PEDIATRIC COMPLEX CARE PLATFORM | منصة رعاية الأطفال ذوي الحالات الطبية المعقدة

CLINICAL GUIDELINE · PEDIATRIC COMPLEX CARE PLATFORM

Pediatric Iron Deficiency: Diagnosis and Management

Identification, investigation, treatment and monitoring of iron deficiency (ID) and iron-deficiency anemia (IDA) in children and adolescents

Version 1 | Published 28/9/2026 | Review due 28/9/2028

DOCUMENT TYPE	PUBLISHED	NEXT REVIEW DUE
Clinical Guideline	28/9/2026	28/9/2028
GUIDELINE OWNER	**VERSION**	**APPLIES TO**
Pediatric Complex Care Platform	1	Pediatric patients

AUTHORS
Dr. Ahmad Jaafar | Head of Pediatric Complex and Palliative Care Units

Intended for healthcare professionals as a clinical reference. Apply with clinical judgment and in line with local protocols.

CONTENTS

1 Purpose
2 Definitions
3 Risk Factors & Causes
4 Prevention
5 Screening
6 Clinical Features
7 Investigations
8 Management
9 Monitoring
10 Inadequate Response
11 Intravenous Iron
12 Medical Complexity
13 Referral & Red Flags
14 References

1 Purpose

To provide a standardized approach to the identification, investigation, treatment, and monitoring of iron deficiency (ID) and iron-deficiency anemia (IDA) in children and adolescents.

2 Definitions

Iron deficiency (ID)	Depletion of body iron stores, with or without anemia.
Iron-deficiency anemia (IDA)	Iron deficiency resulting in impaired erythropoiesis and a hemoglobin concentration below the age-appropriate reference range.
IDA severity	**Mild** Hb ≥90 g/L (9 g/dL) · **Moderate** Hb ≥70 to <90 g/L (7–<9 g/dL) · **Severe** Hb <70 g/L (7 g/dL)

Iron deficiency may precede anemia and can have clinical consequences even when hemoglobin remains normal.

2.1 Ferritin thresholds

Population	Ferritin threshold
Young and school-aged children	**≤20 ng/mL** consistent with ID
Adolescent and menstruating individuals	**≤30 ng/mL** consistent with ID
Children/youth with NDD and sleep concerns	**>50 ng/mL** recommended by CPS to support sleep

- *Use clinical ferritin thresholds, not laboratory reference ranges.*
- *Ferritin is an acute-phase reactant; normal or elevated ferritin does not exclude iron deficiency in the presence of inflammation.*
- *The CPS >50 ng/mL recommendation is a sleep-related target for children and youth with NDD, not a diagnostic threshold for iron deficiency.*

3 Risk Factors & Causes

Increased iron requirements

Prematurity, low birth weight, and periods of rapid growth.

Inadequate iron intake

Poor or restricted diet, feeding difficulties, excessive cow's milk intake, or inadequate iron provision from enteral feeds.

Blood loss

Heavy menstrual bleeding, gastrointestinal blood loss, or frequent/repeated phlebotomy.

Impaired absorption

Celiac disease, inflammatory bowel disease, or other gastrointestinal disorders associated with malabsorption.

Chronic disease or inflammation

Obesity, chronic inflammatory conditions, recurrent inflammation/infection, and chronic kidney disease.

4 Prevention

Exclusively breastfed term infants

Provide elemental iron **1 mg/kg/day from 4 months of age** until adequate iron-containing complementary foods are established.

Preterm infants on full enteral feeds

Ensure iron intake of **2–3 mg/kg/day**, beginning by approximately 2 weeks of age and continuing until adequate dietary iron intake is established.

- Introduce **iron-rich complementary foods** from approximately 6 months of age.
- **Cow's milk** and plant-based milk alternatives should **not replace human milk or infant formula before 12 months of age**.
- In children >12 months, **limit cow's milk** and/or plant-based milk alternatives to **<24 oz** (approximately 710 mL) **per day**.

5 Screening

✓ **Screening for iron deficiency and iron-deficiency anemia with CBC and serum ferritin.**

Population	When to screen
Primarily breastfed infants	Screen at **9–12 months**.
Primarily formula-fed infants	Screen at **15–18 months**.
Children <4 years with ongoing risk factors	Reassess risk factors at subsequent health visits and repeat screening as clinically indicated.
Menstruating adolescents	Screen **≥1 year after menarche and no later than 14 years of age**; thereafter, repeat screening when symptoms or risk factors for ID/IDA are present (e.g., excessive menstrual blood loss or low-iron diet).
Older children and male adolescents	Screen when risk factors, symptoms, or clinical concerns for ID/IDA are present.

6 Clinical Features and Complications

ID and IDA **may be asymptomatic.**

Clinical manifestations may include:

- Fatigue, reduced activity, or exercise intolerance.
- Irritability, impaired attention, or poor concentration.
- Pica.
- Restless sleep or restless legs.
- Pallor.
- Tachycardia or dyspnea, particularly with significant anemia.
- Headache, dizziness, or syncope, particularly with significant anemia.

! *Prolonged iron deficiency, particularly during infancy and early childhood, may adversely affect **cognitive, behavioral, and motor development**.*

7 Investigations

7.1 Initial investigations

Obtain 1 CBC + 2 Serum ferritin

Typical laboratory findings in **IDA** include:

↓ **Ferritin** ↓ **Hemoglobin** ↓ **MCV** ↓ **MCH**

↑ **RDW**

A normal hemoglobin does not exclude iron deficiency.

i *In microcytic anemia, the **Mentzer index** (MCV ÷ RBC count) may help differentiate IDA **(>13)** from thalassemia trait **(<13)**, but should not be used in isolation.*

7.2 Assessment for inflammation

When infection, inflammation or chronic disease is present or suspected, obtain **CRP ± ESR**.

Ferritin is an acute-phase reactant and may be normal or elevated despite iron deficiency in the presence of inflammation.

7.3 Iron profile

An iron profile may be considered when ferritin is difficult to interpret or the diagnosis remains uncertain. Typical findings in iron deficiency include:

↓ Serum iron (fasting)	↓ Transferrin saturation (TSAT = serum iron ÷ TIBC × 100)	↑ Transferrin	↑ TIBC

- Inflammation may alter this pattern; interpret alongside ferritin and inflammatory markers.
- **Serum iron should not be used alone** to diagnose iron deficiency, as it is affected by recent iron intake and has substantial biological variability.

7.4 Additional investigations

Consider according to the clinical presentation or suspected underlying cause:

Celiac screening

Assessment for blood loss

Including GI blood loss and heavy menstrual bleeding.

Hemoglobinopathy testing

Particularly in persistent or unexplained microcytic anemia.

Further investigations directed by the clinical presentation

Including evaluation for gastrointestinal, inflammatory, or renal disease.

8 Management

Treatment for children with iron deficiency anemia includes identifying and addressing the underlying etiology (e.g., dietary changes, control of blood loss) as well as initiation of iron replacement therapy.

8.1 Dietary management

Identify and address dietary factors contributing to iron deficiency.

Encourage

- ✓ Encourage **iron-rich foods**, including meat, poultry, fish, legumes, and iron-fortified cereals.
- ✓ Combine iron-rich foods with **vitamin C**-rich foods (e.g., citrus fruits, tomatoes, peppers) to enhance non-heme iron absorption.
- ✓ Introduce iron-rich complementary foods from **approximately 6 months of age**.

Avoid

- **Avoid excessive cow's milk intake**; after 12 months of age, limit cow's milk to <24 oz (approximately 710 mL) per day.
- **Avoid tea and coffee with iron-rich meals**, as they may reduce iron absorption.
- **Avoid taking oral iron together with milk, dairy products, or calcium supplements.** If calcium supplementation is required, separate calcium and iron doses by at least 2 hours.

Review & refer

- For children receiving **enteral nutrition**, review the total daily iron provided by feeds and supplements.
- Consider **dietitian referral** for restricted diets, feeding difficulties, enteral feeding, or persistent nutritional iron deficiency.

Dietary modification should accompany, but not replace, therapeutic iron supplementation when iron deficiency is established.

8.2 Oral iron therapy

Oral iron is the **first-line treatment** for most children with ID or IDA.

TREATMENT DOSE
3–6 mg/kg/day
of elemental iron · **maximum 200 mg/day**

TYPICAL INITIAL · YOUNG CHILDREN
3 mg/kg
once daily

TYPICAL INITIAL · ADOLESCENTS
65 mg
once daily

- Consider higher doses within the therapeutic range in severe IDA, as tolerated.
- Children with severe IDA who are clinically stable and have reliable follow-up may be treated with oral iron and close monitoring.

8.3 Oral iron administration

- ✓ **Once-daily administration** is preferred where tolerated.
- ✓ Give on an **empty stomach when possible** to optimize absorption.
- ✓ **Vitamin C** may enhance iron absorption.
- ✓ **Avoid administration with milk, dairy products, or calcium supplements.** If calcium supplementation is required, separate doses by at least 2 hours.

Counsel families

- Liquid iron may cause **dental staining**; administer toward the back of the mouth when possible and rinse/brush teeth afterward.
- Counsel families that **dark or black stools** are expected.

Store iron preparations safely out of reach of children, as accidental overdose can cause serious toxicity.

8.4 Adverse effects and adherence

Oral iron commonly causes gastrointestinal adverse effects, including **nausea, abdominal discomfort, constipation, diarrhea, vomiting, and unpleasant or metallic taste**.

Poor tolerability may reduce adherence and contribute to treatment failure.

If significant gastrointestinal adverse effects occur:

1. Administer iron with or immediately after a small amount of food.
2. If a large once-daily dose is poorly tolerated, consider dividing the total daily dose into two doses.
3. Consider temporarily reducing the dose, where clinically appropriate, with subsequent escalation as tolerated.
4. Consider an alternative oral iron preparation if intolerance persists.

9 Monitoring and Treatment Response

9.1 Early response

✓ All children with IDA should be reassessed at **1 month and 3 months** after starting treatment.

Mild IDA treated with oral iron

Adequate response: normalization of Hb by 1 month.

Moderate IDA treated with oral iron

Adequate response: increase in Hb of ≥20 g/L (2 g/dL) by 1 month.

Clinically stable severe IDA treated with oral iron

- Arrange early follow-up within **7–10 days** to assess clinical status, adherence, and hematologic response; consider CBC and reticulocyte count.
  Reticulocytosis is expected within **5–7 days** after starting iron therapy.
- **Adequate response:** increase in Hb of ≥20 g/L (2 g/dL) by 1 month.

*Failure to demonstrate an appropriate hematologic response should prompt reassessment as outlined in the **Inadequate Treatment Response** section.*

9.2 Duration of therapy

Continue oral iron at the therapeutic dose for a minimum total treatment course of **3 months**.

Start	1 month	3 months	+3 months
Oral iron at therapeutic dose	Reassess response	Reassess CBC and ferritin (± CRP/ESR if inflammation is suspected)	If ferritin remains below the applicable diagnostic threshold, continue iron for an additional 3 months

10 Inadequate Treatment Response

Failure to demonstrate an appropriate hematologic response should prompt reassessment for:

- ✓ Inadequate elemental iron dose.
- ✓ Poor adherence.
- ✓ Reduced iron absorption, including administration with milk/calcium, celiac disease, or inflammatory bowel disease.
- ✓ Ongoing blood loss, including gastrointestinal or menstrual blood loss.
- ✓ Chronic inflammation, causing impaired iron availability.
- ✓ Alternative diagnoses, including thalassemia or other causes of anemia.
- ✓ Rare refractory disorders, such as iron-refractory iron-deficiency anemia (IRIDA).

! ***Do not simply escalate the oral iron dose without identifying the reason for treatment failure.***

11 Intravenous Iron

1. **Oral iron remains first-line therapy for most children with ID/IDA.**

IV iron should be considered when oral iron is ineffective, poorly tolerated, unlikely to be adequately absorbed, or when rapid iron repletion is required.

Indications include:

1. Significant intolerance to oral iron despite measures to improve tolerability.
2. Persistent ID/IDA despite an adequate trial of oral iron with confirmed adherence.
3. Malabsorption or gastrointestinal disease likely to impair oral iron absorption.
4. Ongoing blood loss exceeding the capacity of oral iron replacement.
5. Chronic inflammatory disease associated with impaired iron absorption or availability.
6. Need for rapid iron repletion, such as before non-deferrable surgery.

IV iron should generally be discussed with or administered under the guidance of an appropriate **pediatric specialist**.

Selection of IV iron preparation, calculation of the total iron requirement, administration, and monitoring should follow the **local institutional pediatric IV iron protocol**.

Important considerations

Benefits

IV iron provides more **rapid iron repletion** and **avoids the gastrointestinal adverse effects associated with oral iron**.

Infusion reactions

Infusion reactions may occur, although severe hypersensitivity reactions are uncommon with contemporary IV iron preparations.

Hypophosphatemia

Hypophosphatemia may occur with some preparations, particularly ferric carboxymaltose, and should be considered in patients receiving repeated or high-dose therapy or those at increased risk.

12 Children with Medical Complexity

Children with medical complexity may be at increased risk of iron deficiency due to nutritional, chronic disease, and treatment-related factors, including:

Inadequate iron intake

Including restricted/selective diets, feeding difficulties or intolerance, and insufficient iron provision from enteral feeds.

Chronic or recurrent inflammation/infection

Which may impair iron absorption and availability.

Frequent blood sampling and other iatrogenic blood loss

Particularly with recurrent or prolonged hospitalizations.

Medications, feeds, or supplements

That may interfere with iron absorption or administration.

12.1 Assessment

There is no specific ferritin threshold established for diagnosing iron deficiency in CMC. **Apply the age-appropriate thresholds outlined in Section 2.1**, while considering the effect of underlying inflammation.

- Ferritin may be normal or elevated with inflammation and may not exclude iron deficiency.
- Consider CRP ± ESR when inflammation is suspected or present.
- If ferritin is difficult to interpret, consider an iron profile, particularly transferrin saturation.
- Do not use serum iron alone to assess iron status due to substantial biological and dietary variability.

12.2 Neurodevelopmental disability and sleep

In children and youth with neurodevelopmental disabilities and sleep disturbance, iron status should be considered as part of the sleep assessment.

The Canadian Pediatric Society recommends a **ferritin level >50 ng/mL to support sleep** in this population. This is a sleep-related target, not a diagnostic threshold for iron deficiency, and should not be routinely applied to all CMC.

13 Specialist Referral, Red Flags and Transfusion

13.1 Specialist referral

Consider specialist referral for:

- Severe or symptomatic anemia.
- Unexplained or recurrent IDA.
- Inadequate response to appropriate oral iron therapy.
- Suspected significant blood loss, malabsorption, or gastrointestinal disease.
- Uncertain or alternative diagnosis, including hemoglobinopathy or IRIDA.
- Consideration of IV iron, where specialist input is required.

13.2 Red flags

Urgent assessment is required for:

Hemodynamic instability	Cardiorespiratory compromise	Active significant bleeding

13.3 RBC transfusion

RBC transfusion should not be based on hemoglobin level alone.

Children with severe IDA who are **clinically stable** and have reliable follow-up may be managed with iron therapy and close monitoring.

Consider RBC transfusion in severe IDA with clinical instability or cardiorespiratory compromise.

When transfusion is required, follow the **local institutional pediatric blood transfusion protocol**.

14 References

1. Powers JM, Heeney MM, Hord J, Lehmann CU, Abrams SA, Buchanan GR; AAP Section on Hematology-Oncology; AAP Committee on Nutrition; American Society of Pediatric Hematology-Oncology. Prevention, screening, diagnosis, and treatment of iron deficiency and iron deficiency anemia in infants, children, and adolescents: clinical report. *Pediatrics*. 2026;158(1):e2026077414. doi:10.1542/peds.2026-077414
2. Powers JM, Lim MY, Achebe MO, et al. American Society of Hematology 2026 guidelines for diagnosis of iron deficiency. *Blood Adv*. Published online September 16, 2026. doi:10.1182/bloodadvances.2025015950
3. Canadian Paediatric Society. Sleep matters: Supporting healthy sleep for children and youth with neurodevelopmental disabilities. 2025.
4. Royal Children's Hospital Melbourne. Clinical Practice Guidelines: Iron Deficiency. Melbourne: The Royal Children's Hospital.
5. Cohen CT, Powers JM. Intravenous iron therapy in pediatrics: who should get it and when is the right time? *Hematology Am Soc Hematol Educ Program*. 2023;2023(1):617–624.
6. Powers JM, Buchanan GR. Diagnosis and management of iron deficiency anemia. *Hematol Oncol Clin North Am*. 2014;28(4):729–745.