Anaesthesia and Perfusion strategies for the Norwood 1 operation

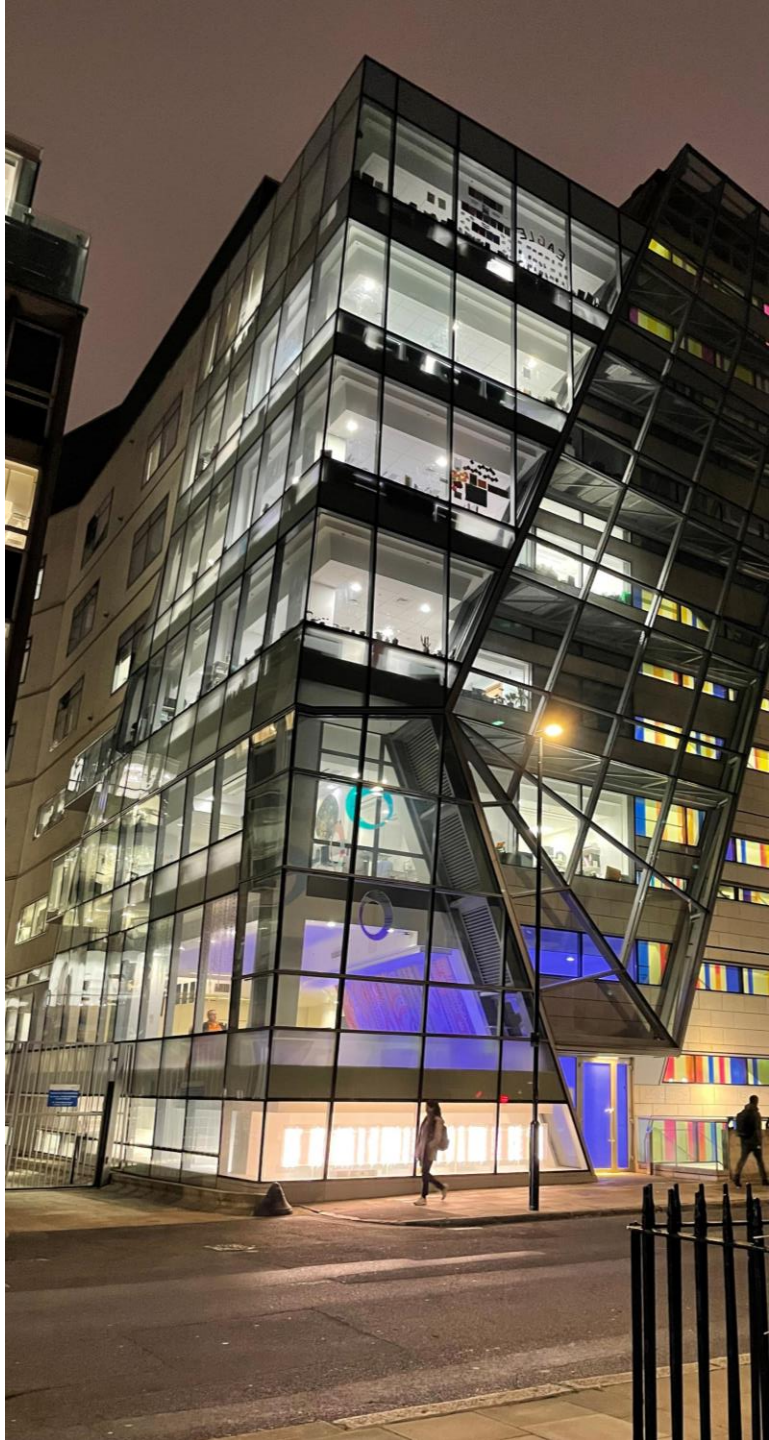
Lucy Hepburn

Consultant Anaesthetist

Great Ormond Street Hospital

London

Great Ormond Street Hospital for Children NHS Trust



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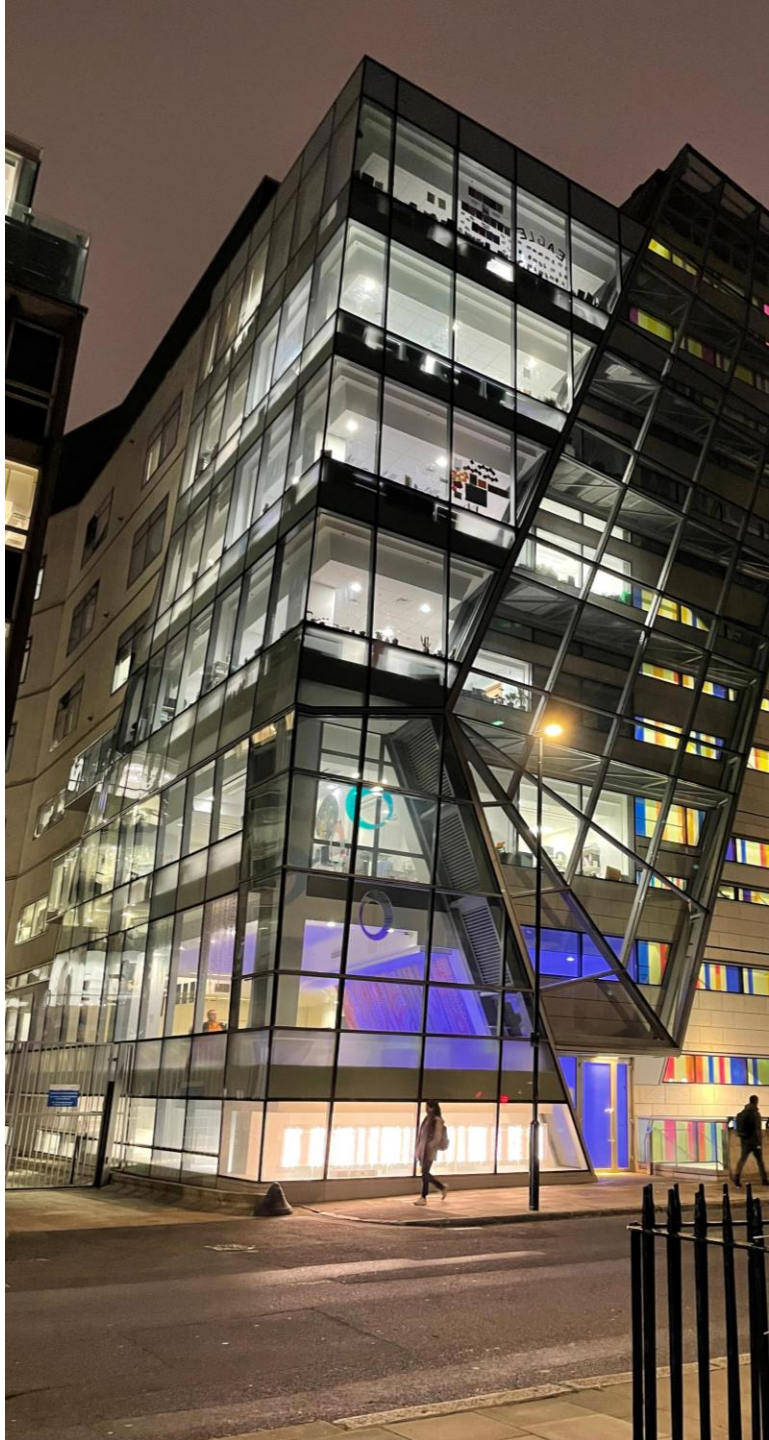
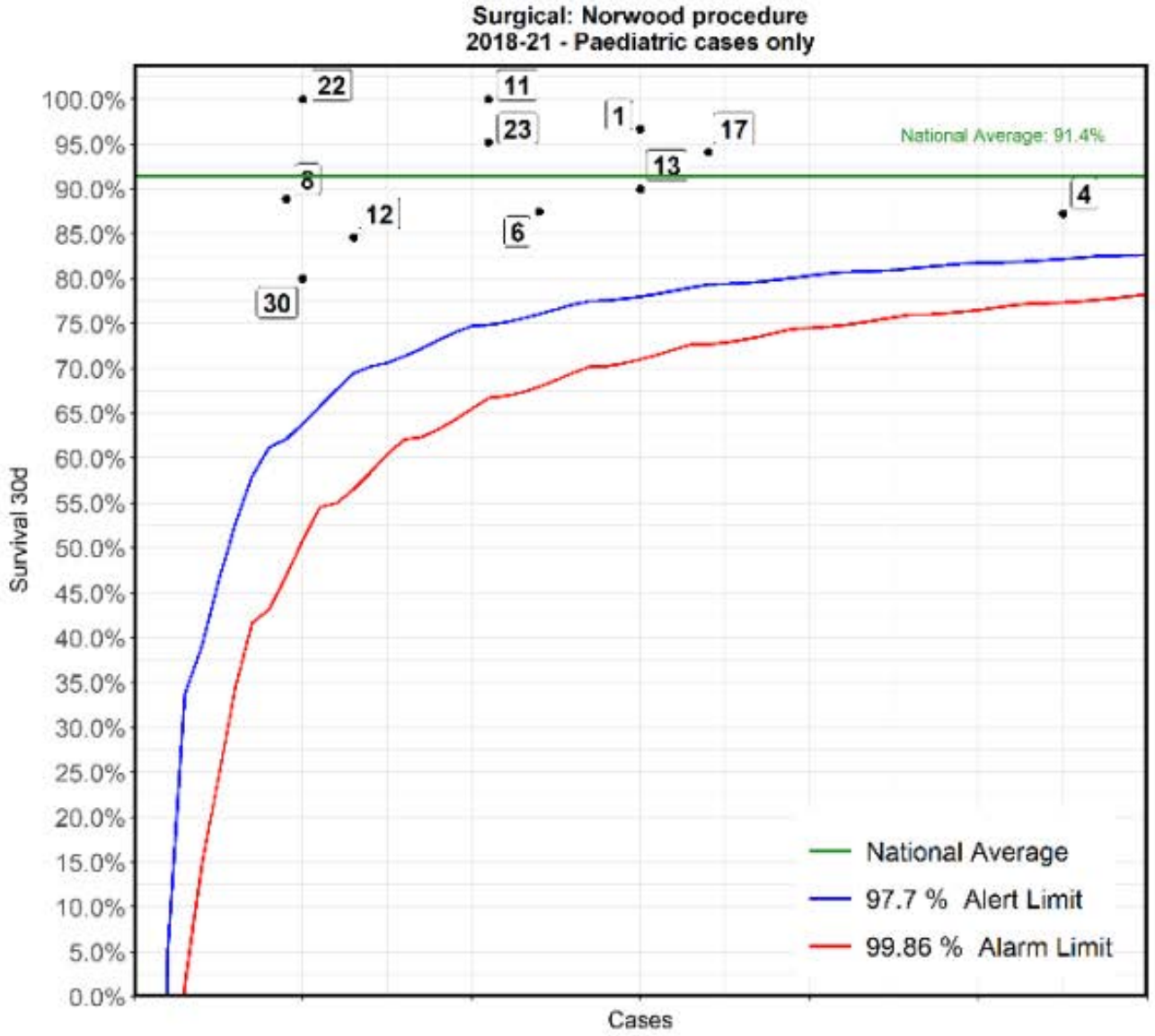
Disclosures:
I have no conflicts of interest
I am not a perfusionist





No	Hospital Name	Survival 30d
4	Birmingham Children's Hospital	87%
17	Leeds General Infirmary	94%
1	Liverpool Alder Hey Hospital	97%
13	London Evelina London Children's Hospital	90%
6	Bristol Royal Hospital For Children	88%
11	London Great Ormond Street Hospital for Children	100%
23	Dublin Our Lady's Children's Hospital	95%
12	Leicester Glenfield Hospital	85%
22	London Royal Brompton Hospital	100%
30	Southampton Wessex Cardiothoracic Centre	80%
8	Newcastle Freeman Hospital	89%

	2022	2021	2020	2019
total	11	10	6	7
deaths	1	2 (@2mo)	0	2
ecmo	2	1	0	1
Hybrid(ish)	2	1	0	3
BTS	1	4	3	3
Sano	10	6	3	4
HLHS	9	8	5	6
Other	2	2	1	1

The Great Ormond Street Scene……

Long-term survival and center volume for functionally single-ventricle congenital heart disease in England and Wales

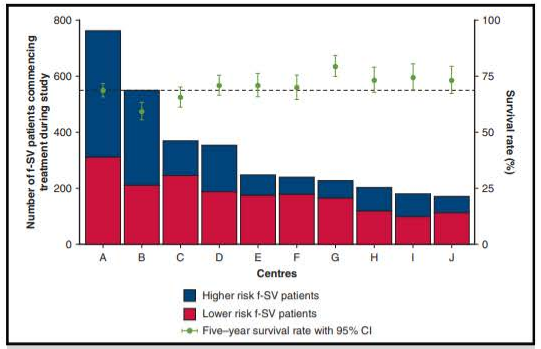
Kate L. Brown, MPH, MD,[a] Qi Huang, PhD,[b] Elena Hadjicosta, PhD,[b] Anna N. Seale, MD, MRCP,[c] Victor Tsang, FRCS,[a] David Anderson, FRCS,[d] David Barron, MD, FRCS,[c] Hannah Bellsham-Revell, MD,[d] Christina Pagel, PhD,[b] Sonya Crowe, PhD,[b] Ferran Espuny-Pujol, PhD,[b] Rodney Franklin, MD, FRCP,[e] and Deborah Ridout, MSc[f]

ABSTRACT

Objectives: Long-term survival is an important metric for health care evaluation, especially in functionally single-ventricle (f-SV) congenital heart disease (CHD). This study's aim was to evaluate the relationship between center volume and long-term survival in f-SV CHD within the centralized health care service of England and Wales.

Methods: This was a retrospective cohort study of children born with f-SV CHD between 2000 and 2018, using the national CHD procedure registry, with survival ascertained in 2020.

Results: Of 56,039 patients, 3293 (5.9%) had f-SV CHD. Median age at first intervention was 7 days (interquartile range [IQR], 4, 27), and median follow-up time was 7.6 years (IQR, 1.0, 13.3). The largest diagnostic subcategories were hypoplastic left heart syndrome, 1276 (38.8%); tricuspid atresia, 440 (13.4%); and double-inlet left ventricle, 322 (9.8%). The survival rate at 1 year and 5 years was 76.8% (95% confidence interval [CI], 75.3%-78.2%) and 72.1% (95% CI, 70.6%-73.7%), respectively. The unadjusted hazard ratio for each 5 additional patients with f-SV starting treatment per center per year was 1.04 (95% CI, 1.02-1.06), $P < .001$. However, after adjustment for significant risk factors (diagnostic subcategory; antenatal diagnosis; younger age, low weight, acquired comorbidity, increased severity of illness at first procedure), the hazard ratio for f-SV center vol-



Functionally single ventricle (f-SV) center volume by complexity and 5-year survival. High-risk f-SV subtypes are (unbalanced) AVSD and HLHS.

CENTRAL MESSAGE

In the centralized service provided for children with f-SV hearts in England, we found no evidence for a relationship between center volume and long-term survival after adjusting for case mix.

CONG

……2022 patient cohort

- 9 HLHS
- 1 unbalanced AVSD
- 1 DILV

- 10 Norwood-Sano – 1 Norwood BTS

- 7 days to 16 days (exception: hybrid)

- 2 ECMO - one died (2.5kg, complex)
- 2x significant arrythmia (one ECMO day 1-3> recovery)

- 1x early bilateral PAB+ Prostin+ Septectomy (neonatal sepsis)

  -Norwood at 5 weeks

……2022 patient cohort

- 9 HLHS
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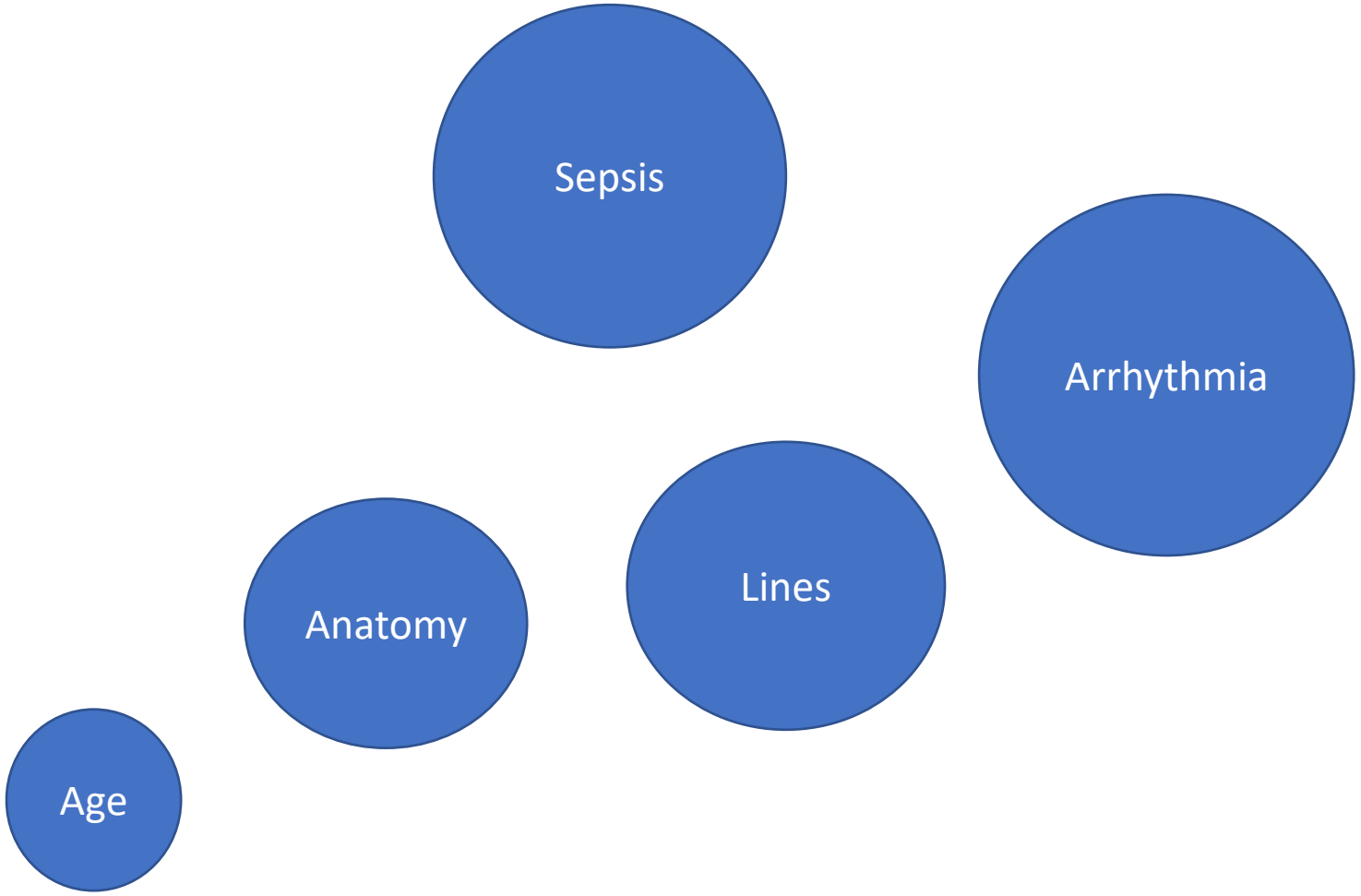
- 2 ECMO – one died

- 2x significant arrythmia (one ECMO day 1-3>recovery)

- 1x early bilateral PAB+prostin+septectomy (neonatal sepsis), Norwood at 5 weeks

RED FLAGS

-Need for pre Norwood GA
-Complex coronaries
-Sepsis
-Vascular access complications



Pre op planning and thoughts

Emotional labour…….the stuff you do to keep people happy and everything running smoothly, which nobody notices because they are happy and everything is running smoothly

Anaesthesia…….the
stuff
you do to keep
people happy and
everything running
smoothly, which
nobody notices because
they
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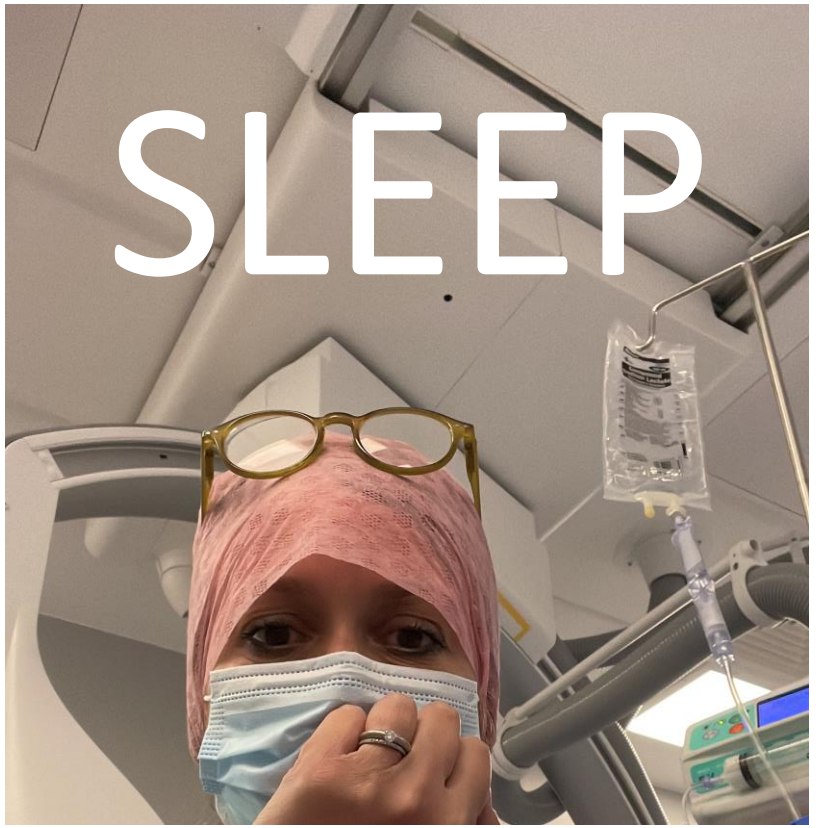
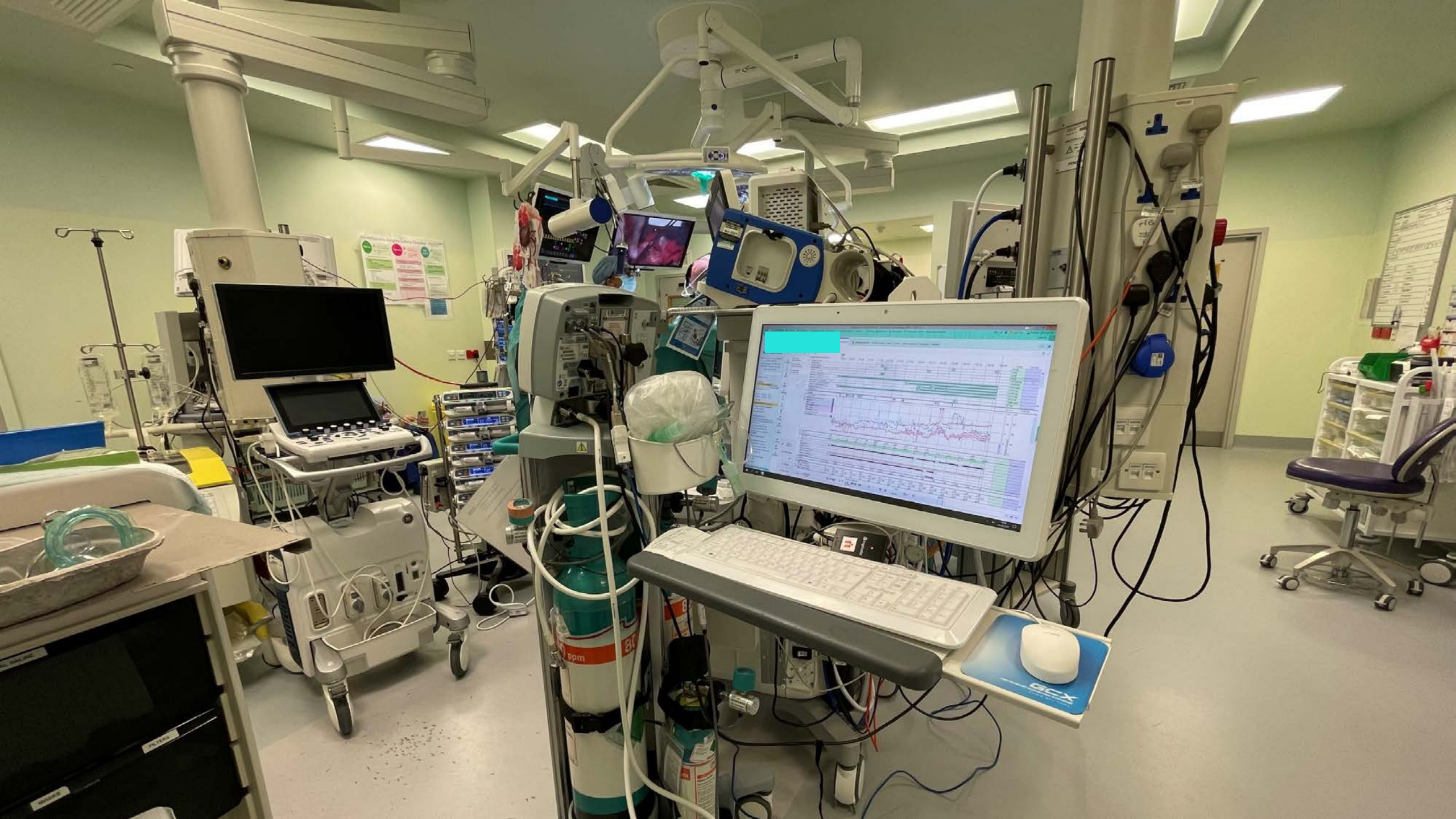
is running smoothly



Sometimes anaesthesia looks like this



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Original research

Exposure to incivility hinders clinical performance in a simulated operative crisis

PDF

Daniel Katz [1], Kimberly Blasius [2], Robert Isaak [2], Jonathan Lipps [3], Michael Kushelev [3], Andrew Goldberg [1], Jarrett Fastman [1], Benjamin Marsh [1], Samuel DeMaria [1]

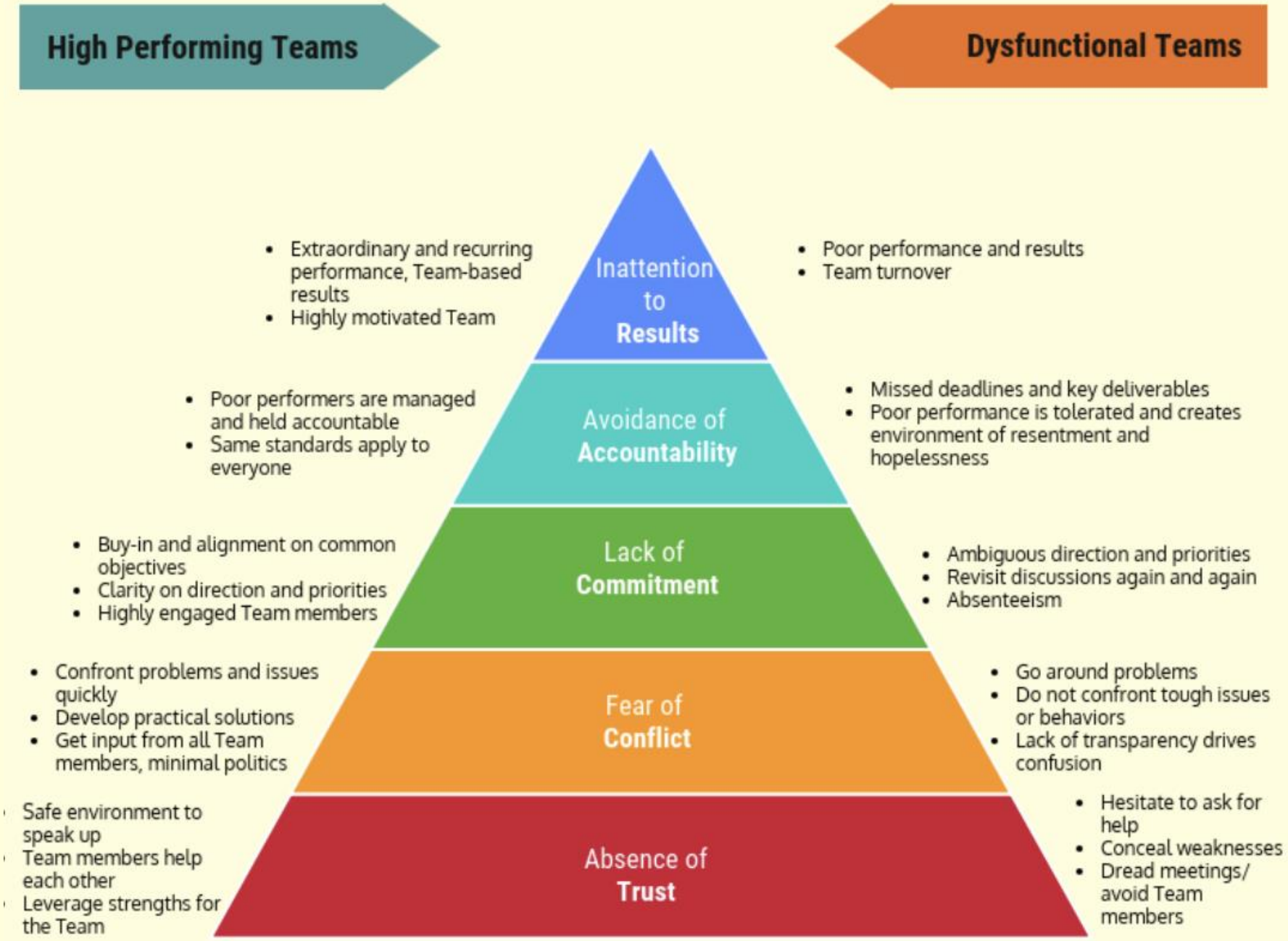
Correspondence to Dr Daniel Katz, Anesthesiology, Perioperative and Pain Medicine, Icahn School of Medicine at Mount Sinai Department of Anesthesiology Perioperative and Pain Medicine, New York city, NY 10029, USA; daniel.katz@mountsinai.org

Abstract

Background Effective communication is critical for patient safety. One potential threat to communication in the operating room is incivility. Although examined in other industries, little has been done to examine how incivility impacts the ability to deliver safe care in a crisis. We therefore sought to determine how incivility influenced anaesthesiology resident performance during a standardised simulation scenario of occult haemorrhage.

Methods This is a multicentre, prospective, randomised control trial from three academic centres. Anaesthesiology residents were randomly assigned to either a normal or 'rude' environment and subjected to a validated simulated operating room crisis. Technical and non-technical performance domains including vigilance, diagnosis, communication and patient management were graded on survey with Likert scales by blinded raters and compared between groups.

Results 76 participants underwent randomisation with 67 encounters included for analysis (34 control, 33 intervention). Those exposed to incivility scored lower on every performance metric, including a binary measurement of overall performance with



Cardiothoracic Surgery Safety Checklist

Great Ormond Street Hospital for Children NHS

Team brief

Led by the surgeon, nurse or anaesthetist

Before starting the list

1 Introductions and review each case:

- **Planned procedure**
  - JCC / Pump meeting outcome
  - Redo sternotomy
  - Preferred vascular access sites
  - Post-op destination
- **Homograft / special equipment**
- **Perfusion strategy / cardioplegia**
- **Anaesthetic concerns**
- **Bleeding management**
  - Red cells / platelets available
  - Anti-fibrinolytics
- **Echocardiography / imaging**
- **Surgical Site Infection**
  - Infectious alerts
  - Antibiotics
- **Pregnancy testing required?**

3 Confirm surgeon / scrub team/ perfusionist / anaesthetist

4 Any staffing / time issues?

5 Any outside issues? e.g. ICU beds

6 Confirm list order

7 Can we give a drink?

8 Any more questions?

9 Who is sending?

Sign in

Led by the anaesthetist

Before induction of anaesthesia

1 Confirm identity of child against list & consent
- Duplicator BloodTrack ID sticker printed

2 Surgical site marking

3 Ward Pre-operative Checklist

4 Allergies

6 Difficult airway / aspiration risk?
- Equipment/ assistance available

7 Anaesthetic machine / CGO switch / drugs checked?

8 Blood in MSCB fridge?

9 Stop before you block!
- Immediately before needle insertion confirm site marking and side of block

Checklist group Sept 2017

Cardiothoracic Surgery Safety Checklist

Great Ormond Street Hospital for Children NHS
NHS Foundation Trust

Time out

Led by a member of the theatre team

Before start of surgery

1 Introduce any new team members

2 Surgeon, anaesthetist and scrub nurse confirm:
- Patient's identity
- Procedure, site and position
- Consent for research study (e.g. thymus)
- Imaging displayed

3 Anaesthetist confirms:
- ASA score
- Allergies
- Antibiotics
- Antifibrinolytics
- Local anaesthetic dose
- Any new concerns since induction

4 Perfusionist confirms:
- Circuit / cannula sizes
- Fluids / drugs
- Perfusion strategy

5 Scrub nurse confirms:
- All relevant equipment available
- Defib pads applied if necessary
- Warming
- Pressure areas checked
- Flowtrons applied if necessary

Sign out

Led by the circulating nurse

Before any team member leaves the OR

1 What procedure have we performed?
- Check against consent form

2 Are all counts complete? (instruments, swabs, sharps)

3 Confirm presence of pacing wires and chest drains on suction

4 Are specimens labelled and how are we sending them?

5 Have there been any equipment problems?

6 Anaesthetic concerns and postoperative plans

7 Procedure specific checks

8 Infection status?

Team debrief

Led by the surgeon, nurse or anaesthetist

At the end of the list

REVIEW THE PRINTED LIST:

1. **How well was the Surgical Safety Checklist done today?**
2. **What worked well today? If relevant complete a praise form.**
3. **Were there any staffing, equipment or prosthesis issues?**
4. **What could improve for next time?**
5. **Were there any avoidable delays?**
6. **Did any incidents occur which require a Datix? If yes who will complete the Datix form?**

Cardiothoracic Surgery Safety Checklist

Great Ormond Street Hospital for Children NHS

Team brief

Led by the surgeon, nurse or anaesthetist

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- **Pregnancy testing required?**

3 **Confirm surgeon / scrub team/ perfusionist / anaesthetist**

4 **Any staffing / time issues?**

5 **Any outside issues?** e.g. ICU beds

6 **Confirm list order**

7 **Can we give a drink?**

8 **Any more questions?**

9 **Who is sending?**

Led by the

9 **Stop before you block!**

- Immediately before needle insertion confirm site marking and side of block

Checklist group Sept 2017

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fety Checklist

Great Ormond Street Hospital for Children NHS Foundation Trust

Led by the circulating nurse

Before any team member leaves the OR

have we performed?
consent form

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6. Did any incidents occur which require a Datix? If yes who will complete the Datix form?


120
120
97
24
83/45 (61)
(11)
(16)
24
4.3
0.35
0.00
36.0
50
56
PHILIPS
26
1.1

Paracetamol 10 mg/ml
10 ml
Milrinone
Bromide
2 mg/ml
Injection
infusion after dilution.
POM
09/2022

Balanced anaesthesia


Balanced anaesthesia
Balanced circulation


Balanced anaesthesia
Balanced circulation
Vascular access

steroids

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE FREE PREVIEW

Methylprednisolone for Heart Surgery in Infants — A Randomized, Controlled Trial

Kevin D. Hill, M.D., M.S.C.I., Prince J. Kannankeril, M.D., M.S.C.I., Jeffrey P. Jacobs, M.D., H. Scott Baldwin, M.D., Marshall L. Jacobs, M.D., Sean M. O'Brien, Ph.D., David P. Bichel, M.D., Eric M. Graham, M.D., Brian Blasiole, M.D., Ph.D., Ashraf Resheidat, M.D., Adil S. Husain, M.D., S. Ram Kumar, M.D., Ph.D., et al., for the STRESS Network Investigators*

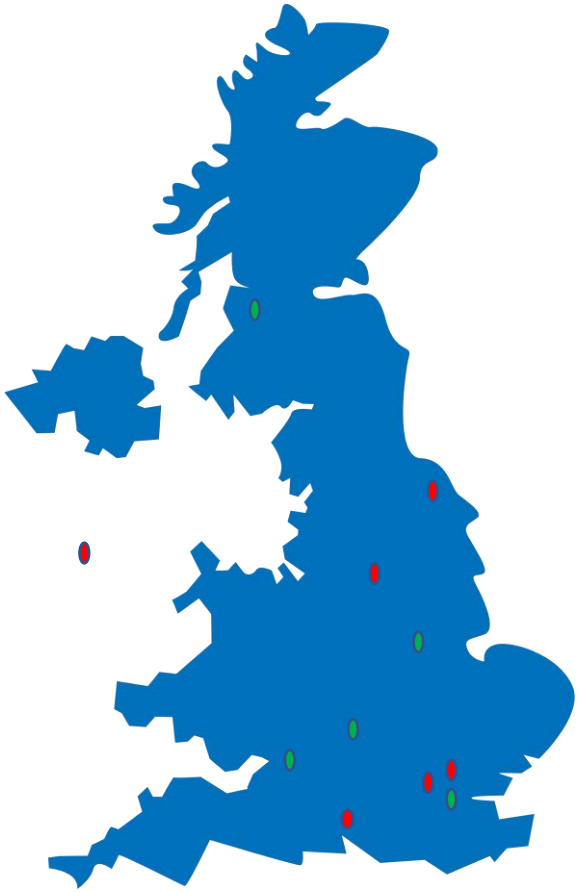
December 8, 2022
N Engl J Med 2022; 387:2138-2149
DOI: 10.1056/NEJMoa2212667

Abstract

BACKGROUND Although perioperative prophylactic glucocorticoids have been used for decades, whether they improve outcomes in infants after heart surgery with cardiopulmonary bypass is unknown.

METHODS We conducted a multicenter, prospective, randomized, placebo-controlled, registry-based trial involving infants (<1 year of

The likelihood of a worse outcome didn't differ between groups, although insulin requirement more likely in steroid group.



UK centres almost split 50:50

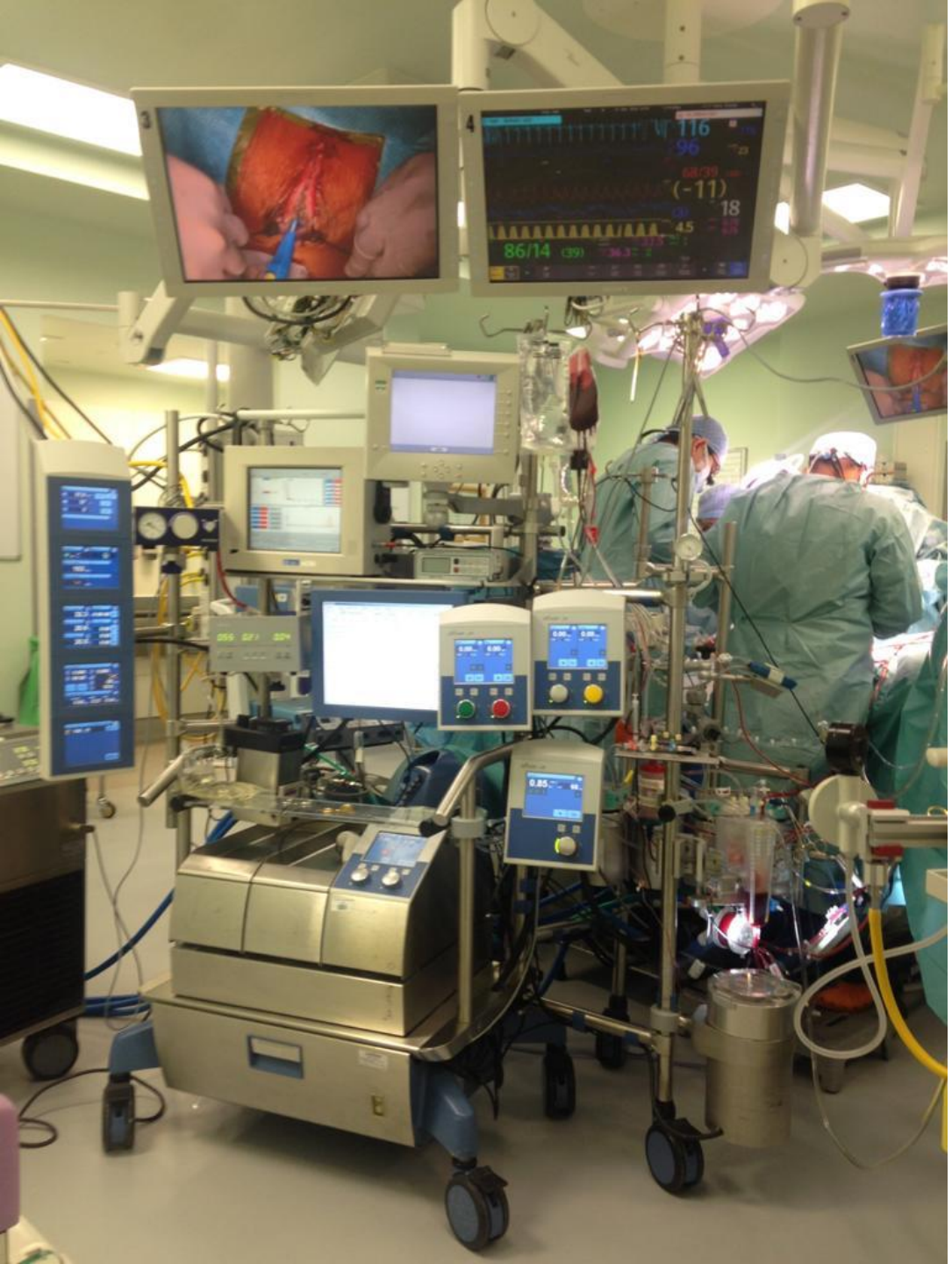
Surgery

Perfusion

Perfusion

I am not a perfusionist


Cardiothoracic Surgery Safety Checklist
Accriva
NEX D1 DRY



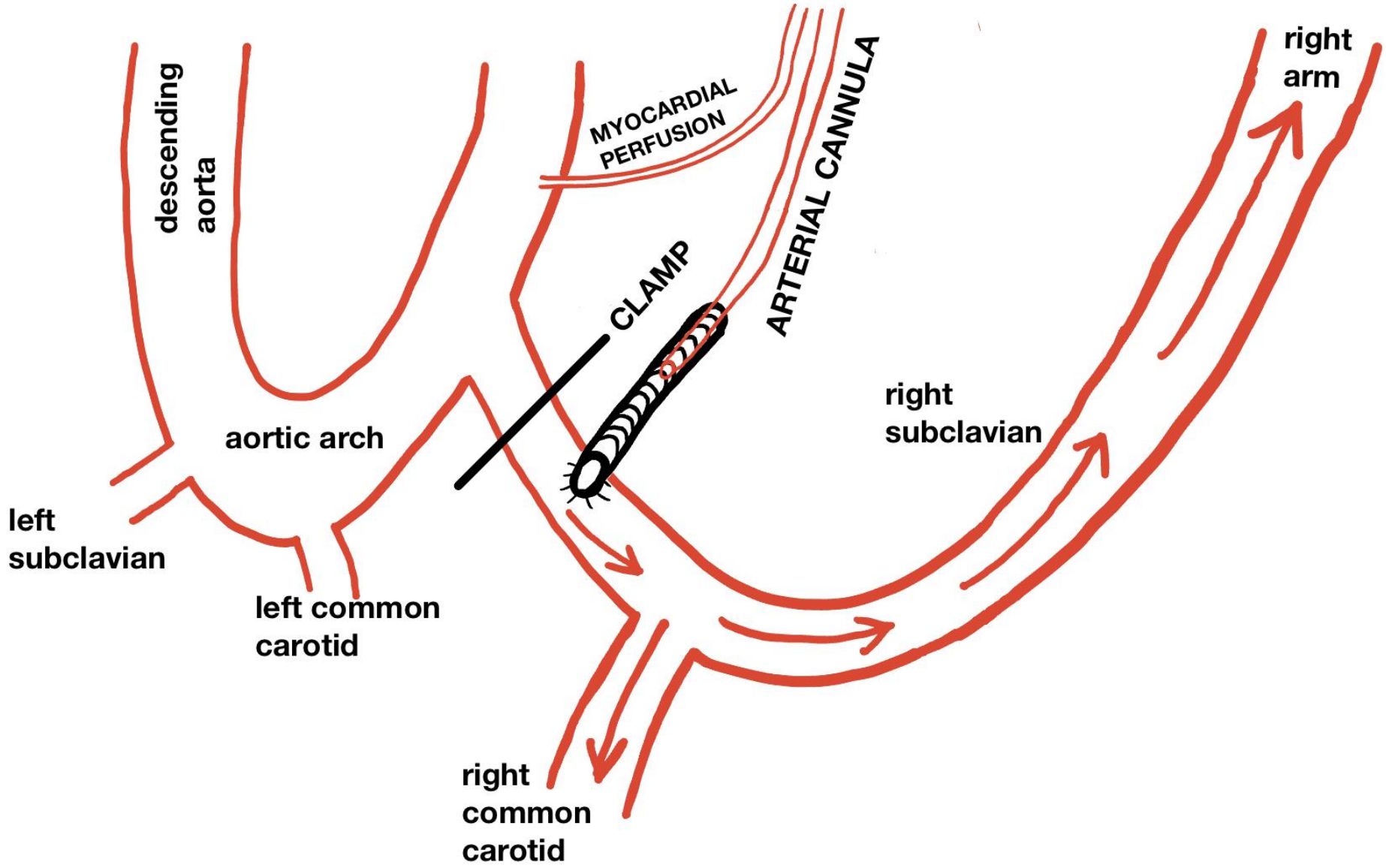
-1L plasmalyte
-50ml HAS
-10ml $NaHCO3^-$
-3ml THAM
-150units Heparin
-150ml PRBC
-200ml Octaplas

Prime filtered (PBUF) to approximately 400ml

Prime gas taken – aim to match patient

¼”, $^3/_{16}$ “ circuit and small FXO5 oxygenator

Anaesthetists view



Coagulopathy

-Subgroup analysis supports octaplas prime especially in cyanotic patients undergoing complex procedures or those less than 6 months of age
-Reduced bleeding post operatively, although increased transfusion in total

BJA

British Journal of Anaesthesia, 118 (5): 788–96 (2017)

doi: 10.1093/bja/aex069
Paediatrics

Early or late fresh frozen plasma administration in newborns and small infants undergoing cardiac surgery: the APPEAR randomized trial

P. Bianchi[1,*], M. Cotza[1], C. Beccaris[1], S. Silvetti[2], G. Isgrò[1], G. Pomè[3], A. Giamberti[3] and M. Ranucci[1]; for the Surgical and Clinical Outcome REsearch (SCORE) group

[1]Department of Cardiothoracic, Vascular Anaesthesia and Intensive Care, IRCCS Policlinico San Donato, Via Morandi 30, 20097 San Donato Milanese, Milan, Italy, [2]Department of Cardiac Anaesthesia and Intensive Care, IRCCS San Raffaele Scientific Institute, Milan, Italy and [3]Department of Congenital Heart Surgery, IRCCS Policlinico San Donato, Milan, Italy

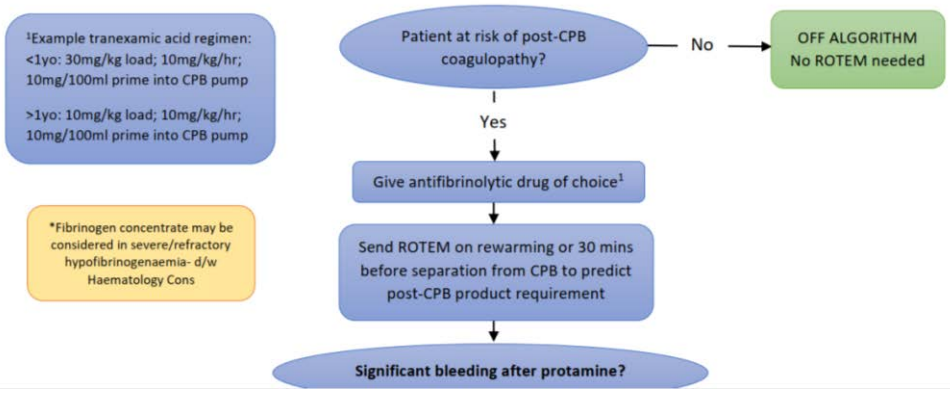
*Corresponding author. E-mail: paolo_bianchi@icloud.com

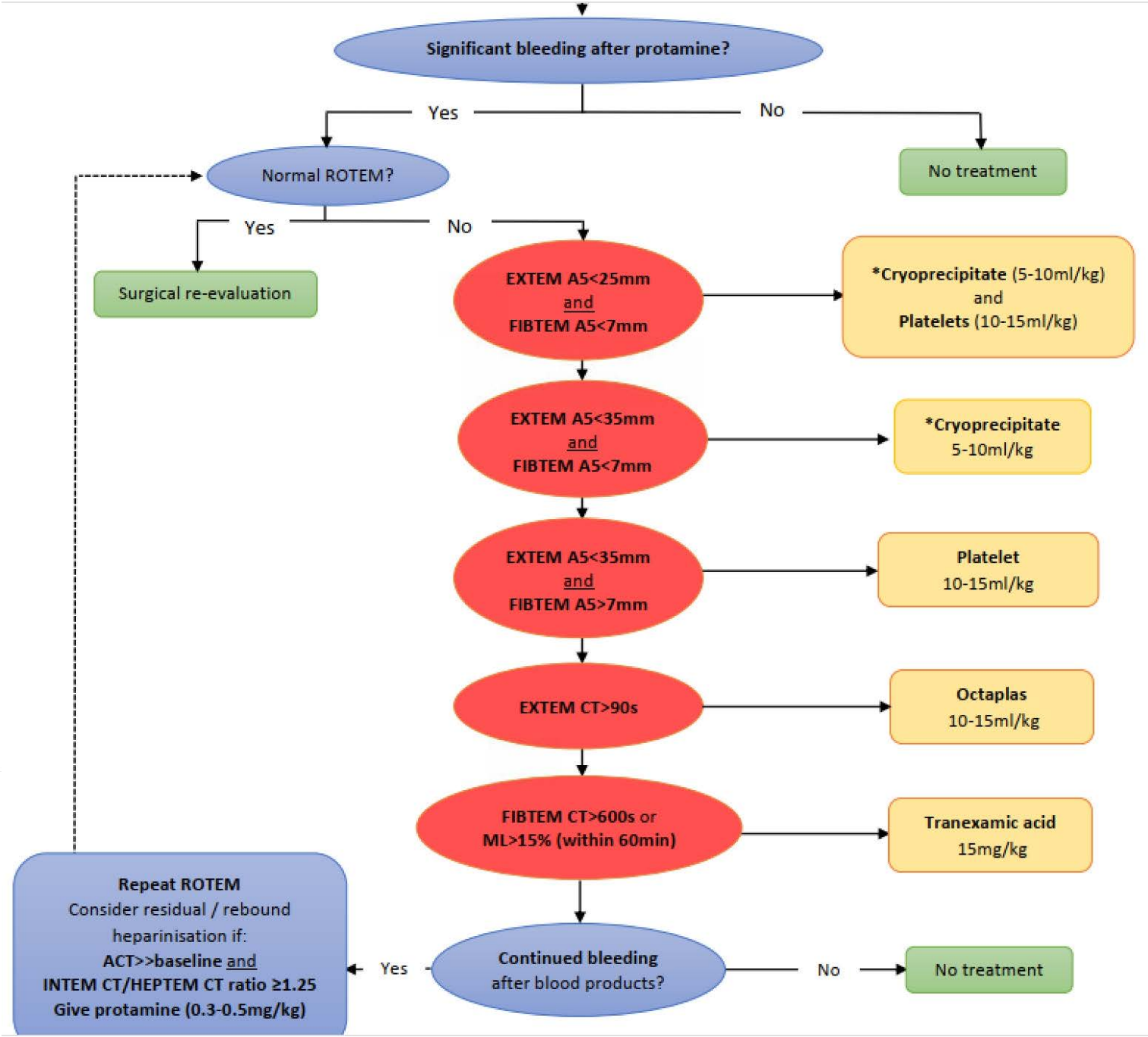
Abstract

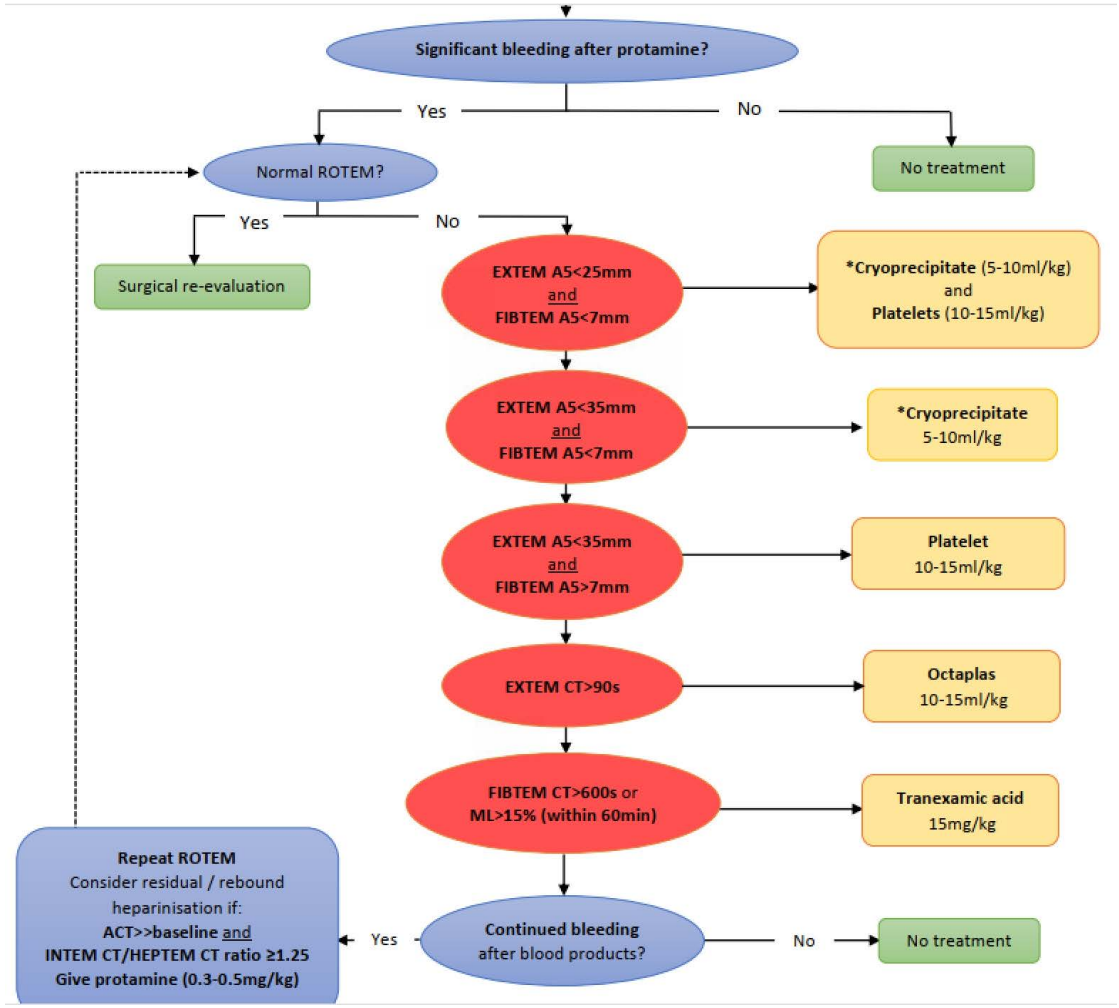
Background. In newborns and small infants undergoing cardiac surgery with cardiopulmonary bypass (CPB) and blood priming, it is unclear whether there is reduced blood loss if fresh frozen plasma (FFP) is added to the CPB priming volume. This single-centre, randomized trial tested the hypothesis that the administration of FFP after CPB (late FFP group) is superior to FFP priming (early FFP group) in terms of postoperative bleeding and overall red blood cell (RBC) transfusion.
Methods. Seventy-three infants weighing <10 kg were randomly allocated to receive FFP to supplement RBCs in the CPB priming solution (n=36) or immediately after CPB (n=37). The primary endpoint was a difference in postoperative blood loss; secondary endpoints included the amount of RBCs and FFP transfused through the first 48 postoperative hours.
Results. All patients were included in the analysis. Patients in the late FFP arm had greater postoperative mean blood loss than patients in the early FFP arm [33.1 (SD 20.6) *vs* 24.1 (12.9) ml kg^{-1}; P=0.028], but no differences in transfusions were found. The subgroup of cyanotic heart disease patients had comparable results, but with greater use of RBCs in the late FFP

Rewarm ROTEM

GOSH ROTEM Guideline for Cardiopulmonary Bypass Surgery






Significant bleeding after protamine?
Yes
No
No treatment
Normal ROTEM?
Yes
No
Surgical re-evaluation
EXTEM A5<25mm and FIBTEM A5<7mm
*Cryoprecipitate (5-10ml/kg) and Platelets (10-15ml/kg)
EXTEM A5<35mm and FIBTEM A5<7mm
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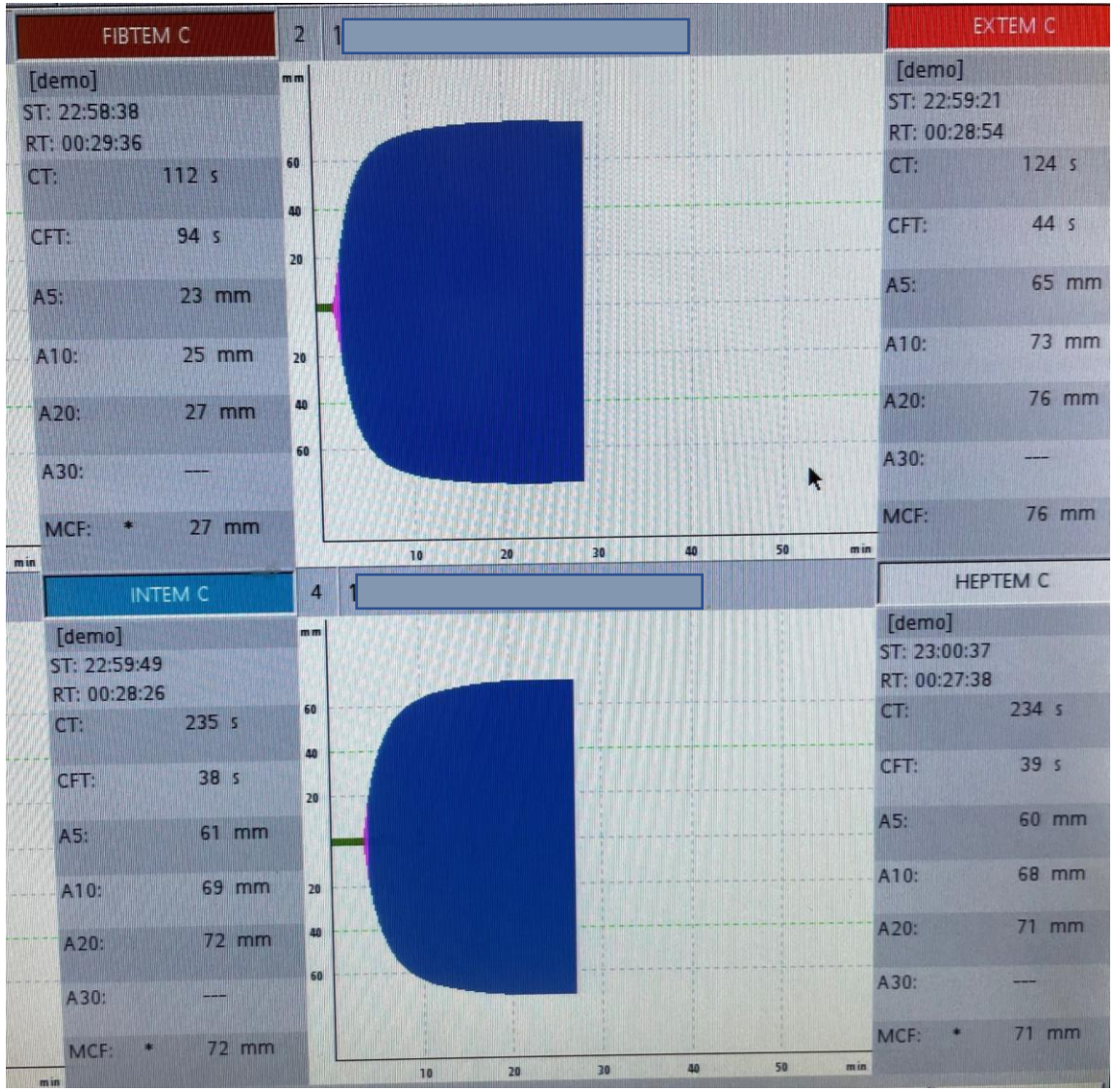
EXTEM A5<35mm and FIBTEM A5>7mm
Platelet 10-15ml/kg
EXTEM CT>90s
Octaplas 10-15ml/kg
FIBTEM CT>600s or ML>15% (within 60min)
Tranexamic acid 15mg/kg
Continued bleeding after blood products?
Yes
No
No treatment
Repeat ROTEM
Consider residual / rebound heparinisation if:
ACT>>baseline and
INTEM CT/HEPTEM CT ratio ≥1.25
Give protamine (0.3-0.5mg/kg)


FIBTEM C
[demo]
ST: 22:58:38
RT: 00:29:36
CT: 112 s
CFT: 94 s
A5: 23 mm
A10: 25 mm
A20: 27 mm
A30: ---
MCF: * 27 mm
EXTEM C
[demo]
ST: 22:59:21
RT: 00:28:54
CT: 124 s
CFT: 44 s
A5: 65 mm
A10: 73 mm
A20: 76 mm
A30: ---
MCF: 76 mm
INTEM C
[demo]
ST: 22:59:49
RT: 00:28:26
CT: 235 s
CFT: 38 s
A5: 61 mm
A10: 69 mm
A20: 72 mm
A30: ---
MCF: * 72 mm
HEPTEM C
[demo]
ST: 23:00:37
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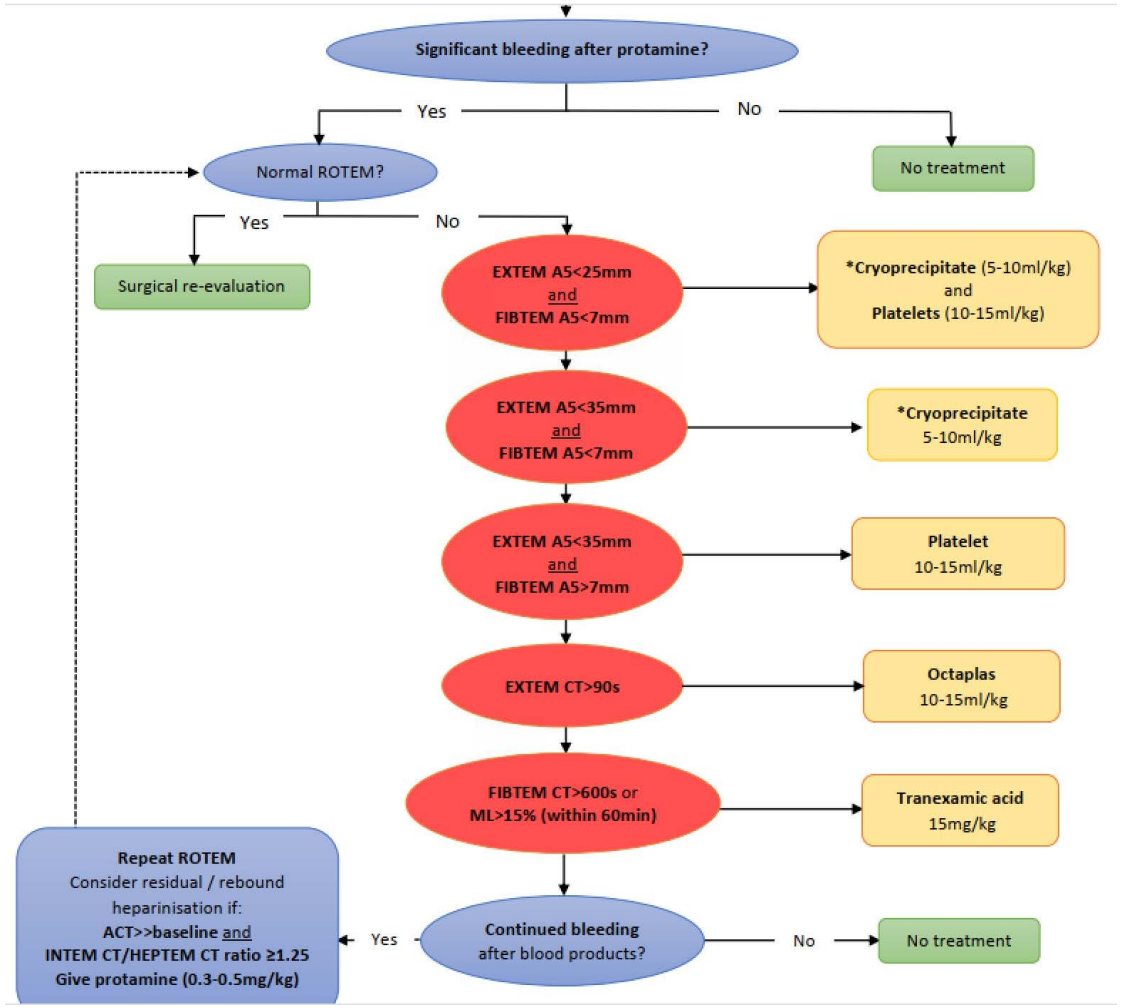
CT: 234 s
CFT: 39 s
A5: 60 mm
A10: 68 mm
A20: 71 mm
A30: ---
MCF: * 71 mm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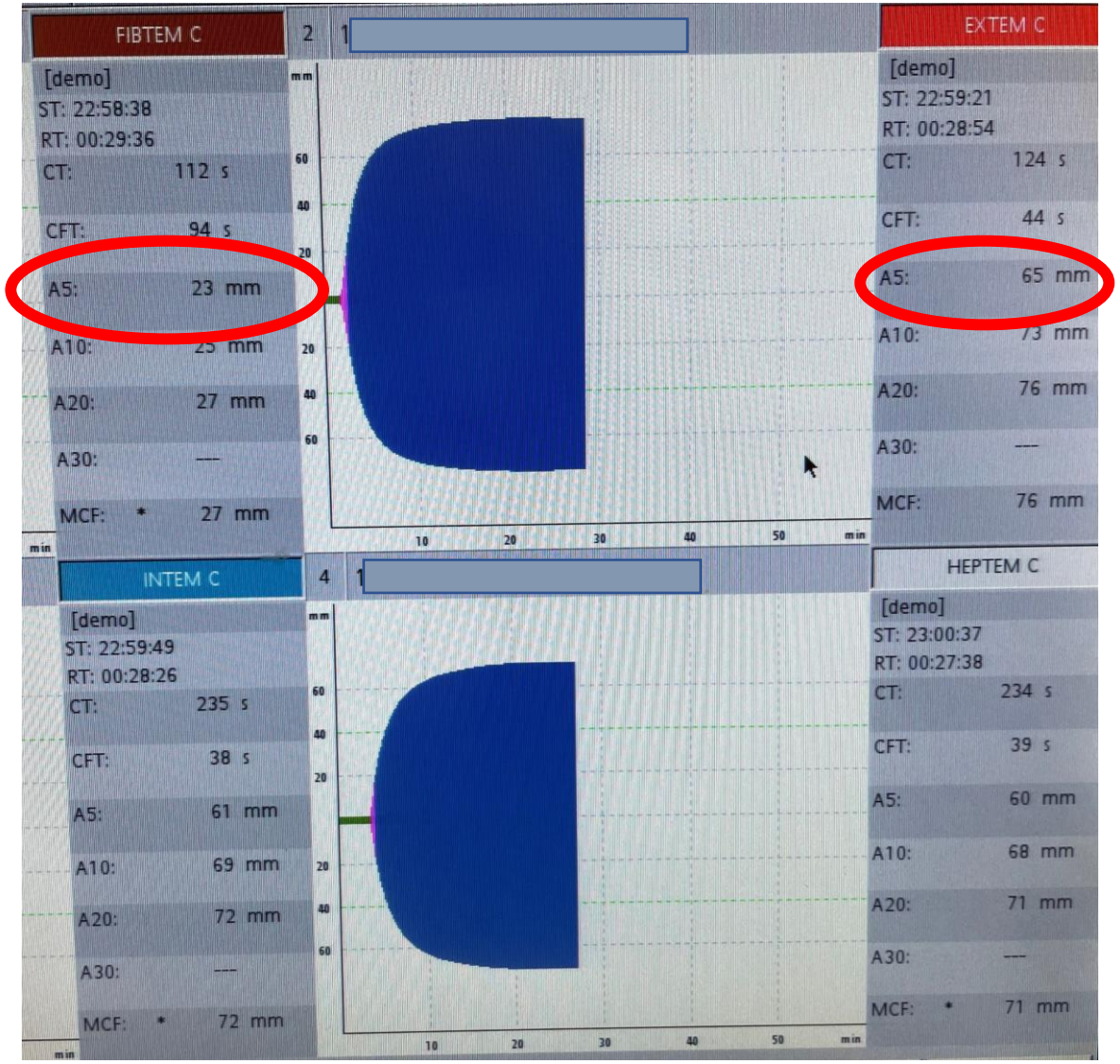
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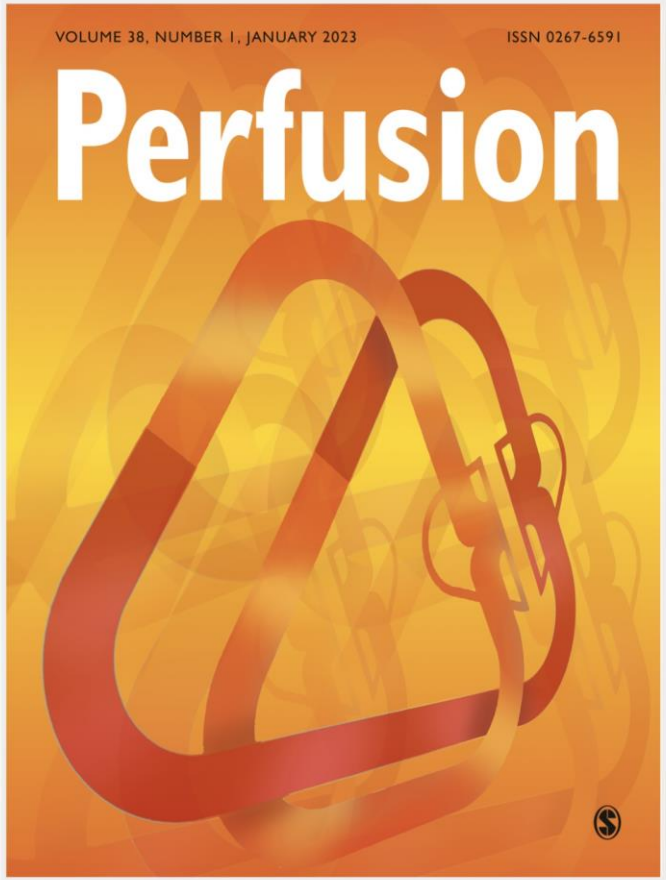

Safety and utility of modified ultrafiltration in pediatric cardiac surgery

David A Palanzo, Robert K Wise, [...], and John L Myers +3 View all authors and affiliations

Volume 38, Issue 1

World Journal for Pediatric & Congenital Heart Surgery

Ultrafiltration in Pediatric Cardiac Surgery Review

Joel Bierer, MD, Roger Stanzel, PhD, CPC, [...], and David Horne, MD +2 View all authors and affiliation

Volume 10, Issue 6 | https://doi.org/10.1177/2150135119870176

Abstract

Introduction:

Modified ultrafiltration (MUF) is employed at the termination of cardiopulmonary bypass in paediatric and neonatal patients undergoing congenital heart surgery to reduce toe accumulation of otal body water thus increasing the concentration of red cells and other elements of the circulation. MUF has been reported to remove circulating pro-inflammatory mediators that result in systemic inflammatory response syndrome

Modified ultrafiltration significantly promotes improved myocardial function, reduction in fluid overload, and reduced bleeding and transfusion complications.
Conflicting evidence that it reduces ventilation time or critical care stay.

Enhanced recovery programmes

Great Ormond Street Hospital for Children NHS Trust