GUIDELINE

Anaemia

Scope (Staff):	Nursing and Medical Staff
Scope (Area):	NICU KEMH, NICU PCH, NETS WA

Child Safe Organisation Statement of Commitment

CAHS commits to being a child safe organisation by applying the National Principles for Child Safe Organisations. This is a commitment to a strong culture supported by robust policies and procedures to reduce the likelihood of harm to children and young people.

This document should be read in conjunction with this disclaimer

Also refer to: Blood Components and Blood Products Administration

Contents

Aim

To provide guidance on the management of anaemia in the neonatal period.

Risk

Failure to detect and diagnose anaemia can result in a delay in treatment or result in poor health outcomes.

Causes of Anaemia

Anaemia can occur due to either decreased production of red blood cells or increased destruction/loss.

1. Early onset within the first week (Acute or chronic blood loss).
2. Later onset after the first week (Decreased red cell production and/or shortened red cell survival).

In normal healthy newborns haemoglobin levels decrease from a mean of 19.3 g/dl at birth to a nadir of 10.7 g/dl (8.9-12.5) at 9 weeks. The Hb levels of preterm infants are only slightly lower than full term infants however the nadir occurs earlier and is lower.

Early Onset

- APH - Placenta Prævia, Abruption, Velamentous cord insertion / cord rupture.
- Twin to twin transfusion - donor.
- Feto-maternal hemorrhage.
- Haemolytic disease, Isoimmunisation ~ Rhesus disease / ABO incompatibility.
- Sub-galeal haemorrhage.
- Haemorrhagic disease - Vitamin K deficiency, Thrombocytopenia.
- Pulmonary haemorrhage, IVH and GI bleeds can acutely drop Hb.
- Congenital infections i.e., CMV.

Later Onset

- Anaemia of prematurity.
- Haemoglobinopathies. See WNHS O & G Guideline for more information on neonatal screening at KEMH. Neonatal Screening: Haemoglobin Disorders
- Hereditary spherocytosis.
- Iatrogenic blood loss from frequent blood sampling.
- Sepsis, NEC.

Laboratory Testing

Laboratory investigations will be tailored based on the presentation and a detailed history, including family history and previous pregnancies. Below are some of the investigations that need to be customized according to the clinical situation.

Tier 1 investigations:

- Complete Blood Count (CBC) with Red Blood Cell (RBC) indices and peripheral smear examination.
- Reticulocyte count.
- Coombs' test.

- Liver Function Tests (LFTs) - if the infant presents with hyperbilirubinemia or suspicion of congenital infections.
- Keilhauer Betke test (for quantification of fetal-maternal hemorrhage).
- Serum iron studies (in preterm infants)

Tier 2 investigations:

- TORCH and Parvo virus workup
- Urine CMV
- Haemoglobin electrophoresis.
- Haptoglobin level.
- Lactate dehydrogenase (LDH) level.
- Follow-up newborn screening results.
- Discussion with Haematology team for specific queries

Tier 3 investigations:

- Bone marrow biopsy/aspirate - for suspected neonatal leukemias, bone marrow infiltrative disorders, or neonatal hemochromatosis.

Initiation of iron supplements, erythropoietin administration, or red blood transfusion is tailored to each infant's needs, with careful consideration given to their clinical condition and the underlying cause of anaemia. There are no fixed numerical cut-offs or thresholds for these interventions.

Indications for transfusion in acute blood loss

- Acute blood loss >20 percent of blood volume.
- Acute blood loss >10 percent of blood volume with symptoms of decreased oxygen delivery (such as persistent acidosis) after volume resuscitation.

If the estimated blood loss exceeds 40 ml/kg and is accompanied by shock, instability, or anticipated ongoing bleeding, it is necessary to activate the critical bleeding protocol.

In the absence of clear evidence from high-quality trials, the clinical/consumer reference group (CRG) provides the following clinical guidance for transfusion in preterm infants.

Post-natal week	Hb (g/L)	
	No Respiratory Support	Respiratory support
1	100-120	110-130
2	85-110	100-125
>3	70-100	85-110

Table adapted from Patient Blood Management Guidelines: National blood authority. Module 6 (2016)

The threshold for transfusion within these ranges may be influenced by the presence of symptoms and other factors such as:

- Anticipated blood loss (e.g., haemolysis or surgery)
- Severity of illness
- Site of sampling

Transfusions can lead to various complications including ischemia-reperfusion injury, inhibit haematopoiesis, risk of infection. Transfusion associated lung and gut injury are severe complications associated with transfusions, with TRALI being caused by a two-hit mechanism involving neutrophil activation. Feeding during transfusion is controversial, with varying practices and outcomes. Consider stopping feeds prior to transfusion in high-risk infants.

Retrospective studies have shown that early transfusions are associated with increased ROP due to changes in oxygen delivery. CMV negative blood products are recommended for preterm infants to minimize transfusion related CMV infection. See Blood Components and Blood Products: Administration

Iron Deficiency Anaemia

- Term infants generally have sufficient iron stores to meet their requirements for the first 4–6 months of life.
- In Preterm and low birth weight infants iron stores are largely laid down during the third trimester of pregnancy, hence most preterm infants are at risk of subsequent iron deficiency.
- Iron supplementation should begin in infants born < 35 weeks gestation and greater than 4 weeks postnatal age and fed unfortified breast milk.
- Preterm infants have a daily requirement of 2–3 mg/kg/day of elemental iron, which can usually be met by iron supplementation until there is adequate dietary iron intake.

Iron supplementation for preterm infants is recommended with caution due to the risk of iron overload, which can lead to adverse effects on sensitive organ systems. A balance must be maintained to promote optimal growth and development while minimizing the risk of excess iron. (Wessling-Resnick M)

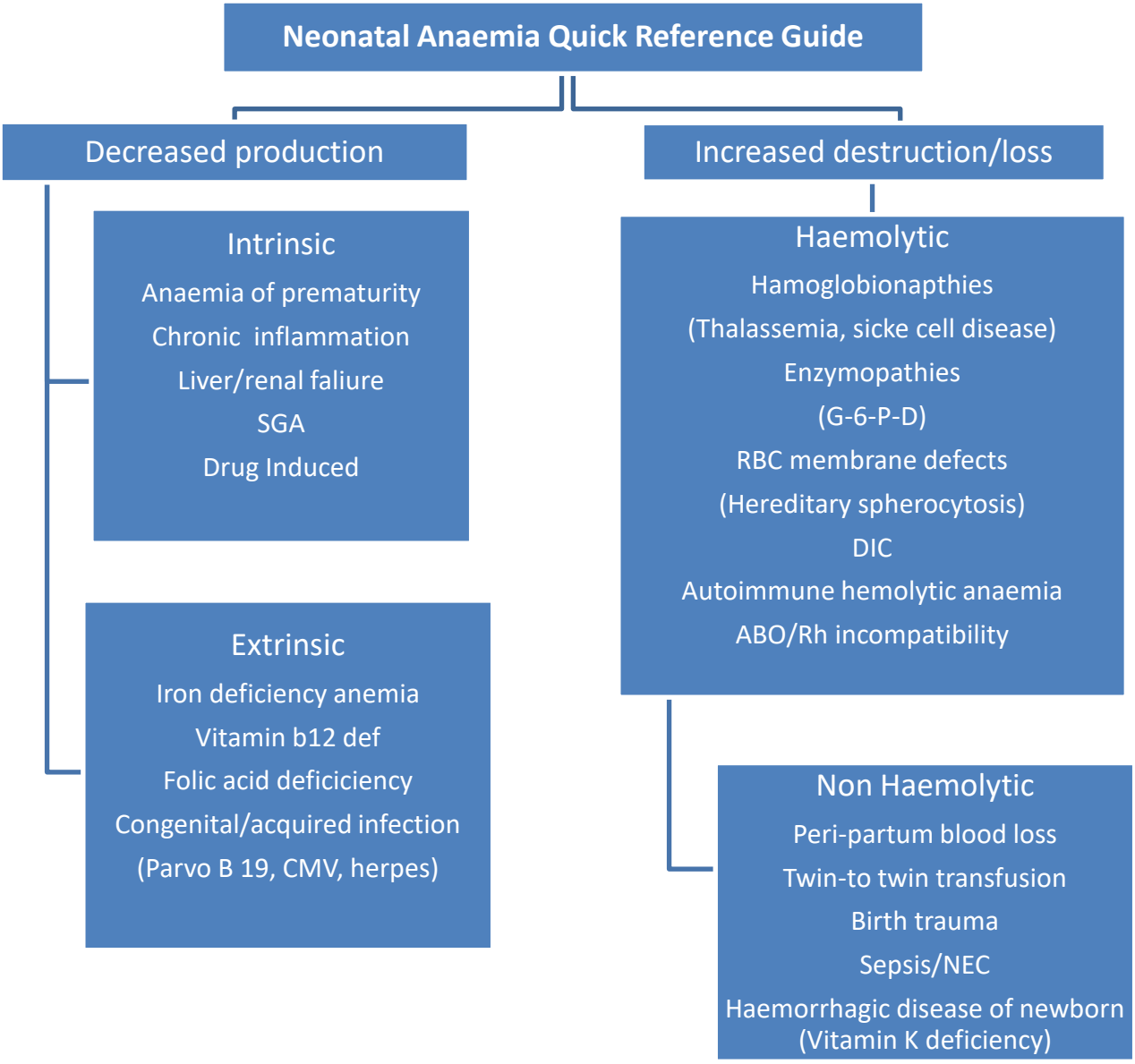
Before transitioning from prophylactic to treatment dose of iron supplementation in preterm infants, it is necessary to conduct iron studies and increase the dose based on haemoglobin levels and serum ferritin concentration. Increase only If the ferritin concentration is <40 micrograms per liter (µg/L).

Refer to Ferrous Sulphate protocol for iron supplementation.

Human Recombinant Erythropoietin (EPO)

Human Recombinant Erythropoietin (EPO) is a glycoprotein that stimulates red blood cell production and is typically produced by the kidneys. It functions as an erythropoietin agonist and is used for the treatment of anaemia of prematurity in selected patients. Refer to the erythropoietin protocol for specific instructions on the dosage, duration of treatment, and whether concurrent vitamin supplementation is required.

Neonatal Anaemia Quick Reference Guide



Neonatal anaemia based on pathophysiology (adapted from Chaudhary et al. 2022)

Related CAHS internal policies, procedures and guidelines

Neonatal Erythropoietin Protocol

Neonatal Ferrous Sulphate Protocol

Blood Components and Blood Products: Administration (CAHS-Neonatology)

Neonatal Critical bleeding protocol

Sub-galeal haemorrhage (Neonatology).

References and related external legislation, policies, and guidelines

- Howarth C, Banerjee J, Aladangady N. Red blood cell transfusion in preterm infants: current evidence and controversies. Neonatology 2018;114(1):7–16. DOI: 10.1159/000486584.
- Wessling-Resnick M. Excess iron: considerations related to development and early growth. *Am J Clin Nutr.* 2017;106(suppl 6):1600s–1605s.
- Chaudhary N, Jassar R, Singh R. Neonatal anemia. newborn. 2022;1:263-70.
- Lust C, Vesoulis Z, Jackups R Jr, et al. Early red cell transfusion is associated with development of severe retinopathy of prematurity. J Perinatol 2019;39(3):393–400.

This document can be made available in alternative formats on request.

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