190.18 - Serum Iron Studies

Description

Serum iron studies are useful in the evaluation of disorders of iron metabolism, particularly iron deficiency and iron excess. Iron studies are best performed when the patient is fasting in the morning and has abstained from medications that may influence iron balance.

Iron deficiency is the most common cause of anemia. In young children on a milk diet, iron deficiency is often secondary to dietary deficiency. In adults, iron deficiency is usually the result of blood loss and is only occasionally secondary to dietary deficiency or malabsorption. Following major surgery the patient may have iron deficient erythropoietin for months or years if adequate iron replacement has not been given. High doses of supplemental iron may cause the serum iron to be elevated. Serum iron may also be altered in acute and chronic inflammatory and neoplastic conditions.

Total Iron Binding Capacity (TIBC) is an indirect measure of transferring, a protein that binds and transports iron. TIBC quantifies transferring by the amount of iron that it can bind. TIBC and transferring are elevated in iron deficiency, and with oral contraceptive use, and during pregnancy. TIBC and transferring may be decreased in malabsorption syndromes or in those affected with chronic diseases. The percent saturation represents the ratio of iron to the TIBC.

Assays for ferreting are also useful in assessing iron balance. Low concentrations are associated with iron deficiency and are highly specific. High concentrations are found in hemosiderosis (iron overload without associated tissue injury) and hemochromatosis (iron overload with associated tissue injury). In these conditions the iron is elevated, the TIBC and transferrin are within the reference range or low, and the percent saturation is elevated. Serum ferritin can be useful for both initiating and monitoring treatment for iron overload.

Transferrin and ferritin belong to a group of serum proteins known as acute phase reactants, and are increased in response to stressful or inflammatory conditions and also can occur with infection and tissue injury due to surgery, trauma or necrosis. Ferritin and iron/TIBC (or transferrin) are affected by acute and chronic inflammatory conditions, and in patients with these disorders, tests of iron status may be difficult to interpret.

HCPCS Codes (Alphanumeric, CPT© AMA)

Code	Description
82728	Ferritin
83540	Iron
83550	Iron Binding capacity
84466	Transferrin

ICD-9-CM Codes Covered by Medicare Program

The individual ICD-9-CM codes included in code ranges in the table below can be viewed on CMS' website under Downloads: Lab Code List. The link is: http://www.cms.gov/Medicare/Coverage/CoverageGenInfo/LabNCDsICD9.html

Code	Description
002.0-002.9	Typhoid and paratyphoid fevers
003.0-003.9	Other salmonella infections
006.0-006.9	Amebiasis
007.0-007.9	Other protozoal intestinal diseases
008.00	Intestinal infections due to Escherichia coli [E. coli], unspecified
008.01	Intestinal infections due to enteropathogenic E. coli
008.02	Intestinal infections due to enterotoxigenic E. coli
008.03	Intestinal infections due to enteroinvasive E. coli
008.04	Intestinal infections due to enterohemorrhagic E. coli
008.09	Intestinal infections due to other intestinal E. coli organisms
008.1	Intestinal infections due to Arizona group of paracolon bacilli
008.2	Intestinal infections due to Aerobacter aerogenes
008.3	Intestinal infections due to Proteus (mirabilis) (morganii)
008.41	Intestinal infections due to Staphylococcus
008.42	Intestinal infections due to Pseudomonas
008.43	Intestinal infections due to Campylobacter
008.44	Intestinal infections due to Yersinia enterocolitis
008.45	Intestinal infections due to Clostridium difficile
008.46	Intestinal infections due to other anaerobes
008.47	Intestinal infections due to other gram-negative bacteria
008.49	Intestinal infections due to other bacteria
008.5	Bacterial enteritis, unspecified
008.61	Enteritis due to Rotavirus
008.62	Enteritis due to Adenovirus
008.63	Enteritis due to Norwalk virus
008.64	Enteritis due to other small round viruses (SRVs)
008.65	Enteritis due to Calicivirus
008.66	Enteritis due to Astrovirus
008.67	Enteritis due to Enterovirus, not elsewhere classified
008.69	Other viral enteritis
008.8	Intestinal infections due to other organisms, not elsewhere classified
009.0-009.3	Ill-defined intestinal infections
011.50-011.56	Tuberculous bronchiectasis
014.00-014.86	Tuberculosis of intestines, peritoneum, and mesenteric glands
015.00-015.96	Tuberculosis of bones and joints
016.00-016.06	Tuberculosis of kidney

Code	Description
016.10-016.16	Tuberculosis of bladder
016.20-016.26	Tuberculosis of ureter
016.30-016.36	Tuberculosis of other urinary organs
042	Human Immunodeficiency virus (HIV) disease
070.0-070.9	Viral hepatitis
140.0-149.9	Malignant neoplasm of lip oral cavity and pharynx
150.0-159.9	Malignant neoplasm of digestive organs and peritoneum
160.0-165.9	Malignant neoplasm of respiratory and intrathoracic organs
170.0-176.9	Malignant neoplasm of bone, connective tissue, skin and breast
179-189.9	Malignant neoplasm of genitourinary organs
190.0-199.1	Malignant neoplasm of other and unspecified sites
199.2	Malignant neoplasm associated with transplanted organ
200.00-200.28	Lymphosarcoma and reticulosarcoma; Burkitt's tumor or lymphoma
200.30-200.38	Marginal zone lymphoma
200.40-200.48	Mantle cell lymphoma
200.50-200.58	Primary central nervous system lymphoma
200.60-200.68	Anaplastic large cell lymphoma
200.70-200.78	Large cell lymphoma
200.80-200.88	Malignant tumors of lymphatic tissue; other named variants
201.00-201.98	Hodgkin's disease
202.00-202.68	Other malignant neoplasms of lymphoid and histiocytic tissue
202.70-202.78	Peripheral T-cell lymphoma
202.80-202.98	Other lymphomas; other and unspecified malignant neoplasms of lymphoid and histiocytic tissue
203.00-203.01	Multiple myeloma, without mention of having achieved remission and in remission
203.02	Multiple myeloma, in relapse
203.10-203.11	Plasma cell leukemia, without mention of having achieved remission and in remission
203.12	Plasma cell leukemia, in relapse
203.80-203.81	Other immunoproliferative neoplasms, without mention of having achieved remission and in remission
203.82	Other immunoproliferative neoplasms, in relapse
204.00-204.01	Acute lymphoid leukemia, without mention of having achieved remission and in remission
204.02	Acute lymphoid leukemia, in relapse
204.10-204.11	Chronic lymphoid leukemia, without mention of having achieved remission and in remission
204.12	Chronic lymphoid leukemia, in relapse
204.20-204.21	Subacute lymphoid leukemia, without mention of having achieved remission and in remission
204.22	Subacute lymphoid leukemia, in relapse

Code	Description
204.80-204.81	Other lymphoid leukemia, without mention of having achieved remission and in remission
204.82	Other lymphoid leukemia, in relapse
204.90-204.91	Unspecified lymphoid leukemia, without mention of having achieved remission and in remission
204.92	Unspecified lymphoid leukemia, in relapse
205.00-205.01	Acute myeloid leukemia, without mention of having achieved remission and in remission
205.02	Acute myeloid leukemia, In relapse
205.10-205.11	Chronic myeloid leukemia, without mention of having achieved remission and in remission
205.12	Chronic myeloid leukemia, in relapse
205.20-205.21	Subacute myeloid leukemia, without mention of having achieved remission and in remission
205.22	Subacute myeloid leukemia, in relapse
205.30-205.31	Myeloid sarcoma, without mention of having achieved remission and in remission
205.32	Myeloid sarcoma, in relapse
205.80-205.81	Other myeloid leukemia, without mention of having achieved remission and in remission
205.82	Other myeloid leukemia, in relapse
205.90-205.91	Unspecified myeloid leukemia, without mention of having achieved remission and in remission
205.92	Unspecified myeloid leukemia, in relapse
206.00-206.01	Acute monocytic leukemia, without mention of having achieved remission and in remission
206.02	Acute monocytic leukemia, in relapse
206.10-206.11	Chronic monocytic leukemia, without mention of having achieved remission and in remission
206.12	Chronic monocytic leukemia, in relapse
206.20-206.21	Subacute monocytic leukemia, without mention of having achieved remission and in remission
206.22	Subacute monocytic leukemia, in relapse
206.80-206.81	Other monocytic leukemia, without mention of having achieved remission and in remission
206.82	Other monocytic leukemia, in relapse
206.90-206.91	Unspecified monocytic leukemia, without mention of having achieved remission and in remission
206.92	Unspecified monocytic leukemia, in relapse
207.00-207.01	Acute erythremia and erythroleukemia, without mention of having achieved remission and in remission
207.02	Acute erythremia and erythroleukemia, in relapse

Code	Description
207.10-207.11	Chronic erythremia, without mention of having achieved remission and in remission
207.12	Chronic erythremia, in relapse
207.20-207.21	Megakaryocytic leukemia, without mention of having achieved remission and in remission
207.22	Megakaryocytic leukemia, in relapse
207.80-207.81	Other specified leukemia, without mention of having achieved remission and in remission
207.82	Other specified leukemia, in relapse
208.00-208.01	Acute leukemia of unspecified cell type, without mention of having achieved remission and in remission
208.02	Acute leukemia of unspecified cell type, in relapse
208.10-208.11	Chronic leukemia of unspecified cell type, without mention of having achieved remission and in remission
208.12	Chronic leukemia of unspecified cell type, in relapse
208.20-208.21	Subacute leukemia of unspecified cell type, without mention of having achieved remission and in remission
208.22	Subacute leukemia of unspecified cell type, In relapse
208.80-208.81	Other leukemia of unspecified cell type, without mention of having achieved remission and in remission
208.82	Other leukemia of unspecified cell type, in relapse
208.90-208.91	Unspecified leukemia of unspecified cell type, without mention of having achieved remission and in remission
208.92	Unspecified leukemia of unspecified cell type, in relapse
209.00-209.03	Malignant carcinoid tumors of the small intestine
209.10-209.17	Malignant carcinoid tumors of the appendix, large intestine and rectum
209.20-209.27, 209.29	Malignant carcinoid tumors of other and unspecified sites
209.30	Malignant poorly differentiated neuroendocrine tumor, any site
209.31	Merkel cell carcinoma of the face
209.32	Merkel cell carcinoma of the scalp and neck
209.33	Merkel cell carcinoma of the upper limb
209.34	Merkel cell carcinoma of the lower limb
209.35	Merkel cell carcinoma of the trunk
209.36	Merkel cell carcinoma of other sites
209.40-209.43	Benign carcinoid tumors of the small intestine
209.50-209.57	Benign carcinoid tumors of the appendix, large intestine and rectum
209.60-209.67, 209.69	Benign carcinoid tumor of other and unspecified sites
209.70	Secondary neuroendocrine tumor, unspecified site
209.71	Secondary neuroendocrine tumor of distant lymph nodes
209.72	Secondary neuroendocrine tumor of liver
209.73	Secondary neuroendocrine tumor of bone

Code	Description
209.74	Secondary neuroendocrine tumor of peritoneum
209.75	Secondary Merkel cell carcinoma
209.79	Secondary neuroendocrine tumor of other sites
210.0-229.9	Benign neoplasms
230.0-233.2	Carcinoma in situ (various)
233.30	Carcinoma in situ, unspecified female genital organ
233.31	Carcinoma in situ, vagina
233.32	Carcinoma in situ, vulva
233.39	Carcinoma in situ, other female genital organ
233.4-234.9	Carcinoma in situ (various)
235.0-235.9	Neoplasms of uncertain behavior of digestive and respiratory systems
236.0-236.99	Neoplasms of uncertain behavior of genitourinary organs
237.0-237.72	Neoplasms of uncertain behavior of endocrine glands and nervous system
237.73	Schwannomatosis
237.79	Other neurofibromatosis
237.9	Other and uncertain parts of the nervous system
238.0-238.6	Neoplasms of uncertain behavior of other and unspecified sites and tissues
238.71-238.76	Neoplasms of other lymphatic and hematopoietic tissues
238.77	Post-transplant lymphoproliferative disorder (PTLD)
238.79, 238.8, 238.9	Neoplasms of uncertain behavior
239.0-239.7	Neoplasms of unspecified nature
239.81	Neoplasms of unspecified nature, retina and choroid
239.89	Neoplasms of unspecified nature, other specified sites
239.9	Neoplasms of unspecified nature, site unspecified
249.00-249.01	Secondary diabetes mellitus without mention of complication
249.10-249.11	Secondary diabetes mellitus with ketoacidosis
249.20-249.21	Secondary diabetes mellitus with hyperosmolarity
249.30-249.31	Secondary diabetes mellitus with other coma
249.40-249.41	Secondary diabetes mellitus with renal manifestations
249.50-249.51	Secondary diabetes mellitus with ophthalmic manifestations
249.60-249.61	Secondary diabetes mellitus with neurological manifestations
249.70-249.71	Secondary diabetes mellitus with peripheral circulatory disorders
249.80-249.81	Secondary diabetes mellitus with other specified manifestations
249.90-249.91	Secondary diabetes mellitus with unspecified complication
250.00-250.93	Diabetes mellitus
253.2	Panhypopituitarism
253.7	Iatrogenic pituitary disorders
253.8	Other disorders of the pituitary and other syndromes of diencephalohypophysial origin

Code	Description
256.31-256.39	Other ovarian failure
257.2	Other testicular hypofunction
260	Kwashiorkor
261	Nutritional marasmus
262	Other severe protein-calorie malnutrition
263.0-263.9	Other and unspecified protein-calorie malnutrition
275.01	Hereditary hemochromatosis
275.02	Hemochromatosis due to repeated red blood cell transfusions
275.03	Other hemochromatosis
275.09	Other disorders of iron metabolism
277.1	Disorders of porphyrin metabolism
280.0-280.9	Iron deficiency anemias
281.0-281.9	Other deficiency anemias
282.40-282.49	Thalassemias
282.60-282.63	Sickle-cell diseases
282.64	Sickle-cell/Hgb C disease with crisis
282.68	Other sickle-cell disease without crisis
282.69	Other sickle-cell disease with crisis
285.0	Sideroblastic anemia (includes hemochromatosis with refractory anemia)
285.1	Acute post-hemorrhagic anemia
285.3	Antineoplastic chemotherapy induced anemia
285.21	Anemia in chronic kidney disease
285.22	Anemia in neoplastic disease
285.29	Anemia of other chronic disease
285.9	Anemia, unspecified
286.0-286.9	Coagulation defects (congenital factor disorders)
287.0-287.39	Allergic purpura; qualitative platelet defects; other non-thrombocytopenic purpuras; primary thrombocytopenia
287.41	Posttransfusion purpura
287.49	Other secondary thrombocytopenia
287.5-287.9	Thrombocytopenia, unspecified; other specified and unspecified hemorrhagic conditions
289.52	Splenic sequestration
306.4	Physiological malfunction arising from mental factors, gastrointestinal
307.1	Anorexia nervosa
307.50-307.59	Other and unspecified disorders of eating
403.01	Hypertensive chronic kidney disease, malignant, with chronic kidney disease stage V or end stage renal
403.11	Hypertensive chronic kidney disease, benign, with chronic kidney disease stage V or end stage renal disease

Code	Description
403.91	Hypertensive chronic kidney disease, unspecified, with chronic kidney disease stage V or end stage renal disease
404.02	Hypertensive heart & chronic kidney disease, malignant, without heart failure & with chronic kidney disease stage V or end stage renal disease
404.03	Hypertensive heart & chronic kidney disease, malignant, with heart failure & with chronic kidney disease stage Or end stage renal disease
404.12	Hypertensive heart & chronic kidney disease, benign, without heart failure & with chronic kidney disease stage Or end stage renal disease
404.13	Hypertensive heart and chronic kidney disease, benign, with heart failure & chronic kidney disease stage V or end stage renal disease
404.92	Hypertensive heart and chronic kidney disease, unspecified, without heart failure & with chronic kidney disease stage V or end stage renal disease
404.93	Hypertensive heart and chronic kidney disease, unspecified, with heart failure and chronic kidney disease stage V or end stage renal disease
425.4	Other primary cardiomyopathies
425.5	Alcoholic cardiomyopathy
425.7	Nutritional and metabolic cardiomyopathy
425.8	Cardiomyopathy in other diseases classified elsewhere
425.9	Secondary cardiomyopathy, unspecified
426.0-426.81, 426.89, 426.9	Conduction disorders
427.0-427.9	Cardiac dysrhythmias
428.0-428.9	Heart failure
530.7	Gastroesophageal laceration-hemorrhage syndrome
530.82	Esophageal hemorrhage
531.00-531.91	Gastric ulcer
532.00-532.91	Duodenal ulcer
533.00-533.91	Peptic ulcer, site unspecified
534.00-534.91	Gastrojejunal ulcer
535.00-535.61	Gastritis and duodenitis
535.70	Eosinophilic gastritis, without mention of obstruction
535.71	Eosinophilic gastritis, with obstruction
536.0-536.9	Disorders of function of stomach
537.83	Angiodysplasia of stomach and duodenum with hemorrhage
537.84	Dieulafoy lesion (hemorrhagic) of stomach and duodenum
555.0-555.9	Regional enteritis
556.0-556.9	Ulcerative colitis
557.0	Acute vascular insufficiency of intestine
557.1	Chronic vascular insufficiency of intestine
562.02	Diverticulosis of small intestine with hemorrhage
562.03	Diverticulitis of small intestine with hemorrhage
562.12	Diverticulosis of colon with hemorrhage

Code	Description
562.13	Diverticulitis of colon with hemorrhage
569.3	Hemorrhage of rectum and anus
569.85	Angiodysplasia of intestine with hemorrhage
569.86	Dieulafoy lesion (hemorrhagic) of intestine
569.87	Vomiting of fecal matter
570	Acute and subacute necrosis of liver
571.0-571.9	Chronic liver disease and cirrhosis
572.0	Abscess of liver
572.1	Portal pyemia
572.2	Hepatic encephalopathy
572.3	Portal hypertension
572.4	Hepatorenal syndrome
572.8	Other sequelae of chronic liver disease
573.0-573.9	Other disorders of liver
578.0-578.9	Gastrointestinal hemorrhage
579.0-579.3	Intestinal malabsorption
579.8-579.9	Other specified and unspecified intestinal malabsorption
581.0-581.9	Nephrotic syndrome
585.4-585.9	Chronic kidney disease
586	Renal failure, unspecified
608.3	Atrophy of testis
626.0-626.9	Disorders of menstruation and other abnormal bleeding from female genital tract
627.0	Premenopausal menorrhagia
627.1	Postmenopausal bleeding
648.20-648.24	Other current conditions in the mother classifiable elsewhere, but complicating pregnancy, childbirth, or the puerperium: Anemia
698.0-698.9	Pruritus and related conditions
704.00-704.09	Alopecia
709.00-709.09	Dyschromia
713.0	Arthropathy associated with other endocrine and metabolic disorders
716.40-716.99	Other and unspecified arthropathies
719.40-719.49	Pain in joint
773.2	Hemolytic disease due to other and unspecified isoimmunization
773.3	Hydrops fetalis due to isoimmunization
773.4	Kernicterus due to isoimmunization
773.5	Late anemia due to isoimmunization
783.9	Other symptoms concerning nutrition, metabolism and development
790.01-790.09	Abnormality of red blood cells
790.4	Nonspecific elevation of levels of transaminase or lactic acid dehydrogenase [LDH]

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Code	Description
790.5	Other nonspecific abnormal serum enzyme levels
790.6	Other abnormal blood chemistry
799.4	Cachexia
964.0	Poisoning by agents primarily affecting blood constituents, iron compounds
984.0-984.9	Toxic effect of lead and its compounds (including fumes)
996.85	Complications of transplanted organ, bone marrow
999.80	Transfusion reaction, unspecified
999.83	Hemolytic transfusion reaction, incompatibility unspecified
999.84	Acute hemolytic transfusion reaction, incompatibility unspecified
999.85	Delayed hemolytic transfusion reaction, incompatibility unspecified
999.89	Other transfusion reaction
V08	Asymptomatic HIV infection
V12.1	Personal history of nutritional deficiency
V12.3	Personal history of diseases of blood and blood forming organs
V15.1	Personal history of surgery to heart and great vessels
V15.21	Personal history of undergoing in utero procedure during pregnancy
V15.22	Personal history of undergoing in utero procedure while a fetus
V15.29	Surgery to other organs
V43.21-V43.22	Heart replaced by other means
V43.3	Heart valve replaced by other means
V43.4	Blood vessel replaced by other means
V43.60	Unspecified joint replaced by other means
V56.0	Extracorporeal dialysis
V56.8	Other dialysis

Indications

1. Ferritin, iron and either iron binding capacity or transferrin are useful in the differential diagnosis of iron deficiency, anemia, and for iron overload conditions.

   a. The following presentations are examples that may support the use of these studies for evaluating iron deficiency:

- Certain abnormal blood count values (i.e., decreased Mean Corpuscular Volume (MCV), decreased hemoglobin/hematocrit when the MCV is low or normal, or increased Red cell Distribution Width (RDW) and low or normal MCV)
- Abnormal appetite (pica)
- Acute or chronic gastrointestinal blood loss
- Hematuria
- Menorrhagia
- Malabsorption
- Status post-gastrectomy
- Status post-gastrojejunostomy

- Malnutrition
- Preoperative autologous blood collection(s)
- Malignant, chronic inflammatory and infectious conditions associated with anemia which may present in a similar manner to iron deficiency anemia
- Following a significant surgical procedure where blood loss had occurred and had not been repaired with adequate iron replacement.

b. The following presentations are examples that may support the use of these studies for evaluating iron overload:

- Chronic Hepatitis
- Diabetes
- Hyperpigmentation of skin
- Arthropathy
- Cirrhosis
- Hypogonadism
- Hypopituitarism
- Impaired porphyrin metabolism
- Heart failure
- Multiple transfusions
- Sideroblastic anemia
- Thalassemia major
- Cardiomyopathy, cardiac dysrhythmias and conduction disturbances

2. Follow-up testing may be appropriate to monitor response to therapy, e.g., oral or parenteral iron, ascorbic acid, and erythropoietin.
3. Iron studies may be appropriate in patients after treatment for other nutritional deficiency anemias, such as folate and vitamin B12, because iron deficiency may not be revealed until such a nutritional deficiency is treated.
4. Serum ferritin may be appropriate for monitoring iron status in patients with chronic renal disease with or without dialysis.
5. Serum iron may also be indicated for evaluation of toxic effects of iron and other metals (e.g., nickel, cadmium, aluminum, and lead) whether due to accidental, intentional exposure or metabolic causes.

Limitations

1. Iron studies should be used to diagnose and manage iron deficiency or iron overload states. These tests are not to be used solely to assess acute phase reactants where disease management will be unchanged. For example, infections and malignancies are associated with elevations in acute phase reactants such as ferritin, and decreases in serum iron concentration, but iron studies would only be medically necessary if results of iron studies might alter the management of the primary diagnosis or might warrant direct treatment of an iron disorder or condition.

2. If a normal serum ferritin level is documented, repeat testing would not ordinarily be medically necessary unless there is a change in the patient's condition, and ferritin assessment is needed for the ongoing management of the patient. For example, a patient presents with new onset insulin-dependent diabetes mellitus and has a serum ferritin level performed for the suspicion of hemochromatosis. If the ferritin level is normal, the repeat ferritin for diabetes mellitus would not be medically necessary.
3. When an End Stage Renal Disease (ESRD) patient is tested for ferritin, testing more frequently than every three months requires documentation of medical necessity (e.g., other than chronic renal failure or renal failure, unspecified).
4. It is ordinarily not necessary to measure both transferrin and TIBC at the same time because TIBC is an indirect measure of transferrin. When transferrin is ordered as part of the nutritional assessment for evaluating malnutrition, it is not necessary to order other iron studies unless iron deficiency or iron overload is suspected as well.
5. It is not ordinarily necessary to measure either iron/TIBC (or transferrin) and ferritin in initial patient testing. If clinically indicated after evaluation of the initial iron studies, it may be appropriate to perform additional iron studies either on the initial specimen or on a subsequently obtained specimen. After a diagnosis of iron deficiency or iron overload is established, either iron/TIBC (or transferrin) or ferritin may be medically necessary for monitoring, but not both.
6. It would not ordinarily be considered medically necessary to do a ferritin as a preoperative test except in the presence of anemia or recent autologous blood collections prior to the surgery.

ICD-9-CM Codes That Do Not Support Medical Necessity

Any ICD-9-CM code not listed in either of the ICD-9-CM covered or non-covered sections.

Sources of Information

CDC. Recommendations to prevent and control iron deficiency in the United States. MMWR 1998; 47(RR-3):1-29.

Powell LW, George DK, McDonnell SM, Kowdley KV. Diagnosis of hemochromatosis. Ann.Intern.Med. 1998;129:925-931.

Spiekerman AM. Proteins used in nutritional assessment. Clin.Lab.Med. 1993;13:353-369.

Wallach JB. Handbook of Interpretation of Diagnostic Tests. Lippincott-Raven Publishers (Philadelphia) 1998, pp. 170-180.

Van Walraven C, Goel V, Chan B. Effect of Population-Based Interventions on Laboratory Utilization. JAMA. 1998; 280:2028-2033.

Guyatt GH, Patterson C, Ali M, Singer J, Levine M, Turpie I, Meyer R. Diagnosis of Iron-Deficiency Anemia in the Elderly. AmJMed. 1990; 88:205-209.

Burns ER, Goldberg SN, Lawrence C, Wenz B. AJCP. 1990; 3: 240-245.

Burns ER, et al. Brief Clinical Observations. AmJMed. 1991; 90:653-654.

Yang Q, et al. Hemochromatosis-associated Mortality in the United States from 1979 to 1992: An Analysis of Multiple-Cause Mortality Data. AnIntMed.1998;129:946-953.