Madigan Army Medical Center Clinical Practice Guidelines

Clinical Guideline for the Management and Screening for Anemia in Infants and Children

Department of Pediatrics
Madigan Army Medical Center
Maintained by Quality Services Division
Clinical Practice and Referral Guidelines Administrator

Last Review for this Guideline: **July 2012**
Clinical Guidelines require review every three years

Core Document

TITLE: CLINICAL GUIDELINE FOR THE MANAGEMENT AND SCREENING FOR ANEMIA IN INFANTS AND CHILDREN

INDICATIONS FOR THE CLINICAL GUIDELINE: Iron deficiency (ID) and iron-deficiency anemia (IDA) continue to be of worldwide concern. Among children in the developing world, iron is the most common single-nutrient deficiency. In industrialized nations, despite a demonstrable decline in prevalence, IDA remains a common cause of anemia in young children. Nine percent of U.S. toddlers (i.e., children ages 12 months to 35 months) are iron-deficient. However, even more important than anemia itself is the indication that the more common ID without anemia may also adversely affect long-term neurodevelopment and behavior and that some of these effects may be irreversible. This clinical guideline covers diagnosis and prevention of ID and IDA in infants (both breastfed and formula fed) and toddlers aged 1 through 3 years.

METRICS: THE KEY ELEMENTS OF THE CLINICAL GUIDELINE THAT WILL BE USED TO MONITOR PROVIDER ADHERENCE TO THE CLINICAL GUIDELINE.

This guideline will be used to manage more than one thousand infants and children per year. For assessing the adherence the following metrics will be audited:
1. Iron prescribed within three months if the venous CBC Hgb is <11.0% or Hct <33.0 g/dL (monitored by prescriptions placed in CHCS).

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AUTHORS:
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AREAS OF DISAGREEMENT: The recommendation to screen 12-month old infants for anemia still remains controversial. The American Academy of Pediatrics recommends universal screening of infants six to twelve months old for iron deficiency anemia. On the other hand, the American Academy of Family Practice and United States Preventive Services Task Force recommends screening of only high-risk infants. While there was disagreement about the use of the screening Hgb/Hct, a consensus was obtained about the management of a positive screen if one was identified.

PUBLISHED GUIDELINES OF CARE AND OTHER REFERENCES UPON WHICH THE CLINICAL GUIDELINE IS BASED:
American Academy of Pediatrics, Clinical Report-Diagnosis and Prevention of Iron Deficiency and Iron-Deficiency Anemia in Infants and Young Children (0-3 years of Age). 2010

CLINICAL PRACTICE RECOMMENDATIONS:

BREAST FED INFANTS
Term, healthy infants have sufficient iron for at least the first 4 months of life. Human milk contains very little iron. Exclusively breastfed infants are at increasing risk of ID after 4 completed months of

age. Therefore, at 4 months of age, breastfed infants should be supplemented with 1 mg/kg per day of oral iron until appropriate iron-containing complementary foods (including iron-fortified cereals) are introduced in the diet. For partially breastfed infants, the proportion of human milk versus formula is uncertain; therefore, beginning at 4 months of age, partially breastfed infants (more than half of their daily feedings as human milk) who are not receiving iron containing complementary foods should also receive 1 mg/kg per day of supplemental iron.

FORMULA FED INFANTS

For formula-fed infants, the iron needs for the first 12 months of life can be met by a standard infant formula (iron content: 10–12 mg/L) and the introduction of iron-containing complementary foods after 4 to 6 months of age, including iron-fortified cereals. Whole milk should not be used before 12 completed months of age.

The iron intake between 6 and 12 months of age should be 11 mg/day. When infants are given complementary foods, red meat and vegetables with higher iron content should be introduced early. To augment the iron supply, liquid iron supplements are appropriate if iron needs are not being met by the intake of formula and complementary foods.

ONE TO THREE YEAR OLDS

Toddlers 1 through 3 years of age should have an iron intake of 7 mg/day. This would be best delivered by eating red meats, cereals fortified with iron, vegetables that contain iron, and fruits with vitamin C, which augments the absorption of iron. For toddlers not receiving this iron intake, liquid supplements are suitable for children 12 through 36 months of age, and chewable multivitamins can be used for children 3 years and older.

PRETERM INFANTS

All preterm infants should have an iron intake of at least 2 mg/kg per day through 12 months of age, which is the amount of iron supplied by iron-fortified formulas. Preterm infants fed human milk should receive an iron supplement of 2 mg/kg per day by 1 month of age, and this should be continued until the infant is weaned to iron-fortified formula or begins eating complementary foods that supply the 2 mg/kg of iron. An exception to this practice would include infants who have received an iron load from multiple transfusions of packed red blood cells.

SCREENING

Universal screening for anemia should be performed at approximately 12 months of age (12-15 months of age) with determination of Hemoglobin (Hb) concentration via CBC and an assessment of risk factors associated with ID/IDA. These risk factors would include low socioeconomic status (especially children of Mexican American descent), a history of prematurity or low birth weight, exposure to lead, exclusive breastfeeding beyond 4 months of age without supplemental iron, and weaning to whole milk or complementary foods that do not include iron-fortified cereals or foods naturally rich in iron. Additional risk factors are the feeding problems, poor growth, and inadequate nutrition typically seen in infants with special health care needs. For infants and toddlers (1–3 years of age), additional screening can be performed at any time if there is a risk of ID/IDA, including inadequate dietary iron intake.

If the Hb level is less than 11.0 mg/dL at 12-15 months of age, then further evaluation for IDA is required to establish it as a cause of anemia. If there is a high risk of dietary ID, then further testing for

ID should be performed, given the potential adverse effects on neurodevelopmental outcomes. Additional screening tests for ID or IDA should include measurement of: Ferritin and iron panel.

If a child has mild anemia (Hb level of 10 –11 mg/d) and can be closely monitored, an alternative method of diagnosis would be to document a 1 g/dL increase in plasma Hb concentration after 1 month of appropriate iron-replacement therapy, especially if the history indicates that the diet is likely to be iron deficient.

If child has Hb <9mg/d or MCV >80 evaluate for other causes of anemia as well as iron deficiency, consider consult to Pediatric Hematology.

Once started on oral iron therapy, repeat CBC after one month. If hemoglobin increases by 1mg/d, continue iron for 3-6 months after CBC (hemoglobin, MCV, RDW) have normalized.

Appropriate iron-replacement therapy for the iron deficient child is 4-6 mg/kg/day of elemental iron. Some parents feel that the lower dose is better tolerated and if used replacement should be for at least a total of 6 months. At 6 mg/kg replacement may be accomplished in 4 months.

If hemoglobin does not increase by 1mg/d after one month of treatment assess compliance. If poor compliance, educate to family and recheck in one month. If good compliance and no change in hemoglobin assess for other causes of anemia, consider hematology consult.

IMPACT STATEMENT TO INSTITUTION: This guideline will impact many areas of the hospital including the Pediatric Clinic, the Family Practice Wellness Clinic, Pediatric Hematology, laboratory, and pharmacy. The risk of bacterial infection is not increased due to iron therapy for treatment of suspected iron deficiency anemia. A venous CBC is more difficult to obtain than a capillary Hgb/Hct. Health care providers are instructed to place a comment in the order for a *venous CBC* and instruct parents that this is different than the initial capillary "finger stick." Venous CBCs will be attempted twice in the lab. If unsuccessful, then a capillary Hgb/Hct will be done. Pharmacy orders for iron replacement may increase with increased screening at risk infants.

LINKS WITHIN THE MAMC INTRANET: This guideline will be published on the MAMC Intranet under the heading of: *Anemia in infants and children.*

METHODS OF PROVIDER EDUCATION: Designated Standardization POC's for the departments will forward this guideline to the Department/Service Chiefs of Pediatrics and Family Practice. Department/Service Chiefs will notify their departments of the guideline and emphasize the use of the guideline. Annual education to all providers should be performed. The guideline will be listed on the MAMC Intranet. Hard copies of this guideline should be kept readily available in following departments: Department of Pediatrics and Department of Family Practice.

METHODS OF PATIENT EDUCATION: To be done in clinic by providers seeing the patients

REVISION FREQUENCY: This guideline will be reviewed and updated by the POC every 3 years. If the changes are substantial the guideline will be subject to review and approval by the Clinical

Guidelines Committee. Changes not deemed "substantial" will be approved by the Chair, Clinical Guidelines Committee.

Foods to Increase Iron Intake and Iron Absorption (Elemental Iron, mg)

Baby food, lamb, junior, 1 jar (2.5 oz) 1.2
Baby food, chicken, strained, 1 jar (2.5 oz) 1.0
Baby food, lamb, strained, 1 jar (2.5 oz) 0.8
Baby food, beef, junior, 1 jar (2.5 oz) 0.7
Baby food, beef, strained, 1 jar (2.5 oz) 0.7
Baby food, chicken, junior, 1 jar (2.5 oz) 0.7
Baby food, pork, strained, 1 jar (2.5 oz) 0.7
Baby food, ham, strained, 1 jar (2.5 oz) 0.7
Baby food, ham, junior, 1 jar (2.5 oz) 0.7
Baby food, turkey, strained, 1 jar (2.5 oz) 0.5
Baby food, veal, strained, 1 jar (2.5 oz) 0.5
Baby food, green beans, junior, 1 jar (6 oz) 1.8
Baby food, peas, strained, 1 jar (3.4 oz) 0.9
Baby food, green beans, strained, 1 jar (4 oz) 0.8
Baby food, spinach, creamed, strained, 1 jar (4 oz) 0.7
Baby food, sweet potatoes, junior (6 oz) 0.7
Baby food, brown rice cereal, dry, instant, 1 tbsp 1.8
Baby food, oatmeal cereal, dry, 1 tbsp 1.6
Baby food, rice cereal, dry, 1 tbsp 1.2
Baby food, barley cereal, dry, 1 tbsp 1.1

Clams, canned, drained solids, 3 oz 23.8
Chicken liver, cooked, simmered, 3 oz 9.9
Oysters, Eastern canned, 3 oz 5.7
Beef liver, cooked, braised, 3 oz 5.6
Shrimp, cooked moist heat, 3 oz 2.6
Beef, composite of trimmed cuts, lean only, all grades, cooked, 3 oz 2.5
Sardines, Atlantic, canned in oil, drained solids with bone, 3 oz 2.5
Turkey, all classes, dark meat, roasted, 3 oz 2.0
Lamb, domestic, composite of trimmed retail cuts, separable lean only, choice, cooked, 3 oz 1.7
Fish, tuna, light, canned in water, drained solids, 3 oz 1.3
Chicken, broiler or fryer, dark meat, roasted, 3 oz 1.1
Turkey, all classes, light meat, roasted, 3 oz 1.1
Veal, composite of trimmed cuts, lean only, cooked, 3 oz 1.0
Chicken, broiler or fryer, breast, roasted, 3 oz 0.9
Pork, composite of trimmed cuts (leg, loin, shoulder), lean only, cooked, 3 oz 0.9
Fish, salmon, pink, cooked, 3 oz 0.8

Oatmeal, instant, fortified, cooked, 1 cup 14.0
Blackstrap molasses,b 2 tbsp 7.4
Tofu, raw, regular, 1⁄2 cup 6.7
Wheat germ, toasted, 1⁄2 cup 5.1
Ready-to-eat cereal, fortified at different levels, 1 cup _4.5 to 18
Soybeans, mature seeds, cooked, boiled, 1⁄2 cup 4.4
Apricots, dehydrated (low-moisture), uncooked, 1⁄2 cup 3.8
Sunflower seeds, dried, 1⁄2 cup 3.7
Lentils, mature seeds, cooked, 1⁄2 cup 3.3
Spinach, cooked, boiled, drained, 1⁄2 cup 3.2
Chickpeas, mature seeds, cooked, 1⁄2 cup 2.4
Prunes, dehydrated (low-moisture), uncooked, 1⁄2 cup 2.3
Lima beans, large, mature seeds, cooked, 1⁄2 cup 2.2
Navy beans, mature seeds, cooked, 1⁄2 cup 2.2
Kidney beans, all types, mature seeds, cooked, 1⁄2 cup 2.0

Molasses, 2 tbsp 1.9
Pinto beans, mature seeds, cooked, 1⁄2 cup 1.8
Raisins, seedless, packed, 1⁄2 cup 1.6