



Current
Controversies
in
Pre-hospital
Resuscitation
of
Haemorrhagic
Shock

Dr Nick Crombie
Birmingham, UK

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“Trauma is the leading cause of death in the under-45 population in the US and across the world”

“HIV, malaria and TB combined”



how do i treat traumatic haemorrhage

Images

Videos

News

Books

Maps

Flights

About 5,510,000 results (0.47 seconds)



how do i treat malaria

Images

At home

Severe

Today

How

About 64,400,000 results (0.45 seconds)



kim kardashian

News

Images

Videos

Family

Age

Pe

About 263,000,000 results (0.48 seconds)



how do i treat cancer

Images

Stomach

Oral

Bone

Uteru

About 2,800,000,000 results (0.36 seconds)





Adults (>16) with traumatic injury and hypotension (defined as systolic pulse <90mmHg or absent radial pulse, believed to be due to traumatic haemorrhage)



Patients were enrolled if they had at least one episode of hypotension (<90mmHg) or tachycardia (>108), or any episode of severe hypotension (<70mmHg)

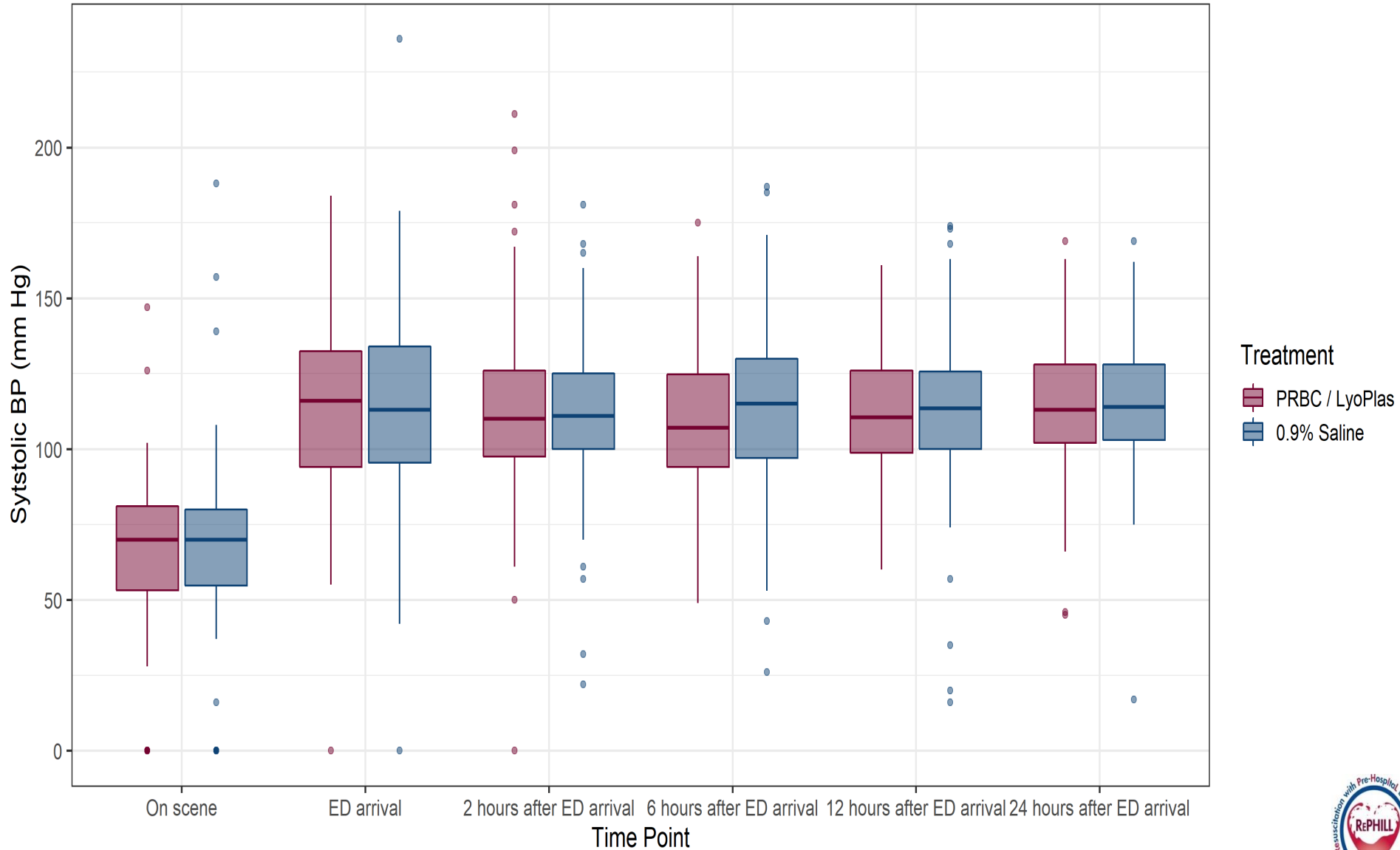
COMBAT

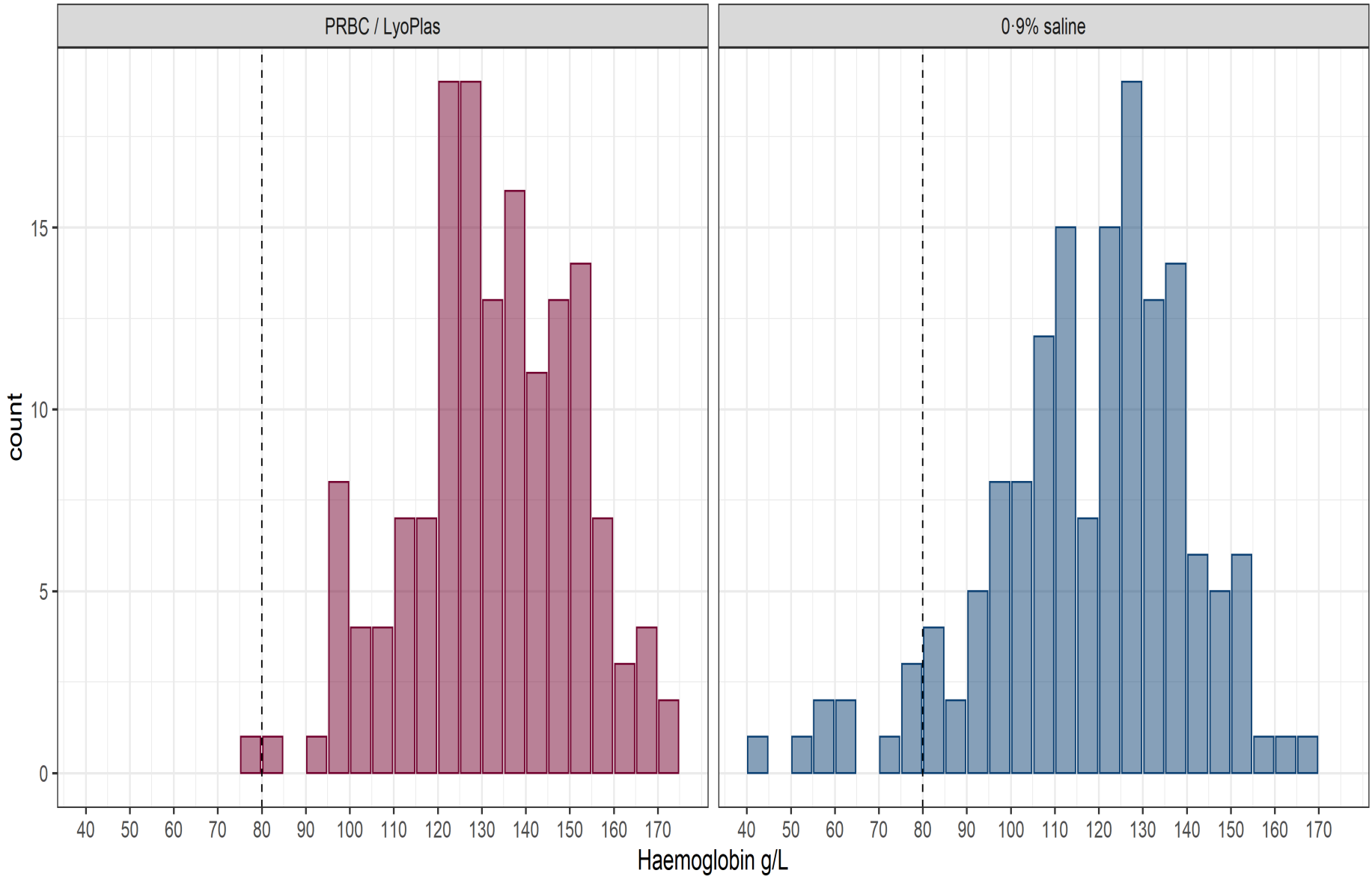
Severely injured patients in presumed hemorrhagic shock were enrolled .. Based on their vital signs (combination of BP and HR)



Patient (of any age) who has suffered a traumatic injury attended by a participating Air Ambulance Service (AAS) clinical team who requires pre-hospital blood transfusion to treat major traumatic haemorrhage

Physiology: Systolic Blood Pressure







BLED



BLEEDING



UK REBOA TRIAL



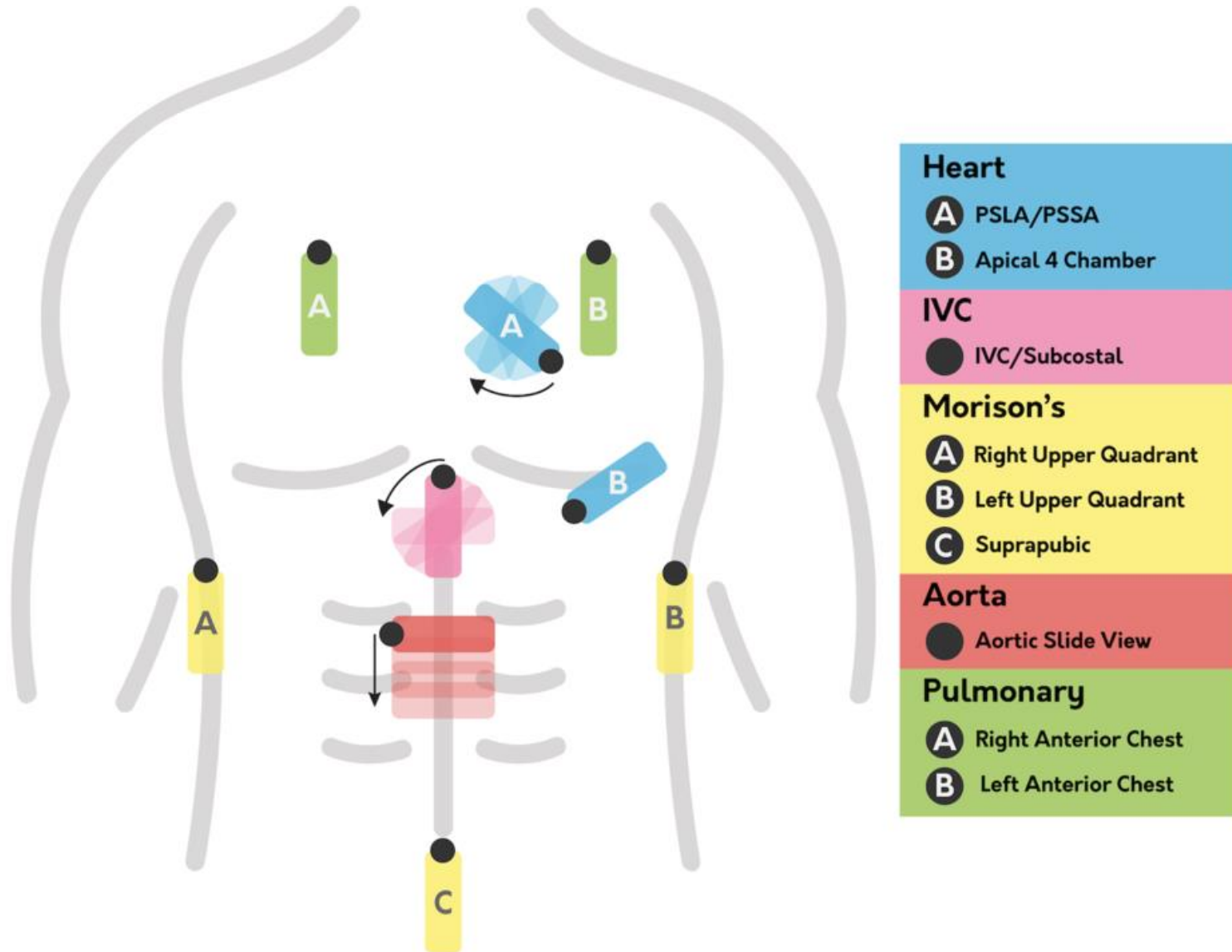
REBOA increased mortality at 90 days and at all interim time points.

REBOA increased deaths due to bleeding at 3 hours and 90 days.

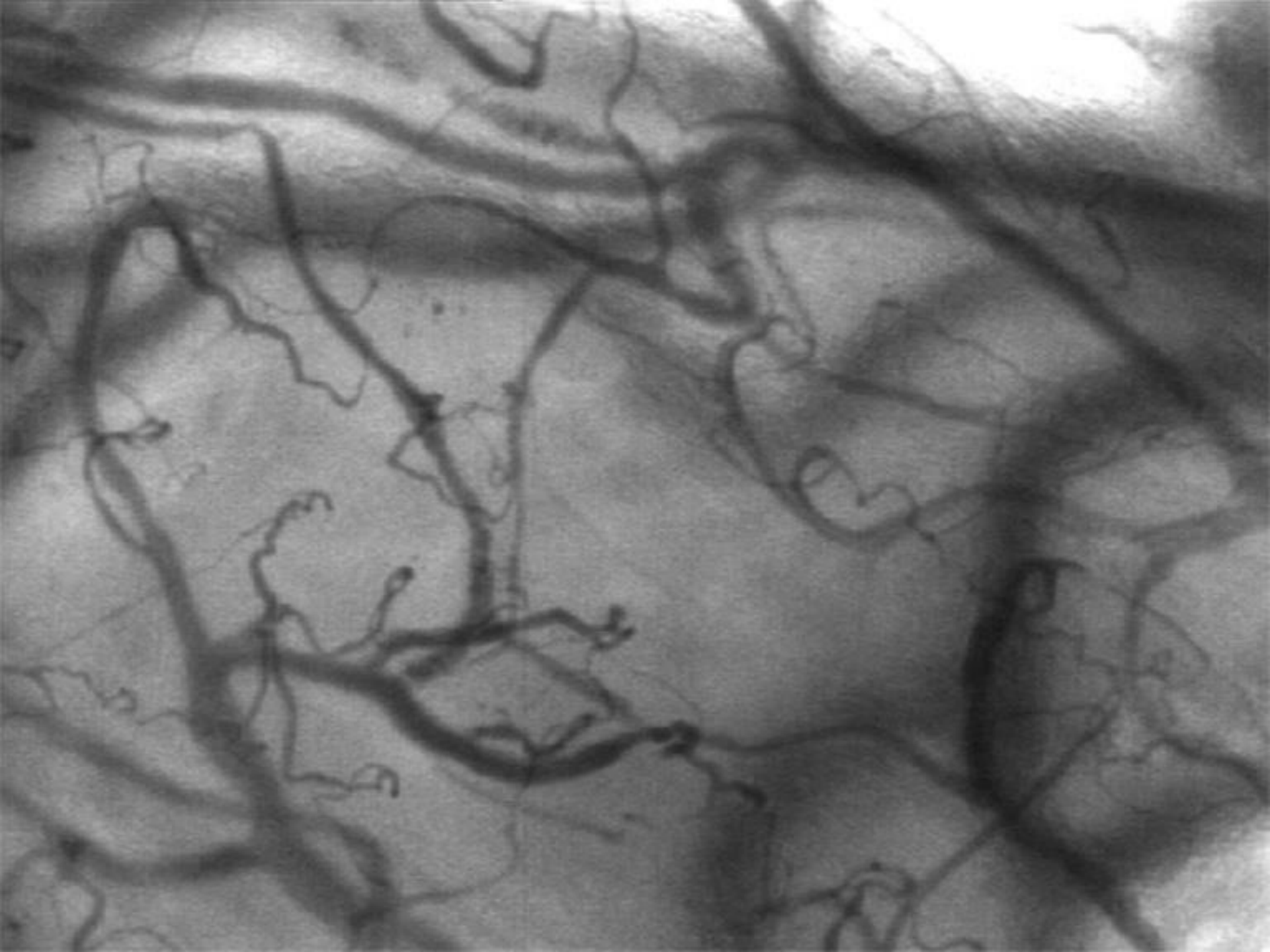
REBOA substantially delayed time to definitive haemorrhage control.

Play ▶

The RUSH Protocol Scan Locations



*Probe orientation is based on a single dot location set to the left-upper screen. For this reason, for cardiac imaging probe orientation is based on emergency medicine preference.





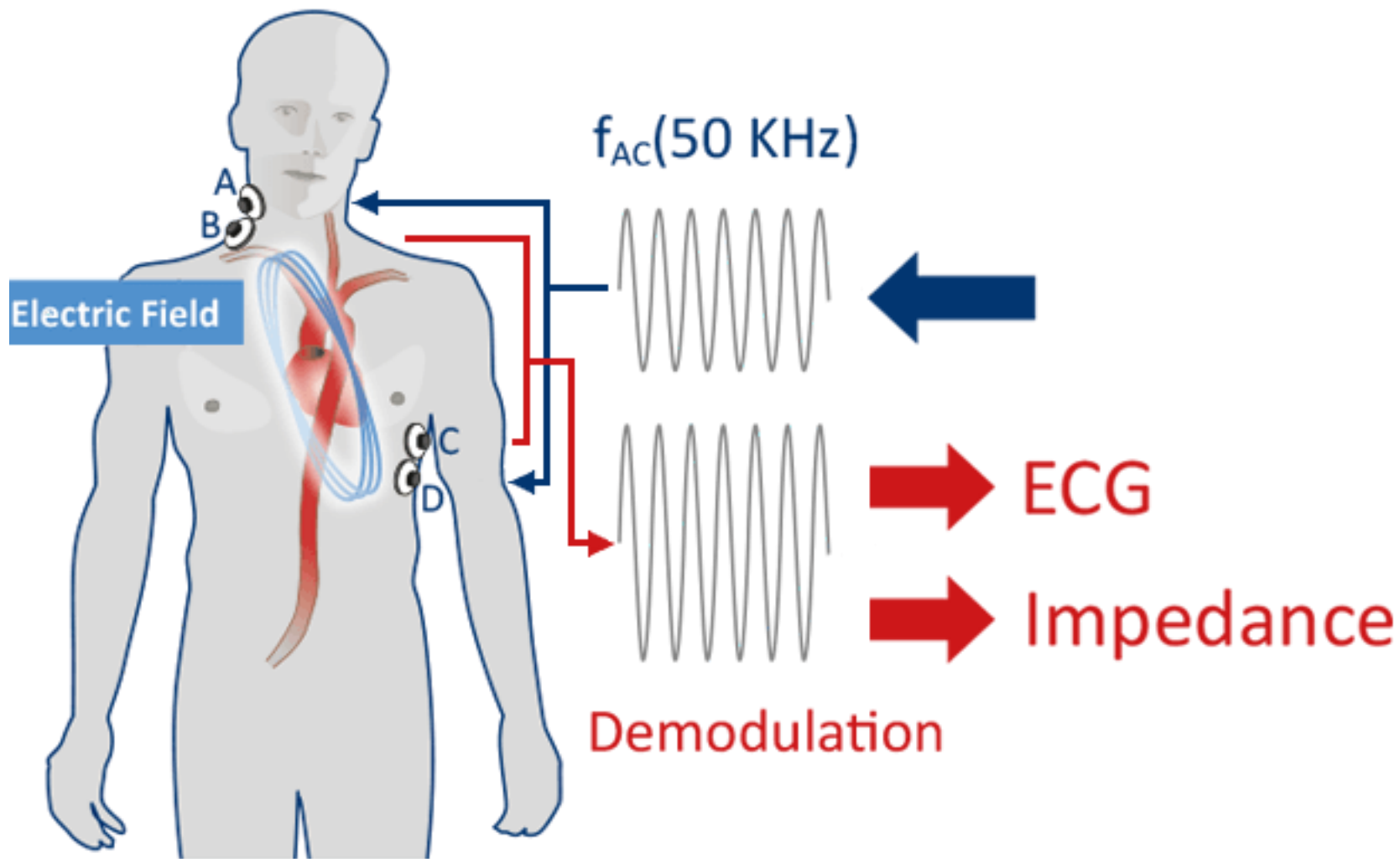


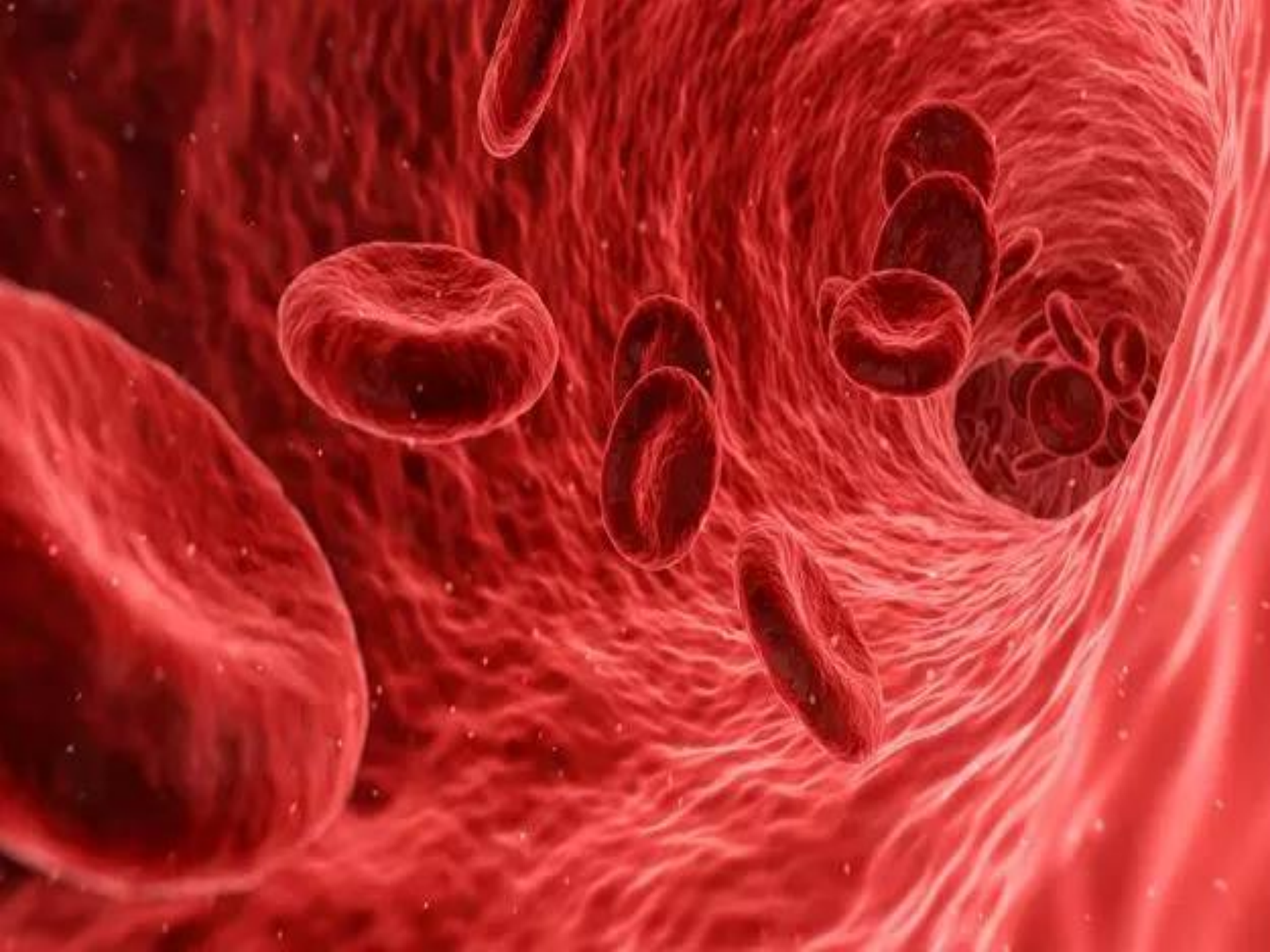
ICON



DEPHE MEDICA

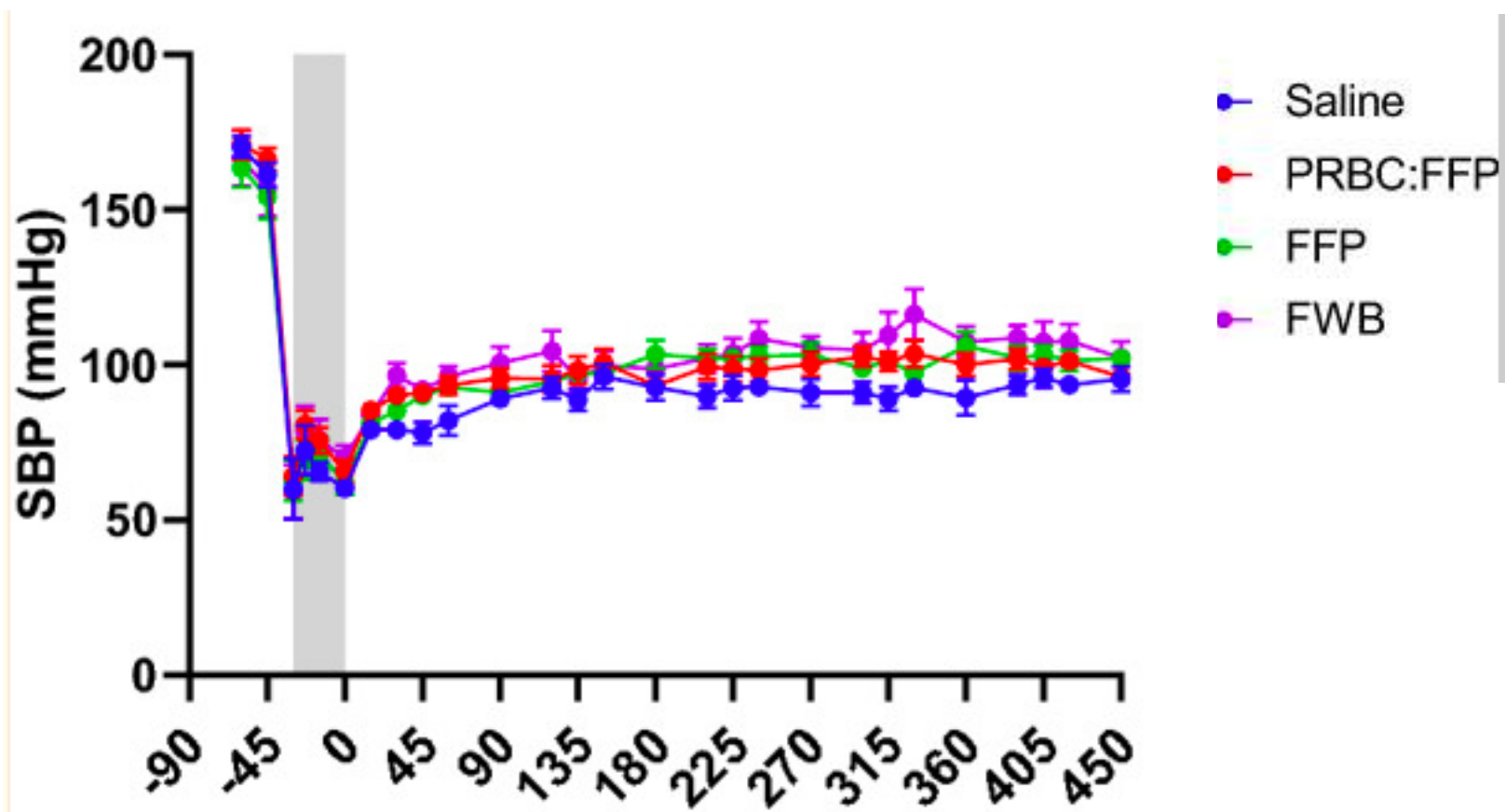
CALL 0800 111 111

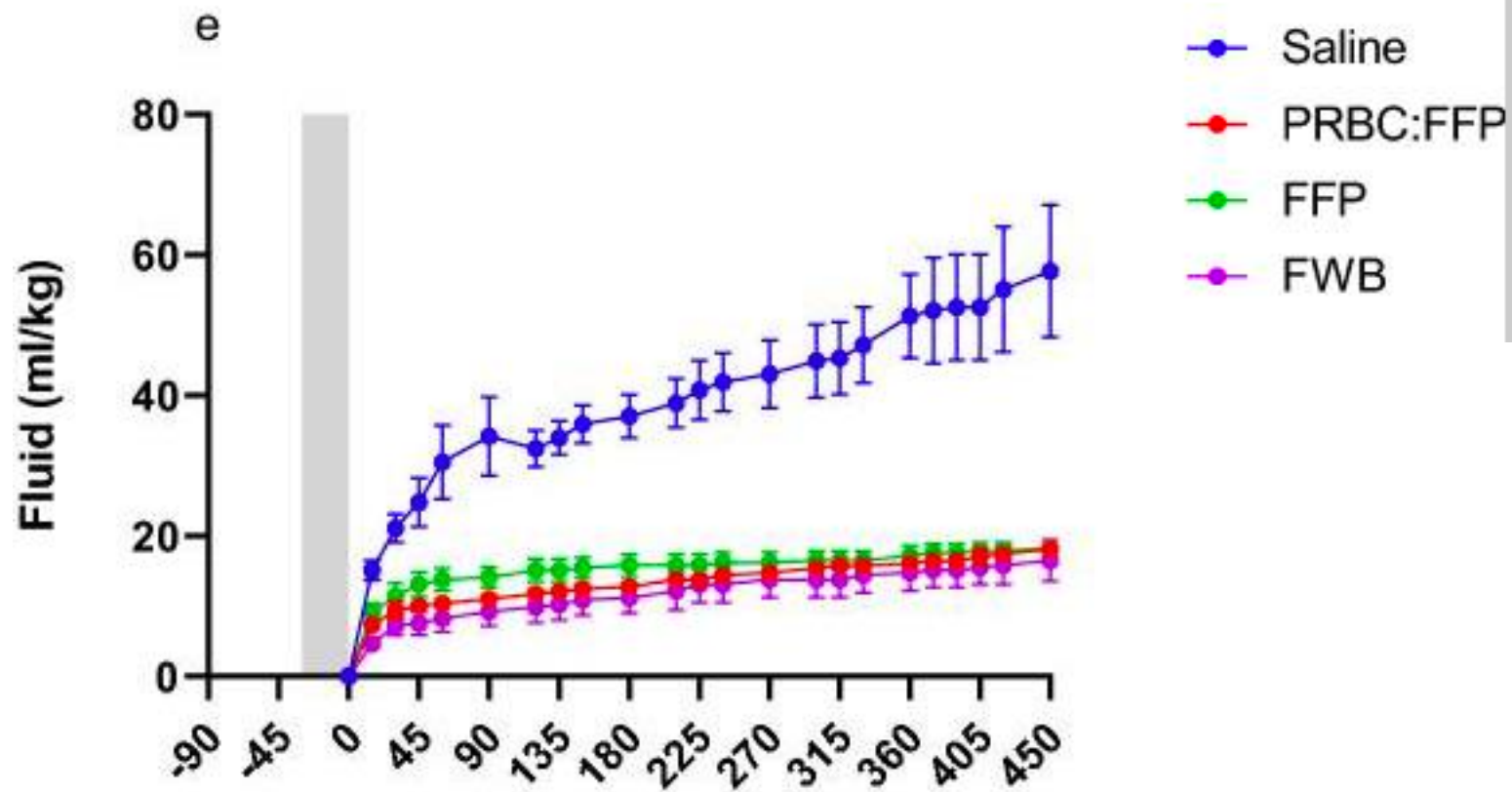


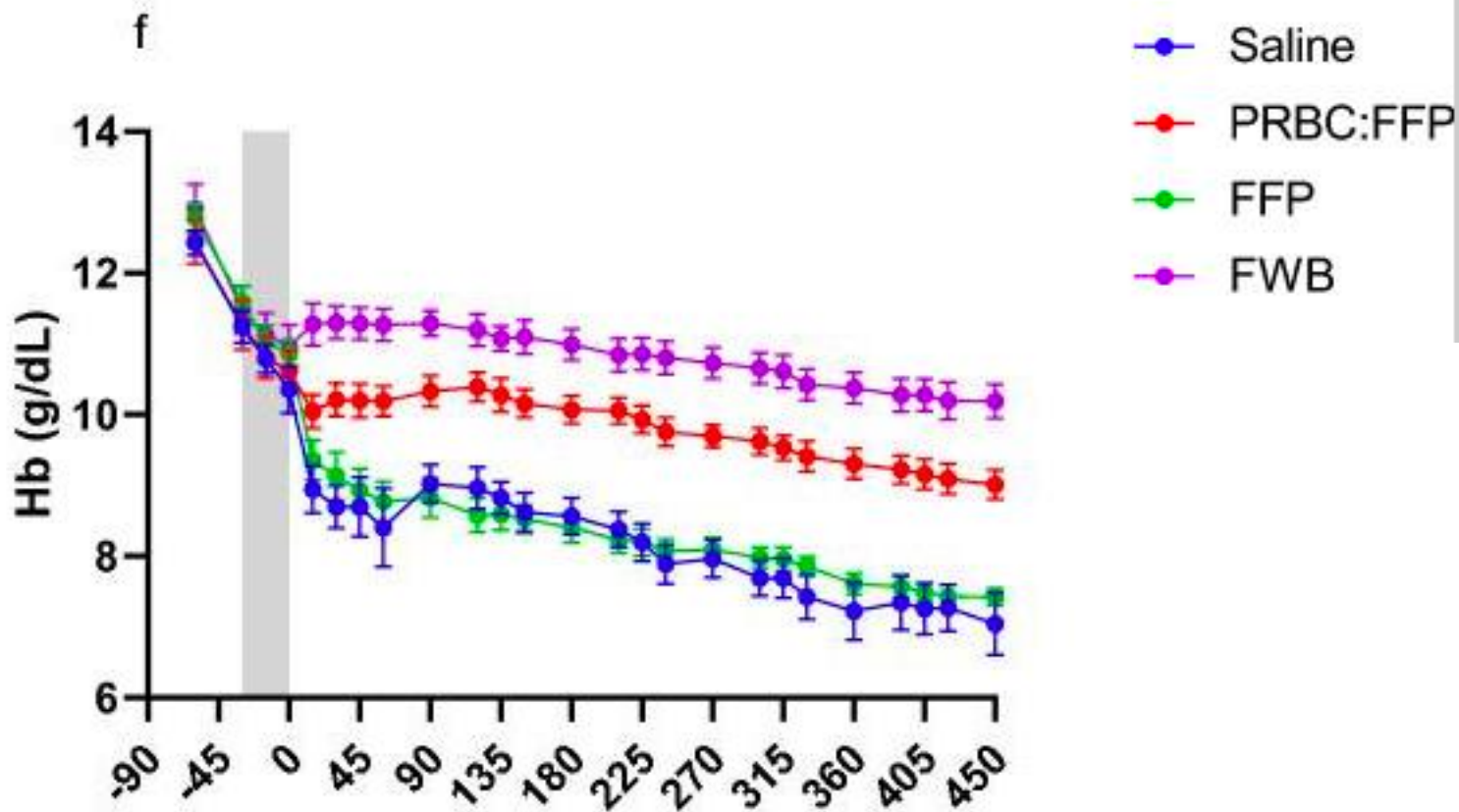


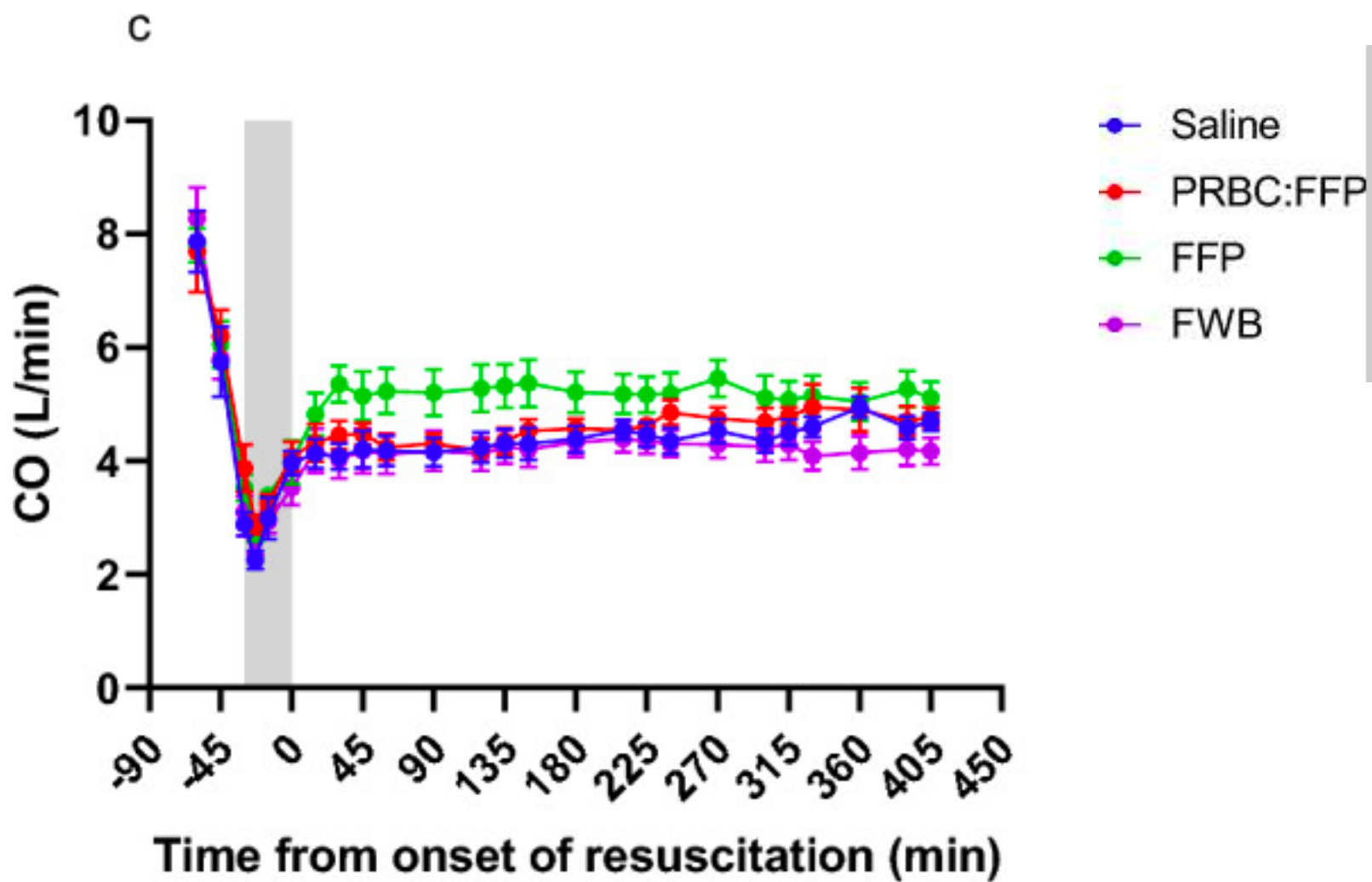
Watts, Sarah Ann et al. “Resuscitation with whole blood or blood components improves survival and lessens the pathophysiological burden of trauma and haemorrhagic shock in a pre-clinical porcine model.” *European journal of trauma and emergency surgery* : official publication of the European Trauma Society vol. 49,1 (2023): 227-239.

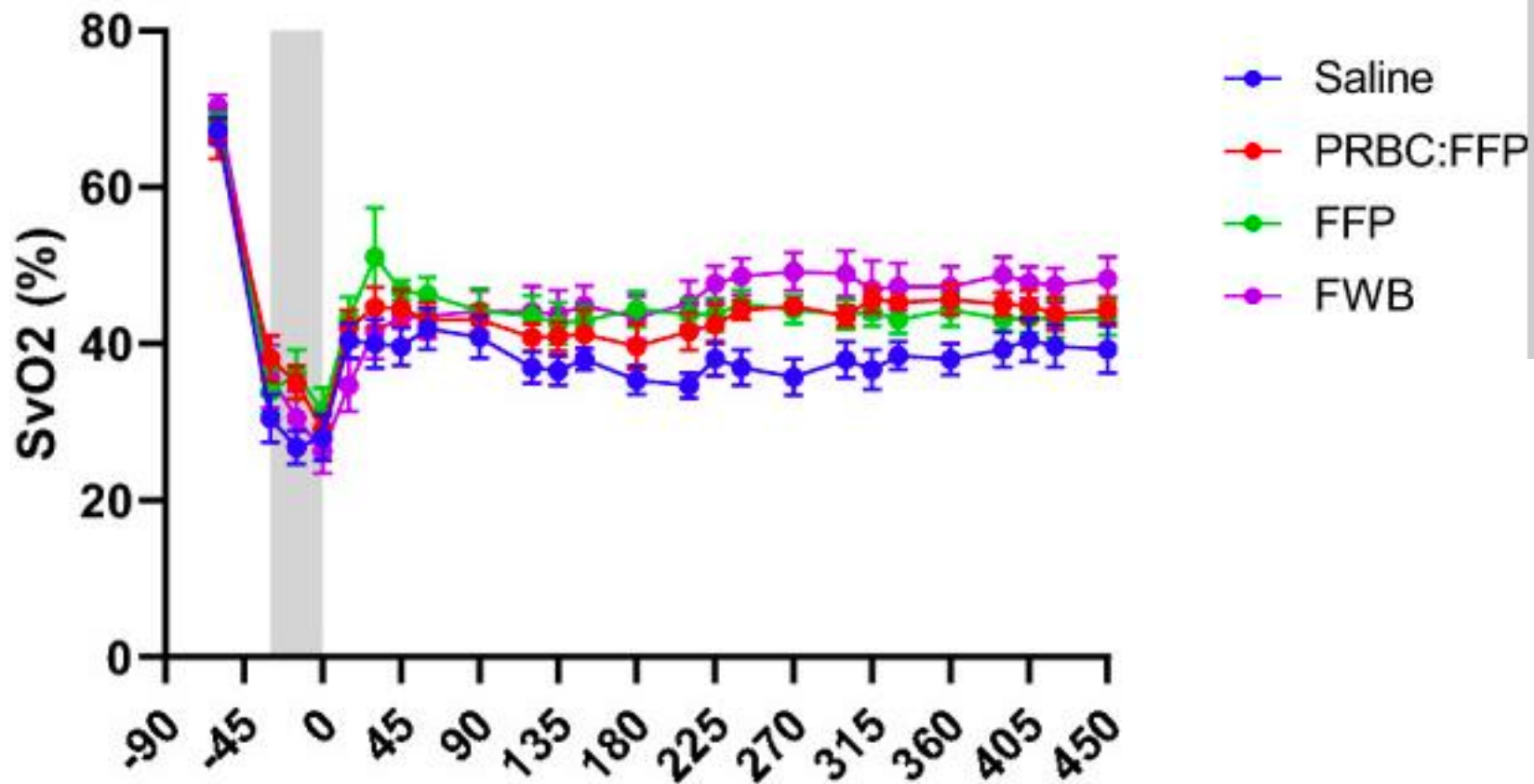
- Terminally anaesthetised juvenile white pigs
- Injury
 - Shot 4 times in thigh
 - 30% blood volume loss over 9 minutes
 - Uncontrolled non-compressible liver laceration
- 'Shock' phase
 - Aim of SBP 60mmHg
 - Up to 500ml saline administered
 - Up to further 10% blood volume withdrawn
- Forward Prolonged Resuscitation (450 min)
 - Group 1 – no treatment
 - Treatment groups – 3ml/kg of fluid when SBP < 80mmHg
 - Group 2 – Saline
 - Group 3 – Fresh Whole Blood
 - Group 4 – FFP / PRC
 - Group 5 - FFP

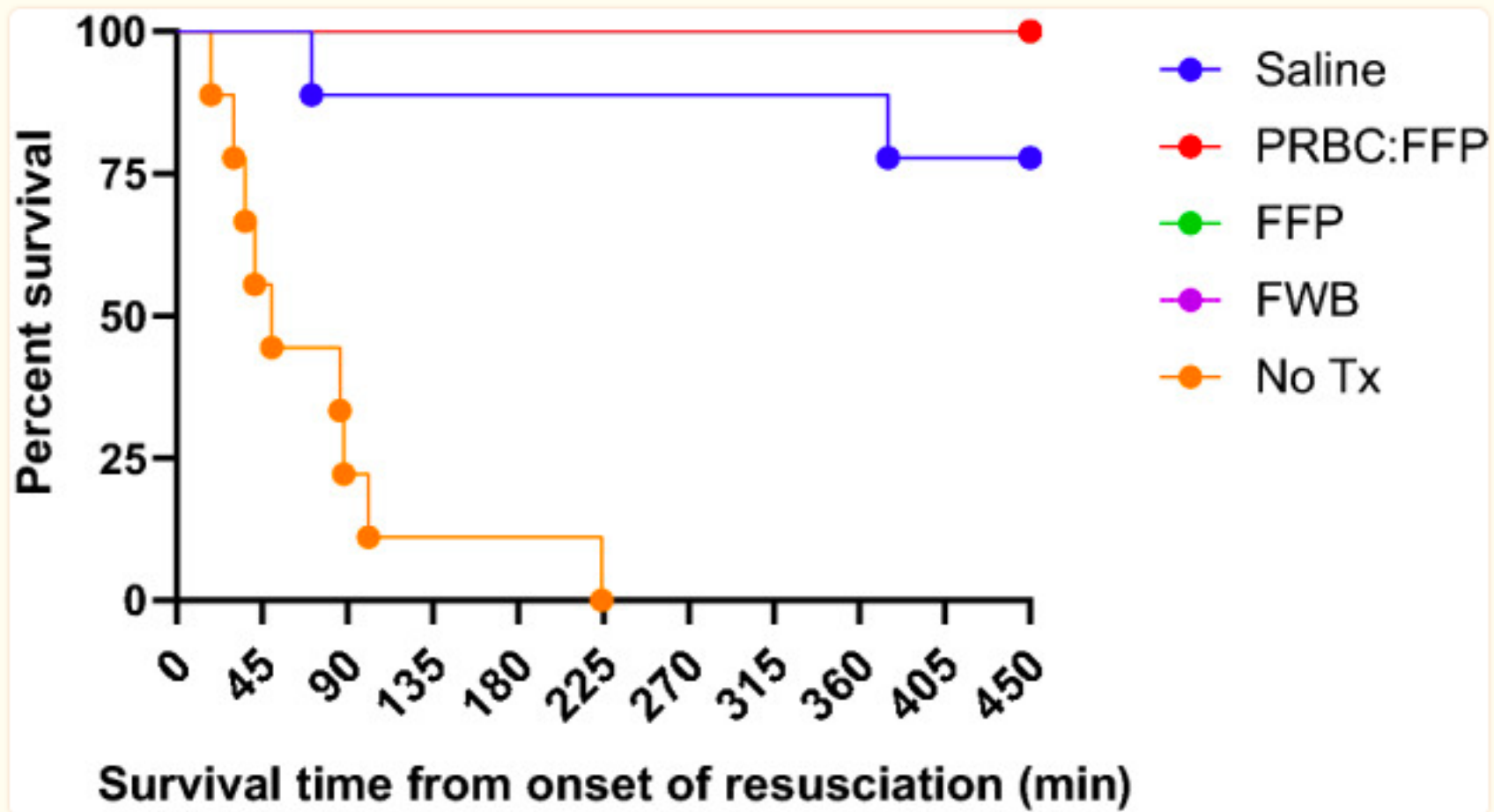


















Part No. G073 508 213 303 3
CE
RED CELLS IN ADDITIVE SOLUTION
LEUCOCYTE DEPLETED
STORE AT 4 °C ± 2°C

Volume 288.0 ml

A
Rh D NEGATIVE

Expiry Date: 17 Nov

Additional Information
D C E c e
+ - + + +

DO NOT VENT

REF: WB436CEU
Date Bled: 13 Oct

Part No. G073 508 233 690
CE
1.5 IN ADDITIVE SOLUTION
% DEPLETED

Volume 288.0 ml

O
Rh D POSITIVE

Expiry Date: 01 Dec

Additional Information
D C E c e
+ - + + +

DO NOT VENT

REF: WB436CEU
Date Bled: 27 Oct

Part No. G073 508 282 006 4
CE
RED CELLS IN ADDITIVE SOLUTION
LEUCOCYTE DEPLETED
STORE AT 4 °C ± 2°C

Volume 288.0 ml

B
Rh D POSITIVE

Expiry Date: 05 Dec

Additional Information
D C E c e
+ - + + +

DO NOT VENT

REF: WB436CEU
Date Bled: 31 Oct

0.9% saline / Pastawater / Satan's Urine

Sodium 154 mmol/L

Chloride 154 mmol/L

CROMBIE'S MAGIC RESUSCITATION SOLUTION

pH 6.7

Base Excess 29.2 mmol/L

Potassium 20.5 mmol/L

Glucose 24.1 mmol/L

Lactic Acid 9.4 mmol/l

Sodium 126 mmol/L





0
Rh POSITIVE

21 DEC 2014

UNIVERSITY OF MICHIGAN
MEDICAL CENTER
1100 APPOINTMENT BUILDING
1100 UNIVERSITY AVENUE
ANN ARBOR MI 48106-0001

UNIVERSITY HEALTH SERVICES
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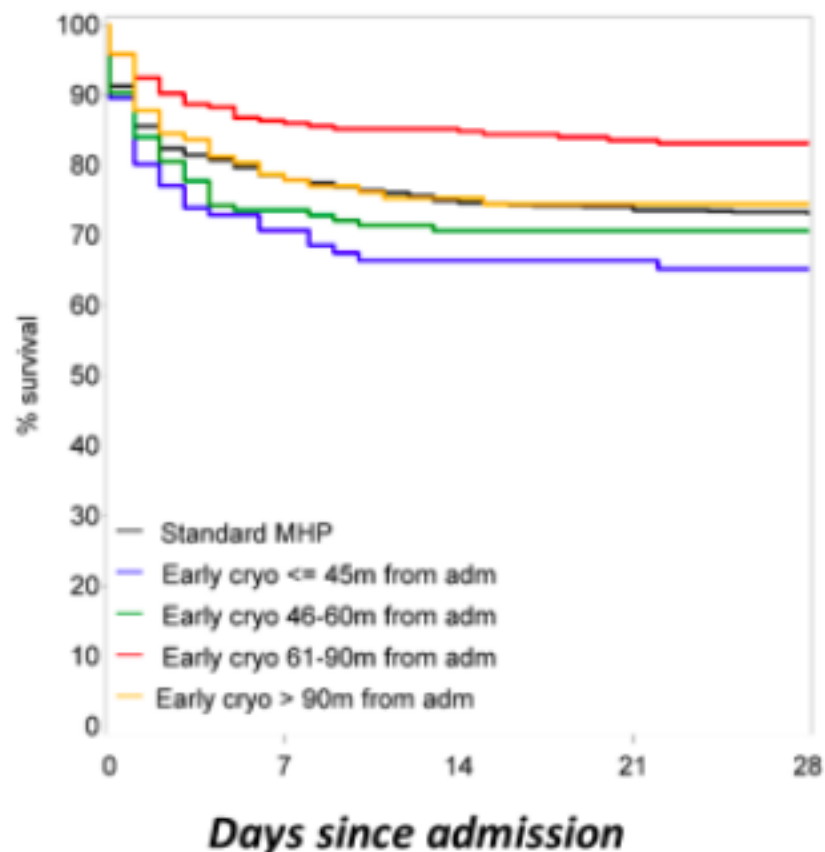


HEMOCUE[®]



Hb 201+





CRYSTAT-2

Primary Outcome by timing of Cryoprecipitate

	Std MHP	Cryo <45 mins	Cryo 46-60 mins	Cryo 60-90 mins	Cryo >90 mins
n	805	101	147	273	128
28-day Mortality	26.1%	34.4%	29.2%	16.5%	25.2%
OR		1.29 (0.94-1.77)	1.11 (0.84-1.48)	0.65 (0.46-0.91)	1.00 (0.71-1.41)



FORM 100-7789-0002 211119578

WHOLE BLOOD

COLLECTION DATE

0

Rh NEGATIVE

DONATION CENTER
ANYTOWN, PROVINCE



FORM 100-7789-0002 211119578

EXPIRES:

VOLUNTEER DONOR

Properly Identified Recipient



30 OCT 1978 00071889

GLOBAL HEALTH BLOOD
ANYWHERE, ANYPLACE

CHECK FOR TEMPERATURE ABUSE

* BREACH WINDOW SHOWS BLUE BLOOD
BAG HAS REACHED UNSAFE TEMPERATURES



FORM 32971 080124X 100



0000012 998887 04271850

Brill, Jason B., et al. "Impact of incorporating whole blood into hemorrhagic shock resuscitation: analysis of 1,377 consecutive trauma patients receiving emergency-release uncrossmatched blood products." *Journal of the American College of Surgeons* 234.4 (2022): 408-418.

2 groups – “whole blood” or component

Raw data – 75% v 76% survival (univariate)

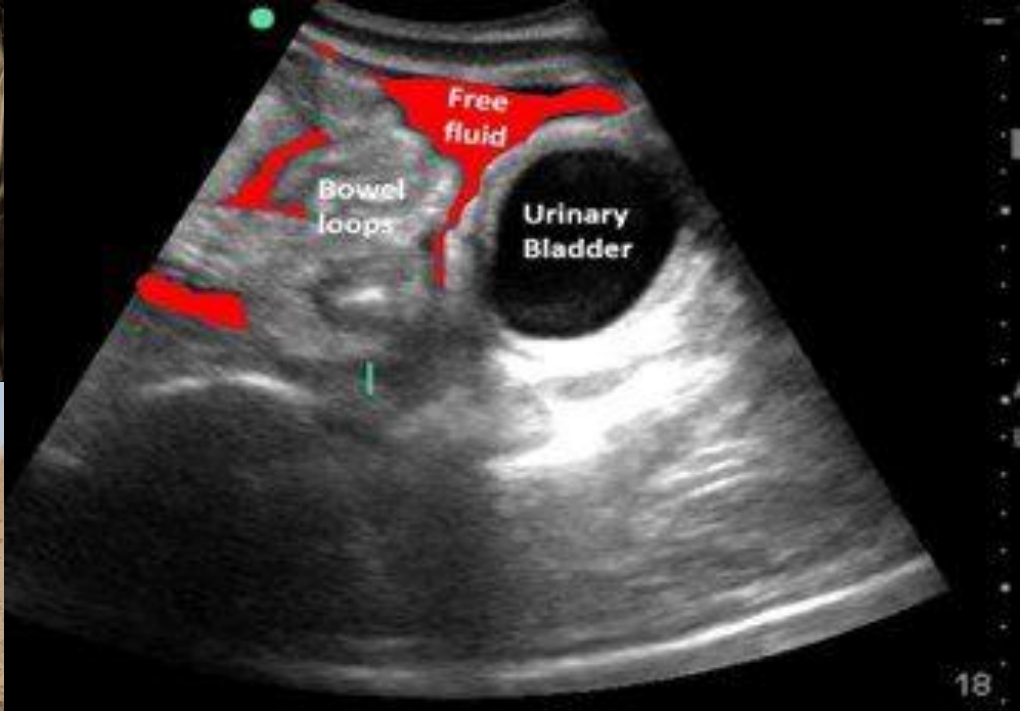
Logistical regression – 4-fold survival advantage

Knight, CD, Bebarta, V, Meledeo, MA, Ross, E, Wu, X, Bynum, J, et al. A narrative review of prehospital hemorrhagic shock treatment with non-blood product medications. *Transfusion*. 2023; 63(S3): S256– S262.

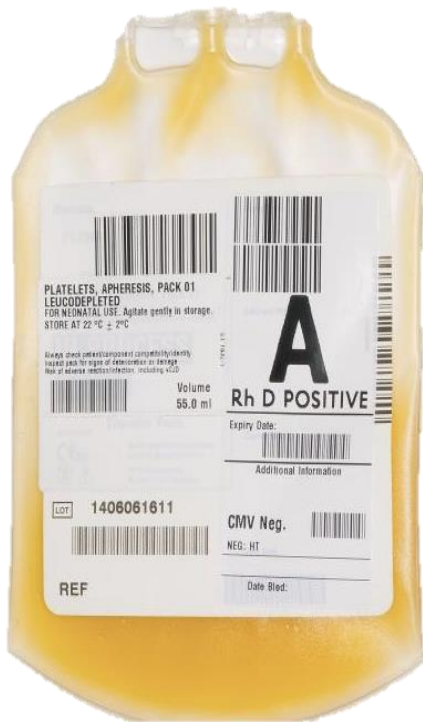
- ethinyl estradiol sulfate (EES)
- polyethylene glycol 20,000 (PEG20K)
- C1 esterase inhibitors
- cyclosporin A
- niacin
- bortezomib
- rosiglitazone
- lcatibant
- diazoxide,
- valproic acid (VPA)

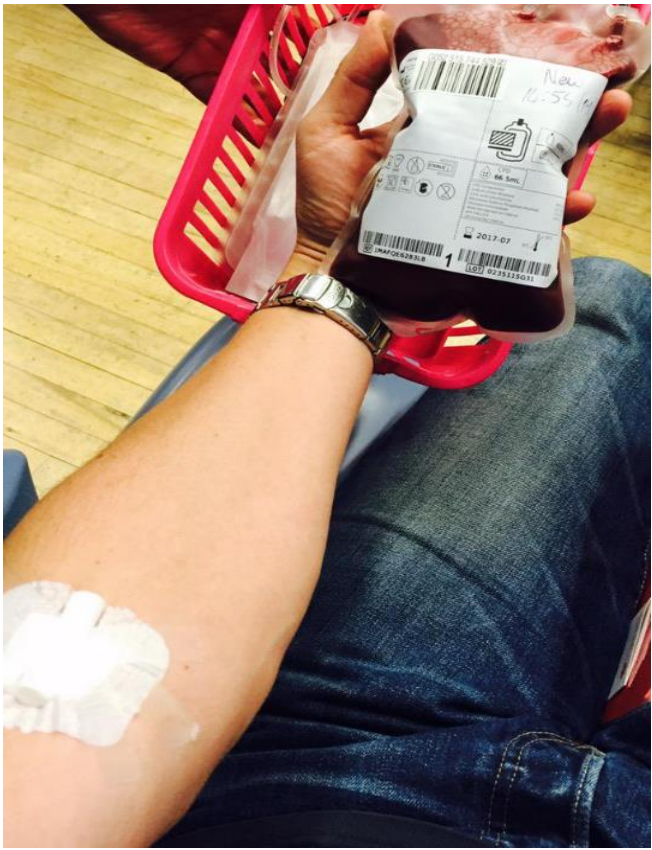
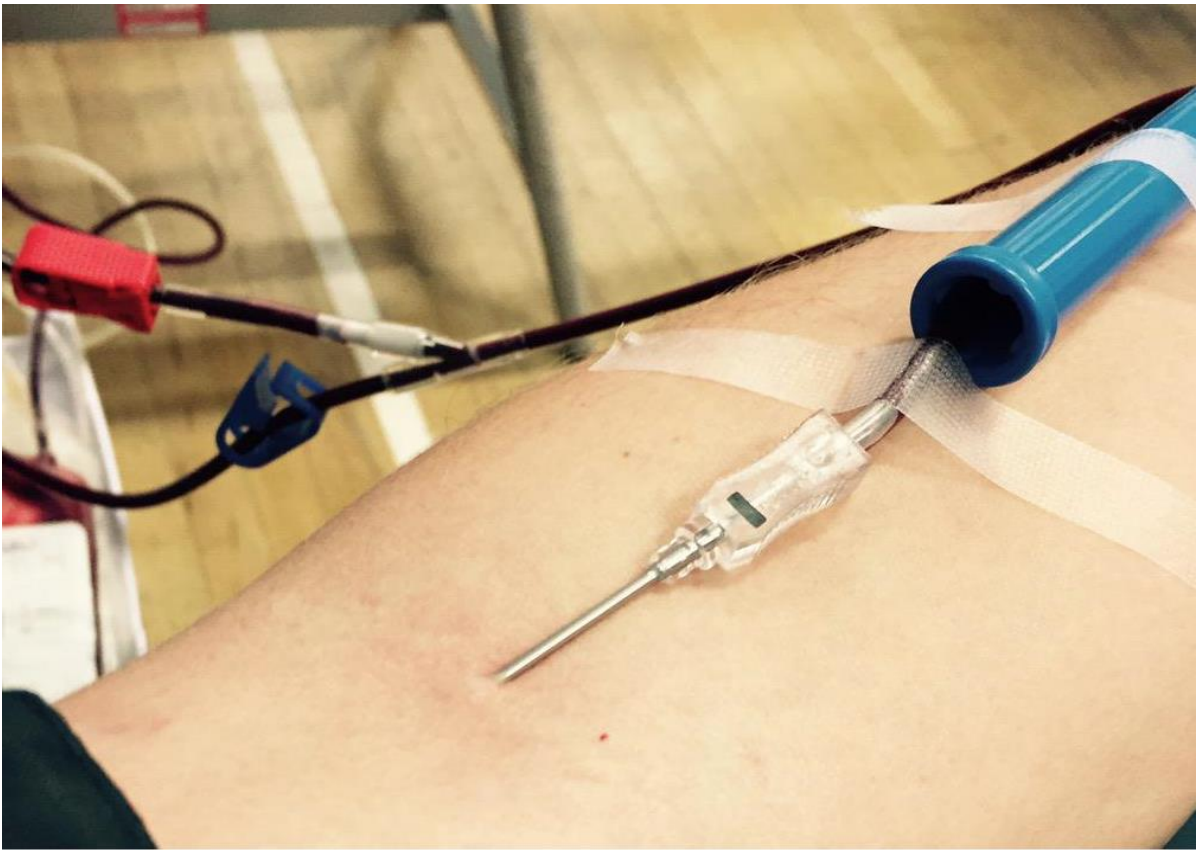
Question :

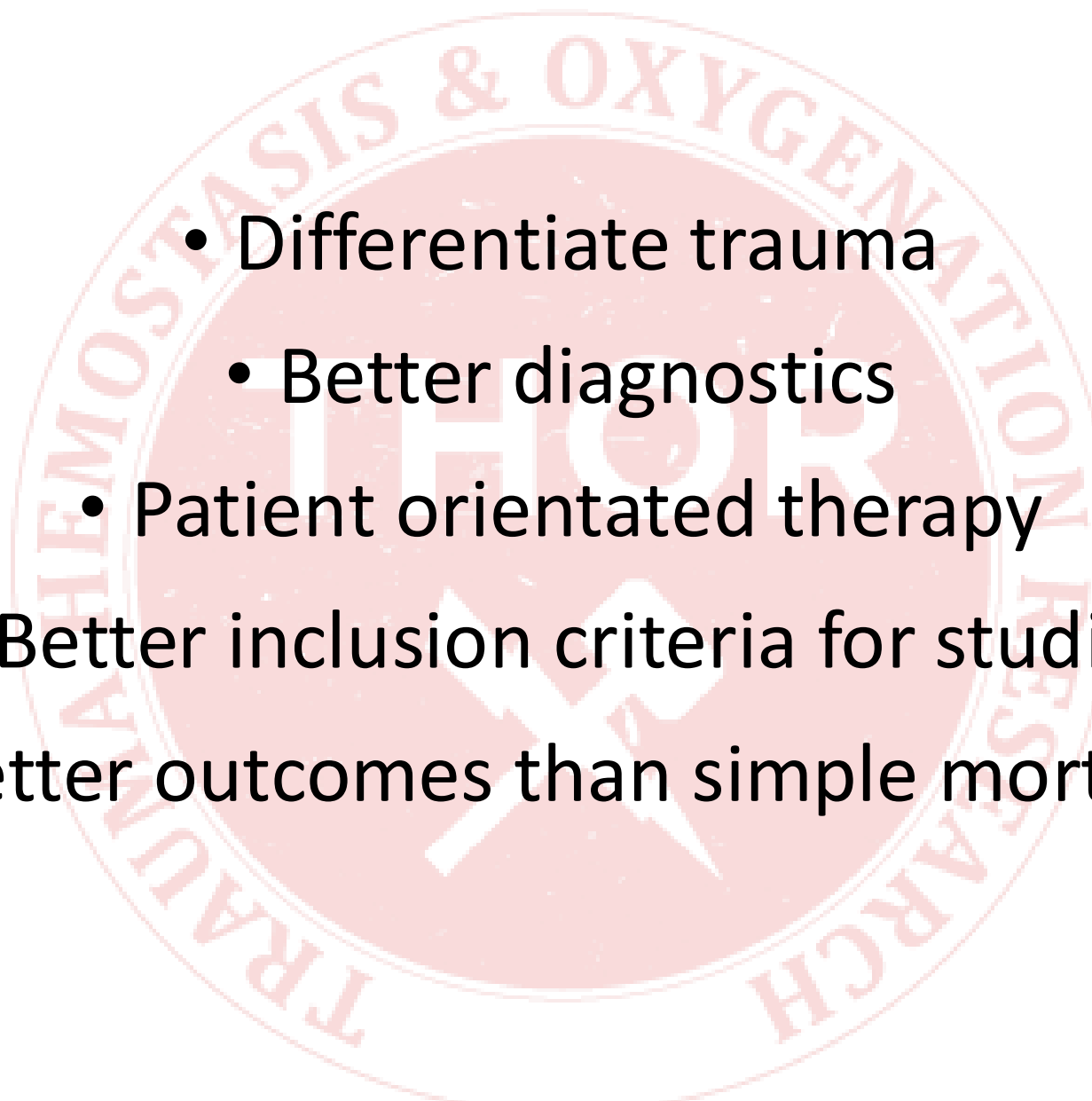
Typical patient scenario, and
access to any therapy and
technology, how would you
treat pre-hospital
haemorrhagic shock?









- 
- Differentiate trauma
 - Better diagnostics
 - Patient orientated therapy
 - Better inclusion criteria for studies
 - Better outcomes than simple mortality