SASKATCHEWAN REGISTERED NURSES' ASSOCIATION

RNs WITH ADDITIONAL AUTHORIZED PRACTICE
CLINICAL DECISION TOOL
DECEMBER 1, 2016

IRON DEFICIENCY ANEMIA ADULT & PEDIATRIC

DEFINITION

Microcytic anemia with low serum ferritin due to depletion of iron stores. Iron deficiency anemia (IDA) is not a disease but a sign of an underlying disorder causing iron deficiency.

IMMEDIATE CONSULTATION REQUIRED IN THE FOLLOWING SITUATIONS

- Hemoglobin < 90 g/L
- Client appears acutely ill and/or is experiencing chest pain or showing signs of heart failure
- Client is actively bleeding

CAUSES

- Inadequate dietary intake of iron
- Blood loss
- Increased iron requirement
- Decreased absorption

PREDISPOSING AND RISK FACTORS

- Iron deficiency anemia can be due to increased iron requirements, decreased iron intake, increased loss of iron and decreased absorption. Clients presenting with symptoms of IDA should be screened for the following risk factors:
  - Increased Requirements
    - Growing infants and children
      - Risk factors include low birth weight, history of prematurity, exposure to lead, exclusive breastfeeding beyond 4 months of age, and weaning to whole milk and complementary foods without iron-fortified foods.
    - Menstruation
    - Pregnancy
    - Lactation
    - Multiparity
    - Parturition
    - Treatment with erythropoietin
  - Decreased Intake

- Low socioeconomic status
- Vegetarian diet
- Lack of balanced diet or poor intake of iron rich foods
  - Alcoholism
  - Elderly
  - High risk ethnic groups (First Nations)

o Increased Loss
- Menorrhagia
- Gastrointestinal (GI) bleeding
- Regular blood donors
- Postoperative clients with significant intraoperative blood loss
- Hematuria
- Intestinal parasites
- Intravascular hemolysis
- Hemoglobinuria
- Extreme physical exercise
- Pathological

o Decreased Absorption
- Dietary factors (tannins, phytates in fibre, calcium in milk, tea, coffee, carbonated drinks)
- GI pathology including colorectal cancer
- Chronic gastritis
- Gastric lymphoma
- Celiac disease
- Crohn's disease
- Medications that decrease gastric acidity or bind iron include:
  - Antacids or supplements containing aluminum, magnesium, calcium, zinc, proton pump inhibitors, and histamine H_2-receptor antagonists
- Gastrectomy or intestinal bypass
- Duodenal pathology
- Chronic renal failure

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HISTORY

- Adult clients may:
  - complain of fatigue and malaise, 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.
  - have an abnormal craving to eat substances (e.g., ice, dirt, clay, paint) – pica.
  - complain of a sore or smooth tongue, brittle nails or hair loss.
- Pediatric clients may present with tiredness, restlessness, attention-deficit/hyperactivity disorder (ADHD), irritability, growth retardation, cognitive and intellectual impairment.
- Client may be asymptomatic even when IDA is identified when routine blood work is performed.
- Symptoms vary according to severity of the anemia, underlying cause, rapidity with which the underlying condition developed and presence of pre-existing heart and lung disease.
- Female clients may complain of menstrual disturbances.
- Clients should be questioned about the use of medications that are linked to iron deficiency anemia including:
  - Anticoagulants (e.g., clopidogrel), acetylsalicyclic acid (ASA) and non-steroidal anti-inflammatory drugs (NSAIDs)
  - Anticonvulsants (e.g., phenytoin)
  - Sulfamethoxazole/trimethoprim (long-term use only)
  - HIV medications (e.g., zidovudine)
  - Antivirals (e.g., ribavirin)
  - Antineoplastic drugs
- Review alcohol intake.
- Identify comorbidities such as chronic inflammatory disease (e.g., rheumatoid arthritis, systemic lupus erythametosus, Crohn's disease), malignant disease, diminished renal, hepatic or thyroid function, cardiac disease.
- Recent surgery.
- Family history of anemia.
- Dietary history and any recent weight loss especially in the pediatric population.

PHYSICAL FINDINGS

- Impaired mental status (particularly for elderly clients)
- Weight loss
- Skin pallor (check palmar surfaces)
- Cool and dry skin temperature
- Diminished capillary refill
- Nail changes (e.g., thin, brittle, and coarsely ridged or concave - koilonychia)
- Hair may be dry or brittle
- Conjunctiva pallor
- Possible angular cheilitis
- Tongue glossitis
- Tachycardia
- S3 or physiologic murmur
- Displaced point of maximal impulse related to cardiac enlargement
- Orthostatic hypotension, including orthostatic pulse from lying to standing
- Tachypnea
- Lungs clear unless congestive heart failure present
- Hepatomegaly and splenomegaly or masses
- Hemorrhoids and melena/blood in stools
- Impaired muscle strength and sensation

DIFFERENTIAL DIAGNOSIS

- Thalassemia
- Sideroblastic anemias
- Anemia of chronic disease
- Lead poisoning
- Chronic inflammatory states

COMPLICATIONS

- Decompensation of pre-existing medical problems
- Heart failure
- Myocardial infarction
- Immunosuppression

INVESTIGATIONS AND DIAGNOSTIC TESTS

- Screening of the general population is not indicated.
- Female clients should be screened during pregnancy.
- Pediatric clients from low-income or newly immigrated families should be screened at 9-12 and 18 months of age and again at 4 years of age. Consider screening preterm and low birth weight infants before 6 months of age if they are not given iron-fortified formula.
- Male and postmenopausal female clients should not be screened but should be evaluated for GI disease/pathology if diagnosed with iron deficiency anemia.
- Investigation of anemia in the elderly is recommended if the life expectancy is more than a year.
- Laboratory tests to diagnose IDA include:
  - Complete blood count (CBC)
    - Demonstrates a microcytic, hypochromic anemia with a normal or reduced red blood cell (RBC) count and high red cell width distribution (RDW).
  - Serum ferritin
    - 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.
    - Additional tests such as serum iron, total iron binding capacity (TIBC), and percent saturation (transferrin saturation) are not indicated and should not be ordered. These tests lack specificity and their results can be distorted in certain clinical situations limiting their diagnostic use.
- Based on history and physical consider:
  - Screening adult clients for celiac disease
  - C-reactive protein (CRP) and liver function tests may be ordered when necessary to help determine if a ferritin result is elevated due to inflammation
  - Stool for occult blood using fecal immunochemical test (FIT)
  - Upper GI endoscopy if no overt blood loss or obvious cause for IDA
  - Colonoscopy
  - Bone marrow examination in rare cases

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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.
- Iron deficiency anemia should be suspected if CBC indices suggest microcytic anemia.
  - Hemoglobin < normal for age and sex as per laboratory reference ranges
  - Mean corpuscular volume < 80*f*L
  - Ferritin level < 20 mcg/L (or low as per laboratory reference ranges)
  - Red cell distribution width (RDW) is elevated
- It is important to note that:
  - early stage iron deficiency can exist before any hematological changes occur in which case a low serum ferritin would be the only indication.
  - in the presence of inflammatory disease, malignancy, or liver disease, serum ferritin may be elevated and will therefore not accurately reflect iron stores.
- **Iron Deficiency in Pregnancy**
  - Iron deficiency anemia is the most frequent form of anemia in pregnant clients. Anemia in pregnancy is defined as:
    - 1st trimester - hemoglobin of < 110 g/L
    - 2nd trimester - hemoglobin of < 104 g/L
    - 3rd trimester - hemoglobin of < 110 g/L

MANAGEMENT AND INTERVENTIONS

Goals of Treatment

- Identify and address underlying cause of the iron deficiency
- Alleviate signs and symptoms of anemia
- Replenish body stores of iron
  - Normalize hemoglobin levels and red cell indices; replenish iron stores
  - Individualize management depending on underlying cause

Appropriate Consultation

- Presentation consistent with those identified in the Immediate Consultation Required in the Following Situations section.

- Stool is positive for occult blood.
- Client is actively bleeding.
- Clients with no inflammatory states and in whom the ferritin level is indeterminate, to determine what other tests should be performed to ascertain iron status.
- Clients requiring parenteral administration of iron.
- Clients requiring a blood transfusion.
- Clients who have no response to pharmacologic treatment after 1 month.

Non-Pharmacological Interventions

- Explain nature, course and prognosis of anemia; this is a symptom related to lifestyle and/or a chronic condition that can be managed.
- Counsel client/caregiver about appropriate use of medications.
  - Avoid concurrent administration with drugs that reduce iron absorption including:
    - Antacids, calcium preparations, cholestyramine, histamine H_2-receptor antagonists (e.g., ranitidine), levodopa, proton pump inhibitors (e.g., omeprazole), quinolone antibiotics (e.g., ciprofloxacin), tetracycline antibiotics
    - Separate administration of these medications and iron by 2 or more hours
- Assess use of ASA and NSAIDs and if these medications are required for care ensure proper gastric protection.

Iron Deficiency in Pediatric Populations

- IDA in children is associated with motor and cognitive deficits which may be irreversible.
  - Consider the introduction of iron rich foods/formula or routine iron supplementation for asymptomatic pediatric clients who are 6-12 months of age and at increased risk for IDA.

Iron Deficiency in Pregnancy

- There is an increase in iron requirement during pregnancy, parturition and lactation. Total iron loss associated with pregnancy and lactation is about 1000 mg. Iron is mandatory for normal fetal development. It is important to prevent iron deficiency in the fetus by preventing iron deficiency in pregnant clients.

- An increase in iron consumption by about 15-30 mg of elemental iron/day is recommended for non-anemic clients, an amount provided by prenatal vitamins.
- Clients with iron deficiency anemia should receive an additional iron supplement.

Pharmacological Interventions

- Commonly used oral iron preparations include: ferrous gluconate, ferrous fumarate, and ferrous sulfate. One preparation is not preferred over another; client tolerance should be the guide.
- The usual adult dose of elemental iron is 2-3 mg/kg/day or 60-300 mg/day orally. In pregnancy, the dose is between 60-200 mg/day orally.
- Preparations containing iron salts differ in their elemental iron content:
  - Ferrous gluconate (35 mg elemental iron/300 mg tablet)
    - One tablet orally up to TID
  - Ferrous sulfate (60 mg elemental iron/300 mg tablet)
    - One to three tablets orally at bedtime
  - Ferrous fumarate (100 mg elemental iron/300 mg capsule)
    - One to two tablets orally at bedtime
  - Polysaccharide-iron complex is a non-ionic preparation that contains 150 mg elemental iron/capsule
- 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.
- Use a graduated approach to dosing to minimize GI side effects and improve compliance.
- Initiate therapy with a single tablet taken after a meal. As tolerance permits, increase the dose at weekly intervals until the client is taking one tablet with each meal. If well tolerated, shift the time of administration to before meals to maximize iron absorption.
- Administration with Vitamin C marginally increases iron absorption. This is an option for clients who may not reach the dietary recommended daily allowance:
  - Adult: 250 mg orally once a day with the iron
  - Children > 4 years of age: 100 mg orally once a day with the iron

Iron Deficiency in Pediatric Populations

- Recommended treatment dose for infants and children is 3-6 mg of elemental iron/kg/day orally in divided doses up to maximum of 60 mg/day orally. Adolescents can receive 60-120 mg/day orally.
- Oral liquid preparations include
  - Ferrous sulphate (Fer-In-Sol) drops (15 mg elemental iron/75 mg/mL)
  - Ferrous sulphate syrup (6 mg elemental iron/30 mg/mL)

Iron Deficiency in Elderly Populations

- Low dose iron therapy (15 mg elemental iron per day) is an effective treatment in octogenarians if standard dosing is not tolerated, with significantly reduced adverse effects.

Client and Caregiver Education

- Counsel client/caregiver about appropriate use of medications (dose, frequency, compliance, etc.).
  - Avoid concurrent administration with drugs that reduce iron absorption including:
    - Antacids, calcium preparations, cholestyramine, histamine H_2-receptor antagonists (e.g., ranitidine), levodopa, proton pump inhibitors (e.g., omeprazole), quinolone antibiotics (e.g., ciprofloxacin), tetracycline antibiotics
    - Separate administration of these medications and iron by 2 or more hours
- 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 with coffee, tea and milk, which impair absorption of iron.
- Instruct client/caregiver 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 client/caregiver about prevention of constipation due to iron (e.g., encourage a high-fibre diet).

- Advise clients that iron can be toxic to children and should always be safely stored.
- Oral liquid, except for polysaccharide iron complex preparations, 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.

Monitoring and Follow-Up

- Clients receiving pharmacologic therapy for IDA should have:
  - an initial follow-up 1 month after initiating therapy with an increase in hemoglobin of about 20 g/L in 1 month by assessing CBC.
  - a subsequent follow-up visit after 3-6 months to assess restoration of iron stores by performing a CBC and ferritin level. Test reticulocyte count if concerns regarding response to therapy.

Referral

- Presentation consistent with those identified in the Immediate Consultation Required in the Following Situations section.
- Client is actively bleeding.
- Clients with an underlying condition that causes iron deficiency anemia should be referred to a specialist (e.g., gynecologist, gastroenterologist) for definitive treatment.
- No improvement after 4 weeks of treatment.

DOCUMENTATION

- As per employer policy

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