Red Blood Cell Transfusions

East Bay Newborn Specialists Guideline

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Background

Anemia is treated in order to provide adequate oxygen carrying capacity. In the non-emergent situation, use of restrictive transfusion policies limit the risks associated with RBC transfusion by reducing the number of transfusions and the number of donor exposures.

The data on the relationships between anemia, transfusion, and outcome is confusing. Key points from the literature include:

- There is no compelling evidence that any strategy of transfusion improves outcome;
- In general, randomized controlled trials have shown that restrictive transfusion guidelines can be used safely without significantly increasing death or major morbidity (ROP, BPD, brain injury, growth, apnea, NEC, or sepsis) particularly in very low birth weight preterm infants;
- There is some evidence that anemia increases the odds of developing NEC;
- There is some evidence that packed red cell transfusion may be temporally related to the onset of NEC.
- The PINT trial suggests that that extremely restrictive transfusion practices may be associated with worse long term neurodevelopmental outcome.
- The Iowa data suggests more acute brain injury but better neurodevelopmental outcome in the restrictive transfusion group. It is important to note that the transfusion threshold for the restrictive group in the Iowa study was similar to that of the liberal transfusion arm of the PINT study.

Clinical Assessment

These guidelines do not apply to infants that have an immediate need for increased oxygen delivery to the tissues such as acute blood loss, severe hypoxemia, shock, hemodynamic instability or cyanotic congenital heart disease who may require transfusion above the levels listed below. Furthermore, the transfusion thresholds provided by the guideline should be interpreted in the context of the individual patient (i.e., age, reticulocyte count and parental concerns). There are many cases where it is reasonable to treat the anemia by a means other than blood transfusion.

Documentation

Document the hemoglobin, level of respiratory support and clinical symptoms, if any, in the daily progress note on the day of transfusion. Document response (or lack of response) to transfusion in the daily progress note following the transfusion. Response should include change in clinical symptoms, adverse events possibly related to the transfusion and, if measured, hemoglobin value. For infants whose hemoglobin falls to 1 gm/dL below the "consider transfusion" threshold, document the hemoglobin, level of respiratory support and the reason for deferring a blood transfusion on the daily progress note.

EBNS Guideline for RBC transfusions:

- These guidelines may not apply to critically ill or actively bleeding infants
- These guidelines should be interpreted in the clinical context of the infant. It may be appropriate to transfuse at levels below the levels listed.

- In general, try to **AVOID** a transfusion when Hgb is **ABOVE** this level:

Status	**Avoid Tx**
Pressors Ventilation, including non-invasive NCPAP with high FIO2	> 10
NCPAP with low FIO2 Nasal cannula	> 9
Room Air and stable	> 8

- In general, **CONSIDER** a transfusion when Hgb falls **BELOW** this level :

Status	**Consider Tx**
Pressors Ventilation, including non-invasive NCPAP with high FIO2	< 10
NCPAP with low FIO2 Nasal cannula	< 8
Room Air and stable	<7

Consent
Transfusion risks, benefits, and alternatives should be discussed with a parent/guardian prior to transfusion.

Infectious risks:
- HIV 1 in 2-3 million units
- Hepatitis C 1 in 1-2 million units
- Hepatitis B 1 in 200,000-300,000 units
- HTLV-I/II 1 in 1,500,000
- West Nile 1 in 350,000 to 1,400,000
- Bacterial contamination 1 in 40,000 units

Non-infectious risks:

- Acute hemolytic reaction 1 in 6,000 to 20,000
- Anaphylactic reaction 1 in 20,000 to 50,000
- TRALI 1 in 1,300 to 2,400

A consent form must be completed by the parent/guardian, physician, and nurse (witness) either in person or by telephone and the form should be placed in the patient chart. The nurse should confirm the presence of an appropriate consent for transfusion in the chart prior to transfusion. Informed consent is not required if blood is transfused in an emergency.

Transfusion Orders

- Transfuse 20 mL / kg PRBC's over 4 hours. Smaller volumes may be considered, e.g., 10-15 mL/kg, for patients at risk for fluid overload. More rapid transfusion, e.g., over 1-2 hours, may be performed with a physician's order in the presence of acute blood loss or other cause of hypovolemia.

- PRBC's are type- and Rh-compatible (usually O negative), washed (not washed at ABSMC, not sure about JMMC but generally this is not standard of care), irradiated, and leukocyte filtered.

Transfusion and Fluid Overload

For infants with fluid overload, consider furosemide 0.5-1 mg/kg during or after the transfusion. For infants with severe anemia and acute CHF or hydrops fetalis, a partial exchange transfusion is necessary to avoid volume overload. Use PRBC's, and the following formula to calculate the volume of the exchange:

$$\text{Transfusion Volume} = (\text{Wt(kg)} \times 80 \times (\text{Hbf-Hbi})) \div (\text{HbPRBC} - \text{Hbi})$$

Where Hbf is the final desired Hb concentration, Hbi is the initial Hb concentration and HbPRBC is the Hb concentration of the packed red cells used.

Erythropoietin and Iron

Administration of iron with or without erythropoietin may be considered as alternatives to transfusion for the threshold levels suggested above, depending on the clinical status of the patient.

References

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