TNM Staging

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Presentation Overview

TNM Staging
- Importance of Staging
  - Clinicians and Patients
  - Population-Based Cancer Registries
- Staging History for Surveillance
- TNM Staging Highlights and Key Points
- TNM Staging Resources

Cancer

Cancer is characterized by:
- uncontrolled, rapid cell growth
- avoidance of programmed cell death (apoptosis)
- ability to signal vessel growth (angiogenesis)
- invasion of adjacent structures, including nodes
- metastasis to distant organs

Staging is a way of describing the spread of disease within a cancer patient at the time of diagnosis through grouping patients with similar cancer characteristics, based on the experience and outcomes of prior patients

2 Major Staging Systems

AJCC/UICC (TNM) Stage
- Detailed, narrower categories, developed for clinicians, critical for cancer care delivery and research

Summary Stage
- Broad categories, most general, excellent for surveillance, monitoring trends

Clinicians and Patients

TNM System
- T - Extent of the primary tumor
- N - The absence or presence and extent of regional lymph node metastasis
- M - The absence or presence of distant metastasis

Collect both clinical and pathologic TNM, where available

Combine elements (grouping similar prognoses) to obtain stage groups (0-IV)

Value of Clinical Stage

- Develop initial treatment plan
- Review treatment guidelines (based on clinical stage)
- Define initial measures of prognosis
- Facilitate comparison of patient groups
  - Differences in primary therapy (surg vs neoadjuvant therapy) can make comparisions based on pathologic assessment impossible. Some patients get no treatment (ex. lung, advanced GI, head and neck, prostate)

Value of Pathologic Stage

- Provides best measure of tumor extent
- Most precise estimate of prognosis
- Helps define subsequent therapy after surgery

Both clinical and pathologic stage

- Facilitate exchange and comparison of information among clinicians

Population-Based Cancer Registries

Approached staging from a slightly different angle

- Interested in the best measure of prognosis across the population of all cancer patients in the registry
- Developed a system based around collecting data from the medical record using trained personnel
- Using all available information in the medical record, combines the most precise clinical and pathologic documentation of the spread of disease in the cancer patient

Broad Assessment of Prognosis

Summary Stage

Code	Definition
0	In situ
1	Localized
2	Regional by direct extension only
3	Regional lymph node involvement only
4	Regional by both direct extension and lymph node
5	Regional, NOS
7	Distant
9	Unknown

Elements with Greater Detail

Extent of Disease (EOD)

- Size of the tumor
- Tumor Extension
- Regional Lymph Node Involvement
- Regional Nodes Examined
- Regional Nodes Positive

Collecting elements allowed deriving Summary Stage or TNM-like Stage …but was a combined staging system (merging clinical and pathologic data together)

Value of Combined Stage

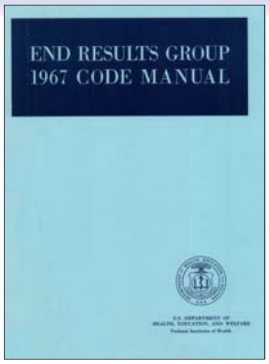
- Best measure of outcome available for each patient
- Monitor surveillance trends (early detection efforts)
- Assist with cancer control planning / resource allocation
- Allow for comparison across registries

EOD

- Provide valuable measures for researchers (size, # nodes, etc)
- Facilitate our understanding of disparities in outcomes
- Components help to compare outcomes over time
- Re-evaluate existing TNM stage groups by monitoring survival (explore new prognostic models)

Very Brief History of Staging for Population-Based Cancer Surveillance

Past -- The Beginning



OUTLINE OF 1967 ERG CODE *

Field	Columns	Title of Field
		IDENTIFICATION OF THE PATIENT
A	1– 2	ERG Registry Number
B	3– 5	Hospital Number
C	6–11	Case Number
D	12	Sex
E	13	Race or Color
F	14–15	Age at Diagnosis
G	16	Class of Case
		DESCRIPTION OF THE TUMOR
H	17–20	Date of Initial Diagnosis
I	21–24	Date of First Definitive Therapy
J	25	Malignancy
K	26–28	Primary Site
L	29	Sequence Number
M	30–32	Histological Type
N	33	Diagnostic Confirmation
O	34–36	Extent of Disease
		DESCRIPTION OF TREATMENT
P	37	Suggestive Treatment Before Definitive Therapy
Q	38–40	First Course of Definitive Treatment **
R	41–43	Subsequent Courses of Definitive Treatment **
		FOLLOW-UP
S	44–47	Date of Last Follow-Up or Death
T	48	Follow-Up Status or Death
U	49–52	Survival Time Since Diagnosis
V	53–56	Cause of Death
W	57	Autopsy
		SUPPLEMENTARY INFORMATION
X	58	Paired Organ Involvement
Y	59	Regional Lymph Node Assessment
Z	60	Multiplicity Within Primary Site
XX	77	SCD Revision Used In Field Y
YY	78	Review Status of Fields I, K, and O
ZZ	79–80	Year of Submission of Punchcard Deck
		FOR NON-ANALYTIC CASES ONLY
O(NA)	34	Extent of Disease
P(NA)	35–37	Tumor Treatment—Prior to Admission

* An abridged summary of the detailed code begins on the next right-hand page.
** Detailed definitions of definitive treatment categories are presented in a section between the instructions for Field P and Field Q.

1967 Code Manual Introduction

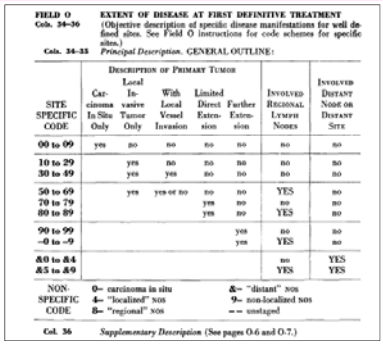
The ERG code in the past contained a crude assessment of prognosis in terms of three "stages"—local, regional, and distant spread of disease. Experience with this seemingly simple classification proved it to be imprecise in practice and pointed to a need for obtaining detailed descriptive data as a basis for a more meaningful summary classification system. Field O in the 1967 ERG Code represents, therefore, a change in emphasis since it provides identification of many objectively defined descriptive categories with the necessary resultant expansion of the code-number system.

Field O has expanded to a three-column field with major emphasis upon a two-digit summary code to be found in columns 34 and 35 with a supplementary code in column 36. For most well-defined sites a separate page will be found which contains a highly

1967 Code Manual Introduction

After a few years' experience with survival data, it should be possible to combine the descriptive categories of the summary code in columns 34–35 into meaningful prognostic groupings. Presumably, codes with similar survival rates might be grouped together. At such a time, depending upon the results, it is conceivable that the phrase "stage of disease" will again be useful. However, the present Field O is *not* a "stage" code—as indicated by the title "*Extent of Disease*"; it is a site-specific set of descriptive categories.

Field O – Extend of Disease (2-digit)



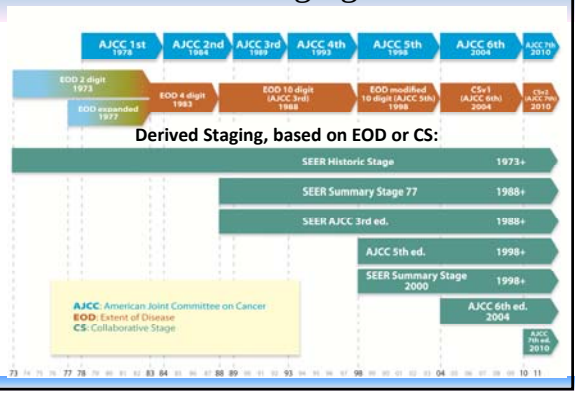
FIELD O — EXTENT OF DISEASE AT FIRST DEFINITIVE TREATMENT
Cols. 34–36 (Objective description of specific disease manifestations for well defined sites. See Field O instructions for code schemes for specific sites.)
Cols. 34–35 *Principal Description.* GENERAL OUTLINE:

SITE SPECIFIC CODE	Description of Primary Tumor: Carcinoma In Situ Only	Local Invasive Tumor Only	With Local Vessel Invasion	Limited Direct Extension	Further Extension	Involved Regional Lymph Nodes	Involved Distant Node or Distant Site
00 to 09	yes	no	no	no	no	no	no
10 to 29		yes	no	no	no	no	no
30 to 49		yes	yes	no	no	no	no
50 to 69		yes	yes or no	no	no	YES	no
70 to 79				yes	no	no	no
80 to 89				yes	no	YES	no
90 to 99					yes	no	no
–0 to –9					yes	YES	no
&0 to &4						no	YES
&5 to &9						YES	YES

NON-SPECIFIC CODE: 0– carcinoma in situ; 4– "localized" NOS; 8– "regional" NOS; &– "distant" NOS; 9– non-localized NOS; –– unstaged

Col. 36 *Supplementary Description* (See pages O-6 and O-7.)

Cancer EOD/Staging: Timeline



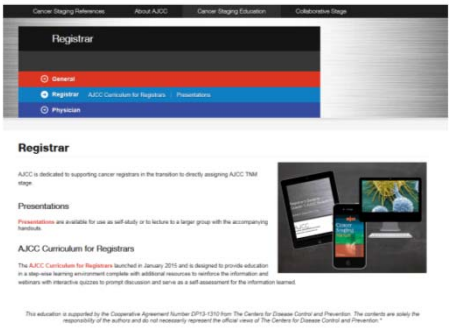
The Present – Crossroad

- Transitioning from CS v2 to TNM (effective 2016)
  - Separate Clinical and Pathologic Stage
- Continue Summary Stage 2000 (CDC-NPCR)
- Continue collection of Selected Elements from CS v2

TNM Staging Basics

TNM Staging Resources

www.cancerstaging.org



TNM Staging Resources

www.cancerstaging.org

Reference Dates

TABLE 1.1. *AJCC Cancer Staging Manual* editions

Edition	*Publication*	*Dates effective for cancer diagnosed*
1	1977	1978–1983
2	1983	1984–1988
3	1988	1989–1992
4	1992	1993–1997
5	1997	1998–2002
6	2002	2003–2009
7	2009	2010–

Chapter Outline

TABLE 1.10. Chapter outline for the seventh edition of the *AJCC Cancer Staging Manual*

Staging at a Glance	Summary of anatomic stage/prognostic grouping and major changes
Changes in Staging	Table summarizing changes in staging from the 6th edition
Introduction	Overview of factors affecting staging and outcome for the disease
Anatomic Considerations	Primary tumor
	Regional lymph nodes
	Metastatic sites
Rules for Classification	Clinical
	Pathologic
Prognostic Features	Identification and discussion of nonanatomic prognostic factors important in each disease
Definitions of TNM	T: Primary tumor
	N: Regional lymph nodes
	M: Distant metastases
Anatomic Stage/ Prognostic Groups	
Prognostic Factors (Site-Specific Factors)	(a) Required for staging (b) Clinically significant
Grade	
Histopathologic Type	
Bibliography	
Staging Form	

Outline – Big Picture

TNM Staging Basics

- Stage Classifications
- Timing Rules
- Elements (T, N, M)
- Stage Groups
- Data Entry
- Blanks vs X

Stage Classifications

Stage can be defined at numerous points in the care of the patient.

Clinical Stage (pretreatment stage) – cTNM

- Evidence acquired before treatment (surg, neoadjuvant, ww)
  - physical examination, symptoms
  - scans, x-rays, other imaging
  - endoscopy and biopsy of primary
  - diagnostic biopsy of ln, sentinal node, metastatic site
  - surgical exploration without resection
- Definition varies somewhat by site

Stage Classifications

Pathologic Stage (postsurgical stage) – pTNM

- Use all Clinical evidence PLUS
  - evidence from operative findings during resection and pathology report findings (can be viewed or palpated without biospy)
- Definition of what constitutes resection varies by site

Key points

- Clinical information is used to help stage unless disproven by operative or pathologic findings
- Operative findings include surgeon judgement and can overrule pathology if tissue was not submitted

Stage Classifications

Pathologic staging depends on proven extent of disease

Pathologic staging criteria met without surgical resection of the primary if :

- Microscopic confirmation of highest T and highest N

  or ……
- Microscopic confirmation of M1

Stage Classifications

PostTherapy Stage (neoadjuvant stage) - yTNM

- Documents the extent of disease for patients whose first course therapy includes systemic or radiation therapy prior to surgery or when systemic or radiation treatment is the primary treatment without surgery
- Can be recorded as clinical or pathologic
  - pathologic assessment after neoadjuvant therapy and surgery – yp
- Identifies response to therapy
- Helps define subsequent therapy

Timing of Data Collection

Clinical

- Includes all information obtained before the initiation of definitive treatment (surgery, radiation, systemic therapy, active surveillance) or within 4 months of diagnosis, whichever is **shorter**. Must be in the absence of disease progression.

Pathologic

- Includes information obtained through the completion of first course definitive surgery or within 4 months of diagnosis, whichever is **longer** as long as there is no systemic or radiation therapy initiated or disease progression

Defining T

- Primary Tumor (T)
  - T0 - No evidence of primary tumor
  - TIS - Carcinoma in situ
  - T1, T2, T3, T4 - Increasing size and/or local extension of primary tumor
  - TX - Primary tumor cannot be assessed

Defining T

Clinical classification cT

- Physical exam, imaging, endoscopy, biopsy of primary site, surgical exploration without resection

Pathologic classification pT

- Resection of tumor, may require resection of organ
- Must read each chapter for details
- Biopsy of tumor is adequate (without resection) if highest T

Defining N

- Regional Lymph Nodes (N)
  - N0 - No regional lymph node metastasis
  - N1, N2, N3 - Increasing involvement of regional lymph nodes
  - NX - Regional lymph nodes cannot be assessed

Defining N

Clinical classification cN

- Physical exam, imaging, diagnostic biopsy/workup

Pathologic classification pN

- Resection of node(s) with surgical resection of primary (pT) – i.e. pT is generally necessary to assign pN
- Any microscopic examination of nodes when pT is available

Exception: excision of nodes is pN when no resection is performed due to unknown primary (T0)

Defining T and N

Pathologic staging depends on proven anatomic extent of disease, whether or not the primary tumor has been completely removed.

When a biopsied tumor cannot be removed or is unreasonable to remove, if the highest T category and the highest N category or the M1 category can be confirmed microscopically, the criteria for pathologic staging have been satisfied.

Example

If diagnostic biopsy proves highest T category

- Use to assign cT
- Also use to assign pT if
  - Surgical node dissection or
  - Biopsy of highest N category

Defining M

- Distant Metastasis (M)
  - M0 - No distant metastasis
  - M1 - Distant metastasis
  - MX – Does not exist (pathologist often don't have metastatic tissue to assess)
  - Common metastatic sites
    - Lung, Liver, Bone, Brain
    - Distant lymph nodes

Defining M

- Classification of cM only required History and Physical
  - Infer cM0 status unless known cM1 or pM1
  - Extensive imaging is not needed
- The designation MX is not a valid category
- Pathologic (pM0) is not allowed. A case with a negative biopsy of a metastatic site is reported as cM0 not pM0
- pM1 classification requires positive biopsy of metastatic site

Stage Groups

- Once collected, TNM elements are grouped together into anatomic stage/prognostic groups.
- Stage groups range from 0 to IV with increasing severity
- Generally a pure clinical and a separate pure pathologic stage are recorded. Used for guideline development.
- Nonanatomic factors are incorporated where needed (ex. Gleason)

Pure Stage Group

Rule

Clinical Stage Group

- cT
- cN
- cM or pM
- clinical stage group

Pathologic Stage Group

- pT
- pN
- cM or pM
- pathologic stage group

Pure Stage Group - Exceptions

Pos Biopsy Met Site

Clinical Stage Group
- cT
- cN
- pM1
- clinical stage group IV

Pathologic Stage Group
- cT, cN } Resection not required
- pM1
- pathologic stage group IV

Carcinoma In situ

Clinical Stage Group
- pTis
- cN0
- cM0
- clinical stage group 0

Pathologic Stage Group
- pTis
- cN0
- cM0
- pathologic stage group 0

Registry Data Entry

Data Fields Available in NAACCR layout (FORDS)

	T	N	M	Stage Group
CLINICAL	T	N	M	Stage Group
PATHOLOGIC	T	N	M	Stage Group

Use appropriate c or p data fields

It is ok, and even expected, for some fields to be left blank

Data fields for assigning stage, not data collection

Example

In situ breast cancer with mastectomy and no nodal resection (pTis, cN0, cM0 for clinical and pathologic stage)

	T	N	M	Stage Group
CLINICAL	blank	0	0	0
PATHOLOGIC	T	N	M	Stage Group
	Is	blank	blank	0

Example

TURB of the bladder with in situ disease. No cystectomy.

	T	N	M	Stage Group
CLINICAL	blank	0	0	0
PATHOLOGIC	is	blank	blank	blank*

* Cystectomy (radical or partial) req for pathologic staging

Understanding Blanks vs X

AJCC allows X for T and N categories (TX, NX)

- Used when these variables cannot be assessed (information is unknown to the clinician)

  and…..
- Criteria is met for this specific stage classification (c or p)

Blank is used when:

- Criteria is not met for this specific stage classification (c or p)

  or ……
- Criteria is met but no information in record if assessment was performed (registrar does not have access to information)
- Blank is also appropriate for stage group

Is Criteria Met for Stage Classification?

No - Use blank not X

X would indicate patient eligible for staging

examples: no surgical resection for path stage

no diagnostic workup for clinical stage

Yes -

Use X if physician did not assess or have info on patient's T and/or N

example: surgical resection but no nodes examined

Use blank if information is not available in the chart

Thank you

QUESTIONS?

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Extra Slides for Reference

Non-Anatomic Factors

Chapters utilizing additional categories

8. Thyroid
   - Histology, age
10. Esophagus & Esophagogastric Junction
    - Histology, location, grade
13. Appendix
    - Histology, grade
16. GIST
    - Mitotic rate
27. Bone
    - Grade
28. Soft Tissue Sarcoma
    - Grade
36. Corpus Uteri
    - Histology
39. Gestational Trophoblastic Tumors
    - Prognostic scoring index
41. Prostate
    - PSA, Gleason
42. Testis
    - Serum Tumor Markers (AFP, hCG, LDH)
57. Primary Cutaneous Lymphomas
    - Peripheral blood involvement

Overriding Path Report pT

Clinical information can override pathology report information in certain circumstances

During operative resection, surgeon observes that cancer extended into the retroperitoneum (no biopsy). This would be T4b. If the path report shows, tumor invaded subserosal fat with the radial margin involved (T3) we can still use the clinical information to assign pT4b

Overriding Path Report pN

Clinical information can override pathology report information in certain circumstances

Physical exam and imaging show involved ipsilateral supraclavicular nodes (N3c). Pathology resection of axillary nodes only shows mets in 7 nodes (pN2a). Can use clinical information (not disproved by pathology) and assign pN3c.