

Whole Blood

Pasta Water

Pre-Hospital Whole Blood Administration

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Potential Conflicts of Interest

- ◆ I am medical director for the following pre-hospital agencies:
Kansas City Fire Department, Harrisonville EMS, Lee's Summit Fire Department, AMR Independence, Healthstar one
- ◆ Otherwise, no financial interests related to the acquisition or dispensation of blood products

Objectives

- ◊ Discuss physiology behind using whole blood for resuscitation
- ◊ Discuss importance of early blood-based resuscitation to patient outcomes
- ◊ Provide an overview of pre-hospital whole blood logistics

Case 1

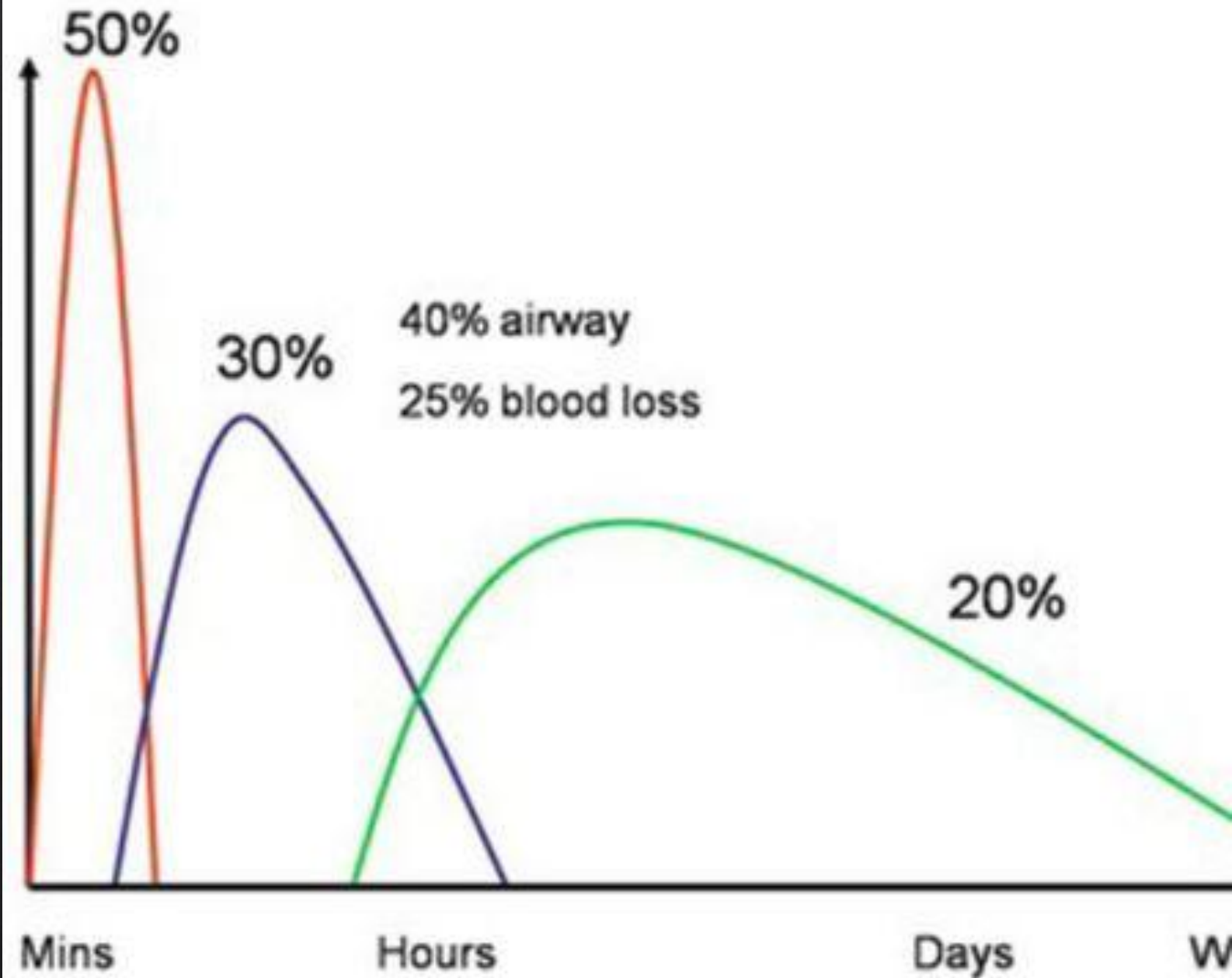
- ◆ 41-year-old male attacked by his large breed dog in his home
- ◆ Bilateral arms mauled with heavy bleeding controlled by tourniquet, abdominal puncture wounds
- ◆ Massive blood loss on scene-direct quote from the paramedic “all of his blood was outside his body on the floor”
- ◆ Patient had a cardiac arrest in front of providers
- ◆ CPR provided, ROSC questionably obtained in the field with thready pulses at rate of 141
- ◆ Trauma activation at the hospital, mass transfusion activated
- ◆ Patient sustained pulses after blood administration and went to the OR
- ◆ From time of patient contact to leaving scene: 20 minutes
- ◆ Time to hospital: 10 minutes
- ◆ Time to transfer of care to hospital staff: 3 minutes
- ◆ Total time in EMS care: 33 minutes

Case 2

- ◇ 27-year-old female who is 17 weeks pregnant, dropped off at the fire station with a gunshot wound in her leg with an improved tourniquet in place
- ◇ Patient is ashen, pale, clammy and oozing from her leg, as well as copiously bleeding from Vagina
- ◇ HR 172 (very high); RR 30; unable to obtain blood pressure (HR > BP is a predictor of badness)
- ◇ Transport time 18 minutes
- ◇ Time to care transferred to hospital staff: 20 minutes
- ◇ Total time in EMS care: 20 minutes



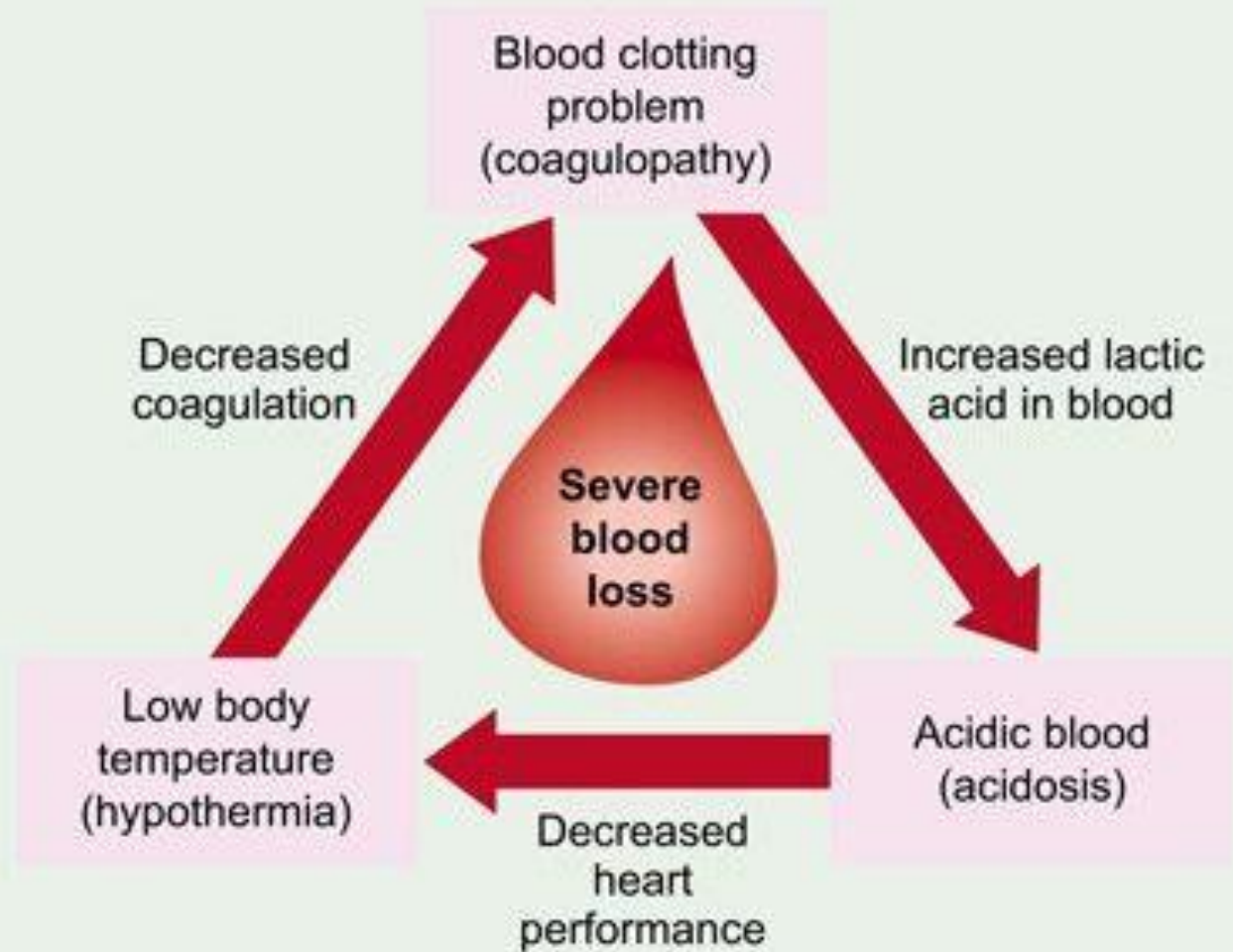
Death from Trauma





- ❖ Crystalloid fluids -> Coagulopathy
- ❖ Coagulopathy -> increased risk of death

Trauma Triad of Death





Why do we continue to give crystalloid
when we know it just makes things worse

Because right now.... We don't have any other options in the field

Carrying and administering whole blood pre-hospital can address multiple issues

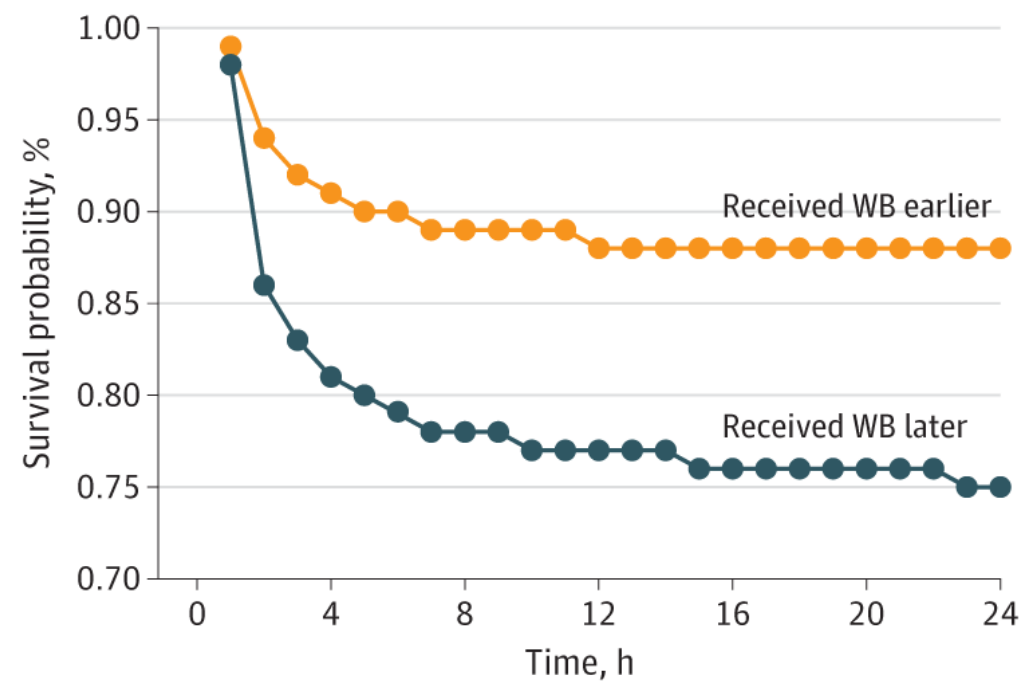
1. Time: we can give it to patients much faster- optimizing time to resuscitation and maximizing amount of resuscitation of patients
2. Reduces us giving them acidotic, diluting fluids
3. Decreases heat loss because will be given with a warmer, which our fluids are currently not done
4. Whole blood in the field = 3 blood components in the hospital: PRBCs, Plasma, Cryo

TABLE 5 Prehospital, arrival vital signs, mortality, massive transfusion rates, transfusion volumes upon arrival to emergency department, and LOS transfusion volumes for propensity-matched group

	PHT (<i>n</i> = 58)	NT (<i>n</i> = 156)	<i>p</i>-value
Median prehospital nadir SBP (IQR)	75 (62–83)	74 (66–82)	.91
Median prehospital HR (IQR)	113 (90–128)	93 (79–125)	.03
Median prehospital SI (IQR)	1.5 (1.2–2.0)	1.4 (1.1–1.8)	.051
Median arrival SBP, mmHg (IQR)	92 (81–114)	86 (77–100)	.07
Median arrival HR, mmHg (IQR)	113 (92–130)	106 (83–128)	.87
Median arrival SI (IQR)	1.2 (0.87–1.48)	1.21 (0.9–1.5)	.66
Median Delta SI (IQR)	−0.38 (−0.08 to −0.72)	−0.18 (0.02 to −0.48)	.04
Death in ED, % (<i>n</i>)	0.0 (0)	7.1 (11)	.04
Death in 6 h, % (<i>n</i>)	5.3 (3)	14.1 (22)	.08
Death in 24 h, % (<i>n</i>)	17.2 (10)	23.1 (36)	.36
Hospital death, % (<i>n</i>)	13.8 (8)	25 (39)	.08
CAT3+ transfusion requirement, % (<i>n</i>)	53.4 (31)	60.3 (94)	.37
MT (>10 U in 24 h), % (<i>n</i>)	61.5 (16)	48.7 (75)	.23
Median arrival transfusion volume, ml (IQR)	1300 (0–2000)	1975 (1000–3175)	<.01
Median LOS transfusion volume, ml, (IQR)	2825 (1550–5500)	2000 (1300–4000)	.048

Abbreviations: CAT3+, critical administration threshold of >3 U of product in 1 h; ED, emergency department; HR, heart rate; IQR, interquartile range; LOS, length of stay; MT, massive transfusion (>10 U of product in 24 h); NT, no prehospital transfusion; PHT, prehospital transfusion; SBP, systolic blood pressure; SI, shock index.

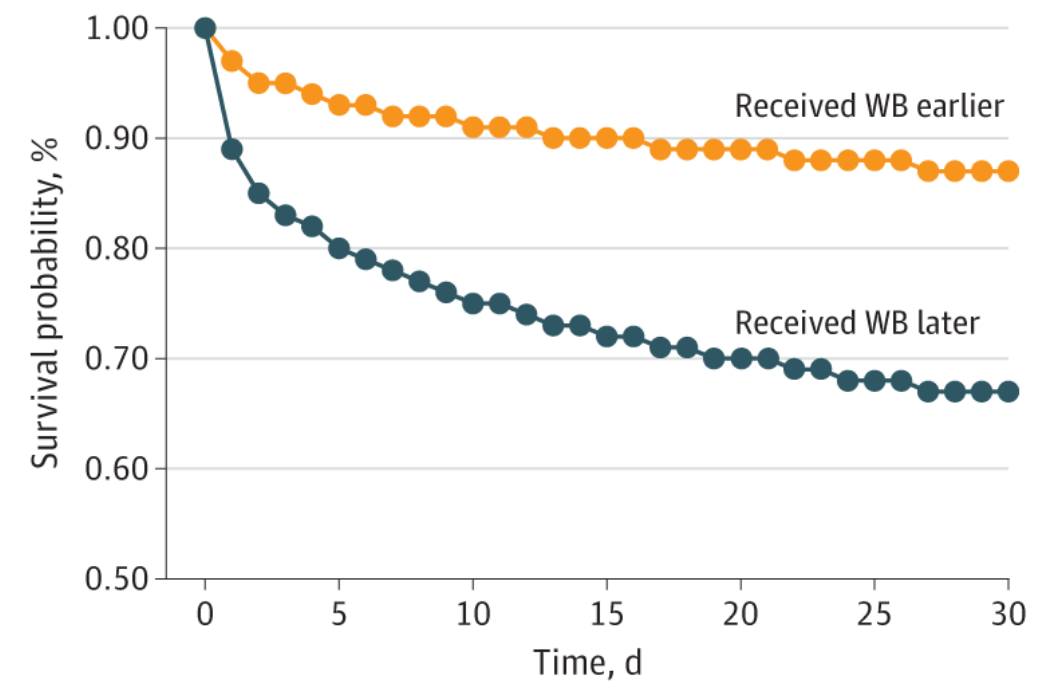
A Survival within 24 h after WB transfusion



No. at risk

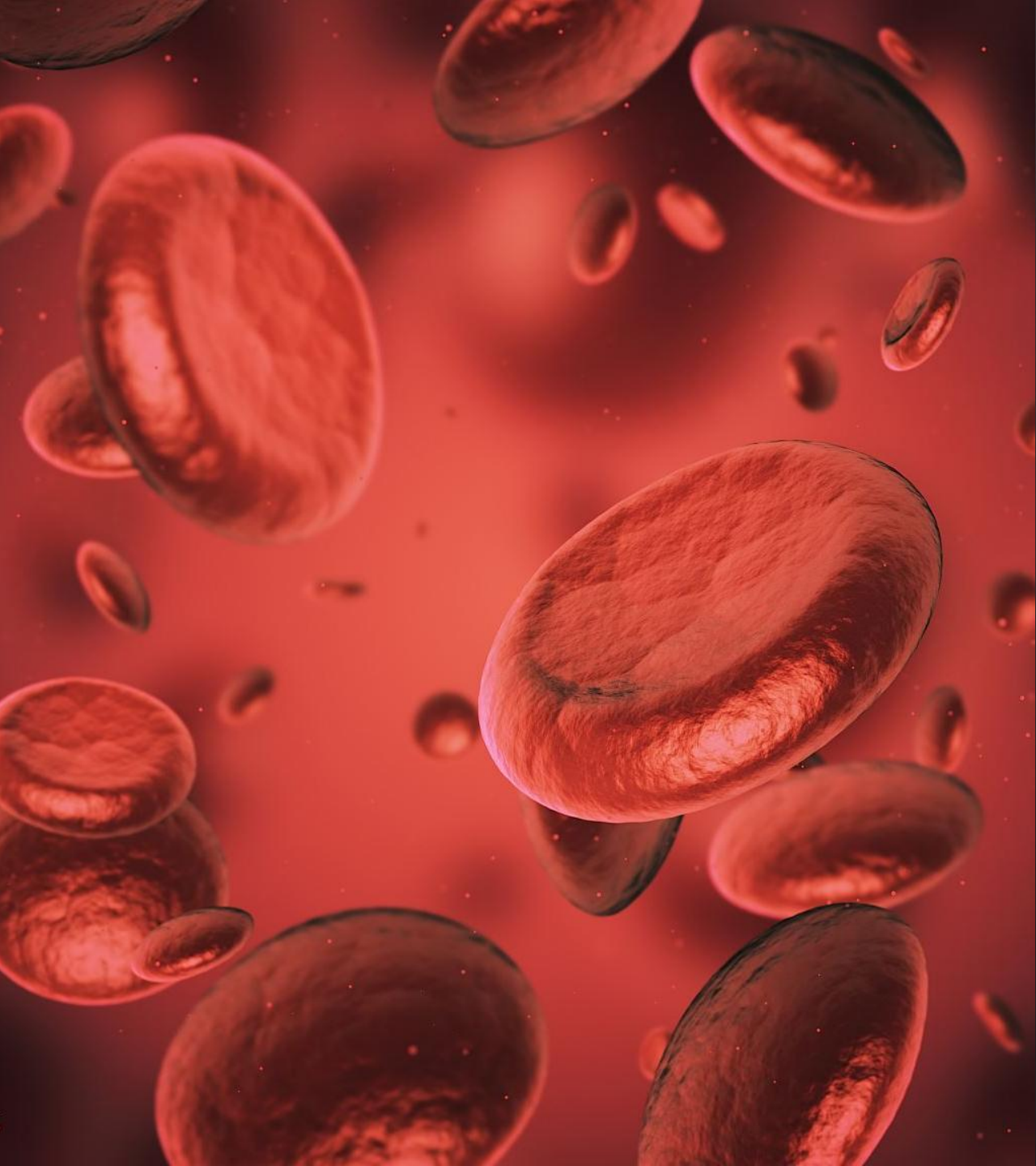
Received WB earlier	1238	1140	1122	1117	1114	1109	1106
Received WB later	156	15	8	7	7	5	5

B Survival within 30 d of WB transfusion



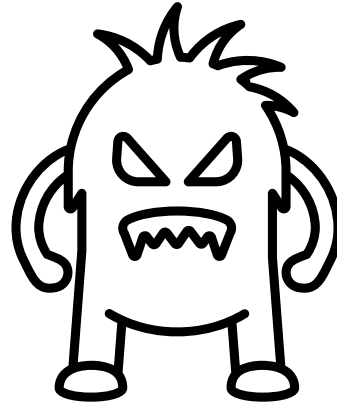
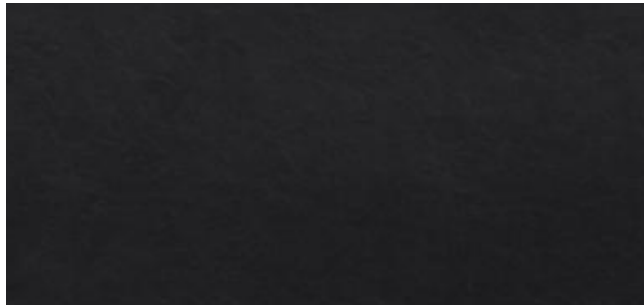
No. at risk

Received WB earlier	1238	1098	1087	1081	1072	1069	1067
Received WB later	156	114	110	108	107	105	105

A detailed microscopic illustration of numerous red blood cells (erythrocytes) floating in a fluid medium. The cells are depicted as biconcave discs with a reddish-orange hue and a textured surface. They are scattered across the frame, with some in sharp focus and others blurred in the background, creating a sense of depth. The overall color palette is dominated by warm reds and oranges.

Why low titer O+ whole blood and not O-?

- ◊ Because there simply isn't enough O negative blood
- ◊ Safe even in children and women of childbearing age



- Our regional guidelines will follow the pre-hospital clinical coalition guidelines for prehospital civilian emergency medical services
- Blood stored in designated coolers designed for the purpose and continuously monitored with a temperature stick that transmits to dispatch to notify when nearing out of range
- Blood checked and inspected daily
- Blood exchanged with hospitals who are designated exchange points when within X time frame of expiration (usually 1 week) so that it gets used

Going back to our cases

41 year-old-male
mauled by dog

- ◇ Could have gotten blood 30 minutes earlier

27-year-old female, 17
weeks pregnant, shot,
and bleeding vaginally

- ◇ Could have gotten blood 20 minutes earlier

Both of these patients died

What could have been their
outcomes if we had been able to
give them blood that much earlier?

“

How can I help with this as
a blood bank manager?

”

Take Home Points

1. Whole blood is better for resuscitating patients who are losing blood on all counts
2. Low titer O+ whole blood prehospital is feasible and being done in other areas
3. We are taking this very seriously and rolling it out slowly to avoid wastage and other issues
4. Blood is going to where it needs to go most
5. You can help us do this easily and successfully by being helpful as an exchange site, with paperwork, and with stocking and ordering whole blood for us

Sources

- ◇ [https://www.strac.org/wp-content/uploads/2024/02/Prehospital whole blood reduces early mortality in patients with hemorrhagic shock.pdf](https://www.strac.org/wp-content/uploads/2024/02/Prehospital_whole_blood_reduces_early_mortality_in_patients_with_hemorrhagic_shock.pdf)
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