Massive Postpartum haemorrhage: Can we do it better?

BaltAnestIC 2023
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SUMMARY: GOALS

General aspects

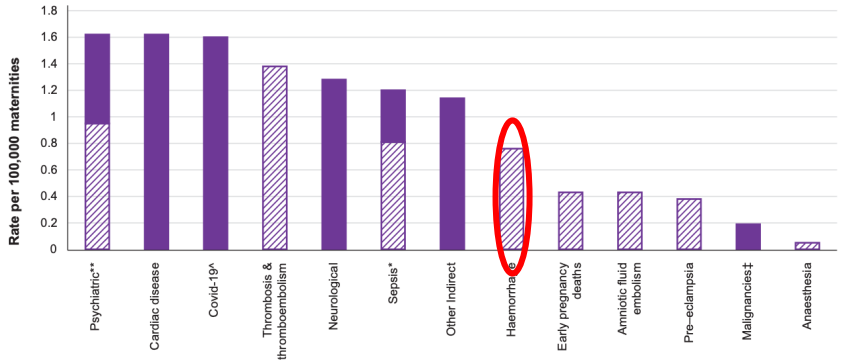
Initial management

Procoagulants use (paradigm change)

Other measures

How to improve

Figure 2.3: Maternal mortality by cause 2018-20



Hatched bars show direct causes of death, solid bars indicate indirect causes of death;
*Rate for direct sepsis (genital tract sepsis and other pregnancy related infections) is shown in hatched and rate for indirect sepsis (influenza, pneumonia, others) in solid bar;
**Rate for suicides (direct) is shown in hatched and rate for indirect psychiatric causes (drugs/alcohol) in solid bar;
‡Rate for indirect malignancies (breast/ovary/cervix);
^Rate for Covid-19 deaths calculated using maternities March to December 2020 as denominator.
Source: MBRRACE-UK

A national update on rates of postpartum haemorrhage and related interventions

Homa K. Ahmadzia[1], Chad A. Grotegut[2], Andra H. James[2]

Blood Transfus 2020; 18: 247-53 DOI 10.2450/2020.0319-19

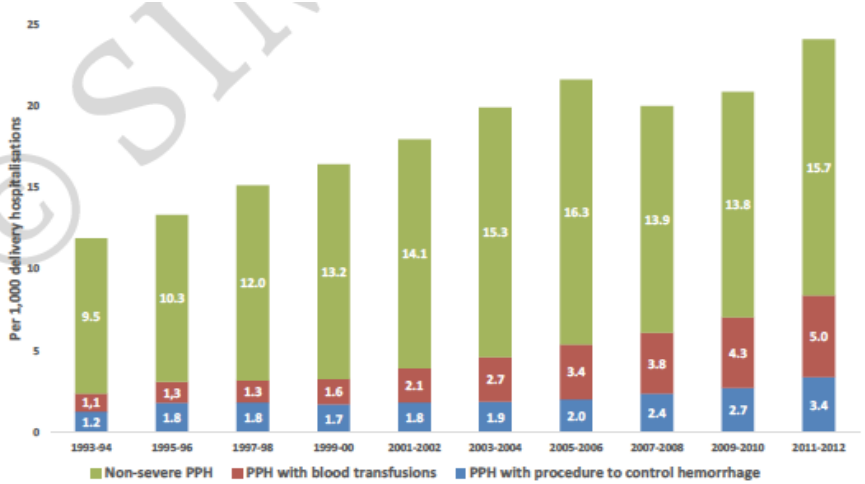
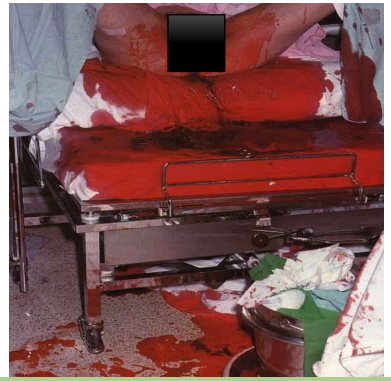


Figure 1 - Prevalence of postpartum haemorrhage (PPH) per 1,000 caesarean delivery hospitalisations requiring blood transfusion or procedure for intervention
Grouped into non-severe PPH and severe PPH (requiring either transfusion or additional surgical intervention).

General aspects



Too little is done too late!!

Quantification of bleeding

Delay: diagnosis and tratment

- ➢500 mL after vaginal delivery
- ➢> 1000 mL after CD

Which PPH will progress to massive?

- Clear local policies
- Training of front-line staff
- Multidisciplinary team working
- Regular 'fire drills'
- Excellent communication with the blood transfusion laboratory.

JPAC Joint United Kingdom (UK) Blood Transfusion and Tissue Transplantation Services Professional Advisory Committee

Definitions

- Definitions based on blood volume loss
  - 500-1000 mL (woman's baseline health…). Anemia, etc..

Underestimation!!!

- Definitions based on pathophysiological changes
  - Often associated to underestimation of blood loss
  - Tachycardia (late hypotension), pallor, lightheadedness,
  - weakness, oliguria, excessive volume requirement, restlessness

Unmasked!!!

- Definitions based on need of intervention
  - Oxytocics, blood resources, etc…

Such a retrospective view!!!

"A cumulative blood loss equal to or greater than 1000 ml
or
Any blood loss associated with clinical and/or laboratory signs of shock/tissue hypoperfusion within 24 h after birth"

Best Practice & Research Clinical Anaesthesiology 36 (2022) 325–339

Epidemiology

1-2% deliveries

Decrease in LMICs (better care and facilities)

Increase in HICs (Population changes in risk factors)

- Advanced maternal age, obesity, multiple gestation pregnancy,
- Induction of labor
- Cesarean delivery and accretism
- Serious comorbidities
- Some unknown factors….

Be prepared in high risk cases

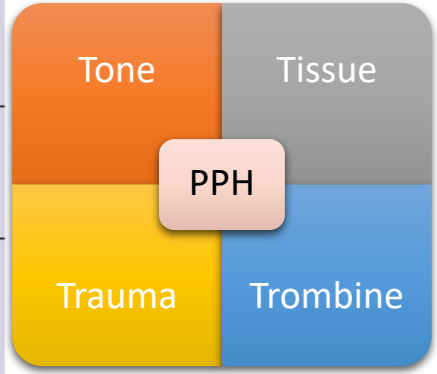
- multiple pregnancies (OR 2.3–4.7);
- history of PPH (OR 3.3);
- pregnancy-induced hypertension (OR 1.9–2.5);
- chorioamnionitis (OR 2.5);
- episiotomy (OR 1.4 to 2.2);
- pre-labor caesarean section (OR 1.3–2.3);
- caesarean section during labor (OR 1.7–3.6);
- macrosomia (OR 1.7 to 3.5);
- operative vaginal delivery (OR 2.3).

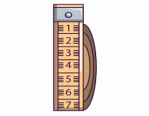
Munoz M, Stensballe J, Ducloy-Bouthors AS, et al. Patient blood management in obstetrics: prevention and treatment of postpartum haemorrhage. A NATA consensus statement. Blood Transfus 2019;17:112–36.

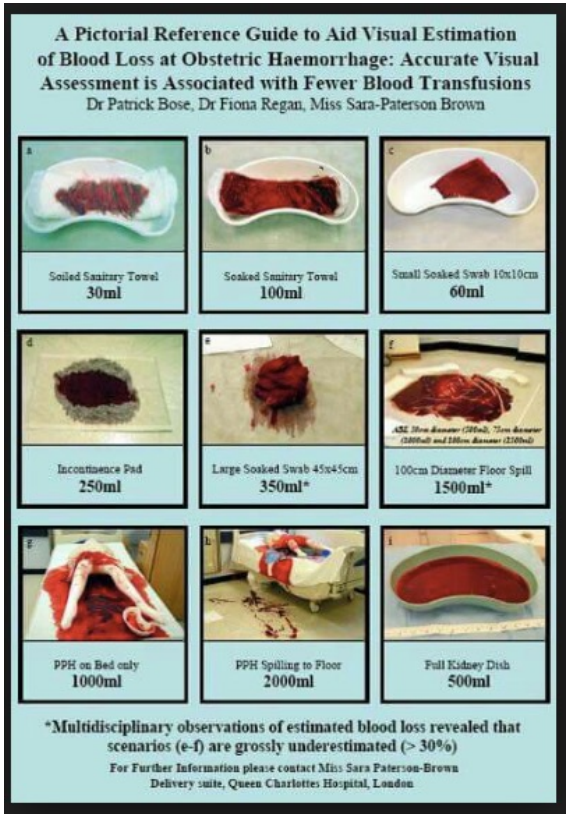
General aspects

Table 2. Risk factors for PPH

Tone	uterine distension (multiple gestation, polyhydramnion, foetal macrosomia) uterotonics quick or prolonged labour (long) oxytocin exposure chorioamnionitis uterus myomatosus
Tissue	retained placenta abnormal placental implantation (placenta adhaerens, accreta / increta / percreta)
Trauma	vulvovaginal injury episiotomy / perineal suture uterine rupture inversion of the uterus
Thrombin	gestational: thrombocytopenia with HELLP syndrome, DIC (i.e., with preeclampsia, intrauterine foetal death, placental abruption, amniotic fluid embolism) other: VWD, plasmatic coagulopathies, platelet function disorders, factor deficiencies (loss, consumption, dilution)







Measure

Weight

Calculate

Estimation

- Physiological changes of pregnancy may mask or change clinical signs
  - More tachycardic, less hypotension than expected

Why is so important to know the amount of blood loss?

Bell *et al. BMC Pregnancy and Childbirth* (2020) 20:271
https://doi.org/10.1186/s12884-020-02971-3

Incidence of postpartum haemorrhage defined by quantitative blood loss measurement: a national cohort

Sarah F. Bell[1], Adam Watkins[2], Miriam John[3], Elinore Macgillivray[2], Thomas L. Kitchen[1], Donna James[4], Cerys Scarr[4], Christopher M. Bailey[5], Kevin P. Kelly[6], Kathryn James[1], Jenna L. Stevens[7], Tracey Edey[8], Rachel E. Collis[1] and Peter W. Collins[9,10*]

Conclusions: Quantitative measurement of blood loss is feasible in all hospitals providing maternity care and is associated with detection of higher rates of postpartum haemorrhage. These results have implications for the definition of abnormal blood loss after childbirth and for management and research of postpartum haemorrhage.

Reduction in massive postpartum haemorrhage and red blood cell transfusion during a national quality improvement project, Obstetric Bleeding Strategy for Wales, OBS Cymru: an observational study

Sarah F Bell [# 1], Rachel E Collis [# 1], Philip Pallmann [2], Christopher Bailey [3], Kathryn James [1], Miriam John [4], Kevin Kelly [3], Thomas Kitchen [1], Cerys Scarr [5], Adam Watkins [6], Tracey Edey [7], Elinore Macgillivray [6], Kathryn Greaves [8], Ingrid Volikas [3], James Tozer [9], Niladri Sengupta [10], Iolo Roberts [3], Claire Francis [5], Peter W Collins [11]

BMC Pregnancy Childbirth. 2021 May 15;21(1):377.

Quality control, trends and definitions of normal and abnormal bleeding in our populations

Best Pract Res Clin Anaesthesiol. 2017 Mar;31(1):107-124.

Managing Major Obstetric Haemorrhage: Pharmacotherapy and Transfusion

Rachel Collis, Emilia Guasch

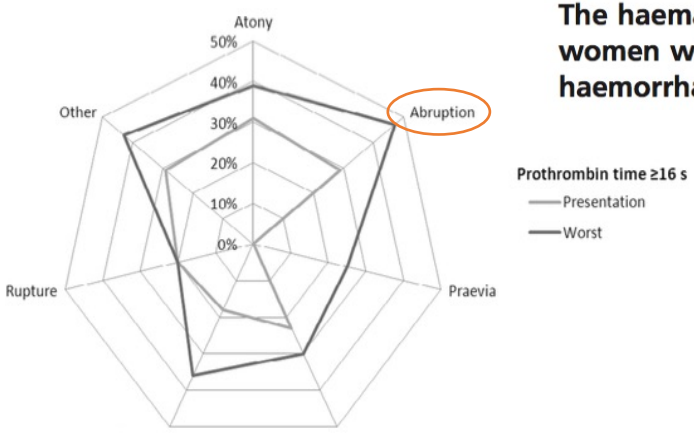
- Etiology where consumption is first
  - Abruptio and placental abnormalities
  - Amniotic fluid embolism
  - HELLP
- Platelets and factors consumption
  - Fibrinogen

- Consensus clinical definition: Not only blood loss, also vital signs, symptoms, and coagulation changes
- Development of clinical algorithms for massive PPH
- Organizational aspects: Local protocols, checklists and simulation

bjh research paper

The haematological features and transfusion management of women who required massive transfusion for major obstetric haemorrhage in the UK: a population based study

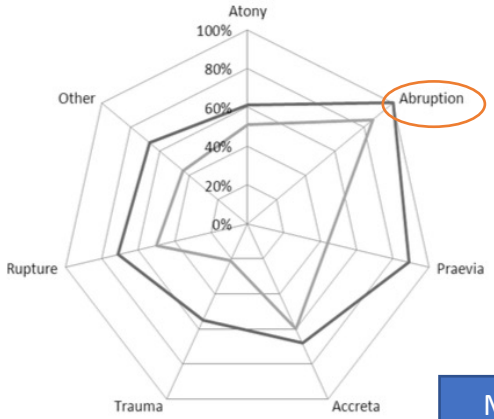
British Journal of Haematology, 2016, **172,** 616–624



Prothrombin time ≥16 s

Presentation

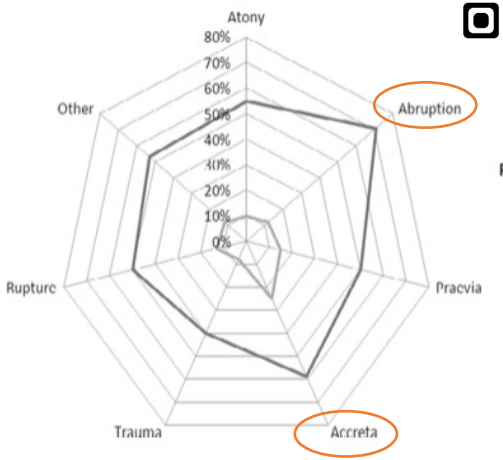
Worst



Fibrinogen <2 g/l

Presentation

Worst



Platelet count <75 x 10⁹/l

Presentation

Worst

Most PPH have normal platelets and fibrinogen at the beginning

Coagulopathy in PPH (In a few words….)

P. Collins — Best Practice & Research Clinical Anaesthesiology 36 (2022) 383–398

1. Deficiency of fibrinogen.
2. Increased fibrinolysis.
3. Reduction in coagulation factors that generate thrombin.
4. Thrombocytopenia.

- Consumptive coagulopathy:
  - *Low Fibrinogen and platelets. Other factors initially normal*
  - *Often in abrution, AFE, sepsis, acute fatty liver, preeclampsia*
- Dilutional coagulopathy:
  - *Worsens consumptive coagulopathy or just dilution of factors (resuscitation)*
- Fibrinogen decrease: first deficit factor (any ethiology of PPH)
  - *FIBTEM, CFF or Clauss fibrinogen measures*
  - *Incidence: 5% if bleeding 1.5 L and 17% if bleeding >2.5 L*
- Other factors deficiency: FFP (low evidence). PT/aPTT >1.5
- Platelets: 75 x 10^9 (threshold)
- Fibrinolysis:
  - *Early (<3h) prevention with TXA (reduces mortality)*

Target values during on-going bleeding

Best Practice & Research Clinical Anaesthesiology 36 (2022) 427–432

Table 1
Target values for haemostasis during on-going bleeding.

Haemoglobin	>90 g/L
Platelets	>100 × 10^9/L
PK (INR)	<1.5
APTT	normal
Fibrinogen	>2–2.5 g/L
pH	>7.2
Calcium	>1.0 mmol/L
Temperature	>36.5 C

PK (INR), Prothrombin Complex (International Normalized Ratio). APTT, activated partial thromboplastin time.

Protocol for postpartum haemorrhage including massive transfusion

Ove Karlsson, MD, PhD, Consultant Anaesthetist [a, b]

[a] *Department of Anaesthesiology and Intensive Care, Institute of Clinical Science, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden*
[b] *Department of Anaesthesiology, Sahlgrenska University Hospital, Gothenburg, Sweden*

We treat and transfuse patients, not numbers!!!

How sick is the patient?

Shock index: an effective predictor of outcome in postpartum haemorrhage?

BJOG 2015;122:268–275.

HL Nathan,[a] A El Ayadi,[b] NL Hezelgrave,[a] P Seed,[a] E Butrick,[b] S Miller,[b] A Briley,[a] S Bewley,[a] AH Shennan[a]

- Shock index: HR / SBP (sepsis, trauma, etc.)

0,5-0,7: normal >0,9: mortality increase	<0,9: Expectant management >1,7: Needs emergency treatment

The golden hour for postpartum hemorrhage: Results from a prospective cohort study

Int J Gynecol Obstet. 2022;156:450–458.

"The rule of 1s":

- heart rate >100 bpm,
- SI ≥1
- estimated blood loss ≥1 L

EJA

Eur J Anaesthesiol 2022; 37:1–10

OPEN

REVIEW ARTICLE

Haemostatic support in postpartum haemorrhage

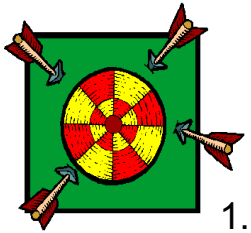
A review of the literature and expert opinion

Stefan Hofer, Jan Blaha, Peter W. Collins, Anne-Sophie Ducloy-Bouthors, Emilia Guasch, Francesco Labate, Filipe Lança, Lill Trine Nyflet, Kostja Steiner and Marc Van de Velde

Table 2 Clinical signs that may indicate beginning or undetected PPH within 24 h after delivery and should activate close and active patient monitoring

Symptoms:		
Tachycardia more than 100 bpm, in spite of balanced volume state and adequate pain control	→	Patient at risk Close and active monitoring
Pallor/Drop in Hb> 2 g dl^{-1} before crystalloid administration		
Hypotension (BP ≤85/45 mmHg or 20% drop in baseline value)		
Critical values in blood gas analysis (e.g., base excess <-4, pH <7.2)		
Shock index of >0.9		
Lactate >4.0 mM/l		
Oliguria (diuresis <500 ml $24h^{-1}$)		
Excessive volume requirement		
Inappropriate fear or restlessness		
Coagulopathy (detected clinically or by VET)		

BP, blood pressure; bpm, beat per minute; Hb, haemoglobin; PPH, postpartum haemorrhage; VET, viscoelastic testing.



Management: Goals

Protocols in every department

1. Hypovolemia correction: macro and microcirculation
2. Coagulopathy treatment: (Prevention and procoagulants)
3. Uterine contraction / Surgical control of haemorrhage

2. All such institutions should have protocols and the necessary facilities for managing the following

- Preoperative assessment and preparation
- Checking Equipment and drugs
- Syringe labelling
- Difficult/failed intubation
- Malignant hyperpyrexia
- Anaphylaxis
- Local anaesthetic toxicity
- Massive haemorrhage
- Infection control
- Postoperative care including pain relief

The Helsinki Declaration on Patient Safety in Anaesthesiology

Jannicke Mellin-Olsen, Sven Staender, David K. Whitaker and Andrew F. Smith

Eur J Anaesthesiol 2010;27:592–597

Initial management: Letal thriad

- Negative effect:
  - Dilution (hypercloremia, platelet function, hypocalcemia..)
  - Hypothermia (prevention, monitoring and active treatment. Factors and platelets decreased function)
  - Acidosis (hypoperfusion. Fibrinogen consumption)

Fluid resuscitation

- Goal:
  - To improve CO to maintain global blood flow and increase tissue perfusion and oxygen availability for cellular respiration

Timing: start as soon as PPH is diagnosed

- If too late: cell apoptosis may have started yet.

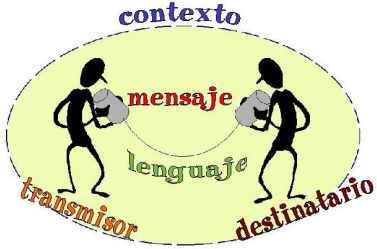
- Fluid resuscitation should start earlier than anaerobic metabolism

Amount:

- Trauma model?
- Sepsis model?
- 3 mL every 1 mL of EBL?

Type:
Cristalloids (ideal one?)
Not too much saline.
Avoid too much gelatin

Initial management: blood bank



Obstetric hemorrhage

C. MCLINTOCK*† and A. H. JAMES*†
*National Women's Health, Auckland City Hospital, Auckland, New Zealand; and †Division of Maternal-Fetal Medicine, Department of Obstetrics and Gynecology, Duke University Medical Center, Durham, NC, USA

J Thromb Haemost 2011; **9**: 1441–51.

Major PPH
with EBL > 1000 mL

Evidence of hemodynamic compromise: tachycardia, hypotension?

Ongoing significant bleeding?

No — Yes

Blood needed 30–45 min	Blood needed < 30 min	Blood needed NOW
G&S results: *Negative antibody screen* → Group-specific units *positive antibody screen* → Urgent crossmatch	G&S available: *Negative antibody screen* → Group-specific units *No G&S available or positive antibody screen* → O negative units	O negative units (unless negative antibody screen and group-specific units immediately available)

Initial management:Uterotonics

- Oxitocine, Metilergonovine, Carbetocine, Carbaprost, Misoprostol and mixes…..
- Slightly better Carbetocine, with same side effects
- Risk / benefit. All of them better than placebo

Cochrane Library

Cochrane Database of Systematic Reviews

Uterotonic agents for preventing postpartum haemorrhage: a network meta-analysis (Review)

Gallos ID, Papadopoulou A, Man R, Athanasopoulos N, Tobias A, Price MJ, Williams MJ, Diaz V, Pasquale J, Chamillard M, Widmer M, Tunçalp Ö, Hofmeyr GJ, Althabe F, Gülmezoglu AM, Vogel JP, Oladapo OT, Coomarasamy A

Serum Lactate Level as a Predictor for Blood Transfusion in Postpartum Hemorrhage

Surbhi Agrawal, MD[1] Maria Smith, BS[1] Robert Berg, MD[1] Iffath A. Hoskins, MD[1]

American Journal of Perinatology © 2021.

Prediction

- Retrospective study PPH 2016-19
- N=938. Divided in lactate >2 or <2mMol/L
- Women with higher lactate, higher probability of transfusion
- And even more units…

Prediction

Predicting the need for blood transfusion requirement in postpartum hemorrhage

THE JOURNAL OF MATERNAL-FETAL & NEONATAL MEDICINE
2022, VOL. 35, NO. 25, 7911–7916

Emmanuel Attali[a,b], Ariel Many[a,b], Guy Kern[b], Lee Reicher[a,b], Adiel Kahana[a,b], Asaf Shemer[b], Georgy Kagan[b,c], Ronni Gamzu[b,d], Yariv Yogev[a,b] and Liat Zakar[a,b]

Immediate point-of-care hemoglobin and lactate levels comprise simple and readily available tools in the delivery room and are good predictors for blood transfusion requirements of women with PPH. In combination with the SI findings, they could assist physicians in quick risk stratification: rapid request for blood products, rapid mobilization of adequate response team, and decision about women transfer destination. Future studies with large numbers of patients are warranted to validate these promising findings.

	AUC	PPV (%)	NPV (%)
SI	0.61	77.4	70.0
Lactate	0.61	72.2	25.0
iHb	0.83	84.0	73.7
SI + Lactate	0.66	77.8	61.5
SI + iHb	0.87	83.8	70.0
Lactate + iHb	0.83	84.7	68.2
SI + Lactate + iHb	0.86	86.3	76.2

AUC: area under the curve; NPV: negative predictive value; PPV: positive predictive value; SI: shock index; iHb: initial hemoglobin.

› Int J Gynaecol Obstet. 2023 Sep;162(3):906-912. doi: 10.1002/ijgo.14747. Epub 2023 Apr 1.

Risk factors for blood component therapy in parturients-Case-control study

Daniel Gabbai [1 2 3], Ariel Many [2 4], Liat Lerner-Geva [2 3 5], Emmanuel Attali [1 2]

Retained placenta and anemia < 10g/dL are predictors of transfusion in a cohort of > 187000 deliveries (2011-19)

Pro-hemostatic drugs

- Tranexamic acid (TXA)
- Fibrinogen concentrate/ Cryoprecipitate
- Others:
  - Prothrombin complex(PCC)
  - Recombinant VIIa factor (rFVIIa)

Effect of early tranexamic acid administration on mortality, hysterectomy, and other morbidities in women with post-partum haemorrhage (WOMAN): an international, randomised, double-blind, placebo-controlled trial

WOMAN Trial Collaborators*

www.thelancet.com Published online April 26, 2017

- ✓ Lower number of maternal deaths due to PPH
- ✓ No differences in other causes of death

- ✓ Less mortality with TXA
- ✓ More effective between 1st and 3rd hour
- ✓ More effective in uterine atony

- ✓ Less laparotomies for haemorrhage
- ✓ Even better when early administration

TXA reduces death rate in one third

Antifibrinolytic drugs for treating primary postpartum haemorrhage (Review)

Cochrane Library

Cochrane Database of Systematic Reviews

Shakur H, Beaumont D, Pavord S, Gayet-Ageron A, Ker K, Mousa HA

Authors' conclusions

TXA when administered intravenously reduces mortality due to bleeding in women with primary PPH, irrespective of mode of birth, and without increasing the risk of thromboembolic events. Taken together with the reliable evidence of the effect of TXA in trauma patients, the evidence suggests that TXA is effective if given as early as possible.

Cochrane Database Syst Rev. 2018 Feb 20;2:CD012964.

Best Practice & Research Clinical Obstetrics and Gynaecology 61 (2019) 66–74

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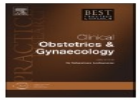
journal homepage: www.elsevier.com/locate/bpobgyn



6

Tranexamic acid for post-partum haemorrhage: What, who and when

Amy Brenner*, Katharine Ker, Haleema Shakur-Still, Ian Roberts

Clinical Trials Unit, Department of Population Health, London School of Hygiene and Tropical Medicine, Keppel Street, London, WC1E 7HT, United Kingdom

Research agenda

- Tranexamic acid use for the prevention of post-partum haemorrhage, particularly in high-risk groups.
- Alternative routes of administration of tranexamic acid to increase accessibility and reduce time to treatment.
- Studies to examine the risk factors of maternal morbidity after post-partum haemorrhage and to investigate possible ways to reduce these risk factors.

Association between fibrinogen level and severity of postpartum haemorrhage: secondary analysis of a prospective trial

BJA 2012 June

M. Cortet[1,2,3,4*], C. Deneux-Tharaux[5], C. Dupont[6,7], C. Colin[8], R.-C. Rudigoz[9], M.-H. Bouvier-Colle[5] and C. Huissoud[2,9,10]

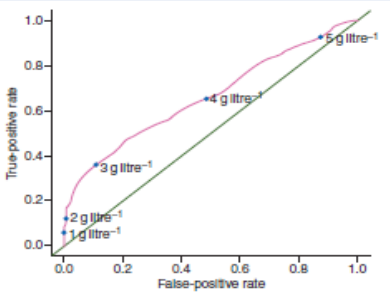


Fig 3 ROC curve of fibrinogen concentration at diagnosis for the prediction of severe PPH. Area under the curve=0.66, 95% CI=(0.64–0.68).

suggests that the fibrinogen level at diagnosis correlates with the course of the haemorrhage and that its low level is associated with an increased risk of aggravation (12 times higher risk of severe PPH when fibrinogen is ≤ 2 g litre^{-1}). Independent of other laboratory indicators, a fibrinogen level between 2 and 3 g litre^{-1}, usually considered normal, is also associated with a nearly doubled risk of severe haemorrhage and may constitute an early warning sign.

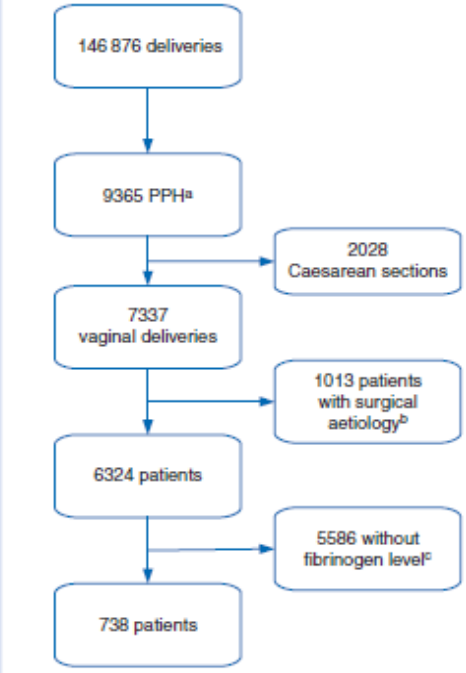


Fig 1 Flow chart of study population. [a]Postpartum haemorrhage; [b]uterine rupture, wound of birth canal, placenta accreta, placenta praevia, [c]measured in 2h after diagnosis of PPH.

British Journal of Anaesthesia Page 1 of 11
doi:10.1093/bja/aeu444

BJA

Pre-emptive treatment with fibrinogen concentrate for postpartum haemorrhage: randomized controlled trial

A. J. Wikkelsø[1*], H. M. Edwards[2], A. Afshari[3], J. Stensballe[4], J. Langhoff-Roos[5], C. Albrechtsen[3], K. Ekelund[3], G. Hanke[3], E. L. Secher[3], H. F. Sharif[5], L. M. Pedersen[6], A. Troelstrup[6], J. Lauenborg[7], A. U. Mitchell[1], L. Fuhrmann[1], J. Svare[2], M. G. Madsen[8], B. Bødker[9], A. M. Møller[1] and FIB-PPH trial group

In conclusion, we found no evidence for the use of pre-emptive treatment with fibrinogen concentrate for severe post-partum haemorrhage in patients with normofibrinogenaemia.

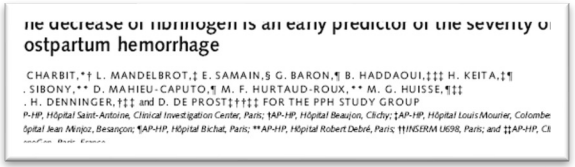
Early and systematic administration of fibrinogen concentrate in postpartum haemorrhage following vaginal delivery: the FIDEL randomised controlled trial

AS Ducloy-Bouthors,[a,b] FJ Mercier,[c,*] JM Grouin,[d] F Bayoumeu,[e] J Corouge,[a] A Le Gouez,[c] T Rackelboom,[f] F Broisin,[g] F Vial,[h] A Luzi,[i] O Capronnier,[j] C Huissoud,[g,k,*] A Mignon,[f,*] the FIDEL working group[†]

- Multicentre, double-blind, randomised placebo-controlled trial. 30 French hospitals.
- 437 pts: 3 g FIB – 224, Placebo – 213
- No significant differences in efficacy outcomes or side effects were observed

But... **FIB level at inclusion was 4,1 g/l !!!**

And... **There are limited chances to perform randomized trial in coagulopathic patients with recent improvements in obstetric care in Western World**



he decrease of fibrinogen is an early predictor of the severity of
ostpartum hemorrhage

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ôpital Jean Minjoz, Besançon; ¶AP-HP, Hôpital Bichat, Paris; **AP-HP, Hôpital Robert-Debré, Paris; ††INSERM U698, Paris; and ‡‡AP-HP, Cl

Eur J Anaesthesiol 2023; **40:**226–304

Management of severe peri-operative bleeding: Guidelines from the European Society of Anaesthesiology and Intensive Care

EJA

Second update 2022

Sibylle Kietaibl, Aamer Ahmed, Arash Afshari, Pierre Albaladejo, Cesar Aldecoa, Giedrius Barauskas, Edoardo De Robertis, David Faraoni, Daniela C. Filipescu, Dietmar Fries, Anne Godier, Thorsten Haas, Matthias Jacob, Marcus D. Lancé, Juan V. Llau, Jens Meier, Zsolt Molnar, Lidia Mora, Niels Rahe-Meyer, Charles M. Samama, Ecaterina Scarlatescu, Christoph Schlimp, Anne J. Wikkelsø and Kai Zacharowski

We suggest assessing fibrinogen levels in parturients with bleeding, as levels less than 2 g l^{-1} may identify those at risk of severe postpartum haemorrhage. 1C

Coagulopathy risk assessment should include the obstetric conditions associated with PPH not just an estimated blood loss. 1C

High-volume resuscitation with crystalloids and colloids is associated with coagulopathy and adverse maternal outcomes in women with postpartum haemorrhage. C

Dynamic platelet count decrease or a level less than 150×10^9 l^{-1} at the onset of labour, particularly if combined with plasma fibrinogen level less than 2.0 g l^{-1}, may indicate an increased risk of postpartum haemorrhage. C

At the beginning of labour, aPTT and PT are of little predictive value for postpartum haemorrhage. C

VHA can identify obstetric coagulopathy including hypofibrinogenaemia and reduced platelet level. B

VHA-guided haemostatic treatment reduces the need for blood products. B

We recommend against pre-emptive fibrinogen replacement; however, in ongoing postpartum haemorrhage with hypofibrinogenaemia, we recommend fibrinogen replacement. 1B

Fibrinogen substitution in women with ongoing postpartum haemorrhage and a fibrinogen level above 2 g l^{-1} or FIBTEM A5 >12 mm is not indicated. 1B

In severe postpartum haemorrhage, we suggest a VHA-guided intervention protocol. 2C

We recommend the administration of tranexamic acid in postpartum haemorrhage at a dose of 1 g intravenously as soon as possible within 3 h, which can be repeated if bleeding continues. 1B

blood

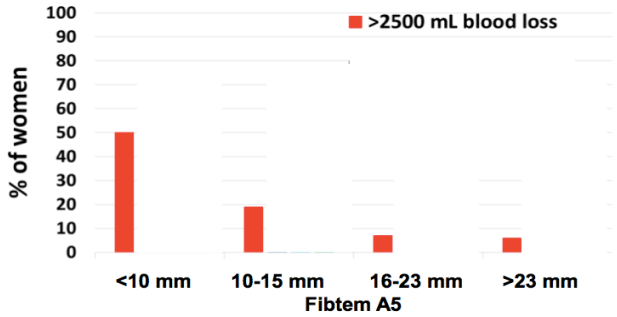
Obstetric Bleeding Study 1: OBS1

Fibrin-based clot formation as an early and rapid biomarker for progression of postpartum hemorrhage: a prospective study

Peter W. Collins,[1,2] Graeme Lilley,[3] Daniel Bruynseels,[3] David Burkett-St. Laurent,[3] Rebecca Cannings-John,[4] Elizabeth Precious,[1] Vincent Hamlyn,[3] Julia Sanders,[4,5] Raza Alikhan,[1] Rachel Rayment,[1] Alexandra Rees,[5] Abigail Kaye,[5] Judith E. Hall,[2,3] Shantini Paranjothy,[6] Andrew Weeks,[7] and Rachel E. Collis[3] Blood 124:1727-1736, 2014

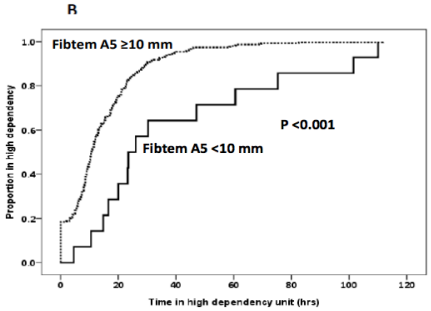
n=>6000 deliveries

Outcome of PPH dependent on early Fibtem A5 level: OBS1



Fibtem A5 taken after 1000-1500 mL and before any transfusion

Time on high dependency unit: OBS1

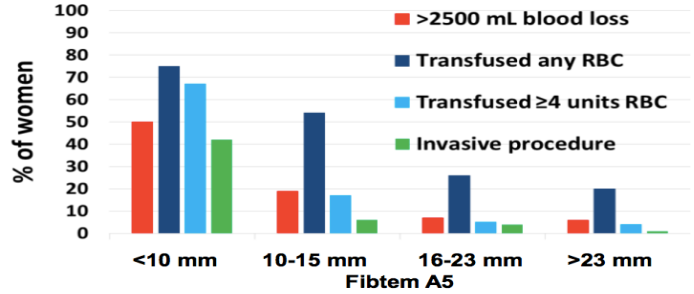


Median 95% CI

Fibtem A5 <10 mm: 23.5 (18.4-28.5) hrs
Fibtem A5 ≥10 mm: 10.8 (9.7-11.8) hrs

Fibtem A5 <10 mm roughly equal to fibrinogen <2 g/L

Outcome of PPH dependent on early Fibtem A5 level: OBS1



Fibtem A5 taken after 1000-1500 mL and before any transfusion

Goal: Avoid PPH progresion to severe PPH (>2500 mL) and reduce morbidity

Lessons learned:

- ✓ Risk evaluation of every women
- ✓ Blood loss accuracy measure (gravimetry). 500, 1000, 1500.
- ✓ Multidisciplinary care bedside(seniors)
- ✓ POC-ROTEM/TEG (algorithm OBS-2)

"Quality improvement" Project

International Journal of Obstetric Anesthesia 47 (2021) 102983

The incidence, aetiology, and coagulation management of massive postpartum haemorrhage: a two-year national prospective cohort study

S.F. Bell [a,*], R.E. Collis [a], C. Bailey [b], K. James [a], M. John [c], K. Kelly [b], T. Kitchen [a], C. Scarr [d], E. Macgillivray [e], P.W. Collins [f]

- Massive PPH=5.7 per 1000 (349/60914). No deaths. Leading cause: genital trauma
- ICU admission: 10.9%. Hysterectomy 4.6%.
- 80.6% transfused & 22.9% coagulation products. Abnormal ROTEM 17.1%
- VHA use in 70.2%; FIBTEM A5<12 mm in 17.1%, low platelets 5.1% aPTT> 1.5 in 3%

Management of postpartum haemorrhage: from research into practice, a narrative review of the literature and the Cardiff experience

International Journal of Obstetric Anesthesia (2019) 37, 106–117

P.W. Collins,[a] S.F. Bell,[b] L. de Lloyd,[b] R.E. Collis[b]

Changes after OBS1, OBS2, OBS-Cymru

Less FFP use

Less women >5 CH

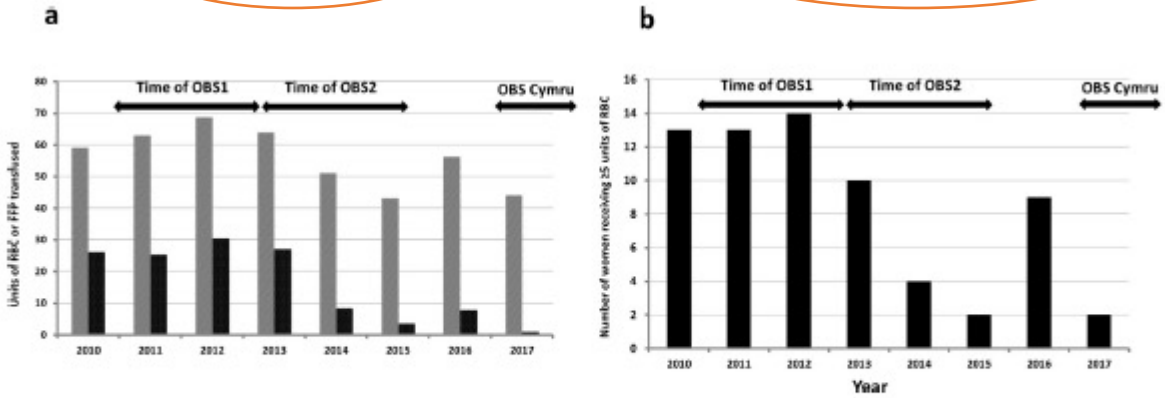


Fig. 4 Changes in transfusion practice across time in Cardiff. Fig. 4a shows the number of units of red blood cells (RBC) (grey) and fresh frozen plasma (FFP) (black) transfused for each year between 2010 and 2017. The Obstetric Bleeding Study-2 study was associated with a reduction in RBC and FFP transfusion which increased after the study finished and fell again once the Obstetric Bleeding Study for Wales Cymru was initiated. Fig. 4b shows data for the number of women who received at least 5 units of RBC, representing a subgroup of very severe postpartum haemorrhage. A similar temporal trend was observed

The role of recombinant activated factor VII in obstetric hemorrhage

Curr Opin Anesthesiol 2012, 25:309–314

(1) Transfuse RBCs to aim for a hemoglobin level of 90–100 g/L.
(2) Transfuse platelets to aim for a platelet count of more than 70×10^9/L.
(3) Transfuse FFP/fibrinogen/cryoprecipitate to aim for a fibrinogen level of more than 2 g/L.
(4) Transfuse FFP to aim for prothrombin time and APTT less than 1.5 × the upper normal range.
(5) Try to avoid/correct acidosis and hypothermia.
(6) Correct low ionized calcium.
(7) Rule out arterial bleeding (surgical interventions/arterial embolization).

Recombinant factor VIIa for the prevention and treatment of bleeding in patients without haemophilia (Review)

Simpson E, Lin Y, Stanworth S, Birchall J, Doree C, Hyde C

- Only for RCT
- Thromboembolic events

EJA

Eur J Anaesthesiol 2023; **40:**226–304

GUIDELINES

Management of severe peri-operative bleeding: Guidelines from the European Society of Anaesthesiology and Intensive Care

Second update 2022

We suggest that administration of rFVIIa can be considered for life-threatening postpartum haemorrhage, which cannot be stopped by conventional, surgical or interventional radiological means and/or when comprehensive coagulation therapy fails. 2C

We recommend against a prophylactic/general use of rFVIIa in postpartum haemorrhage because of increased risk of fatal thrombosis. 1C

EMA approval (april 2022)

- Authorized use of VIIa factor in severe PPH

4.1 Therapeutic indications

NovoSeven is indicated for the treatment of bleeding episodes and for the prevention of bleeding in those undergoing surgery or invasive procedures in the following patient groups:

- in patients with congenital haemophilia with inhibitors to coagulation factors VIII or IX > 5 Bethesda Units (BU)
- in patients with congenital haemophilia who are expected to have a high anamnestic response to factor VIII or factor IX administration
- in patients with acquired haemophilia

- in patients with congenital FVII deficiency
- in patients with Glanzmann's thrombasthenia with past or present refractoriness to platelet transfusions, or where platelets are not readily available.

Severe postpartum haemorrhage

NovoSeven is indicated for the treatment of severe postpartum haemorrhage when uterotonics are insufficient to achieve haemostasis.

Journal of Thrombosis and Haemostasis, **14**: 205–210 DOI: 10.1111/jth.13174

RECOMMENDATIONS AND GUIDELINES

Management of coagulopathy associated with postpartum hemorrhage: guidance from the SSC of the ISTH

P. COLLINS,* R. ABDUL-KADIR† and J. THACHIL,‡ FOR THE SUBCOMMITTEES ON WOMEN'S HEALTH ISSUES IN THROMBOSIS AND HAEMOSTASIS AND ON DISSEMINATED INTRAVASCULAR COAGULATION

**Institute of Infection and Immunity, School of Medicine, Cardiff University, Cardiff; †The Royal Free Foundation Hospital, University College London, London; and ‡Haemostasis and Thrombosis Unit, Manchester Royal Infirmary, Manchester, UK*

RCT comparing Fibrinogen+PCC vs FFP

- Only RCT

Anaesthesia 2016 doi:10.1111/anae.13489

Guidelines

AAGBI guidelines: the use of blood components and their alternatives 2016

A. A. Klein,[1] P. Arnold,[2] R. M. Bingham,[3] K. Brohi,[4] R. Clark,[5] R. Collis,[6] R. Gill,[7] W. McSporran,[8] P. Moor,[9] R. Rao Baikady,[10] T. Richards,[11] S. Shinde,[12] S. Stanworth[13] and T. S. Walsh[14]

Special blood components

Prothrombin complex concentrate

Prothrombin complex concentrate (in the UK) comes as four-factor concentrate containing factors II, VII, IX and X, with protein S, C and heparin. It can be rapidly reconstituted providing a high concentration of these four clotting factors in a small volume. It is indicated in acquired factor deficiency and for urgent reversal of warfarin. There is limited evidence for use in any other setting.

CONSENSUS DOCUMENT

Multidisciplinary consensus document on the management of massive haemorrhage. First update 2023 (document HEMOMAS-II)☆☆

Juan V. Llau[a,*], César Aldecoa[b], Emilia Guasch[c], Pascual Marco[d], Pilar Marcos-Neira[e], Pilar Paniagua[f], José A. Páramo[g], Manuel Quintana[h], F. Javier Rodríguez-Martorell[i], Ainhoa Serrano[j]

Medicina Intensiva 47 (2023) 454–467

Recommendation 29

In the context of MH, in patients not receiving antivitamin K-type oral anticoagulants, it is not advisable to use PCC as first option for correcting coagulopathy. Such treatment may be used in selected patients conditioned to the urgency of therapy and the availability of fresh plasma. (1C)

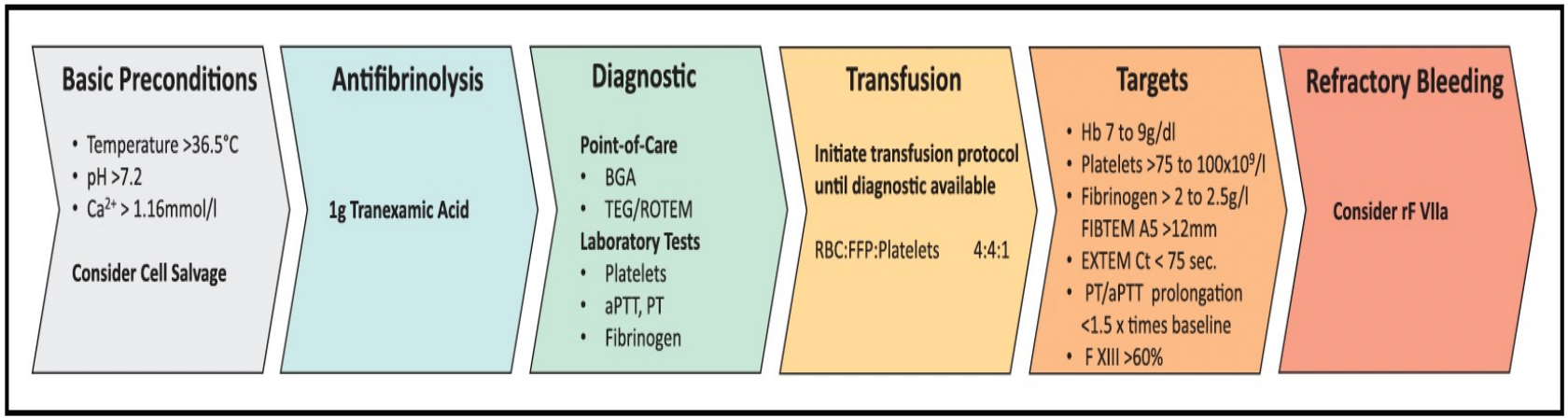
Not enough evidence has been found to recommend PCC as the hemostatic option of first choice in MH.

However, in specific scenarios such as refractory coagulopathy, cardiac surgery,[63,64] liver surgery and polytraumatized patients,[65] the off-label use of PCC has been suggested, in accordance with the established legal references,[3–5,9,17] in the context of the multimodal management of MH.

Coagulation management and transfusion in massive postpartum hemorrhage

Curr Opin Anesthesiol 2023, 36:000–000

Christina Massoth[a], Manuel Wenk[b], Patrick Meybohm[c] and Peter Kranke[c]



Surgical treatment

Blood Transfus 2020; 18: 247-53 DOI 10.2450/2020.0319-19

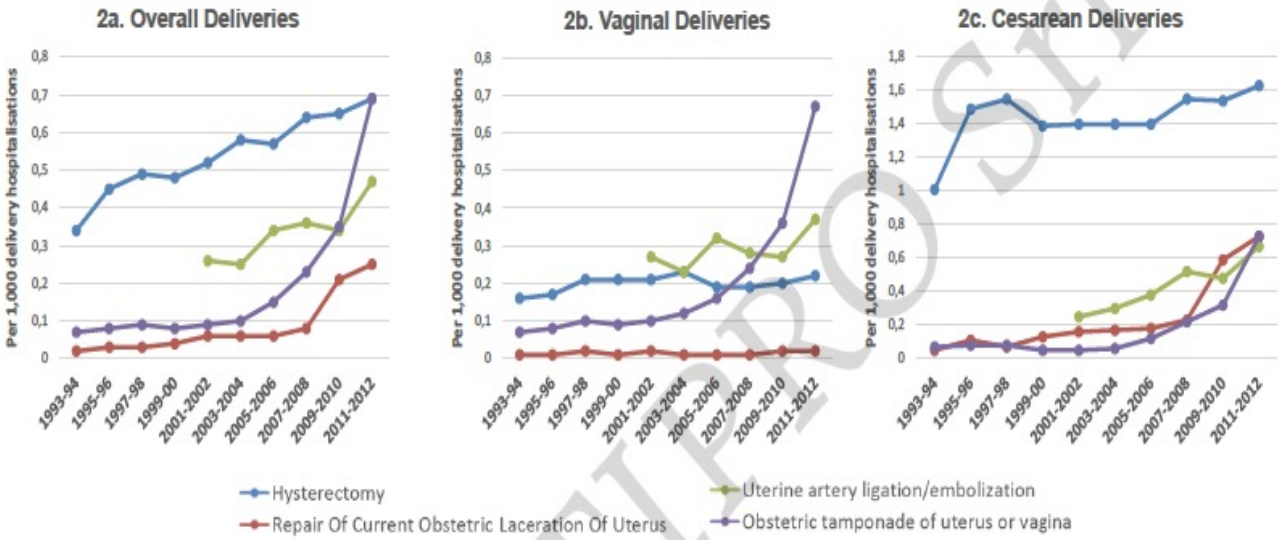


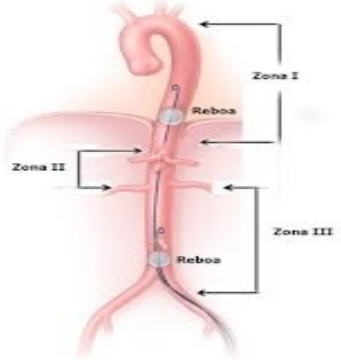
Figure 2 - Prevalence of procedures to control postpartum haemorrhage (PPH) per 1,000 delivery hospitalisations, the Nationwide Inpatient Sample, USA
Separated into graphs for overall (2a), vaginal (2b) and caesarean deliveries (2c).

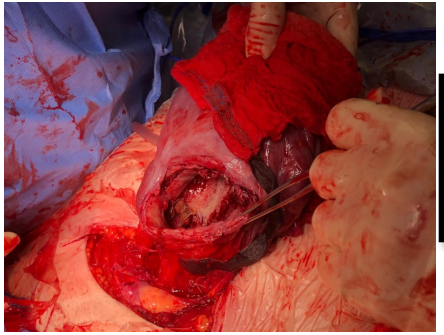
Other treatments: embolization and REBOA ballon

Prophylactic Placement of Internal Iliac Balloons in Patients with Abnormal Placental Implantation: Maternal and Foetal Outcomes

Patrick J. Nicholson[1] · Owen O'Connor[1] · John Buckley[1] · Liam D. Spence[1] · Richard A. Greene[2] · David J. Tuite[1]

Cardiovasc Intervent Radiol. 2018 Oct;41(10):1488-1493.





Perioperative Internal Iliac Artery Balloon Occlusion, In the Setting of Placenta Accreta and Its Variants: The Role of the Interventional Radiologist

David A. Petrov, MD[a,*], Benjamin Karlberg, MD[a], Kamalpreet Singh, MD[a], Matthew Hartman, MD[a], Pardeep K. Mittal, MD[b]

[a] Department of Diagnostic and Interventional Radiology, Allegheny Health Network, Pittsburgh, PA
[b] Department of Radiology and Imaging Sciences, Emory University School of Medicine, Atlanta, GA

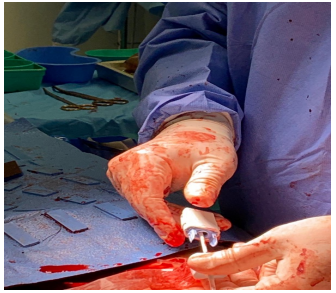
Current Problems in Diagnostic Radiology ▮ (2017) ▮▮▮–▮▮▮

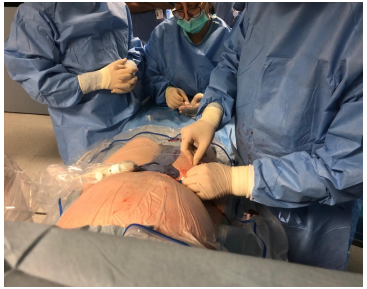
PLOS ONE | https://doi.org/10.1371/journal.pone.0174520 March 29, 2017

Fluoroscopy-free Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) for controlling life threatening postpartum hemorrhage

Knut Haakon Stensaeth[1,2]*, Edmund Sovik[1], Ingrid Natasha Ylva Haig[3], Erna Skomedal[4], Arve Jorgensen[1,2]

1 Dept of Radiology and Nuclear Medicine, St Olavs University Hospital, Trondheim, Norway, 2 Institute of Circulation and Medical Imaging, Norwegian University of Science and Technology, Trondheim, Norway, 3 Dept of Radiology and Nuclear Medicine, Oslo University Hospital Ullevaal, Oslo, Norway, 4 Dept of Radiology and Nuclear Medicine, Stavanger University Hospital, Stavanger, Norway





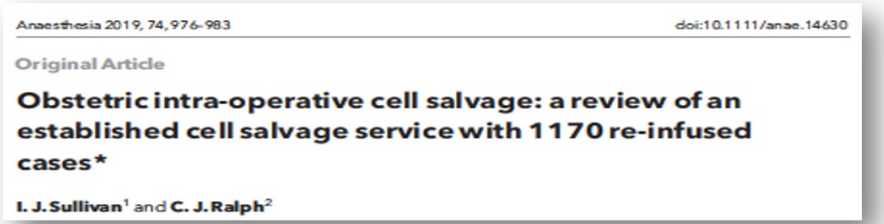
Cell-savers: SALVO trial

Khan SK, Moore P, Wilson M, Hooper R, Allard S, Wrench I, *et al*. A randomised controlled trial and economic evaluation of intraoperative cell salvage during caesarean section in women at risk of haemorrhage: the SALVO (cell SALVage in Obstetrics) trial. *Health Technol Assess* 2018;**22**(2).

- Multicentric.
- 26 hospitals UK (1498 and 1492 women).

- Transfusion rate 2,5 y 3,5%
- Isoinmunization rate significatively higher
- No AFE
- High cost

1. Can reduce transfusion rate (alogenic).
2. No cost-effective as routine
3. Isoinmunizacion risk. Prophylaxis anti-D
4. Jehova whitness and accretism. Risk-Benefit



Anaesthesia 2019, 74, 976-983 doi:10.1111/anae.14630

Original Article

Obstetric intra-operative cell salvage: a review of an established cell salvage service with 1170 re-infused cases*

I. J. Sullivan[1] and C. J. Ralph[2]

Used in every CD
Safer and cheaper

PBM in obstetrics
(Patient blood management)

Preoperative risk identification and care planning

Intravenous iron therapy:

indicated for patients who fail oral therapy

advanced gestational age,

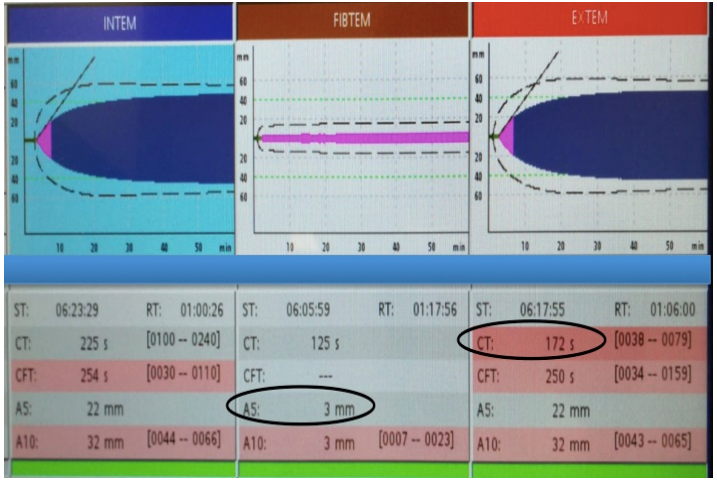
hemoglobin levels below 8 g/dL.

postpartum anemia

Hemodilution (not often)

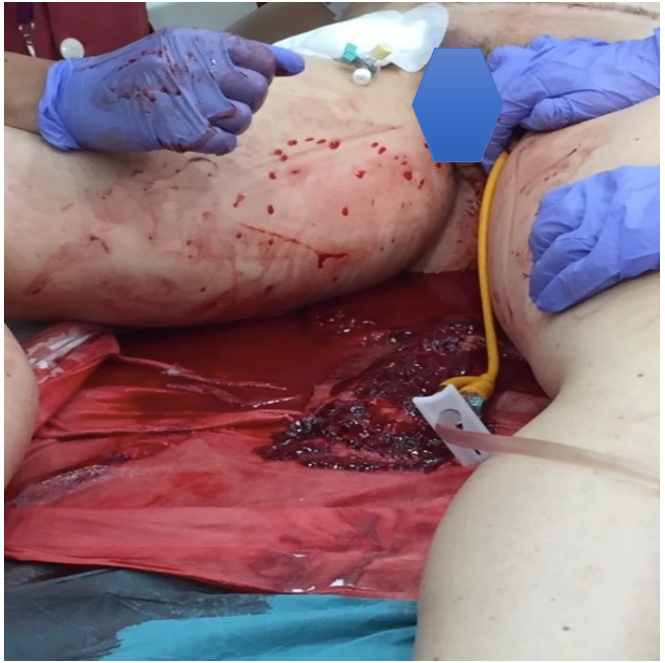
Intraoperative cell salvage

Curr Opin Anesthesiol 2023, 36:255–262



On duty…..at 2 am!!!

Experience and evidence



- Medical errors, patient or family behaviour, other reasons may lead **to rare (?)**, but **extremely severe** bleedings.
- ***Everything could be needed: Fib, FFP, PCC, PLTs***
- Need to analyse real-life experience, extrapolate from other areas, apply to physiology, etc…

Reducing Hemorrhage-Related Maternal Morbidity Using Interdisciplinary Simulation Training

Sim Healthcare 00:00–00, 2022

Game-Based Learning and Nursing Students' Clinical Judgment in Postpartum Hemorrhage: A Pilot Study

Alexis Zehler, MSN, RN, C-EFM; and Eyad Musallam, PhD, MSN, CCRN

J Nurs Educ. 2021;60(3):159-164.

The Journal of Continuing Education in Nursing · Vol 53, No 11, 2022

Enhancing Clinical Judgment in Managing Postpartum Hemorrhage: A Replication Study

Alexis Zehler, MSN, RNC-IAP, CEFM; and Erica Severi, MSN, RNC, CEFM

euro anaes thesia 2023

G GLAS GOW 03 ▸ 05 JUNE

SERIOUS GAMES

80 hospitals

Kenia, Nigeria, SA, Tanzania

>200000 women

Vaginal delivery

The NEW ENGLAND JOURNAL of MEDICINE

This article was published on May 9, 2023, at NEJM.org.

ORIGINAL ARTICLE

I. Gallos, A. Devall, J. Martin, L. Middleton, L. Beeson, H. Galadanci, F. Alwy Al-beity, Z. Qureshi, G.J. Hofmeyr, N. Moran, S. Fawcus, L. Sheikh, G. Gwako, A. Oscoli, A. Aswat, K.-M. Mammoliti, K.N. Sindhu, M. Podesek, I. Horne, R. Timms, I. Yunas, J. Okore, M. Singata-Madliki, E. Arends, A.A. Wakili, A. Mwampashi, S. Nausheen, S. Muhammad, P. Latthe, C. Evans, S. Akter, G. Forbes, D. Lissauer, S. Meher, A. Weeks, A. Shennan, A. Ammerdorffer, E. Williams, T. Roberts, M. Widmer, O.T. Oladapo, F. Lorencatto, M.A. Bolven, S. Miller, F. Althabe, M. Gülmezoglu, J.M. Smith, K. Hemming, and A. Coomarasamy

Randomized Trial of Early Detection and Treatment of Postpartum Hemorrhage

DOI: 10.1056/NEJMoa2303966

DETECT AND TREAT POSTPARTUM HEMORRHAGE EARLY

E

Early detection and trigger criteria

- Calibrated drape for blood loss collection with trigger lines at **300ml and 500ml** for the first hour after birth
- Observations (blood loss, blood flow, uterine tone) every **15 minutes** documented on the blood loss monitoring chart
- Blood pressure and pulse carried out once in the **1st hour** postpartum and documented on the blood loss monitoring chart

Trigger criteria

1 Clinical judgement
2 Blood loss 500ml or more
3 Blood loss 300ml or more plus one abnormal observation

M

Massage of uterus

- Massage until uterus has contracted or for **one minute**

O

Oxytocic drugs

- **10 IU IV oxytocin injection** or diluted in **200-500ml crystalloid** over **10 minutes** plus a maintenance dose for **20 IU IV oxytcin** diluted in **1000ml saline** over **4 hours** (+- misoprostol 800mcg PR/SL if used)

T

Tranexamic acid

- **1g IV injection of tranexamic acid** or diluted in **200ml crystalloid** over **10 minutes**

IV

IV fluids

- IV fluids in addition to the infusion should be given if clinically indicated for resuscitation and will require a **2nd IV access**

E

Examination and escalation

- Ensure bladder is empty, evacuate clots, check for tears with an internal examination and placenta for completeness
- Escalate if bleeding does not stop after first response or you are unable to identify or manage cause of bleeding

Implementation strategies

Audit newsletters: sharing with all staff monthly detection and bundle use rates along with PPH, severe PPH, blood transfusion, laparotomy and death from PPH rates and given feedback at monthly departmental meetings

Champions: midwife and doctor to oversee change, troubleshoot, give feedback on audit newsletters, connect with other champions through chats, meeting and websites for sharing knowledge and lessons learnt

Trolley and/or carry case: including all medicines and devices required for the treatment of PPH restocked after every use and complete a stocking checklist at the start of every shift

Training: on-site, simulation-based, and peer-assisted training of 90 minutes to a whole day facilitated by the use of provider guides, flipcharts and job aids displayed in labour wards

World Health Organization

hrp research for impact

Take home messages

- Define
- Quantify
  - Risk
  - Bleeding volume
- Diagnosis
  - Cause of bleeding
  - Coagulopathy
- Blood replacement
  - Goal directed
  - ROTEM/TEG guided

- Avoid
  - Dilution
  - Hypothermia
  - Acidosis
- Fluids
- Protocols
  - Each hospital
  - No universal recipe
- Prediction
  - Sick patients
  - Progression PPH

- Teach, analyze and simulate
- Use procoagulants when needed

emiguasch@hotmail.com

Aitäh!