Prehospital Blood Administration: The Pearland Perspective and Case review

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Our Friends at Memorial Hermann Pearland

* No financial disclosures

What we know:

- Blood is better than other fluids for hemorrhagic shock.
- Whole blood (O+ low titer) has advantages in the emergency and prehospital environment versus component therapy.
- Administration is a time sensitive intervention.

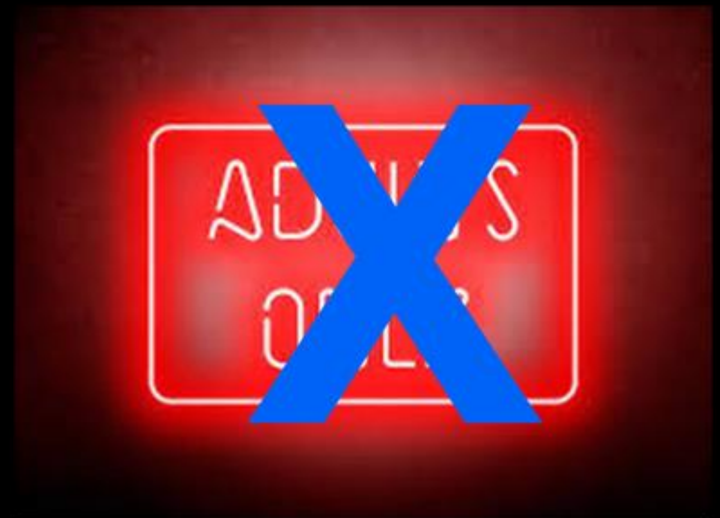
Every minute counts

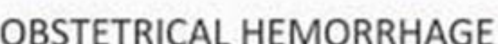
"Delays in blood protocol activation and delays in initial cooler arrival were associated with prolonged time to achieve hemostasis and an increase in mortality"

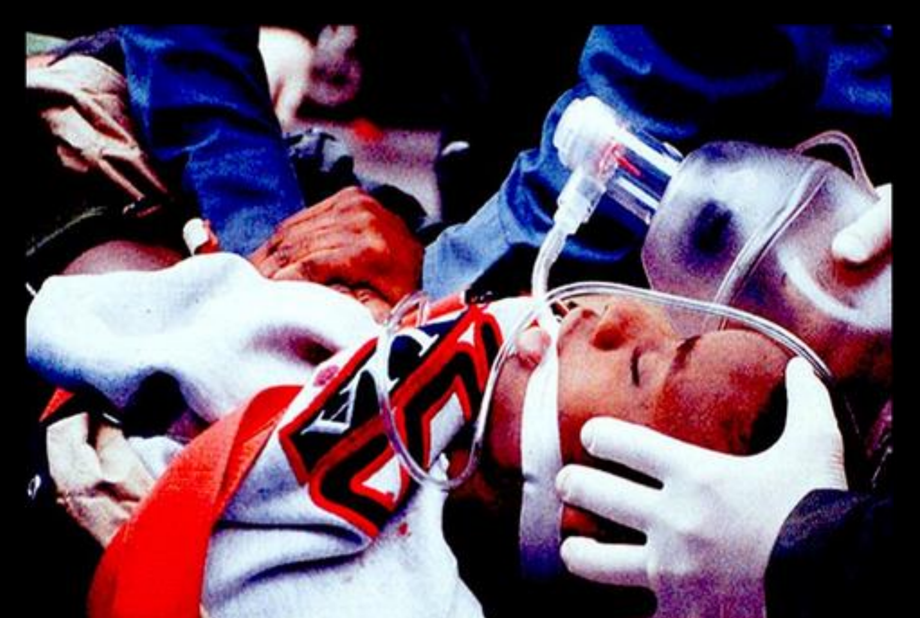
"...Every minute from time of activation to time of initial cooler arrival increases odds of mortality by 5%."

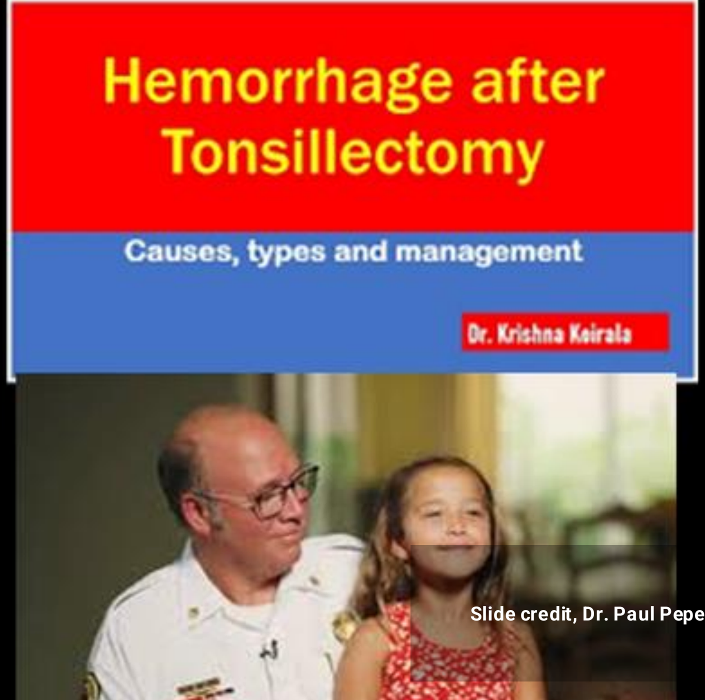
- Meyer, David E. MD; Vincent, Laura E. RN; Fox, Erin E. PhD; O'Keeffe, Terence MBChB; Inaba, Kenji MD; Bulger, Eileen MD; Holcomb, John B. MD; Cotton, Bryan A. MD. Every minute counts, July (2017)

We are figuring out it's not just for trauma







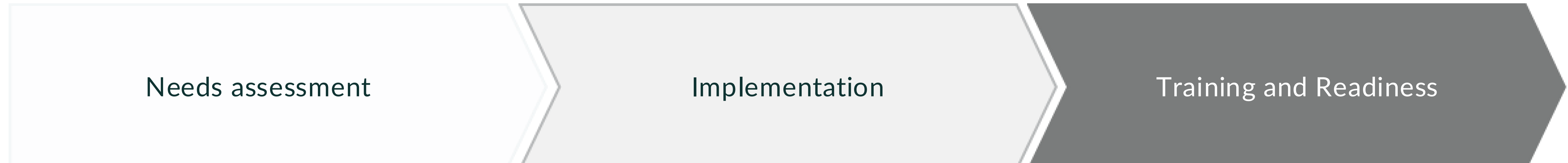


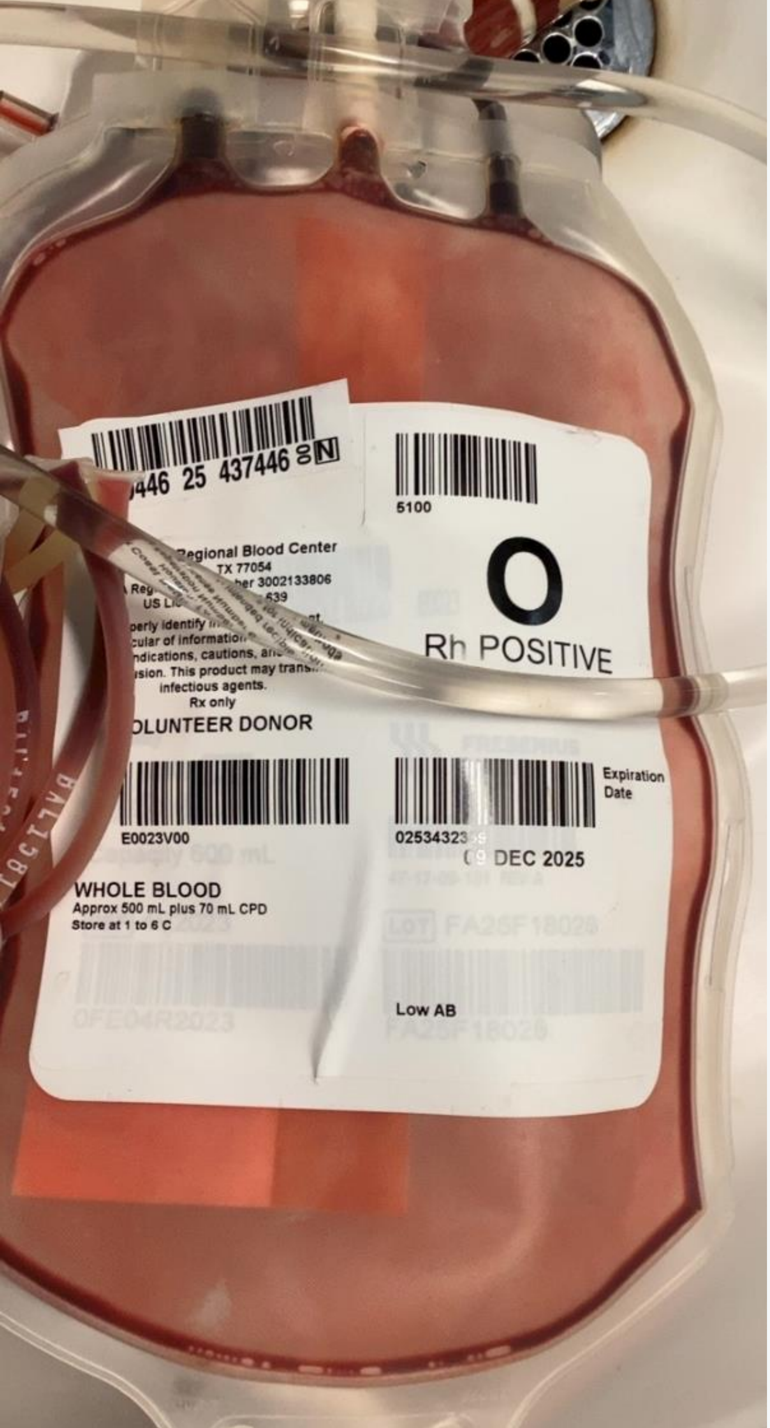
Slide credit, Dr. Paul Pepe

The program

Pearland Program Design and Rollout

Followed best practices from STRAC and local partners. (HCESD 48, Eric Bank)





Needs and Rollout.

Prehospital providers were given a completely subjective question in their EMS chart in 2021-2022.

- "Could this patient have benefitted....."
- Reviewed these calls and noted a minimum 12 units a year
  - Bags have 21-day shelf life at best, 17 bags a year minimum.

Starting a program highlights

- Creating a budget, approx. 9000-15000$ per set up, along with the cost of blood 900$ per admin.
- Ups and downs with local blood bank.
  - Contracts, credits and deliveries (not a regular business and not a hospital)

Products we give what we use

Whole blood.

- Speed (transport time is 12-20 minutes)
- Science (supports all in one package)
- Availability 👎

QinFlow device for heat and the Lifeflow for administration. (pressure bag as backup)

First Quarter 2025, Rollout

- In Dec 2024, Boundtree along with device partners, educated all three shifts (148 personnel) on the devices, setup, and administration.
- We were expecting Jan 1 rollout, due to contracts, we went live March 15th.
  - First admin, 3/28/25

Clinical Activation and Decision-Making

How this all works

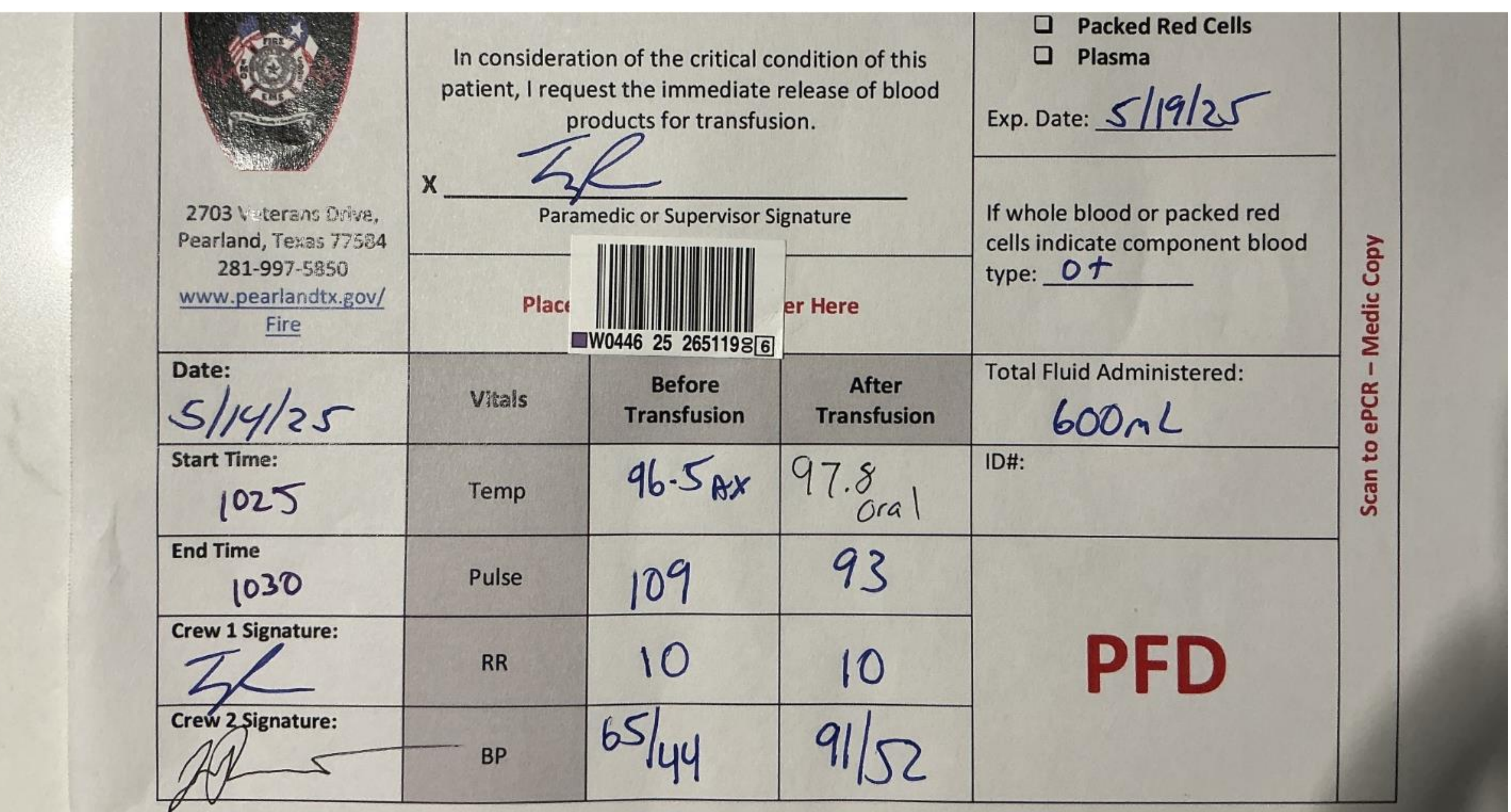
- We have one unit of O+LT Whole Blood in the City of Pearland
  - This is kept with the "Squad 1". He/She is our EMS Captain.
  - Blood is kept in a "fancy Igloo" with special ice packs. This maintains temperature for over 24hrs at 1-6 degrees Celsius. They have a system of swapping ice packs every 24 hours
  - There are temperature sensors and redundancy systems in place for temperature monitoring.
  - Along with the blood they have our "pump" the LifeFlow device, and our "heater" the Qinflow device.

EMS calls for service.

LACERATION
INJURY TRAUMA GASTROINTESTINAL
MAJOR NOSEBLEED OF GASTROSTOMY
LACERATION
HEMORRHAGE SPONTANEOUS SHOCK HEMATOMA
WOUND CIRCULATORY TRAUMATIC VASCULAR LACERATION INJURY OF....
ALL HEMORRHAGE ABRASION ANEMIA AND ABORTION
TAMPONADE CARDIAC THE DIALYSIS CATHETER ARREST
BLEEDING HEMOTHORAX LEAKAGE HEMATOMA
HEMORRHAGIC INJURY EPISTAXIS MELENA
HEMORRHAGE

Clinical Activation and Decision Making

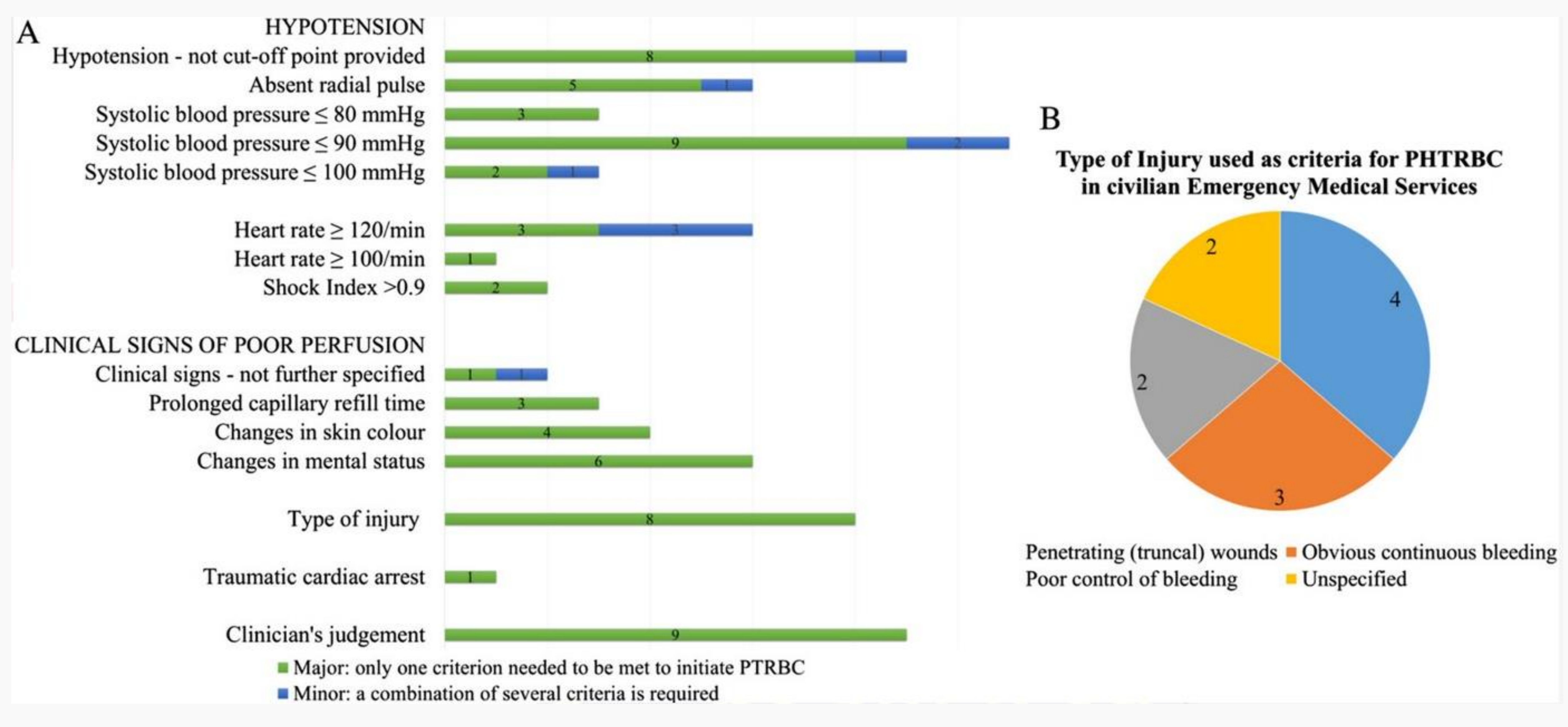
The Paperwork



A wristband is also applied to the patient; this is for the Texas Wristband Project and patient tracking.

Along with our typical EMS chart, by AABB standards, we are required to leave "transfusion records".

The protocol


A
HYPOTENSION
Hypotension - not cut-off point provided
Absent radial pulse
Systolic blood pressure ≤ 80 mmHg
Systolic blood pressure ≤ 90 mmHg
Systolic blood pressure ≤ 100 mmHg
Heart rate ≥ 120/min
Heart rate ≥ 100/min
Shock Index >0.9
CLINICAL SIGNS OF POOR PERFUSION
Clinical signs - not further specified
Prolonged capillary refill time
Changes in skin colour
Changes in mental status
Type of injury
Traumatic cardiac arrest
Clinician's judgement
8
1
5
1
3
9
2
2
1
3
3
1
2
1
1
3
4
6
8
1
9
Major: only one criterion needed to be met to initiate PTRBC
Minor: a combination of several criteria is required
B
Type of Injury used as criteria for PHTRBC in civilian Emergency Medical Services
2
4
2
3
Penetrating (truncal) wounds
Obvious continuous bleeding
Poor control of bleeding
Unspecified

Blood Product Administration

Criteria:

Any patient presenting in hemorrhagic shock whose clinical course may be improved with the use of blood products:

- **Trauma Transfusion Criteria**

Blood is indicated for adult trauma (blunt or penetrating) with a known or presumed source of bleeding:

- **Adult: Any of the following are a qualifier for blood products**
    - Systolic blood pressure <70 mmHg
        - OR
    - Heart rate >110 and SBP <90
        - OR
    - EtCO2 < 25
- **Pediatric**: Systolic blood pressure <70 mmHg + (age x 2)
- High suspicion from Paramedic provider and vitals cannot be readily obtained
- Witnessed traumatic arrest, Definitive loss of pulse for < 10 minutes prior to arrival of first unit

- **Medical Transfusion Criteria**

Obvious source of bleeding (gastrointestinal hemorrhage, vaginal bleeding, hemodialysis AVfistula/AV-graft bleeding) with one of the following:

- **Adult: Any of the following are a qualifier for blood products**
    - Systolic blood pressure <70 mmHg
        - <u>OR</u>
    - Heart rate >110 and SBP <90
        - <u>OR</u>
    - EtCO2 < 25
- **Pediatric**: Systolic blood pressure <70 mmHg + (age x 2)
- High suspicion from Paramedic provider and vitals cannot be readily obtained
- Recent or witnessed cardiac arrest with etiology of known hemorrhage

Contraindications:

- History of prior transfusion reaction (relative)
- Refusal/non-consent for any reason, including religious objection
- Stable vital signs

Notes/Precautions:

- **If at any time you are uncertain regarding the administration of blood products for a patient contact OLMC**
- Understand that medications can affect the patient's coagulopathy (blood thinners) or can lower the patient's intrinsic heart rate (beta-blockers & calcium channel blockers)
- Pediatric Dosing: 10 ml/kg of blood product should be given as bolus no faster than 50 mLs/min. Contact OLMC for patients less than 28 days or 3 kg.

Fresh Frozen Plasma (FFP) and Packed Red Blood Cells (RBC's) in lieu of Whole Blood.

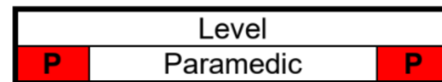
When whole blood is not available, at times the Pearland Fire department will stock component blood products. All other sections of the Blood product administration protocol will be still in effect with component blood administration. Blood components will be administered in the following order.

1. 1 unit of Liquid Plasma followed by 1 unit of packed red blood cells.
    a. There is no need to flush line or change tubing between blood products.

All transfusion reactions and documentation protocols should be followed as the same with whole blood.

Tranexamic Acid (TXA)

Indications



- Severely bleeding trauma patient OR GI/GU OR post-partum hemorrhage not amenable to conservative measures.
  AND
- Systolic blood pressure less than 90 mm/Hg due to hemorrhage.

All with expected requirement for massive transfusion.

Procedure

- Administer via slow IV infusion for hemorrhage.
- Nebulize 5 ml (0.5 g) x 2 for 1 g dose

Dosages

- Trauma patients
  - **Bolus of 2 grams over 10 minutes, slow IV/IO push**

- Epistaxis not amenable to conservative measures (OLMC)
  - **Nebulize 5 ml (0.5 g) x 2 for 1 g dose**

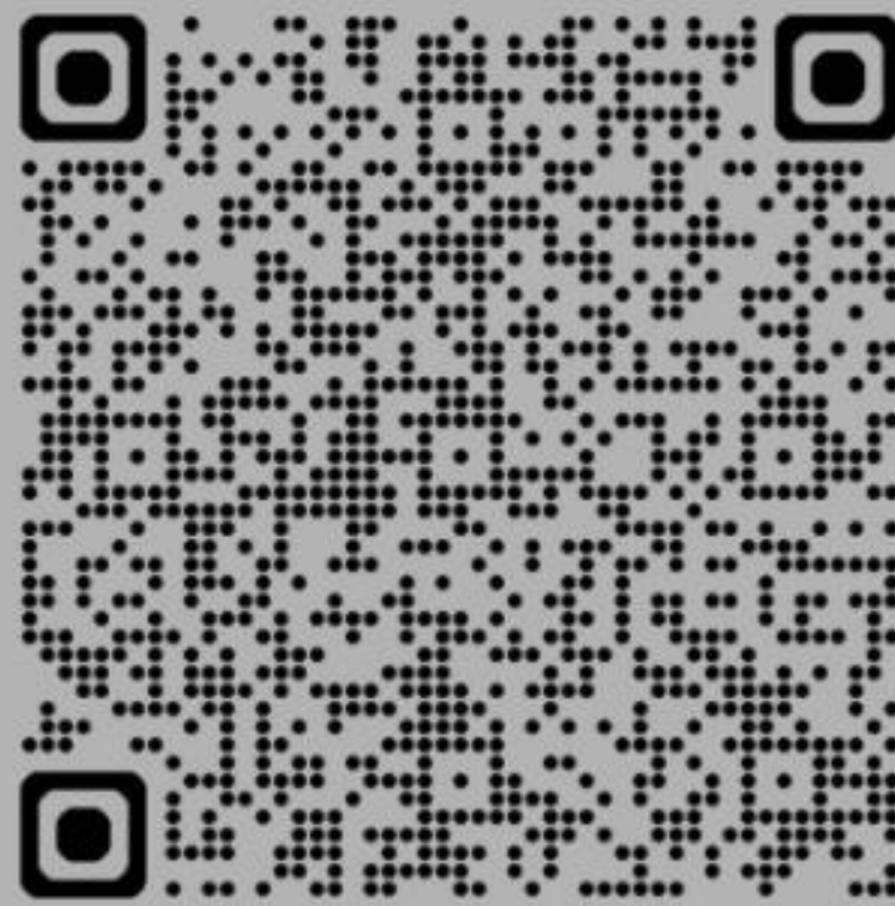
- Consider Nebulized use for hemorrhagic Post-Tonsillectomy (OLMC)

CIRCULAR OF INFORMATION

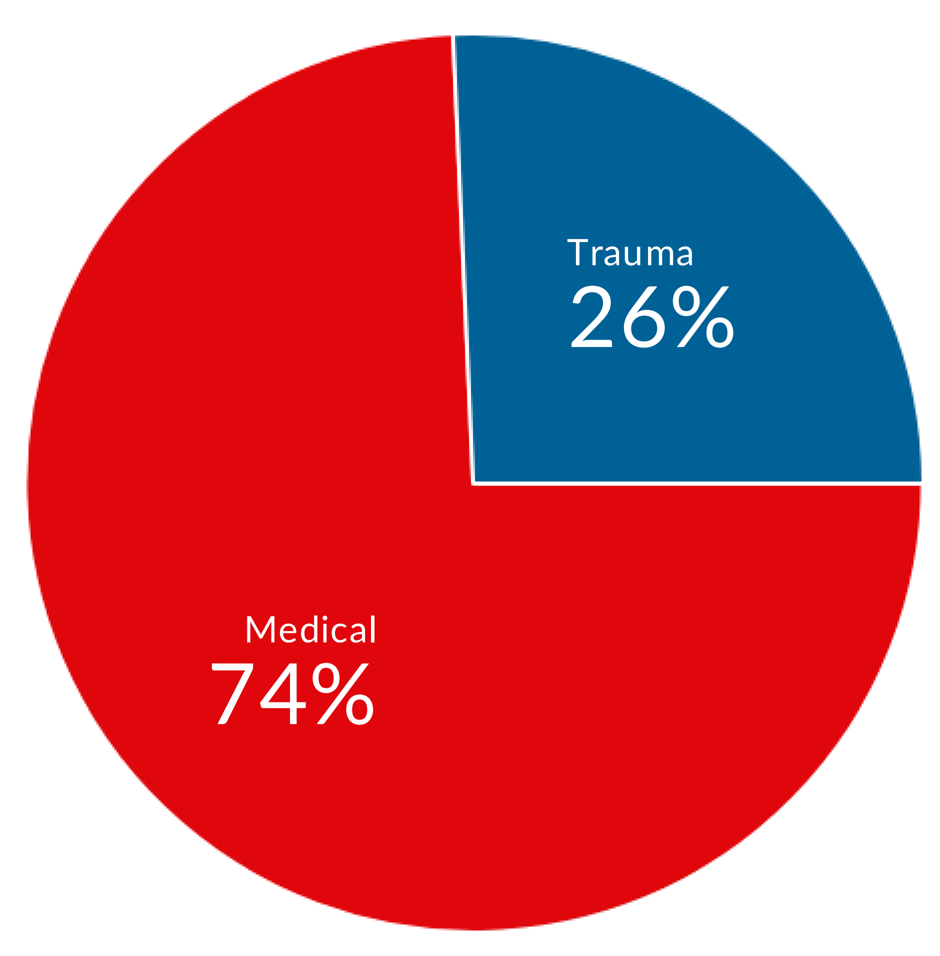
FOR THE USE OF HUMAN BLOOD AND BLOOD COMPONENTS

This *Circular* was prepared jointly by AABB, the American Red Cross, America's Blood Centers, and the Armed Services Blood Program. The Food and Drug Administration recognizes this *Circular of Information* as an acceptable extension of container labels. *Federal Law prohibits dispensing the blood and blood components described in this circular without a prescription.*

DO NOT COPY



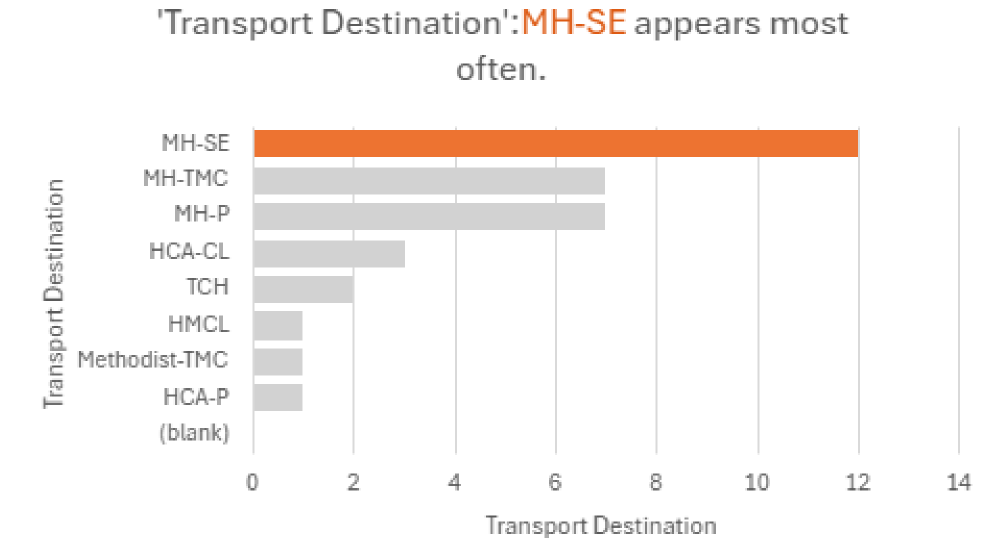
Medical versus Trauma



Program Start date: March 15, 2025

Elapsed time: 426 days (as of 5/15/26)

Average one administration every 7.89 days



Learning to deal with changes

Running out of LifeFlow devices (backordered).

Blood supply.

Whole blood vs component.

Learning to identify patients

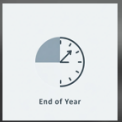
Crews had to be trained and understand need for heightened patient recognition.

Easy to miss opportunities.

As of 5/15/2026

We have administered to 55 patients.

Much higher than our expected 1 per month.



In our first year

We had over 40 patient administrations.

Program pitfalls and obstacles

- Immediate Protocol pitfalls
  - Issues with missed patients. "Missed opportunities"
  - Noted vitals would initially fit, then we would make the patient better before the blood arrived. (laying the patient supine)
- We found that getting SpO_2 and $ETCO_2$ first was the fastest way to identify patients in need of blood products.

Interesting encounters

Special Populations and Operations

- Pediatrics
  - Immediately, we had one that received blood products
  - GU bleed requiring several blood products after transfer to ER
- OB Patient
  - In the first six months, we had a Precenta Priva patient requiring blood products

- Pediatric protocols reviewed local with local partners & ER stakeholders prior to implementation.
  - We were thankful to already have this addressed in protocols.
- Thankfully again, we had already reviewed the risk/benefit for OB blood product administration prior to implementation.

Case Review

Perspective in a whole blood administration patient.

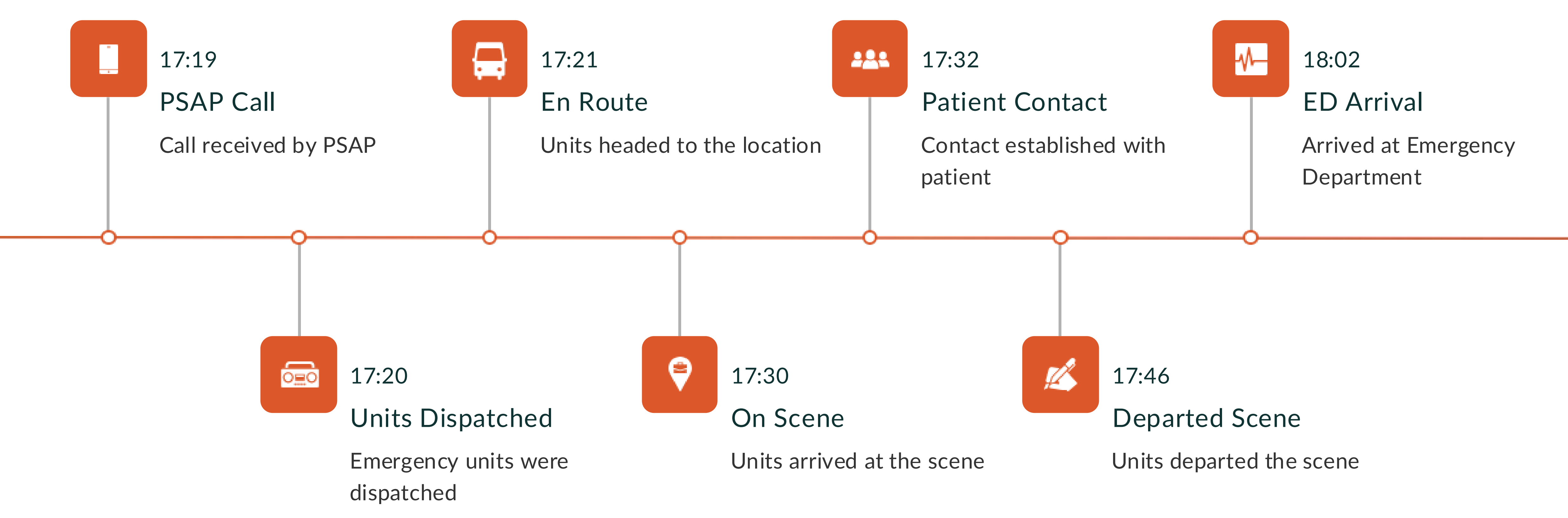
Gastrointestinal Hemorrhage

Case Overview

- **Patient Profile:** Adult male, mid-60s
- Presents with hematemesis. Patient reported that he has been experiencing heart burn and abdominal pain to peri-umbicalregion x3 days. Patient reported today that he began feeling dizziness and weakness since this morning when he woke up that has progressed throughout the day.
- Before 911 was called, he had 1 episode of vomiting blood

Response Timeline

Emergency service sequence of events



History & Clinical Presentation

Initial Patient Assessment

- Chief Complaint

  3 days of persistent heartburn and abdominal pain.

- Associated Symptoms

  Worsening dizziness, episodes of hematemesis, and rectal bleeding.

- Medical Background

  History of hypertension, hyperlipidemia, anxiety, and prior CVA
  (no deficits noted).

- Initial Assessment

  Patient is GCS 15; physical exam shows pallor and diaphoresis;
  clear airway and breath sounds.

- Vitals & Diagnostics

  Blood glucose level recorded at 128 mg/dL.

Let's get to the rest of the vitals....

Vital Sign Trend & Shock Index

Monitoring Hemodynamic Stability

Clinical Observation

Patient noted to be "critically unstable" and resources requested for blood administration.

Shock Index

1.4 - 1.8

indicating hemodynamic instability

Vital Signs

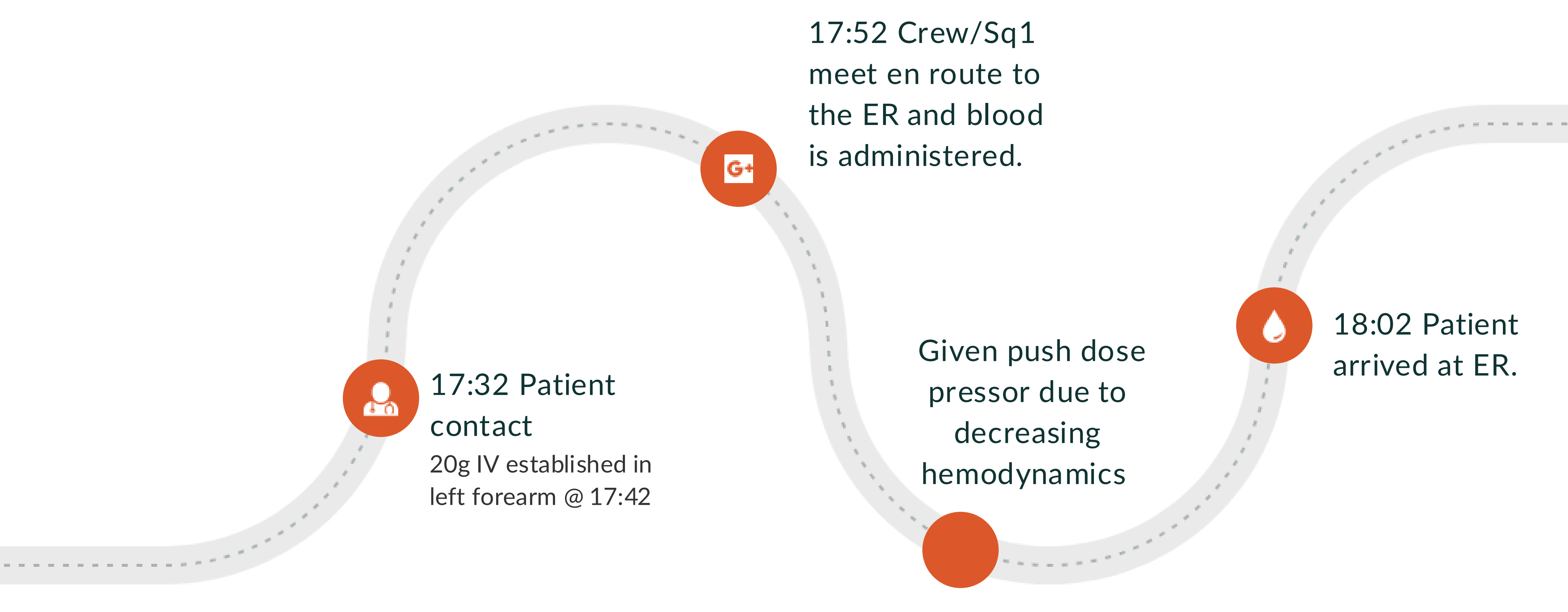
Side	POS	BP	Pulse	RR
L	Lay	87/55 A	121 R	16 R
L	Lay	87/62 A	110 R	18 R
L	Sit	63/53 A	109 R	18 R
L	Sit	58/37 A	105 R	
L	Sit	87/53 A	100 R	18 R
L	Sit	80/55 A	103 R	18 R

Patient met our blood adminstration protocol in several areas.

Vitals, ETCO2, Known or suspected source of bleeding.

Vascular Access & Fluid Resuscitation

Emergency Procedure Timeline



17:32 Patient contact

20g IV established in left forearm @ 17:42

17:52 Crew/Sq1 meet en route to the ER and blood is administered.

Given push dose pressor due to decreasing hemodynamics

18:02 Patient arrived at ER.

PEARLAND FIRE DEPARTMENT

FIRE EMS

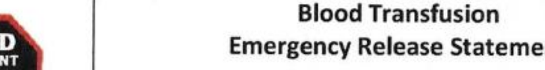
Est. 1966

2703 Veterans Drive,
earland, Texas 77584
281-997-5850
www.pearlandtx.gov/Fire

Blood Transfusion
Emergency Release Statement

In consideration of the critical condition of this patient, I request the immediate release of blood products for transfusion.

X [signature]
Paramedic or Supervisor Signature


Place Bloo W0446 26 209825 S

- ☑ **Whole Blood**
- ☐ **Packed Red Cells**
- ☐ **Plasma**

Exp. Date: 3-4-26

If whole blood or packed red cells indicate component blood type: O+

	Vitals	Before Transfusion	After Transfusion	
ate: 2-16-26				Total Fluid Administered: 600mL
tart Time: 1757	Temp	97.8	97.8	ID#: 20260613 6
nd Time 1805	Pulse	116	100	
rew 1 Signature: [signature]	RR	16	16	**PFD**
rew 2 Signature: [signature]	BP	87/55	80/55	

Scan to ePCR – Medic Copy

Disposition & Handoff

Summary of patient transition and clinical status

- Arrival at ED

  Patient arrived at the Emergency Department at 18:02.

- Clinical Status

  Patient exhibits marked improvement relative to initial presentation.

Discussion and Q&A

Thank you!

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RAC-R – Prehospital Blood, Beyond Trauma

The Hospital Course

& A Clinical Review

Continuing the same patient — ED arrival through discharge.

65-year-old man · hematemesis · hemorrhagic shock

June 2026

ED Arrival & Resuscitation

Picking up at the ED door: stabilize the airway, replace what's being lost.

Handoff from EMS

Arrived 18:02 having received 1 unit of prehospital blood and a push-dose pressor. Hemodynamically improved relative to the scene.

Arrival vital signs

HR 102 · BP 92/42. Persistent tachycardia and hypotension — still under-resuscitated on arrival.

Airway protection

Intubated in the ED for airway protection given ongoing hematemesis and aspiration risk.

Continued transfusion

Transfused to a total of 3 units of packed red blood cells, with improvement in hemodynamics.

Medical Management

Pharmacologic support alongside resuscitation and endoscopy

Medication	Role
Pantoprazole (PPI)	Acid suppression to stabilize clot at the bleeding site; transitioned to oral PPI before discharge.
Octreotide	Reduces splanchnic blood flow — started empirically for upper GI hemorrhage.
Metoclopramide	Prokinetic to clear gastric blood and improve visualization at endoscopy.
Azithromycin	Prokinetic to clear gastric blood and improve visualization at endoscopy.
Norepinephrine (low-dose, intermittent)	Short-term vasopressor support for hypotension during active resuscitation.

Diagnosis & Endoscopic Therapy

GI consulted urgently — endoscopy is both the diagnosis and the treatment

EMERGENT EGD — DAY 1

Dieulafoy lesion identified as the bleeding source.
Injected with epinephrine — temporizing hemostasis.

→

REPEAT EGD — DAY 2

Returned for second look at the oozing lesion.
Hemoclips applied — durable mechanical control.

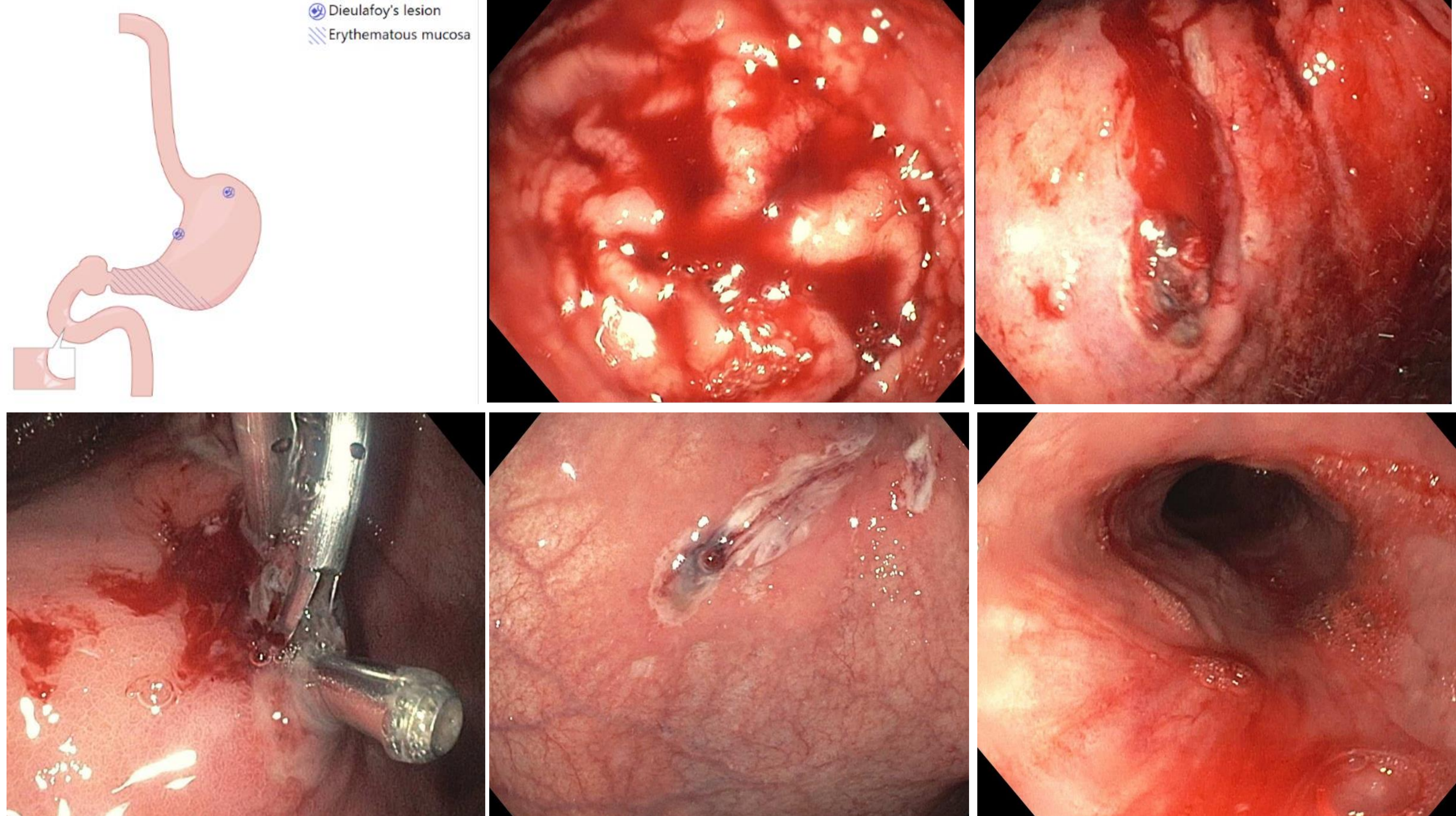
→

RESULT

Bleeding controlled; no further transfusion needed.
Cleared the path to extubation and the floor.

Teaching pearl

Epinephrine injection alone is temporizing — it slows bleeding but rebleeds often. Durable control here came from adding a mechanical method (clips) on the repeat exam. Combination therapy is the rule for a Dieulafoy lesion.



Dieulafoy's lesion
Erythematous mucosa

Hospital Course & Disposition

From intubated and bleeding to home in four days

2/16 — Admission
Intubated, resuscitated, emergent EGD with epinephrine injection.

2/17 — Repeat EGD
Hemoclips applied to the oozing lesion — definitive hemostasis.

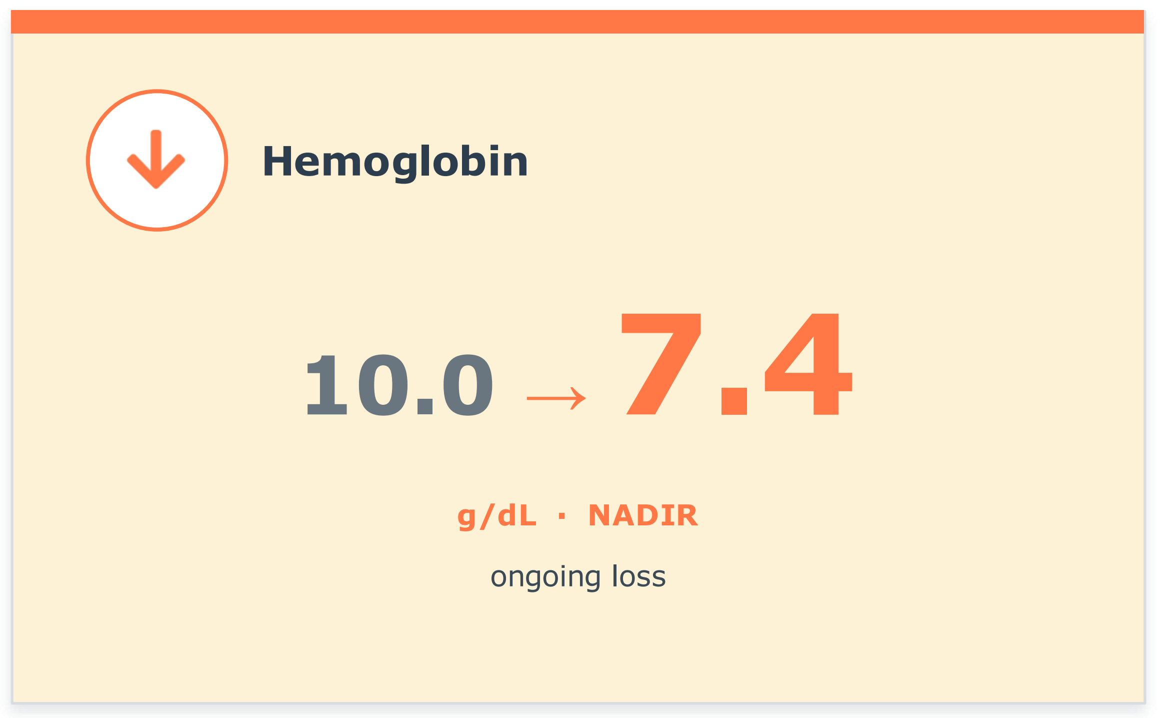
2/18 — Extubated
Extubated and transferred to the floor.

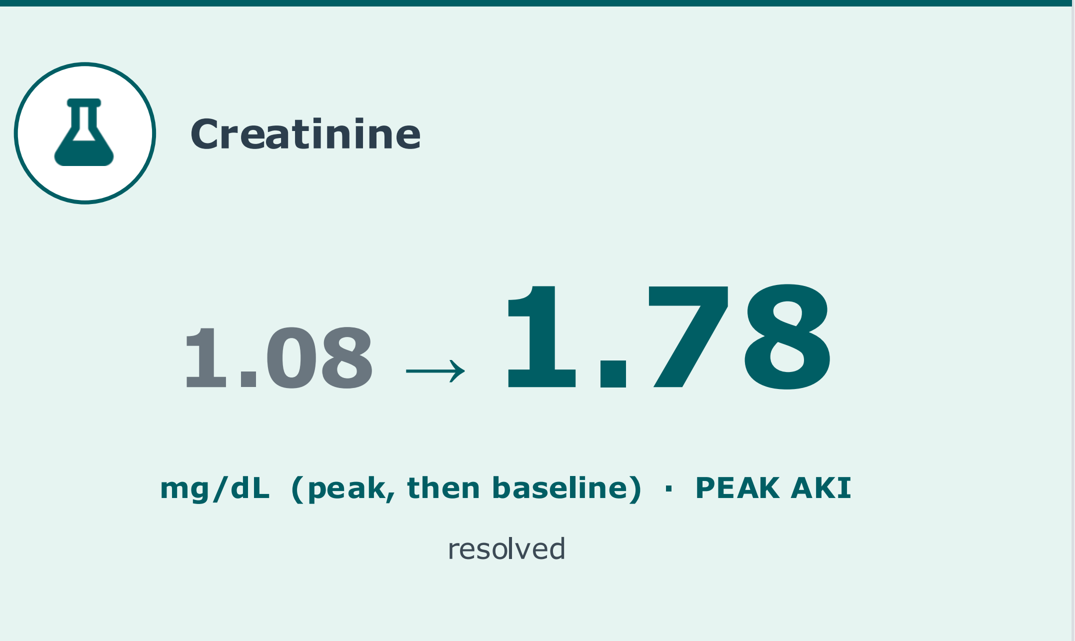
2/18–20 — Stepped down
Transitioned from IV to oral PPI; monitored for rebleeding.

2/20 — Discharged
Discharged home, hemodynamically stable.

Laboratory Snapshot

Two trends tell the story: ongoing blood loss and a kidney that felt the shock





The falling hemoglobin reflects continued bleeding and guided transfusion to response; the transient creatinine rise is a hypoperfusion (pre-renal) AKI that returned to baseline once bleeding was controlled and the patient was resuscitated.

Beyond Trauma: Blood for Medical Bleeding

Hemorrhagic shock kills the same way whether the source is an injury or a GI bleed — and guidance now reflects that.

Why it applies to medical bleeding

- Early blood improves survival in hemorrhagic shock — irrespective of etiology. (Coalition CPG, 2025)
- Minutes matter — prehospital blood is linked to better survival. (JAMA 2017; NEJM 2018)
- Whole blood appears safe and effective in non-trauma bleeding. (Am Surg 2023; Transfusion 2022)

Medical indications named in the guideline

- **★ GI bleeding**
- Ruptured ectopic pregnancy
- Peripartum hemorrhage
- Ruptured aortic aneurysm
- Ruptured AV fistula / graft
- Post-surgical bleeding
- Severe epistaxis
- Post-tonsillectomy bleeding

Guideline stance: support early blood for hemorrhagic shock regardless of etiology — GI bleeding is listed first among the medical indications. (Coalition CPG, 2025)

What the Evidence & Societies Say

Strong randomized data come from trauma; non-trauma use rests on physiologic rationale plus growing observational evidence.

Evidence to date

- Trauma: prehospital plasma reduced mortality (PAMPer, NEJM 2018); combat prehospital blood linked to better survival (JAMA 2017).
- Non-trauma: whole blood appears safe and effective in non-trauma hemorrhage (Am Surg 2023).
- Regional civilian programs already transfuse for non-traumatic bleeding (San Antonio, Transfusion 2022).
- Caveat: high-level randomized evidence is strongest in trauma; non-trauma use is still maturing.

Professional guidance

- NAEMSP position statement (2025): blood components / low-titer O whole blood first-line for traumatic life-threatening bleeding; active reaction monitoring.
- THOR–AABB Working Party (2022): four-pillar program framework, including handover to the hospital team.
- Prehospital Blood Transfusion Coalition CPG (2025): civilian EMS; medical hemorrhage included; a living document.
- AABB Standards for out-of-hospital transfusion (2025): quality, safety, and traceability across the continuum of care.

Receiving the Prehospital-Blood Patient

What should happen once they reach the ED — the hospital side of the handoff.

1

Structured handoff & reconcile

Take the blood-bag segments, transfusion record, unit numbers and times given; reconcile the total volume into the hospital chart.

THOR–AABB 2022 · Coalition CPG 2025

2

Loop in the blood bank (traceability)

Link the EMS-issued unit to the patient, complete the transfusion record, reconcile/replace units, and report any adverse events.

AABB Standards 2025 · Coalition CPG 2025

3

Continue balanced resuscitation → source control

Resuscitate to physiologic response, activate MTP if bleeding continues, then definitive control (endoscopy / IR / surgery). The field unit was a bridge.

Coalition CPG 2025

4

Post-transfusion surveillance

Watch for transfusion reactions, citrate-related hypocalcemia, hyperkalemia and hypothermia; recheck hemoglobin and coagulation.

Coalition CPG 2025

Rh & alloimmunization follow-up

If an Rh-negative female of childbearing potential received Rh-positive blood, involve transfusion services ± maternal-fetal medicine. No acute RhoGAM.

Coalition CPG 2025 · Crowe 2024

Sources

VALIDATED REFERENCES

Peer-reviewed literature and professional-society guidance — each checked against its original source.

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6 Sperry JL, et al. Prehospital plasma during air medical transport in trauma (PAMPer). N Engl J Med. 2018;379:315–326.

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KEY TAKEAWAYS

One patient, one team, one through-line

Prehospital

- Recognize hemorrhagic shock early — shock index plus a known or suspected bleeding source.
- Blood beats crystalloid, and minutes matter; the prehospital unit bought real time here.
- Expect airway compromise with ongoing hematemesis — transport fast and pre-notify the ED.

In-Hospital

- Resuscitate to response, not to a fixed number; watch for transient (pre-renal) AKI.
- Endoscopy is diagnostic and therapeutic — use combination hemostasis for a Dieulafoy lesion.
- Anticipate rebleeding; durable control is what enabled extubation and a 4-day discharge.

The through-line: scene recognition + prehospital blood → ED resuscitation → endoscopic hemostasis → home on day 4.

Thank You!