



## Co-management Guide

Pediatric  
Hematology/Oncology

Iron Deficiency Anemia in Infancy and  
Childhood

<p><b>Guidelines Referenced</b></p>	<ol style="list-style-type: none"> <li>1. Powers JM, Buchanan GR. Diagnosis and Management of Iron Deficiency Anemia. Hematol Oncol Clin N Am. 28 (2014). 729-745.</li> <li>2. Baker RD, Greer FR, et al. Clinical Report – Diagnosis and Prevention of Iron Deficiency and Iron Deficiency Anemia in Infants and Young Children (0-3 Years of Age). Pediatrics. 126(5). 2010. 1040-1050.</li> <li>3. <a href="https://www.uptodate.com/contents/iron-deficiency-in-infants-and-children-less-than12-years-screening-prevention-clinical-manifestations-and-diagnosis?search=iron%20deficiency%20anemia%20in%20children&amp;source=search_result&amp;selectedTitle=1~150&amp;usage_type=default&amp;display_rank=1">https://www.uptodate.com/contents/iron-deficiency-in-infants-and-children-less-than12-years-screening-prevention-clinical-manifestations-and-diagnosis?search=iron%20deficiency%20anemia%20in%20children&amp;source=search_result&amp;selectedTitle=1~150&amp;usage_type=default&amp;display_rank=1</a></li> </ol>
<p><b>Background</b></p>	<p>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.</p> <ul style="list-style-type: none"> <li>• ID is defined by serum ferritin measurements and is age-based: <ul style="list-style-type: none"> <li>○ Children &lt;5yo = Serum Ferritin &lt;12mcg/L</li> <li>○ Children &gt;5yo = Serum Ferritin &lt;15mcg/L</li> </ul> </li> <li>• Anemia is defined as a hemoglobin (Hgb) &gt; 2 standard deviations below the mean for healthy population of same age and gender: <ul style="list-style-type: none"> <li>○ 6mo – &lt;5yo = Hgb &lt;11g/dL</li> <li>○ 5yo – &lt;12yo = Hgb &lt;11.5g/dL</li> </ul> </li> <li>• IDA is defined as have both criteria with or without symptoms</li> </ul> <p>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.</p>
<p><b>Initial Evaluation</b></p>	<p>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</p> <p><u>Risk Factors</u></p> <p>Perinatal:</p> <ul style="list-style-type: none"> <li>• Maternal iron deficiency</li> <li>• Prematurity</li> <li>• Administration of EPO for anemia of prematurity</li> <li>• Perinatal hemorrhagic events</li> </ul> <p>Infancy</p> <ul style="list-style-type: none"> <li>• Dietary Risk Factors <ul style="list-style-type: none"> <li>○ Lack of iron supplementation for BF infants</li> <li>○ Use of Low-iron formula</li> <li>○ Feeding of unmodified (non-formula) cow's milk, goat's milk, or soy milk</li> </ul> </li> </ul>



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### Pediatric Hematology/Oncology

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- 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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	<ul style="list-style-type: none"> <li>• Jaundice</li> </ul> <p>Laboratory testing</p> <ul style="list-style-type: none"> <li>• Hgb &lt;7 or symptomatic</li> <li>• Evidence of hemolysis on labs</li> <li>• Pancytopenia/Leukocytosis</li> <li>• Extremely Elevated Serum Ferritin (&lt;500)</li> </ul>
<p><b>Initial Management</b></p>	<p><u>Screening Labs*</u></p> <ul style="list-style-type: none"> <li>• Routine CBC – evaluation of other lineages, MCV, RDW, and smear if available <ul style="list-style-type: none"> <li>○ IDA is typically a microcytic, hypochromic anemia</li> </ul> </li> <li>• Serum Ferritin</li> <li>• Serum Lead level, if risk factors exist</li> <li>• Repeat labs in 4 weeks after initiation to monitor for therapeutic response</li> </ul> <p>*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</p> <p>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:</p> <p><u>Oral Iron Supplementation</u></p> <ul style="list-style-type: none"> <li>• 3mg/kg of elemental Iron (Fe) <b>DAILY</b> <ul style="list-style-type: none"> <li>○ Preferred Formulation: Ferrous Sulfate</li> <li>○ Other Formulations include: Ferrous Fumarate, Ferrous Gluconate, Polysaccharide-iron complex (PIC)</li> <li>○ For optimal absorption, give at least 2 hours before/after meals with water or juice <ul style="list-style-type: none"> <li>▪ milk products should be avoided</li> <li>▪ some recommendations recommend giving dose at night</li> </ul> </li> <li>○ Increase in Hgb by &gt;1 g/dL can be expected in 4 weeks in children in mild anemia</li> <li>○ Continue for at least 3 months</li> <li>○ Provide education regarding known side effects: <ul style="list-style-type: none"> <li>▪ Bad taste</li> <li>▪ Teeth staining with liquid preparation -- temporary</li> <li>▪ Constipation*</li> <li>▪ Abdominal Pain*</li> </ul> </li> </ul> </li> </ul> <p>*these side effects have been shown to be decreased with low dose (3mg/kg) supplementation</p> <p><u>Dietary Changes</u></p> <ul style="list-style-type: none"> <li>• Infants &gt;6mo ensure adequate consumption of iron containing foods – cereal, pureed meat</li> <li>• Delay introduction of Cow's Milk until &gt;1 year of age</li> <li>• Consuming &lt;16-20oz of Cow's Milk/day for those &gt;1 year of age <ul style="list-style-type: none"> <li>○ There are similar recommendations for milk alternatives such as soy, goat, almond, and coconut milk</li> </ul> </li> </ul>



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	<ul style="list-style-type: none"> <li>• Transition from bottle to sippy cup after 1 year of age             <ul style="list-style-type: none"> <li>◦ Delayed transition between bottle to sippy cup has been shown to increase incidence of IDA (RR = 2.5%, 95% CI 2.46-2.53)</li> </ul> </li> <li>• Encourage consumption of iron-rich foods             <ul style="list-style-type: none"> <li>◦ Heme dietary sources (fish, poultry, meat) = 30% bioavailability</li> <li>◦ Non-Heme dietary sources (vegetables) = 10% bioavailability                 <ul style="list-style-type: none"> <li>▪ Vitamin C containing foods can assist with iron absorption on non-heme foods</li> </ul> </li> </ul> </li> <li>• Avoidance of excessive amounts of tea, bran/oats, soy protein and antacids</li> </ul> <p><b>Routine Iron Supplementation</b></p> <p>Full-term Breast Feeding Infant (&gt;1/2 of total nutrition)</p> <ul style="list-style-type: none"> <li>• 1mg/kg/d (max 15mg/d) starting at 4 months</li> <li>• Continue until sufficient quantities of iron containing foods are started (~ 2 servings of infant cereal/day)</li> </ul> <p>Full-term Formula Fed Infant (&lt;1/2 of total nutrition is Breast Milk)</p> <ul style="list-style-type: none"> <li>• No iron supplementation is required</li> <li>• Iron-fortified (12mg iron/L) – avoid low-iron containing formulas</li> </ul> <p>Premature Infant*</p> <ul style="list-style-type: none"> <li>• 2-4mg/kg/d (max 15mg/d) starting at 2 weeks to 1 month of age</li> <li>• Continue for the ENTIRE FIRST YEAR</li> </ul> <p>*The exception in this population is an infant who has received multiple blood transfusions</p> <p>Toddlers/Children</p> <ul style="list-style-type: none"> <li>• At this point, there are no recommendations for prophylactic supplementation in infants/children &gt;6mo in the US outside of the above recommendations</li> </ul>	
<p><b>When to Refer</b></p>	<ul style="list-style-type: none"> <li>• Red Flag(s)</li> <li>• Empiric Iron Supplementation was not effective</li> </ul>	
<p><b>Pre-Visit Work Up</b></p>	<ol style="list-style-type: none"> <li>1. Screening Lab Results</li> <li>2. Newborn screen, if available</li> <li>3. Stool Hemocult</li> <li>4. Brief summary of treatment course, including medication used, dosing, and any compliance issues</li> <li>5. Reason for consult</li> </ol>	
<p><b>Co-management Strategy</b></p>	<p><b>Specialist scope of care</b> Tailored to the patient</p>	<p><b>Primary care scope of care</b> Routine care</p>
<p><b>Return to Primary Care Endpoint</b></p>	<p>Tailored to the patient</p>	