Neonatal Platelet Transfusion Practices
What do these encompass?

- Who to transfuse?
- What to transfuse?
- How much to transfuse?
- Why transfuse?
- When to transfuse?
Who should we transfuse?

- Thrombocytopenic Neonates
  But which ones?
# Clinical Presentations and Mechanisms of Neonatal Thrombocytopenia

## Table 1
Clinical presentations and mechanisms of different varieties of neonatal thrombocytopenia

<table>
<thead>
<tr>
<th>Categories</th>
<th>Subtypes</th>
<th>Severity</th>
<th>Onset</th>
<th>Time to resolution</th>
<th>Likely mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immune</td>
<td>Alloimmune</td>
<td>Severe</td>
<td>Early</td>
<td>Days to weeks</td>
<td>↑ consumption</td>
</tr>
<tr>
<td></td>
<td>Autoimmune</td>
<td>Moderate</td>
<td>Early</td>
<td>Weeks to months</td>
<td>↑ consumption</td>
</tr>
<tr>
<td>Infections</td>
<td>Bacterial</td>
<td>Variable</td>
<td>Variable</td>
<td>1–7 days</td>
<td>Mixed</td>
</tr>
<tr>
<td></td>
<td>Viral</td>
<td>Variable</td>
<td>Early</td>
<td>2–7 days</td>
<td>Mixed</td>
</tr>
<tr>
<td></td>
<td>Fungal</td>
<td>Severe</td>
<td>Late</td>
<td>Days to weeks</td>
<td>Mixed</td>
</tr>
<tr>
<td>Genetic disorders</td>
<td>Chromosomal</td>
<td>Moderate</td>
<td>Early</td>
<td>Variable</td>
<td>↓ production</td>
</tr>
<tr>
<td></td>
<td>Bone marrow failure</td>
<td>Severe</td>
<td>Early</td>
<td>2–7 days</td>
<td>↓ production</td>
</tr>
<tr>
<td>Drugs</td>
<td>Familial thrombocytopenias</td>
<td>Mild–moderate</td>
<td>Early</td>
<td>Days to weeks</td>
<td>↓ production</td>
</tr>
<tr>
<td>DIC</td>
<td></td>
<td>Moderate to severe</td>
<td>Late</td>
<td>Variable</td>
<td>↓ production</td>
</tr>
<tr>
<td>PIH and IUGR</td>
<td></td>
<td>Severe</td>
<td>Variable</td>
<td>7–10 days</td>
<td>↑ consumption</td>
</tr>
<tr>
<td>NEC</td>
<td></td>
<td>Mild–moderate</td>
<td>Early</td>
<td>7–10 days</td>
<td>↑ consumption</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moderate–severe</td>
<td>Late</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Abbreviations: DIC, disseminated intravascular coagulation; IUGR, intrauterine growth restriction; NEC, necrotizing enterocolitis; PIH, pregnancy-induced hypertension.*

*a* Most congenital bone marrow failure syndromes are present at birth (ie, congenital amegakaryocytic thrombocytopenia or thrombocytopenia-absent radii). However, the hematologic manifestations of Fanconi anemia usually do not appear until childhood.

*b* Thrombocytopenia associated with TAR syndrome usually resolves before school age. Other thrombocytopenias associated with bone marrow failure do not improve.

*c* After discontinuation of the offending drug.
What should we transfuse?

Platelets

Let’s discuss them for a moment.
Birth of a Platelet (preterm or neonatal platelet)

Present as early as 17 weeks gestation

Platelet Facts in Newborns

- Platelet structure similar to adults

- ~ Half the number of alpha$_2$ adrenergic receptors are on neonatal platelets accounting for poor response to epi stimuli (Corby et al. Dev Pharmacol Ther 1981; Davidson et al. Am J Dis Child. 1991)

- At 2 months alpha$_2$ adrenergic receptors reach adult levels (Davidson et al. Am J Dis Child. 1991)

- Granule release from neonatal platelets is reduced (Israels et al. Pediatr Res. 1987)
Platelet Facts in Newborns

- Agonist-induced secretion of platelet granule content is reduced in term and preterm neonates due to immature signal transduction pathways not granule content. (Israels et al. Pediatr Res. 1987)

- Reduced response to collagen due to impairment of calcium mobilization. (Israels et al. Pediatr Res. 1990)

Platelet Facts in Newborns


Platelet Facts in Newborns


Functional Differences Between Neonatal and Adult Platelets

- Decreased aggregation responses to agonists (including: epi, collagen, ADP, thrombin, thromboxane A₂ analogues)
- Decreased agonist-induced exposure of the fibrinogen binding site on the GPIIb-IIIa complex
- Decreased agonist-induced granule secretion
- Decreased agonist-induced calcium mobilization
- Increased vWF-mediated platelet adhesion and agglutination
- Shorter bleeding times and PFA closure times

Platelet Transfusion Facts

- Over 4 million platelet transfusions performed annually in the U.S.
- 3 M Random Donor Platelets (RDP) and 1 M Single Donor Platelets (SDP)
- Platelet shelf life is 5 days at Room Temp. (22 °C) with gentle agitation
- Bacterial contamination is the most frequent complication with platelets
- Wastage rate ~50%
- COST=$1 billion annually (U.S.)
**Typical Patients Receiving Platelets**

- Critical to supportive care of hypoproliferative thrombocytopenic patients
- Primarily used prophylactically
  - 20% of heme/onc inpatient costs associated with platelet transfusions
  - Subset of patients require specialized components
    - Leukocyte reduced, $\gamma$-irradiated, cross-matched, HLA-matched
- Intensive care settings (ie. NICU, PICU, ICU)
- Massive Transfusion - Dilutional Coagulopathy
- Platelet Dysfunction
If it was only that easy!!!
Whole blood derived platelets
Random Donor Platelets (RDP)

- WB
- pRBC
- PRP
- FFP
- PC
- Cryo

Stored at 22-24°C with agitation X 5 days

5.5 X 10^{10} plts

(10^6-10^8)

-18°C
4°C spin -18°C