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Cancer Staging Atlas

A Companion to the Seventh Editions of the AJCC Cancer Staging Manual and Handbook

SECOND EDITION

Springer

AJCC CANCER STAGING ATLAS

A Companion to the Seventh Editions of the AJCC Cancer Staging Manual and Handbook Second Edition

AMERICAN JOINT COMMITTEE ON CANCER
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AMERICAN JOINT COMMITTEE ON CANCER

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Second Edition

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Preface

The second edition of the AJCC Cancer Staging Atlas has been created as a compendium to the 7th Edition of the AJCC Cancer Staging Manual, which was updated and expanded in 2010 and continues to promulgate the importance of anatomical and pathological staging in the management of cancer. This Atlas has been viewed as a companion to illustrate the TNM classifications of all cancer sites and types that are included in the 7th Edition of the Manual. It is fully illustrated to give meaningful visualization at a glance to the TNM classifications and stage groupings and will serve as a useful reference for clinicians, registrars, students, trainees, and patients alike.

There have been many evidence-based changes in staging strategies in the 7th Edition of the AJCC Cancer Staging Manual, the differences compared to the 6th edition have been highlighted throughout the Atlas. This provides meaningful comparisons as well as a reference for teaching and training.

The 616 illustrations have been developed exclusively for the AJCC Cancer Staging Atlas by Alice Y. Chen, our exceptional medical illustrator. The drawings are specifically designed for simplicity and clarity and have been verified through multi-disciplinary vetting to ensure their accuracy and relevancy for clinical usage. Every illustration provides detailed anatomic depictions to clarify critical structures and to allow the reader to instantly visualize the progressive extent of malignant disease. Appropriate labeling has been incorporated to identify significant anatomic structures, and each illustration is accompanied by a relevant explanatory legend. Throughout all anatomic sites and cancer types, the newly developed illustrations reflect concepts that are more completely discussed in the 7th Edition of the AJCC Cancer Staging Manual and the companion Handbook.

The AJCC Cancer Staging Atlas is an official publication of the American Joint Committee on Cancer and reinforces the AJCC's position as the leader in disseminating state-of-the-art information on TNM staging. The AJCC continues to have as its mission the education of physicians, registrars, and patients and the promotion of evidence-based patient management. The Atlas continues to enhance this mission. This project has been fully supported by our publishing colleagues at Springer and especially Margaret Burns, Richard Lansing, Gregory Sutorius, and Bill Curtis.

The editors of this most recent AJCC project wish to underscore the concept that TNM is a universal language, which must be applied by all clinicians caring for cancer patients. The creation of visual images of clinical and pathological staging parameters serves to clarify and augment this language. We dedicate this work to all of our patients and colleagues and hope that they too will benefit from this illustrated resource.

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General Information on Cancer Staging and End-Results Reporting

PART I

General Information on Cancer Staging and End-Results Reporting

Purposes and Principles of Cancer Staging

1

INTRODUCTION AND OVERVIEW

The extent or *stage* of cancer at the time of diagnosis is a key factor that defines prognosis and is a critical element in determining appropriate treatment based on the experience and outcomes of groups of prior patients with similar stage. In addition, accurate staging is necessary to evaluate the results of treatments and clinical trials, to facilitate the exchange and comparison of information among treatment centers, and to serve as a basis for clinical and translational cancer research. At a national and international level, the agreement on classifications of cancer cases provides a method of clearly conveying clinical experience to others without ambiguity.

Several cancer staging systems are used worldwide. Differences among these systems stem from the needs and objectives of users in clinical medicine and in population surveillance. The most clinically useful staging system is the tumor node metastasis (TNM) system maintained collaboratively by the American Joint Committee on Cancer (AJCC) and the International Union for Cancer Control (UICC). The TNM system classifies cancers by the size and extent of the primary tumor (T), involvement of regional lymph node (N), and the presence or absence of distant metastases (M), supplemented in recent years by carefully selected nonanatomic prognostic factors. There is a TNM staging algorithm for cancers of virtually every anatomic site and histology, with the primary exception in this manual being staging of pediatric cancers.

Philosophy of TNM Revision. The AJCC and UICC periodically modify the TNM system in response to newly acquired clinical data and improved understanding of cancer biology and factors affecting prognosis. Revision is one factor that makes the TNM system the most clinically useful staging system and accounts for its use worldwide. However, changes in staging systems may make it difficult to compare outcomes of current and past groups of patients. Because of this, the organizations only make these changes carefully and based on the best possible evidence.

The revision cycle for TNM staging is 6–8 years. This provides sufficient time for implementation of changes in clinical and cancer registry operations and for relevant examination and discussion of data supporting changes in staging. Table 1.1 shows the publication years for each of the versions of the TNM system up through this current seventh edition of the TNM system. The prior sixth edition was used for cases diagnosed on or after January 1, 2003. The seventh edition published in this manual is effective for cancer cases diagnosed on or after January 1, 2010.

Anatomic Staging and Use of Nonanatomic Information. Cancer staging is historically based solely on the anatomic extent of cancer and remains primarily anatomic. However, an increasing number of nonanatomic factors about a cancer and its host provide critical prognostic information and may predict the value of specific therapies. Among those factors known to affect patient outcomes and/or response to therapy are the clinical and pathologic anatomic extent of disease, the reported duration of signs or symptoms, gender, age and health status of the patient, the type and grade of the cancer, and the specific biological properties of the cancer. Clinicians use the pure anatomic extent of disease in defining treatment, but in many cases must supplement TNM with other factors in order to counsel patients and make specific treatment recommendations. As more of these factors are fully validated, it will be necessary to develop strategies to incorporate them into

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prognostic systems for patient management while maintaining the core anatomic structure of staging. The restriction of TNM to anatomic information has led clinicians to develop other prognostic systems and even led some to conclude that TNM is "obsolete" or "anachronistic."

As outlined in this chapter and throughout the *Manual* in many of the revised AJCC staging algorithms, nonanatomic factors are incorporated into stage grouping where needed. This practice started in a limited fashion in prior editions. However, anatomic extent of disease remains central to defining cancer prognosis. Most proposed nonanatomic prognostic factors in use have been validated only for patients with specific types of disease grouped largely on the anatomic stage (e.g., Gleason's score in early stage prostate cancer and genomic profiles that are validated only in women with node-negative breast cancer). Further, it is critical to maintain the ability to report purely anatomic information to allow comparability of patients treated using new prognostic schemas with patients treated in the past using prior anatomic schemas or with current patients for whom new prognostic factors are not obtained because of cost, available expertise, reporting systems, or other logistical issues.

Defining T, N, M and Timing of Staging Data. Stage is determined from information on the tumor T, regional nodes N, and metastases M and by grouping cases with similar prognosis. The criteria for defining anatomic extent of disease are specific for tumors at different anatomic sites and of different histologic types. For example, the size of the tumor is a key factor in breast cancer but has no impact on prognosis in colorectal cancer, where the depth of invasion or extent of the cancer is the primary prognostic feature. Therefore, the criteria for T, N, and M are defined separately for each tumor and histologic type. With certain types of tumors, such as Hodgkin and other lymphomas, a different system for designating the extent of disease and prognosis, and for classifying its groupings, is necessary. In these circumstances, other symbols or descriptive criteria are used in place of T, N, and M, and in the case of lymphoma only the *stage group* is defined. The general rules for defining elements of staging are presented later, and the specifics for each type of disease are in the respective chapters.

Beginning with the sixth edition of the *AJCC Cancer Staging Manual*, TNM adopted a change in the rules for timing of staging data collection to coordinate data collection among the major cancer registry organizations in the USA including the North American Central Registry programs [e.g., the NCI Surveillance Epidemiology and End Results Program (SEER) and the National Program of Cancer Registries (NPCR) of the Center for Disease Control and Prevention], and the National Cancer Data Base, and to accommodate changing practice patterns with increased use of sensitive imaging studies that often were applied during the initial diagnostic phase of care, but occurred after surgery. The timing rules state that:

- *Clinical staging* includes any information obtained about the extent of cancer before initiation of definitive treatment (surgery, systemic or radiation therapy, active surveillance, or palliative care) or within 4 months after the date of diagnosis, whichever is *shorter*, as long as the cancer has not clearly progressed during that time frame.
- *Pathologic staging* includes any information obtained about the extent of cancer through completion of definitive surgery as part of first course treatment or identified within 4 months after the date of diagnosis, whichever is *longer*, as long as there is no systemic or radiation therapy initiated or the cancer has not clearly progressed during that timeframe.

TNM Staging Classification: Clinical, Pathologic, Recurrent, Posttreatment, and Autopsy. Stage may be defined at a number of points in the care of the cancer patient. These include "pretreatment stage" or "clinical stage," and postsurgical or "pathologic stage." In addition, stage may be determined (a) after therapy for those receiving systemic or radiation therapy before surgery (termed neoadjuvant therapy) or as primary treatment without surgery, (b) at the time of recurrence, and (c) for cancers identified at autopsy.

Clinical stage (*pretreatment stage*) is the extent of disease defined by diagnostic study before information is available from surgical resection or initiation of neoadjuvant therapy, within the required time frame (see previous discussion). The nomenclature for clinical staging is cT, cN, and cM, and the anatomic stage/prognostic groups based on cTNM are termed the clinical stage groups. Clinical staging incorporates information obtained from symptoms; physical examination; endoscopic examinations; imaging studies of the tumor, regional lymph nodes, and metastases; biopsies of the primary tumor; and surgical exploration without resection. When T is classified only clinically (cT), information from biopsy of single or sentinel lymph nodes may be included in clinical node staging (cN). On occasion, information obtained at the time of surgery may be classified as clinical such as when liver metastases that are identified clinically but not biopsied during a surgical resection of an abdominal tumor.

Pathologic stage is defined by the same diagnostic studies used for clinical staging supplemented by findings from surgical resection and histologic examination of the surgically removed tissues. This adds significant additional prognostic information that is more precise than what can be discerned clinically before therapy. This pathologic extent of disease or pathologic stage is expressed as pT, pN, and pM.

Posttherapy stage (*yTNM*) documents the extent of the disease for patients whose first course of therapy includes systemic or radiation treatment prior to surgical resection or when systemic therapy or radiation is the primary treatment with no surgical resection. The use of so-called *neoadjuvant* therapy is increasingly common in solid tumors including breast, lung, gastrointestinal, head and neck, and other cancers. Posttherapy stage may be recorded as clinical or pathologic depending on the source of posttreatment information. The extent of disease is classified using the same T, N, and M definitions and identified as posttreatment with a "yc" or "yp" prefix (ycT, ycN, ycTNM; ypT, ypN, ypTNM). Note that American registry systems do not have a data element to record "yc" elements, but these may be recorded in the medical record. The measured response to therapy and/or the extent of cancer after therapy may be prognostic. It is also used to guide subsequent surgery or other therapy.

When a patient receives presurgical treatment and has a posttherapy yc- or yp-TNM stage, the *stage* used for surveillance analysis and for comparison purposes is the clinical stage before the start of therapy. Care should be taken not to record the postneoadjuvant therapy stage as the primary stage for comparison of populations or for clinical trials. This could lead to erroneous reports. For example, a patient with a clinical Stage III breast cancer after chemotherapy could have only residual carcinoma in situ. If the final y stage was used as the original stage, the cancer would be erroneously staged as Stage 0. This would be grossly misleading for a case that in fact presented as a locally advanced Stage III cancer.

Two other staging classifications are defined, though there are no data fields reserved for these stages in most cancer registry systems. The first of these is "*Retreatment*" *classification* (*rTNM*). This is used because information gleaned from therapeutic procedures and from extent of disease defined clinically may be prognostic for patients with recurrent cancer after a disease-free interval. Clearly the extent of recurrent disease guides therapy, and this should be recorded in the medical record using the TNM classification. It is important to understand that the rTNM classification does not change the original clinical or pathologic staging of the case. The second of these is the "*Autopsy*" *classification* (*aTNM*) used to stage cases of cancer not recognized during life and only identified postmortem.

TNM Groupings. For the purposes of tabulation and analysis of the care of patients with a similar prognosis, T, N, and M are grouped into so-called *anatomic stage/prognostic groups*, commonly referred to as stage groups. Groups are classified by Roman numerals from I to IV with increasing severity of disease. Stage I generally denotes cancers that are smaller or less deeply invasive with negative nodes; Stage II and III define cases with increasing tumor or nodal extent, and Stage IV identifies

those who present with distant metastases (M1) at diagnosis. In addition, the term Stage 0 is used to denote carcinoma in situ with no metastatic potential. Stage 0 is almost always determined by pathologic examination.

The primary TNM groupings are purely clinical or pathologic. However, in clinical medicine, it is often expedient to combine clinical and pathologic T, N, and M information to define a mixed stage group for treatment planning. An example of a clinical situation where such "mixed staging" is used clinically is a woman with breast cancer who has had the primary tumor resected providing pathologic T, but for whom there was no lymph node surgery, requiring use of the clinical N. The mixed stage combining clinical and pathologic information is sometimes referred to as *working stage*. However, pure clinical and pathologic stage is still defined for comparative purposes. In addition, clinical M status (M0 or M1) may be mixed with pathologic T and N information to define pathologic stage, and the classification pTis cN0 cM0 may be used to define both clinical and pathologic stage for in situ carcinoma. If there is pathologic evidence of metastases (pM1), it may be used with clinical T and N information to define clinical Stage IV and pathologic Stage IV.

The grouping recommendations in this manual are based primarily on anatomic information. Anatomic extent of disease is supplemented by selected nonanatomic prognostic factors in some disease sites. To denote the significance of this selective use of nonanatomic factors and to underscore the importance of anatomic information, the title of the groupings in the *AJCC Cancer Staging Manual* has been changed to "*Anatomic Stage/Prognostic Groups.*"

Recording Cancer Stage in the Medical Record. All staging classifications, and most importantly clinical and pathologic T, N, and M and stage grouping, should be recorded in the medical record. Clinical stage is used in defining primary therapy (including surgery if surgery is performed), and when surgery is the initial treatment, subsequent systemic or radiation treatment is based on the pathologic stage. Recording clinical stage is also important because it may be the only common denominator among all cancers of a certain anatomic site and histology. Examples include lung cancer, advanced GI tumors, and head and neck cancers where surgery may not be performed, as well as cancers such as prostate cancer and others where surgical resection for limited disease may be omitted. In such scenarios, it may be impossible to compare cases where information is only obtained by clinical means with those where surgical resection is performed. For this reason, clinical stage remains an important component of application of the TNM staging system. This was reinforced in 2008 by the American College of Surgeons Commission on Cancer in its cancer program standards with the requirement that clinical stage be recorded in all cases.

There are many options for recording staging data in the medical record. These include documenting in the initial clinical evaluations, operative reports, discharge summaries, and follow-up reports. Physicians are encouraged to enter the stage of cancer in every record of clinical encounters with the cancer patient. In addition, a paper or electronic staging form may be useful to record stage in the medical record as well as to facilitate communication of staging data to a cancer registry. A simple form for collecting staging data is included for each disease site in this manual.

The Cancer Registry and the Collaborative Stage Data Collection System. Recording stage information in a cancer registry allows analysis of treatment effects and longitudinal population studies. Traditionally registries recorded the staging data provided in the medical record or on a staging form by the physician. With the increasing complexity of staging, the potential to incorporate various nonanatomic factors into staging algorithms, and the need to coordinate staging data collection for hospital- and population-based central registries, there was a need for a more standardized data collection tool for staging data. Such a system, termed the Collaborative Stage Data Collection System (CS), was developed by the AJCC and its cancer surveillance and staging partner organizations and implemented in cancer registries in the USA in 2004. It has also been implemented in parts of Canada with the expectation to implement throughout Canada by 2012.