ORBCoN
Ontario Regional Blood Coordinating Network

Inspiring and facilitating best transfusion practices in Ontario.

The triage group and screen

Jeannie Callum
Dir. of Transfusion Medicine
Kingston Health Sciences Centre
Queen's University

Disclosures

- Research support from CBS, Octapharma, DRDC, and CIHR

Objectives

- By the end of the session, participates should be able to:

1. Understand the low value of universal testing on all women at triage
2. Select situations when testing should be performed
3. Feel confident in the safety of using O D-negative, K-negative uncrossmatched blood when a patient unexpectedly needs red cells
4. State the healthcare economic impacts of universal testing at triage

Outline

- Medical reasons for needing a Group and Screen
  - Maternal [and newborn]

- Management of unexpected need for transfusion in a patient without a Group and Screen

- Economics of universal testing


embrace
SPLASHMASK
4% CHG
For Handwashing
Only
THE CHECKLIST MANIFESTO
ATUL GAWANDE

1 **Do not routinely perform a group and screen test at the time of delivery unless there is no prior test during the current pregnancy and/or the risk of maternal ~~hemorrhage or~~ transfusion is high.**

The likelihood of requirement for transfusion at the time of delivery is low. In a patient with a prenatal record confirming maternal ABO, Rh and a negative antibody screen provision of emergency uncrossmatched units is relatively safe when required on rare occasions. Routine pre delivery group and screen is not cost effective given the very low risk of transfusion with either vaginal delivery or routine Caesarean section. In the rare occasion that patients require a blood transfusion, O negative un-crossmatched blood or a stat crossmatch could be done pre-transfusion.

>5-10%

Vaginal 0.7%
Vaginal with “instruments” 1.5%
C-Section 2.3%

[without modern PBM in Canada]

Shehata N, et al. Transfusion. 2017;57(9):2197-2205

We can (and must) do better

- Retrospective cohort study of 35,477 women who delivered at term (≥37 weeks)

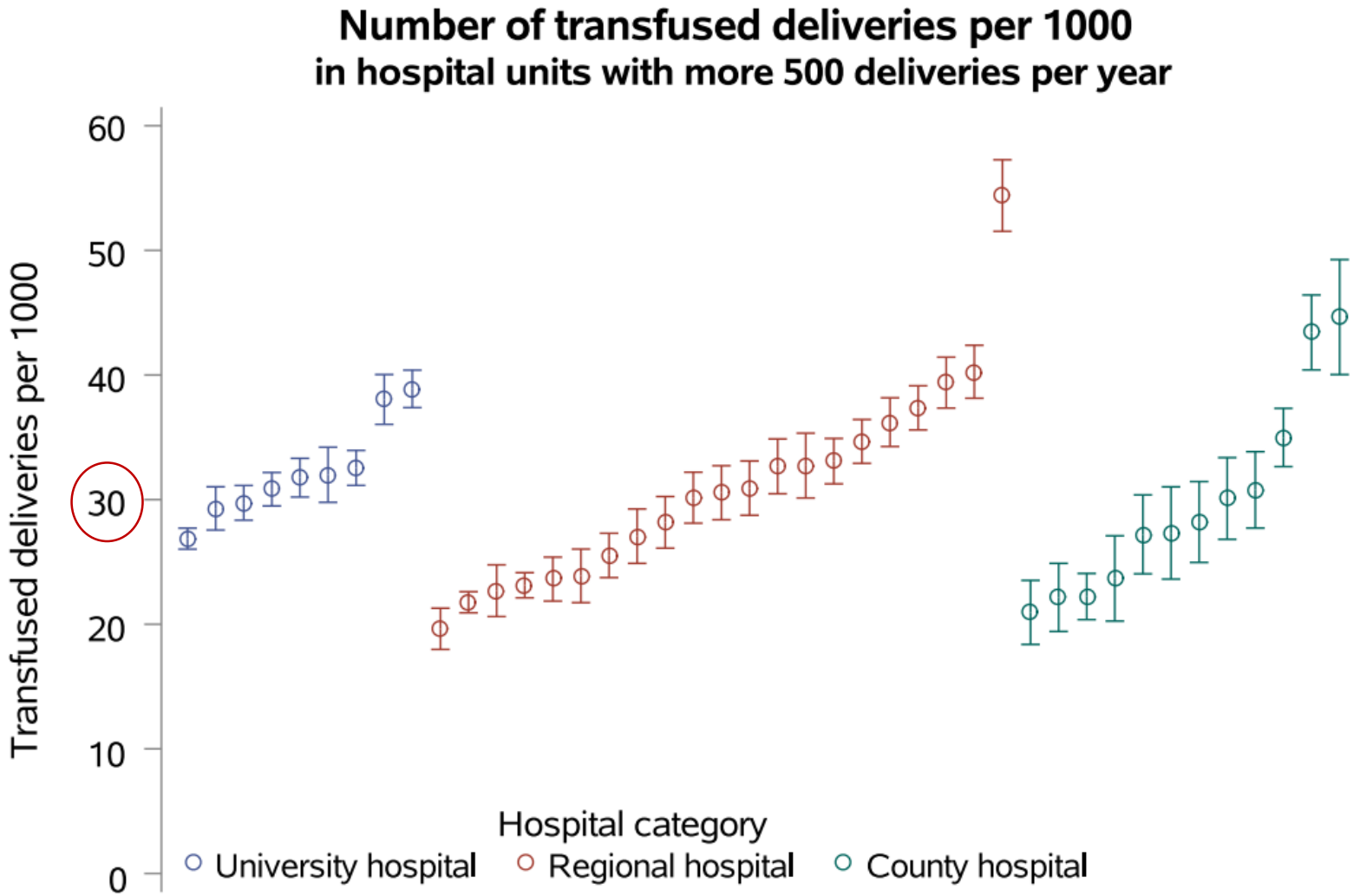
- **Rate of blood transfusion:**
  - Spontaneous vaginal birth = 0.86%
  - **Elective C/S = 0.47%**
  - Emergency C/S = 1.67%

Table 2 Known risk factors for blood transfusion

Risk factor	Transfused *N* (%)	Not transfused *N* (%)	*P*	OR (95%CI)
Placenta praevia	6 (1.58)	267 (0.67)	0.07	2.1 (0.9, 4.7)
Placenta accreta	2 (0.53)	6 (0.02)	0.03	30.9 (6.2, 153.8)
Multiple pregnancy	7 (1.84)	631 (1.80)	0.95	1.0 (0.5, 2.2)
APH/ abruption	7 (1.84)	249 (0.71)	0.009	2.6 (1.2, 5.6)
Anaemia (Hb < 100 g/dL)	45 (11.8)	733 (2.1)	<0.001	6.3 (4.6, 8.7)

Stock O. Aust New Zeal J Obstet Gynaecol. 2014;54(3):279–82.

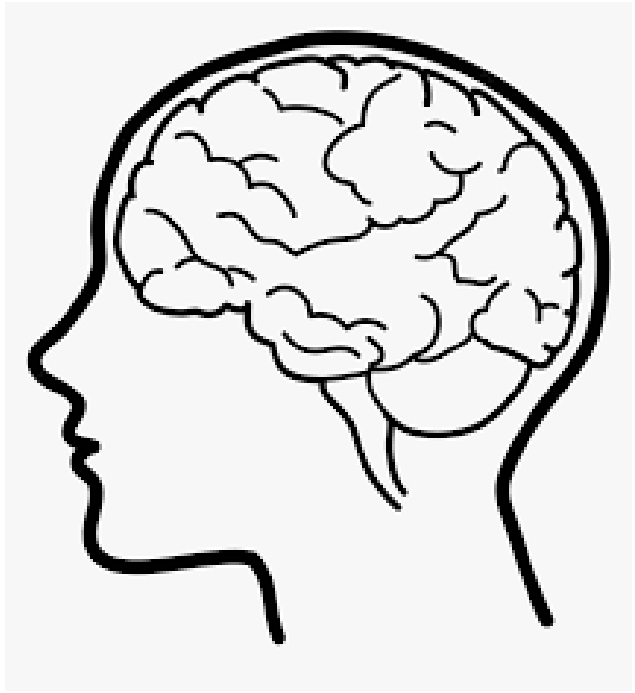
We can (and must) do better [Sweden]



Vox Sanguinis (2021) **116**, 821–830

Maternal reasons for higher transfusion rate

Admission Hemorrhage Risk Assessment For determining the need for Group and Screen
Collect
Hemoglobin <110 g/L
Multiple gestation
Placental abnormalities (incl. abruption)
Bleeding disorder
Antepartum hemorrhage
Platelets <50 $x10^9$/L
History of post-partum hemorrhage
Pre-eclampsia
Chorioamnionitis



+

[to antenatal and intrapartum info]

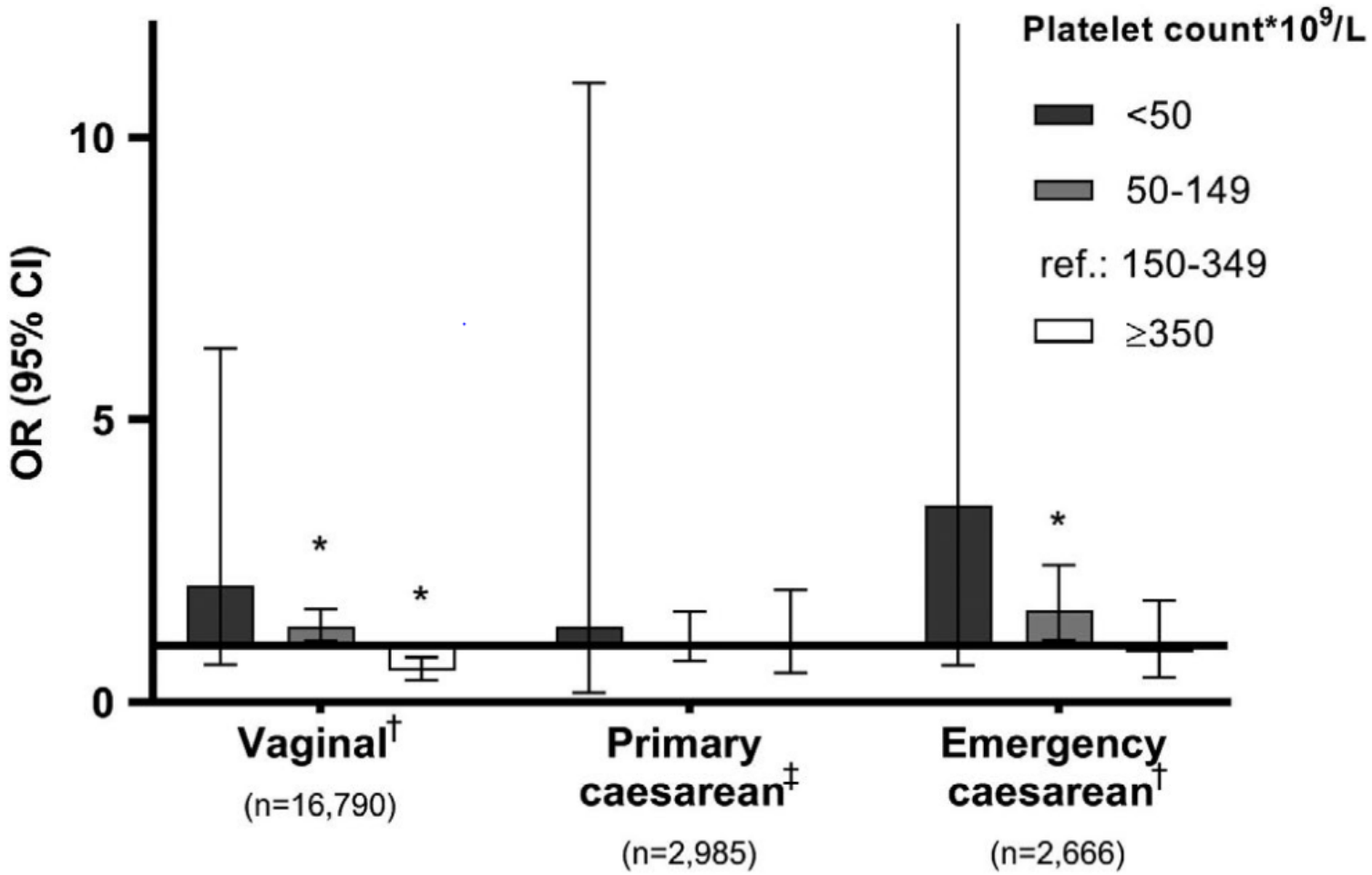
Evidence for higher rates of transfusion

- Mild thrombocytopenia 100-150 (vs >150) does not increase transfusion[1]
- Platelet count <50 increases risk of PPH[2]
- Baseline risk about 14 per 1000 deliveries (1.4%)[3]
  - Bleeding disorder 142 per 1000
  - Iron deficiency anemia 134 per 1000
  - Placenta Previa 103 per 1000
  - Antepartum hemorrhage 47 per 1000
  - Multiple birth 45 per 1000
- One-third of transfusions could be avoided with correction of iron deficiency anemia[4]
- 18% of patients with pre-eclampsia require transfusion[5]
- 5.5% with chorioamnionitis require transfusion[6]

1. Attali E, et al. Int J Gynaecol Obstet. 2022 Mar 21
2. van Dijk WEM, et al. J Thromb Haemost. 2021;19(11):2873-2883
3. Patterson JA, et al. Obstet Gynecol. 2014 Jan;123(1):126-133
4. Papalia N, et al. JOGC 2020: 42: 688
5. Boyer T, et al. AJOG 2022: Abstract 777
6. Bateman BT, et al. Anesth Analg. 2010;110(5):1368-73.

Platelet count - <50 = 2.2-fold increase in PPH

[and she might need a platelet transfusion]



van Dijk WEM, et al. J Thromb Haemost. 2021;19(11):2873-2883

Prior PPH – 15% risk of PPH

TABLE 3

Risk of subsequent postpartum hemorrhage because of a history of postpartum hemorrhage in all and restricted to vaginal deliveries

Pregnancy history		Recurrence in all deliveries				Recurrence in vaginal deliveries			
First pregnancy	Second pregnancy	n	%	RR (95% CI)	RR (95% CI)[a]	n	%	RR (95% CI)	RR (95% CI)[a]
No	—	289,982	5.0	1.0	1.0	226,310	3.7	1.0	1.0
Yes	—	19,853	15.0	3.0 (2.9–3.1)	3.0 (2.9–3.1)	13,552	14.2	3.8 (3.6–4.0)	3.7 (3.6–3.9)
No	No	52,847	4.4	1.0	1.0	41,631	3.5	1.0	1.0
Yes	No	2782	9.9	2.3 (2.0–2.5)	2.3 (2.0–2.6)	1937	9.4	2.7 (2.3–3.1)	2.7 (2.3–3.2)
No	Yes	2405	15.0	3.4 (3.1–3.8)	3.4 (3.0–3.8)	1443	15.3	4.4 (3.8–5.0)	4.2 (3.7–4.9)
Yes	Yes	406	26.6	6.1 (5.1–7.2)	6.2 (5.2–7.3)	247	26.7	7.6 (6.2 9.4)	7.6 (6.1–9.5)

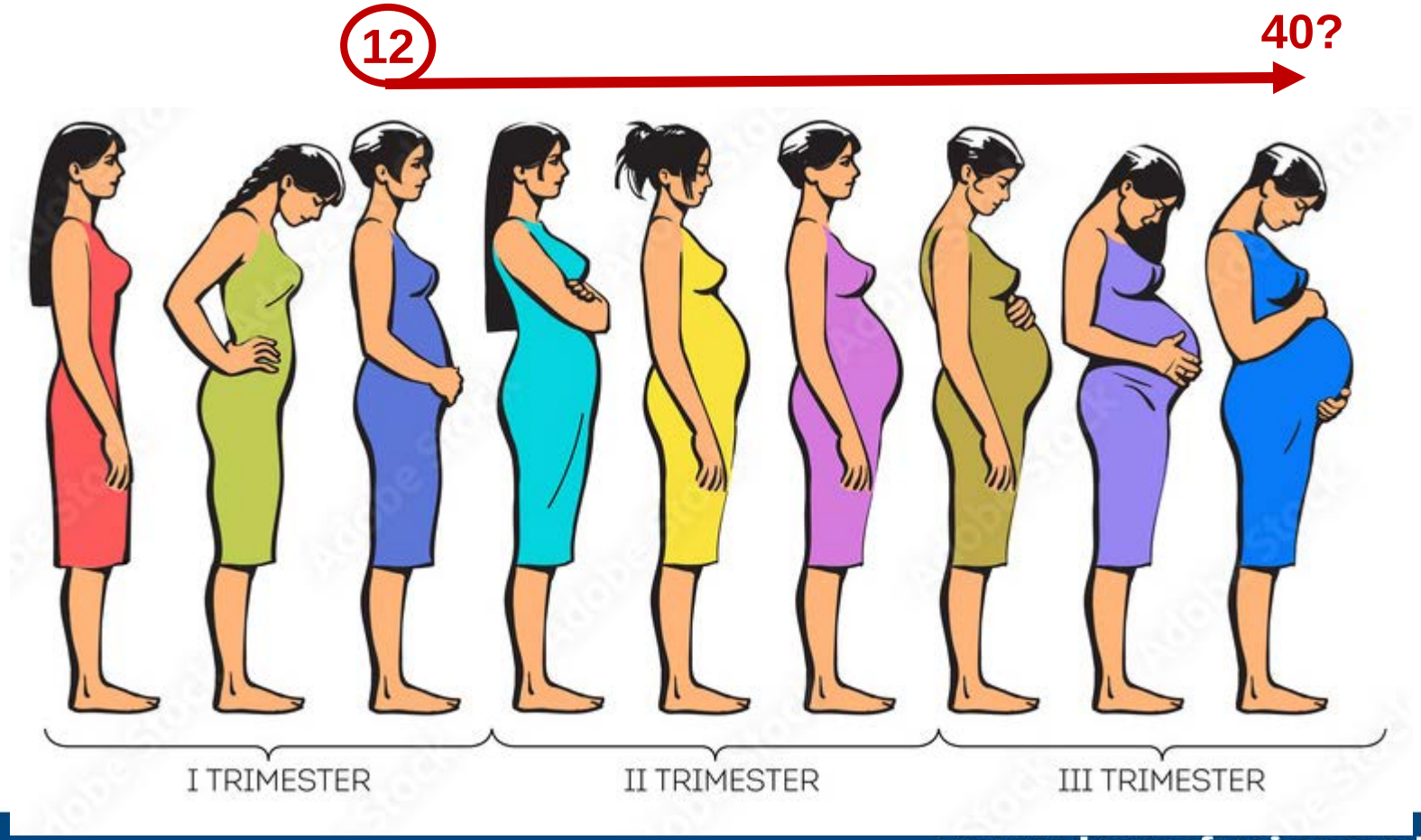
Oberg AS, et al. Am J Obstet Gynecol. 2014 Mar;210(3):229.e1-8.

The List

Admission Hemorrhage Risk Assessment For determining the need for Group and Screen
Collect
Hemoglobin <110 g/L
Multiple gestation
Placental abnormalities (incl. abruption)
Bleeding disorder
Antepartum hemorrhage
Platelets <50 $x10^9$/L
History of post-partum hemorrhage
Pre-eclampsia
Chorioamnionitis


YOU ARE NEEDED NOW.
O-

Risk of a new antibody after 12 week test?



What are the facts?

- ABO-incompatibility and RHIG protect women from becoming alloimmunized (to non-D antigens)[1]
- Failure of RHIG is 0.3% outside of clinical trials (most not from errors)[2]
- Of Rh D-positive and Rh c-negative women, 0.16% became immunized, 1 of 62,096 needed antenatal intervention with intrauterine transfusion (attributed to high titre anti-E)[3]
- In the modern era, 0.7% of women will have antibodies detected in pregnancy[4]
- McMaster: new clinically significant antibody between 12 and delivery is 0.24% x risk of transfusion 0.09% = 1 in 500,000 deliveries BOTH antibody and transfusion (and only 1 in 4 patients the antigen is expected on Rh-neg, K-neg units)[5]
- Providing K-negative reduces anti-K by half[6]

1. Zwiers C, et. Transfusion. 2018 Jul;58(7):1611-1617
2. McCauley CJ, et al. Transfus Med. 2017 Apr;27(2):132-135
3. Slootweg YM, et al. BJOG. 2016 May;123(6):955-63.
4. Pal M, et al. Pathology. 2015 Feb;47(2):151-5
5. Heddle NM, et al. Transfusion. 1993 Mar;33(3):217-20
6. Luken JS, et al. Transfusion. 2021 Mar;61(3):713-721.

Little c-negative NNT – 1 in 31,048

[note: the hospital would have to test 100% of Rh-positive women to find the c-negative patients]

	Screened Rhc-negative women 1/10/2011–1/10/2013 (*n* = 62 096)			Numbers needed to screen to detect one case*
	n	% (95% CI) of Rhc-negative women	% (95% CI) of cases with late alloimmunisation	*n*
Late alloimmunisation	99	0.159 (0.128–0.191)		628
HDFN	22	0.035 (0.021–0.050)	22.22 (12.94–31.51)	2823
Severe	2	0.003 (0–0.008)	2.02 (0–4.82)	31 048
Moderate	20	0.032 (0.018–0.046)	20.20 (11.35–29.06)	3105

Antibodies – will rh-neg, k-neg be safe?

System and antibody	Number	Percentage
Rh	242	50.2%
D	50	10.4%
C	8	1.7%
c	42	8.7%
E	133	27.6%
e	6	1.2%
C^w	3	0.6%
Kell	46	9.5%
K (Kell)	44	9.1%
k (Cellano)	2	0.4%
Duffy	15	3.1%
Fy^a	13	2.7%
Fy^b	2	0.4%
Kidd	25	5.2%
Jk^a	21	4.4%
Jk^b	3	0.6%
JK3	1	0.2%
MNS	38	7.9%
S	7	1.5%
s	2	0.4%
M	29	6.0%
N	0	0.0%
Lewis	29	6.0%
Le^a	28	5.8%
Le^b	1	0.2%
Le^{a+b}	0	0.0%
Lutheran	4	0.8%
Lu^a	4	0.8%
Lu^b	0	0.0%
Gerbich Ge^a	0	0.0%
P P1	3	0.6%
High frequency LAN	1	0.2%
Two or more antibodies	79	16.4%

330 / 482 patients (68%) either:

Antigen not on RH-neg, K-neg OR
Doesn't cause hemolytic reactions

0.24% x 0.32 = 0.08% risk

[poor sensitivity era]

Pal M, et al. Pathology. 2015 Feb;47(2):151-5

Antibodies – will rh-neg, k-neg be safe [take 2]

Table 2. *Specificities of clinically significant antibodies produced during pregnancy*

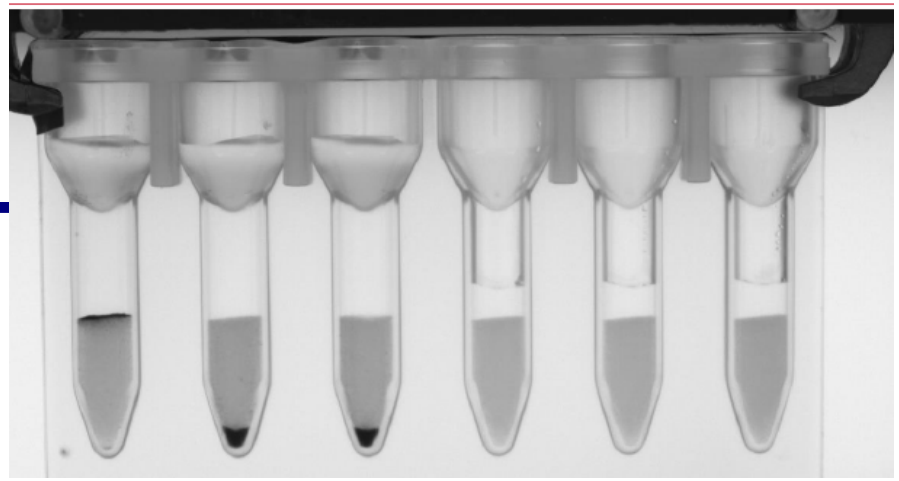
Specificity	Number
Anti-E	11
Anti-K	8
Anti-Jk^a	7
Anti-C	5
Anti-Fy^a	4
Anti-M	3
Anti-S	1
Anti-Fy^b	1
Anti-Jk^b and anti-Fy^a	1
Anti-C and anti-e	1
Total	42

Of 17,568 pregnancies

14 of 17,568 (0.08%)
Risk of a hemolytic reaction

Heddle NM, et al. Transfusion. 1993 Mar;33(3):217-20

AND Sensitivity has improved for the 12 week G&S



1 2 3

\+ - -

			Rh-hr								KELL						DUFFY		KIDD		Sex Linked	LEWIS		MNS				P	LUTHERAN	
Cell #	Rh-hr	Donor Number	D	C	E	c	e	f	C^w	V	K	k	Kp^a	Kp^b	Js^a	Js^b	Fy^a	Fy^b	Jk^a	Jk^b	Xg^a	Le^a	Le^b	S	s	M	N	P_1	Lu^a	Lu^b
1	R1wR1	315357	+	+	0	0	+	0	+	0	0	+	0	+	/	+	0	+	0	+	+	0	+	+	+	+	0	+s	+	+
2	R2R2	319426	+	0	+	+	0	0	0	0	0	+	0	+	/	+	+	+	0	+	+	+	0	+	0	+	+	+	0	+
3	rr	102926	0	0	0	+	+	+	0	0	+	+	0	+	0	+	+	0	+	0	+	0	+	0	+	0	+	+s	0	+

D-negative Haplotypes		
r': dCe		
r": dcE		
r: dce	-ce/-ce	99%
r^{y}: dCE		

The risk of acute hemolysis with uncrossmatched blood = remote

- No group and screen in this pregnancy AND has antibody 0.7% AND this was missed by triage
- New antibody since 12 weeks and antigen on O-/K- = 0.08% [with poor quality testing]
- The transfusion is for a PPH and you had less than 45 minute lead time – the bulk of transfusion in pregnancy are day 1+ for severe anemia <50 g/L
- The patient was a low risk pregnancy and sample not sent by triage – probably 70%
- Patient at risk for the antibody (e.g., anti-Jk^a - 23% of us are at risk of this antibody and alloimmunization rate is only 1 in 3 people)

You can be confident in holding off on low risk patients until the bleeding starts


THE·TORONTO·STOCK·EXCHANGE

359, 533
Births in 2021
X $25

Universal testing
$9.0 million

25% of deliveries
$2.2 million

Original Research

Transfusion Preparedness Strategies for Obstetric Hemorrhage

A Cost-Effectiveness Analysis

RESULTS: In the base-case analysis, the strategy of universal type and screen with crossmatch for high-risk patients yielded an incremental cost of $115,541 per emergency-release transfusion prevented compared with a strategy of universal hold clot. The universal hold clot strategy yielded a cost of $2,878 per emergency-release transfusion prevented compared with a strategy of no routine admission testing. Strategies using universal type and screen were cost-effective in zero of the 10,000 simulations at a willingness-to-pay threshold of $1,500 per emergency-release transfusion prevented. Even at willingness to pay greater than $10,000 to prevent an emergency-release transfusion, universal type and screen strategies were not cost-effective.

(Obstet Gynecol 2017;130:1347–55)

A group and screen sample is not required at triage unless there is:

1. No test in current pregnancy
2. A clinically significant antibody
3. The risk of transfusion at delivery exceeds 5-10%
4. Immediate transfusion anticipated for the newborn (HDFN, abruption)

Admission Hemorrhage Risk Assessment

For determining the need for Group and Screen

Collect
Hemoglobin <110 g/L
Multiple gestation
Placental abnormalities (incl. abruption)
Bleeding disorder
Antepartum hemorrhage
Platelets <50 $x10^9$/L
History of post-partum hemorrhage
Pre-eclampsia
Chorioamnionitis

The 12 week antibody screen is sufficient as a "pre-transfusion screen"

8 per 10,000 residual risk of
a set up for hemolytic transfusion reaction

STATEMENT 22

Group and screen testing at the time of delivery is not routinely required unless:

- **There is no prior test during the current pregnancy; or**
- **There is a clinically significant alloantibody; and/or**
- ~~**The risk of maternal hemorrhage is increased; or**~~
- **The likelihood of transfusion is high; and/ or**
- **There is a transfusion planned for the neonate.**

an immediate

References:

Stock O, Beckmann M. Why group & save? Blood transfusion at low-risk elective caesarean section. Aust New Zeal J Obstet Gynaecol. 2014;54(3):279–282.

White J, Qureshi H, Massey E, Needs M, Byrne G, Daniels G, et al. Guideline for blood grouping and red cell antibody testing in pregnancy. Transfus Med. 2016;26(4):246–263.

Admission Hemorrhage Risk Assessment **For determining the need for Group and Screen**
Collect
Hemoglobin <110 g/L
Multiple gestation
Placental abnormalities (incl. abruption)
Bleeding disorder
Antepartum hemorrhage
Platelets <50 x10^9/L
History of post-partum hemorrhage
Pre-eclampsia
Chorioamnionitis