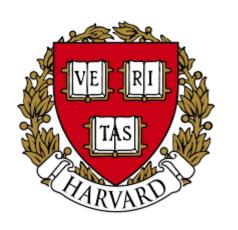
Review of Platelet Transfusion Practices in the NICU and Newborn Nursery

Mike Meade, MD Transfusion Medicine Fellow

Beth Israel Deaconess Medical Center



Disclosures



I have no financial disclosures or conflicts of interest with the presented material in this presentation

Case #1

Baby Boy AZ:

- 31 1/7 week male
- Pregnancy c/b growth restriction, gHTN, GDM
- Urgent C/S for NRFHT → Now in NICU

NICU Course:

- Prematurity/SGA, ?sepsis
- Platelets: downtrend from 73 to 46 \rightarrow Transfused 1u platelets

Case #2

Baby Boy ZA:

- 31 1/7 week male
- Pregnancy c/b growth restriction, gHTN, GDM
- Urgent C/S for NRFHT → Now in NICU

NICU Course:

- Prematurity/SGA, ?sepsis
- Platelets: downtrend from 73 to 46 → Not Transfused

Discussion & Objectives

Same Case, Different Transfusion Practice:

- Which choice do you agree with?
- Which choice was correct?

Objectives:

- Define platelet transfusion thresholds
- Unique considerations in preterm neonates
- Application of these data in our institution

Standard Platelet Transfusion Thresholds

When to Transfuse

Active Blading

- Generally <

BIDMC Guidelines for Adult Inpatient Transfusion Practice

The following represent an evidence-based approach to transfusion practice agreed upon by the BIDMC Transfusion Committee. Transfusion therapy should always be individualized for each patient.

Prophylactic transfusion indications

Surgical	Prosin	gical
Duigical		

Varies by
 → How were these thresholds developed?

, no	≤ 50	

Platelet count

 $(x 10^3 per \mu L)$

Prophylactic:

- Generally <10k for uncomplicated/inpatient
- Generally <20k for complicated/outpatient

Transfusion Thresholds

Evidence-Based Transfusion Practices

· Various trials - different patient populations



Applicability:

- Broad vs Narrow?
- Demographic differences?
- Study design?

Recommendation 1: The AABB recommends that platelets should be transfused prophylactically to reduce the risk for spontaneous bleeding in hospitalized adult patients with therapy-induced hypoproliferative thrombocytopenia. The AABB recommends transfusing hospitalized adult patients with a platelet count of 10 × 109 cells/L or less to reduce the risk for spontaneous bleeding. The AABB recommends transfusing up to a single apheresis unit or equivalent. Greater doses are not more effective, and lower doses equal to one half of a standard apheresis unit are equally effective. (Grade: strong recommendat → Narrow, well-defined populations

Recommendation 2: _______nts having elective central venous catheter placement with a platelet count less than 20 × 109 cells/L. (Grade: weak

recommendation; low-quality evidence).

Recommendation 3: The AABB suggests prophylactic platelet transfusion for patients having elective diagnostic lumbar puncture with a platelet count less than 50 × 109 cells/L. (Grade: weak recommendation; very-low-quality evidence).

Not Without Risk!

	Frequency, Episodes: Unit
Reactions	
Febrile (FNHTR)	· 1–4:100
Allergic	· 1-4:100
Delayed hemolytic	• 1:1000
TRALI	· 1:5000
Acute hemolytic	• 1:12,000
Fatal hemolytic	• 1:100,000
Anaphylactic	• 1:150,000
Infections ^a	
Hepatitis B	• 1:220,000
Hepatitis C	· 1:1,800,000
HIV-1, -2	 1:2,300,000
HTLV-1 and -2	• 1:2,993,000
Malaria	· 1:4,000,000
Other Complications	
RBC allosensitization	• 1:100
HLA allosensitization	• 1:10
Graft-versus-host disease	Rare

Unique Considerations in Preterm Neonates

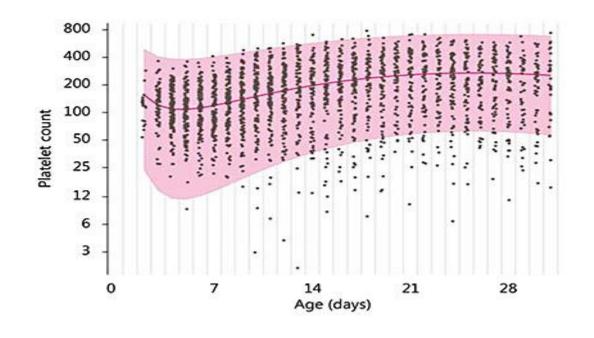
Thrombocytopenia in Neonates

Common Complication in Preterm Neonates

- Incidence inversely proportional to GA
- Predicts poor outcomes

Diverse Etiologies

- Maternal factors
- "Early" vs "Late" onset



	III-Appearin	g, Premature	Well-Appearing, Full Term				
Туре	Early Onset (<24 h)	Late Onset (>72 h)	Early Onset (<24 h)	Late Onset (>72 h)			
Common	Sepsis TORCH infection Birth asphyxia DIC NEC	Sepsis Thrombosis DIC NEC Drug-induced	Placental insuf- ficiency Autoimmune Alloimmune (NAIT) Occult infection	Occult infection NEC			
Rare	Chromosomal disorders Trisomy 13 Trisomy 18 Trisomy 21 Turner syndrome	Inborn errors of metabolism Fanconi anemia	Inherited syndromes • Bernard-Soulier • Wiskott-Aldrich • Thrombocytope- nia absent radii • Others Vascular tumors • Kasabach-Merritt	Inborn errors of metabolism Fanconi anemia			

Sillers et a

Thrombocytopenia in Neonates

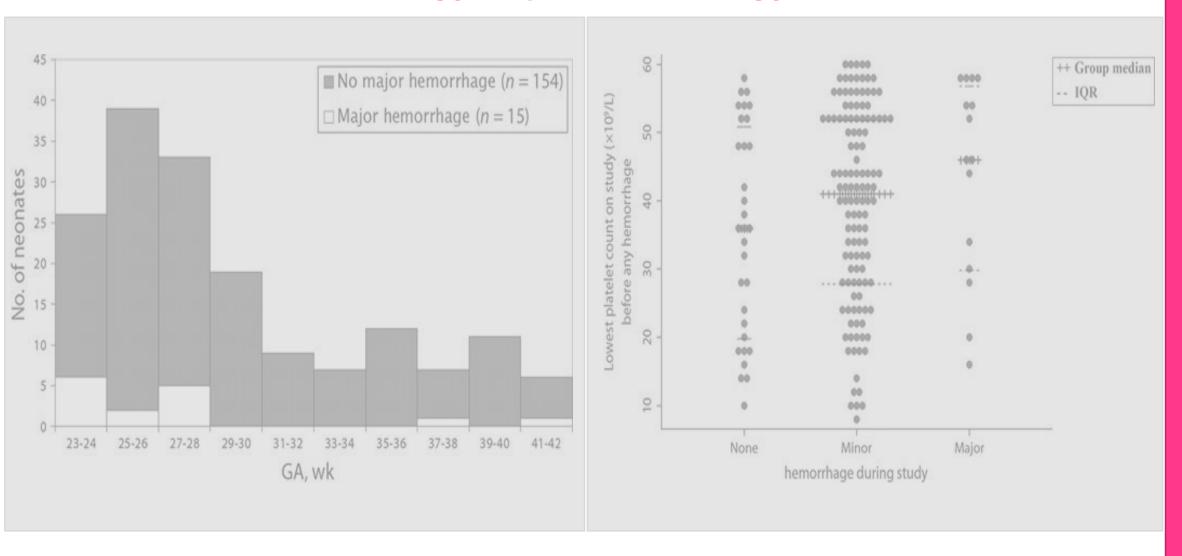
Relationship of Platelet Count to Bleeding Risk:

- IVH vs other
- · Benefit vs Harm
- Observational data Trials?

Table 3 Bleeding conditions in 371 neonates with neonatal thrombocytopenia

Bleeding condition	Number (%)
Intra-/periventricular hemorrhage (I/PVH)	104 (55.3)
IVH I	36 (19.2)
IVH II	15 (8.0)
IVH III	26 (13.8)
PVH	27 (14.3)
Cutaneous bleeding	46 (24.5)
Gastrointestinal bleeding	16 (8.5)
Pulmonary hemorrhage	14 (7.4)
Hematuria	4 (2.1)
Umbilical cord bleeding	3 (1.6)
Adrenal gland hemorrhage	1 (0.6)

PlaNeT-1 Trial



→ Need for high-quality comparative RCT...

PlaNeT-2 Trial

PlaNeT-2 Trial

Multicenter RCT

Goal: Establish optimal platelet transfusion thresholds in preterm neonates

Primary Comparison: Restrictive vs Liberal threshold

- Restrictive: <25k
- Liberal: <50k

PlaNeT-2 Trial

• Demographic: Preterm neonates with thrombocytopenia

• Inclusion Criteria:

- GA <34w
- Platelet count < 50k
- No IVH Confirmed by cranial US

• Exclusion Criteria:

- H/o serious bleed
- Terminal comorbidity/malformation
- Immune thrombocytopenia
- Did not receive parenteral VitK

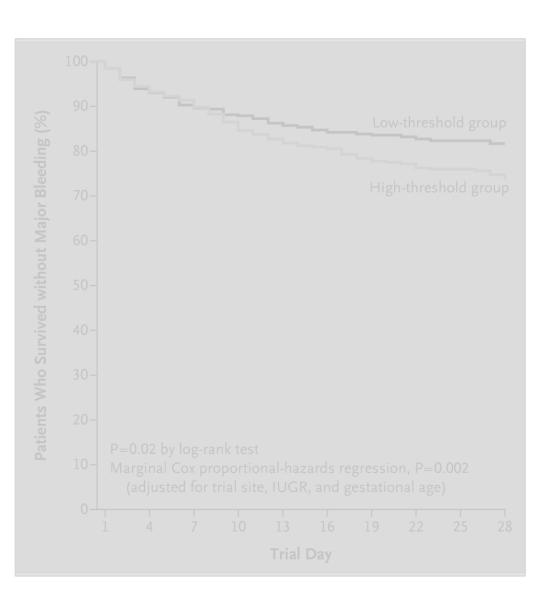
- Primary Outcome: Death or new major bleed within 28d
 - Many secondary outcomes

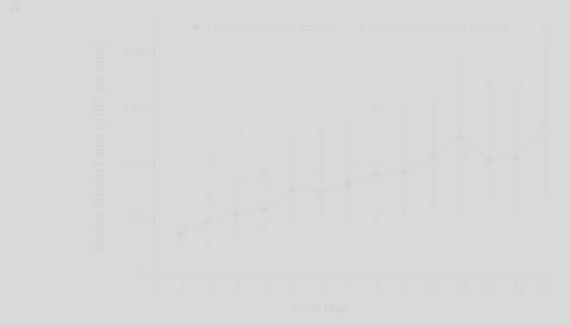
Table 1. Characteristics of the Trial Population.*

Variable	Low-Threshold Group (N = 331)	High-Threshold Group (N = 329)
Intrauterine growth restriction — no./total no. (%)†‡	125/331 (38)	120/328 (37)
Antenatal glucocorticoids — no./total no. (%)	289/329 (88)	292/326 (90)
Full course of glucocorticoids, ≥2 doses — no./total no. (%)	191/281 (68)	194/281 (69)
Clinical evidence of chorioamnionitis — no./total no. (%)	26/330 (8)	28/322 (9)
Cesarean delivery — no./total no. (%)†	201/329 (61)	208/328 (63)
Female sex — no./total no. (%)†	140/331 (42)	123/328 (38)
Median weight at birth (IQR) — g†	743 (605–990)	728 (600–940)
Median gestation at birth (IQR) — wk†	26.7 (24.9–28.7)	26.6 (24.9–28.9)
Median corrected gestational age at randomization (IQR) — wk†	28.9 (26.9–31.6)	29.0 (27.2–31.5)
Median weight at randomization (IQR) — g§	892 (670–1190)	860 (668-1170)
Median postnatal age at randomization (IQR) — days†	7.0 (3.7–18.9)	8.4 (4.0-21.0)
Randomization ≤5 days of age — no./total no. (%)	125/331 (38)	116/328 (35)
Was receiving treatment for necrotizing enterocolitis at randomization — no./total no. (%) $\uparrow \P$	49/331 (15)	58/328 (18)
Was receiving antibiotic treatment for sepsis at randomization — no./total no. (%)†	206/331 (62)	209/328 (64)
Major bleeding before randomization — no./total no. (%)†	62/331 (19)	60/328 (18)
Pulmonary bleeding — no./total no. (%)	31/62 (50)	22/60 (37)
Frank rectal bleeding — no./total no. (%)	8/62 (13)	9/60 (15)
Intraventricular hemorrhage — no./total no. (%)**	40/59 (68)	39/58 (67)
Intracranial hemorrhage — no./total no. (%)	10/62 (16)	7/60 (12)
Other bleeding — no./total no. (%)	7/62 (11)	4/60 (7)
Median platelet count at randomization (IQR) — \times 10 $^{-3}$ per cubic millimeter†	38 (28–44)	38 (29–44)

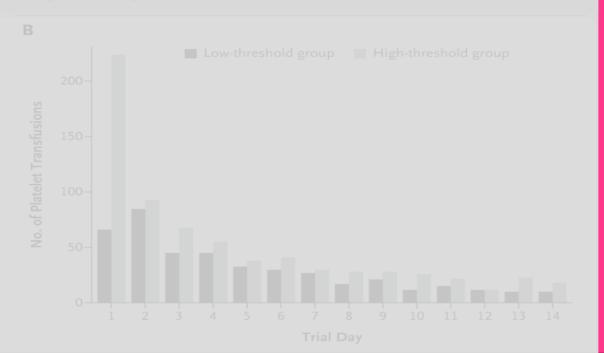
PlaNeT-2 Trial: Data

Table 2. Primary and Secondary Outcomes, According to Treatment Group. Low-Threshold High-Threshold Odds Ratio or Group Group **Hazard Ratio** (N = 329)(N = 331)(95% CI)* Outcome Primary outcome Death or major bleeding episode through trial day 28 — no./total no. (%) 61/329 (19) 85/324 (26) OR, 1.57 (1.06-2.32) Secondary outcomes: Death through trial day 28 - no./total no. (%) OR, 1.56 (0.95-2.55) 33/330 (10) 48/326 (15) At least one major bleeding episode through trial day 28 — no./total no. (%) HR, 1.32 (1.00-1.74) 35/330 (11) 45/328 (14) Survival with bronchopulmonary dysplasia at 36 wk — no./total no. (%) 153/281 (54) 169/269 (63) OR, 1.54 (1.03-2.30) Post hoc outcome of death or bronchopulmonary dysplasia at 36 wk 200/329 (61) 224/324 (69) OR, 1.56 (1.07-2.27) - no./total no. (%) Discharge by 38 wk of corrected gestational age — no./total no. (%) 41/328 (12) 29/326 (9) HR, 0.68 (0.46-1.00) 71/297 (24) OR, 1.37 (0.91-2.08) Survival with unilateral or bilateral retinopathy of prematurity of stage 82/279 (29) ≥2 at 38 wk of corrected gestational age — no./total no. (%)¶ Unilateral or bilateral retinopathy of prematurity of stage ≥2 treated 29/295 (10) 36/278 (13) OR, 1.38 (0.79-2.42) with laser or bevacizumab therapy - no./total no. (%) New sepsis event after randomization — no./total no. (%) 175/326 (54) 181/324 (56) HR, 1.10 (0.92-1.33) 54/326 (17) HR, 0.72 (0.37-1.41) New necrotizing enterocolitis event after randomization — no./total no. (%)** 42/324 (13) >1 Major bleeding episode through trial day 28 — no./total no. (%) 14/330 (4) 11/328 (3) HR, 0.80 (0.40-1.60) At least one minor or worse bleeding episode through trial day 14 HR, 0.96 (0.84-1.09) 232/328 (71) 225/324 (69) - no./total no. (%) At least one moderate or worse bleeding episode up to trial day 14 114/328 (35) 111/324 (34) HR, 1.01 (0.86-1.18) - no./total no. (%) At least one platelet transfusion — no./total no. (%) HR, 2.75 (2.36-3.21) 177/331 (53) 296/328 (90) No. of platelet transfusions administered in infants who received at least 2(1-3)2(1-3)one transfusion - median (IQR)

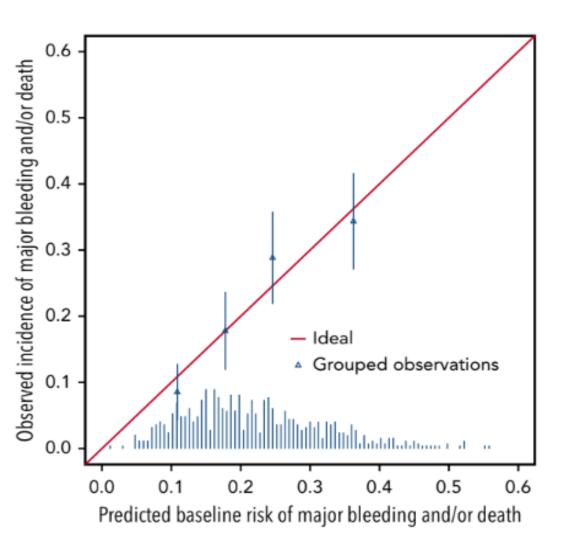


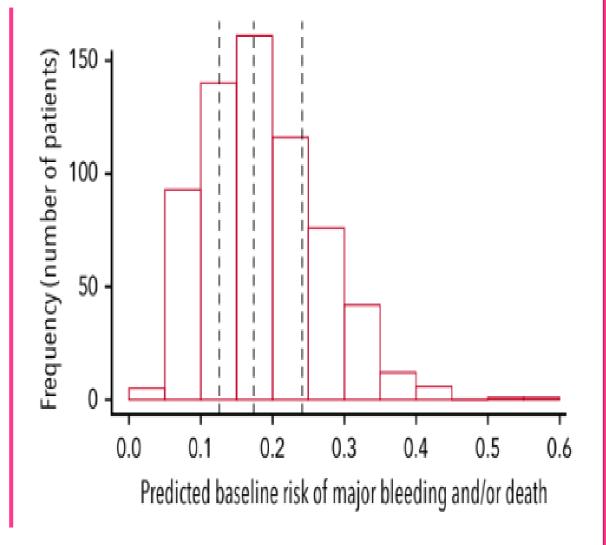


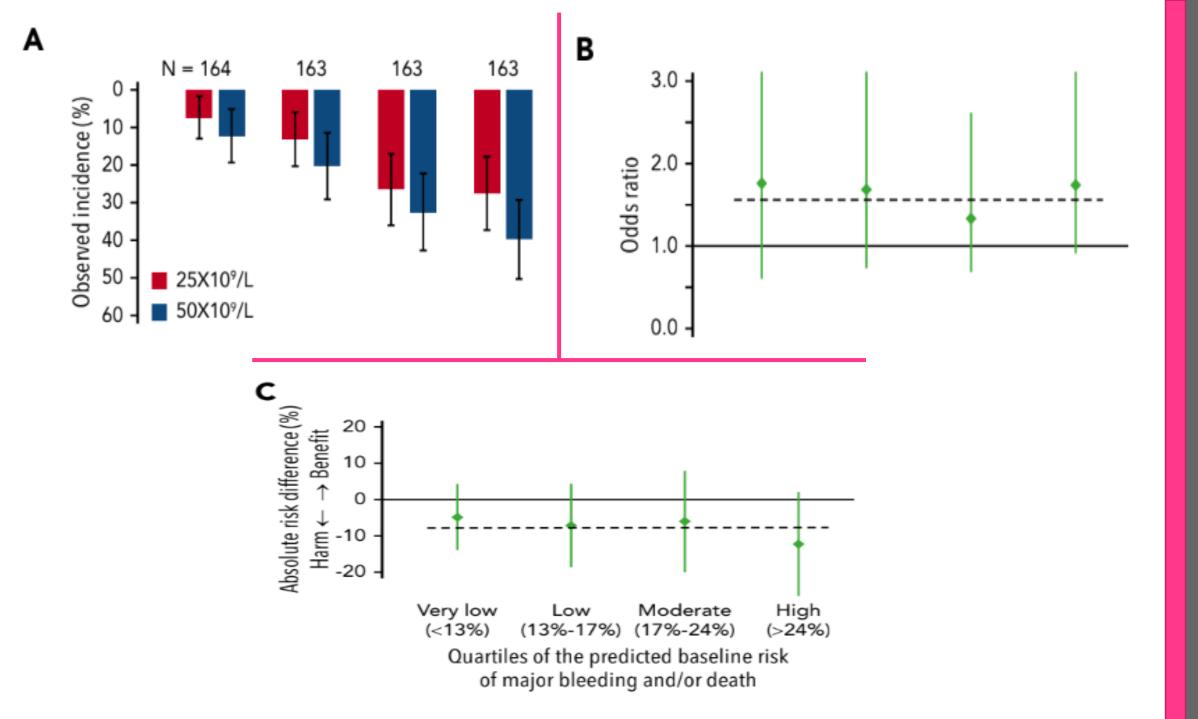
No. at Risk Low-threshold group = 331 283 261 221 221 196 174 159 140 139 131 127 132 124 High-threshold group = 328 271 242 219 196 184 187 158 147 133 144 122 125 130



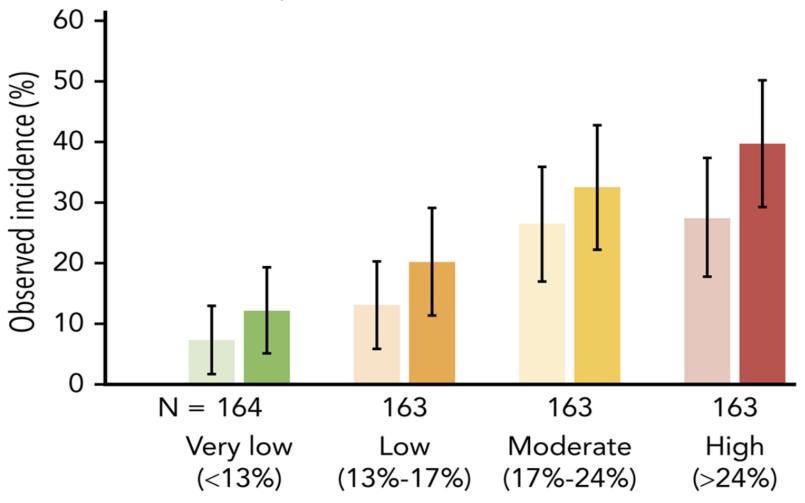
PlaNeT-2 Trial: Post-Hoc Analysis







Preterm neonates benefit from a 25×10⁹/L prophylactic platelet count threshold, irrespective of predicted baseline outcome risk



Quartiles of the predicted baseline risk of major bleeding and/or death

PlaNeT-2 Trial: Final Results

PlaNeT-2 Trial Results:

- "Among preterm infants with severe thrombocytopenia, the use of a platelet-count threshold of 50,000 per cubic millimeter for prophylactic platelet transfusion resulted in a higher rate of death or major bleeding than a restrictive threshold of 25,000 per cubic millimeter within 28 days after randomization."
- "...a 25 × 109/L prophylactic platelet count threshold can be adopted in all preterm neonates, irrespective of predicted baseline outcome risk."

At Our Institution...

Implementation at BIDMC

First Step: Identify BIDMC's established transfusion practices

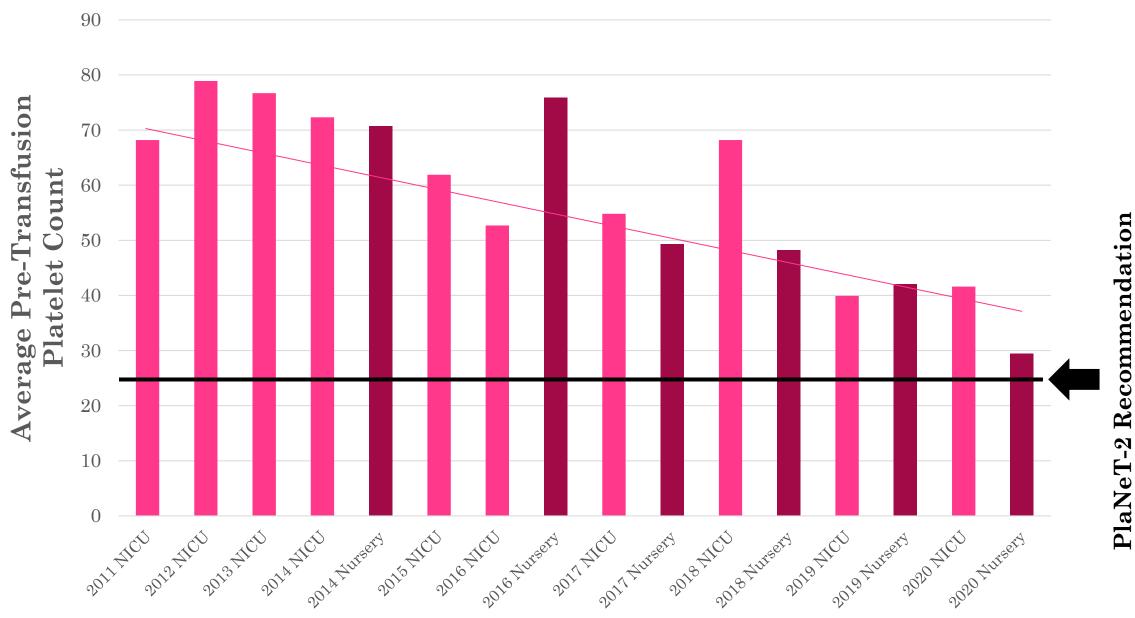
- Define demographic → same as PlaNeT-2
- Policies in place → Standard Operating Procedures

Second Step: Review transfusion data for this demographic

→ Time for a chart review!

		Gestational Age at time of Birth	Age at time of Transfusion (day of Ifie)	Transfusion Indi	lication	# of products Transfused	Pre- Count	Post-Count	Bleeding Events/C	Complications	Disposition	Weight		Additional Information	
estational Age at time of Bi	Age at time of Trans (day of life)	35w2d	4	Progressive thromboo subpial hemorr		1 (3 total)	80	209	Subpial hemorrhage di 1 of life iso thromi		Discharged home	1850g at birth	h antip	onatal alloimmune thrombocytopenia Maternal platelet antibody screen was positive odies against GPA la-llaHHPA 5-b, Pt	for
Gestational Age	e at time of Birth Ag	36w2d	1	Thrombocytopenia IS		1 (4 total)	73	125	Thrombocytopenia al of 37k, as well as chro	nic subchorionic	Discharged home	2300g at birth	Conce	rn for possible NAIT, so patient was 2 doses of IVIG. Testing of parents	
		36w2d	1	Thrombocytopenia IS		1 (4 total)	65	97	hematoma presen Thrombocytopenia a of 37k, as well as chro	t birth with count nic subchorionic	Discharged home	2300g at birth	Conce	recommended rn for possible NAIT, so patient was g 2 doses of IVIG. Testing of parents	given
	estational Age at time of estational Age at time of Birth	36w2d	3	Thrombocytopenia IS		1 (4 total)	54	38	hematoma presen Thrombocytopenia al of 37k, as well as chro hematoma presen	t birth with count nic subchorionic	Discharged home	2300g at birth		recommended rn for possible NAIT, so patient was : 2 doses of IVIG. Testing of parents recommended	give
	35w2d	36w2d	3	Thrombocytopenia IS		1 (4 total)	15	191	Thrombocytopenia at of 37k, as well as chro	t birth with count nic subchorionic	Discharged home	2300g at birth		rn for possible NAIT, so patient was ; 2 doses of IVIG. Testing of parents	give
Gestational Age a	36w2d	34w1d	0	Platelets dropped to 3- of a double volume transfusion (done for	exchange or hemolytic	1	34	212	hematoma presen		Transferred to Beverly Hospital on day of life 14	1950g at birth	, Fe	recommended iell antibodies and anti-Jka antibodies etal heemolytic anemia requiring fetal usion. Infant was also given IVIG on d	1
	36w2d	32w4d	6	anemia iso of anti Slow decrease of plate birth) to 60	elets (167k at	1	62	132	None lis	ted	Discharged home	1200g at birth	'n	life 0 None	
24	36w2d	32w0d	1	Persistent thrombooy	ytopenia and	1 (6 total)	57	No post	None lis	ted	Discharged home	2840g at birth	h	Was twin A of a di-di pregnancy	
		32w0d	1	Persistent thrombocy	ytopenia and	1 (6 total)	89 1	131 (poor post)	None lis	ted	Discharged home	2840g at birth	h	Was twin A of a di-di pregnancy	
25.5	36w2d	32w0d	2	Persistent thrombocy coagulopati	ytopenia and	1 (6 total)	86	91 (next day)	None lis	ted	Discharged home	2840g at birth	h	Was twin A of a di-di pregnancy	
25.5 37.0	34w1d	32w0d	3	Persistent thrombocy coagulopati	ytopenia and	1 (6 total)	91	No post	None lis	ted	Discharged home	2840g at birth	h	Was twin A of a di-di pregnancy	
	STWIG	32w0d	5	Persistent thrombody coagulopati	ytopenia and	1 (6 total)	54	148	None lis	ted	Discharged home	2840g at birth	h	Was twin A of a di-di pregnancy	
27.€	32w4d	32w0d	6	Persistent thrombody coagulopati	ytopenia and	1 (6 total)	90	183	None lis	ted	Discharged home	2840g at birth	h	Was twin A of a di-di pregnancy	
28.1	32w0d	37w.					91 on day				ed.	2385g at birth	h Born w	with cardiac anomalies not consistent life	t w
20.1	32w0d	24w:									home	720g at birth		None elets not checked on day of transfusi	i
28.1	32w0d	24w-									home	740g at birth		before or after	
20.1	32w0d	26w:	_			_					ed	320g at birth		Severe growth restriction iso twin/twin fusion syndrome. Prenatal care most	
20.1		26w- 26w-		• A lot	- of d	oh ovt	· vot	7101	. 7		home	490g		None None	
28.1	32w0d	26W-													
		34.60			OI	JIIaI t	IEI	VIE V	V • • •		home	490g	h Patie	ent requiring resuscitation at time of b	211
	32w0d	34w! 26w•				JIIai t	161	VIEV	V • • •		ed home	2300g at birth	h Patie	and did not survive	OII
28.1	32w0d 37w2d	34w! 26w- 26w-			OI	Jiiai t	161	viev	V • • •		ĕd		n	and did not survive None None	
		26w•					161	viev	V • • •		ed home	2300g at birth 520g	IVE	and did not survive None	on
28.1	37w2d	26w- 26w-	11	thrombocytopenia of		1(total 2)	72	225	None lis	ted	ed home home	2300g at birth 520g 520g	IVF comp	and did not survive None None F dichorionic-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week E dichorionic-diamniotic twin gestatio	on,
	37w2d 24w3d 24w4d 26w2d	26w- 26w- 27wl		thrombocytopenia of Thrombocytopenia double volume ex	f immaturity a following xchange						ed home home home	2300g at birth 520g 520g 980g	IVF comp IVF comp ma	and did not survive None None F dichorionic-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week dichorionic-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week aternal isoimmunization to the B and 1 gens, this is the maternal first pregnan	on, is on, is C
28.1	37w2d 24w3d 24w4d	26w- 26w- 27wl 27w6d 34w0d	11	thrombocytopenia of Thrombocytopenia double volume ex transfusio thrombocytope	f immaturity a following xohange on nia iso	1(total 2) 1	72 66	225 210	None lis None Lis	sted emorrhage plus	nd home home home Discharged home	2300g at birth 520g 520g 980g 980g 2260g	IVF comp IVF comp ma	and did not survive None None None Grand Brand B	on on on on
28.1	37w2d 24w3d 24w4d 26w2d 26w4d	26w- 26w- 27wl 27w6d	11	thrombocytopenia of Thrombocytopenia double volume ex transfusio thrombocytopei ooagulopathy, st	if immaturity a following xchange yn nia iso ubdural	1 (total 2)	72 66	225 210	None lis None Lis b/l Intraventricular he subdural hemorrhage p	sted emorrhage plus present on day of	nd home home home Discharged home	2300g at birth 520g 520g 980g 980g	IVF comp IVF comp ma	and did not survive None None F dichorionic-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week dichorionic-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week aternal isoimmunization to the B and 1 gens, this is the maternal first pregnan	on is on is
28.1	37w2d 24w3d 24w4d 26w2d 26w4d 26w4d 34w5d 26w4d	26w- 26w- 27wl 27w6d 34w0d 30w0d 29w6d	11	thrombocytopenia of Thrombocytopenia double volume ex transfusio thrombocytope ooagulopathy, st hemorrhage, and thrombocytop	f immaturity a following schange on nia iso ubdural t bil IVH penia	1(total 2) 1 1 1 1(total 2)	72 66 41	225 210 160 (next day) no post	None lis None Lis b/I Intraventricular he subdural hemorrhage p life 1 None Lis	sted emorrhage plus present on day of sted	Discharged home Discharged home Discharged home Discharged home	2300g at birth 520g 520g 980g 980g 980g 2260g 1110g	IVF comp IVF comp ma	and did not survive None None F dichorionic-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week F dichorionic-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week sternal isoimmunization to the B and to gens, this is the maternal first pregnan required intra uterine transfusion for Born with hypothyroidism None	on is on is
28.1 28.1 26.2	37w2d 24w3d 24w4d 26w2d 26w4d 26w4d 34w5d 26w4d 26w4d	26w- 26w- 27wl 27w6d 34w0d 30w0d 29w6d 29w6d	11	thrombocytopenia of Thrombocytopenia double volume ex transfusion thrombocytope ooagulopathy, st hemorrhage, and thrombocytop thrombocytop Thrombocytope	f immaturity a following schange nn italiso ubdural bit IVH penia penia	1(total 2) 1	72 66 41 34 86	225 210 160 (next day) no post No post	None lis None Lis b/l Intraventricular he subdural hemorrhage p life 1 None Lis None Lis Pulmonary hemo	emorrhage plus present on day of sted sted prrhage plus	Discharged home Discharged home Discharged home Discharged home Deceased Deceased	2300g at birth 520g 520g 980g 980g 2260g 1110g 1515g 1515g	IVF comp IVF comp ma antig Fetus	and did not survive None None F dichorionic-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week dichorionic-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week dichorionic-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week sternal isoimmunization to the B and t gens, this is the maternal first pregnan required intra uterine transfusion for Born with hypothyroidism None None	on, is on, is C
28.1	37w2d 24w3d 24w4d 26w2d 26w4d 34w5d 26w4d 26w4d 26w4d 27w6d	26w- 26w- 27wl 27w6d 34w0d 30w0d 29w6d	11	thrombocytopenia of Thrombocytopenia double volume ex transfusio thrombocytope ooagulopathy, st hemorrhage, and thrombocytop thrombocytope pulmonary/neuro he	f immaturity a following xchange n nila iso ubdural d b/I IVH penia penia penia emia iso emorrhage	1(total 2) 1 1 1 1(total 2)	72 66 41	225 210 160 (next day) no post	None lis None Lis bil Intraventricular he subdural hemorrhage i life 1 None Lis None Lis	emorrhage plus present on day of sted sted prrhage plus	Discharged home Discharged home Discharged home Discharged home	2300g at birth 520g 520g 980g 980g 980g 2260g 1110g	IVF comp IVF comp ma antig Fetus	and did not survive None None F dichorionic-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week F dichorionic-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week sternal isoimmunization to the B and to gens, this is the maternal first pregnan required intra uterine transfusion for Born with hypothyroidism None	on son cs Conc fe
28.1 28.1 26.2	37w2d 24w3d 24w4d 26w2d 26w4d 26w4d 34w5d 26w4d 26w4d	26w- 26w- 27wl 27w6d 34w0d 30w0d 29w6d 29w6d	11	thrombocytopenia of Thrombocytopenia double volume ex transfusion thrombocytope coagulopathy, st hemorrhage, and thrombocytop thrombocytop pulmonary/neuro he Thrombocytopenia double volume ex transfusion	f immaturity a following schange nn ila iso ubdural bit IVH penia penia penia senia iso emorrhage a following schange	1(total 2) 1 1 1 1(total 2)	72 66 41 34 86	225 210 160 (next day) no post No post	None lis None Lis b/l Intraventricular he subdural hemorrhage p life 1 None Lis None Lis Pulmonary hemo	emorrhage plus present on day of sted sted orrhage plus hemorrhage	Discharged home Discharged home Discharged home Deceased Deceased Deceased Discharged home	2300g at birth 520g 520g 980g 980g 2260g 1110g 1515g 1515g	IVF comp IVF comp Fetus Mater antibo status	and did not survive None None F dichorionic-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week dichorionic-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week aternal isoimmunization to the B and gens, this is the maternal first pregnan required intra uterine transfusion for Born with hypothyroidism None None Chronic lung disease on ventilator	on as one for the
28.1 28.1 26.2 26.2	37w2d 24w3d 24w4d 26w2d 26w4d 26w4d 34w5d 26w4d 26w4d 27w6d	26w- 26w- 27w6 27w6d 34w0d 30w0d 29w6d 29w6d 24w3d	11 0 0 1 2 3	thrombocytopenia of Thrombocytopenia double volume ex transfusion thrombocytopenia ocagulopathy, st hemorrhage, and thrombocytop Thrombocytop pulmonaryfneuro he Thrombocytopenia double volume ex transfusion Thrombocytopenia is	if immaturity a following schange in nia iso ubdural d b/I IVH penia penia emorrhage a following schange in	1(total 2) 1 1 1 1(total 2)	72 66 41 34 86 96	225 210 160 (next day) no post No post 194	None lis None Lis bil Intraventricular he subdural hemorrhage p life 1 None Lis None Lis Pulmonary hemo parenchymar brain	etted emorrhage plus present on day of sted sted orrhage plus hemorrhage	Discharged home Discharged home Discharged home Discharged home Deceased Deceased Deceased Drischarged home Transferred to	2300g at birth 520g 520g 980g 980g 2260g 1110g 1515g 601g	IVF comp IVF comp ma antig Fetus	and did not survive None None Fidichorionidamniotic twin gestatio plicated by IUFD of Twin A at 24 week dichorionic-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week dichorionic-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week aternal isoimmunization to the B and the second properties of th	on as one for the interest of
28.1 28.1 26.2 26.2	37w2d 24w3d 24w4d 26w2d 26w4d 26w4d 34w5d 26w4d 26w4d 27w6d	26w- 26w- 27wl 27w6d 34w0d 30w0d 29w6d 29w6d 24w3d	11 0 0 1 2 3	thrombocytopenia of Thrombocytopenia double volume ex transfusion thrombocytope ooagulopathy, st hemorrhage, and thrombocytop thrombocytop Thrombocytope pulmonaryfneuro he Thrombocytopenia double volume ex transfusion Thrombocytopenia is sepsis Thrombocytopenia is sepsis Thrombocytopenia i	if immaturity a following xchange in nia iso ubdural d b/I IVH penia penia penia penia penia semorrhage a following xchange iso IVH and	1(total 2) 1 1 1(total 2) 1(total 2) 1 1	72 66 41 34 86 96	225 210 160 (next day) no post No post 194 161	None lis None Lis bil Intraventrioular he subdural hemorrhage ; life 1 None Lis Pulmonary hemo parenchymar brain	etted emorrhage plus present on day of etted etted orrhage plus hemorrhage etted	Discharged home Discharged home Discharged home Discharged home Deceased Deceased Deceased Transferred to Children's Hospital Transferred to	2300g at birth 520g 520g 520g 980g 980g 2260g 1110g 1515g 601g 2440g	IVF comp IVF comp ma antig Fetus	and did not survive None None None F dichorionic-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week dichorionic-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week dichorionic-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week aternal isoimmunization to the B and t gens, this is the maternal first pregnan required intra uterine transfusion for Born with hypothyroidism None None Chronic lung disease on ventilator nal antibody positive for anti-C and at dies severe fetal anemia without hydr post PUBS procedure ±6 with intraut packed red blood cell transfusions. V	on on on on on on on on on on on on on o
28.1 28.1 26.2 26.2 26.2	37w2d 24w3d 24w4d 26w2d 26w4d 26w4d 34w5d 26w4d 27w6d 27w6d 34w0d 30w0d	26w- 26w- 27wl 27w6d 34w0d 30w0d 29w6d 29w6d 24w3d 23w5d 29w1d	11 0 0 1 2 3 0 12 13	thrombocytopenia of Thrombocytopenia double volume ex transfusio thrombocytope ooagulopathy, st hemorrhage, and thrombocytop Thrombocytop pulmonaryfneuro he Thrombocytopenia double volume ex transfusio Thrombocytopenia i sepsis Thrombocytopenia i sepsis Thrombocytopenia i sepsis Thrombocytopenia i sepsis	if immaturity a following xchange in in in in in it	1(total 2) 1 1 1(total 2) 1(total 2) 1 1 1(total 2) 1(total 2)	72 66 41 34 86 96 48 42 77	225 210 160 (next day) no post No post 194 161 no post No post	None lis None Lis None Lis b/I Intraventrioular he subdural hemorrhage p life 1 None Lis Pulmonary hemo parenchymar brain None Lis Grade 1 IVH (discover "Mild" pulmonary	emorrhage plus present on day of sted sted orrhage plus a hemorrhage sted red day of life 11) red day of life 11) hemorrhage	Discharged home Discharged home Discharged home Discharged home Deceased Deceased Deceased Transferred to Children's Hospital Transferred to Children's Hospital	2300g at birth 520g 520g 980g 980g 2260g 1110g 1515g 1515g 601g 2440g 1720g	IVF comp IVF comp ma antig Fetus Materi antibo status fetal	and did not survive None None None To Mone None Fidiohorionio-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week Fidiohorionio-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week sternal isoimmunization to the B and igens, this is the maternal first pregnan required intra uterine transfusion for Born with hypothyroidism None None Chronio lung disease on ventilator nal antibody positive for anti-C and at dies severe fetal anemia without hydr post PUBS procedure x5 with intraut packed red blood cell transfusions, v None None None	on son son fine te w
28.1 28.1 26.2 26.2	37w2d 24w3d 24w4d 26w2d 26w4d 26w4d 34w5d 26w4d 27w6d 27w6d 34w0d 30w0d 23w6d 23w6d	26w- 26w- 27w6 27w6d 34w0d 30w0d 29w6d 29w6d 24w3d 23w5d	11 0 0 1 2 3 0	thrombocytopenia of Thrombocytopenia double volume ex transfusior thrombocytope ooagulopathy, st hemorrhaqe, and thrombocytope Thrombocytope pulmonary/neuro he Thrombocytopenia double volume ex transfusion Thrombocytopenia i sepsis Thrombocytopenia i sepsis	if immaturity a following schange in nia iso ubdural d bit IVH penia penia penia penia penia penia penia penia iso IVH schange iso IVH and cytopenia iso pertopenia	1(total 2) 1 1 1(total 2) 1(total 2) 1 1 1(total 2) 1(total 2) 1(total 2) 1(total 2)	72 66 41 34 86 96 48 42 77 108 hemorrhage plus	225 210 160 (next day) no post No post 194 161 no post No post	None lis None Lis None Lis Bil Intraventrioular he subdural hemorrhage p life 1 None Lis Pulmonary hemo parenchymar brain None Lis Grade 1 IVH (discover "Mild" pulmonary "Mild" pulmonary	emorrhage plus present on day of sted ted orrhage plus hemorrhage sted red day of life 11) hemorrhage	Discharged home Discharged home Discharged home Discharged home Deceased Deceased Deceased Discharged home Transferred to Children's Hospital Transferred to Children's Hospital Discharged home	2300g at birth 520g 520g 980g 980g 2260g 1110g 1515g 1515g 601g 2440g	IVF comp IVF comp ma antig Fetus Materi antibo status fetal	and did not survive None None Fidichorionic-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week dichorionic-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week aternal isoimmunization to the B and tyens, this is the maternal first pregnan required intra uterine transfusion for Born with hypothyroidism None None Chronic lung disease on ventilator nal antibody positive for anti-C and ai dise severe fetal anemia without hydr post PUBS procedure x5 with intraut packed red blood cell transfusions. V None None None None Intigens, this is the maternal first pre	on in rotte
28.1 28.1 26.2 26.2 26.2	37w2d 24w3d 24w4d 26w2d 26w4d 26w4d 34w5d 26w4d 27w6d 27w6d 34w0d 30w0d	26w- 26w- 27wl 27w6d 34w0d 30w0d 29w6d 29w6d 24w3d 23w5d 29w1d 29w1d 23w6d 3	11 0 0 1 2 3 0 12 13 Thrombooytopenia iso ulmonary/neuro hemorrhage (hombooytopenia following double volume exchange	thrombocytopenia of Thrombocytopenia double volume ex transfusion thrombocytopenia coagulopathy, st hemorrhage, and thrombocytope Thrombocytopenia double volume ex transfusion Thrombocytopenia i sepsis Thrombocytopenia i sepsis Progressive thrombocytopenia 1 9	if immaturity a following xchange in in in in in it	1 (total 2) 1 1 1 (total 2) 1 (total 2) 1 1 1 (total 2) 1 (total 2) 1 (total 2) 2 (total 2) 4 (total 2) 4 (total 2) 4 (total 2) 5 (total 2) 7 (total 2) 8 (total 2) 9 (total 2) 9 (total 2)	72 66 41 34 86 96 48 42 77	225 210 160 (next day) no post No post 194 161 no post No post	None lis None Lis All Intraventricular he subdural hemorrhage plife 1 None Lis Pulmonary hemo parenchymar brain None Lis Grade 1 IVH (discover grade 1 IVH) (discover grade 1 IVH	emorrhage plus present on day of sted sted orrhage plus the hemorrhage sted red day of life 11) hemorrhage sted Chronic lun Maternal antibody	Discharged home Discharged home Discharged home Discharged home Deceased Deceased Deceased Discharged home Transferred to Children's Hospital Transferred to Children's Hospital Obscharged home g disease on ventilator positive for anti-C and antifetal anemia without hydro	2300g at birth 520g 520g 980g 980g 2260g 1110g 1515g 1515g 601g 2440g 1720g 1720g 680g	IVF comp IVF comp ma antig Fetus Materi antibo status fetal	and did not survive None None None Fidishorionio-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week dichorionio-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week dichorionio-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week ternal isoimmunization to the B and to gens, this is the maternal first pregnan required intra uterine transfusion for Born with hypothyroidism None None Chronic lung disease on ventilator nal antibody positive for anti-C and at idies severe fetal anemia without hydr post PUBS procedure x5 with intraut packed red blood cell transfusions. V None None None Intigens, this is the maternal first pre etus required intra uterine transfusion Born with hypothyroidism	or concept of the con
28.1 28.1 26.2 26.2 24.2 28.3 28.3	37w2d 24w3d 24w4d 26w2d 26w4d 26w4d 34w5d 26w4d 27w6d 27w6d 34w0d 30w0d 29w6d 24w3d	26w- 26w- 27wl 27w6d 34w0d 34w0d 30w0d 29w6d 24w3d 23w5d 29w1d 29w1d 29w1d 29w1d	11 0 0 1 1 2 3 0 12 13 13 Thrombooytopenia iso ulmonary/neuro hemorrhage rhrombooytopenia following double volume exchange transfusion	thrombocytopenia of Thrombocytopenia double volume ex transfusion thrombocytopenia coagulopathy, st hemorrhage, and thrombocytope Thrombocytopenia double volume ex transfusion Thrombocytopenia i sepsis Thrombocytopenia i sepsis Progressive thrombocytopenia 1 9	if immaturity a following schange in in inia iso ubdural b b l IVH penia penia penia emorrhage a following schange in iso IVH and iso IVH and optopenia iso grouppenia iso	1 (total 2) 1 1 1 (total 2) 1 (total 2) 1 1 (total 2) 1 (total 2) 1 (total 2) None	72 66 41 34 86 96 48 42 77 108 hemorrhage plus brain hemorrhage	225 210 160 (next day) no post No post 194 161 no post No post No post Discharge	None lis None Lis b/I Intraventrioular he subdural hemorrhage plife 1 None Lis Pulmonary hemo parenchymar brain None Lis Grade 1 IVH (discover "Mild" pulmonary (dandaged decorated 601g) ed home 2440g	ested emorrhage plus present on day of sted sted orthage plus n hemorrhage sted red day of life 11) hemorrhage Chronic lun Maternal antibody antibodies severe status post PUBS	Discharged home Discharged home Discharged home Discharged home Deceased Deceased Deceased Discharged home Transferred to Children's Hospital Transferred to Children's Hospital Obscharged home gdisease on ventilator	2300g at birth 520g 520g 980g 980g 2260g 1110g 1515g 601g 2440g 1720g 1720g 680g 7	IVF comp IVF comp ma antig Fetus Materiantibo status fetal	and did not survive None None None F dichorionic-diamnicotic twin gestatio plicated by IUFD of Twin A at 24 week dichorionic-diamnicotic twin gestatio plicated by IUFD of Twin A at 24 week aternal isoimmunization to the B and i gens, this is the maternal first pregnan required intra uterine transfusion for Born with hypothyroidism None None Chronic lung disease on ventilator nal antibody positive for anti-C and at idies severe fetal anemia without hydr post PUBS procedure x5 with intraut packed red blood cell transfusions. V None None None Intigens, this is the maternal first pre- ntus required intra uterine transfusions.	on in rotte
28.1 28.1 26.2 26.2 24.2 28.3	37w2d 24w3d 24w4d 26w2d 26w4d 26w4d 34w5d 26w4d 27w6d 27w6d 34w0d 30w0d 29w6d 24w3d	26w- 26w- 27wl 27w6d 34w0d 34w0d 30w0d 29w6d 23w6d 24w3d 23w5d 29w1d 29w1d 29w1d 29w6d 3 P	11 0 0 1 2 3 0 12 13 15 Thromboeytopenia iso ulmonary/neuro hemorrhage Thromboeytopenia following double volume exchange transfusion promboeytopenia iso IVH and sepsis	thrombocytopenia of Thrombocytopenia double volume ex transfusion thrombocytopenia oagulopathy, st hemorrhage, and thrombocytop Thrombocytopenia double volume ex transfusion Thrombocytopenia i sepsis Thrombocytopenia i sepsis Progressive thrombocytopenia i sepsis Progressive thrombocytopenia i sepsis 1 8	if immaturity a following schange in in inia iso ubdural b b l IVH penia penia penia emorrhage a following schange in iso IVH and iso IVH and optopenia iso grouppenia iso	1 (total 2) 1 1 1 (total 2) 1 (total 2) 1 1 1 (total 2) 1 (total 2) 1 (total 2) None	72 66 41 34 86 96 48 42 77 108 hemorrhage plus brain hemorrhage	225 210 160 (next day) no post No post 194 161 no post No post No post Discharge 211) Transfe Children's	None lis None Lis None Lis bil Intraventrioular he subdural hemorrhage plife 1 None Lis Pulmonary hemoparenchymar brain None Lis Grade 1 IVH (discover grade	ested emorrhage plus present on day of sted sted orthage plus n hemorrhage sted red day of life 11) hemorrhage Chronic lun Maternal antibody antibodies severe status post PUBS	Discharged home Discharged home Discharged home Discharged home Deceased Deceased Deceased Deceased Discharged home Transferred to Children's Hospital Transferred to Children's Hospital Obstarged home g disease on ventilator positive for anti-C and antifetal anemia without hydroj procedure 85 with intrauter	2300g at birth 520g 520g 980g 980g 2260g 1110g 1515g 601g 2440g 1720g 1720g 680g 7	IVF comp IVF comp ma antig Fetus Materiantibo status fetal	and did not survive None None None To dichorionic-diamniotic twin gestatio blicated by IUFD of Twin A at 24 week dichorionic-diamniotic twin gestatio blicated by IUFD of Twin A at 24 week dichorionic-diamniotic twin gestatio blicated by IUFD of Twin A at 24 week aternal isoimmunization to the B and telepars, this is the maternal first pregnan required intra uterine transfusion for Born with hypothyroidism None Chronio lung disease on ventilator nal antibody positive for anti-C and at dies severe fetal anemia without hydr post PUBS procedure x5 with intraut packed red blood cell transfusions. V None None None None Intigens, this is the maternal hirst pre tus required intra uterine transfusion Born with hypothyroidism None None Chronio lung disease on ventila	on cs cc find free w/
28.1 28.1 26.2 26.2 24.2 28.3 28.3	37w2d 24w3d 24w4d 26w4d 26w4d 26w4d 26w4d 26w4d 27w6d 27w6d 34w0d 30w0d 29w6d 24w3d 23w5d 29w1d 29w1d	26w- 26w- 27wl 27w6d 34w0d 30w0d 29w6d 29w6d 24w3d 23w5d 29w1d 29w1d 23w6d 3	11 0 0 1 1 2 3 0 12 13 15 Thrombocytopenia iso ulmonarymeuro hemorrhage thrombocytopenia following double volume exchange transfusion rrombocytopenia iso IVH and sepsis rrombocytopenia iso IVH and sepsis rrombocytopenia iso IVH and sepsis	thrombocytopenia of Thrombocytopenia double volume ex transfusion thrombocytopenia oagulopathy, st hemorrhage, and thrombocytopenia double volume ex transfusion Thrombocytopenia double volume ex transfusion Thrombocytopenia is sepsis Progressive thrombocytopenia in sepsis Progressive thrombocytopenia double volume ex transfusion Thrombocytopenia is sepsis	if immaturity a following schange in in ininia iso ubdural d bil IVH penia penia penia penia penia penia penia iso IVH and penia penia penia penia iso IVH and penia pen	1 (total 2) 1 1 1 (total 2) 1 (total 2) 1 1 1 (total 2) 1 1 (total 2) 1 (total 2)	72 66 41 34 86 96 48 42 77 108 hemorrhage plus brain hemorrhage ne Listed	225 210 160 (next day) no post No post 194 161 no post No post No post Discharge 11) Transfe Children's	None lis None Lis bil Intraventricular he subdural hemorrhage life 1 None Lis Pulmonary hemo parenchymar brain None Lis Grade 1 IVH (discover "Mild" pulmonary for	ested emorrhage plus present on day of sted sted orthage plus n hemorrhage sted red day of life 11) hemorrhage Chronic lun Maternal antibody antibodies severe status post PUBS	Discharged home Discharged home Discharged home Discharged home Deceased Deceased Deceased Discharged home Transferred to Children's Hospital Discharged home og disease on ventilator upositive for anti- C and anti fetal anemia without hydro procedure vib with intrauter blood cell transfusions. Wa None	2300g at birth 520g 520g 980g 980g 2260g 1110g 1515g 601g 2440g 1720g 1720g 680g 7	IVF comp. IVF co	and did not survive None None None F dichorionic-diamnicotic twin gestatio plicated by IUFD of Twin A at 24 week dichorionic-diamnicotic twin gestatio plicated by IUFD of Twin A at 24 week dichorionic-diamnicotic twin gestatio plicated by IUFD of Twin A at 24 week aternal isoimmunization to the B and I gens, this is the maternal first pregnan required intra uterine transfusion for Born with hypothyroidism None Chronic lung disease on ventilator nal antibody positive for anti-C and ar dides severe fetal anemia without hydr post PUBS procedure x5 with intraut packed red blood cell transfusions. V None None None Intigens, this is the maternal hirst pre atus required intra uterine transfusion Born with hypothyroidism None Chronic lung disease on ventila aternal antibody positive for anti-C a tibodies severe fetal anemia without intraudicular internal antibody sositive for anti-C a tibodies severe fetal anemia without	on on cs cc on fr in rectee w/
28.1 26.2 26.2 26.2 24.2 28.3 28.3 34.6	37w2d 24w3d 24w4d 26w2d 26w4d 26w4d 34w5d 26w4d 27w6d 27w6d 34w0d 30w0d 29w6d 24w3d 23w5d	26w- 26w- 27wl 27w6d 34w0d 34w0d 30w0d 29w6d 24w3d 24w3d 23w5d 29w1d 29w1d 29w1d 29w1d 12 TH	11 0 0 1 1 2 3 0 11 12 13 13 Thrombooytopenia iso Ulmonary/neuro hemorrhage Thrombooytopenia following double volume exchange transfusion prombooytopenia iso IVH and sepsis prombooytopenia iso IVH and sepsis	thrombocytopenia of Thrombocytopenia double volume ex transfusion thrombocytopenia oagulopathy, st hemorrhage, and thrombocytopenia coagulopathy, st hemorrhage, and thrombocytopenia double volume ex transfusion Thrombocytopenia is sepsis Thrombocytopenia is sepsis Thrombocytopenia is sepsis Thrombocytopenia in sepsis	if immaturity a following schange in in inia iso ubdural b b l IVH penia penia penia penia penia sio lowing schange in iso IVH and oytopenia iso group penia group penia penia iso IVH and oytopenia iso group penia iso IVH and oytopenia iso oyt	1 (total 2) 1 1 1 (total 2) 1 (total 2) 1 1 1 (total 2) 1 1 (total 2) 1 (total 2)	72 66 41 34 86 96 48 42 77 108 hemorrhage plus brain hemorrhage	225 210 160 (next day) no post No post 194 161 no post No post No post No post Transfe Children's Transfe Children's Transfe Children's	None lis None Lis bil Intraventricular he subdural hemorrhage life 1 None Lis Pulmonary hemo parenchymar brain None Lis Grade 1 IVH (discover "Mild" pulmonary for	emorrhage plus present on day of sted sted orrhage plus the day of life 11) red day of life 11) hemorrhage sted Chronio lun Maternal antibor antibora stevere status post PUBS fetal packed red	Discharged home Discharged home Discharged home Discharged home Deceased Deceased Deceased Deceased Discharged home Transferred to Children's Hospital Transferred to Children's Hospital Obstract to thildren's Hospital Discharged home or discharged home g disease on ventilator positive for anti-C and antifetal anemia without hydroj procedure to with intrauter blood cell transfusions. Wa	2300g at birth 520g 520g 980g 980g 2260g 1110g 1515g 601g 2440g 1720g 680g 770g 680g 7	IVF comp. IVF co	and did not survive None None None Fidichorionic-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week dichorionic-diamniotic twin gestatio plicated by IUFD of Twin A at 24 week aternal isoimmunization to the B and i gens, this is the maternal first pregnan Rone Born with hypothyroidism None None Chronic lung disease on ventilator nal antibody positive for anti-C and ai dies severe fetal anemia without hydr post PUBS procedure x5 with intraut packed red blood cell transfusions. y None None None None Intigens, this is the maternal hirst pre Hus required intra uterine transfusion Born with hypothyroidism None None Chronic lung disease on ventila One Chronic did disease on ventila aternal antibody positive for anti-C a	in receipt
28.1 26.2 26.2 26.2 24.2 28.3 28.3 34.6	37w2d 24w3d 24w4d 26w4d 26w4d 26w4d 26w4d 26w4d 27w6d 27w6d 34w0d 30w0d 29w6d 24w3d 23w5d 29w1d 29w1d	26w- 26w- 27wl 27w6d 34w0d 30w0d 29w6d 29w6d 24w3d 23w5d 29w1d 29w1d 23w6d 3 P 0 T1 13 T1 16 Pro	11 0 0 1 2 3 0 12 13 Thromboeytopenia iso ulmonary/neuro hemorrhage transfusion tromboeytopenia iso IVH and sepsis aromboeytopenia iso IVH and sepsis gressive thromboeytopenia iso	thrombocytopenia of Thrombocytopenia double volume ex transfusion thrombocytopenia oagulopathy, st hemorrhage, and thrombocytopenia coagulopathy, st hemorrhage, and thrombocytopenia double volume ex transfusion Thrombocytopenia is sepsis Thrombocytopenia is sepsis Thrombocytopenia is sepsis Thrombocytopenia in sepsis	if immaturity a following schange in in ininia iso ubdural d bil IVH penia penia penia penia penia penia penia iso IVH and penia penia penia penia iso IVH and penia pen	1 (total 2) 1 1 1 (total 2) 1 (total 2) 1 1 1 (total 2) 1 1 (total 2) 1 (total 2)	72 66 41 34 86 96 48 42 77 108 hemorrhage plus brain hemorrhage he Listed covered day of life covered day of life covered day of life	225 210 160 (next day) no post No post 194 161 no post No post No post Disoharge 21) Transfe Children's 21) Disoharge 21) Disoharge 21) Children's	None lis None Lis None Lis B/I Intraventrioular he subdural hemorrhage plife 1 None Lis Pulmonary hemo parenohymar brain None Lis Grade 1 IVH (discover "Mild" pulmonary demonstration of the sed of the s	emorrhage plus present on day of sted sted orrhage plus the day of life 11) red day of life 11) hemorrhage sted Chronio lun Maternal antibor antibora stevere status post PUBS fetal packed red	Discharged home Discharged home Discharged home Discharged home Deceased Deceased Deceased Deceased Discharged home Transferred to Children's Hospital Transferred to Children's Hospital Observed home g disease on ventilator ig disease on ventilat	2300g at birth 520g 520g 980g 980g 2260g 1110g 1515g 601g 2440g 1720g 1720g 680g y ps, inine as	IVF comp IVF comp IVF comp ma antig Fetus Materiantibo status fetal 1790g 940g	and did not survive None None None F dichorionic-diamnicotic twin gestatio plicated by IUFD of Twin A at 24 week dichorionic-diamnicotic twin gestatio plicated by IUFD of Twin A at 24 week aternal isoimmunization to the B and I gens, this is the maternal first pregnan required intra uterine transfusion for Born with hypothyroidism None Chronic lung disease on ventilator nal antibody positive for anti-C and at idies severe fetal anemia without hydr post PUBS procedure x5 with intraut packed red blood cell transfusions. I None None None None intigens, this is the maternal hirst pre Hus required intra uterine transfusion Born with hypothyroidism None Chronic lung disease on ventila aternal antibody positive for anti-C at tibodies severe fetal anemia without itus post PUBS procedure x5 with in etal packed red blood cell transfusion	on, (S)

NICU/Nursery Platelet Pre-Transfusion Averages 2011-2020



What We Determined

Platelet transfusion thresholds trended down over time

~However~

• The "restrictive" threshold recommended by the PlaNeT-2 Trial data was never achieved

• These data were presented to the BIDMC NICU and Neonatology teams

Outcomes

Formal Guidance Document Created

• Establishes protocols for platelet transfusion in this demographic

Baseline Data Available

- Foundation for ongoing review process
- QA/QI value

Increased Visibility of BB Team to Clinicians

Return to Case

Baby Boy AZ/ZA:

- 31 1/7 week male
- Pregnancy c/b growth restriction, gHTN, GDM
- Urgent C/S for NRFHT → Now in NICU

NICU Course:

- Prematurity/SGA, ?sepsis
- Platelets: downtrend from 73 to 46 -> Transfusion Indicated?

→ Would not recommend transfusion at this time

Take-Home Points

• Specific demographics may require individualized transfusion management

• Platelet transfusion at a restrictive threshold of <25K reduces composite risk of death or major bleeding in preterm neonates

• Understanding your institution's guidelines can help you to implement evidence-based practices

Works Cited

- "Randomized Trial of Platelet-Transfusion Thresholds in Neonates." Curley A, et al. N Engl J Med. 2019 Jan 17;380(3):242-251. doi: 10.1056/NEJMoa1807320. Epub 2018 Nov 2. PMID: 30387697 Clinical Trial.
- Simon J. Stanworth, MD; Paul Clarke, MD; Tim Watts, MD; Sally Ballard; Louise Choo, PhD; Tim Morris, MSc; Mike F. Murphy, MD; Irene Roberts, MD; for the Platelets and Neonatal Transfusion Study Group. Pediatrics (2009) 124 (5): e826–e834. https://doi.org/10.1542/peds.2009-0332
- Carr R, Kelly A, M, Williamson L, M: Neonatal Thrombocytopenia and Platelet Transfusion A UK Perspective. Neonatology 2015;107:1-7. doi: 10.1159/000365163
- Muthukumar P, Venkatesh V, Curley A, Kahan BC, Choo L, Ballard S, Clarke P, Watts T, Roberts I, Stanworth S, for the Platelets Neonatal Transfusion Study Group. Severe thrombocytopenia and patterns of bleeding in neonates: results from a prospective observational study and implications for use of platelet transfusions. Transfusion Medicine 2012; 22: 338-43 [E Pub 27Jun 2012 doi:10.1111/j.1365-3148.2012.01171.x]
- Fustolo-Gunnink SF, Fijnvandraat K, van Klaveren D, Stanworth SJ, Curley A, Onland W, Steyerberg EW, de Kort E, d'Haens EJ, Hulzebos CV, Huisman EJ, de Boode WP, Lopriore E, van der Bom JG; PlaNeT2 and MATISSE collaborators. Preterm neonates benefit from low prophylactic platelet transfusion threshold despite varying risk of bleeding or death. Blood. 2019 Dec 26;134(26):2354-2360. doi: 10.1182/blood.2019000899. Erratum in: Blood. 2020 Jun 11;135(24):2199. PMID: 31697817; PMCID: PMC6933290.
- Neonatal Thrombocytopenia: Etiology and Diagnosis. Laura Sillers, MD, Charles Van Slambrouck, MD, and Gabrielle Lapping-Carr, MD. Published Online: July 10, 2015https://doi.org/10.3928/00904481-20150710-11. https://journals.healio.com/doi/full/10.3928/00904481-20150710-11
- https://obgynkey.com/neonatal-thrombocytopenia-2/
- https://accessmedicine.mhmedical.com/content.aspx?bookid=2129§ionid=191734593

Questions?

