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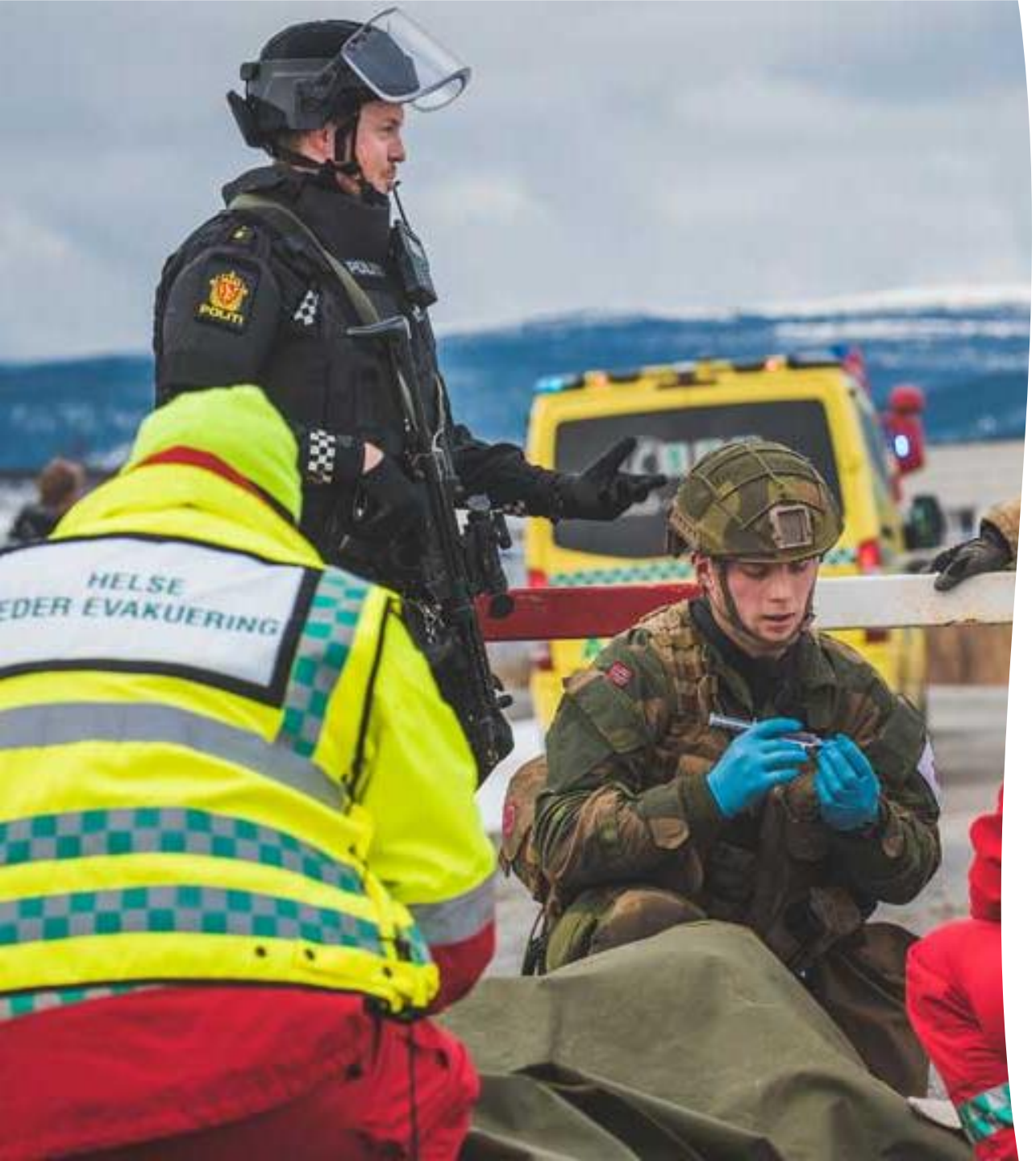
Whole blood for obstetric bleeding - experience from Bergen, Norway

Torunn Oveland Apelseth, MD, PhD
Director, Norwegian Centre for Blood Preparedness
Senior Consultant, Department for Immunology and Transfusion Medicine,
Haukeland University Hospital, Bergen, Norway
Professor, Faculty of Medicine, University of Bergen

Epost*: torunn.oveland.apelseth@helse-bergen.no*



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The Norwegian Center for Blood Preparedness

Government funded center for national coordination of Civilian-Military blood preparedness
Established June 2022
Stakeholders represented:

- Civilian blood services
- Clinical hospital services
- Prehospital and community health services
- Military medical services

Work tasks:

- Coordination civilian and military blood supply in crisis and war
- Training
- Counselling
- Logistics
- Research and innovation

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Norwegian guidelines for treatment of patients with severe bleeding (Trauma)

Norwegian civilian and military guidelines recommend an **early balanced transfusion** therapy for patients with severe bleeding.

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Norwegian guidelines on postpartum hemorrhage

- Definitions:
  - Severe postpartum hemorrhage: > 1000 ml/24 h
  - Life-threatening bleeding: > 40% blood loss (i.e. 2800 ml for woman 70 kg)

- Frequency:
  - >1000 ml: 5 %
  - >1500 ml: 2.5%
  - Life-threaening bleeding: 0.37%

- Treatment recommendations:
  - Combination of:
    - Medication (Oxytocin, Tranexamic Acid, etc.)
    - Mechanical compression
    - Surgery
    - Clear fluids (max up to 1000 ml bleeding)
    - Transfusion

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Norwegian guidelines on postpartum hemorrhage: Transfusion

- Clear fluids (for up to maximum 1000 ml blood loss)
- Early start of transfusion
  - RBCs and plasma (1:1), or
  - RBCs, plasma, platelets (1:1:1)
  (platelets should be given if plt count < 100 x 10^9/L)
- Fibrionogen (target value ≥2.5 g/L)

TRANSFUSJON VED PÅGÅENDE ALVORLIG BLØDNING

Behandling av blodtap og væske startes parallelt med annen behandling (I-III).

Vi anbefaler:

1. Ringer acetat. Unngå å gi mye krystalloider grunnet fare for fortynningskoagulopati (max. 1000 ml) før oppstart med blodprodukter.
2. Tidlig oppstart med transfusjon. Vurder både SAG og plasma (Octaplas®) initialt, alternativt massiv transfusjonspakke (5 SAG: 5 Plasma: 1 Trombocyttkons). Det er mye som tyder på at plasmabehovet ikke er så stort i initialfasen av en PPB, gitt at det ikke foreligger koagulopati, som f.eks. ved placentaløsning/fostervannsemboli/preeklampsi m/koagulopati.
3. SAG og plasma (Octaplas®) ordineres i forholdet 1:1 så lenge blødningen pågår. VE-POCT (Rotem®/TEG®) for fortløpende måling av koagulasjonsevnen er lovende, men fortsatt på forskningsstadiet.
4. Trombocytter bør transfunderes ved trombocytt-tall < 100x109/l (basert på lab.svar).
5. Fibrinogenkonsentrat anbefales (Riastap®): 4 g i.v. bør gis ved mistanke om tap av ett blodvolum evt. etter fibrinogen konsentrasjonsmåling. Et plasma-nivå ≥ 2,5 g/l bør tilstrebes.
6. Kalsiumtilskudd ved ionisert Ca2+< 1,2 mmol/l. (Kalsiumnivået er viktig for hemostasen og i-Ca må enten måles jevnlig, evt gis det 5-10 mmol CaCl2 per infundert massiv transfusjonspakke).
7. Desmopressin (Octostim®) er anbefalt ved hemofili/von Willebrands sykdom og evt. ved andre årsaker til dårlig fungerende trombocytter som ved bruk av acetylsalisylsyre.

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Alternatives for balanced transfusion

= All components of blood in a 1:1:1 ratio

Platelets

Red cells

Plasma

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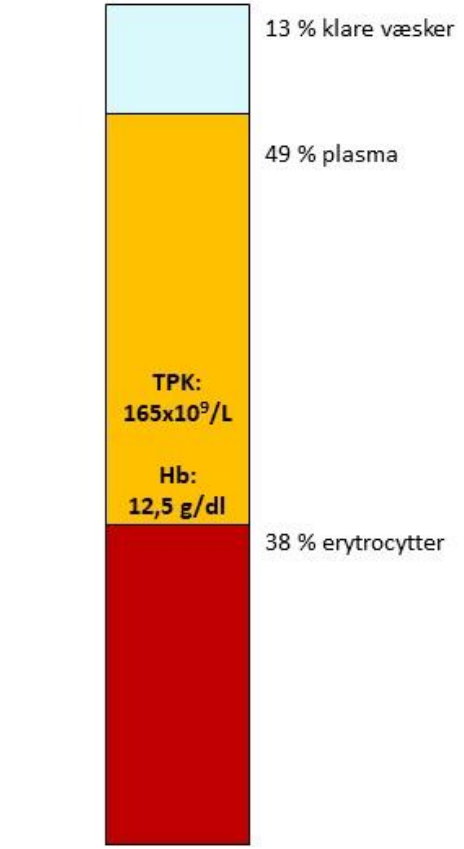
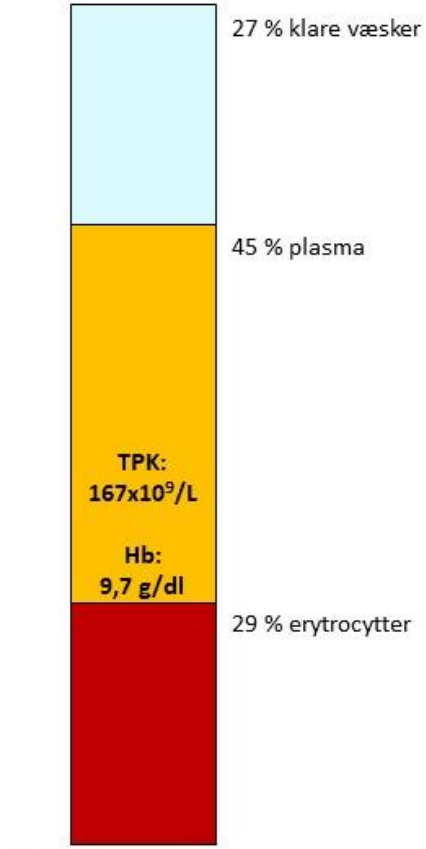
Why Whole Blood?

- Superior logistics
- Less excess fluids, more concentrated blood product



3 Whole Blood



3+3+1 Blood Components

Characteristics of Whole Blood used in Haukeland University Hospital

- Donors:
  - Low titer group O Whole Blood (LTOWB)
    - Titer threshold
      - IgM: 256
      - IgG 512
  - Both RhD positive and negative
  - Both male and female donors
- Type:
  - Leucocyte-depleted with a platelet-sparing filter
    - CPD (citrate-phosphate-dextrose), Imuflex, Terumo)
  - Warm fresh Non-Leukocyte depleted Whole Blood can be used in emergencies
- Storage: Cold for up to 21 days
- Use: Both for in-hospital and prehospital use

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Timeline implementation of Whole Blood in Bergen, Norway

Whole Blood in Air Ambulance

(From 2013: Dried plasma in Air Ambulance
From 2015: RBCs in Air Ambulance)

Whole Blood implemented at Haukeland University Hospital

Whole Blood in Voss Hospital (smaller local hospital with obstetric ward)

LTOWB O neg K neg forward stored at Obstetric Ward, Haukeland University Hospital (replaced O neg RBCs)

LTOWB O neg K neg forward storage in Emergency Room, Haukeland University Hospital (replaced O neg RBCs)

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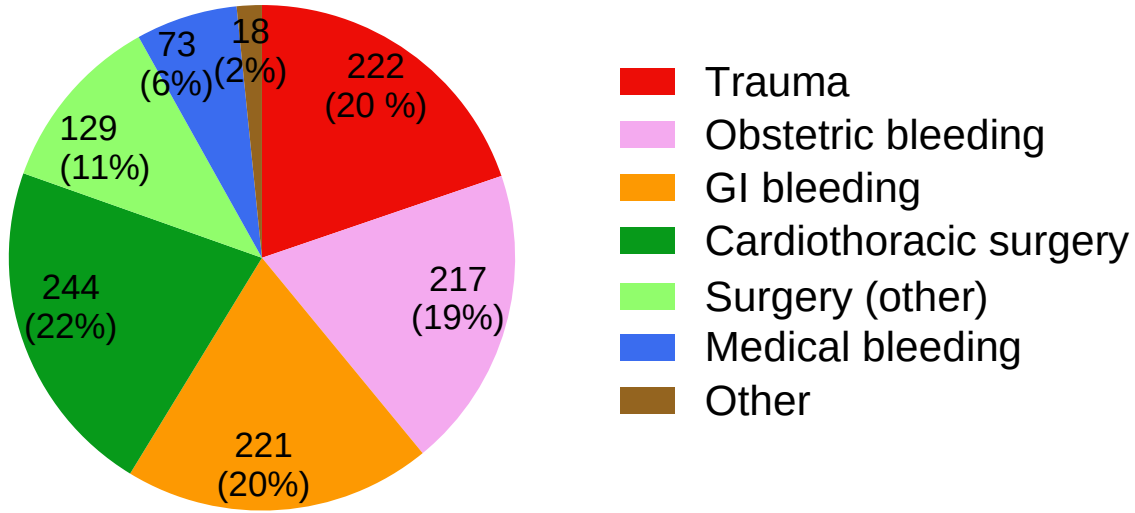
Whole Blood in Haukeland University Hospital
(December 2017- April 2025)

- 1056 patients
- 1124 transfusion episodes (24 hour)
- 3582 units
- Wastage: 6,5% (2024)

➢ End users and blood service staff prefer whole blood for massively bleeding patients.
➢ Post-implementation follow-up of the program includes hemovigilance and quality registry monitoring the efficacy and safety

Indication for transfusion:



n=1124 episodes

Ref. Data from Helse Bergen Massive Transfusion Quality Registry by Hanne Braathen

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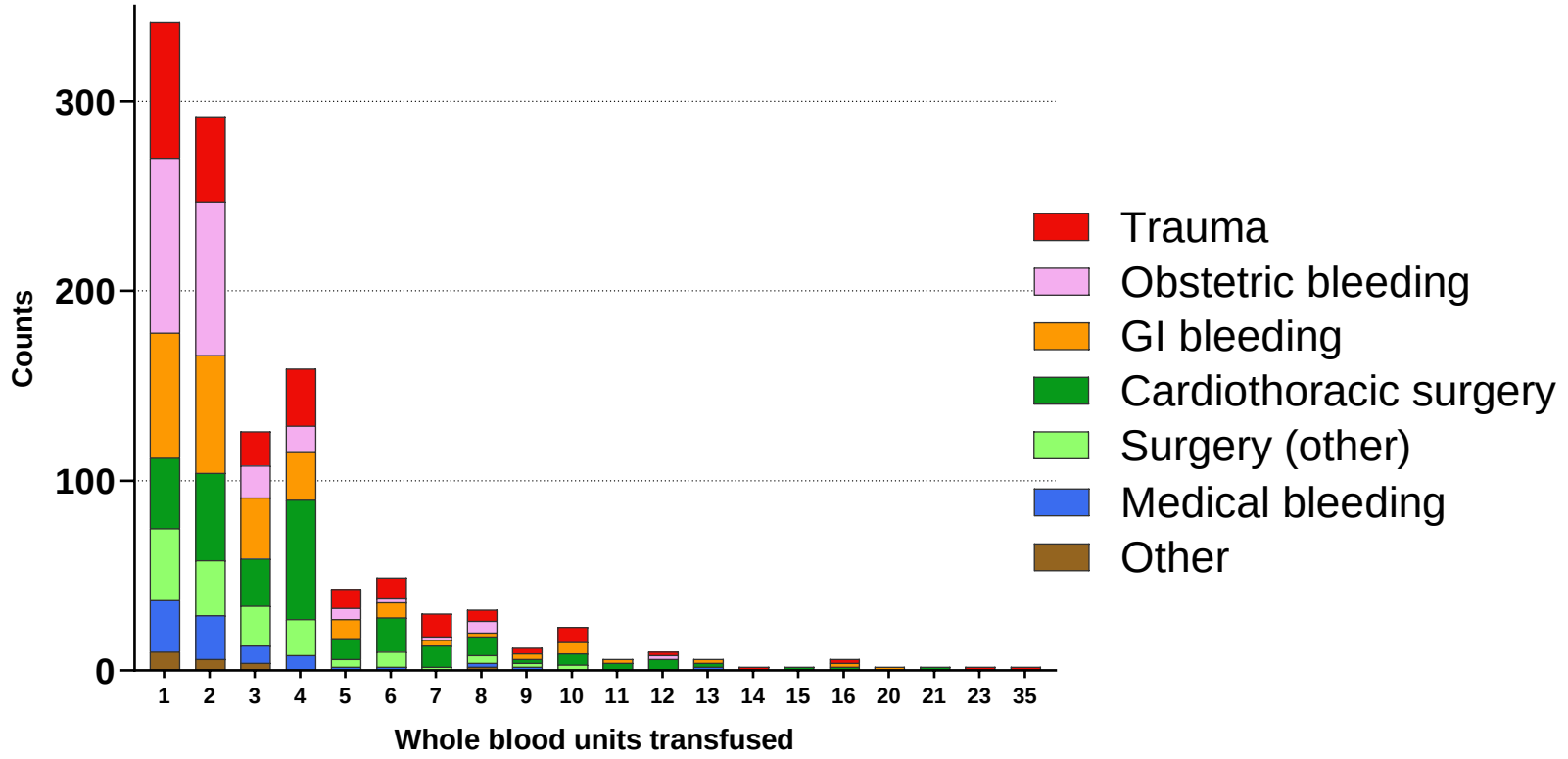
Number of WB units transfused per episode

Mean WB units given per transfusion episode: 3.2



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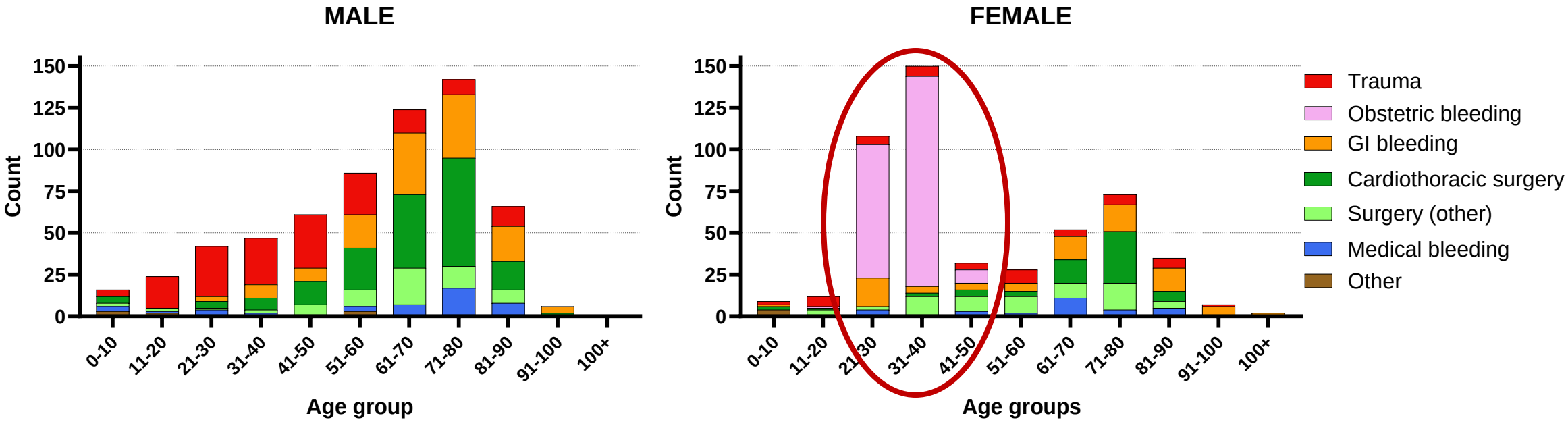
Age of patients per indications



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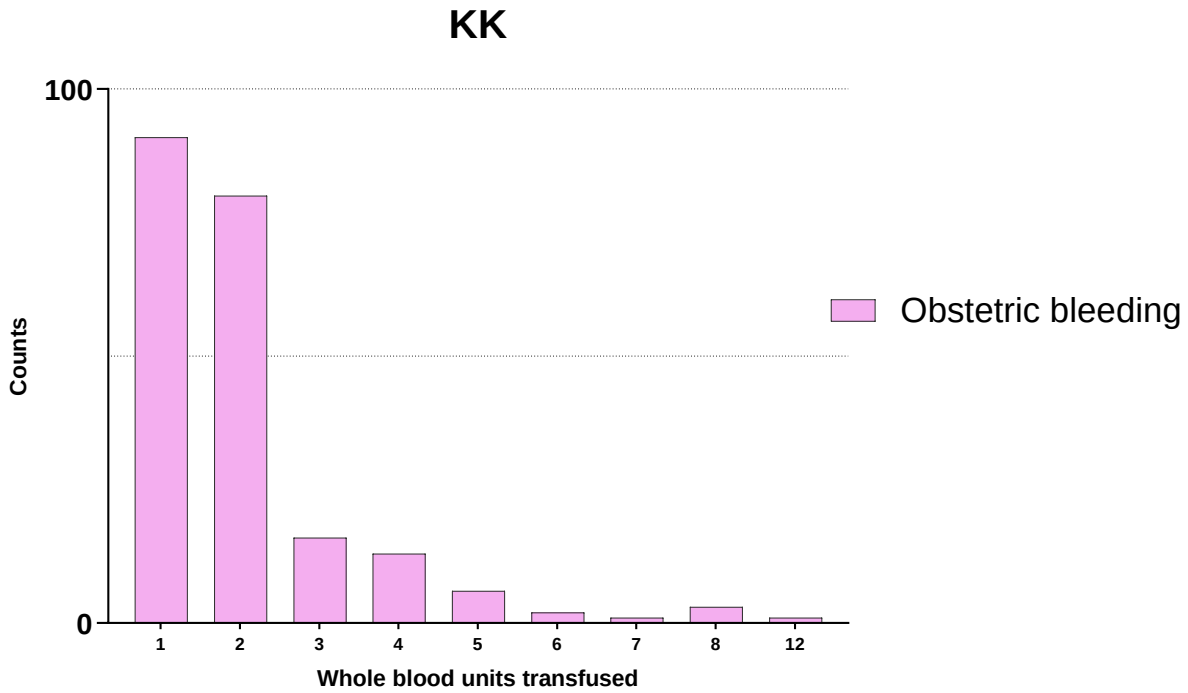
Whole Blood transfusions in the Obstetric ward
(December 2017- April 2025)

- 213 patients
- 436 units
- Suspected transfusion reactions: 3 (1,4%) (allergic)
- No clinical hemolysis reported
  - Low Haptoglobin levels: 4/85 (4.7%) of group A patients
- Survival
  - >30 days: 207/208 patients
  - <24 timer: 1/208 patients (trauma)



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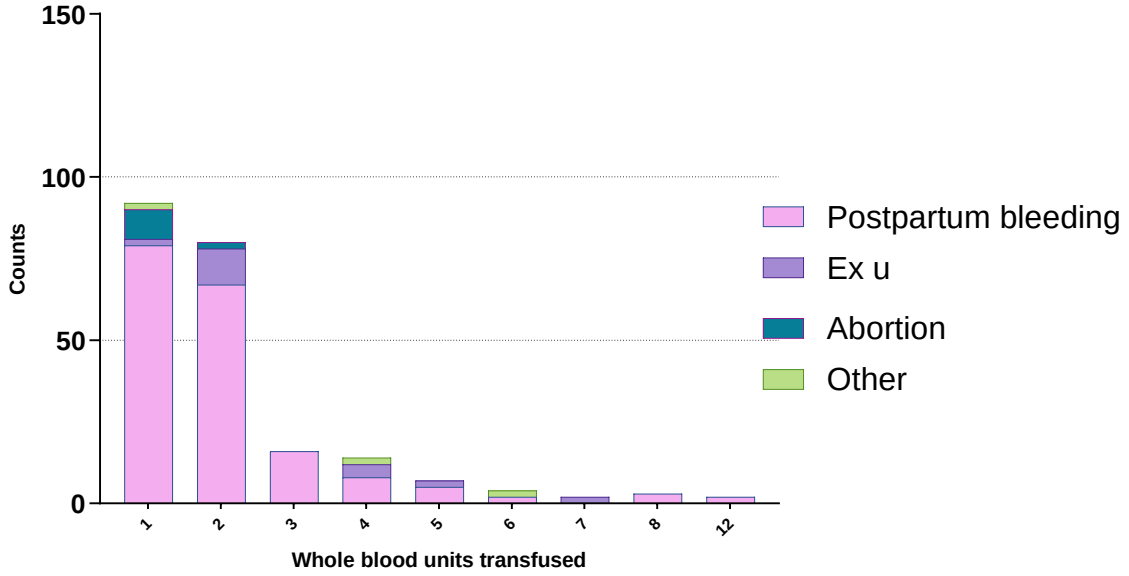
Number of units transfused per indication

Transfusions	n	Median (IQR, min-max)
Postpartum	180	2 (1-2, 1-12)
Ex u	19	2 (2-4, 1-7)
Abortion	11	2 (1-1, 1-2)
Other	3	4 (1-6, 1-6)



Postpartum bleeding volumes (mean, min-max): 2400, 400-10000 ml

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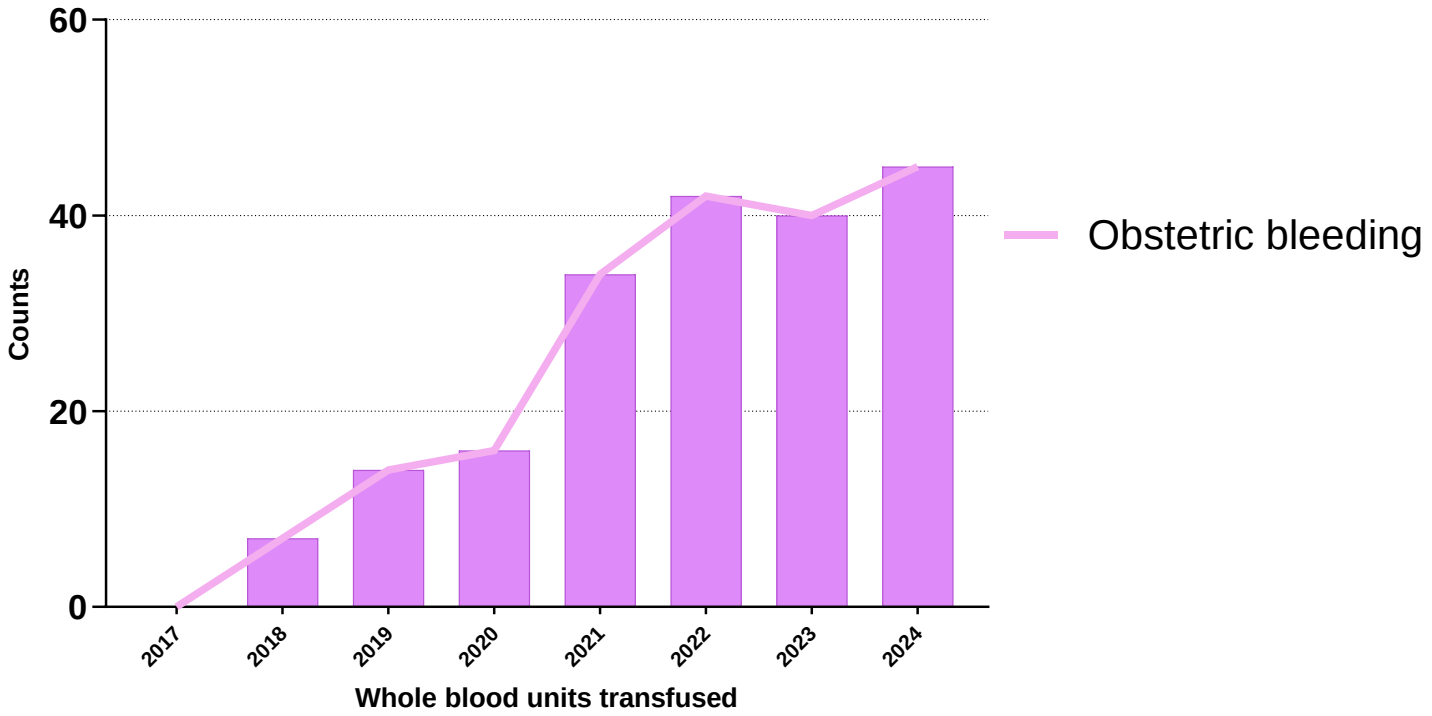
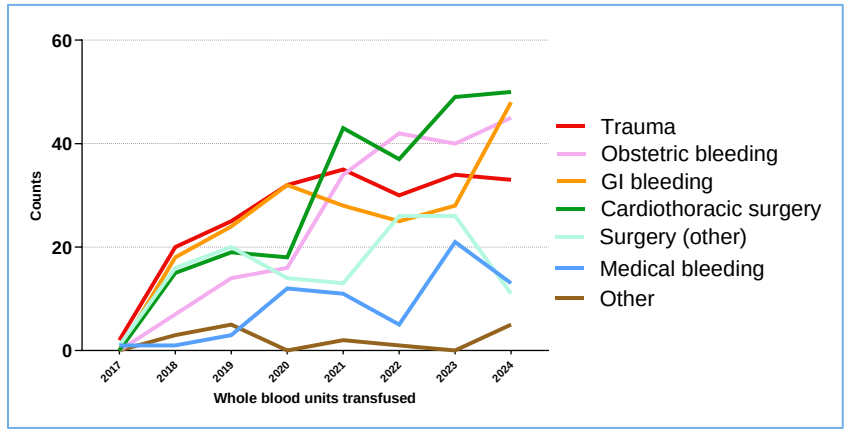
Change in transfusion practice over time





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Summary

- The use of Whole Blood for obstetric patients in Bergen has increased after implementation of forward storage at the Womens Clinic
- Quality registry data indicates that Whole Blood can be useful in treatment of patients with postpartum bleeding

NEXT STEPS:

- Survey of end users
- Compare to patients receiving RBCs?
- Fibrinogen use?