Clinical Staging System for Carcinoma of the Lung*

General Rules for Staging

Each cancer has a number of characteristics which influence its natural history. Among these characteristics, the anatomic extent of the cancer at the time of diagnosis is of special importance, and various systems have been developed to describe the extent and stage of disease.

Increasingly sophisticated diagnostic techniques and more intensive study of each patient have enhanced our ability to determine the extent of each cancer. Future developments may alter the amount and character of information used, and the classification systems will require revision periodically.

The purpose of assessing the extent of the disease in each patient with cancer is to:
- help in more precise communication about patients with cancer;
- aid in the selection of the most effective treatment;
- assist in determining prognosis;
- make possible meaningful comparison of end results reporting from different sources;
- help study cancer control measures.

To achieve these objectives, it is essential to develop a common language acceptable to and used by the medical profession and others concerned with the control of cancer. To this end the following general rules are proposed:

1. The TNM System provides a basis for categorizing the extent of disease and, when appropriate, will be used. When the TNM System is used, the letter T represents the primary tumor, with appropriate subscripts to describe increasing sizes of the tumor and/or the involvement by direct extension. The letter N represents regional lymph node involvement, with appropriate subscripts to describe the absence of involvement or increasing degrees of such involvement. The letter M represents distant metastasis, with appropriate subscripts to describe the absence of such metastasis or increasing degrees of dissemination. The various categories of TNM may be grouped into appropriate combinations to create a small number of stages of the disease. This classification is extended by the following designations:

| Tumor | Description |
|-------|-------------|
| T0    | No evidence of primary tumor. |
| T1    | Carcinoma in situ. |
| T2    | Progressive increase in tumor size and involvement. |
| T3    | Tumor cannot be assessed. |
| TX    | Regional lymph nodes not demonstrably abnormal. |
|      | Increasing degrees of demonstrable abnormality of regional lymph nodes. |
|      | For many primary sites the subscript "a," e.g., N1a, may be used to indicate that metastasis to the node is not suspected, and the subscript "b," e.g., N1b, may be used to indicate that metastasis to the node is not suspected but is proven. |

| Nodes | Designation |
|-------|-------------|
| N0    | Regional lymph nodes not demonstrably abnormal. |
| N1    | Increasing degrees of demonstrable abnormality of regional lymph nodes. |
|      | For many primary sites the subscript "a," e.g., N1a, may be used to indicate that metastasis to the node is not suspected, and the subscript "b," e.g., N1b, may be used to indicate that metastasis to the node is not suspected but is proven. |
|      | Regional lymph nodes cannot be assessed clinically. |

| Metastasis | Description |
|------------|-------------|
| MO         | No evidence of distant metastasis. |
| M1         | Ascending degrees of distant metastasis, including metastasis to distant lymph nodes. |
| M2         | Ascending degrees of distant metastasis, including metastasis to distant lymph nodes. |
| M3         | Ascending degrees of distant metastasis, including metastasis to distant lymph nodes. |

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*Adapted from the publication, "Clinical Staging System for Carcinoma of the Lung," published by the American Joint Committee for Cancer Staging and End Results Reporting, September, 1973. Direct correspondence to: The Executive Secretary, American Joint Committee, 55 East Erie Street, Chicago, Illinois 60611.
2. Different types of evaluative evidence are used for classifying the extent of disease at different sites. The terms clinical classification, surgical evaluative classification and postsurgical treatment classification are used.

3. For cancer at certain accessible sites, especially those which can be treated in an appropriate manner by more than one treatment modality, the extent of the cancer should be determined and recorded before definitive treatment is carried out. This provides a clinical classification and makes it possible to compare the results of different modalities of treatment of certain accessible lesions, such as carcinoma of the cervix, larynx and oral cavity.

4. For cancers at sites inaccessible to clinical evaluation, such as carcinoma of the ovary, stomach, colon and kidney, information obtained by surgical exploration and/or histopathologic studies of removed specimens may be used in describing the extent of disease. This rule permits information obtained during or after definitive treatment to be used in describing extent of disease.

5. The term surgical evaluative classification is to be used to describe the known extent of disease following a major surgical exploration and/or biopsy.

6. The term postsurgical treatment classification is to be used to describe the known extent of the disease following the complete examination of the therapeutically resected specimen.

7. For cancers of some sites it may be desirable to record a clinical classification, a surgical evaluative classification and/or a postsurgical treatment classification.

8. Variable amounts of information may be used in determining each of the three classifications for each primary site. Specific recommendations as to which information should be used for each classification are given for each primary site.

9. Once the extent of disease has been established according to either
classification, the classification should not be changed. The subsequent course of the neoplasm does not alter the original description of extent of tumor or stage classification.

10. Cases in which treatment has failed and additional supplementary treatment is being considered cannot be classified with a primary treatment series. Such recurrent cases may be grouped together and reported separately but they must not be deleted from the original primary treatment series.

11. Histologic or cytologic verification of cancer is necessary.

Specific Considerations in Staging

The TNM staging system for carcinoma of the lung (Table I) was developed by a thorough analysis of more than 2,000 cases. The data confirmed the opinion that the four major cell types of carcinoma of the lung—squamous cell, adenocarcinoma, undifferentiated large cell and undifferentiated small cell (oat cell)—differ significantly from each other and should be classified and reported separately.

The data showed that all patients with undifferentiated small cell (oat cell) carcinoma, regardless of the demonstrable anatomic extent of the cancer, have such a poor prognosis that classification by the TNM categories and grouping into stages are not very meaningful at this time; however, such data may be recorded for possible use in the future.

Analysis of the data showed that for patients with squamous cell carcinoma, adenocarcinoma and undifferentiated large cell carcinoma, the prognosis was related to the size of the tumor; its location; and its extension; complications such as atelectasis, obstructive pneumonitis or pleural effusion; metastasis to regional lymph nodes; and the presence of more distant metastasis. Consequently, the primary tumor, designated by the letter T, is classified by its size, location, extension and complications. Involvement of the regional lymph
T1. A solitary tumor that is 3.0 cm or less in greatest diameter, surrounded by lung or visceral pleura and without evidence of invasion proximal to a lobar bronchus at bronchoscopy. Three examples of T1 lesions are shown.

T2. The primary tumor is more than 3.0 cm in greatest diameter as depicted in 1a or a tumor of any size which with its associated atelectasis or obstructive pneumonitis extends to the hilar region as depicted in 1b. At bronchoscopy the proximal extent of demonstrable tumor must be at least 2.0 cm distal to the carina. Any associated atelectasis or obstructive pneumonitis must involve less than an entire lung and there must be no pleural effusion.

T3. A primary tumor of any size with direct extension into an adjacent structure such as chest wall (3a), mediastinum and its contents (3b) with direct invasion of the aorta, main pulmonary artery or veins; recurrent or phrenic nerves (3c) or with invasion of the pericardium or diaphragm (3d). T3 lesions include tumors demonstrable bronchoscopically to be less than 2.0 cm distal to the carina (3e) and any tumor associated with a pleural effusion (3f) or with atelectasis or obstructive pneumonitis of an entire lung.
nodes is indicated by an appropriate category of N and the absence or presence of distant metastasis is indicated by an appropriate category of M. These categories of T, N and M are combined to obtain Stages I, II or III. (Table 2.)

Patients with other malignancies of the lung, such as alveolar cell or terminal bronchiolar carcinoma, bronchial
carcinoids, mucoepidermoids, and lymphomas, were not included in this study. This staging system is not thought to be applicable to them.

The clinical classification of patients with carcinoma of the lung should be based on the anatomic extent of the disease which can be detected by the examination prior to any treatment, including a thoracotomy. Such an examination may include a medical history, physical examination, routine and special roentgenograms, bronchoscopy, esophagoscopy, mediastinoscopy, mediastinotomy, thoracentesis, thoracoscopy, and other special examinations including those used to demonstrate the presence of extrathoracic metastasis.

The surgical evaluative classification should be based on all the data obtained for the clinical classification, and on information obtained at the time of exploratory thoracotomy, including biopsy but not including that information obtained by complete examination of a therapeutically resected specimen.

That information, and all other available data, should be used to assign a postsurgical treatment classification to those patients having such a resection.

All patients must have a clinical classification. Those patients having a thoracotomy should have, in addition, a surgical evaluative classification and/or a postsurgical treatment classification.

All the data in this article are based on the clinical classification. Application of this staging system for the assignment of a surgical evaluative and/or postsurgical treatment classification seems reasonable but has not been tested.

Summary of Results of Retrospective Review

The TNM staging system was developed after analysis of the records of more than 2,000 patients with proven carcinoma of the lung. Specially structured work-sheets with spaces for 111 items of information about each of these
patients were completed by physicians in six medical centers. The data included size and location of each primary tumor, the presence of extrapulmonary extension, and complications such as obstructive pneumonitis, atelectasis, and pleural effusion. The presence of metastasis to lymph nodes in the hilar region and in the mediastinum, and the presence of more distant metastasis, were recorded. Although histologic proof of the diagnosis may have been obtained by exploratory thoracotomy, only the information obtained by prethoracotomy diagnostic examination was used to measure the anatomic extent of the patient's cancer for the development of this staging system. Patients were admitted to the study only if the cancer had been diagnosed four or more years prior to the start of the study, and if follow-up information was available either to the time of death or to survival for at least four years.

Because there is convincing evidence that the four major cell types of lung cancer differ significantly from each other, data for patients with each cell type were analyzed separately. More than 300 survival curves of these patients were plotted for various characteristics of the primary tumor, metastasis to the regional lymph nodes, and the presence of more distant metastasis in various combinations.

All the survival curves for patients with undifferentiated small cell (oat cell) carcinoma indicated that these patients have a very poor prognosis regardless of the demonstrable anatomic extent of their cancer. (See Graph IV.) It was, therefore, concluded by the Task Force that it should be recognized that any patient with this cell type has such a poor prognosis regardless of the TNM classification or the stage grouping that such a classification is not meaningful at this time.

The survival curves for patients with the other three cell types (adeno-
carcinoma, undifferentiated large cell carcinoma, and squamous cell carcinoma) showed that the prognosis was related to the extent of and the complications due to the primary tumor, metastasis to the regional lymph nodes, and the presence of more distant metastasis. The survival rates for patients with squamous cell carcinoma were consistently better than for those with undifferentiated large cell and adenocarcinoma; these rates confirmed the opinion that in reports of groups of patients with lung cancer these cases should be classified by cell type and analyzed separately. Since, however, the relationship between survival and anatomic extent was similar for these three cell types, a single set of definitions of the various categories of T, N, and M was developed. These definitions have been grouped into a single set of stages for the classification of these patients. (See graphs I, II and III.) Table 3 lists a summary of results of the field trials.

Although few patients with occult cancer were included in the more than 2,000 cases analyzed, there is great interest in such cases. Therefore, it seemed advisable to include the TX NO

MO category under the heading of "Occult Carcinoma." Thorough study of such patients, however, will frequently result in the localization of the primary tumor, permitting the more accurate classification of the patient's cancer.

A more complete report of the analysis of these cases and the development of the TNM definitions and their combination into stages is being prepared for publication by the American Joint Committee for Cancer Staging and End Results Reporting.

**Work Sheet for Staging**

The Work Sheet on the following page is a useful tool in determining the stage of a patient's cancer of the lung. By following the directions near the top of the sheet, one can easily classify each patient’s cancer by the TNM system and, by adding the corresponding values, quickly determine the stage of the cancer. The information can be transferred to the patient’s clinical record, or the Work Sheet may be made a part of the patient’s record.

Permission is granted to reproduce the Work Sheet as desired to expedite the use of this staging system in the classification of patients with lung cancer.
Work Sheet for Staging Lung Cancer

No. ___________________________ Name ___________________________

Directions: Encircle the T, N, and M rating following the description that is most accurate for the patient's cancer. Encircle the value for each rating and add to obtain the total value. Consult the table at the bottom of the form to determine the stage. If patient had a thoracotomy, the surgical evaluative (post-thoracotomy) classification may be entered on this same form. Similarly, if patient had a resection, the post-surgical treatment classification may be entered on this form.

| PRIMARY TUMOR – T | Classification: |
|-------------------|-----------------|
| No evidence of primary tumor | Clinical Value | Surgical Evaluative Value | Post-Surg. Treatment Value |
| T0 0 | T0 0 | T0 0 |
| TX 0 | TX 0 | TX 0 |
| T1 1 | T1 1 | T1 1 |
| T2 2 | T2 2 | T2 2 |
| T3 4 | T3 4 | T3 4 |

| REGIONAL LYMPH NODES – N | Classification: |
|--------------------------|-----------------|
| No demonstrable spread to regional lymph nodes | N0 0 | N0 0 | N0 0 |
| N1 1 | N1 1 | N1 1 |
| N2 4 | N2 4 | N2 4 |

| DISTANT METASTASIS – M | Classification: |
|-----------------------|-----------------|
| No distant metastasis | M0 0 | M0 0 | M0 0 |
| M1 4 | M1 4 | M1 4 |

| TOTAL VALUE | STAGE |
|-------------|-------|
| 0 0 0 0 0 0 | Occult Carcinoma |
| 1 0 0 0 0 1 | SUMMARY T T T |
| 3 0 0 0 0 3 | OF N N N |
| 4 0 0 0 0 4 | STAGING M M M |
| 5 0 0 0 0 5 | Stage Stage Stage |

Cell type: Squamous □ Small □ Adenocarcinoma □ Large □ Unknown □

If patient had a resection, indicate whether post-surgical treatment classification was based on pathological evaluation of:

- primary tumor mass □ yes □ no □ unknown
- regional lymph nodes □ yes □ no □ unknown
- distant sites □ yes □ no □ unknown