

GENERAL CANCER CLASSIFICATION, STAGING, AND GROUPING SYSTEMS

Roman Numeral Staging, I–IV and Recurrent Cancers (also called Stage Grouping)

Staging depends on cancer cell type. Specific cell types may use designations such as A–D for prostate or colon, rather than I–IV.

I	Small localized cancers, usually curable
II	Locally advanced and/or involvement of lymph nodes
III	Locally advanced and/or involvement of lymph nodes
IV	Inoperable or metastatic
Recurrent	After all visible tumor eradicated
Locally recurrent	In area of primary tumor
Distant recurrent	Metastases (interchangeable with stage IV)

Subcategories of stage groupings are delineated by capital letters (e.g., IIB, IIIC). When using stage grouping, if the combination of tumor-node-metastasis elements is not in the stage grouping table, the case should be considered unstageable, or categorized as stage group 99.

Solid Tumor Staging

Tumor-Node-Metastasis (TNM) Category (also called American Joint Committee [AJC], American Joint Committee on Cancer [AJCC] and l'Union Internationale Contre le Cancer [UICC]). Staging is not relevant for occult carcinoma, which is designated TX N0 M0.

TNM Staging

T	Primary tumor, size, and invasiveness
TX	Primary tumor cannot be assessed.
T0	No evidence of primary tumor
Tis	Carcinoma in situ (carcinomas represent the only type of cancer that can be classified as being 'in situ,' because only carcinomas have a basement membrane. Thus, sarcomas are never described as being in situ.)
T1–T4	Presence of tumors. Higher numbers indicate increased size, extent, or degree of penetration. Each cancer type has specifics to classify under the number.
N	Regional lymph nodes, presence or absence. Variable value
NX	Regional lymph nodes cannot be assessed.
N0	No regional lymph node metastasis
N1–N3	Regional lymph node metastasis. Higher numbers indicate greater involvement.
M	Distant metastasis, presence or absence of distant metastasis, including lymph nodes that are not regional
MX	Distant metastasis cannot be assessed.
M0	No distant metastasis
M1	Distant metastasis

Clinical and Pathologic Staging

a	Autopsy
c	Clinical
p	Pathologic
r	Recurrent
y	During or after multimodality treatment

Other Descriptors

GX, G1–G4	Histopathologic grade
LX, L0, L1	Lymphatic vessel invasion
RX, RO–R2	Residual tumor
SX, SO–S2	Scleral invasion, serum markers
VX, V0–V2	Venous invasion

Roman Numeral/TNM Subsets (type-specific, examples only) Lung Cancer

Stage 0	Carcinoma in situ
Stage IA	T1 N0 M0
Stage IB	T2 N0 M0
Stage IIA	T1 N1 M0
Stage IIB	T2 N1 M0; T3 N0 M0
Stage IIIA	T3 N1 M0; T1 N2 M0; T2 N2 M0; T3 N2 M0
Stage IIIB	T4 N0 M0; T4 N1 M0; T4 N2 M0; T1 N3 M0; T2 N3 M0; T3 N3 M0; T4 N3 M0
Stage IV	Any T, Any N, M1

Adapted from Vaporciyan AA, Nesbitt JC, Lee JS, et al. Cancer of the Lung. In: Bast RC, Kule DW, Poliock RE, et al., eds. *Cancer Medicine, 5th ed.* Hamilton: BC Decker Inc; 2000:1227-1292.

Specific Cancers, Staging And Classification

Breast Tumors Clinical Classification (TNM)

TX	Primary tumor cannot be assessed.
TO	No evidence of primary tumor found.
Tis	Carcinoma in situ: intraductal carcinoma, or lobular carcinoma in situ, or Paget disease of the nipple with no tumor (Note: Paget disease associated with a tumor is classified according to the size of the tumor.)
T1	Tumor \leq 2 cm in greatest dimension
T1a	\leq 0.5 cm in greatest dimension
T1b	0.5 cm but $<$ 1 cm in greatest dimension
T1c	$>$ 1 cm but not $>$ 2 cm in greatest dimension
T2	Tumor $>$ 2 cm but not $>$ 5 cm in greatest dimension
T3	Tumor $>$ 5 cm in greatest dimension
T4	Tumor of any size with direct extension to chest wall or skin
T4a	Extension to chest wall
T4b	Edema (including peau d'orange), or ulceration of the skin of the breast, or satellite skin nodules confined to the same breast
T4c	Findings of both 4a and 4b
T4d	Inflammatory carcinoma

Note: Chest wall includes ribs, intercostal muscles, and serratus anterior muscle, but not pectoral muscle. Inflammatory carcinoma of the breast is characterized by diffuse, brawny induration of the skin with an erysipeloid edge, usually with no underlying palpable mass. If the result of skin biopsy is negative and no localized measurable primary cancer is found, the T category is pTX when pathologically staging a clinical inflammatory carcinoma (e.g., T4d). Dimpling of the skin, nipple retraction, or other skin changes, except those considered as T4b and 4d, may occur in T1, T2, or T3 cases without affecting the classification.

NX	Regional lymph nodes cannot be assessed.
N0	No regional lymph node metastasis
N1	Metastasis to movable ipsilateral axillary node(s)
N2	Metastasis to ipsilateral axillary node(s) fixed to one

	another or to other structures
N3	Metastasis to ipsilateral internal mammary lymph node(s)
MX	Presence of distant metastasis cannot be assessed.
M0	No distant metastases are found.
M1	Distant metastases are present.

Breast Cancer Staging

Stage 0	Carcinoma in situ of the breast (ductal carcinoma in situ [DCIS] lobular carcinoma in situ [LCIS])
Stage I	T1, N0, M0 <2 cm in diameter, does not touch the skin, does not touch the muscles, and has not invaded the lymph nodes anywhere.
Stage II	>2 cm in diameter but <5 cm in diameter, does not touch the skin, and does not touch the muscles. or Any size <5 cm but has spread to the lymph nodes in the axilla
Stage IIa	T0–1, N1, M0; T2, N0, M0
Stage IIb	T2, N1, M0; T3, N0, M0
Stage III	>5 cm in diameter and/or Spread to lymph nodes fixed to one another, or to the surrounding tissue (e.g., skin, muscle, blood vessels) or Breast cancers of any diameter that involve skin, the ribs of the chest wall, or the internal mammary lymph nodes beneath the middle part of the ribs No spread to other organs No spread to bones away from the chest area No spread to lymph nodes far from the breast
Stage IIIa	T0-2, N2, M0, or T3, N1-2, M0
Stage IIIb	T4, N (any), M0; T(any), N3, M0
Stage IV	T(any), N(any), M1 Any size tumor, metastasized to organs or lymph nodes away from the breast

Pathologic Staging (pTN) Breast Tumor

pT	Primary tumor (correspond to the T categories) Primary carcinoma No gross tumor at the margins of resection Tumor size is a measurement of the invasive component. Example: A large in situ component of 4 cm and a small invasive component of 0.5 cm = pT1 a.
PN	Regional lymph nodes (correspond to P categories) Breast tumor Resection and examination of at least the low axillary lymph resection ordinarily includes six or more lymph nodes.
pNX	Regional lymph nodes cannot be assessed (not removed for study or previously removed).
pNO	No regional lymph node metastasis
pNI	Metastasis to movable ipsilateral axillary node(s)
pN1 a	Only micrometastasis (none >0.2 cm)
pN1b	Metastasis to lymph node(s), any >0.2 cm
pN1bi	Metastasis to one to three lymph nodes, any >0.2 cm and all <2.0 cm in greatest dimension
pN1bii	Metastasis to four or more lymph nodes, any >0.2 cm and all <2.0 cm in greatest dimension
pN1biii	Extension of tumor beyond the capsule of a lymph

	node metastasis <2.0 cm in greatest dimension
pN1biv	Metastasis to a lymph node ≥2.0 cm in greatest dimension
pN2	Metastasis to ipsilateral axillary lymph nodes fixed to one another or other structures
pN3	Metastasis to ipsilateral internal mammary lymph node(s)

Scarff-Bloom-Richardson (SBR) Grading System, Breast Tumor (also known as: (BR) Bloom-Richardson [BR] grading system, Modified BR, Elston-Ellis modification of BR grading system). BR grading scheme is a semi-quantitative grading method for invasive (no special type) breast cancers, based on three morphologic features: degree of tumor tubule formation tumor mitotic activity, and nuclear pleomorphism of tumor cells (nuclear grade). Seven possible scores are condensed into three BR grades. The three grades then translate into:

Bloom-Richardson combined scores	Differentiation/BR Grade
3, 4, 5	Well-differentiated (BR low grade)
6,7	Moderately differentiated (BR intermediate grade)
8,9	Poorly differentiated (BR high grade)

Melanoma**Melanoma Stage Information**

The microstage of malignant melanoma is determined on result of histologic examination by the vertical thickness of the lesion in millimeters (Breslow classification) and/or the anatomic level of local invasion (Clark classification). The Breslow thickness is more reproducible and more accurately predicts subsequent behavior of malignant melanoma in lesions >1.5 mm in thickness and should always be reported. Accurate microstaging of the primary tumor requires careful histologic evaluation of the entire specimen by an experienced pathologist. Estimates of prognosis should be modified by sex and anatomic site as well as by clinical and histologic evaluation.

Clark Level of Invasion

Histologic classification is based on resection of entire lesion.

Restrictions: Does not take nodal involvement into consideration; deals only with primary tumor. Uniformity of staging not always reproducible because of variations in the depth of layers of the skin. Cannot be applied accurately to melanomas affecting the palms and soles. Histologic difference exists between growth patterns of superficial spreading and nodular malignant melanomas.

Level I	Confined to epidermis (in situ); never metastasizes; 100% cure rate
Level II	Invasion into papillary dermis; invasion past basement membrane (localized)
Level III	Tumor filling papillary dermis (localized), and compressing the reticular dermis
Level IV	Invasion of reticular dermis (localized)
Level V	Invasion of subcutaneous tissue (regionalized by direct extension)

Breslow Depth of Invasion

Pathologic staging based on measurement of tumor invasion of dermis using the micrometer on the microscope; more reproducible than Clark levels.

Categories	Actual measurement of depth of lesion is recorded
<i>Cases are grouped for study as follows</i>	
0.75 mm	Comparable with Clark level II
>0.75–1.5 mm	Comparable with Clark level III

- >1.5–4.0 mm Comparable with Clark level IV
>4.0 mm Comparable with Clark level V

Clinical Staging for Malignant Melanoma

Used for staging of melanomas that have spread beyond the primary tumor or do not have adequate tissue for pathologic examination

Clinical staging includes results of tests and examinations as well as pathologic findings. Clinical staging parallels summary staging

- Stage I Localized, without metastases to distant or regional nodes (allows localized disease ≤ 5 cm. from initial tumor within primary lymphatic drainage area)
- Stage II Regionalized, involvement of regional nodes
- Stage III Disseminated, visceral, or lymphatic metastases or multiple cutaneous or subsequent metastases

Reference to stage in melanoma cannot be assumed to be clinical, Clark, or Breslow unless specifically identified as such.

From Cancer staging module: melanoma staging schemes. SEER's Training Web Site. Available at http://training.seer.cancer.gov/module_staging_cancer/unit03_sec04_part05_melanoma.html. Accessed June 23, 2006.

TNM Staging of Melanoma

Primary tumor (T)

- TX Primary tumor cannot be assessed (e.g., shave biopsy or regressed melanoma).
- T0 No evidence of primary tumor
- Tis Melanoma in situ
- T1 Tumor ≤ 1.0 mm thick with or without ulceration
- T1a Tumor ≤ 1.0 mm thick and Clark level II or III, no ulceration
- T1b Tumor ≤ 1.0 mm thick and Clark level IV or V or with ulceration
- T2 Tumor >1.0 mm but not >2.0 mm thick with or without ulceration
- T2a Tumor >1.0 mm but not >2.0 mm thick, no ulceration
- T2b Tumor >1.0 mm but not >2.0 mm thick, with ulceration
- T3 Tumor >2.0 mm but not >4 mm thick with or without ulceration
- T3a Tumor >2.0 mm but not >4 mm thick, no ulceration
- T3b Tumor >2.0 mm thick, but not >4 mm, with ulceration
- T4 Tumor >4.0 mm thick with or without ulceration
- T4a Tumor >4.0 mm thick, no ulceration
- T4b Tumor >4.0 mm thick, with ulceration

Regional lymph nodes (N), Melanoma

- NX Regional lymph nodes cannot be assessed.
- N0 No regional lymph node metastasis
- N1 Metastasis to 1 lymph node
- N1a Clinically occult (microscopic) metastasis
- N1b Clinically apparent (macroscopic) metastasis
- N2 Metastasis to 2 or 3 regional nodes or intralymphatic regional metastasis without nodal metastases
- N2a Clinically occult (microscopic) metastasis
- N2b Clinically apparent (macroscopic) metastasis
- N2c Satellite or in-transit metastasis without nodal metastasis
- N3 Metastasis in 4 or more regional nodes, or matted lymph nodes, or in-transit metastasis or satellite(s) with metastatic regional node(s)

(Note: Micrometastases are diagnosed after elective or sentinel lymphadenectomy; macrometastases are defined as clinically detectable lymph nodes metastases confirmed by therapeutic lymphadenectomy, or when any lymph node metastasis exhibits gross extracapsular extension.)

Distant Metastasis (M), Melanoma

- MX Distant metastasis cannot be assessed.
- M0 No distant metastasis
- M1 Distant metastasis
- M1a Metastasis to skin, subcutaneous tissues, or distant lymph nodes
- M1b Metastasis to lung
- M1c Metastasis to all other visceral sites or distant metastasis at any site associated with elevated levels of serum lactic dehydrogenase

Clinical Staging, American Joint Committee on Cancer Stage Groupings, Melanoma

Clinical staging includes microstaging of the primary melanoma and clinical and/or radiologic evaluation for metastases. By convention, it should be assigned after complete excision of the primary melanoma with clinical assessment for regional and distant metastases.

- Stage 0 Tis, N0, M0
- Stage IA T1a, N0, M0
- Stage IB T1b, N0, M0; T2a, N0, M0
- Stage IIA T2b, N0, M0; T3a, N0, M0
- Stage IIB T3b, N0, M0; T4a, N0, M0
- Stage IIC T4b, N0, M0;
- Stage III Any T, N1, M0; Any T, N2, M0; Any T, N3, M0
- Stage IV Any T, any N, M1

Pathologic Staging, American Joint Committee on Cancer Stage Groupings

With the exception of patients with clinical stage 0 or stage IA lesions (who have a low risk of lymphatic involvement and do not require pathologic evaluation of their lymph nodes), pathologic staging includes microstaging of the primary melanoma and pathologic information about the regional lymph nodes after sentinel node biopsy and, if indicated, complete lymphadenectomy.

- Stage 0 Tis, N0, M0
- Stage IA T1a, N0, M0
- Stage IB T1b, N0, M0; T2a, N0, M0
- Stage IIA T2b, N0, M0; T3a, N0, M0
- Stage IIB T3b, N0, M0; T4a, N0, M0
- Stage IIC T4b, N0, M0
- Stage IIIA T1-4a, N1a, M0; T1-4a, N2a, M0
- Stage IIIB T1-4b, N1a, M0; T1-4b, N2a, M0; T1-4a, N1b, M0; T1-4a, N2b, M0; T1-4a/b, N2c, M0;
- Stage IIIC T1-4b, N1b, M0; T1-4b, N2b, M0; T1-4b, N2c, M0; Any T, N3, M0
- Stage IV Any T, any N, M1

Adapted from Melanoma of the skin. In: American Joint Committee on Cancer. *AJCC Cancer Staging Manual*, 6th ed. New York, NY: Springer; 2002: 209-220.

System-Specific Cancer Classification, Gastrointestinal/Genitourinary

Colorectal Cancer Staging: Dukes Staging (also called: Astler-Coller, Turnbull, modified Astler-Coller [MAC]).

Originally staging for rectal cancer only; first Kirklin and then Astler and Coller added colon and rectal cancers; Turnbull included stage for unresectable tumors and distant metastases.

Dukes staging (the generic term) is based on pathologic examination and resection of the tumor; measures the depth of invasion through the mucosa and bowel wall. It does not take into account level of nodal involvement or the grade of the tumor.

Dukes	Categories	Stage	TNM Category
Stage A	Confined to mucosa	I	T1 or T2, N0 M0
Stage B	Varies by system	II	T3 or T4, N0 M0
Stage C	Positive lymph nodes	III	Any T, N1/N2, M0
Stage D	Distant metastases	IV	Any T, Any N, M1 (Turnbull system only)

Modified from American Joint Committee on Cancer, *AJCC Cancer Staging Manual, 5th ed.* Philadelphia: Lippincott-Raven;1998.

Bladder Cancer Staging: Jewett Staging (also called Marshall, Jewett-Marshall Staging, and American Urologic System [AUS]).

Histologic staging based on depth of invasion through the bladder wall. It does not consider grade of tumor, local recurrence rate, or multicentricity of tumors. A deep resection is mandatory for this method.

Jewett Categories:

Stage A	Submucosal invasion but no involvement of muscle
Stage B	Bladder wall or muscle invasion
Stage B1	Superficial
Stage B2	Deep
Stage C	Extension through serosa into perivesical fat (around bladder)
Stage D	Lymph node and distant metastases
Stage D1	Regional nodes
Stage D2	Distant nodes and other distant metastases

AJCC Tumor notation T1 – T4 is equivalent to Jewett stages A through D, respectively

N (node) and M (metastases) are part of Jewett stage D.

Prostate Cancer Staging: American or American Urologic System: Staging has been translated to TNM extent of disease notation by the American Joint Committee.

Stage A	Can be subdivided based on the number of cell clusters (foci) seen on microscopic examination.
Stage B	Difference between Stage A and Stage B is whether nodule(s) are clinically palpable (or visibly seen) in prostate.
Stage C	Dividing line between Stage B and Stage C is microscopically evident capsular invasion.
Stage D	Determinant is presence of metastatic disease identified either clinically or microscopically.

Gynecologic Cancers

International Federation of Gynecologists and Obstetricians (FIGO) Gynecologic Cancer Staging: Based on clinical data including examination and colposcopy.

FIGO Stage Characteristics (cervical cancer)

Stage 0	Carcinoma in situ, intraepithelial carcinoma; cases of stage 0 should not be included in any therapeutic statistics for invasive carcinoma.
Stage I	Carcinoma is strictly confined to the cervix (extension to the corpus should be disregarded)
Stage IA	Invasive cancer identified only microscopically. (All gross lesions, even with superficial invasion, are considered stage IB cancers). Invasion is limited to measured stromal invasion of ≤ 5 mm deep taken from the base of the epithelium, either surface or glandular, from which it originates. Vascular space involvement, either venous or lymphatic, should not alter the staging).
Stage IA1	Measured invasion of stroma ≤ 3 mm deep and ≤ 7 mm wide

Stage IA2	Measured invasion of stroma >3 mm and ≤ 5 mm deep and ≤ 7 mm wide
Stage IB	Clinical lesions confined to the cervix or preclinical lesions $>IA$
Stage IB1	Clinical lesions ≤ 4 cm in size
Stage IB2	Clinical lesions >4 cm in size
Stage II	Carcinoma extends beyond the cervix but has not extended onto pelvic wall; carcinoma involves the vagina, but not as far as the lowest third
Stage IIA	No obvious parametrial involvement
Stage IIB	With parametrial involvement
Stage III	Carcinoma has extended onto the pelvic wall; on rectal examination no space between the tumor and the pelvic wall is free from cancerous involvement; tumor involves the lowest third of vagina; all cases involving hydronephrosis or a nonfunctioning kidney should be included, unless such findings are known to be due to other causes
Stage IIIA	No extension onto the pelvic wall, but involvement of the lowest third of the vagina
Stage IIIB	Extension onto the pelvic wall or hydronephrosis or nonfunctioning kidney
Stage IV	Carcinoma has extended beyond the true pelvis or has clinically involved the mucosa of the bladder or rectum
Stage IVA	Spread of the growth to adjacent organs
Stage IVB	Spread to distant organs

Histopathologic grades (G), unless otherwise detailed

Gx	Grade cannot be assessed
G1	Well-differentiated
G2	Moderately differentiated
G3	Poorly differentiated or undifferentiated

Adapted from Benedet JL, Bender H, Jones H 3rd, Ngan HY, Pecorelli S. FIGO staging classifications and clinical practice guidelines in the management of gynecologic cancers. FIGO Committee on Gynecologic Oncology. *Int J Gynaecol Obstet.* 2000 Aug;70(2):207-312.

Lymph/Blood Cancers Classifications And Categories

Lymphomas: Hodgkin and Non-Hodgkin Lymphoma

Ann Arbor Classification (originally proposed for Hodgkin, but now also used for Non-Hodgkin Lymphoma)

Stage I	Involvement of a single lymph node region
Stage IE	A single extralymphatic organ or site
Stage II	Involvement of two or more lymph node regions on same side of diaphragm
Stage II ₃	Number of lymph node regions involved may be indicated by a subscript.
Stage IIE	Localized involvement of extralymphatic organ or site and of one or more lymph node regions on the same side of the diaphragm
Stage III	Involvement of lymph node regions on both sides of diaphragm
Stage IIIE	Localized involvement of extralymphatic organ or site
Stage IIIS	Involvement of spleen
Stage IIISE	Both stage IIIE and IIIS. Also written Stage III+SE
Stage IV	Diffuse or disseminated multifocal involvement of one or more extralymphatic organs or tissues with or without associated lymph node enlargement.
	or
	Isolated extralymphatic organ involvement with distant (nonregional) nodal involvement.
Stage IVE	Used when extranodal lymphoid malignancies arise in tissues separate from, but near, the major lymphatic

	aggregates
Extralymphatic sites of involvement use letter code and plus sign (+).	
N	nodes
H	liver
L	lung
M	bone marrow
S	spleen
P	pleura
O	bone
D	skin

Lymphoma and Non-Hodgkin Lymphoma Categories

A	Without well-defined generalized symptoms
B	With well-defined generalized symptoms: unexplained loss of >10% of body weight in the 6 months before diagnosis; unexplained fever with temperatures exceeding 38°C; and drenching night sweats

Revised European American Lymphoma (REAL) Classification System

REAL Hodgkin Lymphoma Categories

Excellent prognosis	Average 5-year survival rate of 70%
Good prognosis	Average 5-year survival rate of 50–70%
Fair prognosis	Average 5-year survival rate of 30–49%
Poor prognosis	Average 5-year survival rate of <30%

Hodgkin Lymphoma (Hodgkin Disease) Classification

Nodular lymphocyte-predominant Hodgkin lymphoma

Classical Hodgkin lymphoma: nodular sclerosis, mixed cellularity, and lymphocyte depletion

B-Cell Neoplasm Classification

- Precursor B-cell lymphoblastic leukemia/lymphoma
- Mature B-cell neoplasms
- B-cell chronic lymphocytic leukemia/small lymphocytic lymphoma
- B-cell prolymphocytic leukemia
- Lymphoplasmacytic lymphoma
- Mantle cell lymphoma
- Follicular lymphoma
- Cutaneous follicle center lymphoma
- Marginal zone B-cell lymphoma (MALT type, nodal, and splenic type)
- Hairy cell leukemia
- Diffuse large B-cell lymphoma
- Burkitt lymphoma
- Plasmacytoma and plasma cell myeloma

T-Cell Neoplasm Classification

- Precursor T-cell lymphoblastic lymphoma
- Mature T-cell and natural killer-cell neoplasms
- T-cell prolymphocytic leukemia
- T-cell large granular lymphocytic leukemia
- Aggressive natural killer-cell leukemia
- Mycosis fungoides and Sezary syndrome

- Angioimmunoblastic T-cell lymphoma
- Peripheral T-cell lymphomas
- Adult T-cell leukemia/lymphoma
- Anaplastic large cell lymphoma
- Primary cutaneous CD30+ T-cell lymphoproliferative disorders
- Subcutaneous panniculitislike T-cell lymphoma
- Entropathy-type intestinal T-cell lymphoma
- Hepatosplenic T-cell lymphoma

Note: The REAL lymphoma classification system relies on immunophenotypic markers and on unusual proteins secreted by cancerous white blood cells. The REAL system includes NHL and other hematologic cancers that share these markers: Hodgkin lymphomas, plasma cell myeloma, and chronic lymphocytic leukemia.

Working Formulation System Categories (Lymphoma)

- High grade grows very quickly and causes serious symptoms.
- Intermediate grows more rapidly than low grade and causes serious symptoms.
- Low grade grows more slowly and produces fewer symptoms.

Leukemia Classification

French-American-British (FAB) Categories: Cell classification by types and subtypes, also sometimes referred to as Bennett system

Acute lymphocytic leukemia (diagnosed primarily in children), three subtypes

Acute myelogenous leukemia (the most common type of leukemia, diagnosed in both children and adults), eight subtypes

Chronic myelogenous leukemia (diagnosed primarily in adults)

Chronic lymphocytic leukemia (diagnosed primarily in adults) uses different classification system

Acute Lymphocytic Leukemia (ALL), Primarily Pediatric Patients (also called Acute Lymphoblastic Leukemia)

- | | |
|--------------|--|
| L1 | Mature-appearing lymphoblasts (T cells or pre-B cells), small with uniform genetic material, regular nuclear shape, nonvisible, little cytoplasm. |
| L2 | Immature and pleomorphic lymphoblasts (T cells or pre-B cells, large and variable in size, variable genetic material, irregular nuclear shape, one or more large nucleoli, and variable cytoplasm. |
| L3 | Lymphoblasts (B cells; Burkitt cells) large and uniform, genetic material finely stippled and uniform, nuclear shape is regular (oval to round), one or more prominent nucleoli, cytoplasm is moderately abundant. |
| T-cell type: | Thymus is involved. May lead to superior vena cava syndrome) |

Acute Myelogenous Leukemia (AML), Pediatric and Adult Patients (also called acute nonlymphocytic Leukemia or ANL)

- | | |
|----|--|
| M0 | Undifferentiated acute myelogenous leukemia. Bone marrow cells show no significant signs of differentiation (allow maturation to obtain distinguishing cell characteristics). |
| M1 | Myeloblastic leukemia with/without minimal cell maturation. Bone marrow cells show some signs of granulocytic differentiation. |
| M2 | Myeloblastic leukemia with cell maturation. Maturation of bone marrow cells is at or beyond the promyelocyte (early granulocyte) stage; varying amounts of maturing granulocytes may be seen; often associated with a specific genetic change involving translocation of chromosomes 8 and 21. |

M3, M3 variant [M3V]	Myelocytic leukemia. Most cells are abnormal early granulocytes, between myeloblasts and myelocytes in stage of development; contain many small particles. The cell nucleus may vary in size and shape. Bleeding and blood clotting problems (e.g., disseminated intravascular coagulation, are commonly seen with this form of leukemia. Good responses have been observed after treatment with retinoids.
M4E, M4 variant with eosinophilia [M4E]	Monocytic leukemia. Bone marrow and circulating blood have variable amounts of differentiated granulocytes and monocytes. The proportion of monocytes and promonocytes in bone marrow is >20% of all nucleated cells. The M4E variant also contains abnormal eosinophils in bone marrow.
M5	Monocytic leukemia (two forms). First characterized by poorly differentiated monoblasts with lacy-appearing genetic material; second, differentiated form characterized by a large population of monoblasts, promonocytes, and monocytes; proportion of monocytes in the bloodstream may be higher than in the bone marrow. M5 leukemia may infiltrate skin and gums; prognosis in such patients worse.
M6	Erythroleukemia characterized by abnormal erythrocyte-forming cells, which comprise over half of the nucleated cells in the bone marrow.
M7	Megakaryoblastic leukemia Blast cells look like immature megakaryocytes or lymphoblasts; may be distinguished by extensive fibrous tissue deposits (fibrosis) in the bone marrow.

In addition, patients sometimes develop isolated tumors of the myeloblasts, such as isolated granulocytic sarcoma, or chloroma. Patients with chloroma frequently develop AML.

Chronic Myelogenous Leukemia (CML), Primarily Adult Patients

Chronic	>5% blast cells and promyelocytes in blood and bone marrow; marked by increasing overproduction of granulocytes; generally only mild symptoms; responds well to conventional treatment.
Accelerated	>5% but <30% blast cells. Cells exhibit Philadelphia chromosome and other chromosomal abnormalities; more abnormal cells are produced; patients with noticeable symptoms (e.g., fever, poor appetite, weight loss) may not respond as well to therapy.
Blast	>30% blast cells in blood and bone marrow; blast cells frequently invade other tissues and organs. The disease transforms into an aggressive, acute leukemia (70% acute myelogenous leukemia, 30% acute lymphocytic leukemia)

Chronic Lymphocytic Leukemia (CLL)

American Society of Anesthesiologists (ASA) Preoperative Assessment and Grading (also called Dripps-ASA, which reduced seven components to five).

ASA Grade	Definition
I	Normally healthy person
II	Mild systemic disease that does not limit activity
III	Severe systemic disease that limits activity but is not incapacitating
IV	Incapacitating systemic disease that is constantly life-threatening
V	Moribund, not expected to survive 24 hours with or without surgery

Eastern Cooperative Oncology Group (ECOG) Performance Status (also called Zubrod scale. See WHO Performance Scale.

Grade	Definition
0	Fully active, able to carry on all predisease activities
1	Restricted in physically strenuous activity but ambulatory and able to carry out work of a light or sedentary nature (e.g., light house work, office work)
2	Ambulatory and capable of all self-care but unable to carry out any work activities. Up and about >50% of waking hours
3	Capable of only limited self-care, confined to bed or chair >50% of waking hours
4	Completely disabled. Cannot carry on any self-care. Totally confined to bed or chair
5	Dead

Adapted from Owen MM, et al. Toxicity and response criteria of the Eastern Cooperative Oncology Group. *Am J Clin Oncol.* 1982;5:649-655.

World Health Organization (WHO) Performance Scale (also called Zubrod scale; sometimes called ECOG).

Measures levels of patient capability. For example, an inpatient getting metabolic studies done may be fully capable of performing normal activities but will remain in bed by personal choice. Such a patient should be coded 0, "normal."

0	Normal activity
1	Symptoms, but nearly fully ambulatory
2	Some bed time, but needs to be in bed <50% of normal daytime
3	Needs to be in bed >50% of normal daytime
4	Unable to get out of bed

Karnofsky Performance Status Scale

Criteria	Definition
100%	Normal, no complaints; no evidence of disease
90%	Able to carry on normal activity; minor signs or symptoms of disease
80%	Normal activity with effort; some signs or symptoms of disease; able to carry on normal activity and to work
70%	Cares for self; unable to carry on normal activity or to do active work
60%	Requires occasional assistance, can care for most personal needs
50%	Requires considerable assistance and frequent medical care
40%	Disabled; requires special care and assistance
30%	Severely disabled; hospital admission is indicated although death not imminent
20%	Very sick; hospital admission necessary; active supportive treatment necessary
10%	Moribund; fatal processes progressing rapidly
0	Dead