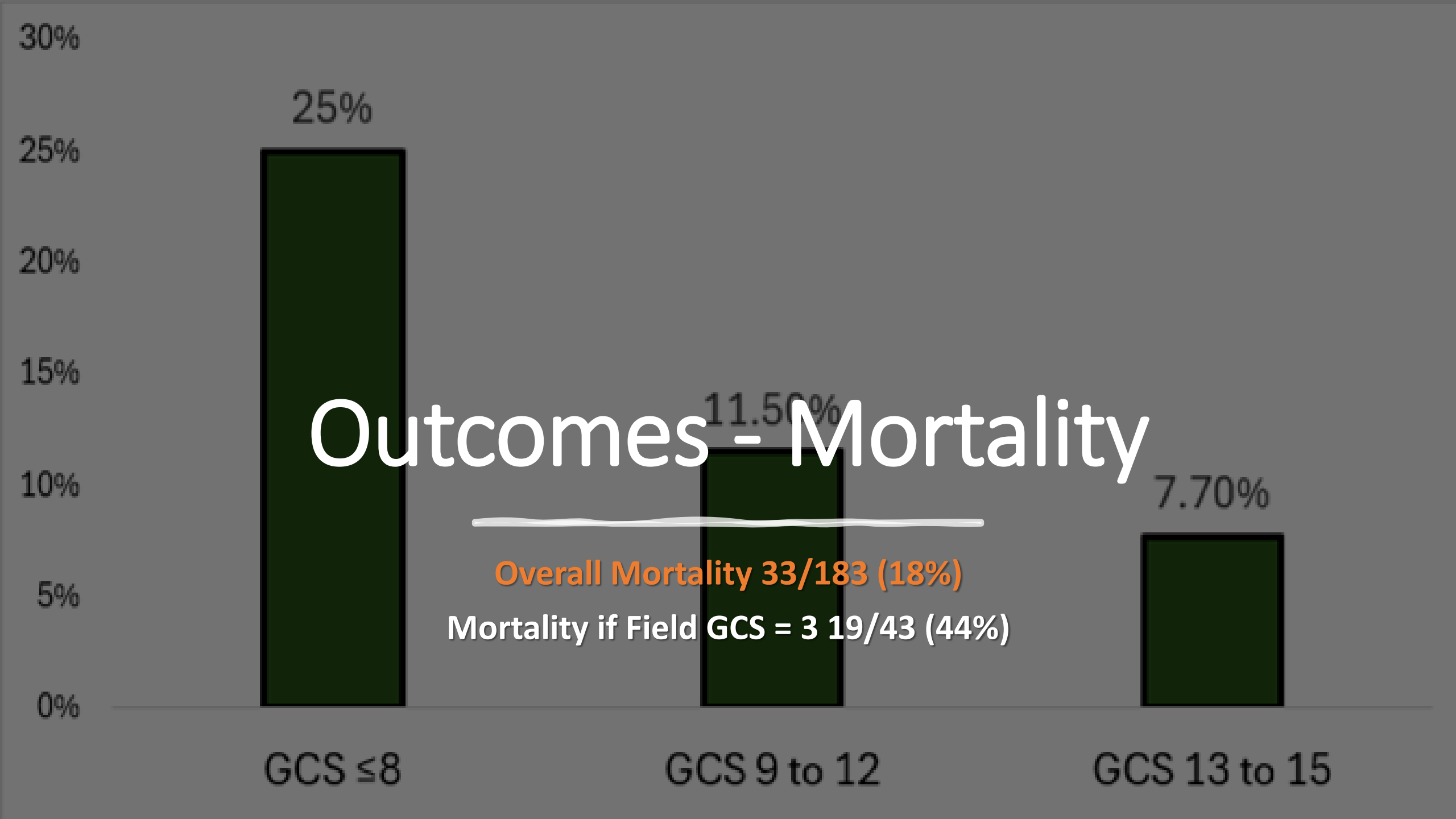
ICU LOS shows a linear association.

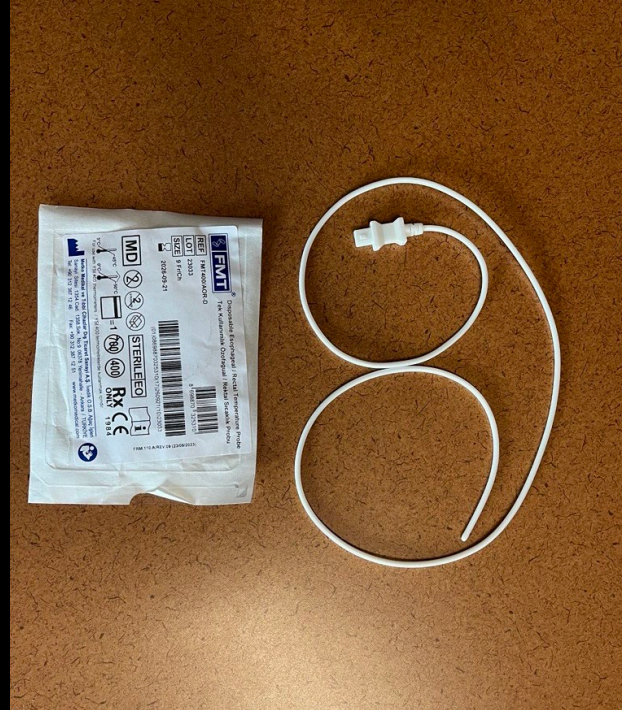
Hospital LOS not influenced by GCS Field Score





Outcomes - Mortality





Limitations / Challenges

Why does this matter?

A	Superior Heat Transfer Efficiency
B	Drastic Reduction in Mortality
C	Prevention of Multi-Organ Failure
D	All the above



How did we make a difference

Department-Wide Training

Bi-Monthly Communication

- Membership
- Fire Agencies
- Hospital Networks

Heat-relief (Respite) Centers

Arizona Department of Health Services

- Heat Response Organization



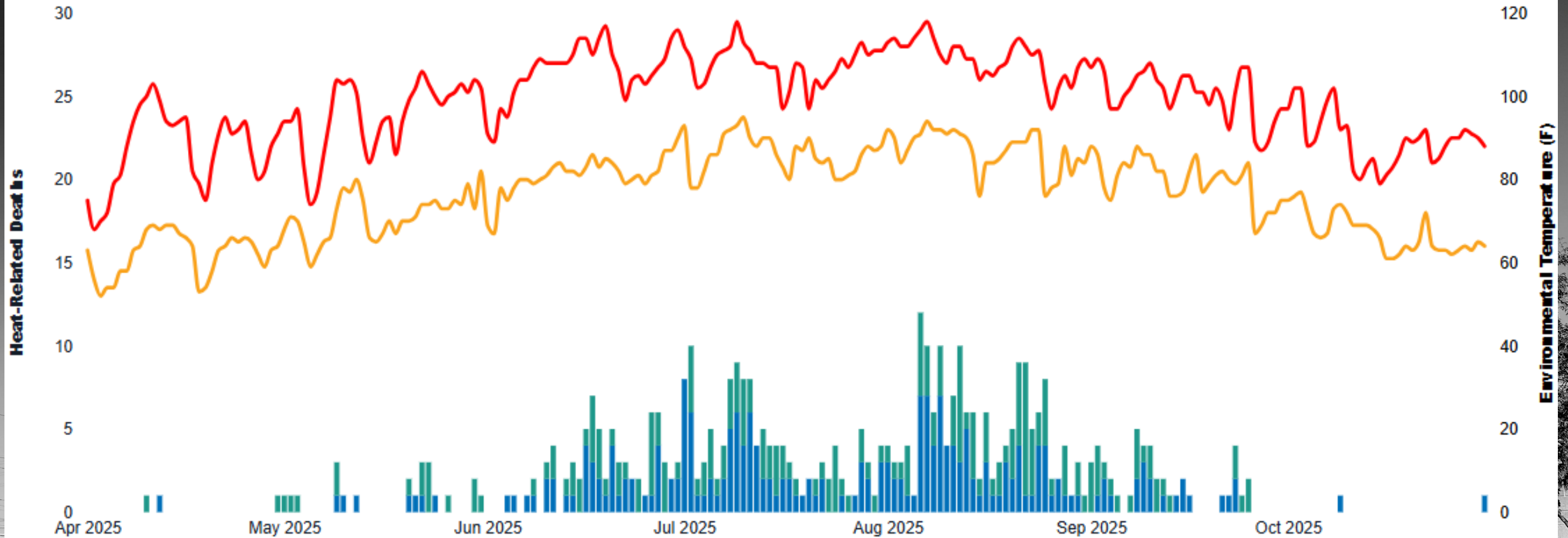
Daily

Weekly

Heat-Related Deaths and Environmental Temperature

Maricopa County, AZ

● Heat Caused ● Heat Contributed ● Under Investigation — Maximum Temperature — Minimum Temperature



Total Confirmed

430



Heat Caused

226



Heat Contributed

204



Under Investigation



Overall Numbers 2024					
Heat Related Calls					1,347
Cold Water Immersion Uses					304
	May	Jun	Jul	Aug	Sep
Heat Related Calls	60	341	539	279	100
Cold Water Immersion Uses	5	66	151	70	12

Overall Numbers 2025					
Heat Related Calls					1,254
Cold Water Immersion Uses					161
	May	Jun	Jul	Aug	Sep
Heat Related Calls	115	286	347	395	111
Cold Water Immersion Uses	15	63	44	34	5



Heat Season Comparison



Continue Our Collaborative Team Approach

Reaching out to Fire Agencies and Hospital Networks across our country to participate in this innovative approach to rapid identification and management of heat stroke patients.

Phoenix Fire Department is interested in working with you to help educate your membership and staff.

Increase our collaboration in research with fire agencies, hospital networks and academic institutions.

Work on ways to identify and improve patient care from the time a 911 call is dispatched to the patient leaving the hospital.

Next Steps...





Dr. Charles Finch
charles.finch@phoenix.gov

