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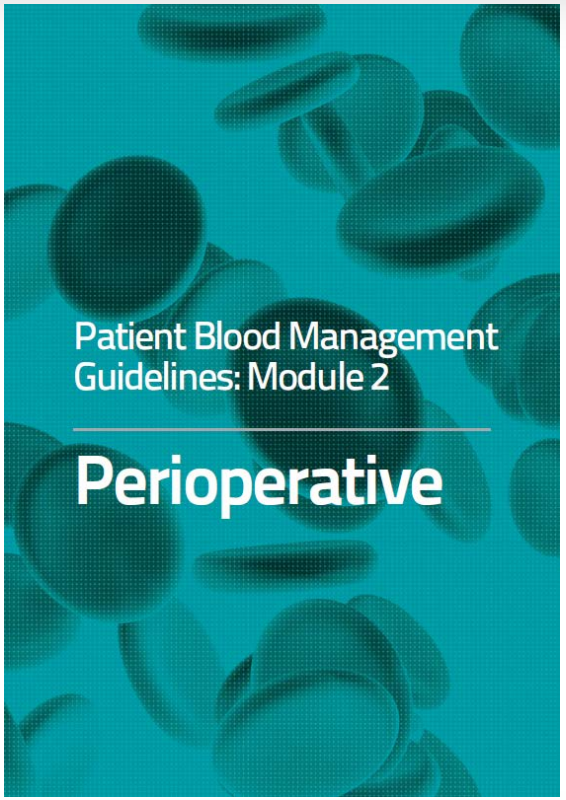
Hospital Authority Convention
Perioperative medicine symposium

Patient blood management: Experience in a regional hospital

Dr. Ryan Wan
Associate consultant
Department of Anaesthesia and Operating Theatre Services
Tseung Kwan O Hospital

What is PBM?

- Multidisciplinary
- Evidence-based
- Minimize the need of allogeneic transfusion
- Improve outcomes



THERAPY	RISKS	BENEFITS
Blood transfusion, including RBCs, platelets, FFP and cryoprecipitate	▪ Administrative error leading to transfusion of incorrect blood component, with potential for severe transfusion reaction (haemolytic) due to blood group (ABO) incompatibility ▪ Transfusion transmitted infections (extremely rare) ▪ Transfusion-related acute lung injury ▪ Other transfusion reactions (mild febrile to severe anaphylaxis) ▪ Bacterial infection from contaminated blood or platelets ▪ Transfusion-associated circulatory overload (usually iatrogenic) ▪ Transfusion-related immunomodulation	▪ RBC to prevent critical lack of oxygen to the body tissues ▪ Platelets to treat or prevent bleeding ▪ FFP to treat or prevent bleeding ▪ Cryoprecipitate to treat or prevent bleeding

https://www.blood.gov.au/pubs/pbm/module2/appendix-b-transfusion-risks-in-the-context-of-patient-blood-management.html

THREE PILLARS OF PATIENT BLOOD MANAGEMENT

	PILLAR ONE Optimise RBC Mass	PILLAR TWO Minimise Blood Loss	PILLAR THREE Manage Anaemia
PREOPERATIVE	> detect/treat anaemia & iron deficiency > treat underlying causes > optimise haemoglobin > cease medications	> identify, manage & treat bleeding/bleeding risk > minimise phlebotomy > plan/rehearse procedure	> patient's bleeding history & develop management plan > estimate the patient's tolerance for blood loss > optimise cardiopulmonary function
INTRAOPERATIVE	> time surgery with optimisation of erythropoiesis & red blood cell mass	> meticulous haemostasis/ surgical/anaesthetic techniques > cell salvage techniques > avoid coagulopathy > patient positioning/warming > pharmacological agents	> optimise cardiopulmonary function > optimise ventilation & oxygenation > restrictive transfusion strategies
POSTOPERATIVE	> manage anaemia & iron deficiency > manage medications & potential interactions	> monitor & manage post op bleeding > keep patient warm > minimise phlebotomy > awareness of drug interactions & adverse events > treat infections promptly	> maximise oxygen delivery > minimise oxygen use > treat infections promptly > tolerance of anaemia > restrictive transfusion strategies

Adapted from Spahn DR. Goodnough LT. *Alternatives to Blood Transfusion*. Lancet 2013; 381:1855-65; Hofman A. Farmer S. Towler SC. *Strategies to preempt and reduce the use of blood products: an Australian perspective*. Curr Opin Anaesthesiol. 2012; 25:66-73; Isbister JP. *The three-pillar matrix of patient blood management – an overview*. Best Pract Res Clin Anaesthesiol. 2013; 27:69-84.

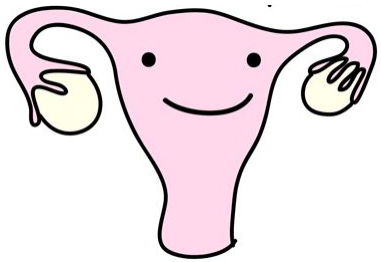
https://www.blood.gov.au/system/files/documents/pbm-3-pillars.pdf

PBM in TKOH

Colorectal OT
2015

TKR
2016

Major gynae OT
2017

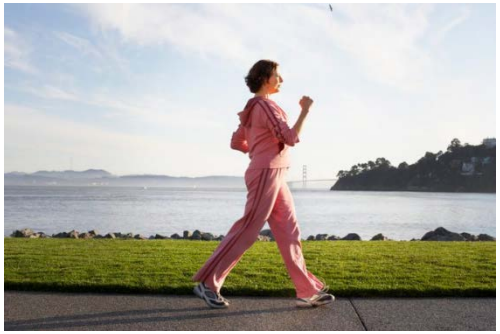


Major colorectal surgery

- Anaemia is very common
  - Chronic blood loss
  - Anaemia of chronic disease
  - Malnutrition
  - Bone marrow infiltration
  - Chemotherapy

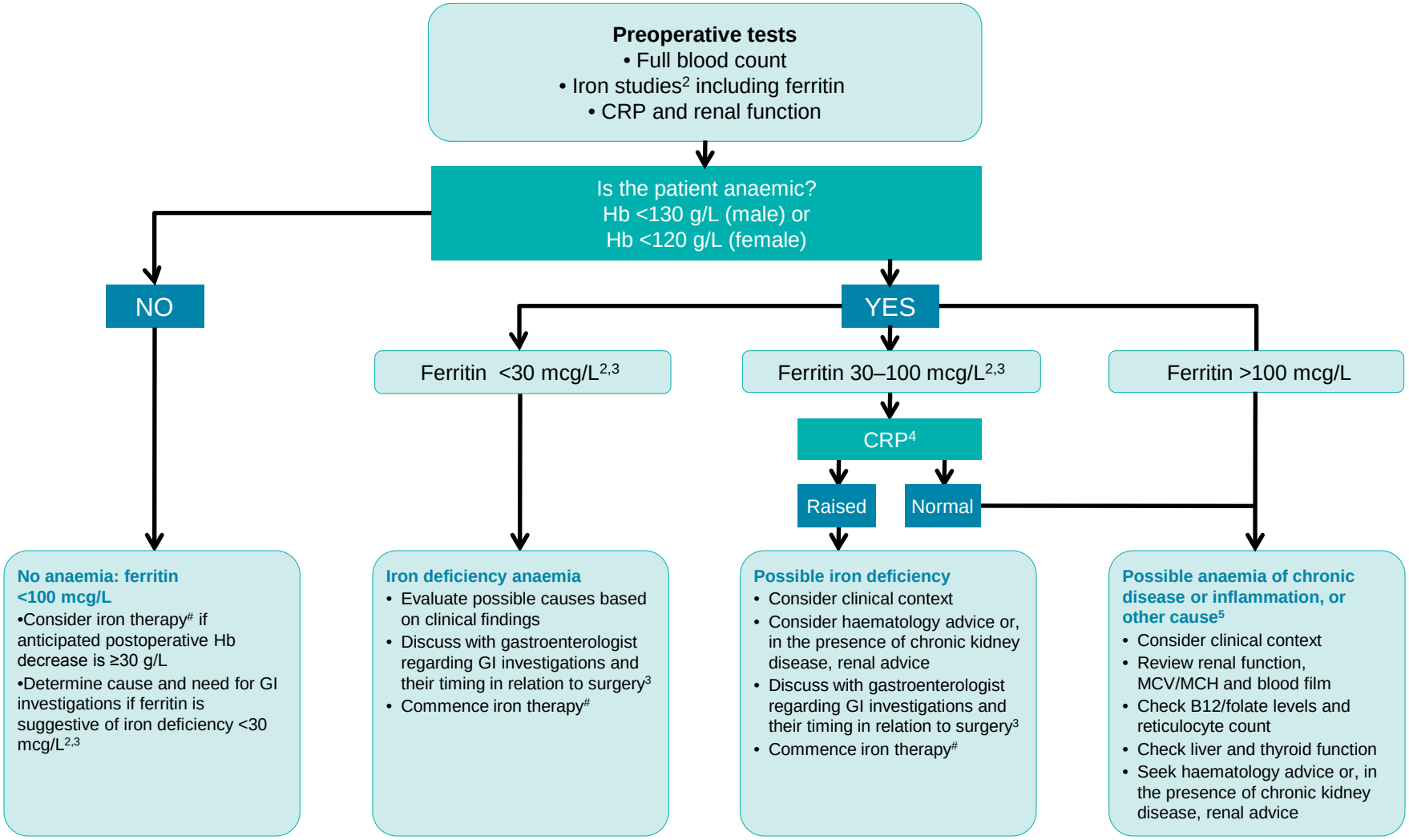
Pre-operative

- Prehabilitation
  - Smoking cessation
  - Pre-op exercise
  - Nutritional support
- Medical optimization
- Oral FeSO4 / IV iron



Preoperative haemoglobin assessment and optimisation template

This template[1] is for patients undergoing procedures in which substantial blood loss is anticipated such as cardiac surgery, major orthopaedic, vascular and general surgery. Specific details, including reference ranges and therapies, may need adaptation for local needs, expertise or patient groups.



https://www.blood.gov.au/pubs/pbm/module2/appendix-f-preoperative-haemoglobin-assessment-and-optimisation-template.html

Indications of IV iron

- Oral iron used but
  - Not effective
  - Not tolerated
- Oral iron contraindicated
- Short interval between treatment and surgery

Ganzoni formula

Cumulative iron deficit =

[Weight (kg) × (Target Hb - Current Hb (g/dl)) × 2.4] + Iron store* (mg)

**Iron store = 500 mg if body weight >35 kg 15 mg/kg if body weight <35 kg*

IV iron preparation

	Iron gluconate**	Iron sucrose††	Low molecular weight iron dextran (LMWID)‡‡	Ferric carboxymaltose§§	Iron isomaltoside 1000¶¶	Ferumoxytol***
Brand name	Ferrlecit®	Venofer®	Cosmofer® INFeD®	Ferinject® Injectafer®	Monofer® Monoferro®	FeraHeme® Rienso®
Carbohydrate shell	Gluconate (monosaccharide)	Sucrose (disaccharide)	Dextran (branched polysaccharide)	Carboxymaltose (branched polysaccharide	Isomaltoside (linear oligosaccharide)	Polyglucose sorbitol carboxy-methylether
Complex type*	Type II	Type II	Type I	Type I	Type I	Type I
Molecular weight; kD	289–440	30–60	165	150	150	750
Initial distribution volume; l	6	3.4	3.5	3.5	3.4	3.16
Plasma half-life; h	1	6	20	16	20	15
Labile iron (% injected dose)†	3.3	3.5	2.0	0.6	1.0	0.8
Iron content; $mg.ml^{-1}$	12.5	20	50	50	100	30
Maximal single dose; mg	125	200	20 $mg.kg^{-1}$	20 $mg.kg^{-1}$ (max 1000 mg)	20 $mg.kg^{-1}$	510
Infusion time for 1000 mg; min‡	720	300	90–150§	≥ 15	≥ 15	≥ 15
Product cost per 1000 mg; €¶	–	128	100	227	212	162

Anaesthesia 2017, 72, 233-247

Monitoring

- Vital signs (BP/P, temp, RR)
  - Before the start
  - 15 mins after the start
  - At the end
  - 30 mins after the end

Intra-operative

- Laparoscopic approach
- CO monitor
- Maintain normothermia
- Restrictive transfusion strategy

Post-operative

- Minimize phlebotomy
- Multidisciplinary ward round
- Optimize fluid status
- Restrictive transfusion strategy
- IV iron

TKR

- Pre-op
  - Iron therapy
    - Oral FeSO4
    - IV iron if indicated
  - Postpone OT to allow optimization

- Intra-op
  - IV + IA tranexamic acid
    - 1000mg IV at the start + 1000mg IA at the end
  - Controlled hypotension

Major Gynae OT

- Anaemia very common
  - More patients with ‘pure’ IDA
  - Better response to iron
- Younger patient group
  - Better tolerance to anaemia

IV iron

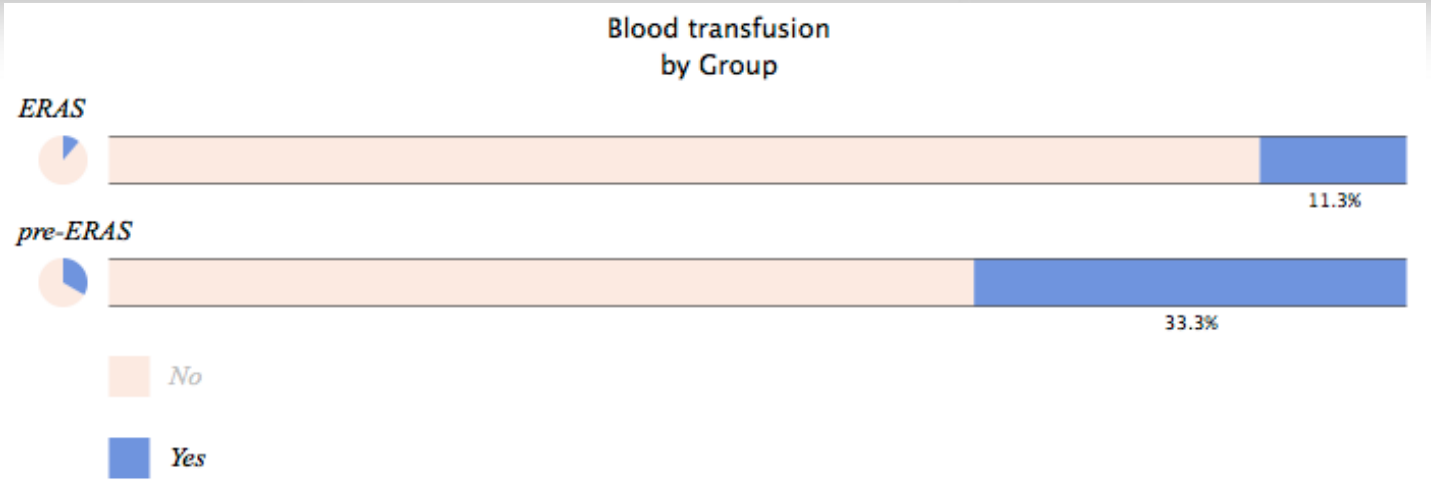
- 9/2016 – 2/2018
- N = 84
- 55 data complete for analysis
- Venofer = 26, Ferinject = 23, Venofer + Ferinject = 1, Monofer = 5

	Pre Hb (g/dL)	Calculated Iron deficit (mg)	Total iron dose (mg)	Difference (mg)	post Hb (g/dL)	Hb change (g/dL)	Time interval (day)
N = 55	10.1	919	853	-67	11.2	1.1	25
For Hb <=9 N = 15	8.1	1177	1020	-156.6	10.1	1.9	26.3

Side effects

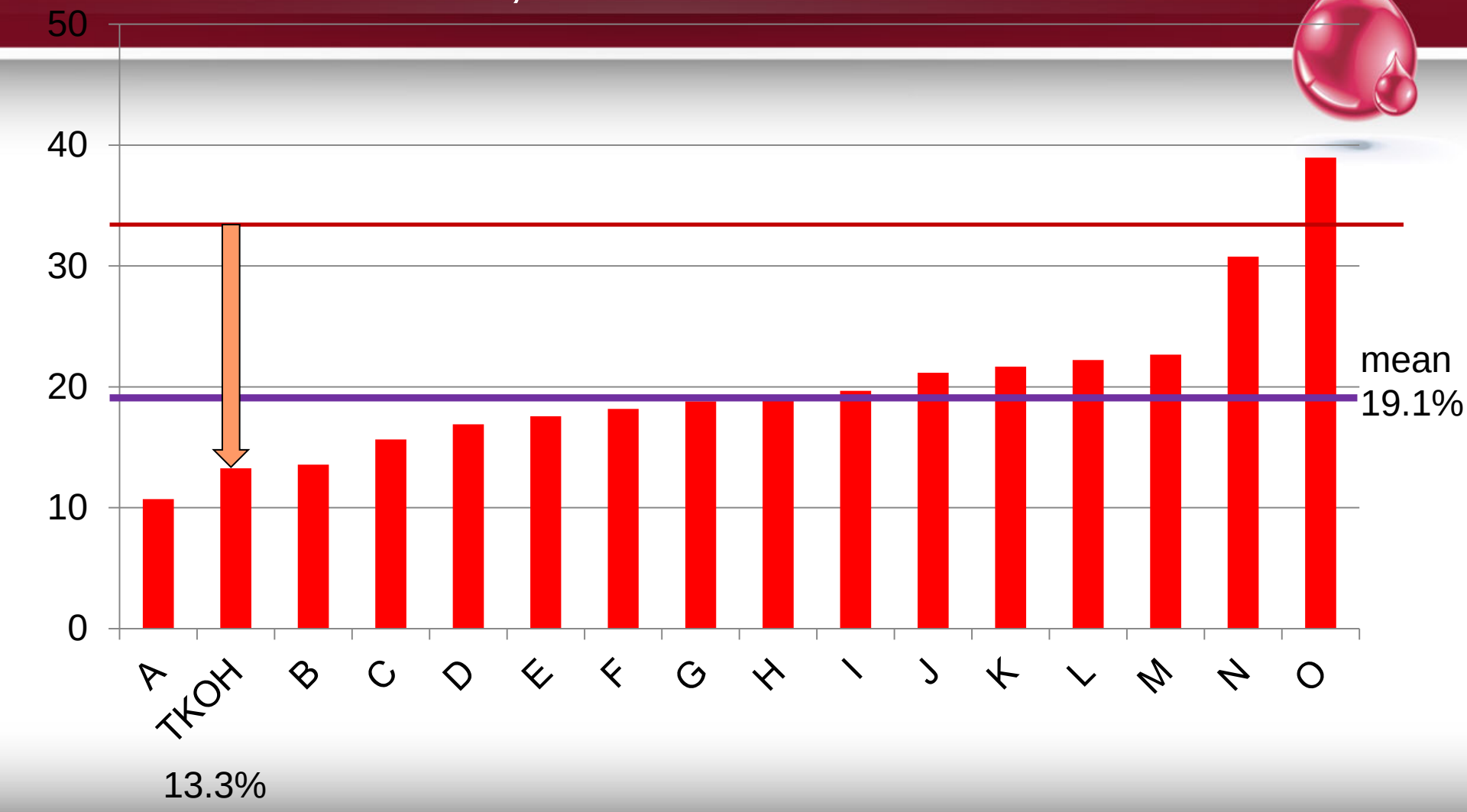
- Hypotension
- Low grade fever
- 1 patient (out of 84) has allergic reaction

Blood transfusion Rate

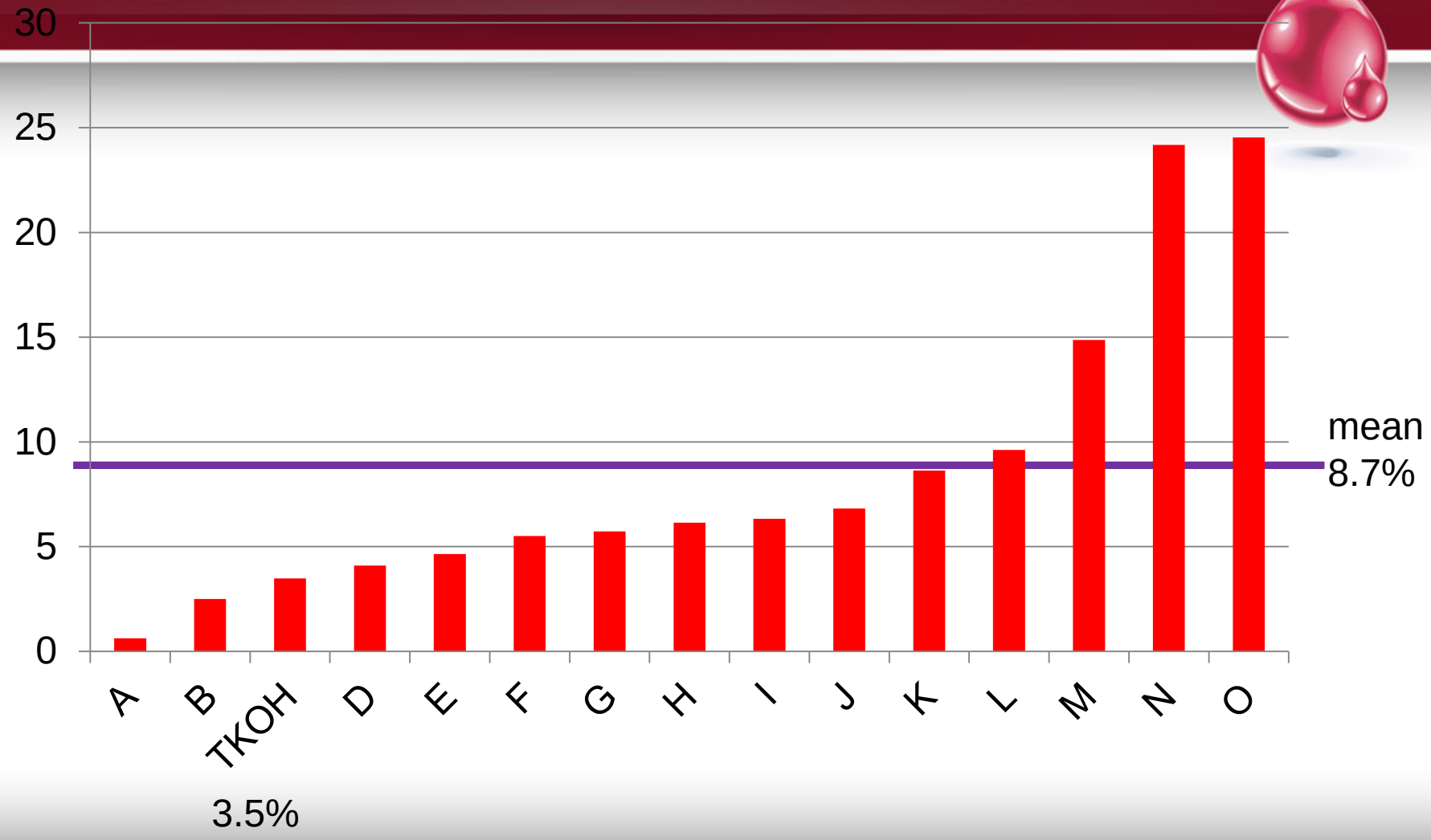


- N = 168 (Nov 2015 – June 2017)
- Blood transfusion rate (whole postop period) dropped from 33.3% to 11.3%
- P<0.05

Elective colorectal OT, transfusion rate (blood products) within the same admission, 10/2016-9/2017, extracted from CDARS



Elective TKR, transfusion rate (blood products) within the same admission, 10/2016-9/2017, extracted from CDARS



References

- National blood authority – Australia. https://www.blood.gov.au/patient-blood-management-pbm
- International consensus statement on the peri-operative management of anaemia and iron deficiency. Anaesthesia 2017, 72, 233-247


THANK YOU