The College of American Pathologists offers these protocols to assist pathologists in providing clinically useful and relevant information when reporting results of examinations of surgical specimens. The College regards the reporting elements in the “Surgical Pathology Cancer Case Summary (Checklist)” portion of the protocols as essential elements of the pathology report. However, the manner in which these elements are reported is at the discretion of each specific pathologist, taking into account clinician preferences, institutional policies, and individual practice.

The College developed these protocols as an educational tool to assist pathologists in the useful reporting of relevant information. It did not issue the protocols for use in litigation, reimbursement, or other contexts. Nevertheless, the College recognizes that the protocols might be used by hospitals, attorneys, payers, and others. Indeed, effective January 1, 2004, the Commission on Cancer of the American College of Surgeons mandated the use of the checklist elements of the protocols as part of its Cancer Program Standards for Approved Cancer Programs. Therefore, it becomes even more important for pathologists to familiarize themselves with the document. At the same time, the College cautions that use of the protocols other than for their intended educational purpose may involve additional considerations that are beyond the scope of this document.

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PROTOCOL FOR THE EXAMINATION OF SPECIMENS FROM PATIENTS WITH SOFT TISSUE TUMORS OF INTERMEDIATE MALIGNANT POTENTIAL, MALIGNANT SOFT TISSUE TUMORS, AND BENIGN/LOCALLY AGGRESSIVE AND MALIGNANT BONE TUMORS

This protocol applies to soft tissue tumors of intermediate malignant potential, malignant soft tissue tumors, and benign/locally aggressive and malignant bone tumors only. The American Joint Committee on Cancer (AJCC)/International Union Against Cancer (UICC) TNM classification system is recommended.

Background Documentation

These recommendations are designed to be applied principally to bone and soft tissue sarcomas in teenagers and adults, since pediatric sarcomas are, in general, treated under strict protocols that may differ significantly from the recommendations supplied herein.

I. Biopsy

A. Clinical Information

1. Patient identification
   a. Name
   b. Identification number
   c. Birth date
   d. Sex

2. Responsible physician(s)

3. Date of procedure

4. Other clinical information
   a. Relevant history
      (1) duration of lesion
      (2) relevant radiologic findings (note A)
      (3) preexisting conditions (eg, Paget disease of bone, bone infarction, osteomyelitis, benign soft tissue tumor) or unusual exposures, especially radiation
      (4) history of familial predisposition syndrome (eg, Li-Fraumeni syndrome, Ollier disease, Mafucci syndrome, familial retinoblastoma syndrome, Rothmund-Thomson syndrome)
      (5) previous chemotherapy or radiation therapy
   b. Relevant clinical findings
c. Relevant physical findings
   (1) anatomic site (specify as much as possible)
   (2) depth and/or location of tumor
      i. soft tissue
         (a) superficial
            (i) dermal
            (ii) subcutaneous/suprafascial
         (b) deep
            (i) fascial
            (ii) subfascial
            (iii) intramuscular
            (iv) mediastinal
            (v) intra-abdominal
            (vi) retroperitoneal
            (vii) head and neck
      ii. bone
         (a) location (long bones only) (note B)
            (i) epiphysis
            (ii) metaphysis
            (iii) diaphysis
         (b) location (all bones)
            (i) cortical
            (ii) medullary
            (iii) surface
         (c) joint (involved or uninvolved)
         (d) extension into soft tissue

   e. Procedure
      (1) soft tissue
         i. fine-needle aspirate
         ii. core needle biopsy
         iii. incisional biopsy
         iv. excisional biopsy
      (2) bone
         i. fine-needle aspirate
         ii. core needle biopsy
         iii. incisional biopsy
         iv. excisional biopsy
         v. curettage

B. Macroscopic Examination

1. Specimen
   a. Tissues received (specify components and site)
   b. Unfixed/fixed (specify fixative) (note C)
   c. Oriented or not
   d. Number of pieces of tissue
   e. Size of specimen in centimeters (3 dimensions)
   f. Results of intraoperative consultation, if performed (note D)

2. Tumor, if discernable
   a. Location
   b. Tissues involved
      (1) skin
      (2) subcutaneous adipose tissue
      (3) fascia
      (4) muscle
      (5) bone
      (6) joint
   c. Dimensions in centimeters (3 dimensions)
   d. Presence or absence of necrosis
   e. Other descriptive characteristics (eg, color, firm/soft, gritty, fatty, gelatinous, calcified, hemorrhagic) (Note: if the specimen contains bone, it may require decalcification)
   f. Margins (if excisional biopsy)
      (1) circumscribed/encapsulated or infiltrative
      (2) measured as minimal distance to margins; all margins <2 cm should be measured and specified in the final report
   g. Photograph tumor

3. Tissue submitted for microscopic examination
   a. One section per centimeter (note E)
   b. Frozen section tissue fragment(s)

4. Tissue for special studies
   a. Electron microscopy
   b. Cytogenetics
   c. Flow cytometry
   d. Molecular studies (note F)

C. Microscopic Examination

1. Tumor
   a. Histologic classification (notes G and H)
   b. Grade (note I)
   c. Mitotic count (number of mitotic figures/10 high-power fields) (optional)
   d. Necrosis (present or absent)
   e. Margin status, if any (note J)

2. Results of special studies
   a. Immunohistochemical studies
   b. Electron microscopy
   c. Cytogenetics
   d. Flow cytometry
   e. Molecular studies

3. Comments
   a. Correlation with intraoperative consultations, if any
   b. Correlation with prior specimens, if any
   c. Correlation with clinical findings, as appropriate

II. Excision; Re-excision; Metastectomy

A. Clinical Information

1. Patient identification
   a. Name
   b. Identification number
   c. Birth date
   d. Sex

2. Responsible physician(s)

3. Date of procedure

4. Other clinical information
   a. Relevant history
      (1) duration of lesion
      (2) history of preoperative (neoadjuvant) chemotherapy or radiation therapy
      (3) relevant radiologic findings (note A)
      (4) pre-existing conditions (eg, Paget disease of bone, bone infarction, osteomyelitis, benign soft tissue tumor) or unusual exposures, especially radiation
      (5) history of familial predisposition syndrome (eg, Li-Fraumeni syndrome, Ollier disease, Maffucci syndrome, familial retinoblastoma syndrome, Rothmund-Thomson syndrome)
   b. Relevant clinical findings
   c. Clinical diagnosis
   d. Relevant physical findings
   e. Anatomic site
f. Depth and/or location of tumor
   (1) soft tissue
      i. superficial
         (a) dermal
         (b) subcutaneous/suprafascial
      ii. deep
         (a) fascial
         (b) subfascial
         (c) intramuscular
         (d) mediastinal
         (e) intra-abdominal
         (f) retroperitoneal
         (g) head and neck
   (2) bone
      i. location (long bones only)
         (a) epiphysis
         (b) metaphysis
         (c) diaphysis
      ii. location (all bones)
         (a) cortical
         (b) medullary
         (c) surface
      iii. joint (involved or uninvolved)
      iv. extension into soft tissue

  g. Procedure (note K)
     (1) intraloesional (curettling or debulking)
     (2) marginal/simple/local excision
     (3) wide local excision
     (4) segmental/en block resection (bone tumors)
     (5) radical excision
     (6) amputation

B. Macrosopic Examination

1. Specimen
   a. Tissues received (specify nature and site)
   b. Unfixed/fixed (specify fixative) (note B)
   c. Oriented or not
   d. Number of pieces of tissue
   e. Size of specimen in centimeters (3 dimensions)
   f. Results of intraoperative consultation, if performed

2. Tumor, if discernable
   a. Location
   b. Tissues involved
      (1) skin
      (2) subcutaneous adipose tissue
      (3) muscle
      (4) bone
      (5) joint
      (6) major neurovascular bundles
      (7) attached organs (common in neck, thoracoabdominal, pelvic, and retroperitoneal tumors)
   c. Size of tumor in centimeters (3 dimensions)
   d. Other descriptive characteristics (eg, color, firm/soft, fatty, gelatinous, calcified, hemorrhagic) (Note: if the specimen contains bone, it may require decalcification)
   e. Presence or absence of necrosis (approximate percentage)
   f. Presence or absence of chemotherapy or radiation therapy effect (note L)
   g. Presence or absence of previous biopsy site or scar, with dimensions and relationship to resection margins
   h. Involvement or invasion of major structures (eg, nerve, bone, major blood vessels)
   i. Presence of satellite nodules of tumor away from main tumor mass (relationship to main mass should be described, maximum measurement of each satellite nodule should be noted, and relationship to margins should be described)
   j. Presence of lymph nodes and description of cut surface (note M)
   k. Margins (note J)
   l. Photograph tumor

3. Tissue submitted for microscopic examination
   a. One section per centimeter (note E)
   b. Frozen section tissue fragment(s)

4. Tissue for special studies
   a. Electron microscopy
   b. Cytogenetics
   c. Flow cytometry
   d. Molecular studies (note F)

C. Microscopic Examination

1. Tumor
   a. Histologic classification (notes H and N)
   b. Grade (note I)
   c. Mitotic count (number of mitotic figures/10 high-power fields) (optional)
   d. Percentage necrosis (approximated)
   e. Margin status
   f. Lymphatic/vascular involvement (note O) (optional)
   g. Lymph node involvement (note M)

2. Results of special studies
   a. Immunohistochemical studies
   b. Electron microscopy
   c. Cytogenetics
   d. Flow cytometry
   e. Molecular studies

3. Comments
   a. Correlation with intraoperative consultations, if any
   b. Correlation with prior specimens, if any
   c. Correlation with clinical findings, as appropriate

EXPLANATORY NOTES

A: Relevant Radiologic Findings.—Radiographic imaging plays an especially critical role in the diagnosis of bone tumors. Close collaboration with an experienced musculoskeletal radiologist and orthopedic surgeon is recommended.

B: Location of Neoplasms of Bone.—The Figure is a diagrammatic representation of the “anatomic” regions of a long bone. These locations are very important in classifying bone tumors. For instance, giant cell tumors almost always arise in the epiphysis. The greater trochanter is also considered an epiphyseal region, even though it is not at the end of the bone.

C: Fixation.—Tissue specimens from bone and soft tissue tumors optimally are received fresh/unfixed because of the importance of ancillary studies such as cytogenetics, which require fresh tissue.
Histologic classification of tumors should be made according to the World Health Organization (WHO) classification of bone and soft tissue tumors. Classification of these tumors based on an intraoperative consultation is recommended before rendering a frozen section diagnosis. In the case of primary bone tumors, an intraoperative diagnosis of benign versus malignant will generally guide the immediate decision to curette, excise, or wait for permanent sections. In certain therapeutic options may be lost if the wrong path is pursued. Intraoperative consultation is useful in assessing whether "lesional" tissue is present and whether or not this tissue is necrotic, and in constructing a differential diagnosis that can direct the proper triage of tissue for molecular studies/cytogenetics. Adequate tissue should be submitted for conventional light microscopy before tissue has been taken for cytogenetics, electron microscopy, or molecular analysis.

D: Intraoperative Consultation.—Histologic classification of bone and soft tissue tumors is sufficiently complex that, in many cases, it is unreasonable to expect a precise classification of these tumors based on an intraoperative consultation. A complete understanding of the surgeon’s treatment algorithm is recommended before rendering a frozen section diagnosis. In the case of primary bone tumors, an intraoperative diagnosis of benign versus malignant will generally guide the immediate decision to curette, excise, or wait for permanent sections, and certain therapeutic options may be lost if the wrong path is pursued. Intraoperative consultation is useful in assessing whether “lesional” tissue is present and whether or not this tissue is necrotic, and in constructing a differential diagnosis that can direct the proper triage of tissue for flow cytometry (lymphoma), electron microscopy, and molecular studies/cytogenetics. Tissue triage optimally is performed at the time of frozen section. In many cases, it is important that a portion of tissue be submitted for ancillary studies, even from fine-needle aspiration (FNA) and core needle biopsy specimens, once sufficient tissue has been submitted for histologic evaluation.

E: Tissue Submission for Histologic Evaluation.—One section per centimeter of maximum dimension is usually recommended, although fewer sections are needed for very large tumors, especially if they are homogeneous. Tumors known to be high grade from a previous biopsy do not require as many sections as those that were previously diagnosed as low grade, as documentation of a high-grade component will change stage and prognosis in the latter case. Sections should be taken of grossly heterogeneous areas, and there is no need to submit more than 1 section of necrotic tumor (always with a transition to viable tumor), with the exception of chemotherapy effect on osteosarcomas and Ewing/primitive neuroectodermal tumor (PNET) sarcomas. Occasionally, gross pathology can be misleading, and areas that appear to be grossly necrotic may actually be myxoid or edematous. When this happens, additional sections of these areas should be submitted for histologic examination. When estimates of gross necrosis exceed those of histologic necrosis, the greater percentage of necrosis should be recorded on the surgical pathology report. In general, most tumors require 12 sections or fewer, excluding margins. Tumors with greater areas of heterogeneity may need to be sampled more thoroughly.

Fresh tissue for special studies should be submitted at the time the specimen is received. Note that classification of many subtypes of sarcoma is not dependent upon special studies, such as cytogenetics or molecular genetics, but frozen tissue is often needed to enter patients into treatment protocols. Discretion should be used in triaging tissue from sarcomas. Adequate tissue should be submitted for conventional light microscopy before tissue has been taken for cytogenetics, electron microscopy, or molecular analysis.

F: Molecular Studies.—It is important to snap freeze a small portion of tissue whenever possible. This tissue can be used for a variety of molecular analyses for tumor-specific molecular translocations (Table 1) that help in classifying bone and soft tissue tumors. In addition, treatment protocols increasingly require fresh tissue for correlative studies. Approximately 1 cm³ of fresh tissue (less is acceptable for small specimens, including core biopsies) should be cut into small, 0.2-cm fragments, reserving sufficient tissue for histologic examination. This frozen tissue should ideally be stored at −70°C and can be shipped on dry ice to facilities that perform molecular analysis.

G: Tumor Classification From Biopsies.—It is not always possible to classify bone and soft tissue tumors precisely based on biopsy material, especially FNA and core needle biopsy specimens. Whereas pathologists should make every attempt to classify lesions in small biopsy specimens, on occasion stratification into very basic diagnostic categories, such as lymphoma, carcinoma, melanoma, and sarcoma, is all that is possible. In some cases, precise classification is only possible in open biopsy or resection specimens.

H: World Health Organization Classification of Tumors.—Classification of tumors should be made according to the World Health Organization (WHO) classification of bone and soft tissue tumors listed below. As part of the recent WHO classification of soft tissue tumors, a recommendation was made to divide tumors into 4 categories: benign, intermediate (locally aggressive), intermediate (rarely metastasizing), and malignant.

WHO Classification of Soft Tissue Tumors of Intermediate Malignant Potential and Malignant Soft Tissue Tumors

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adipocytic Tumors</td>
<td>Intermediate (locally aggressive)</td>
</tr>
<tr>
<td>Atypical lipomatous tumor/Well-differentiated liposarcoma</td>
<td></td>
</tr>
<tr>
<td>Malignant</td>
<td>Dedifferentiated liposarcoma</td>
</tr>
<tr>
<td>Myxoid/round cell liposarcoma</td>
<td>Pleomorphic liposarcoma</td>
</tr>
<tr>
<td>Mixed-type liposarcoma</td>
<td>Liposarcoma, not otherwise specified</td>
</tr>
<tr>
<td>Fibroblastic/Myofibroblastic Tumors</td>
<td>Superficial fibromatoses (palmar/plantar)</td>
</tr>
</tbody>
</table>

Table 1. Characteristic Cytogenetic and Molecular Events of Bone and Soft Tissue Tumors*

<table>
<thead>
<tr>
<th>Histologic Type</th>
<th>Cytogenetic Events</th>
<th>Molecular Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alveolar soft part sarcoma</td>
<td>t(X;17)(p11;q25)</td>
<td>ASPL-TFE3 fusion</td>
</tr>
<tr>
<td>Aneurysmal bone cyst</td>
<td>t(16;17)(q22;p13)</td>
<td>CDH11-USP6 fusion</td>
</tr>
<tr>
<td>Angiomatoid fibrous histiocytoma</td>
<td>t(12;16)(q13;p11)</td>
<td>FUS-ATF1 fusion</td>
</tr>
<tr>
<td>Extraskeletal myxoid chondrosarcoma</td>
<td>t(9;17)(q22;q11)</td>
<td>EWS-NRA43 fusion</td>
</tr>
<tr>
<td></td>
<td>t(9;15)(q22;q21)</td>
<td>TCF12-NRA43 fusion</td>
</tr>
<tr>
<td>Chondrosarcoma of bone</td>
<td>Complex</td>
<td></td>
</tr>
<tr>
<td>Clear cell sarcoma</td>
<td>t(12;22)(q13;q12)</td>
<td>EWS-ATF1 fusion</td>
</tr>
<tr>
<td>Desmoplastic small round cell tumor</td>
<td>t(11;22)(p13;q12)</td>
<td>EWS-WT1 fusion</td>
</tr>
<tr>
<td>Dermatofibrosarcoma protubers</td>
<td>t(17;22)(q13;q12)</td>
<td>COL1A1-PDGF fusion</td>
</tr>
<tr>
<td>Ewing sarcoma/PNET</td>
<td>t(11;22)(q13;q12)</td>
<td>COL1A1-PDGF fusion</td>
</tr>
<tr>
<td></td>
<td>t(12;22)(q13;q12)</td>
<td>EWS-FLI1 fusion</td>
</tr>
<tr>
<td>Ewing sarcoma/PNET</td>
<td>t(21;22)(q12;q12)</td>
<td>EWS-ERG fusion</td>
</tr>
<tr>
<td></td>
<td>t(2;22)(q33;q12)</td>
<td>EWS-FEV fusion</td>
</tr>
<tr>
<td>Fibrosarcoma, infantile</td>
<td>t(12;15)(p13;q26)</td>
<td>ETv6-NTRK3 fusion</td>
</tr>
<tr>
<td>Inflammatory myofibroblastic tumor</td>
<td>2p32 rearrangement</td>
<td>ALK fusion genes</td>
</tr>
<tr>
<td>Leiomyosarcoma</td>
<td>Deletion of 1p</td>
<td></td>
</tr>
<tr>
<td>Liposarcoma</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Well-differentiated</td>
<td>Ring form of chromosome 12</td>
<td></td>
</tr>
<tr>
<td>Myxoid/Round cell</td>
<td>t(12;16)(q13;p11)</td>
<td>FUS-CHOP fusion</td>
</tr>
<tr>
<td>Pleomorphic</td>
<td>t(12;22)(q13;q12)</td>
<td>EWS-CHOP fusion</td>
</tr>
<tr>
<td>Low-grade fibromyxoid sarcoma</td>
<td>Complex</td>
<td></td>
</tr>
<tr>
<td>Malignant peripheral nerve sheath tumor</td>
<td>t(7;16)(q32;p11)</td>
<td>FUS-CREB3L2 fusion</td>
</tr>
<tr>
<td>Myxofibrosarcoma (myxoid MFH)</td>
<td>Ring form of chromosome 12</td>
<td></td>
</tr>
<tr>
<td>Osteosarcoma</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low grade</td>
<td>Ring chromosomes</td>
<td></td>
</tr>
<tr>
<td>High grade</td>
<td>Complex</td>
<td></td>
</tr>
<tr>
<td>Rhabdoid tumor</td>
<td>Deletion of 22q</td>
<td>INI1 inactivation</td>
</tr>
<tr>
<td>Rhabdomyosarcoma</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alveolar</td>
<td>t(2;13)(q35;q14)</td>
<td>PAX3-FKHR fusion</td>
</tr>
<tr>
<td>Embryonal</td>
<td>t(7;13)(p36;q14), double minutes</td>
<td>PAX7-FKHR fusion</td>
</tr>
<tr>
<td>Synovial sarcoma</td>
<td>Trisomies 2q, 8, and 20</td>
<td>Loss of heterozygosity at 11p13</td>
</tr>
<tr>
<td>Monophasic</td>
<td>t(X;18)(p11;q11)</td>
<td>SYT-SSX1 or SYT-SSX2 fusion</td>
</tr>
<tr>
<td>Biphasic</td>
<td>t(X;18)(p11;q11)</td>
<td>Predominantly SYT-SSX1 fusion</td>
</tr>
</tbody>
</table>

* PNET indicates primitive neuroectodermal tumor; MFH, malignant fibrous histiocytoma.
Vascular Tumors
Intermediate (locally aggressive)
  Kaposiform hemangioendothelioma
Intermediate (rarely metastasizing)
  Retiform hemangioendothelioma
  Papillary intralymphatic angioendothelioma
  Composite hemangioendothelioma
  Kaposi sarcoma
Malignant
  Epithelioid hemangioendothelioma
  Angiosarcoma of soft tissue
Tumors of Peripheral Nerves
Malignant
  Malignant peripheral nerve sheath tumor
  Epithelioid malignant peripheral nerve sheath tumor
Chondro-osseous Tumors
Malignant
  Mesenchymal chondrosarcoma
  Extraskeletal osteosarcoma
Tumors of Uncertain Differentiation
Intermediate (rarely metastasizing)
  Angiomatoid fibrous histiocytoma
  Ossifying fibromyxoid tumor (including atypical/malignant)
  Mixed tumor/Myoepithelioma/Parachordoma
Malignant
  Synovial sarcoma
  Epithelioid sarcoma
  Alveolar soft part sarcoma
  Clear cell sarcoma of soft tissue
  Extraskeletal myxoid chondrosarcoma ("chordoid" type)
  PNET/Extraskeletal Ewing tumor
  peripheral primitive neuroectodermal tumor (pPNET)
  Extraskeletal Ewing tumor
  Desmoplastic small round cell tumor
  Extrarenal rhabdoid tumor
  Malignant mesenchymoma
  Neoplasms with perivascular epithelioid cell differentiation (PEComa)
  Intimal sarcoma

WHO Classification of Benign/Locally Aggressive and Malignant Bone Tumors

Cartilage Tumors
  Chondrosarcoma
    Central, primary, and secondary
    Peripheral
    Dedifferentiated
    Mesenchymal
    Clear cell
Osteogenic Tumors
  Osteosarcoma
    Conventional
    Chondroblastic
    Fibroblastic
    Osteoblastic
    Telangiectatic
    Small cell
    Low-grade central
    Secondary
    Parosteal
  Periosteal
    High-grade surface
Fibrogenic Tumors
  Desmoplastic fibroma (benign/locally aggressive)
  Fibrosarcoma
  Fibrohistiocytic Tumors
  Malignant fibrous histiocytoma
  Ewing Sarcoma/Primitive Neuroectodermal Tumor
  Ewing sarcoma/PNET
  Hematopoietic Tumors
  Plasma cell myeloma
  Malignant lymphoma, not otherwise specified (NOS)
  Giant Cell Tumors
  Giant cell tumor (benign/locally aggressive)
  Malignancy in giant cell tumor
  Notochordal Tumors
    Chordoma
  Vascular Tumors
    Angiosarcoma
  Smooth Muscle Tumors
    Leiomyosarcoma
  Lipogenic Tumors
    Liposarcoma
  Miscellaneous Tumors
    Adamantinoma
    Metastatic malignancy
  Miscellaneous Lesions
    Langerhans cell histiocytosis

I: Grading.—Unlike with other organ systems, the staging of soft tissue sarcomas is largely determined by grade. Unfortunately, there is no generally agreed-upon scheme for grading bone and soft tissue tumors.6 The most widely used soft tissue grading systems are the French Federation of Cancer Centers Sarcoma Group (FNCLCC) and National Cancer Institute (NCI) systems.7,8 Both systems have 3 grades, evaluate mitotic activity, necrosis, and differentiation, and are highly correlated with prognosis.9 However, in addition to these criteria, the NCI system requires the quantification of cellularity and pleomorphism for certain subtypes of sarcomas, which is difficult to determine objectively. The FNCLCC system is easier to use, in our opinion, and recent data suggest that it may be slightly better in predicting prognosis than the NCI system.9 Other systems with 2 or 4 grades also have been used. Accurate grading requires an adequate sample of tissue, which is not always available from FNA or core needle biopsy or in tumors previously treated with radiation or chemotherapy.

FNCLCC Grading

The FNCLCC grade is based on 3 parameters: differentiation, mitotic activity, and necrosis. Each of these parameters receives a score: differentiation (1–3), mitotic activity (1–3), and necrosis (0–2). The scores are summed to produce a grade.

Grade 1: 2 or 3
Grade 2: 4 or 5
Grade 3: 6 to 8

Differentiation.—Tumor differentiation is scored as follows (see Table 2).

Score 1: Sarcomas closely resembling normal, adult mesenchymal tissue
Score 2: Sarcomas of certain histologic type
Table 2. Tumor Differentiation Score According to Histologic Type in the Updated Version of the French Federation of Cancer Centers Sarcoma Group System*

<table>
<thead>
<tr>
<th>Tumor Differentiation</th>
<th>Histologic Type</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well-differentiated liposarcoma</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Myxoid liposarcoma</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Round cell liposarcoma</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Pleomorphic liposarcoma</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Dedifferentiated liposarcoma</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Fibrosarcoma</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Myxofibrosarcoma (myxoid MFH)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Typical storiform MFH (sarcoma, NOS)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>MFH, pleomorphic type (patternless pleomorphic sarcoma)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Giant cell and inflammatory MFH (pleomorphic sarcoma, NOS with giant cells or inflammatory cells)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Well-differentiated leiomyosarcoma</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Conventional leiomyosarcoma</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Poorly differentiated/pleomorphic/epithelioid leiomyosarcoma</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Biphasic/monophasic synovial sarcoma</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Poorly-differentiated synovial sarcoma</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Pleomorphic rhabdomyosarcoma</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Mesenchymal chondrosarcoma</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Extraskeletal osteosarcoma</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Ewing sarcoma/PNET</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Malignant rhabdoid tumor</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Undifferentiated sarcoma</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

*Modified from Guillou et al, with permission from the American Society of Clinical Oncology. Note: Grading of malignant peripheral nerve sheath tumor, embryonal and alveolar rhabdomyosarcoma, angiosarcoma, extraskeletal myxoid chondrosarcoma, alveolar soft part sarcoma, clear cell sarcoma, and epithelioid sarcoma is not recommended. MFH indicates malignant fibrous histiocytoma; NOS, not otherwise specified; PNET, primitive neuroectodermal tumor.

Score 3: Synovial sarcomas, embryonal sarcomas, undifferentiated sarcomas, and sarcomas of doubtful tumor type

Tumor differentiation is the most problematic aspect of the FNCLCC system. Its use is subjective and does not include every subtype of sarcoma. Nevertheless, it is an integral part of the system, and an attempt should be made to assign a differentiation score.

Mitosis Count.—The count is made in the most mitotically active area in 10 successive high-power fields (HPFs) (a high-power field × 400 = 0.1734 mm²) (use the 40× objective).

Score 1: 0 to 9 mitoses per 10 HPFs
Score 2: 10 to 19 mitoses per 10 HPFs
Score 3: 20 or more mitoses per 10 HPFs.

Tumor Necrosis.—Determined on histologic sections.

Score 0: No tumor necrosis
Score 1: Less than or equal to 50% tumor necrosis
Score 2: More than 50% tumor necrosis

The grading of bone tumors is largely driven by the histologic diagnosis, and traditionally grading has been based on the system advocated by Broders, which assesses cellularity and nuclear features/degree of anaplasia. We advocate a more pragmatic approach to grading aggressive and malignant primary tumors of bone. Two bone tumors that have a tendency to be locally aggressive but have little to no metastatic potential are giant cell tumor and desmoplastic fibroma. Two bone tumors that are locally aggressive and metastasize infrequently, and thus are usually low grade, are low-grade central osteosarcoma and parosteal osteosarcoma. Periosteal osteosarcoma is generally regarded as a grade 2 osteosarcoma. Primary bone tumors that are generally high grade include: malignant giant cell tumor, Ewing sarcoma/PNET, angiosarcoma, dedifferentiated chondrosarcoma, conventional osteosarcoma, telangiectatic osteosarcoma, small cell osteosarcoma, secondary osteosarcoma, and high-grade surface osteosarcoma.

Grading of conventional chondrosarcoma is based on cellularity, cytologic atypia, and mitotic figures. Grade 1 (low-grade) chondrosarcoma is hypocellular and similar histologically to enchondroma. Grade 2 (intermediate-grade) chondrosarcoma is more cellular than grade 1 chondrosarcoma; has more cytologic atypia, greater hyperchromasia and nuclear size; or has extensive myxoid stroma. Grade 3 (high-grade) chondrosarcoma is hypercellular, pleomorphic, and contains prominent mitotic activity. Mesenchymal chondrosarcoma, fibrosarcoma, leiomyosarcoma, liposarcoma, angiosarcoma and other “soft tissue-type” sarcomas that rarely occur in bone can be graded according to the FNCLCC grading system.

Chordomas are locally aggressive lesions with a propensity for metastasis late in their clinical course and are not graded. Adamantinomas tend to have a low-grade clinical course, but this is variable. Fortunately, they are very rare. According to the WHO classification of tumors of bone, adamantinomas are considered low grade.

Bone Tumor Grades (Summary)

Benign/Locally Aggressive
Desmoplastic fibroma
Giant cell tumor
Grade 1 (Low Grade)
Low grade central osteosarcoma
Parosteal osteosarcoma
Adamantinoma
Grade 2
Periosteal osteosarcoma
Grade 3 (High Grade)
Malignant giant cell tumor
Ewing sarcoma/PNET
Dedifferentiated chondrosarcoma
Conventional osteosarcoma
Telangiectatic osteosarcoma
Small cell osteosarcoma
Secondary osteosarcoma
High-grade surface osteosarcoma
Variable Grade
Conventional chondrosarcoma of bone (grades 1–3)
Soft-tissue type sarcomas (eg, leiomyosarcoma)
Ungraded
Chordoma

TNM Grading

The American Joint Committee on Cancer (AJCC) staging system for soft tissue and bone tumors includes a 4-grade system but effectively collapses into high grade and low grade. Grading in the TNM grading system is based on differentiation only and does not apply to sarcomas.

GX Grade cannot be assessed
G1 Well differentiated
G2 Moderately differentiated
G3 Poorly differentiated
G4 Poorly differentiated or undifferentiated (4-tiered systems only)

For purposes of using the AJCC staging system, 3-grade systems such as FNCLCC can be converted to a 4-grade (TNM) system as follows: grade 1 = G1; grade 2 = G2; and grade 3 = G3 and G4. This means that FNCLCC/NCI grade 2 tumors are considered “high grade” for the purposes of stage grouping.

J: Margins.—It has been recommended that for all margins <2 cm, the distance of the tumor from the margin be reported in centimeters. However, there is a lack of agreement on this issue. We recommend specifying the location of all margins <2 cm. Margins from bone and soft tissue tumors should be taken as perpendicular margins, if possible. If bones are present in the specimen and are not involved by tumor, or the tumor is >2 cm from the margin, the marrow can be scooped out and submitted as a margin. In addition, the status of the margin should be listed according to the following scheme:

- Intralesional: within lesion (ie, the margin is positive)
- Marginal: <2.0 cm of normal tissue around all margins, less if bounded by fascia
- Wide: ≥2.0 cm of normal tissue around all margins, less if bounded by fascia

K: Definition of Procedures.—The following is a list of guidelines to be used in defining what type of procedure has been performed.

Intralesional Resection.—Leaving gross tumor behind. Partial debulking or curettage are examples. In general, these procedures are palliative.

Marginal Resection.—Removing the tumor and its pseudocapsule with a relatively small amount of adjacent tissue. There is no gross tumor at the margin; however, microscopic tumor may be present. Note that occasionally, a surgeon will perform an “excisional” biopsy, which effectively accomplishes the same thing as a marginal resection.

Wide Resection.—An intracompartmental resection. The tumor is removed with pseudocapsule and a cuff of 2 cm of normal tissue in all directions, but without the complete removal of an entire muscle group, compartment or bone. A cuff larger than 2.0 cm is typical, but it may be less when the margin is a fascial plane.

Segmental/En Block Resection (Bone Only).—This is similar conceptually to a wide excision in soft tissue. A single piece of bone is resected, including the lesion and a cuff of normal bone.

Radical Resection.—The removal of an entire soft tissue compartment (for example, anterior compartment of the thigh, the quadriceps) or bone, or the excision of the adjacent muscle groups if the tumor is extracompartmental. Radical excisions include amputations and disarticulations.

L: Response to Chemotherapy/Radiation Therapy Effect.—While agreement has not been reached about measuring the effect of preoperative (neoadjuvant) chemotherapy/radiation therapy in soft tissue tumors, an attempt should be made to quantify these effects, especially in the research setting. Therapy response is expressed as a percentage of total tumor area that is either necrotic or replaced by fibrous or granulation tissue. Nonliquefied tumor tissue from a cross section through the longest axis of the tumor should be sampled. At least 1 section of necrotic tumor (always with a transition to viable tumor) should be sampled to verify the gross impression of necrosis. Non sampled necrotic areas should be included in the estimate of necrosis and the percentage of tumor necrosis reported. The gross appearance can be misleading, and areas that appear grossly necrotic may actually be myxoid or edematous. Additional sections from these areas should be submitted for histologic examination. When estimates of gross necrosis exceed those of histologic necrosis, the greater percentage of necrosis should be recorded on the surgical pathology report. It is essential to estimate neoadjuvant treatment effect in primary Ewing sarcoma/PNET and osteosarcoma of bone, as these have been shown to have prognostic significance. An entire representative slice of the tumor taken through the long axis should be mapped using a grid pattern diagram, photography, or radiologic film to indicate the site for each tumor block. In addition, a section of tumor perpendicular to the long axis should be sampled at the rate of 1 section per centimeter. Areas of soft tissue extension and the interface of tumors with normal tissue should also be sampled. Prognostically significant therapy response in osteosarcoma, according to most series, is defined at 90%, with those tumors showing ≥90% therapy response associated with a favorable prognosis. Therapy response in Ewing sarcoma is expressed as grade I (macroscopic viable tumor), grade II (microscopic viable tumor), or grade III (no viable tumor), and is highly correlated with 5-year survival.

M: Lymph Nodes.—Regional lymph node metastasis is uncommon in adult bone and soft tissue sarcomas. Nodes are not sampled routinely, and it usually is not necessary to exhaustively search for nodes. When present, regional lymph node metastasis has prognostic importance and should be reported.

N: Histologic Classification of Treated Lesions.—Due to extensive treatment effects, such as necrosis, fibrosis, and chemotherapy-induced and radiation-induced pleomorphism, it may not be possible to classify some lesions that were either never biopsied or where the biopsy was insufficient for a precise diagnosis.

O: Venous/Lymphatic Invasion.—By American Joint Committee on Cancer (AJCC)/International Union Against Cancer (UICC) convention, vessel invasion (lymphatic or venous) does not affect the T category unless specifically included in the definition of a T category. In all other cases, lymphatic and venous invasion by tumor are coded separately as follows.

Lymphatic Vessel Invasion (L)

LX Lymphatic vessel invasion cannot be assessed
L0 No lymphatic vessel invasion
L1 Lymphatic vessel invasion

Venous Invasion (V)

VX Venous invasion cannot be assessed
V0 No venous invasion
V1 Microscopic venous invasion
V2 Macroscopic venous invasion
P: TNM and Stage Groupings: Soft Tissue Tumors.—The TNM Staging System for soft tissue tumors of the American Joint Committee on Cancer (AJCC) and the International Union Against Cancer (UICC) is recommend ed.11,12

The staging system applies to all soft tissue sarcomas except Kaposi sarcoma, dermatofibrosarcoma protuber ans, desmoid fibromatosis, infantile fibrosarcoma, and angiosarcoma. In addition, sarcomas arising within the confines of the dura mater, including the brain, and sarcomas arising in parenchymatous organs and from hollow viscera are not optimally staged by this system.

Pathologic (pTNM) staging consists of the removal and pathologic evaluation of the primary tumor and clinical/radiologic evaluation for regional and distant metastases. In circumstances where it is not possible to obtain accurate measurements of the excised primary sarcoma specimen, it is acceptable to use radiologic assessment of tumor size to assign a pT category. In examining the primary tumor, the pathologist should subclassify the lesion and assign a histopathologic grade via an accepted grading system.

Although size currently is designated within the TNM system as 5 cm or smaller vs larger than 5 cm, particular emphasis should be placed on providing size measurements. Size should be regarded as a continuous variable, with 5 cm as merely an arbitrary division that makes it possible to dichotomize patient populations.

Depth is also an independent variable and is defined as follows.

1. Superficial
   a. Lesion does not involve superficial fascia.
2. Deep
   a. Lesion is deep to, or involves, the superficial fascia.
   b. All intraperitoneal visceral lesions, retroperitoneal lesions, intrathoracic lesions, and the majority of head and neck tumors are considered deep.
3. Depth is evaluated in relation to tumor size (T)
   a. Tumor 5 cm or less: T1a = superficial; T1b = deep.
   b. Tumor >5 cm: T2a = superficial; T2b = deep.

Nodal involvement is rare in adult soft tissue sarcomas but, when present, has a very poor prognosis. The outcome of patients with N1 disease is similar to that of those with M1 disease. Patients whose nodal status is not determined to be positive for tumor, either clinically or pathologically, should be designated as N0.

Restaging of Recurrent Tumors

The same staging should be used when a patient requires restaging of sarcoma recurrence. Such reports should specify whether patients have primary lesions or lesions that were previously treated and have subsequently recurred. Reporting of possible etiologic factors such as radiation exposure and inherited or genetic syndromes is encouraged. Appropriate workup for recurrent sarcoma usually includes cross-sectional imaging (computed tomography [CT] scan or magnetic resonance imaging [MRI] scan) of the tumor, a CT scan of the chest, and a tissue biopsy to confirm diagnosis prior to initiation of therapy.

Q: TNM and Stage Groupings: Bone Tumors.—The TNM Staging System for bone tumors of the American Joint Committee on Cancer (AJCC) and the International Union Against Cancer (UICC) is recommended.11,12

The classification is to be applied to all primary tumors of bone. Pathologic staging includes pathologic data obtained from examination of a resected specimen sufficient to evaluate the highest T category, histopathologic type and grade, regional lymph nodes as appropriate, or distant metastasis. Because regional lymph node involvement from bone tumors is rare, the pathologic stage grouping includes any of the following combinations: pT pG pN pM, or pT pG cN cM, or cT cN pM.

Primary Tumor (T)

TX Primary tumor cannot be assessed
T0 No evidence of primary tumor
T1 Tumor 5 cm or less in greatest dimension
T1a Superficial tumor
T1b Deep tumor
T2 Tumor more than 5 cm in greatest dimension
T2a Superficial tumor
T2b Deep tumor

Note: Superficial tumor is located exclusively above the superficial fascia without invasion of the fascia; deep tumor is located either exclusively beneath the superficial fascia, superficial to the fascia with invasion of or through the fascia, or both superficial yet beneath the fascia. Retroperitoneal, mediastinal, and pelvic sarcomas are classified as deep tumors.

Regional Lymph Nodes (N)

NX Regional lymph nodes cannot be assessed
N0 No regional lymph node metastasis
N1 Regional lymph node metastasis

*Note: Presence of positive nodes (N1) is considered stage IV.

Distant Metastasis (M)

MX Distant metastasis cannot be assessed
M0 No distant metastasis
M1 Distant metastasis

Stage Groupings

<table>
<thead>
<tr>
<th>Stage</th>
<th>T1a, 1b, 2a, 2b</th>
<th>N0</th>
<th>M0</th>
<th>G1–2</th>
<th>G1</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage I</td>
<td>T1a, 1b, 2a, 2b</td>
<td>N0</td>
<td>M0</td>
<td>G1–2</td>
<td>G1</td>
<td>Low</td>
</tr>
<tr>
<td>Stage II</td>
<td>T2b</td>
<td>N0</td>
<td>M0</td>
<td>G3–4</td>
<td>G2–3</td>
<td>High</td>
</tr>
<tr>
<td>Stage III</td>
<td>Any T</td>
<td>N1</td>
<td>M0</td>
<td>Any G</td>
<td>Any G</td>
<td>High or Low</td>
</tr>
<tr>
<td>Stage IV</td>
<td>Any T</td>
<td>N0</td>
<td>M1</td>
<td>Any G</td>
<td>Any G</td>
<td>High or Low</td>
</tr>
</tbody>
</table>

Bone and Soft Tissue Protocol—Rubin et al
Regional Lymph Nodes (N)

NX Regional lymph nodes cannot be assessed
N0 No regional lymph node metastasis
N1 Regional lymph node metastasis

*Note: Because of the rarity of lymph node involvement in sarcomas, the designation NX may not be appropriate and could be considered N0 if no clinical involvement is evident.

Distant Metastasis (M)

MX Distant metastasis cannot be assessed
M0 No distant metastasis
M1 Distant metastasis
M1a Lung
M1b Other distant sites

Stage Groupings

<table>
<thead>
<tr>
<th>Stage</th>
<th>4-Tier System</th>
<th>3-Tier System</th>
</tr>
</thead>
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<tr>
<td>Stage IA</td>
<td>T1</td>
<td>N0</td>
</tr>
<tr>
<td>Stage IB</td>
<td>T2</td>
<td>N0</td>
</tr>
<tr>
<td>Stage II A</td>
<td>T1</td>
<td>N0</td>
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<tr>
<td>Stage II B</td>
<td>T2</td>
<td>N0</td>
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<tr>
<td>Stage III</td>
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<td>Stage IV A</td>
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<tr>
<td>Stage IV B</td>
<td>Any T</td>
<td>N1</td>
</tr>
<tr>
<td></td>
<td>Any T</td>
<td>Any N</td>
</tr>
</tbody>
</table>

R: TNM Descriptors.—For identification of special cases of TNM or pTNM classifications, the “m” suffix and “y,” “r,” and “a” prefixes are used. Although they do not affect the stage grouping, they indicate cases needing separate analysis.

The “m” suffix indicates the presence of multiple primary tumors in a single site and is recorded in parentheses: pTNM(M).

The “y” prefix indicates those cases in which classification is performed during or following initial multimodality therapy (ie, neoadjuvant chemotherapy, radiation therapy, or both chemotherapy and radiation therapy). The cTNM or pTNM category is identified by a “y” prefix. The ycTNM or ypTNM categorizes the extent of tumor actually present at the time of that examination. The “y” categorization is not an estimate of tumor prior to multimodality therapy (ie, before initiation of neoadjuvant therapy).

The “r” prefix indicates a recurrent tumor when staged after a documented disease-free interval, and is identified by the “r” prefix: rTNM.

The “a” prefix designates the stage determined at autopsy: aTNM.

Additional Descriptors

Residual Tumor (R)

Tumor remaining in a patient after therapy with curative intent (eg, surgical resection for cure) is categorized by a system known as R classification, shown below.

RX Presence of residual tumor cannot be assessed
R0 No residual tumor
R1 Microscopic residual tumor
R2 Macroscopic residual tumor

For the surgeon, the R classification may be useful to indicate the known or assumed status of the completeness of a surgical excision. For the pathologist, the R classification is relevant to the status of the margins of a surgical resection specimen. That is, tumor involving the resection margin on pathologic examination may be assumed to correspond to residual tumor in the patient and may be classified as macroscopic or microscopic according to the findings at the specimen margin(s).

References

5. Pathology and Genetics of Tumours of Soft Tissue and Bone. Lyon, France: IARC Press; 2002; World Health Organization Classification of Tumours.
SURGICAL PATHOLOGY CANCER CASE SUMMARY (CHECKLIST)
Soft Tissue: Biopsy

Patient name: ________________________________

Surgical pathology number: __________________

MACROSCOPIC (check 1 response unless otherwise indicated)

Specimen Type
- Core needle biopsy
- Incisional biopsy
- Excisional biopsy
- Other (specify): __________________________
- Not specified

Tumor Site
Specify (if known): __________________________
- Not specified

Tumor Depth (check all that apply)
- Superficial
- Dermal
- Subcutaneous/suprafascial
- Deep
  - Fascial
  - Subfascial
  - Intramuscular
  - Mediastinal
  - Intra-abdominal
  - Retroperitoneal
  - Head and neck
- Other (specify): __________________________
- Cannot be determined

Note: More than 1 tissue plane may be involved and should be indicated.

Tumor Size
Greatest dimension: ___ cm
*Additional dimensions: ___ × ___ cm
- Cannot be determined (see Comment)

MICROSCOPIC (check 1 response unless otherwise indicated)

Histologic Type (World Health Organization [WHO] classification of soft tissue tumors)
Specify: ________________________________
- Cannot be determined

Results of Ancillary Studies
Specify: ________________________________
- Not performed

*Mitotic Rate
*Specify: ___ /10 high-power fields
(1 HPF × 400 = 0.1734 mm²; ×40 objective; most proliferative area)
*Comment(s) __________________________________________

Necrosis
- Absent
- Present
- Extent: ___ %
- Cannot be determined

Prebiopsy Treatment (check all that apply)
- No therapy
- Chemotherapy performed
- Radiation therapy performed
- Therapy performed, type not specified
- Unknown

Grade
System used:
- French Federation of Cancer Centers Sarcoma Group (FNCLCC)
- National Cancer Institute (NCI)
- Other (specify): __________________________
  Specify grade: ___
  Cannot be determined

Regional Lymph Nodes
- Cannot be assessed
- No regional lymph node metastasis
- Regional lymph node metastasis
  Specify: Number examined: ___
  Number involved: ___

Distant Metastasis
- Cannot be assessed
- Distant metastasis
  *Specify site(s), if known:

Margins (for excisional biopsy only)
- Cannot be assessed
- Margins uninvolved by sarcoma
  Distance of sarcoma from closest margin: ___ cm
  Specify margin: __________________________
  Specify other close (less than 2.0 cm) margin(s):
  _______________
- Margins involved by sarcoma
  Specify margin(s): _______________________

*Venous/Lymphatic (Large/Small Vessel) Invasion
*Specify: ___
  - Present
  - Absent
  - Indeterminate

*Additional Pathologic Findings
*Specify: ________________________________

* Data elements with asterisks are not required for accreditation purposes for the Commission on Cancer. These elements may be clinically important, but are not yet validated or regularly used in patient management. Alternatively, the necessary data may not be available to the pathologist at the time of pathologic assessment of this specimen.
SURGICAL PATHOLOGY CANCER CASE SUMMARY (CHECKLIST)

Soft Tissue: Resection

Patient name: ________________________________

Surgical pathology number: ____________________

MACROSCOPIC (check 1 response unless otherwise indicated)

Specimen Type
___ Intralesional resection
___ Marginal resection
___ Wide resection
___ Radical resection
___ Other (specify): ____________________________
___ Not specified

Tumor Site
Specify (if known): ____________________________
___ Not specified

Tumor Depth (check all that apply)
___ Superficial
___ Dermal
___ Subcutaneous/suprafascial
___ Deep
___ Fascial
___ Subfascial
___ Intramuscular
___ Mediastinal
___ Intra-abdominal
___ Retroperitoneal
___ Head and neck
___ Other (specify): ____________________________
___ Cannot be determined

Tumor Size
Greatest dimension: ______ cm
*Additional dimensions: ______ × ______ cm
___ Cannot be determined (see Comment)

MICROSCOPIC (check 1 response unless otherwise indicated)

Histologic Type (WHO classification of soft tissue tumors)
Specify: ____________________________
___ Cannot be determined

Results of Ancillary Studies
Specify: ____________________________
___ Not performed

*Mitotic Rate
*Specify: ______ /10 high-power fields
(1 HPF × 400 = 0.1734 mm²; ×40 objective; most proliferative area)

Necrosis (macroscopic or microscopic)
___ Absent
___ Present
Extent: ______

*Comment(s)

Preresection Treatment (check all that apply)
___ No therapy
___ Chemotherapy performed
___ Radiation therapy performed
___ Therapy performed, type not specified
___ Unknown

Grade
System used:
___ French Federation of Cancer Centers Sarcoma Group (FNCLCC)
___ National Cancer Institute (NCI)
___ Other (specify): ____________________________

Specify grade: ____________________________

Pathologic Staging (pTNM)

Primary Tumor (pT)
___ pTX: Primary tumor cannot be assessed
___ pT0: No evidence of primary tumor
___ pT1a: Tumor 5 cm or less in greatest dimension, superficial tumor
___ pT1b: Tumor 5 cm or less in greatest dimension, deep tumor
___ pT2a: Tumor more than 5 cm in greatest dimension, superficial tumor
___ pT2b: Tumor more than 5 cm in greatest dimension, deep tumor

Regional Lymph Nodes (pN)
___ pNX: Regional lymph nodes cannot be assessed
___ pN0: No regional lymph node metastasis
___ pN1: Regional lymph node metastasis

Specify: Number examined: ______
___ Number involved: ______

Distant Metastasis (pM)
___ pMX: Cannot be assessed
___ pM1: Distant metastasis

*Specify site(s), if known: ____________________________

Margins
___ Cannot be assessed
___ Margins uninvolved by sarcoma
Distance of sarcoma from closest margin: ______ cm
___ Specify margin: ____________________________
___ Specify other close (less than 2.0 cm) margin(s): ______
___ Margins involved by sarcoma
Specify margin(s): ____________________________

*Venous/Lymphatic (Large/Small Vessel) Invasion
___ Present
___ Absent
___ Indeterminate

*Additional Pathologic Findings
*Specify: ____________________________

* Data elements with asterisks are not required for accreditation purposes for the Commission on Cancer. These elements may be clinically important, but are not yet validated or regularly used in patient management. Alternatively, the necessary data may not be available to the pathologist at the time of pathologic assessment of this specimen.

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**SURGICAL PATHOLOGY CANCER CASE SUMMARY (CHECKLIST)**

**Bone: Biopsy**

Patient name: ____________________________________________

Surgical pathology number: ________________________________

**MACROSCOPIC (check 1 response unless otherwise indicated)**

**Specimen Type**

- Core needle biopsy
- Curettage
- Excisional biopsy
- Other (specify): _____________________________
- Not specified

**Bone Involved**

Specify (if known): _____________________________
- Not specified

**Tumor Location (check all that apply)**

- Epiphysis
- Metaphysis
- Diaphysis
- Cortical
- Medullary cavity
- Surface
- Tumor involves joint
- Tumor extension into soft tissue
- Cannot be determined

*Note: More than 1 site may be involved and should be indicated.*

**Radiographs**

- Radiographic images were correlated
- Radiographic images were not correlated

**Tumor Size**

Greatest dimension: ___ cm
*Additional dimensions: ___ × ___ cm
- Cannot be determined (see Comment)

**MICROSCOPIC (check 1 response unless otherwise indicated)**

**Histologic Type (WHO classification of bone tumors)**

Specify: _____________________________________________
- Cannot be determined

**Results of Ancillary Studies**

Specify: _____________________________________________
- Not performed

*Mitotic Rate*

- Specify: ___/10 high-power fields
  
  (1 HPF × 400 = 0.1734 mm²; ×40 objective; most proliferative area)

**Necrosis**

- Absent
- Present
  
  Extent: ___ %
- Cannot be determined

**Prebiopsy Treatment (check all that apply)**

- No therapy
- Chemotherapy performed
- Radiation therapy performed
- Therapy performed, type not specified
- Unknown

**Grade**

Specify: _____________________________________________
- Cannot be determined

*Venous/Lymphatic (Large/Small Vessel) Invasion*

- Present
- Absent
- Indeterminate

*Additional Pathologic Findings*

*Specify: _____________________________________________

*Comment(s)________________________________________

*Data elements with asterisks are not required for accreditation purposes for the Commission on Cancer. These elements may be clinically important, but are not yet validated or regularly used in patient management. Alternatively, the necessary data may not be available to the pathologist at the time of pathologic assessment of this specimen.*
### SURGICAL PATHOLOGY CANCER CASE SUMMARY (CHECKLIST)

#### Bone: Resection

**Patient name:**

**Surgical pathology number:**

#### MACROSCOPIC (check 1 response unless otherwise indicated)

- **Specimen Type**
  - Intralesional resection
  - Marginal resection
  - Wide local/segmental/en block resection
  - Radical resection
  - Other (specify):
  - Not specified

- **Bone Involved**
  - Specify (if known):
  - Not specified

- **Tumor Location (check all that apply)**
  - Epiphysis
  - Metaphysis
  - Diaphysis
  - Cortical
  - Medullary
  - Surface
  - Tumor involves joint
  - Tumor extension into soft tissue
  - Cannot be determined

*Note: More than 1 tissue plane may be involved and should be indicated.*

#### Radiographs

- Radiographic images were correlated
- Radiographic images were not correlated

#### Tumor Size

- Greatest dimension: ____ cm
- *Additional dimensions: ____ × ____ cm
- Cannot be determined

#### MICROSCOPIC (check 1 response unless otherwise indicated)

- **Histologic Type (WHO classification of bone tumors)**
  - Specify:
  - Cannot be determined

- **Results of Ancillary Studies**
  - Specify:
  - Not performed

- **Mitotic Rate**
  - *Specify: ____ /10 high-power fields
  - (1 HPF = 0.1734 mm²; ×40 objective; most proliferative area)

- **Necrosis (macroscopic or microscopic)**
  - Absent
  - Present
  - Extent: ____ %

*Comment(s) *

#### Preresection Treatment (check all that apply)

- No therapy
- Chemotherapy performed
- Radiation therapy performed
- Therapy performed, type not specified
- Unknown

#### Grade

- Specify: __
- Cannot be determined

#### Pathologic Staging (pTNM)

- **Primary Tumor (pT)**

  - pTX: Primary tumor cannot be assessed
  - pT0: No evidence of primary tumor
  - pT1: Tumor 8 cm or less in greatest dimension
  - pT2: Tumor more than 8 cm in greatest dimension
  - pT3: Discontinuous tumors in the primary bone site

- **Regional Lymph Nodes (pN)**
  - pNX: Regional lymph nodes cannot be assessed
  - pN0: No regional lymph node metastasis
  - pN1: Regional lymph node metastasis
  - Specify: Number examined: ____
  - Number involved: ____

- **Distant Metastasis (pM)**
  - pMX: Cannot be assessed
  - pM1: Distant metastasis
  - pM1a: Lung
  - pM1b: Other distant sites
  - *Specify site(s), if known:

- **Margins**
  - Cannot be assessed
  - Margins uninvolved by sarcoma
    - Distance of sarcoma from closest bone margin: ____ cm
    - Specify bone margin:
  - Distance of sarcoma from closest soft tissue margin, if applicable: ____ cm
  - Specify soft tissue margin, if applicable:
  - Margins involved by sarcoma
  - Specify margin(s):

- **Venous/Lymphatic (Large/Small Vessel) Invasion**
  - * Present
  - * Absent
  - * Indeterminate

**Additional Pathologic Findings**

- *Specify: __________

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* Data elements with asterisks are not required for accreditation purposes for the Commission on Cancer. These elements may be clinically important, but are not yet validated or regularly used in patient management. Alternatively, the necessary data may not be available to the pathologist at the time of pathologic assessment of this specimen.