

What could be better than a blood bank full of blood? Ways to reduce wastage



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My disclosures

- **Grífolis**: Scientific advisory board & honoraria
- **Macopharma**: Scientific advisory board
- **Octapharma**: Scientific advisory board
- **Haemonetics**: Honoraria
- **Terumo**: Honoraria
- **Cook Biomedical**: Scientific advisory board
- **Verax Biomedical**: Scientific advisory board

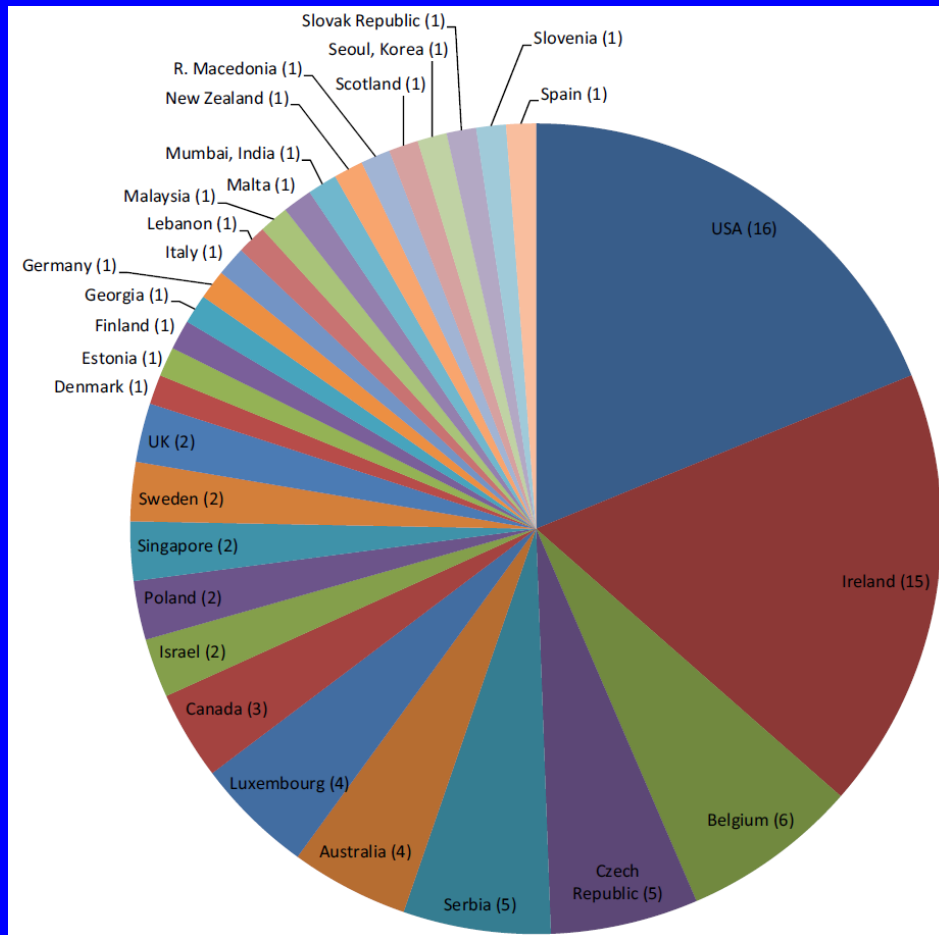
Waste: What a pity!

- There are obvious sources of waste in the blood bank...the products!
- Important to minimize waste to maintain supply and honour the donor
- Waste can occur inside and outside of the blood bank
- Close collaboration with clinical users of products needed



Waste: Worldwide survey

- The ISBT working party on supply chain management conducted an international survey on waste
- 85 replies from 30 countries were received



Waste: Worldwide survey

- 45/85, 53%, were from academic centers
- 14/85, 16%, were from graduate teaching centers
- Waste was calculated by WAPI method

Region	Measure	RBC	Platelet	Plasma
Europe	Number of responses	53	50	50
	Median (range) WAPI	1.6 (0–19.0) ^a	3.3 (0–54.5) ^b	2.7 (0–22.2) ^c
	Overall WAPI	2.8 ^d	8.0 ^e	6.3 ^f
North America	Number of responses	19	19	19
	Median WAPI (%)	1.3 (0.2–15.0) ^a	2.9 (0.2–92.1) ^b	5.0 (0.4–29.2) ^c
	Overall WAPI (%)	1.9 ^d	9.5 ^e	7.3 ^f
Rest of world	Number of responses	12	11	12
	Median (range) WAPI (%)	2.4 (0.1–11.1) ^a	7.2 (0.1–20.3) ^b	5.7 (0.3–27.9) ^c
	Overall (range) WAPI (%)	2.7 ^d	1.9 ^e	2.5 ^f

Waste: Worldwide survey

- The causes of waste were also evaluated

Mechanism of waste	Measure	RBC	Platelet	Plasma
Outdate after issue	Number of responses	12	8	10
	Median (range) WAPI (%)	0.2 (0.1–3.8)	2.4 (0.5–10.7)	2.0 (0.2–6.0)
Returned beyond expiry	Number of responses	33	21	28
	Median (range) WAPI (%)	0.3 (0.1–5.5)	0.8 (0.1–17.9)	2.6 (0.2–13.3)
Storage non-compliance	Number of responses	32	25	23
	Median (range) WAPI (%)	0.2 (0.1–1.4)	0.2 (0.1–6.7)	0.5 (0.1–11.1)
Expiry in hospital blood bank	Number of responses	62	49	36
	Median (range) WAPI (%)	1.3 (0.0–15.3)	5.7 (0.1–44.7)	1.9 (0.1–15.6)

Waste: What a pity!

- So wastage rates are variable around the world
- In some places it is quite high
- What can we do to reduce wastage?
- Some simple steps can really help



Portman Road, Ipswich
Come on you Super Blues!

Eliminating waste reduces cost and improves inventory management



UPMC
LIFE
CHANGING
MEDICINE

PATIENT BLOOD MANAGEMENT BEST PRACTICES

- The best place to store blood products is in the Blood Bank.
- Being aware and compliant with proper storage conditions prevents wasted blood products.
- Keep blood coolers in plain view so they are not forgotten resulting in blood product waste.
- Prepare your patient to receive blood sooner rather than later. Get a signed consent.

Visit Infonet.UPMC.com/BloodManagement for information.

*Screensaver
Education*

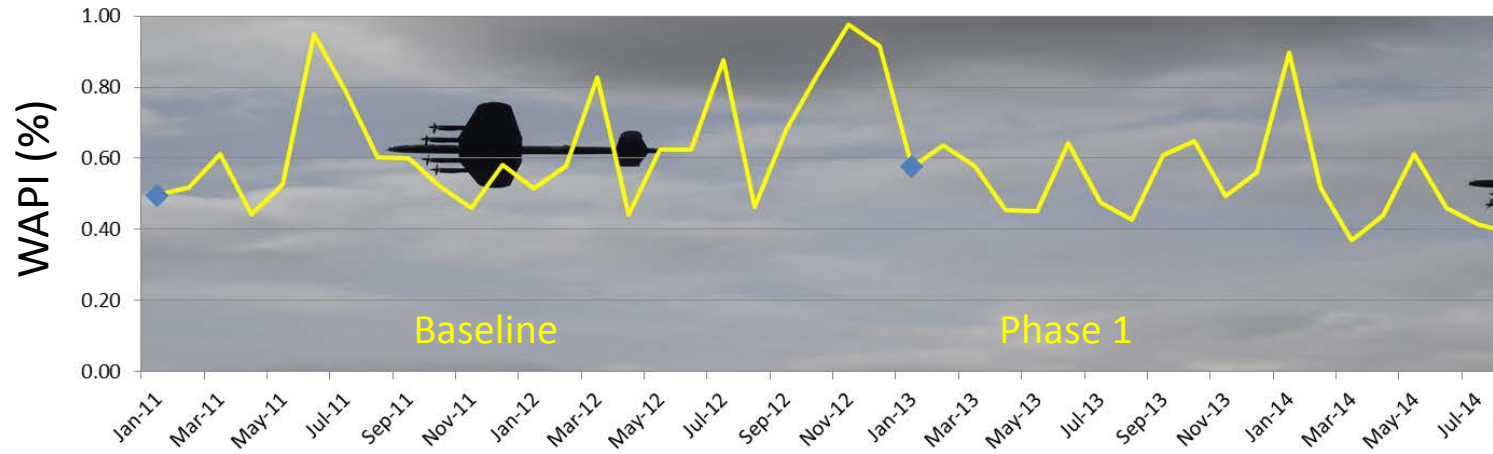


Storage/Outdate Tags

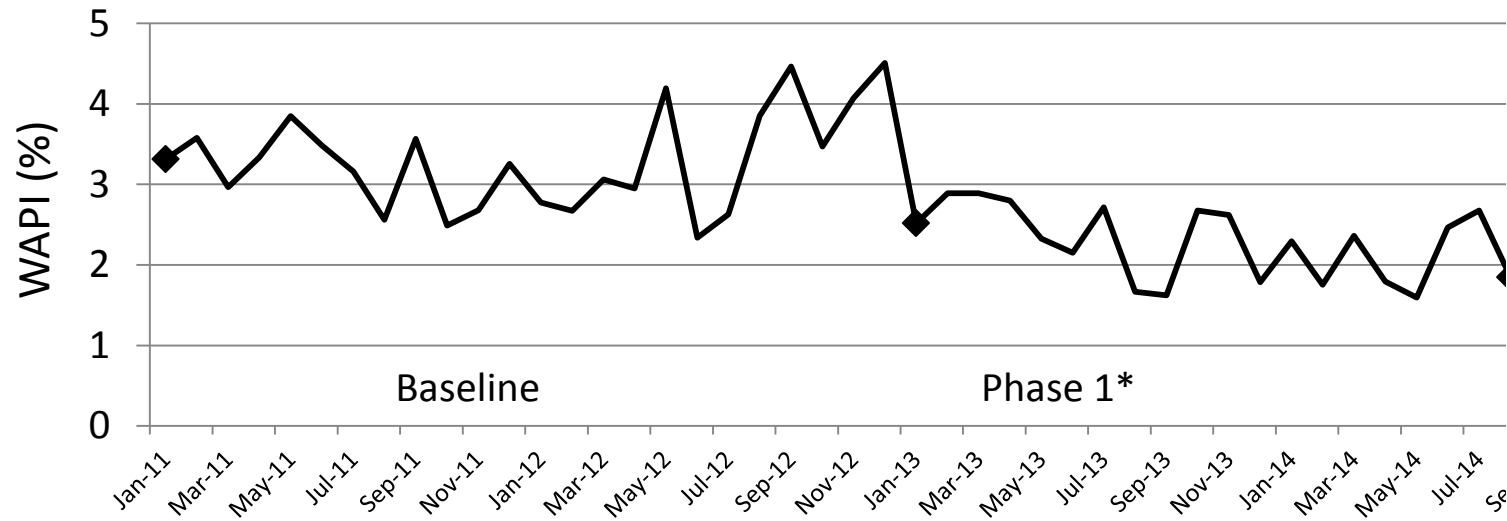


Platelet/Cryo Tote

RBC wastage





Platelet wastage






New ePIF form

▼ Details for Patient Identification Form (PIF) Communication (Communication (PIF) Blood Bank)

 **Details**

 Order Comments



Order details

Requested Start Date/Time [1/23/2015 4:06 PM]

Consent

Vascular patency

Pre-Med Ordered

Red Blood Cell (RBC) Quantity

Platelet Doses

Plasma (FFP) Doses

Cryoprecipitate Doses

Rh Immune Globulin





Must select Product/Quantity above

Pneumatic Tube Station # or Type N/A

RN/PCT/HUC Contact Phone Number

Special Instructions

Future Order [No]

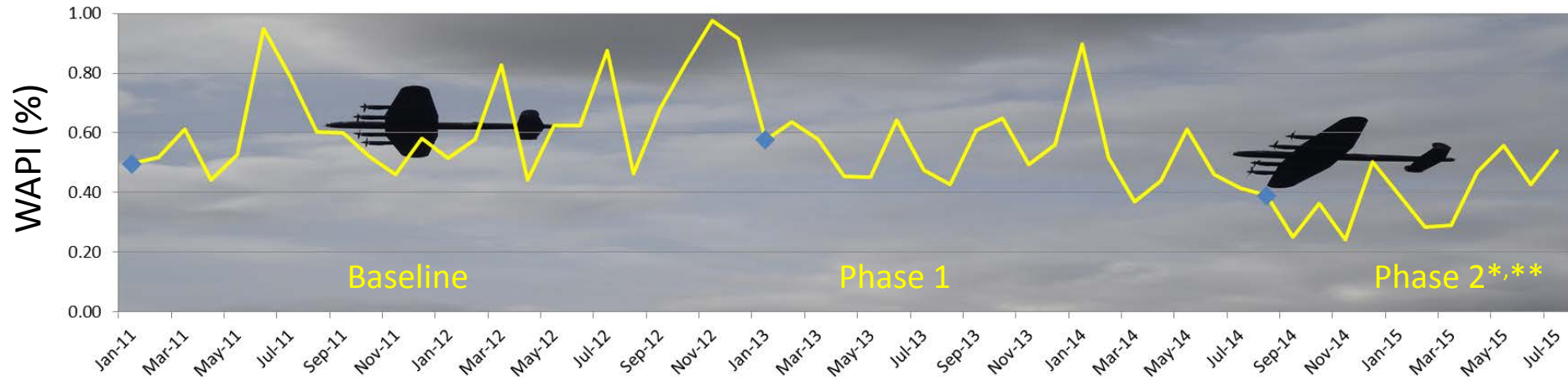


Detail values

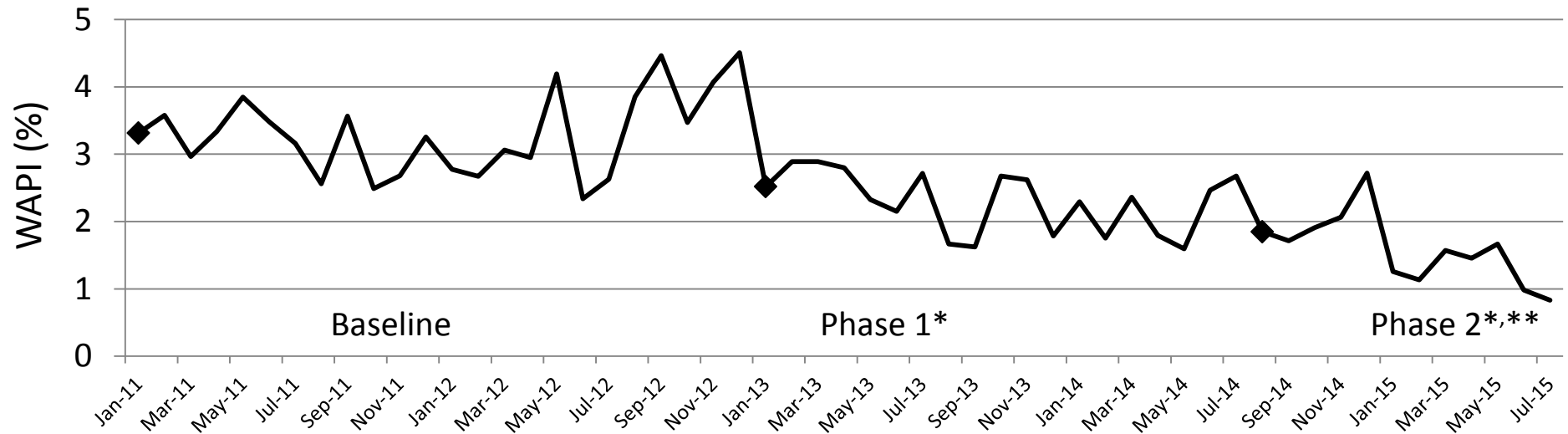
No

Yes

RBC wastage



Platelet wastage



How do we issue our products?

- Anyone can receive AB plasma, O negative RBCs
- Makes stocking them very attractive
- Sadly they're uncommon and in hot demand
 - Trauma
 - Neonates
 - Emergency transfusions
 - Stem cell transplants
- We ought to be using them as specifically as we can
- But we're not...



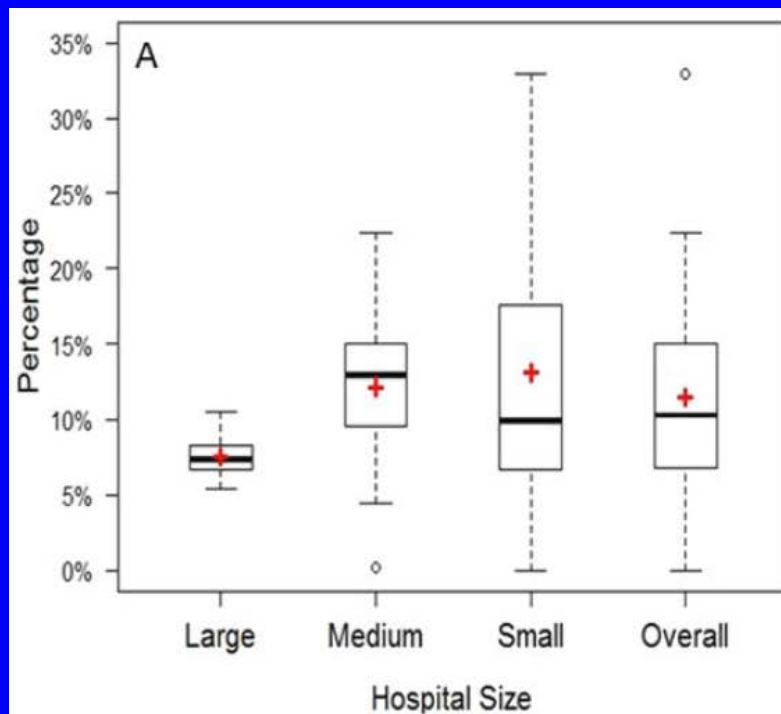
Utilization of AB plasma...a waste?

- Have you thought about where your AB plasma is going?
- BEST collaborative study: 15 participants from different countries
- Only 27% of the AB plasma units went to AB recipients
- Most AB plasma units (69%) were emergently issued, mostly in A&E
- Neonates used only 3% of AB plasma

	Donor Blood Group				
	O	A	B	AB	Total
Recipient O	11,345	3,975	982	1,774	18,076
Recipient A	0	16,770	75*	1,653	18,423
Recipient B	0	6*	4,756	618	5,374
Recipient AB	0	12*	6*	1,496	1,496
Unknown recipient blood group	2	4	0	256	---
Total §	11,345	20,745	5,738	5,541	43,369

Utilization of O neg RBCs...a waste?

- Have you thought about where your O RBCs are going?
- BEST collaborative study: 30 participants from 11 different countries
- 11% of O units were transfused to non-O recipients
 - Mostly on wards, ICU and in A&E



Zeller M et al. *Transfusion* in press

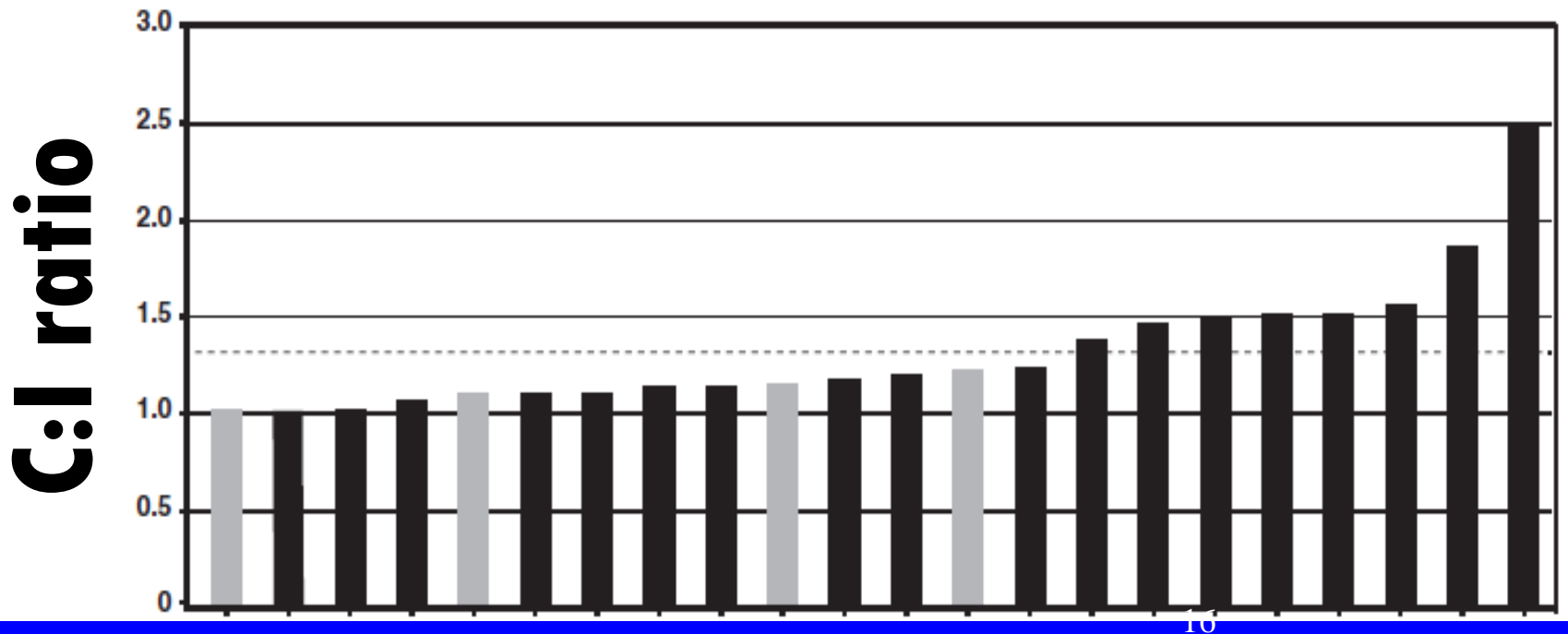
Unnecessary testing is a waste

- Think about how your transfusion service performs the crossmatch
 - At the time an order for RBCs is received?
 - At the time to issue the RBCs is received?
- The fewer RBCs that are crossmatched means the inventory is more fluid



The crossmatch:issue ratio is here!

- The crossmatch:issue ratio indicates how well the blood bank manages its inventory
- The closer the ratio is to 1, the closer the number of crossmatches is to the number of RBC issues
- Similar to the C:T ratio for clinicians
 - The higher the ratio, the more crossmatches are performed than RBCs transfused



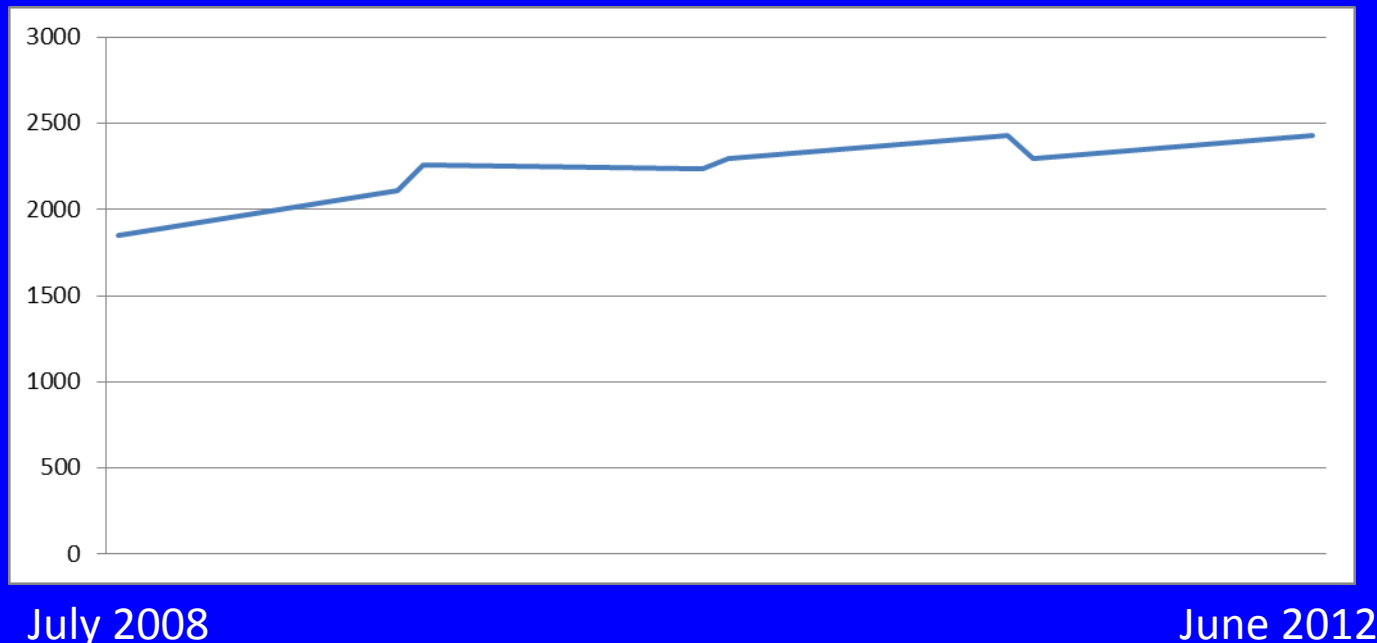
Waste: What about the less obvious sources?

- We know we have to prevent expiration in the blood bank and on the wards
- But this only deals with wastage of the products
- What are some other sources of waste in & around the blood bank?



What's in a type and screen?

- Sure, we have to do it...but how often...and on whom?
- In 2010 California Maternal Quality Care Collaborative developed pre-transfusion guidelines for pregnant women
 - Indicates who needs pretransfusion testing performed
- Adopted rather quickly at our maternal hospital
- Unbeknownst to the blood bank



Audit of transfusion practice of clinical services

Low (No Prenatal Pretransfusion Testing Required)	Medium (Prenatal Type and Screen Performed, No RBC Units Cross-Matched)	High (2 Units of RBCs Cross-Matched)
<p>No previous uterine incision</p> <p>Singleton pregnancy</p> <p>4 or fewer previous vaginal deliveries</p> <p>No known bleeding disorder</p> <p>No history of peripartum hemorrhage</p>	<p>Previous cesarean delivery or uterine surgery</p> <p>Multiple gestation</p> <p>More than 4 previous vaginal deliveries</p> <p>Chorioamnionitis</p> <p>History of peripartum hemorrhage</p> <p>Large uterine leiomyoma</p> <p>Estimated fetal weight more than 4 kg</p> <p>Morbid obesity (BMI greater than 35 kg/m²)</p>	<p>Placenta previa, low-lying placenta</p> <p>Suspected placenta accreta or percreta</p> <p>Hematocrit less than 30 and other risk factor</p> <p>Platelets less than 100,000</p> <p>Active bleeding (greater than show) on admission</p> <p>Known coagulopathy</p>

A lot of wasted type and screens

- Medium group: **2413** T&S tests performed on women who did not need a transfusion in one year

Risk Group	No. of Patients	No. of Patients With Severe Hemorrhage (%)	Relative Risk (95% CI)	P*
Low Nothing	7,260	60 (0.8)	0.30 (0.22–0.42)	<.001
Medium T&S	2,462	49 (2.0)	1.67 (1.20–2.40)	.002
High 2 XM	412	30 (7.3)	6.50 (4.39–9.61)	<.001

- Now we only perform a type and screen for women in the high risk group (no automatic RBC crossmatch)

Intraoperative Cell Salvage (ICS) can be a very useful procedure



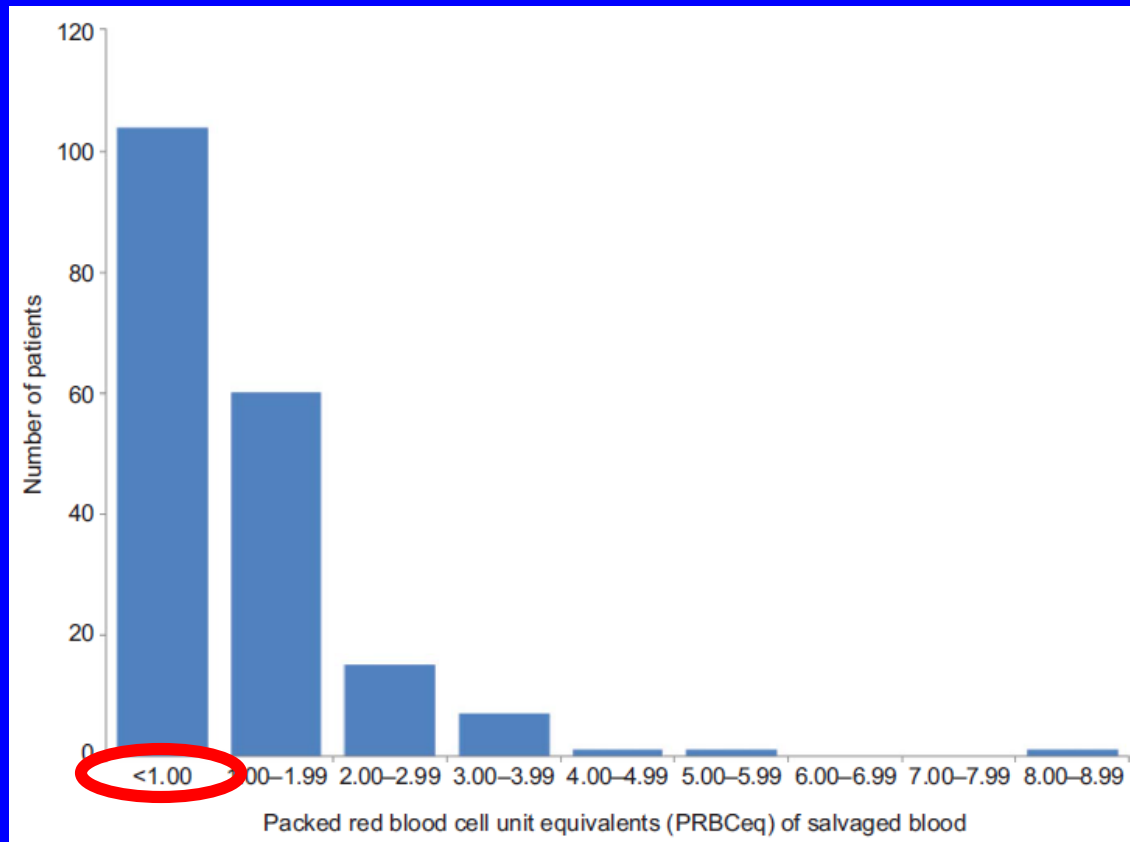
Should intraoperative cell salvage be broadly implemented? No...

- ICS is best when there is enough surgical blood loss to recover enough RBCs to return to the patient

Primary procedure	Total number of cases performed during study period	Patient age (years)	Median volume (mL) of returned RBCs per case (25th-75th percentile)	Median number of 200 mL recovered RBC unit equivalents (25th-75th percentile)
CABG	3201	66.1 ± 11.5	500 (485-750)	1.4 (1.4-2.1)
MIS total hip replacement	3195	62.5 ± 13.0	135 (0-135)	0.4 (0-0.4)
Radical prostatectomy	1159	59.9 ± 6.6	250 (135-280)	0.7 (0.4-0.8)
Lumbar decompression and fusion	996	59.5 ± 13.9	125 (0-250)	0.4 (0-0.7)
Laminectomy and fusion	675	60.0 ± 14.2	235 (0-405)	0.7 (0-1.1)
Total hip replacement	615	63.5 ± 13.8	135 (0-250)	0.4 (0-0.7)
Off-pump CABG	609	66.6 ± 12.0	500 (250-1000)	1.4 (0.7-2.8)
Aortic valve replacement	599	68.3 ± 13.8	750 (500-1000)	2.1 (1.4-2.8)
Total hip revision	490	66.7 ± 13.9	125 (0-270)	0.4 (0-0.8)
Heart, other	403	61.4 ± 15.1	500 (135-950)	1.4 (0.4-2.7)
AAA repair	390	72.3 ± 9.2	690 (250-1250)	1.9 (0.7-3.5)
Aortic valve replacement/CABG	368	74.2 ± 9.7	750 (500-1000)	2.1 (1.4-2.8)
Mitral valve repair	474	60.5 ± 13.6	750 (500-1000)	2.1 (1.4-2.8)
Lung transplant	311	55.8 ± 14.2	1250 (500-2000)	3.5 (1.4-5.6)
Mitral valve repair/CABG	354	69.0 ± 10.4	750 (500-1000)	2.1 (1.4-2.8)
Lumbar fusion	270	57.2 ± 15.5	135 (0-331)	0.4 (0-0.9)
Orthotopic liver transplant	229	53.9 ± 10.8	916 (252-1750)	2.6 (0.7-4.9)
Heart transplant	219	54.6 ± 12.1	1250 (750-1750)	3.5 (2.1-4.9)
Laminectomy and decompression	194	60.8 ± 14.7	0 (0-225)	0 (0-0.7)

Not a lot of blood returned in obstetrics

- 8.5 year review of ICS at single maternity center during obstetrical hemorrhage
- 884 patients had ICS performed during parturition
- 189/884 (21%) of patients had some blood reinfused



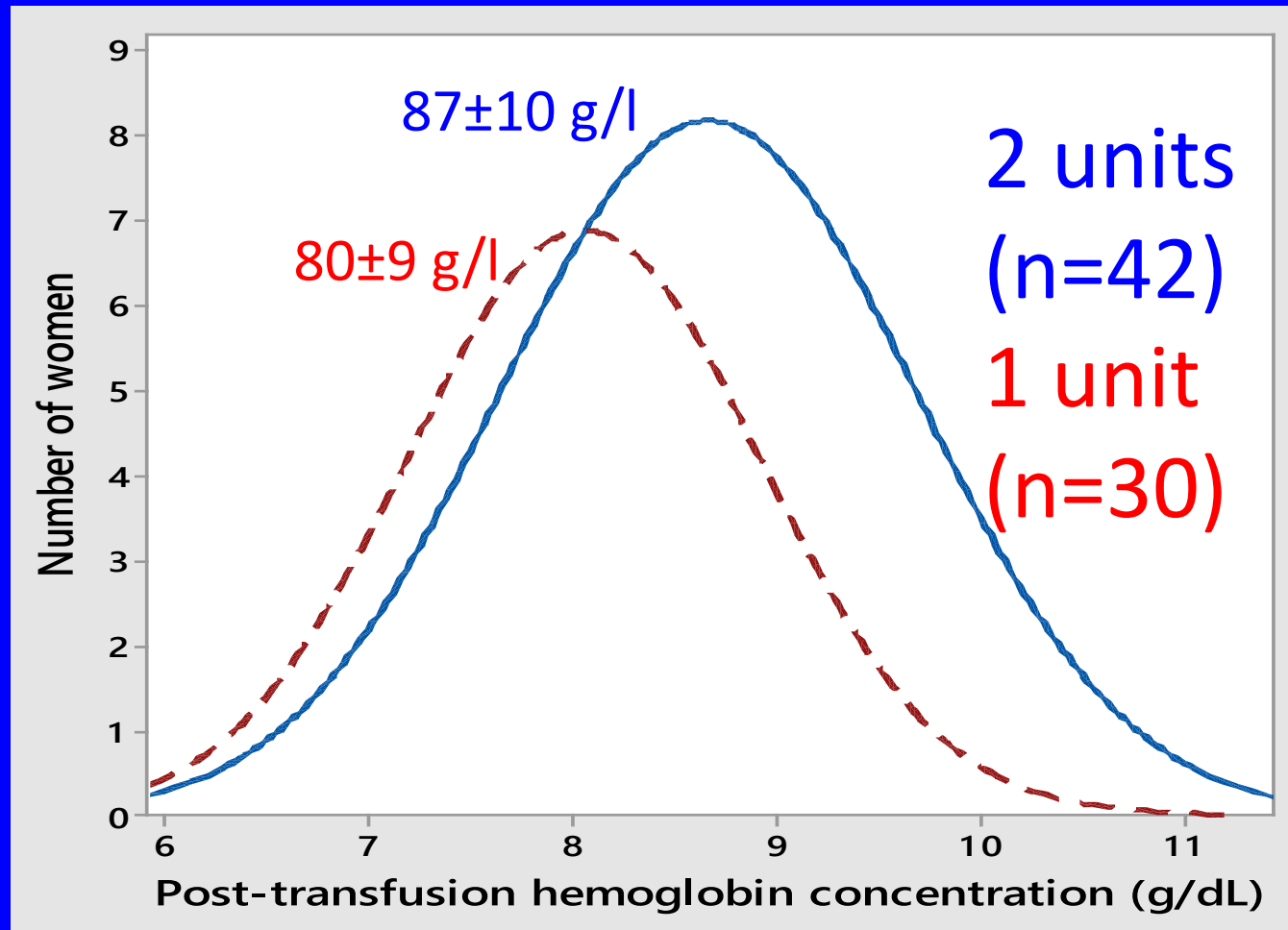
Not a lot of blood returned in obstetrics

- Cesarean hysterectomy patients had the greatest chance of receiving an ICS reinfusion and received the greatest number of RBC equivalents

Nature of Hemorrhage	Age (y)*	Weight (kg)*	No. of Patients in Whom Intraoperative Blood Salvage Was Performed	No. of Standby Cases (%)	No. of Cases in Which Intraoperative Blood Salvage Blood Was Reinfused (%)	Mean No. of PRBCeq Units Reinfused/Patient [†]
Cesarean delivery	30.7±6.4	88.6±23.6	748	654 (87)	94 (13) [‡]	0.9
Cesarean hysterectomy	32.3±5.6	90.6±21.8	103	28 (27)	75 (73)	1.7
Bleeding post-cesarean delivery	33.8±6.3	83.5±20.1	16	5 (31)	11 (69)	1.0
Vaginal delivery	31.1±6.2	85.9±18.1	17	8 (47)	9 (53)	1.4

Why transfuse 2?

- Discharge Hb concentrations for post-partum women

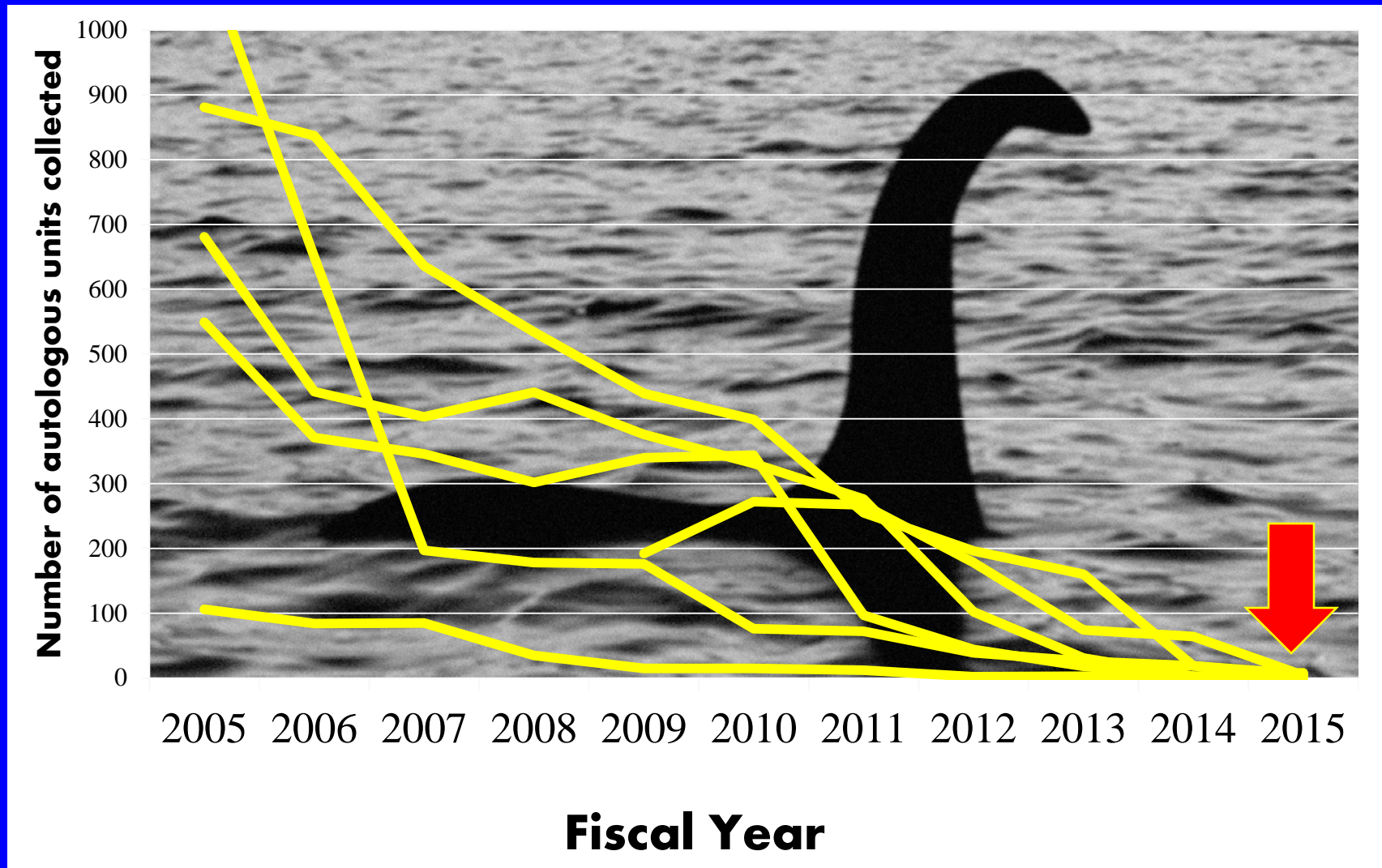


Pre-operative autologous donation (PAD)

- Was popular in the 80s and 90s before NAT testing became routine
- Still has not entirely disappeared
- “Benefits”
 - Reduces donor exposures
 - Prevents allergic reactions
- Cons
 - Does not prevent ABO mistransfusion
 - Does not prevent bacterial contamination
 - Does not prevent TACO
 - Might still receive allogeneic RBC by accident
 - Lowers hemoglobin before surgery



Virtually no pre-operative autologous donations in Pittsburgh anymore!



Blood products issued to operating room

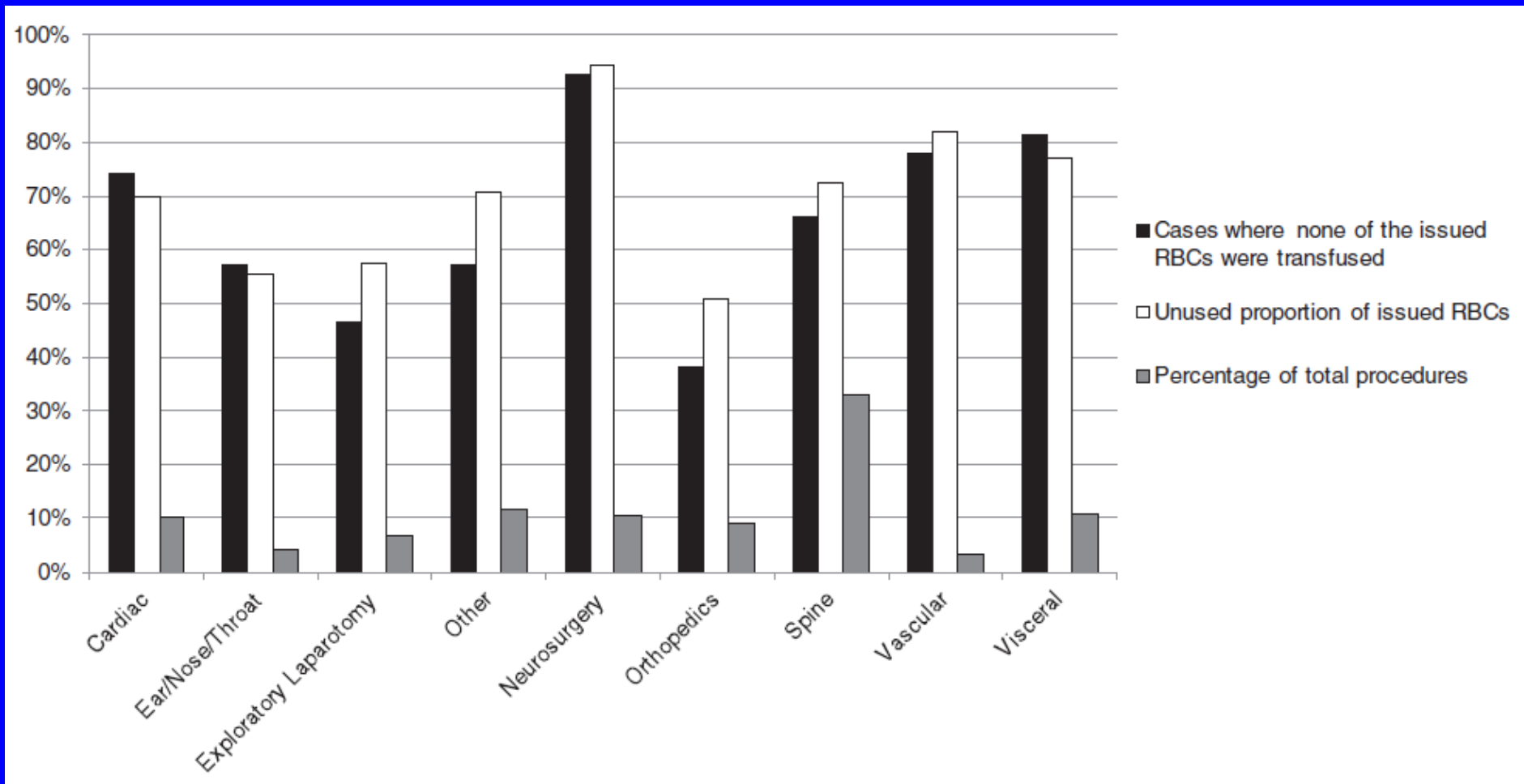
- Blood banks are afraid of causing delays
- We get blamed for it every time
- So how to avoid delays? Issue lots of product when they're ordered
- One month review of all products issued to OR for elective surgery patients
 - Single tertiary care hospital
 - Patients had to be electronic crossmatch eligible
 - What was issued was compared to MSBOS

Blood products issued to operating room

- During the 4-week study period...
 - 1350 qualifying surgical procedures performed
 - MSBOS recommended T&S on 421 patients
 - 18 others also had pre-operative T&S
 - RBCs issued on 215/439 (49%) of cases
 - Average of 3.5 ± 2.8 units per case (742 units)



Blood products issued to operating room



Is this a waste?

- Actual number of wasted units from these 742 was unknown
- Only 131 (0.65%) RBC units wasted in entire hospital in 2014
 - 25/131 (19%) were wasted in OR cases
- A lot of RBCs were issued in coolers that could not have been used for other patients
- A lot of effort to keep RBCs outside of blood bank
 - But surgeons had what they wanted
- What is the right balance between keeping OR stocked and fluid blood bank inventory?

Would you say no to issuing blood products?



Courtesy Dr. (Maj) Andrew Beckett

Blood issuing in massive bleeding

- Of course not
- But can we issue enough to facilitate the resuscitation and still maintain inventory fluidity?
- The fate of blood products issued during first 3 hours of MTP activation at 3 level 1 trauma centers was studied over 12 month period in 2015-16
- How many patients actually get transfused with the issued blood products during MTP

Blood issuing in massive bleeding

Rural trauma center Urban trauma centers

Unit disposition	Hospital 1	Hospital 2	Hospital 3
RBC units			
Transfused	343 (65)	877 (39)	185 (55)
Returned	140 (26)	1361 (61)	153 (45)
Wasted†	47 (9)	4 (0.2)	0 (0)
Total	530 (100)	2242 (100)	338 (100)
Plasma units			
Transfused	221 (65)	967 (43)	156 (66)
Returned	97 (28)	1246 (56)	82 (34)
Wasted†	25 (7)	22 (1)	0 (0)
Total	343 (100)	2235 (100)	238 (100)
PLT doses‡			
Transfused	34 (77)	27 (75)	3 (100)
Returned	7 (16)	7 (19)	0 (0)
Wasted†	3 (7)	2 (6)	0 (0)
Total	44 (100)	36 (100)	3 (100)
Cryoprecipitate doses‡			
Transfused	41 (79)	67 (93)	4 (67)
Returned	0 (0)	0 (0)	0 (0)
Wasted†	11 (21)	5 (7)	2 (33)
Total	52 (100)	72 (100)	6 (100)

Not everyone received blood products during MTP

	Rural trauma center	Urban trauma centers	
	Hospital 1	Hospital 2	Hospital 3
Blood component	(n = 43 patients)	(n = 121 patients)	(n = 19 patients)
RBCs	37 (86)	98 (81)	19 (100)
Plasma	35 (81)	83 (69)	16 (84)
PLT	21 (49)	19 (16)	3 (16)
Cryoprecipitate	11 (26)	22 (18)	2 (11)

Blood issuing in massive bleeding

- Again, wastage rates are relatively low
- So the products are either being used or returned
- Seems like we are issuing a lot of products
 - Undersupplying the resuscitation could be lethal
 - Oversupplying it makes inventory management difficult
- The balance between over- and under-issuing is likely to be determined by clinical need rather than blood bank policy
- Probably better to oversupply products

Conclusions

- Waste is more than just what we throw out
- Any process that slows down issuing of products, causes the issuing of too many products, or encourages non-evidence based practice is a waste
- Time to rethink some of the things we have been doing for a while...times change
- It's all around you...



Alexander Graham Bell National Historic Site, Baddeck, Nova Scotia

Electronic enhancements for waste reduction

- RBCs can be reserved for up to 8 hours
 - Good reminder to order pre-transfusion testing
 - Helps blood bank plan daily inventory
- Electronic patient identification form (ePIF) used to request products
 - No more paper!
 - Can only be sent if nurse indicates on form that...
 - Patient is on the floor
 - Any ordered premedications given
 - Consent obtained
 - Expected to especially help reduce pooled platelet waste