



# HOUSTON FIRE DEPARTMENT

## PREHOSPITAL EMERGENCY MEDICAL ENHANCEMENT PROGRAMS

Samuel Peña, Houston Fire Chief

Dr. David Persse, MD FACEP FAEMS, Houston Chief Medical Officer

May 14, 2024

# Agenda

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- Overview – Houston Fire Department (HFD) Prehospital Emergency Medical Enhancement Programs
- Mobile Stroke Unit
- HFD/UTHealth Houston Mobile ECMO Pilot
- HFD Prehospital Blood Transfusion Program



# Mobile Stroke Unit

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Presented by the  
Houston Fire Department



## Collaborative agreements with stakeholders

- Support from Local EMS (HFD, WUFD, BFD)
- All Community Health Systems
- Memorial Hermann/UTHealth, Methodist, Baylor/St. Luke's, Harris Health, Ben (8 IRBs/Credentialing at 5 health systems)



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## Prospective, Multicenter, Controlled Trial of Mobile Stroke Units

J.C. Grotta, J.-M. Yamal, S.A. Parker, S.S. Rajan, N.R. Gonzales, W.J. Jones, A.W. Alexandrov, B.B. Navi, M. Nour, I. Spokoiny, J. Mackey, D. Persse, A.P. Jacob, M. Wang, N. Singh, A.V. Alexandrov, M.E. Fink, J.L. Saver, J. English, N. Barazangi, P.L. Bratina, M. Gonzalez, B.D. Schimpf, K. Ackerson, C. Sherman, M. Lerario, S. Mir, J. Im, J.Z. Willey, D. Chiu, M. Eishofer, J. Miller, D. Ornelas, J.P. Rhudy, K.M. Brown, B.M. Villareal, M. Gausche-Hill, N. Bosson, G. Gilbert, S.Q. Collins, K. Silnes, J. Volpi, V. Misra, J. McCarthy, T. Flanagan, C.P.V. Rao, J.S. Kass, L. Griffin, N. Rangel-Gutierrez, E. Lechuga, J. Stephenson, K. Phan, Y. Sanders, E.A. Noser, and R. Bowry

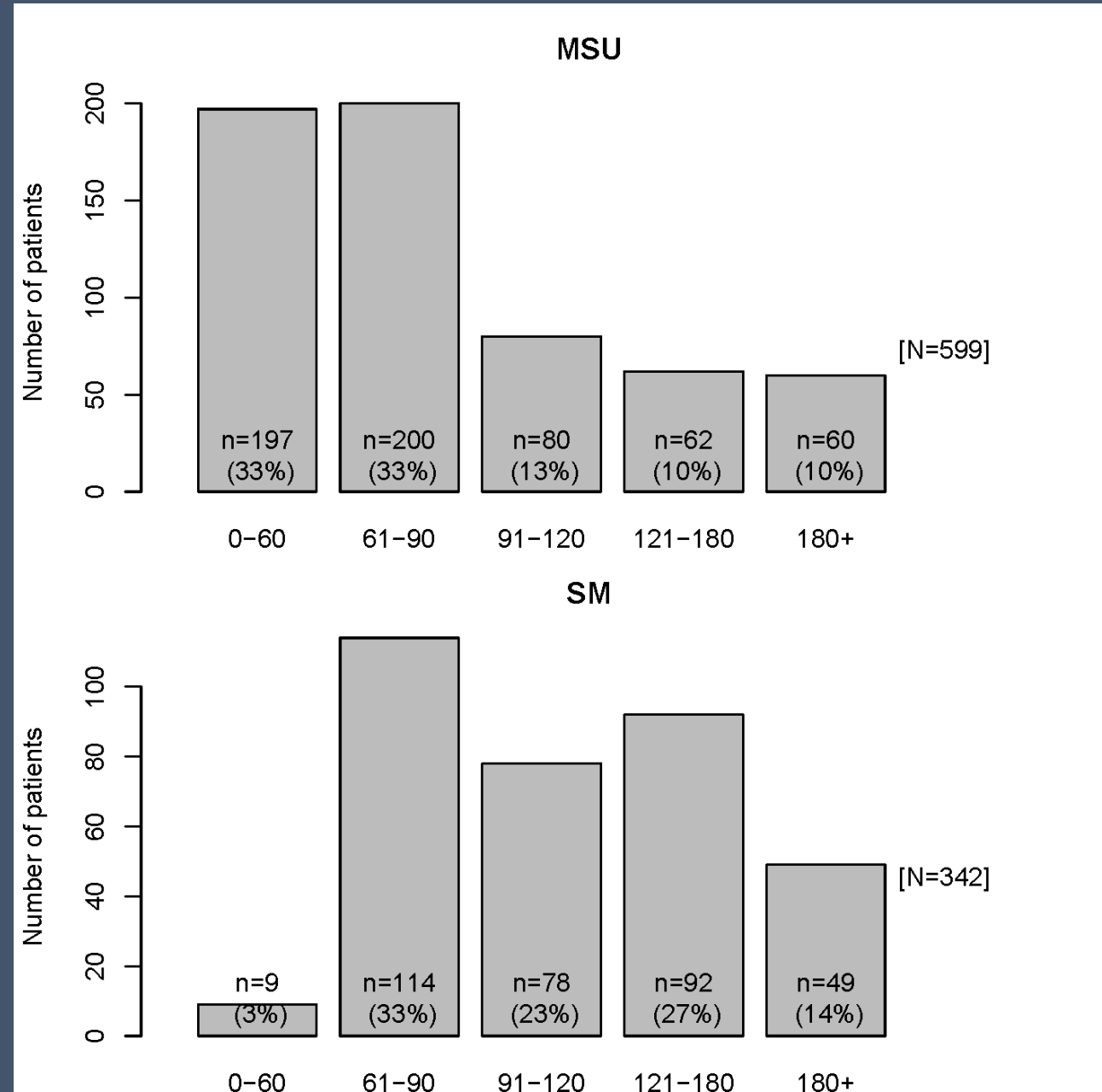


# Results: MSU vs. Standard EMS

“Golden hour”

33% Mobile Stroke

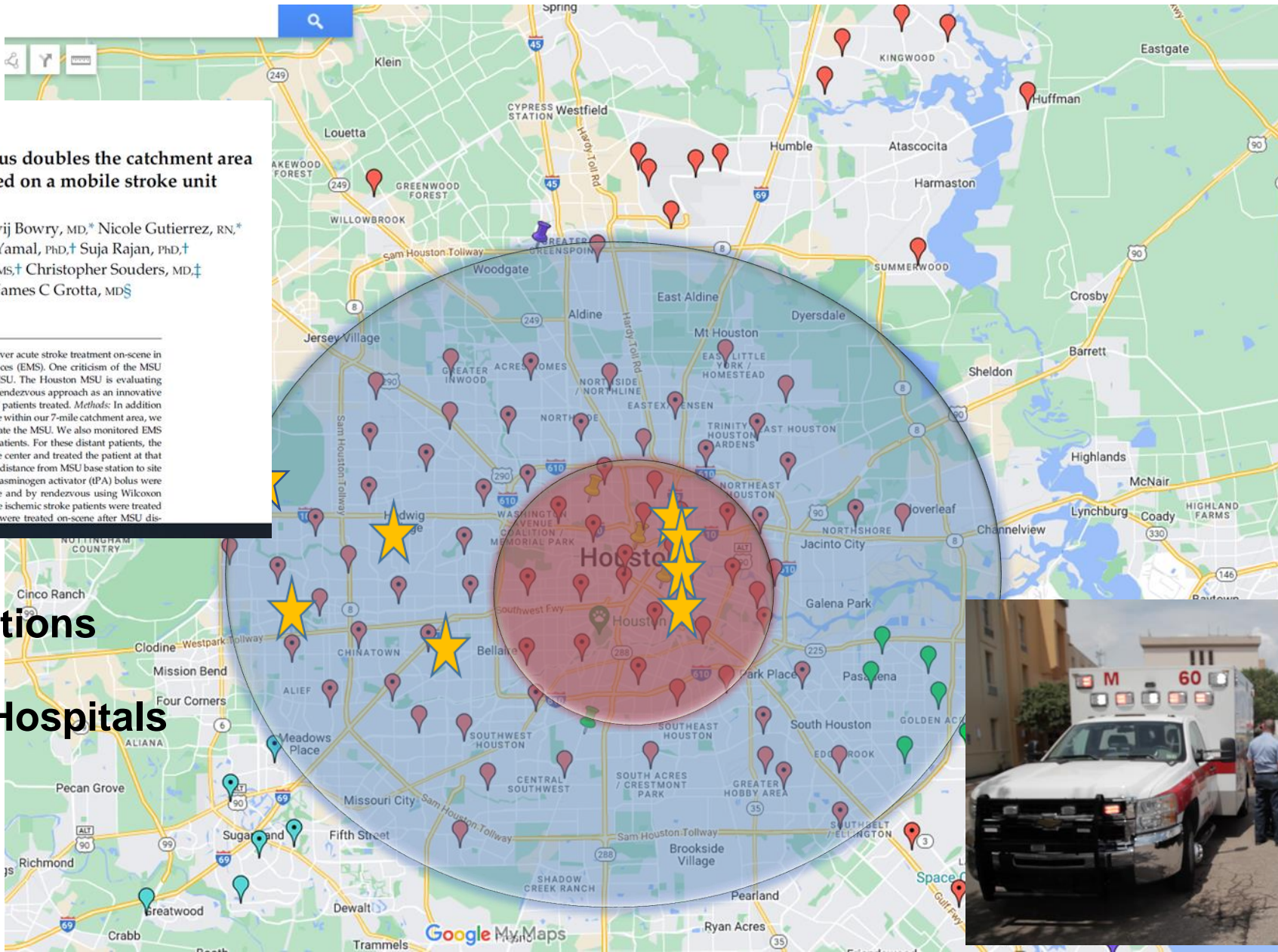
3% Standard EMS Management



## Enhanced dispatch and rendezvous doubles the catchment area and number of patients treated on a mobile stroke unit

Stephanie A Parker, RN,\* Tessa Kus,\* Ritvij Bowry, MD,\* Nicole Gutierrez, RN,\*  
Chunyan Cai, PhD,\* Jose-Miguel Yamal, PhD,† Suja Rajan, PhD,†  
Mengxi Wang, MS,† Asha P Jacob, MS,† Christopher Souders, MD,‡  
David Persse, MD,‡ and James C Grotta, MD§

*Introduction:* Mobile Stroke Units (MSUs) deliver acute stroke treatment on-scene in coordination with Emergency Medical Services (EMS). One criticism of the MSU approach is the limited range of a single MSU. The Houston MSU is evaluating MSU implementation, and we developed a rendezvous approach as an innovative solution to expand the range and number of patients treated. *Methods:* In addition to direct 911 dispatch of our MSU to the scene within our 7-mile catchment area, we empowered more distant EMS units to activate the MSU. We also monitored EMS radio communications to identify possible patients. For these distant patients, the MSU met the EMS unit en route to the stroke center and treated the patient at that intermediate location. The distribution of the distance from MSU base station to site of stroke and time from 911 alert to tissue plasminogen activator (tPA) bolus were compared between patients treated on-scene and by rendezvous using Wilcoxon rank sum test. *Results:* Over 4 years, 338 acute ischemic stroke patients were treated with tPA on our MSU. Of these, 169 (50%) were treated on-scene after MSU dis-



Fire/EMS Stations



Destination Hospitals

## Active MSUs

- Homburg/Saar (Germany)
- Houston, TX , USA
- Berlin (Germany) (3)
- Marburg (Germany)
- Cleveland, OH, USA (2)
- Denver, CO, USA (2)
- Phoenix, AZ, USA
- Chicago, IL, USA (1)
- Trenton, NJ, USA
- Allentown, PA, USA (2)
- New York, NY, USA (1)
- Rochester, NY, USA
- Indianapolis, IN, USA pending 1+
- Los Angeles, CA, USA pending 4+
- Atlanta, GA, USA
- Burlingame, CA, USA
- Edmonton, Alberta, Canada
- Drobak (Norway)
- Southend (UK)
- Buenos Aires (Argentina)
- Melbourne (Australia) (2)
- Coimbatore (Tamil Nadu, India)
- Bangkok (Thailand) (6)
- Columbus, OH, USA (2)
- El Paso, TX

## Future MSUs

- ▲ TBA, Northeast, USA
- ▲ Leuven (Belgium)
- ▲ Lille (France)
- ▲ Paris (France)
- ▲ Aarau (Switzerland)
- ▲ Helsinki (Finland)
- ▲ Zhengzhou (Henan, China)



- Houston Mobile Stroke was the First Mobile Stroke Program in the United States
- Second in the World
- Currently there are 23 programs across the US with 6 more cities implementing programs by 2024

- Active MSUs
- ▲ Future MSUs



# Houston Fire Department/ UTHealth Houston Mobile ECMO Pilot



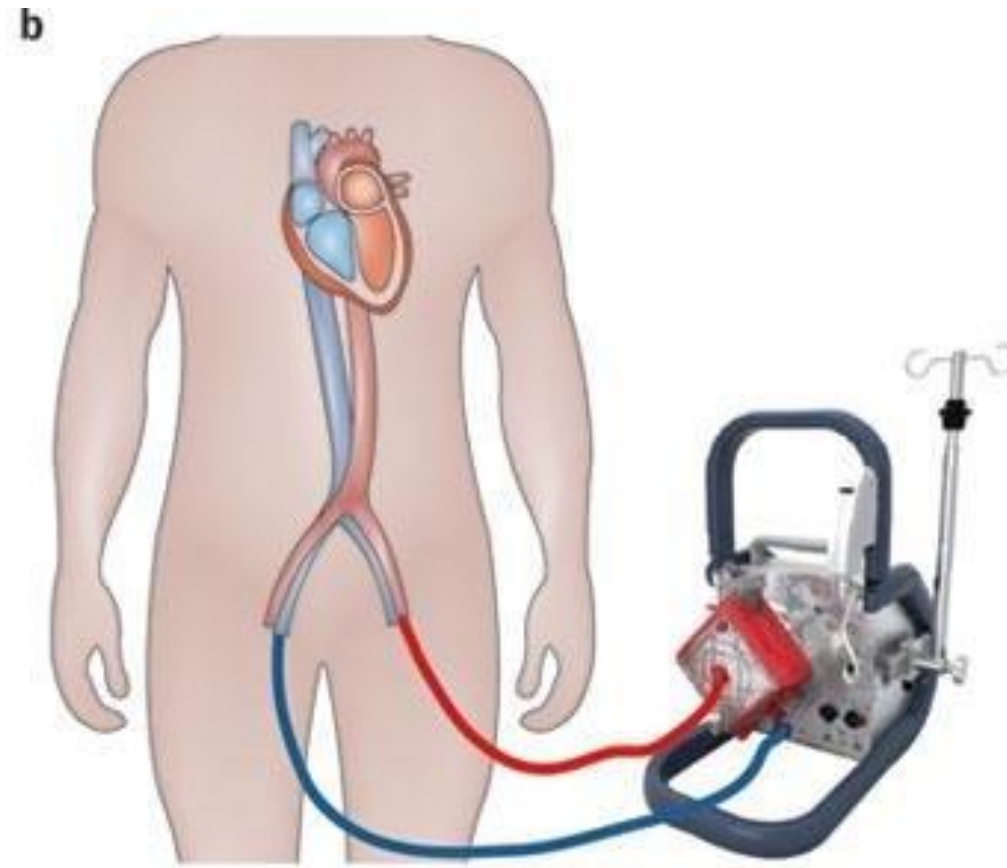
**HFD responded to over 2,200  
cardiac arrests in 2023**



# *Extra Corporeal Membrane Oxygenation*

Develop a collaborative program between the Houston Fire Department, and UTHealth Houston to develop a prehospital response team capable of responding to HFD EMS calls and placing *select cardiac arrest patients* on ECMO in the prehospital setting.

# ECMO Basics



# Evidence

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## Advanced reperfusion strategies for patients with out-of-hospital cardiac arrest and refractory ventricular fibrillation (ARREST): a phase 2, single centre, open-label, randomised controlled trial

*Demetris Yannopoulos, Jason Bartos, Ganesh Raveendran, Emily Walser, John Connett, Thomas A Murray, Gary Collins, Lin Zhang, Rajat Kalra, Marinos Kosmopoulos, Ranjit John, Andrew Shaffer, R J Frascone, Keith Wesley, Marc Conterato, Michelle Biros, Jakub Tolar, Tom P Aufderheide*

## The Minnesota mobile extracorporeal cardiopulmonary resuscitation consortium for treatment of out-of-hospital refractory ventricular fibrillation: Program description, performance, and outcomes

Jason A. Bartos<sup>a,b</sup>, R.J. Frascone<sup>b,c</sup>, Marc Conterato<sup>b,d</sup>, Keith Wesley<sup>e</sup>, Charles Lick<sup>f</sup>, Kevin Sipprell<sup>g</sup>, Nik Vuljaj<sup>e</sup>, Aaron Burnett<sup>h</sup>, Bjorn K Peterson<sup>i</sup>, Nicholas Simpson<sup>j</sup>, Kealy Ham<sup>k</sup>, Charles Bruen<sup>k</sup>, Casey Woster<sup>k</sup>, Kari B Haley<sup>k</sup>, Joanna Moore<sup>j</sup>, Brandon Trigger<sup>l</sup>, Lucinda Hodgson<sup>b</sup>, Kim Harkins<sup>b</sup>, Marinos Kosmopoulos<sup>b</sup>, Tom P. Aufderheide<sup>m</sup>, Jakub Tolar<sup>n</sup>, Demetris Yannopoulos<sup>a,b,\*</sup>



- **United States**
  - **Albuquerque, NM**
  - **Minneapolis, MN**

- **Internationally**
  - **France**
  - **London, England**
  - **Madrid, Spain**
  - **Melbourne, Australia**
  - **Regensburg, Germany**
  - **The Netherlands**

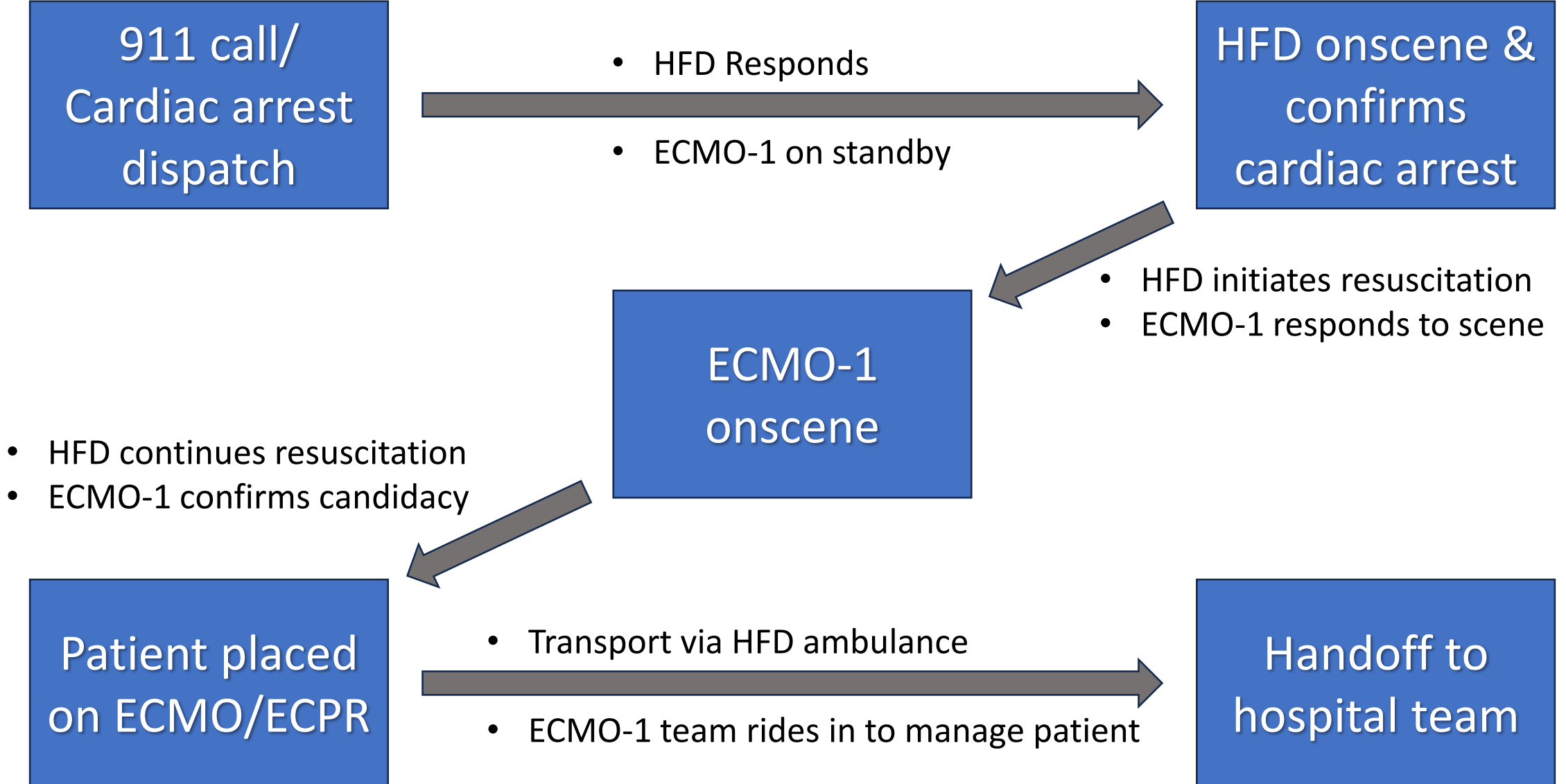
# **Pre-hospital ECPR Programs**

# ECMO-1

- 2 physicians
- 1 support personnel



# ECMO-1 Response Process









A life saved. UT Health Houston mobile EMT team's first-ever deployment for the Chevron Houston Marathon

Updated: February 22, 2024





# HOUSTON FIRE DEPARTMENT

## MEMORANDUM

To: All Officers and Members  
 From: Matthew White, Assistant Fire Chief *MLW*  
 Through: Justin Wells, Executive Assistant Fire Chief *JW*  
 Subject: A-Line Placement (ECMO-01 Phase 1)  
 Date: May 9, 2024

- Mayor**  
John Whitmire
- City Council**
- District A**  
Amy Peck
- District B**  
Tarsha Jackson
- District C**  
Abbie Kamin
- District D**  
Carolyn Evans-Shabazz
- District E**  
Fred Flickinger
- District F**  
Tiffany D. Thomas
- District G**  
Mary Nan Huffman
- District H**  
Mario Castillo
- District I**  
Joaquin Martinez
- District J**  
Edward Pollard
- District K**  
Martha Caslex-Tatum
- At-Large 1**  
Julian Ramirez
- At-Large 2**  
Willie Davis
- At-Large 3**  
Twila Carter
- At-Large 4**  
Lettitia Plummer
- At-Large 5**  
Sallie Aloom
- Controller**  
Chris Hollins

The Houston Fire Department (HFD) is beginning Phase 1 of the UT Health-Houston Advanced Cardiac Resuscitation ECMO-01 Unit (extracorporeal membrane oxygenation) implementation.

Starting Monday, May 13<sup>th</sup>, 2024, the UT Health-Houston Advanced Cardiac Resuscitation Unit (ECMO-01) will respond to certain cardiac arrest calls to place femoral arterial lines in the patients. This advanced procedure, performed by an ECMO-01 physician, involves placing a catheter in the patient's femoral artery and allows for more accurate and invasive monitoring of resuscitation, blood pressure, and ROSC. This phase is an intermediate step towards the roll-out of ECMO (extracorporeal membrane oxygenation, similar to cardiac bypass) in the prehospital setting in Houston. This collaborative effort between UTHealth-Houston and HFD will put Houston on the leading edge of prehospital innovation, joining a handful of sites in the US and Europe providing this advanced care in the field.

The ECMO-01 unit will be based out of Memorial Hermann Hospital-TMC and will be staffed by physicians and research personnel from UTHealth-Houston. When in service, ECMO-01 (ECMO01 in CAD) will add themselves to appropriate cardiac arrest calls within their geographic response area, which extends roughly 5 miles from the Texas Medical Center. Cardiac arrest dispatches that fall within this response area will activate Pager 715, which will alert the ECMO-01 team of a potential response. The team will monitor radio traffic and will add themselves to appropriate records once the patient is confirmed to be in arrest. During this phase of the program, ECMO-01 will be in-service intermittently and for variable hours, so it is important that HFD personnel initiate resuscitation as per normal protocol regardless of whether they believe ECMO-01 will be responding. An anticipated response by ECMO-01 will NOT change the way HFD members handle the initial resuscitation.

Upon ECMO-01's arrival on scene, the physicians will gather information from the crews, family members, and other bystanders to determine if the patient is eligible for arterial line placement. During this evaluation, HFD personnel will continue resuscitation as per HFD Patient Care Guidelines.

24-055



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 "Courage, Commitment and Compassion"  
[www.houstontx.gov/fire](http://www.houstontx.gov/fire)



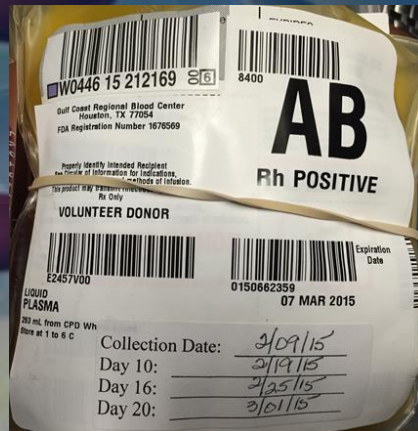
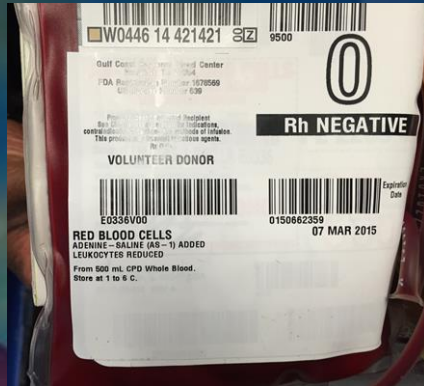


# HFD Rollout of Prehospital Blood Transfusion



# Blood Products for Ground EMS

- Used in military EMS as far back as WWII
- Transition to helicopter EMS
  - Memorial Hermann Life Flight has carried blood for over a decade
- Multiple local EMS agencies in the Houston area now provide blood in the field





## The Use of Whole Blood Transfusion in Trauma

Mary Hanna<sup>1</sup> · Justin Knittel<sup>2</sup> · Jason Gillihan<sup>2</sup>

Accepted: 10 November 2021 / Published online: 17 January 2022  
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### Abstract

**Purpose of Review** This review illustrates the current benefits, limitations, ongoing research, and future paths for Low Titer

O Whole Blood compared to Component Therapy in massive transfusion

**Recent Findings** Many studies show that compared to Component Therapy  
ated with better patient outcomes and simplified transfusion logistics and

## Original Investigation

FREE

January 18, 2023

# Association of Whole Blood With Survival Among Patients Presenting With Severe Hemorrhage in US and Canadian Adult Civilian Trauma Centers

Crisanto M. Torres, MD, MPH<sup>1,2</sup>; Alistair Kent, MD, MPH<sup>3</sup>; Dane Scantling, DO, MPH<sup>2</sup>; et al

» [Author Affiliations](#) | [Article Information](#)

*JAMA Surg.* 2023;158(5):532-540. doi:10.1001/jamasurg.2022.6978

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DOI: 10.1002/emp2.12089

## SYSTEMATIC REVIEW META-ANALYSIS

Trauma



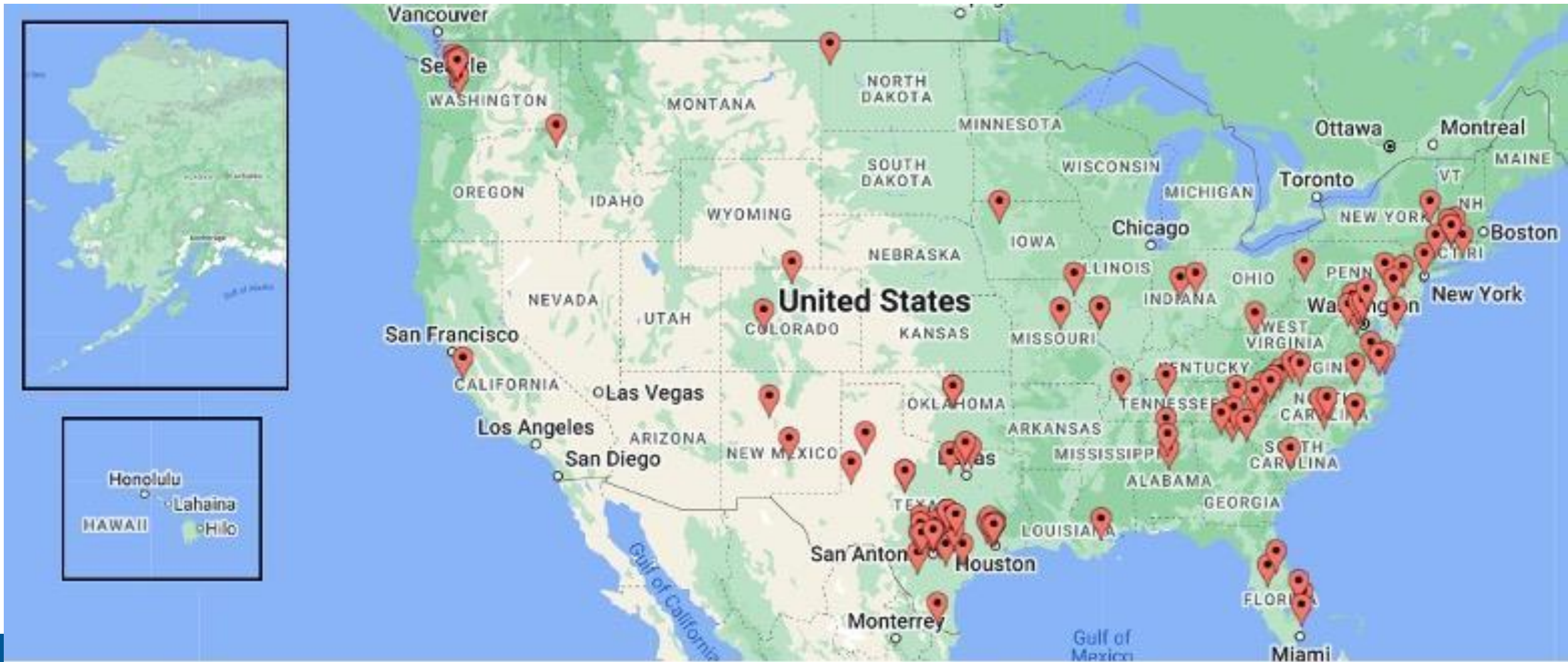
WILEY

# Whole blood transfusion versus component therapy in trauma resuscitation: a systematic review and meta-analysis

Ellen Crowe BSA<sup>1</sup> | Stacia M. DeSantis PhD<sup>2</sup> | Austin Bonnette BS<sup>3</sup> | Jan O. Jansen MBBS, PhD<sup>4</sup> | Jose-Miguel Yamal PhD<sup>2</sup> | John B. Holcomb MD<sup>4</sup> | Claudia Pedroza PhD<sup>5</sup> | John A. Harvin MD, MS<sup>6</sup> | Marisa B. Marques MD<sup>7</sup> | Elenir B.C. Avritscher MD, PhD, MBA<sup>5</sup> | Henry E. Wang MD, MS<sup>3</sup>

<sup>1</sup>McGovern Medical School, The University of Texas Health Science Center at Houston, Houston, Texas, USA

# Whole Blood across the Nation – October 2023





# Local Fire/EMS Agencies Carrying Blood

- Harris County Emergency Corps
- Harris County ESD-48
- Cy-Fair Fire Department
- Community Volunteer Fire Department
- Bellaire Fire Department
- North Channel EMS
- Channelview Fire Department
- Fort Bend County EMS

# Who gets prehospital blood?

Prehospital blood is life-saving for both Trauma and Medical patients who are in hemorrhagic shock from blood loss



## Upper Gastrointestinal Bleed



## Lower Gastrointestinal Bleed

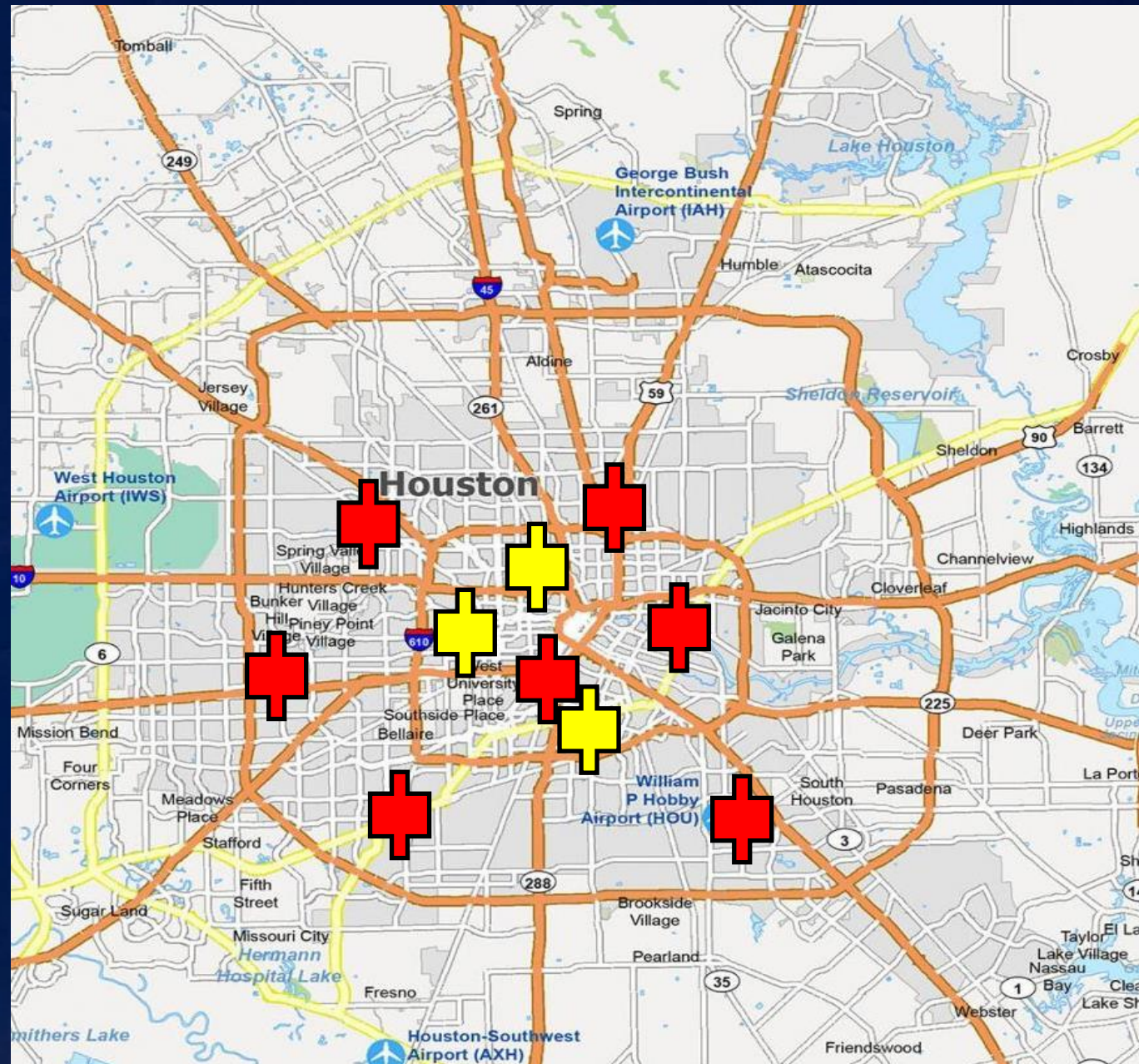


## Phase 1:

- EMS District Chief
- Sr. EMS Supervisors

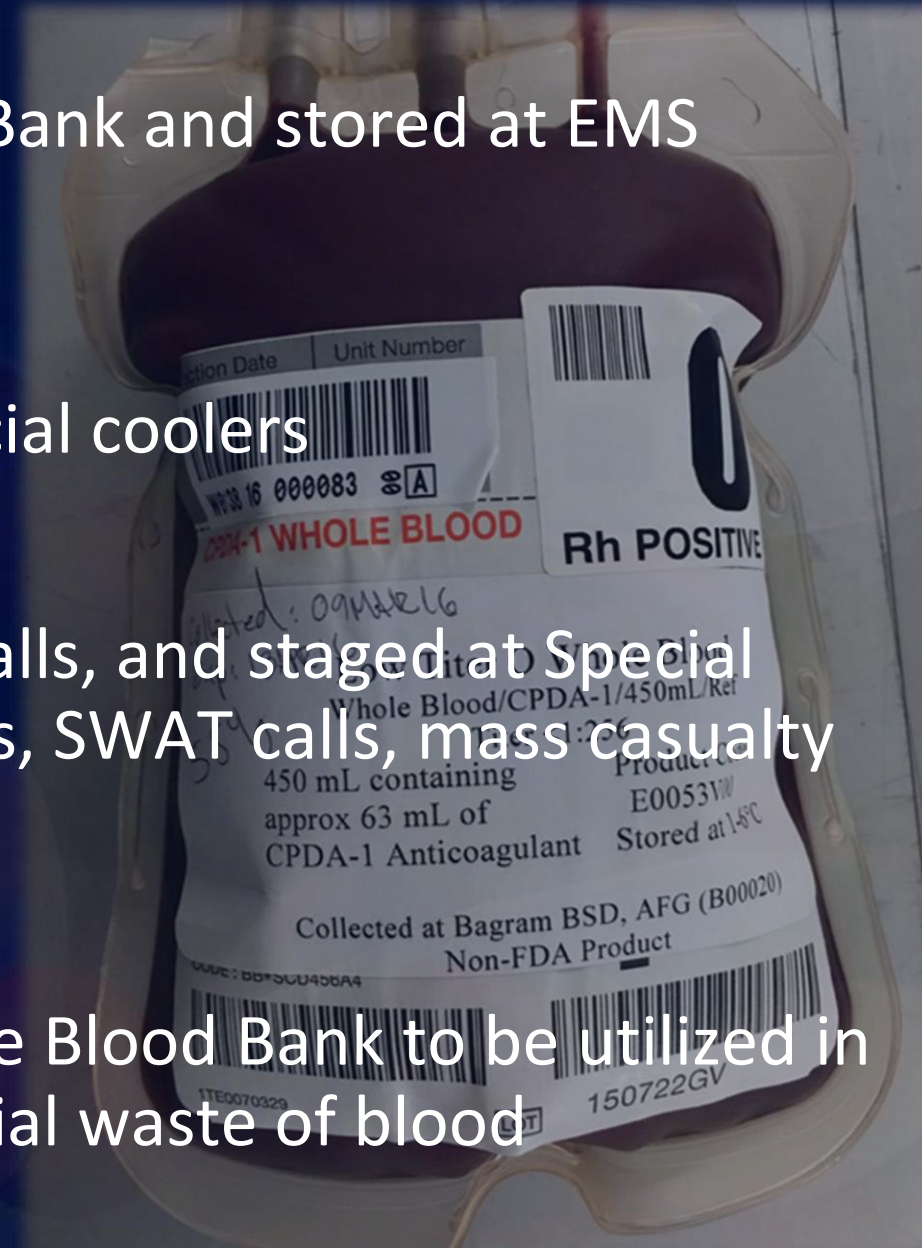
## Phase 2:

- All EMS Supervisors



# Process

- Low-titer O+ whole blood delivered by Blood Bank and stored at EMS Supervisor stations
- Maintained using blood refrigerators and special coolers
- Blood carried on EMS Supervisor vehicles to calls, and staged at Special Events and Critical Incidents (parades, festivals, SWAT calls, mass casualty incidents, etc.)
- Prior to blood expiring, it will be rotated by the Blood Bank to be utilized in the hospital, so as not to minimize any potential waste of blood



A microscopic view of blood cells, including red blood cells and white blood cells, set against a dark blue background. The red blood cells are prominent, appearing as biconcave discs. The white blood cells are larger and more varied in shape. The overall scene is illuminated with a soft, blue light, creating a sense of depth and focus on the cellular structures.

**Questions?**