Co-management Guide

Pediatric Hematology/Oncology

Iron Deficiency Anemia in Infancy and Childhood

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**Guidelines Referenced**


**Background**

Iron deficiency (ID) and Iron Deficiency Anemia (IDA) is the most common nutritional deficiency in children as well as the leading cause of anemia globally. In the United States, roughly 3% of children aged 1-2 years have IDA and another 10-13% have ID. Research has shown that ID and IDA during infancy and childhood can have significant and detrimental effects on neurocognitive development. There exists ethnic, racial, and socio-economical disparity in those diagnosed with ID and IDA. The exact etiology can change throughout childhood however is centered around dietary iron intake/loss and the body’s inherent iron stores.

- **ID** is defined by serum ferritin measurements and is age-based:
  - Children <5yo = Serum Ferritin <12mcg/L
  - Children >5yo = Serum Ferritin <15mcg/L

- **Anemia** is defined as a hemoglobin (Hgb) > 2 standard deviations below the mean for healthy population of same age and gender:
  - 6mo – <5yo = Hgb <11g/dL
  - 5yo – <12yo = Hgb <11.5g/dL

- **IDA** is defined as have both criteria with or without symptoms

The approach to a child with concern for ID or IDA involves identifying potential risk factors as well as identifying any potential red flags that might point away from a diagnosis of ID or IDA. If none are present, providers should be prepared to make a diagnosis of ID or IDA and begin therapy with empiric iron supplementation emphasizing the need for compliance and education for parents and caregivers.

**Initial Evaluation**

It is essential to obtain a thorough history including birth history, dietary history (including amount of cow’s milk consumed per day), associated symptoms, and concurrent medical conditions

**Risk Factors**

Perinatal:

- Maternal iron deficiency
- Prematurity
- Administration of EPO for anemia of prematurity
- Perinatal hemorrhagic events

Infancy

- Dietary Risk Factors
  - Lack of iron supplementation for BF infants
  - Use of Low-iron formula
  - Feeding of unmodified (non-formula) cow’s milk, goat’s milk, or soy milk
Insufficient iron-rich complementary foods

Other Risk Factors
- Disorders with GI blood loss
- Malabsorptive disorders

Childhood (1 to <12yo)
- Dietary Risk Factors
  - Excessive intake of cow’s milk (>24 oz/d)
  - Insufficient iron in foods
  - Lead exposure
- Other Risk Factors
  - Disorders with GI blood loss
  - Malabsorptive disorders
  - Obesity

History and Physical

Typical Findings on HPI:
- Asymptomatic, well-nourished infant/child
- Picky or restricted diet
- Excessive cow’s milk intake
- Pica
- Fatigue
- Difficulty concentrating at school

Typical Findings on Physical Exam:
- Asymptomatic, well-nourished infant/child
- Mild pallor
- Mild tachycardia

Red Flags

Review of Symptoms
- Excessive pallor
- Excessive fatigue
- Weight loss
- Unexplained fevers
- Unexplained or nighttime pain
- Hematochezia/melena
- Bleeding and/or bruising
- Dark or Tea colored urine

Family History
- Family history of inheritable anemia/thalassemias
- Family history of Inflammatory Bowel Disease/Malabsorption

Physical Exam
- Excessive irritability
- Excessive tachycardia or tachypnea
- Hypotension
- Lymphadenopathy
- Organomegaly (hepatomegaly or splenomegaly)
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**Initial Management**

**Screening Labs**
- Routine CBC – evaluation of other lineages, MCV, RDW, and smear if available
  - IDA is typically a microcytic, hypochromic anemia
- Serum Ferritin
- Serum Lead level, if risk factors exist
- Repeat labs in 4 weeks after initiation to monitor for therapeutic response

*It is completely appropriate to treat with empiric iron supplementation based on current AAP recommendations based on H/H and then check screening labs to monitor response to therapy*

If there are no red flags or concerning signs/symptoms, assume that the patient has iron deficiency anemia and initiate oral iron supplementation as below:

**Oral Iron Supplementation**
- 3mg/kg of elemental Iron (Fe) **DAILY**
  - Preferred Formulation: Ferrous Sulfate
  - Other Formulations include: Ferrous Fumarate, Ferrous Gluconate, Polysaccharide-iron complex (PIC)
  - For optimal absorption, give at least 2 hours before/after meals with water or juice
    - milk products should be avoided
    - some recommendations recommend giving dose at night
  - Increase in Hgb by >1 g/dL can be expected in 4 weeks in children in mild anemia
  - Continue for at least 3 months
  - Provide education regarding known side effects:
    - Bad taste
    - Teeth staining with liquid preparation -- temporary
    - Constipation*
    - Abdominal Pain*
  *these side effects have been shown to be decreased with low dose (3mg/kg) supplementation

**Dietary Changes**
- Infants >6mo ensure adequate consumption of iron containing foods – cereal, pureed meat
- Delay introduction of Cow’s Milk until >1 year of age
- Consuming <16-20oz of Cow’s Milk/day for those >1 year of age
  - There are similar recommendations for milk alternatives such as soy, goat, almond, and coconut milk

**Jaundice**

Laboratory testing
- Hgb <7 or symptomatic
- Evidence of hemolysis on labs
- Pancytopenia/Leukocytosis
- Extremely Elevated Serum Ferritin (<500)
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- **Transition from bottle to sippy cup after 1 year of age**
  - Delayed transition between bottle to sippy cup has been shown to increase incidence of IDA (RR = 2.5%, 95% CI 2.46-2.53)
- **Encourage consumption of iron-rich foods**
  - Heme dietary sources (fish, poultry, meat) = 30% bioavailability
  - Non-Heme dietary sources (vegetables) = 10% bioavailability
    - Vitamin C containing foods can assist with iron absorption on non-heme foods
- **Avoidance of excessive amounts of tea, bran/oats, soy protein and antacids**

### Routine Iron Supplementation

**Full-term Breast Feeding Infant (>1/2 of total nutrition)**
- 1mg/kg/d (max 15mg/d) starting at 4 months
- Continue until sufficient quantities of iron containing foods are started (~ 2 servings of infant cereal/day)

**Full-term Formula Fed Infant (<1/2 of total nutrition is Breast Milk)**
- No iron supplementation is required
- Iron-fortified (12mg iron/L) – avoid low-iron containing formulas

**Premature Infant***
- 2-4mg/kg/d (max 15mg/d) starting at 2 weeks to 1 month of age
- Continue for the ENTIRE FIRST YEAR

*The exception in this population is an infant who has received multiple blood transfusions*

**Toddlers/Children**
- At this point, there are no recommendations for prophylactic supplementation in infants/children >6mo in the US outside of the above recommendations

### When to Refer

- Red Flag(s)
- Empiric Iron Supplementation was not effective

### Pre-Visit Work Up

1. Screening Lab Results
2. Newborn screen, if available
3. Stool Hemoccult
4. Brief summary of treatment course, including medication used, dosing, and any compliance issues
5. Reason for consult

### Co-management Strategy

- Specialist scope of care
  - Tailored to the patient

- Primary care scope of care
  - Routine care

### Return to Primary Care Endpoint

- Tailored to the patient