ASH® CLINICAL PRACTICE GUIDELINES

Diagnosis of Iron Deficiency

An Educational Slide Set

American Society of Hematology 2026 guidelines for diagnosis of iron deficiency

Slide set authors:
Dr. Thomas DeLoughery; Dr. Layla Van Doren; Dr. Michelle P. Zeller

Objectives

By the end of this session, you should be able to

1. Understand the recommended ferritin threshold for the diagnosis of iron deficiency in children, adults, and menstruating persons.

2. Understand the need to use transferrin saturation (TSAT) and ferritin for the diagnosis of iron deficiency in those with inflammation.

3. Understand when TSAT should be drawn for the most accurate assessment.

American Society of Hematology 2026 guidelines for diagnosis of iron deficiency

Jacquelyn M. Powers, Ming Y. Lim, Maureen Okam Achebe, Imo J. Akpan, Michael Auerbach, Megan C. Brown, Maria Paula Cardenas, Caroline Cromwell, Thomas DeLoughery, Robert E. Fleming, Martina Fraga, George Goshua, Paula James, Adam Lewkowitz, Jori May, Grace Nnadozie, Frances Ogunnaya, Guillermo J. Ruiz-Arguelles, Michelle Sholzberg, Layla Van Doren, Angela C. Weyand, Michelle P. Zeller, Muayad Azzam, Ali Choaib, Qais Hamarsha, Hassan Kawatharany, Jana Khawandi, Reem A. Mustafa American Society of Hematology 2026 guidelines for diagnosis of iron deficiency. Blood Adv. 2026. doi: 10.1182/bloodadvances.2025015950

How were these guidelines generated?

PANEL FORMATION

Guideline panel was formed following these key criteria:

- Balance of expertise (including disciplines beyond hematology)
- Close attention to minimization and management of conflicts of interest

CLINICAL QUESTIONS

5 **clinically-relevant questions** generated in **PICO format** (population, intervention, comparison, outcome)

Example: PICO question

Should serum ferritin cutoffs of ≤12 ng/mL or ≤20 ng/mL be used to diagnose iron deficiency, with or without anemia, in children aged 9 months to 4 years of age?

EVIDENCE SYNTHESIS

Evidence summary generated for each PICO question via systematic review of health effects plus:

- Resource use
- Feasibility
- Acceptability
- Equity
- Patient values and preferences

MAKING RECOMMENDATIONS

Recommendations made by guideline panel members based on evidence for all factors

ASH guidelines are reviewed annually by expert work groups convened by ASH. Resources, such as this slide set, derived from guidelines that require updating are removed from the ASH website.

How patients and clinicians should use these recommendations

	STRONG Recommendation		CONDITIONAL Recommendation	
	"The panel recommends…"	"The panel recommends against…"	"The panel suggests…"	"The panel suggests against…"
				
For patients	Most individuals would want the intervention.		A majority would want the intervention, but many would not.	
For clinicians	Most individuals should receive the intervention.		Different choices will be appropriate for different patients, depending on their values and preferences. Use **shared decision making**.	

PURPOSE

- Provide evidence-based recommendations on the diagnosis of ID

PRIMARY GOALS

- Review, critically appraise, and implement evidence-based recommendations
- Improve accurate identification of affected individuals & minimize harms of overdiagnosis
- Provide clinical decision support for shared decision-making better recognition of ID, identification and management of underlying etiology, improved counseling , and early initiation of iron therapy

TARGET AUDIENCE

- Hematologists, family physicians, pediatricians, obstetricians and gynecologists, internists, other clinicians and healthcare providers, decision-makers, and patients

IMPACT

- Local, national, or international initiatives that seek to enhance guidance on screening at-risk populations for ID
- Standardized clinical decision limits in laboratory reporting

Background on iron deficiency (ID)

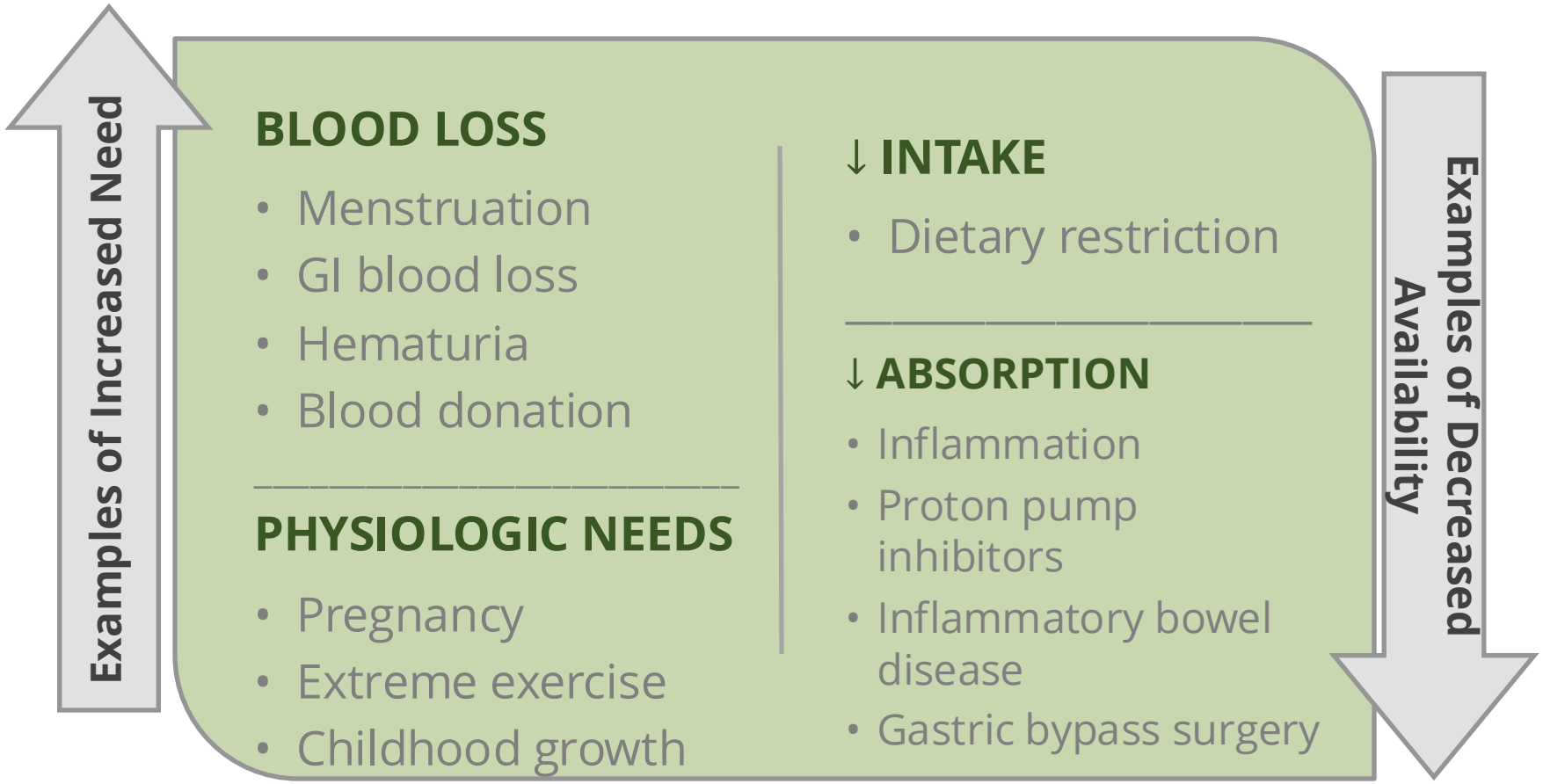
Iron is a critical micronutrient

- Erythropoiesis
- DNA replication
- Mitochondrial energy production
- Neurotransmitter synthesis

ID is common & widespread

- Negative impact on quality of life
- Underrecognized & untreated
- Disproportionate impact on individuals of economically disadvantaged backgrounds and/or within certain racial and ethnic minority groups

Etiology of iron deficiency



Pros & cons of **serum ferritin** testing in iron deficiency

PROS

- Widely available
- Accurate in populations without inflammation
- Best indirect measure of total body iron stores in some populations

CONS

- Inflammation impacts accuracy
- Lack of standardization across platforms
- Variability across assays, most pronounced a higher end of ferritin values

Case 1: Child with iron deficiency

A 7-year-old child has been lethargic and complaining that he can't keep up with his friends at recess. He is known to be very picky about food and only eats pizza, pasta and paneer. He does not like vegetables or meat, including chicken. His mother is worried about iron deficiency and wants to try an oral iron supplement. Unfortunately, he does NOT like pills either.

Case 1: Child with iron deficiency

The child agrees to blood work (with bribery of a new toy dinosaur and spy book)**. Hemoglobin is 10.4 g/dL** and **Ferritin is 15 ng/mL**. Which of the following best summarizes this child's laboratory investigations?

A. The child is non-anemic with adequate iron stores
B. The child is anemic with adequate iron stores
C. The child is anemic with iron deficiency
D. The child is non-anemic with iron deficiency

Recommendation

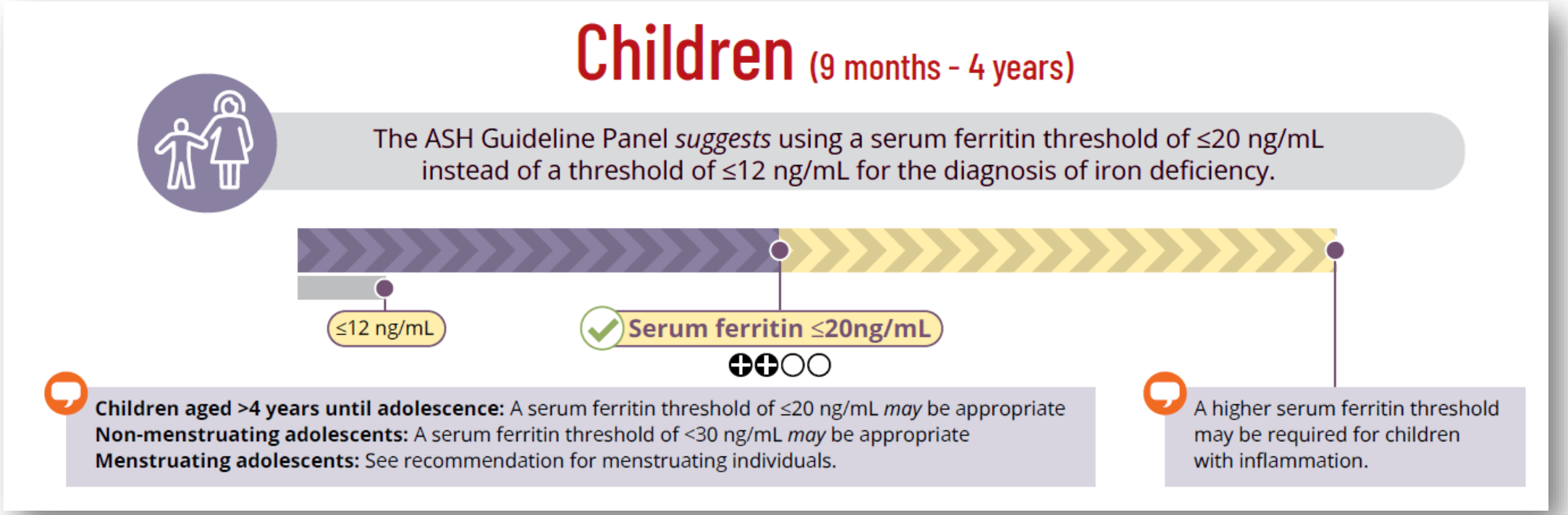


Image from guideline Visual Summary

Summary of Evidence

- Evidence for diagnostic test accuracy included one observational study (n=87) with a median age of 36.5 months (IQR 17.1 months).
- The study compared a serum ferritin threshold of <12 ng/mL versus <18 ng/mL (which was utilized to inform the threshold of 20 ng/mL)

Excluded Populations

Children were excluded from this recommendation if they have:

- **Inflammation**
- **Menstruation**
- **Pregnancy**

Systematic review

Prevalence of ID included 56 studies (n=121,394) with a pooled estimate for the global prevalence of iron deficiency in this population of 30%

Observational studies

Provided indirect evidence through estimation of physiologically based serum ferritin thresholds for this age group

Rationale

The panel prioritized a serum ferritin threshold that maximized sensitivity, prioritizing detection of as many iron-deficient children as possible who could benefit from treatment.

BENEFITS	• Prompt treatment to prevent progression to IDA given high iron demand in childhood • Improvement in hematologic parameters, cognition, and neurodevelopment
RISKS	• Incorrectly identified ID may lead to adverse effects from unnecessary iron supplementation • Intravenous iron, though less commonly used in this group, poses a small risk of infusion reactions
HARMS	• Children in malaria endemic areas may be more vulnerable to harm with unnecessary iron supplementation

Discussion & Caveats

Due to a lack of direct evidence, specific recommendations for children aged >4 years until adolescence (defined as age ≥11 years) and non-menstruating adolescents were not developed.

For children aged >4 years until adolescence

- **Serum ferritin threshold of ≤20 ng/mL** is appropriate for the diagnosis of ID by *indirectly applying evidence for young children.*

For non-menstruating adolescents

- **Serum ferritin threshold of ≤30 ng/mL** is appropriate for the diagnosis of ID by *indirectly applying evidence from menstruating adolescents & adult populations*.

Return to Case 1: Child with iron deficiency

The child agrees to blood work (with bribery of a new toy dinosaur and spy book)**. Hemoglobin is 10.4 g/dL** and **Ferritin is 15 ng/mL**. Which of the following best summarizes this child's laboratory investigations?

A. The child is non-anemic with adequate iron stores
B. The child is anemic with adequate iron stores
C. The child is anemic with iron deficiency
D. The child is non-anemic with iron deficiency

FUTURE RESEARCH NEEDS
Prevalence of ID in children aged >4 years until adolescence and in non-menstruating adolescents
Assessment of changes in serum ferritin and TSAT across all pediatric groups
Evaluation of outcomes related to screening at various serum ferritin thresholds and impact of treatment on such outcomes
Stakeholder engagement
Randomized clinical trials comparing health outcomes in children treated using different serum ferritin thresholds
Cost effectiveness studies
Exploration of health equity implications

Case 2 : Adult with inflammatory bowel disease

A 21-year-old man with a history of inflammatory bowel disease is seen in follow-up. He is being treated with adalimumab but is now having more symptoms, including abdominal pain and an increasing number of stools. He also notes extreme fatigue. A complete blood count shows a **hemoglobin of 9.5 g/dL**. His **MCV was 78 fL**. The remainder of the blood count showed a **WBC of 12,300 x 10^3/µL** and platelets of **585 x 10^3/µL**.

Case 2 : Adult with inflammatory bowel disease

For adults with anemia of inflammation what tests are suggested to evaluate for iron deficiency?

A. Serum ferritin
B. Transferrin saturation
C. Both serum ferritin and transferrin saturation

Case 2 : Adult with inflammatory bowel disease

In adults with the anemia of inflammation, when should the diagnosis of iron deficiency be considered?

A. Ferritin <100 ng/mL and TSAT <20%
B. Ferritin <200 ng/mL and TSAT <20%
C. Ferritin <100 ng/mL or TSAT <20%
D. Ferritin <200 ng/mL and TSAT <20%

Case 2 : Adult with inflammatory bowel disease

To be most accurate, when should a TSAT be drawn?

A. Any time; recent food consumption does not affect results
B. Wait one hour after supplements or an iron-containing meal
C. After fasting for 5-9 hours
D. Wait 12 hours after supplements or an iron-containing meal

Recommendation

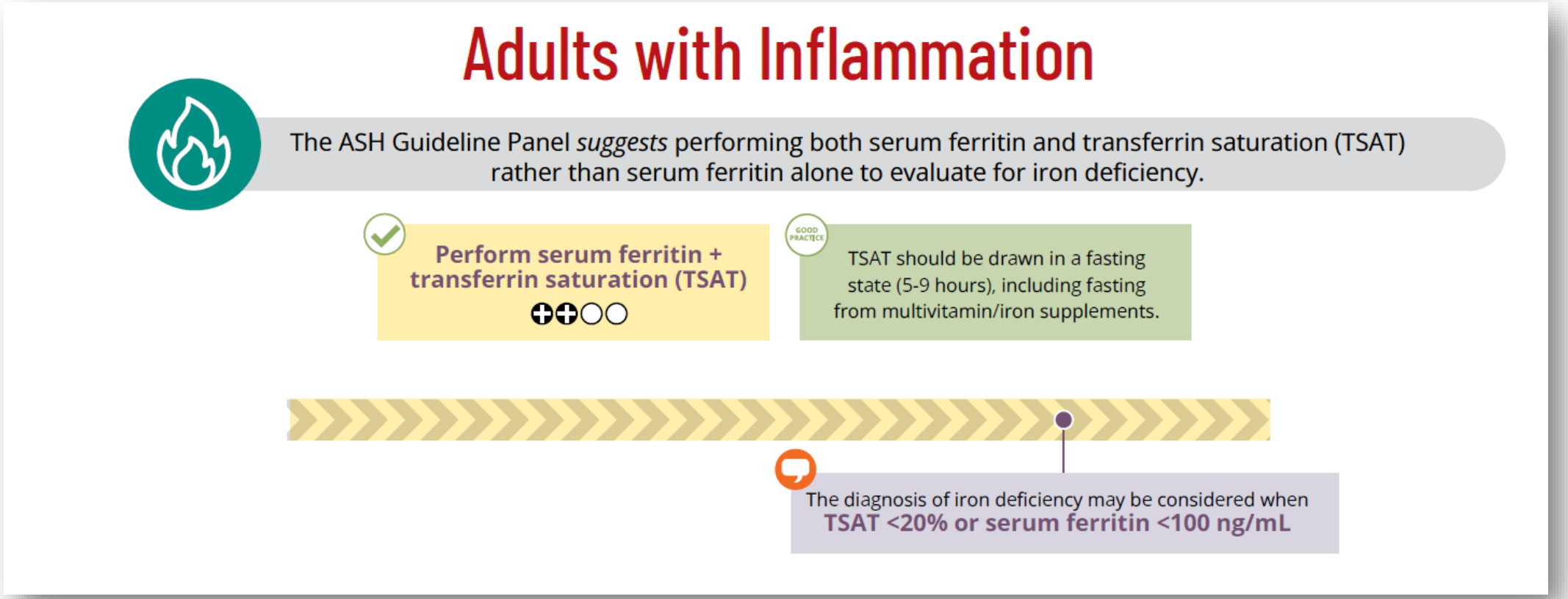


Image from guideline Visual Summary

Summary of Evidence

- Evidence for the diagnostic test accuracy included two comparative cross-sectional studies (n=67), one with heart failure patients & the other with chronic renal disease.
- For serum ferritin threshold <100 ng/mL and/or TSAT <20%, the pooled sensitivity and specificity were 0.91 and 0.70 compared to a ferritin alone of <100 ng/nL (0.38 and 0.88, respectively)

Ferritin vs TSAT

Both studies presented data on the sensitivity and specificity of serum ferritin alone versus serum ferritin combined with TSAT

Adjunctive Tests

Adjunctive tests such as CRP lack sufficient data to use as standalone tests, but may be helpful in the context of the individual's clinical condition and other laboratory values

Randomized Trials

The panel considered indirect evidence from 4 RCTs in individuals with ID and heart failure that defined iron deficiency as serum ferritin ≤100 ng/mL or TSAT <20%.

Rationale

Panel members considered serum ferritin alone often insufficient to assess iron status in adults with inflammation and supported using multiple iron parameters to inform diagnosis. The panel also recognized that inflammation exists on a continuum, limiting the ability of dichotomous thresholds to fully characterize its spectrum.

BENEFITS	Accurate diagnosis of iron deficiency in the setting of inflammation enables timely treatment, mitigating negative consequences such as worsening anemia and poorer outcomes related to the underlying comorbid condition and primary cause of inflammation.
RISKS	Incorrectly identified ID may lead to adverse effects from unnecessary iron supplementation. Intravenous iron poses a small risk reactions.
HARMS	The panel prioritized minimizing false negatives, considering the undesirable effects of serum ferritin ≤100 ng/mL alone as moderate, and the undesirable effects of serum ferritin ≤100 ng/mL or transferrin saturation <20% as likely small overall.

Discussion & Caveats

Due to low certainty in the evidence and very limited number of prospective trials providing indirect evidence, a recommendation regarding specific thresholds was not made.

Based on available evidence, **a serum ferritin of <100 ng/mL or TSAT <20%** may identify many individuals with concomitant iron deficiency in the setting of inflammation.

This will reduce untreated iron deficiency and its attendant negative health consequences.

Return to Case 2 : Adult with inflammatory bowel disease

For adults with anemia of inflammation what tests are suggested to evaluate for iron deficiency?

A. Serum ferritin

B. Transferrin saturation

C. Both serum ferritin and transferrin saturation

Return to Case 2 : Adult with inflammatory bowel disease

In adults with the anemia of inflammation, when should the diagnosis of iron deficiency be considered?

A. Ferritin <100 ng/mL and TSAT <20%

B. Ferritin <200 ng/mL and TSAT <20%

C. Ferritin <100 ng/mL or TSAT <20%

D. Ferritin <200 ng/mL and TSAT <20%

Return to Case 2: Adult with inflammatory bowel disease

To be most accurate, when should a TSAT be drawn?

A. Any time; recent food consumption does not affect results
B. Wait one hour after supplements or an iron-containing meal
C. After fasting for 5-9 hours
D. Wait 12 hours after supplements or an iron-containing meal

FUTURE RESEARCH NEEDS

Studies on various iron parameters including diagnostic hepcidin assays to inform diagnosis of iron deficiency in the setting of anemia of inflammation

Evaluation of the relationship between serum ferritin and TSAT in pediatrics, including optimal threshold for diagnosing iron deficiency in children with concomitant inflammation

Randomized clinical trials that examine different iron parameters for diagnosis of iron deficiency in individuals with inflammation, to guide treatment and assess patient-important outcomes

Case 3: Adult with iron deficiency

A patient was started on vedolizumab therapy for inflammatory bowel disease with an excellent response. At follow-up, all markers of inflammation are negative, and gastroenterology studies show no evidence of inflammation. However, he again reports severe fatigue and exercise limitations.

His complete blood count showed a **hemoglobin of 10.3 g/dL**. His **MCV was 75 fl**. The remainder of the blood count showed a **WBC of 3,500 x 10^3/µL** and platelets of **289 x 10^3/µL**.

Case 3: Adult with iron deficiency

In the adult population (excluding menstruating or pregnant individuals) what is the suggested ferritin threshold for diagnosis of iron deficiency?

A. 15 ng/mL
B. 30 ng/mL
C. 50 ng/mL
D. 100 ng/mL

Case 3: Adult with iron deficiency

Given that the patient is having symptoms, what is the suggested ferritin threshold for diagnosis of iron deficiency?

A. 15 ng/mL
B. 30 ng/mL
C. 50 ng/mL
D. 100 ng/mL

Recommendation

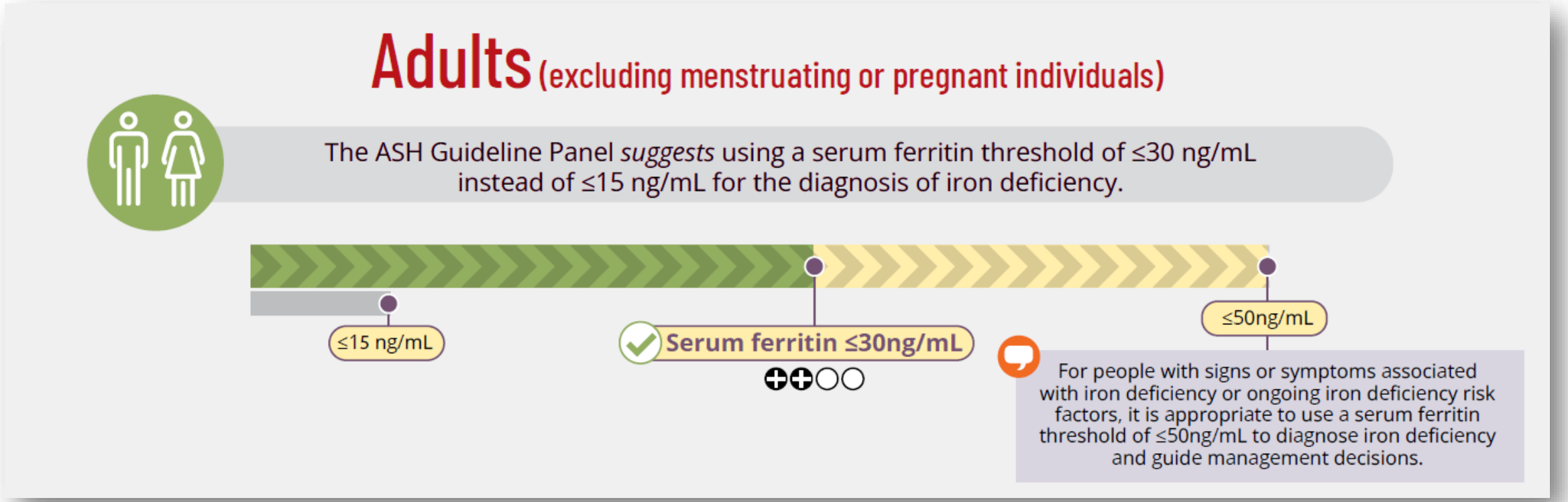


Image from guideline Visual Summary

Summary of Evidence

- Evidence for the diagnostic test accuracy included 19 cross-sectional studies.
- Pooled sensitivity & specify based on serum ferritin cut-off:
  - ≤15 ng/mL: 0.41 & 0.99, respectively
  - ≤30 ng/mL: 0.67 & 0.96, respectively
  - ≤50 ng/mL: 0.89 & 0.86, respectively

Exclusion Criteria

Adults were **excluded** from this recommendation if they have:

- **Menstruation**
- **Pregnancy**
- **Inflammation**

Systematic Review

Prevalence of iron deficiency in adults included 52 studies (n=154,819 individuals). Pooled estimate for the global prevalence of iron deficiency in this population was 16%.

Bone Marrow Reference

All but one of the included studies used serum as the index test and bone marrow examination as a reference standard to confirm the diagnosis of iron deficiency.

Rationale

The panel prioritized a serum ferritin threshold that maximized sensitivity, prioritizing detection of as many iron-deficient individuals as possible who could benefit from treatment.

BENEFITS	Accurate diagnosis allows prompt iron supplementation, preventing progression to iron deficiency anemia or, in those already anemic, progression to more severe anemia.
RISKS	Incorrectly identified ID may lead to adverse effects from unnecessary iron supplementation. Intravenous iron poses a small risk of reaction.
HARMS	The panel determined undesirable effects of the lowest serum ferritin threshold of ≤15 ng/mL were greater than those of the higher serum ferritin thresholds, given that a missed diagnosis of iron deficiency may result in prolongation of unaddressed negative health issues.

Discussion & Caveats

The guideline panel suggests a serum ferritin threshold of ≤30 ng/mL over a serum ferritin threshold of ≤15 ng/mL to diagnose iron deficiency in the general adult population (excluding menstruating or pregnant individuals), despite low certainty in the evidence.

The panel acknowledged a significant variation between patients with iron deficiency and their associated symptoms at different serum ferritin thresholds, which creates important certainty or variability in patient values.

This higher threshold will result in a higher proportion of adults with iron deficiency receiving a diagnosis and potentially benefitting from appropriate evaluation and management.

Return to Case 3: Adult with iron deficiency

In the adult population (excluding menstruating or pregnant individuals) what is the suggested ferritin threshold for diagnosis of iron deficiency?

A. 15 ng/mL
B. 30 ng/mL
C. 50 ng/mL
D. 100 ng/mL

Return to Case 3: Adult with iron deficiency

Given the patient is having symptoms, what is the suggested ferritin threshold for diagnosis of iron deficiency?

A. 15 ng/mL
B. 30 ng/mL
C. 50 ng/mL
D. 100 ng/mL

FUTURE RESEARCH NEEDS

Studies on an appropriate reference standard for iron deficiency and harmonization of serum ferritin laboratory testing
Randomized clinical trials comparing serum ferritin thresholds to guide iron treatment, using patient-important outcomes
Cost-effectiveness studies comparing diagnosis at different serum ferritin diagnostic thresholds
Stakeholder engagement to assess feasibility, acceptability, and health state utility implications of different serum ferritin thresholds
Exploration of health equity implications for different serum ferritin diagnostic thresholds in adults, including in individuals in malaria-endemic regions

Case 4: Menstruating individual with iron deficiency

A 34-year-old patient presents to their primary care physician for fatigue. They report fatigue for at least a year, but over the last several months have developed a craving for ice and a pins-and-needles sensation in their legs, specifically at night, with an inability to stop moving them (restless leg syndrome).

Case 4: Menstruating individual with iron deficiency

When asked about a change in menstruation pattern, they note an increase in menstrual flow over the past year. Menarche occurred at age 11, with periods lasting five days, and pad changes at most four times daily on the heaviest days. Over the last several months, pad changes have increased to every 1-1.5 hours with associated passage of clots, both of which are affecting their quality of life.

Case 4: Menstruating individual with iron deficiency

Lab notes indicate that **hemoglobin is 9.1g/dL** and **ferritin is 4ng/mL.** What ferritin threshold should be used to diagnose iron deficiency in menstruating individuals?

A. Ferritin ≤15 ng/mL

B. Ferritin ≤20 ng/mL

B. Ferritin ≤30 ng/mL

C. Ferritin ≤100 ng/mL

Recommendation

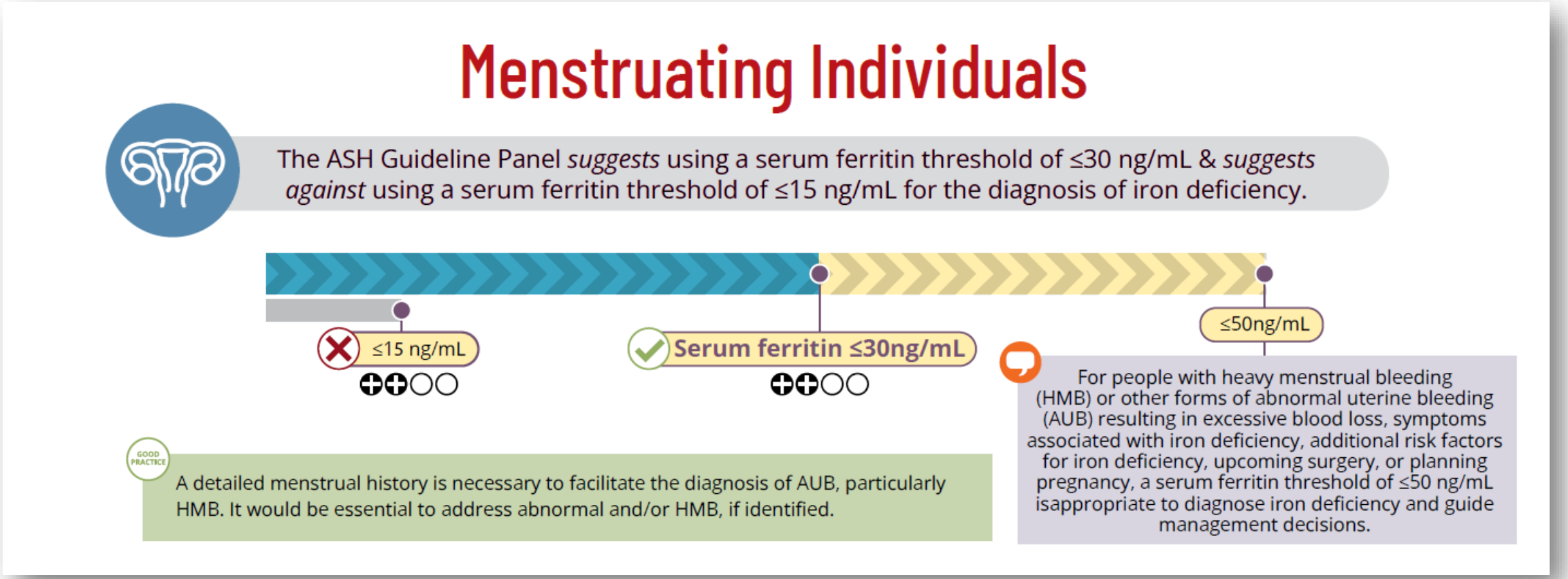


Image from guideline Visual Summary

Summary of Evidence

Direct Evidence	Physiologic & Observational Evidence	Functional & Patient-Important Outcomes
Examined test accuracy of serum ferritin cutoffs (≤15 ng/mL, ≤30 ng/mL, ≤50 ng/mL; n = 7,583) against marrow staining	Physiological effects of serum ferritin thresholds, recommendations from other organizations & the panel's expert consensus	22 studies (5 observational, 12 RCTs, 2 meta-analyses, 2 SRs, 1 Cochrane review) informed impact & treatment decisions on patient-important outcomes

Rationale

The panel prioritized a serum ferritin threshold that maximized sensitivity, prioritizing detection of as many iron-deficient individuals as possible who could benefit from treatment.

BENEFITS	Appropriate diagnosis and treatment will prevent progression of iron deficiency to anemia and the need for blood transfusion, and will improve patient-important outcomes (fatigue, cognition, physical performance, and health-related quality of life). Implementing a threshold of <30 ng/mL is likely feasible across income settings.
RISKS	Incorrectly identified iron deficiency, using a serum ferritin threshold of <50 ng/mL, may lead to adverse effects from unnecessary iron supplementation, although most individuals with heavy menstrual bleeding will likely have a serum ferritin far lower than this threshold. Intravenous iron poses a small risk of reactions.
HARMS	The undesirable effects of a serum ferritin threshold of ≤15 ng/mL were highest, due to the high proportion of this population with HMB.

Discussion & Caveats

Laboratories should shift from shift from reference intervals based on population-derived normative values to clinical decision limits for ferritin thresholds.

Laboratories should flag ferritin ≤30ng/mL as abnormal

- 80% (123/155) of providers surveyed accepted ≤30ng/mL as a practical diagnostic cutoff

Include a post-analytical comment that ≤50ng/mL may be appropriate for high-risk subgroups (i.e. heavy menstrual bleeding)

Return to Case 4: Menstruating individual with iron deficiency

Upon checking labs, it is noted that the **hemoglobin is 9.1g/dL** and **ferritin is 4ng/mL.** What ferritin threshold should be used to diagnose iron deficiency in menstruating individuals?

A. Ferritin ≤15 ng/mL

B. Ferritin ≤20 ng/mL

C. Ferritin ≤30 ng/mL

D. Ferritin ≤100 ng/mL

FUTURE RESEARCH NEEDS

Studies focused on an appropriate reference standard for iron deficiency and harmonization of serum ferritin laboratory testing across platforms
Evaluation of outcomes related to various serum ferritin diagnostic thresholds and impact of treatment on such outcomes
Randomized clinical trials comparing patient-important outcomes using different serum ferritin diagnostic thresholds to guide management
Stakeholder engagement
Cost effectiveness studies
Exploration of the health equity implications of different serum ferritin diagnostic thresholds

Case 5: Pregnant individual with iron deficiency

The patient in the preceding case becomes pregnant. They note fatigue, shortness of breath with exertion, worsening migraines, and PICA for ice. Labs show the following:

- WBC 10,000/uL (normal 4-10,000)
- Hemoglobin 10.5 g/dL (normal 14-17)
- MCV 80 fL (normal 80-95)
- Platelets 439,000/uL (normal 150-350,000)

Case 5: Pregnant individual with iron deficiency

In pregnant individuals what is the suggested ferritin threshold for diagnosis of iron deficiency?

A. Ferritin ≤15 ng/mL
B. Ferritin ≤75 ng/mL
B. Ferritin ≤30 ng/mL
C. Ferritin ≤100 ng/mL

Case 5: Pregnant individual with iron deficiency

Given that she is anemic and symptomatic, what might be an appropriate ferritin threshold to guide management in this patient?

A. 15 ng/mL
B. 50 ng/mL
C. 75 ng/mL
D. 100 ng/mL

Recommendation

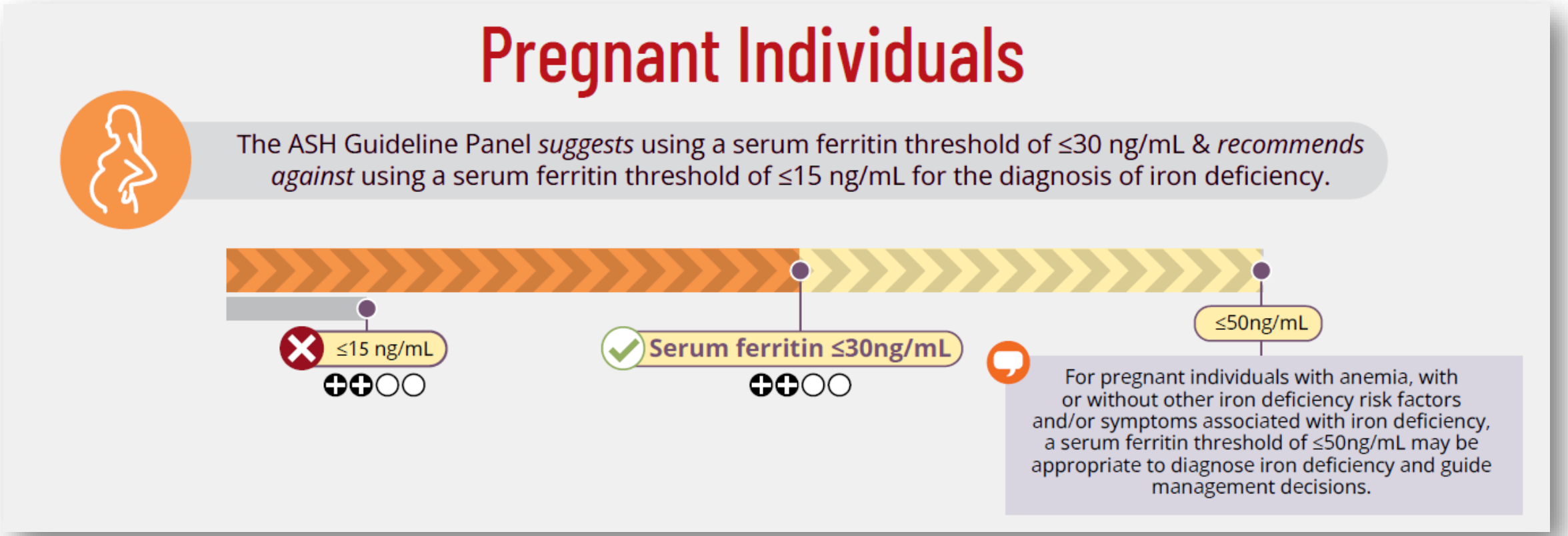


Image from guideline Visual Summary

Summary of Evidence

- The same data on diagnostic test accuracy were used to inform recommendations for adults, menstruating, and pregnant populations
- Systematic review of the prevalence of iron deficiency in pregnancy was performed

Direct Evidence

Examined test accuracy for serum ferritin cutoffs (≤15 ng/mL, ≤30 ng/mL, ≤50 ng/mL; n = 7,583) against marrow staining

Physiologic & Observational Evidence

- A systematic review on the prevalence of iron deficiency in pregnant individuals included 31 studies (n= 93,782 individuals)
- Pooled estimate for global prevalence was 37%

Functional & Patient-Important Outcomes

Improvement in both maternal and neonatal outcomes with iron supplementation

Rationale

Accurate diagnosis of iron deficiency during pregnancy allows prompt iron supplementation, preventing progression to iron deficiency anemia or, in those already anemic, progression to more severe anemia. The panel prioritized a serum ferritin threshold that maximized sensitivity, prioritizing detection of as many iron-deficient individuals as possible who could benefit from treatment.

BENEFITS	Identifying and treating iron deficiency is paramount in pregnant individuals given the high iron demands of pregnancy and delivery, and the associated improvement in maternal and neonatal outcomes with iron supplementation.
RISKS	Those incorrectly identified as iron deficient may experience adverse effects from unnecessary supplementation. Intravenous iron poses a small risk of reactions.
HARMS	The undesirable effects of a serum ferritin threshold of ≤15 ng/mL were highest, due to the high proportion of this population with HMB.

Discussion & Caveats

The panel supported the use of this highest threshold, ≤50 ng/mL, in pregnant individuals with concomitant anemia, with the goal of minimizing progression of iron deficiency anemia in later trimesters and reducing fetal reliance on maternal iron stores.

There were concerns about the feasibility of implementing this threshold

There was not unanimous support for the threshold of 50 ng/mL for pregnant individuals without anemia due to uncertain benefits and uncertain potential harms of treatment at this threshold.

Return to Case 5: Pregnant individual with iron deficiency

In pregnant individuals what is the suggested ferritin threshold for diagnosis of iron deficiency?

A. Ferritin ≤15 ng/mL
B. Ferritin ≤75 ng/mL
C. Ferritin ≤30 ng/mL
D. Ferritin ≤100 ng/mL

Return to Case 5: Pregnant individual with iron deficiency

Given that she is anemic and symptomatic, what might be an appropriate ferritin threshold to guide management in this patient?

A. Ferritin ≤15 ng/mL
B. Ferritin ≤50 ng/mL
C. Ferritin ≤75 ng/mL
D. Ferritin ≤100 ng/mL

FUTURE RESEARCH NEEDS

Examination of the relationship between serum ferritin and TSAT in pregnant individuals across trimesters
Evaluation of outcomes related to serum ferritin testing in pregnancy, including optimal timing (gestational age) for screening and treatment
Randomized clinical trials and prospective comparison of patient-important outcomes at various ferritin thresholds to guide iron therapy in pregnancy
Stakeholder engagement
Cost effectiveness studies
Exploration of the health equity implications of different serum ferritin diagnostic thresholds

In Summary: Back to our objectives

1. Understand the recommended ferritin threshold for the diagnosis of iron deficiency in children, adults, and menstruating persons.

2. Understand the need to use transferrin saturation (TSAT) and ferritin for the diagnosis of iron deficiency in those with inflammation.

3. Understand when TSAT should be drawn for the most accurate assessment

Acknowledgements

- ASH Guideline Panel team members
- Knowledge Synthesis team members
- Evidence-Based Practice and Impact Center, Department of Internal Medicine, University of Kansas Medical Center
- Authors of Diagnosis of Iron Deficiency slide set

See more about the **ASH iron deficiency guidelines** at hematology.org/IDA-guidelines

References: Children (9 months – 4 years)

1. Mei Z, Addo OY, Jefferds ME, Sharma AJ, Flores-Ayala RC, Brittenham GM. Physiologically based serum ferritin thresholds for iron deficiency in children and non-pregnant women: a US National Health and Nutrition Examination Surveys (NHANES) serial cross-sectional study. *Lancet Haematol*. Aug 2021;8(8):e572-e582. doi:10.1016/S2352-3026(21)00168-X
2. Jonker FA, Boele van Hensbroek M, Leenstra T, et al. Conventional and novel peripheral blood iron markers compared against bone marrow in Malawian children. *J Clin Pathol*. Aug 2014;67(8):717-23. doi:10.1136/jclinpath-2014-202291
3. Sezgin G, Monagle P, Loh TP, et al. Clinical thresholds for diagnosing iron deficiency: comparison of functional assessment of serum ferritin to population based centiles. *Sci Rep*. Oct 26 2020;10(1):18233. doi:10.1038/s41598-020-75435-5
4. Mukhtarova N, Ha B, Diamond CA, Plumb AJ, Kling PJ. Serum Ferritin Threshold for Iron Deficiency Screening in One-Year-Old Children. *J Pediatr*. Jun 2022;245:217-221. doi:10.1016/j.jpeds.2022.01.050
5. Addo OY, Mei Z, Jefferds MED, et al. Physiologically based serum ferritin thresholds for iron deficiency among women and children from Africa, Asia, Europe, and central America: a multinational comparative study. *Lancet Glob Health*. May 2025;13(5):e831-e842. doi:10.1016/S2214-109X(25)00009-9

References: Adults with inflammation

1. Nguyen LT, Buse JD, Baskin L, Sadrzadeh SMH, Naugler C. Influence of diurnal variation andfasting on serum iron concentrations in a community-based population. *Clin Biochem*. Dec 2017;50(18):1237-1242. doi:10.1016/j.clinbiochem.2017.09.018
2. Yancy CW, Jessup M, Bozkurt B, et al. 2017 ACC/AHA/HFSA Focused Update of the 2013 ACCF/AHA Guideline for the Management of Heart Failure: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Failure Society of America. *Circulation*. Aug 8 2017;136(6):e137-e161. doi:10.1161/CIR.0000000000000509
3. Kidney Disease: Improving Global Outcomes Anemia Work G. KDIGO 2026 Clinical Practice Guideline for the Management of Anemia in Chronic Kidney Disease (CKD). *Kidney Int*. Jan 2026;109(1S):S1-S99. doi:10.1016/j.kint.2025.06.006
4. Grote Beverborg N, Klip IT, Meijers WC, et al. Definition of Iron Deficiency Based on the Gold Standard of Bone Marrow Iron Staining in Heart Failure Patients. *Circ Heart Fail*. Feb 2018;11(2):e004519. doi:10.1161/CIRCHEARTFAILURE.117.004519
5. Kalantar-Zadeh K, Hoffken B, Wunsch H, Fink H, Kleiner M, Luft FC. Diagnosis of iron deficiency anemia in renal failure patients during the post-erythropoietin era. *Am J Kidney Dis*. Aug 1995;26(2):292-9. doi:10.1016/0272-6386(95)90649-5
6. Anker SD, Comin Colet J, Filippatos G, et al. Ferric carboxymaltose in patients with heart failure and iron deficiency. *N Engl J Med*. Dec 17 2009;361(25):2436-48. doi:10.1056/NEJMoa0908355
7. Ponikowski P, van Veldhuisen DJ, Comin-Colet J, et al. Beneficial effects of long-term intravenous iron therapy with ferric carboxymaltose in patients with symptomatic heart failure and iron deficiencydagger. *Eur Heart J*. Mar 14 2015;36(11):657-68. doi:10.1093/eurheartj/ehu385
8. Kalra PR, Cleland JGF, Petrie MC, et al. Intravenous ferric derisomaltose in patients with heart failure and iron deficiency in the UK (IRONMAN): an investigator-initiated, prospective, randomised, open-label, blinded-endpoint trial. *Lancet*. Dec 17 2022;400(10369):2199-2209. doi:10.1016/S0140-6736(22)02083-9
9. Ezekowitz JA, Mulder H, Mentz RJ, et al. Prediction and Longer-Term Outcomes of All-cause and Cardiovascular Mortality in the HEART-FID Trial. *J Card Fail*. Dec 2025;31(12):1822-1833. doi:10.1016/j.cardfail.2025.01.009

References: Adults (excluding menstruating persons, pregnancy & inflammation)

1. Falkingham M, Abdelhamid A, Curtis P, Fairweather-Tait S, Dye L, Hooper L. The effects of oral iron supplementation on cognition in older children and adults: a systematic review and meta-analysis. Nutr J. Jan 25 2010;9:4. doi:10.1186/1475-2891-9-4
2. Delaney CB, Eddy KT, Hartmann AS, Becker AE, Murray HB, Thomas JJ. Pica and rumination behavior among individuals seeking treatment for eating disorders or obesity. Int J Eat Disord. Mar 2015;48(2):238-48. doi:10.1002/eat.22279
3. Kung WM, Yuan SP, Lin MS, et al. Anemia and the Risk of Cognitive Impairment: An Updated Systematic Review and Meta-Analysis. Brain Sci. Jun 11 2021;11(6)doi:10.3390/brainsci11060777
4. Horner RD, Lackey CJ, Kolasa K, Warren K. Pica practices of pregnant women. J Am Diet Assoc. Jan 1991;91(1):34-8.
5. Shah AA, Donovan K, Seeley C, et al. Risk of Infection Associated With Administration of Intravenous Iron: A Systematic Review and Meta-analysis. JAMA Netw Open. Nov 1 2021;4(11):e2133935. doi:10.1001/jamanetworkopen.2021.33935
6. Tobiasson M, Alyass B, Soderlund S, Birgegard G. High prevalence of restless legs syndrome among patients with polycytemia vera treated with venesectio. Med Oncol. Mar 2010;27(1):105-7. doi:10.1007/s12032-009-9180-5
7. Houston BL, Hurrie D, Graham J, et al. Efficacy of iron supplementation on fatigue and physical capacity in non-anaemic iron-deficient adults: a systematic review of randomised controlled trials. BMJ Open. Apr 5 2018;8(4):e019240. doi:10.1136/bmjopen-2017-019240
8. Avni T, Bieber A, Grossman A, Green H, Leibovici L, Gafter-Gvili A. The safety of intravenous iron preparations: systematic review and meta-analysis. Mayo Clin Proc. Jan 2015;90(1):12-23. doi:10.1016/j.mayocp.2014.10.007
9. Van Doren L, Auerbach M. IV iron formulations and use in adults. Hematology Am Soc Hematol Educ Program. Dec 8 2023;2023(1):622-629. doi:10.1182/hematology.2023000495
10. Malireddi A, Abera M, Suresh SB, et al. Safety and Efficacy of Ferric Carboxymaltose for Iron Deficiency Anemia in Inflammatory Bowel Disease: A Systematic Review. Cureus. Dec 2024;16(12):e76065. doi:10.7759/cureus.76065
11. Phillips Z, Tang G, Thillaye-Kerr R, et al. Changing the serum ferritin lower limit of normal to a clinical decision limit: an acceptability survey. Blood. 2024;144(Supplement 1):7561.
12. Tang GH, Phillips Z, Poutanen S, et al. 'Raise the Bar', a Canadian intervention to combat disparities in the recognition and management of iron deficiency: Development of the intervention, feasibility and implementation. Br J Haematol. Nov 2025;207(5):2219-2223. doi:10.1111/bjh.70150

References: Menstruating persons

1. Bryant BJ, Yau YY, Arceo SM, Hopkins JA, Leitman SF. Ascertainment of iron deficiency and depletion in blood donors through screening questions for pica and restless legs syndrome. *Transfusion (Paris)*. 2013;53(8):1637-1644. doi:10.1111/trf.12061
2. Fernandez-Jimenez MC, Moreno G, Wright I, Shih PC, Vaquero MP, Remacha AF. Iron Deficiency in Menstruating Adult Women: Much More than Anemia. *Womens Health Rep New Rochelle N*. 2020;1(1):26-35. doi:10.1089/whr.2019.0011
3. Barton JC, Barton JC, Bertoli LF. Pica associated with iron deficiency or depletion: clinical and laboratory correlates in 262 non-pregnant adult outpatients. *BMC Blood Disord*. 2010;10:9. doi:10.1186/1471-2326-10-9
4. Khair S, Saidenberg E, Jamil A, Chen I. RISK FACTORS FOR BLOOD TRANSFUSION IN WOMEN UNDERGOING GYNAECOLOGICAL SURGERY. *J Obstet Gynaecol Can*. 2019;41(5):721. doi:10.1016/j.jogc.2019.02.196
5. Patterson AJ, Brown WJ, Powers JR, Roberts DC. Iron deficiency, general health and fatigue: results from the Australian Longitudinal Study on Women's Health. *Qual Life Res Int J Qual Life Asp Treat Care Rehabil*. 2000;9(5):491-497. doi:10.1023/a:1008978114650
6. Comín-Colet J, Enjuanes C, González G, et al. Iron deficiency is a key determinant of health-related quality of life in patients with chronic heart failure regardless of anaemia status. *Eur J Heart Fail*. 2013;15(10):1164-1172. doi:10.1093/eurjhf/hft083
7. Short V, Allen R, Earley CJ, et al. A randomized double-blind pilot study to evaluate the efficacy, safety, and tolerability of intravenous iron versus oral iron for the treatment of restless legs syndrome in patients with iron deficiency anemia. *Am J Hematol*. 2024;99(6):1077-1083. doi:10.1002/ajh.27290
8. Glynis A. A Double-blind, Placebo-controlled Study Evaluating the Efficacy of an Oral Supplement in Women with Self-perceived Thinning Hair. *J Clin Aesthetic Dermatol*. 2012;5(11):28-34.

References: Menstruating persons

9. DellaValle DM, Haas JD. Iron supplementation improves energetic efficiency in iron-depleted female rowers. *Med Sci Sports Exerc*. 2014;46(6):1204-1215. doi:10.1249/MSS.0000000000000208
10. Favrat B, Balck K, Breymann C, et al. Evaluation of a single dose of ferric carboxymaltose in fatigued, iron-deficient women--PREFER a randomized, placebo-controlled study. *PloS One*. 2014;9(4):e94217. doi:10.1371/journal.pone.0094217
11. Anker SD, Comin Colet J, Filippatos G, et al. Ferric carboxymaltose in patients with heart failure and iron deficiency. *N Engl J Med*. 2009;361(25):2436-2448. doi:10.1056/NEJMoa0908355
12. Toblli JE, Lombraña A, Duarte P, Di Gennaro F. Intravenous iron reduces NT-pro-brain natriuretic peptide in anemic patients with chronic heart failure and renal insufficiency. *J Am Coll Cardiol*. 2007;50(17):1657-1665. doi:10.1016/j.jacc.2007.07.029
13. Murray-Kolb LE, Beard JL. Iron treatment normalizes cognitive functioning in young women. *Am J Clin Nutr*. 2007;85(3):778-787. doi:10.1093/ajcn/85.3.778
14. Bruner AB, Joffe A, Duggan AK, Casella JF, Brandt J. Randomised study of cognitive effects of iron supplementation in non-anaemic iron-deficient adolescent girls. *Lancet Lond Engl*. 1996;348(9033):992-996. doi:10.1016/S0140-6736(96)02341-0
15. Krayenbuehl PA, Battegay E, Breymann C, Furrer J, Schulthess G. Intravenous iron for the treatment of fatigue in nonanemic, premenopausal women with low serum ferritin concentration. *Blood*. 2011;118(12):3222-3227. doi:10.1182/blood-2011-04-346304
16. Rezaeian A, Ghayour-Mobarhan M, Mazloum SR, Yavari M, Jafari SA. Effects of iron supplementation twice a week on attention score and haematologic measures in female high school students. *Singapore Med J*. 2014;55(11):587-592. doi:10.11622/smedj.2014156

References: Pregnant persons

1. Abdulrehman J, Lausman A, Tang GH, et al. Development and implementation of a quality improvement toolkit, iron deficiency in pregnancy with maternal iron optimization (IRON MOM): A before-and-after study. *PLoS Med*. Aug 2019;16(8):e1002867. doi:10.1371/journal.pmed.1002867
2. Georgieff MK. Iron deficiency in pregnancy. *Am J Obstet Gynecol*. Oct 2020;223(4):516-524. doi:10.1016/j.ajog.2020.03.006
3. Shao J, Lou J, Rao R, et al. Maternal serum ferritin concentration is positively associated with newborn iron stores in women with low ferritin status in late pregnancy. *J Nutr*. Nov 2012;142(11):2004-9. doi:10.3945/jn.112.162362
4. Pasricha SR, Moya E, Ataide R, et al. Ferric carboxymaltose for anemia in late pregnancy: a randomized controlled trial. *Nat Med*. Jan 2025;31(1):197-206. doi:10.1038/s41591-024-03385-w
5. .Ray JG, Davidson A, Berger H, Dayan N, Park AL. Haemoglobin levels in early pregnancy and severe maternal morbidity: population-based cohort study. *BJOG*. Aug 2020;127(9):1154-1164. doi:10.1111/1471-0528.16216