# Recording Tumor Markers
## in Collaborative Staging System Site-Specific Factors

**IMPORTANT NOTES**

- This information is intended as a guide to help the registrar locate the test in the medical record and to identify which lab test/tumor marker results should be coded in the Collaborative Staging site-specific factors.
- The supplemental normal reference range and notes are included as background information only and should not be used by the registrar to assign a code of normal or elevated. The results of many tumor markers and laboratory tests vary according to the laboratory conducting the test. Whenever possible, code the clinician's/pathologist's interpretation of the lab test. In the absence of a physician's interpretation of the test, if the reference range for the lab is listed on the test report, the registrar can use that information to assign the appropriate code.
- In the "Record" section, only the codes pertaining to coding the test are listed. Refer to the Collaborative Staging Manual for additional code choices (000, 080, 999) when the test results are not in the medical record.

**RESOURCES**

http://www.fpnotebook.com/index.htm, Family Practice Notebook
http://www.labtestsonline.org, American Association for Clinical Chemistry
http://www.medlineplus.gov, MedLine dictionary, National Library of Medicine and NIH
http://medal.org, Medical Algorithms website

**Collaborative Staging Task Force Training Materials effective with version 01.02.00, 04/2005**
Prepared by April Fritz, RHIT, CTR. Reviewed and approved by the CS Task Force and its medical consultants.

# COLON, RECTOSIGMOID AND RECTUM

**CEA** (SSF1)

**Other names** Carcinoembryonic antigen

**Record** the clinician's interpretation of the highest value prior to treatment, based on the reference range used by the lab.

010 Positive/elevated
020 Negative/normal
030 Borderline; undetermined whether positive or negative

**Normal reference range**

Nonsmoker: < 2.5 ng/ml (SI: < 2.5 μg/L)
Smoker: < 5 ng/ml (SI: < 5 μg/L)

**Notes** Not a screening test. Not specific to colorectal cancer. Also raised by biliary obstruction, alcoholic hepatitis, heavy smoking. Unlikely to be benign if > 10 ng/ml. Distant metastasis most likely if > 100 ng/ml. After obtaining a baseline value prior to treatment, a lower result on a subsequent test indicates a response to treatment and an increasing value indicates possible recurrence.
SI Conversion: 1 μg/L = 1 ng/ml
1 μg/ml = 1 mg/L
Micrograms (μg) per liter may be printed as ug/L.

# LIVER

**AFP** (SSF1)

**Other names** αFP, aFP, Alpha Fetoprotein, Alpha-fetoprotein, α–fetoprotein

**Record** the clinician's interpretation of the highest value prior to treatment, based on the reference range used by the lab.

010 Positive/elevated
020 Negative/normal
030 Borderline; undetermined whether positive or negative

**Normal reference range**

Men and non-pregnant women:
< 5.4 ng/ml (SI: < 5.4 μg/L)

**Notes** More useful in monitoring response to therapy than for diagnosis. Unlikely to be benign if AFP > 500 ng/ml. Usually due to hepatocellular carcinoma when > 1,000 ng/ml. Also a tumor marker for testicular cancer.
SI Conversion: 1 μg/L = 1 ng/ml.
1 ng of AFP is approximately equal to 1 mIU.
Micrograms (μg) per liter may be printed as ug/L.

**What does SI mean?**

SI is the French abbreviation for International System, standard units of measure (meter, kilogram, second). Most SI values are based on the kilogram and the liter. A nanogram (ng) is one-thousandth of a microgram (μg). A milliliter (ml) is one-thousandth of a liter. So a lab value expressed in μg/L is equivalent to the same value expressed in ng/ml.
Some lab values, such as hormone levels, are recorded in International Units per Liter (IU/L). This is equivalent to mIU/mL. The equivalence of mIU to ng varies according to what is measured.

## MELANOMA

**LDH** (SSF4)

**Other names** LD, Lactate dehydrogenase, lactase dehydrogenase, lactic acid dehydrogenase.

**Record** the range of the clinician's interpretation of the highest value prior to treatment, based on the reference range used by the lab.

| | |
|---|---|
| 002 | Within normal limits |
| 004 | Range 1: less than 1.5 times the upper limit of normal for that lab; Stated as elevated, NOS |
| 005 | Range 2: 1.5 to 10 times the upper limit of normal for that lab |
| 006 | Range 3: more than 10 times the upper limit of normal for that lab |

**Normal reference range** varies widely by laboratory, patient age, and the units of measurement. Examples of reference range lab values:

| | | |
|---|---|---|
| Lab A | Total LDH | 71 – 207 U/L |
| Lab B | Total LDH | 300 – 600 U/L |
| Lab C | Total LDH | 45 – 90 U/L |
| Lab D | Total LDH | 150 – 250 U/L |

**Notes** Not a screening test; not diagnostic of melanoma. Elevated LDH is an indirect indication of damage to an organ, such as metastatic involvement or a myocardial infarction. LDH may be included in a Liver or Hepatic Panel/ Profile, a Cardiac Panel, or a general metabolic panel of tests. For melanoma, an abnormal value (SSF4 codes 004-006) must be documented by at least two separate tests obtained more than 24 hours apart, according to the *AJCC Cancer Staging Manual*. Total LDH should be the test value that is coded, but five fractions of LDH measure tissue specific cellular damage: LD1 and LD2: heart, red blood cells and kidneys; LD3: lung; LD4 and LD5: liver, skin, skeletal muscles.

## BREAST

**ERA** (SSF1)

**Other names** ER, Estrogen Receptor Assay, Estrogen Receptor Status, Estradiol Receptor, Estrogen Binding Protein, hormone receptor status (with PRA).

**Record** the pathologist's interpretation of the assay value from the most representative tumor specimen if assay is performed on more than one specimen.

| | |
|---|---|
| 010 | Positive/elevated |
| 020 | Negative/normal |
| 030 | Borderline; undetermined whether positive or negative |

**Normal reference range** varies by the laboratory method of expressing the results.

*Immunoperoxidase staining of tumor cell nuclei:*

| | |
|---|---|
| < 5% | negative |
| 5 – 19% | borderline; also expressed as 1+ or + |
| ≥ 20% | positive; 20 – 80% also expressed as 2+ or ++ |
| > 80% | also expressed as 3+ or +++ |

*Femtomoles (fmol/mg) of cytosol protein per milligram*

| | |
|---|---|
| < 3 | negative |
| 3-10 | borderline |
| > 10 | positive |
| > 100 | highly positive |

**Notes** See also PRA. ER positivity is a favorable prognostic factor in breast and endometrial carcinoma and meningioma. Positive results indicate a favorable response to endocrine therapy. Combined ER and PR positivity is associated with increased response to antiestrogen therapies.

## BREAST

**PRA** (SSF2)

**Other names** PR, PgR, Progesterone Receptor Assay, Progesterone Receptor Status, hormone receptor status (with ERA).

**Record** the pathologist's interpretation of the assay value from the most representative specimen if assay is performed on more than one specimen.

| | |
|---|---|
| 010 | Positive/elevated |
| 020 | Negative/normal |
| 030 | Borderline; undetermined whether positive or negative |

**Normal reference range** varies by the laboratory method of expressing the results.

*Immunoperoxidase staining of tumor cell nuclei:*

| | |
|---|---|
| < 5% | negative |
| 5 – 19% | borderline; also expressed as 1+ or + |
| ≥ 20% | positive; 20 – 80% also expressed as 2+ or ++ |
| > 80% | also expressed as 3+ or +++ |

*Femtomoles (fmol/mg) of cytosol protein per milligram*

| | |
|---|---|
| < 5 | negative |
| 5-10 | borderline |
| > 10 | positive |
| > 100 | highly positive |

**Notes** See also ERA. PR positivity is a favorable prognostic factor in breast and endometrial carcinoma and meningioma. Positive results indicate a favorable response to endocrine therapy. Combined ER and PR positivity is associated with increased response to antiestrogen therapies.

# OVARY

**CA-125** (SSF1)

**Other names** Cancer Antigen 125, CA 125, CA125, Carbohydrate Antigen 125

**Record** the clinician's interpretation of the highest value prior to treatment, based on the reference range used by the lab.

010 Positive/elevated
020 Negative/normal
030 Borderline; undetermined whether positive or negative

**Normal reference range** < 35 units/ml. Normal value does not rule out cancer.

**Notes** Not a screening test. Not specific to ovarian cancer. Any value over 35 is highly correlated with cancer. Borderline up to 65 u/ml. Value > 200 unlikely to be due to a benign condition. CA-125 monitors for success of treatment and recurrence.
After obtaining a baseline value prior to treatment, a lower result on a subsequent test indicates a response to treatment, and an increasing value indicates possible recurrence.

# PROSTATE

**PSA Value** (SSF1)

**Other names** Prostate specific antigen, serum PSA, total PSA

**Record** the highest PSA value prior to diagnostic biopsy or treatment. SSF1 allows 3 digits for the result with an implied decimal point between the second and third digits. For example,

| | | |
|---|---|---|
| PSA | 12.4 is recorded as | 124 |
| | 4.24 | 042 (round down) |
| | 1.85 | 019 (round up) |
| | 94 | 940 |

If the actual value of the test exceeds 99.0, record as 990. Lab values for SSF1 and SSF2 should be from the same laboratory test.

**Normal reference range** varies by age and race of patient. In general, normal findings are 0 – 4.0 ng/ml. Optimal range is 0 – 2.6 ng/ml.

By Age and Race *(in ng/ml)*

| | White | Black | Asian |
|---|---|---|---|
| 40-49 | <= 2.5 | < 2.0 | < 2.0 |
| 50-59 | <= 3.5 | < 4.0 | < 3.0 |
| 60-69 | <= 4.5 | < 4.5 | < 4.0 |
| 70-79 | <= 6.5 | < 5.5 | < 5.0 |

**Notes** Not the same as free PSA or precursor PSA. Serum PSA is the most sensitive tumor marker for monitoring individuals with prostate cancer, including progression of disease and response to therapy. Although originally not intended to be a screening test, this relatively simple blood test has become a very common method of detecting new prostate cancer in its earliest stages. However, PSA can be totally negative when prostate cancer is found on digital rectal exam. In such cases, PSA will not be helpful in monitoring for recurrence.

# PROSTATE

**PSA Interpretation**. (SSF2) *See information for PSA.*

**Record** the clinician's interpretation of the PSA value documented in SSF1.

010 Positive/elevated
020 Negative/normal
030 Borderline; undetermined whether positive or negative

Interpretation of the PSA value is a clinical judgment due to differences in the normal range by age and race. The registrar should not assign a code for this field based on the age- and race-specific normal values listed for PSA Value.

**Gleason Pattern and Score—Why Code Both?**

The Gleason pattern and score are not tumor markers *per se*, but are methods of estimating prognosis based on the aggressiveness of the cancer in the prostate. The lower score (the sum of the primary and secondary pattern score), the less aggressive is the cancer.

Why record both? Researchers have found a number of differences among patients who have the same score, because the proportion of Gleason grades 4 and 5 in the tumor does influence patient outcomes. For example, patients with a Gleason score of 4+3 had higher clinical and pathologic stages, higher preoperative PSA levels, were older, had a higher rate of progression and a shorter time to progression compared to patients with a Gleason score of 3+4. We record both the patterns and the sum of the patterns (score) so that we can obtain more population based outcomes data on these patients.

# TESTIS

**AFP** (SSF1)

**Other names** αFP, aFP, Alpha Fetoprotein, Alpha-fetoprotein, α–fetoprotein

**Record** the range of the highest value **after orchiectomy** and prior to treatment, based on the reference range used by the lab.

020 Within normal limits
040 Range 1: less than 1,000 ng/ml
050 Range 2: 1,000 – 10,000 ng/ml
060 Range 3: > 10,000 ng/ml

**Normal reference range**
Men and non-pregnant women: < 15 ng/ml (SI: < 15 μg/L).

**Notes** Elevated values found in non-seminomatous malignancies and mixed tumors. Used with HCG to identify specific cell type of testicular cancer. Not secreted by pure seminoma or teratoma. Falls to < 25 ng/ml by 25-35 days after orchiectomy.
More useful in monitoring response to therapy than for diagnosis. Unlikely to be benign if AFP > 500 ng/ml. Poor prognosis for testis if AFP > 10,000 ng/ml at diagnosis. Also a tumor marker for primary liver cancer.
SI Conversion: 1 μg/L = 1 ng/ml.
1 ng of AFP is approximately equal to 1 mIU.
Micrograms (μg) per liter may be printed as ug/L.

**What does SI mean?**
SI is the French abbreviation for International System, standard units of measure (meter, kilogram, second). Most SI values are based on the kilogram and the liter. A nanogram (ng) is one-thousandth of a microgram (μg). A milliliter (ml) is one-thousandth of a liter. So a lab value expressed in μg/L is equivalent to the same value expressed in ng/ml.
Some lab values, such as hormone levels, are recorded in International Units per Liter (IU/L). This is equivalent to mIU/ml.

# TESTIS

**HCG** (SSF2)

**Other names** Human chorionic gonadotropin, bHCG, beta subunit HCG, beta hCG

**Record** the range of the highest value **after orchiectomy** and prior to treatment, based on the reference range used by the lab.

020 Within normal limits
040 Range 1: less than 5,000 mIU/ml
050 Range 2: 5,000 – 50,000 mIU/ml
060 Range 3: > 50,000 mIU/ml

**Normal reference range** < 10 mIU/ml

**Notes** Used with HCG to identify specific cell type of testicular cancer. Secreted by some non-seminomatous germ cell tumors and mixed tumors. Undetectable by 5 to 8 days after orchiectomy.
SI Conversion: 1 IU/L = 1 mIU/ml
1 ng/ml of HCG is approximately 5 mIU/ml.

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**LDH** (SSF3)

**Other names** LD, Lactate dehydrogenase, lactase dehydrogenase, lactic acid dehydrogenase

**Record** the clinician's interpretation of the highest value prior to treatment, based on the reference range used by the lab.

002 Within normal limits
004 Range 1: less than 1.5 times the upper limit of normal for that lab
005 Range 2: 1.5 to 10 times the upper limit of normal for that lab
006 Range 3: more than 10 times the upper limit of normal for that lab

***LDH, continued***

**Normal reference range** varies widely by laboratory, patient age, and the units of measurement. Examples of reference range lab values:

Lab A Total LDH 71 – 207 U/L
Lab B Total LDH 300 – 600 U/L
Lab C Total LDH 45 – 90 U/L
Lab D Total LDH 150 – 250 U/L

**Notes** Not a screening test. Not diagnostic of testicular cancer. Elevated LDH is an indicator of possible tumor burden, such as metastatic involvement of liver or lung, and is elevated in 60% of patients with nonseminomatous germ cell tumors. LDH may be included in a Liver or Hepatic Panel/ Profile, a Cardiac Panel, or a general metabolic panel of tests.

For testis, multiply the lab's upper limit of normal times 1.5. If the test result is within normal limits, code as 002. If the test result is elevated, determine whether it is less than 1.5 times the upper limit of normal (code 004), between 1.5 and 10 times the upper limit of normal (code 005) or more than 10 times the upper limit of normal (code 006).

***Example:*** Test result is 155.
For Labs A and D (above), that result is within the normal range (code 002).
For Lab C, the test result is elevated. Calculate 1.5 times the upper limit of normal for Lab C (1.5 x 90 = 135). For Lab C, this test result would be coded as 005, between 1.5 and 10 times the upper limit of normal.

The total LDH should be the test value that is coded, but there are five fractions of LDH that measure tissue specific cellular damage: LD1 and LD2: heart, red blood cells and kidneys; LD3: lung; LD4 and LD5: liver, skin and skeletal muscles.