

Iron Deficiency Anemia: Adult & Pediatric

Hematology

Clinical Decision Tools for RNs with Additional Authorized Practice [RN(AAP)s]

Effective Date: February 1, 2022

Background

Iron deficiency anemia (IDA) is classified as a microcytic anemia with a hemoglobin of less than 110 g/L, low serum ferritin due to insufficient body iron stores. This is not a disease but a sign of an underlying disorder causing iron deficiency (Guidelines and Protocols Advisory Committee, 2019; Jimenez, Kulnigg-Dabsch, & Gasche, 2015). Iron deficiency anemia is typically the result of either inadequate dietary intake of iron, blood loss, increased iron requirements, and/or decreased absorption (Dunphy, Winland-Brown, Porter, & Thomas, 2019; Guidelines and Protocols Advisory Committee, 2019; Jimenez et al., 2015). Refer to the Predisposing and Risk Factors for examples from each of these categories.

Immediate Consultation Requirements

The RN(AAP) should seek immediate consultation from a physician/NP when any of the following circumstances exist:

- hemoglobin \leq 80 g/L and client symptomatic;
- client appears acutely ill (e.g., pallor, tachycardia, lethargy) and/or is experiencing chest pain or showing signs of heart failure;
- client is actively bleeding;
- stool is positive for occult blood;
- client who has menorrhagia; or
- client with no inflammatory disease states and in whom the ferritin level is indeterminate, so that determination can be made about what other tests should be performed to ascertain iron status (Interprofessional Advisory Group [IPAG], personal communication, October 14, 2019).

Predisposing and Risk Factors

Predisposing and risk factors for IDA include:

- Inadequate dietary intake related to:
 - exclusive breastfeeding beyond six months of age,
 - weaning infants to whole milk and complementary foods without iron-fortified foods,
 - weaning infants to cow's milk before one year of age,
 - excessive ingestion of cow's milk (e.g., > 2-3 cups per day in children over one year of age),
 - low socioeconomic status,
 - vegetarian diet, or
 - lack of balanced diet or poor intake of iron rich foods (e.g., alcohol use disorder, elderly clients, high risk ethnic groups such as First Nations) (Guidelines and Protocols Advisory Committee, 2019; Jimenez et al., 2015).
- Blood loss related to:
 - menorrhagia,
 - gastrointestinal (GI) bleeding,
 - regular blood donation,
 - postoperative clients with significant intraoperative blood loss,
 - hematuria,
 - intestinal parasites,
 - intravascular hemolysis,
 - hemoglobinuria,
 - extreme physical exercise, or
 - pathological causes (e.g., cancer) (Guidelines and Protocols Advisory Committee, 2019; Jimenez et al., 2015).
- Increased iron requirements related to:
 - rapidly growing infants and children, especially those less than two years of age;
 - risk factors including low birth weight, history of prematurity (deplete iron stores earlier), exposure to lead;
 - pregnancy and lactation;
 - multiparity;
 - parturition; and
 - treatment with erythropoietin (Guidelines and Protocols Advisory Committee, 2019; Jimenez et al., 2015).
- Decreased absorption related to:
 - dietary factors (tannins, phytates in fibre, calcium in milk, tea, coffee, carbonated drinks);
 - GI pathology including colorectal cancer, Crohns, colitis, celiac, and helicobacter pylori;
 - chronic gastritis;
 - gastric lymphoma;

- medications that decrease gastric acidity or bind iron (e.g., antacids or supplements containing aluminum, magnesium, calcium, zinc, proton pump inhibitors, and histamine H₂-receptor antagonists);
- history of gastrectomy or intestinal bypass;
- duodenal pathology; and
- chronic renal failure (Guidelines and Protocols Advisory Committee, 2019; Jimenez et al., 2015).

Health History and Physical Exam

Subjective Findings

Adult clients presenting with IDA may report the following symptoms:

- fatigue and malaise;
- poor appetite;
- apathy/depression;
- hypersensitivity to cold;
- weakness;
- irritability;
- dizziness;
- headache;
- tinnitus;
- shortness of breath;
- palpitations;
- chest pain;
- exercise intolerance;
- lack of strength or endurance with reduced ability to perform activities of daily living;
- Pica, which is an abnormal craving to eat substances with no nutritional value (e.g., ice, dirt, clay, paint); or
- a sore or smooth tongue, brittle nails, or hair loss (Dunphy et al., 2019).

Caregivers of pediatric clients may report the following symptoms or concerns:

- tiredness,
- restlessness,
- attention-deficit/hyperactivity disorder (ADHD),
- irritability,
- growth retardation, or
- cognitive and intellectual impairment (Richardson, 2020).

The client may be asymptomatic even when IDA is identified with routine blood work (Thachil, 2015). Symptoms vary according to the severity of the anemia, underlying cause, the rapidity with which the underlying condition developed, and presence of pre-existing heart and lung disease (Thachil, 2015). All clients presenting with any of the aforementioned symptoms should be

screened for the presence of IDA risk factors as indicated above. The underlying cause of the IDA must be identified to correct the cause.

Objective Findings

The signs and symptoms of IDA may include:

- altered mental status, particularly for pediatric and elderly clients;
- pediatric clients who fail to achieve or maintain growth (height and weight) using standardized measurement tools (e.g., Rourke charts);
- weight loss;
- skin pallor, so it is important to check the tongue, nail beds, palmar surfaces, mucous membranes, and conjunctiva;
- delayed capillary refill;
- nail changes (e.g., thin, brittle, and coarsely ridged or concave, known as koilonychia);
- hair changes (may be dry or brittle);
- angular cheilitis, which is a condition that causes red, swollen patches in the corners of the mouth where the lips meet;
- tongue glossitis;
- tachycardia, S3 or physiologic murmur, displaced point of maximal impulse related to cardiac enlargement, signs of congestive heart failure, and orthostatic hypotension;
- hepatomegaly, splenomegaly, or masses;
- hemorrhoids and melena/blood in stools; and
- impaired muscle strength and sensation (Dunphy et al., 2019).

Differential Diagnosis

The following should be considered as part of the differential diagnosis:

- thalassemia,
- sickle cell disease,
- hemolytic diseases (e.g., glucose-6-phosphate dehydrogenase [G6PD] deficiency),
- sideroblastic anemias,
- anemia of chronic disease,
- acute blood loss, and
- lead poisoning (Dunphy et al., 2019; Richardson, 2020).

Making the Diagnosis

Anemia is defined as a hemoglobin level two standard deviations below normal for age and sex (refer to individual laboratory reference ranges). Lower hemoglobin levels are expected throughout pregnancy. Iron deficiency anemia should be suspected if complete blood count (CBC) indices suggest microcytic anemia:

- hemoglobin < normal for age and sex as per laboratory reference ranges,
- mean corpuscular volume < 80 fL (femtoliters),

- low mean corpuscular hemoglobin concentration (MCHC), and
- elevated red cell distribution width (RDW; Guidelines and Protocol Advisory Committee, 2019; Jimenez et al., 2015)

A ferritin level < 15 mcg/L (or low as per laboratory reference ranges) is diagnostic for IDA (Guidelines and Protocol Advisory Committee, 2019). A low serum ferritin level may be the only indication of IDA in early stages of the condition. Conversely, in the presence of inflammatory disease, malignancy, or liver disease, serum ferritin may be elevated and will therefore not accurately reflect iron stores (Guidelines and Protocol Advisory Committee, 2019). In these situations, a total iron binding capacity (TIBC) should be considered. An elevated TIBC is suggestive of low iron stores (Anemia Review Panel, 2014).

Investigations and Diagnostic Tests

Screening for IDA of the general population is not indicated. Initial tests may be indicated based on the history and physical assessment findings. In those who are otherwise well, initial tests for IDA include a CBC and serum ferritin (Anemia Review Panel, 2014; Guidelines and Protocols Advisory Committee, 2019; Jimenez et al., 2015). The CBC will demonstrate a microcytic, hypochromic anemia with a normal or reduced red blood cell (RBC) count and high red cell width distribution (RDW). A low serum ferritin result indicates depletion of iron stores. It is the most specific test for iron deficiency and the only test that should be used for screening (Guidelines and Protocol Advisory Committee, 2019; Jimenez et al., 2015). Additional tests such as serum iron, TIBC, and percent saturation (transferrin saturation) are not indicated and should not be ordered initially. These tests lack specificity, and their results can be distorted in certain clinical situations limiting their diagnostic use (Guidelines and Protocols Advisory Committee, 2019; RxFiles, 2021).

Screening for IDA may be indicated for the following populations:

- pregnant clients,
- pediatric clients from high-risk groups (e.g., low-income or newly immigrated families) should be screened at nine to 12 and 18 months of age and again at four years of age. Consider screening preterm and low birth weight infants before six months of age if they are not given iron-fortified formula and are not receiving supplemental iron (Guidelines and Protocols Advisory Committee, 2019).

Note that males and postmenopausal female clients should not be screened for IDA, but should be evaluated for GI disease/pathology if diagnosed with IDA. Investigation of anemia in the elderly is recommended if their life expectancy is estimated to be more than one year at the time of diagnosis and should be guided by the client following review of the risks and benefits of various investigations and diagnostic tests (Jimenez et al., 2015).

Management and Interventions

Goals of Treatment

The primary goals of immediate treatment are to identify and address the underlying cause of the iron deficiency, alleviate signs and symptoms of anemia, and replenish body stores of iron (Guidelines and Protocol Advisory Committee, 2019; Richardson, 2020).

Non-Pharmacological Interventions

The RN(AAP) should recommend, as appropriate, the following non-pharmacological options:

- A diet with sufficient iron for sex, age, pregnancy status, and diet preference (Dunphy et al., 2019; Guidelines and Protocols Advisory Committee, 2019). According to Dunphy and colleagues (2019), dietary intake of iron may be adequate if the client is young or middle-aged or the cause of the anemia is short-lived.
- Children should be given breast milk or iron-fortified formula until age one. At age one, milk (e.g., cow's milk) intake should be reduced to 2-3 cups per day and concurrent increase of high-iron foods (e.g., dark green vegetables, beans, whole cereal, dried fruit, pork, beef) (Richardson, 2020).

Pharmacological Interventions

The pharmacological interventions recommended for the treatment of IDA are in accordance with the *Anemia Guidelines for Family Medicine* (Anemia Review Panel, 2014) and the *RxFiles Drug Comparison Charts* (RxFiles Academic Detailing Program, 2021).

Iron Preparations

Commonly used oral iron preparations include ferrous gluconate, ferrous fumarate, and ferrous sulfate (Rx Files, 2021). One preparation is not preferred over another, client preference and tolerance should be the guide. The usual adult dose of elemental iron is 2 to 3 mg/kg/day or 60 to 200 mg elemental iron per day orally (Rx Files, 2021). The pediatric iron preparation dose is 3 to 6 mg/kg/day for four months (Rx Files, 2021). In pregnancy, the dose is between 60-200 mg/day orally (Anemia Review Panel, 2014).

Administration of lower doses of elemental iron is likely to be better tolerated but may require a longer period to correct the anemia and normalize hemoglobin levels (Anemia Review Panel, 2014). Use a graduated approach to dosing to minimize gastrointestinal side effects and improve adherence (Anemia Review Panel, 2014).

	Drug	Dose	Route	Frequency	Duration
Pediatric (≤ 12 years of age)					
	Ferrous sulphate drops (15 mg elemental iron/75 mg/mL)	3 to 6 mg of elemental iron/kg/day (maximum of 60 mg/day)	p.o.	divided t.i.d.	30 days
OR	Ferrous sulphate syrup (6 mg elemental iron/30 mg/mL)	3 to 6 mg of elemental iron/kg/day (maximum of 60 mg/day)	p.o.	divided t.i.d.	30 days
Pediatric (> 12 years of age)					
	Ferrous gluconate (35 mg elemental iron/300 mg tablet)	60-120 mg of elemental iron/day	p.o.	divided t.i.d.	30 days
OR	Ferrous sulfate (60 mg elemental iron/300 mg tablet)	60-120 mg of elemental iron/day	p.o.	Qhs	30 days
OR	Ferrous fumarate (100 mg elemental iron/300 mg capsule)	60-120 mg of elemental iron/day	p.o.	Qhs	30 days
Adults					
	Ferrous gluconate (35 mg elemental iron/300 mg tablet)	one tablet	p.o.	t.i.d.	30 days
OR	Ferrous sulfate (60 mg elemental iron/300 mg tablet)	one to three tablets	p.o.	Qhs	30 days
OR	Ferrous fumarate (100 mg elemental iron/300 mg tablet)	one to two tablets	p.o.	Qhs	30 days

OR	Polysaccharide-iron complex (150 mg elemental iron/capsule)	one capsule	p.o.	once daily	30 days
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Vitamin C

Vitamin C taken concurrently increases iron absorption. This is an option for clients who may not reach the dietary recommended daily allowance.

	Drug	Dose	Route	Frequency	Duration
Pediatric (≥ 4 years of age)					
	Vitamin C	100 mg	p.o.	once daily	30 days
Adult					
	Vitamin C	250-500 mg	p.o.	b.i.d.	30 days

Client and Caregiver Education

The RN(AAP) provides client and caregiver education as follows:

- Counsel about appropriate use of medications, such as purpose, dose, frequency, and side effects.
- Advise to keep iron containing products out of the reach of children as accidental poisoning can be fatal.
- Advise that medications that reduce iron absorption should be separated by at least two hours from the iron replacement, and taken as otherwise directed (e.g., antacids, calcium preparations, cholestyramine, levodopa, quinolone antibiotics, and tetracycline antibiotics).
- Suggest dietary modifications to increase intake of iron (e.g., organ meats, egg yolk, prunes, grapes, raisins, nuts, cereals, dark green vegetables).
- Avoid concurrent administration of iron supplements with coffee, tea and milk, which impair absorption.
- Advise that iron in meat and poultry (heme iron) is more readily absorbed than iron contained in egg yolks and plants (non-heme iron).
- Recommend frequent periods of rest to reduce fatigue.
- Recommend avoidance of alcohol.
- Counsel about prevention of constipation due to iron (e.g., encourage a high-fibre diet and adequate fluid intake).
- Advise that stool color and consistency typically changes to dark and tarry.
- Advise that oral liquid iron preparations (except for polysaccharide iron complex), may stain teeth. Mixing the medication with water or juice and drinking it through a straw may decrease staining. Stains can be removed with baking soda (Richardson, 2020; RxFiles, 2021).

Monitoring and Follow-Up

The RN(AAP) should instruct the client to return for reassessment in one month after initiating therapy. An increase in hemoglobin of about 20 g/L in one month is expected (Guidelines and Protocols Advisory Committee, 2019). A subsequent follow-up visit after three to six months should be scheduled to assess restoration of iron stores (Guidelines and Protocols Advisory Committee, 2019).

Complications

The following complications may be associated with IDA:

- decompensation of pre-existing medical problems,
- heart failure,
- myocardial infarction, and
- immunosuppression (Jimenez et al., 2015; Richardson, 2020).

Referral

Refer to a physician/NP if the client presentation is consistent with the *Immediate Consultation Requirements* section (IPAG, personal communication, October 14, 2019).

References

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