Coding stage: TNM and other staging systems

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OVERVIEW

PART I

- Introduction What is stage? Why stage?
- History and publications of TNM Classification
- Clinical and pathologic stage
- Stage group and prognostic grouping

PART II

- How to code TNM and other staging systems?
- T-, N- and M-categories, examples
- Other staging systems (extent of disease, Ann Arbor, …)
- How to assign T, N and M?

INTRODUCTION – CLASSIFICATION SYSTEMS

Classification of tumours:

- according to primary site
- according to tumour type (histology)
- according to grade of differentiation
- according to specific tumour characteristics such as hormonal status, mutations, etc.
- **according to the anatomic extent of disease (clinically)**
- **according to the anatomic extent of disease histopathologically determined**
- according to clinical symptoms
- according to sex of the patient… age of the patient
- etc.

→ All these factors influence the **prognosis of the patient**

What is stage?

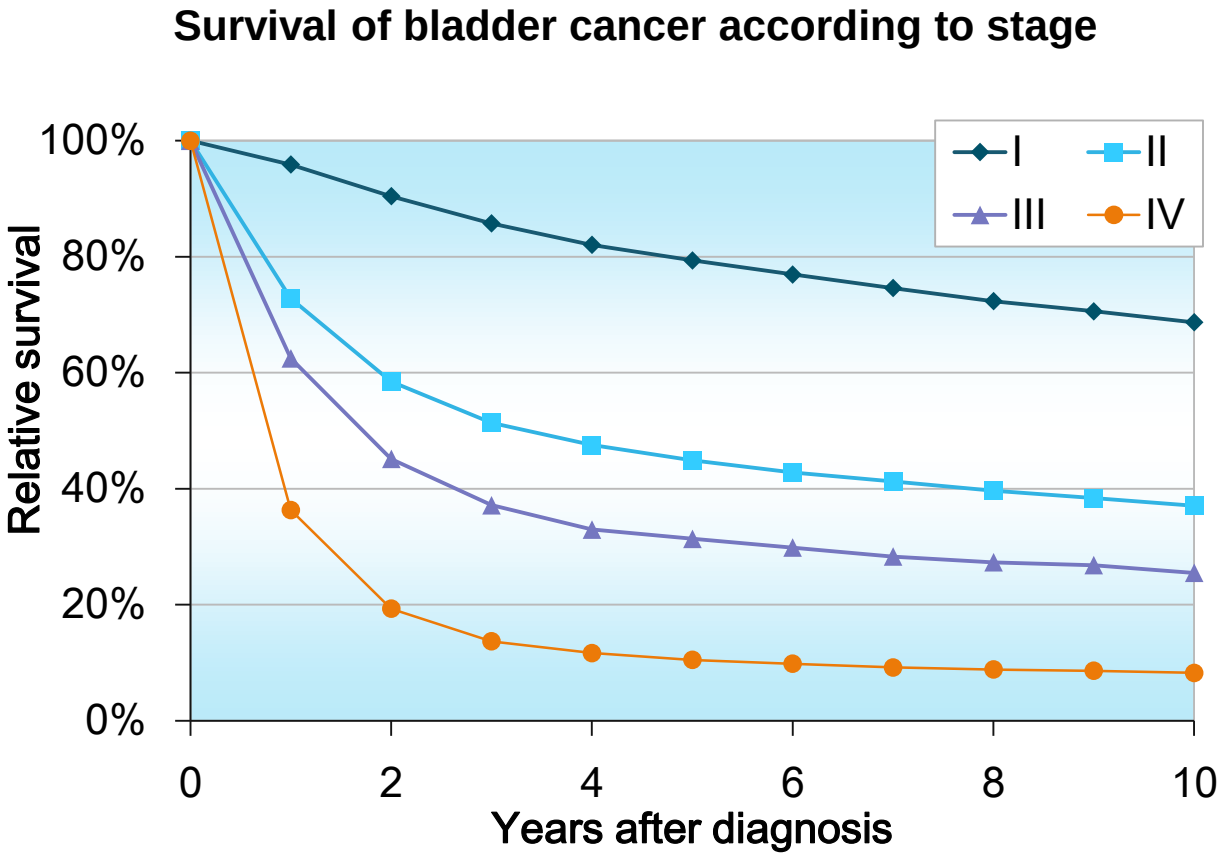
- How far the cancer has spread in the body at time of diagnosis?

- Example:

  - **2.5 cm mass UOQ R Breast. No palpable axillary nodes. Remainder of exam within normal limits.**
  - **Lumpectomy and axillary dissection: 1.8 cm ductal carcinoma. None of four nodes involved.**

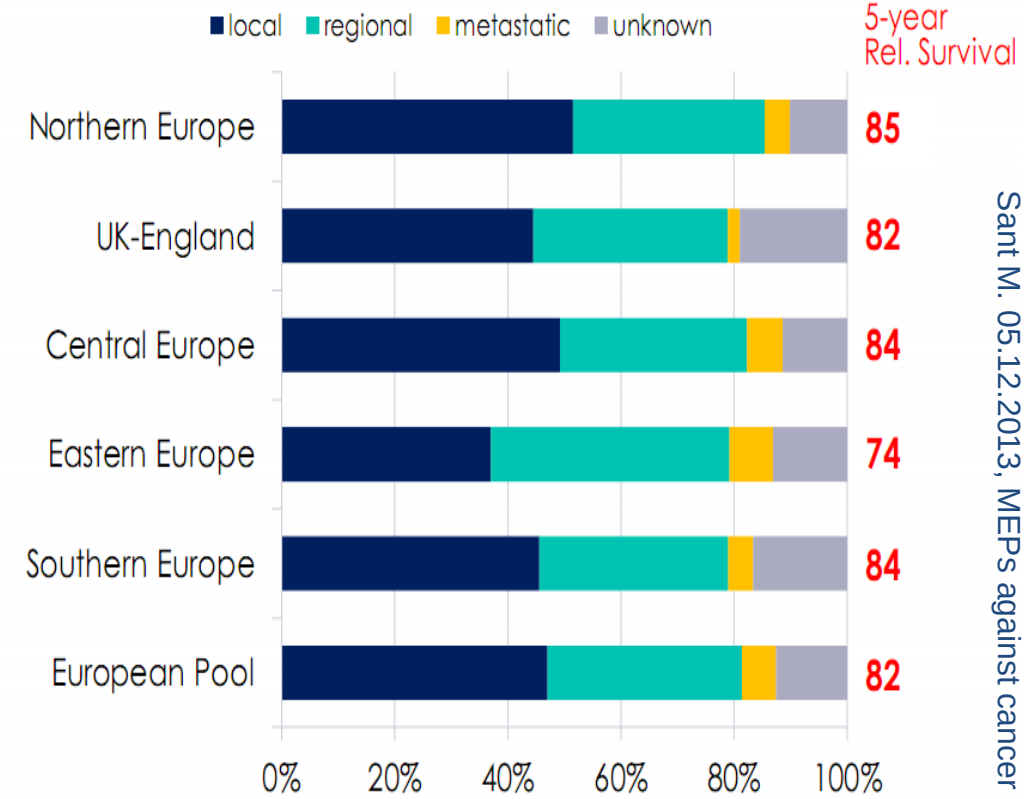
What is staging?

- Describing extent of disease
  - A common medical language
  - A way of describing or estimating prognosis



Why stage?

- **Clinical**
  - Determine treatment
  - Standardize groupings
  - Evaluate and compare results
    - International comparisons
  - Estimate prognosis
- **Population surveillance**
  - Plan and evaluate cancer screening and prevention programs
  - Monitor cancer control efforts



Sant M. 05.12.2013, MEPs against cancer

Coding practices for stage in Europe

- 2010 Questionnaire: Eurochip with ENCR
- 86 registries responded (32 countries) 50% response
- The indicator “stage at diagnosis” was gathered for at least one cancer site by 81% (using TNM in 39%).
  - 40-60% for all cancer sites

Availability of stage at diagnosis, cancer treatment delay and compliance with cancer guidelines as cancer registry indicators for cancer care in Europe: Results of EUROCHIP-3 survey.

Siesling S, Kwast A, Gavin A, Baili P, Otter R; EUROCHIP-3 Workpackage 5.

Int J Cancer. 2013 Jun 15;132(12):2910-7. doi: 10.1002/ijc.27957. Epub 2012 Dec 13.

The TNM system

- The most extensive staging system that exists
- Used all over the world by clinicians and epidemiologists
- Comparability of data
- Changes over time in order to incorporate new developments

- Responsibility? Physician who disposes of the most complete information (clin/path.)

History of TNM

- **1943-1952** TNM developed by the Frenchmen Pierre Denoix
- **1968** International Union Against Cancer (UICC): TNM classification of Malignant Tumours
- **1969** UICC TNM General rules
- **1974** UICC TNM Classification of Malignant Tumours, 2nd edition
- **1978** UICC TNM Classification of Malignant Tumours, 3rd edition
- **1982** UICC TNM Classification of Malignant Tumours, revised 3rd edition
- **1987** UICC TNM Classification of Malignant Tumours, 4th edition
- **1992** UICC TNM Classification of Malignant Tumours, revised 4th edition
- **1997** UICC TNM Classification of Malignant Tumours, 5th edition
- **2002** UICC TNM Classification of Malignant Tumours, 6th edition
- **2009** UICC TNM Classification of Malignant Tumours, 7th edition
- **2016** UICC TNM Classification of Malignant Tumours, 8th edition

History of TNM

Evolution in
-Scientific knowledge
-Therapeutic possibilities

Better registration
→ improved possibilities to analyse subgroups

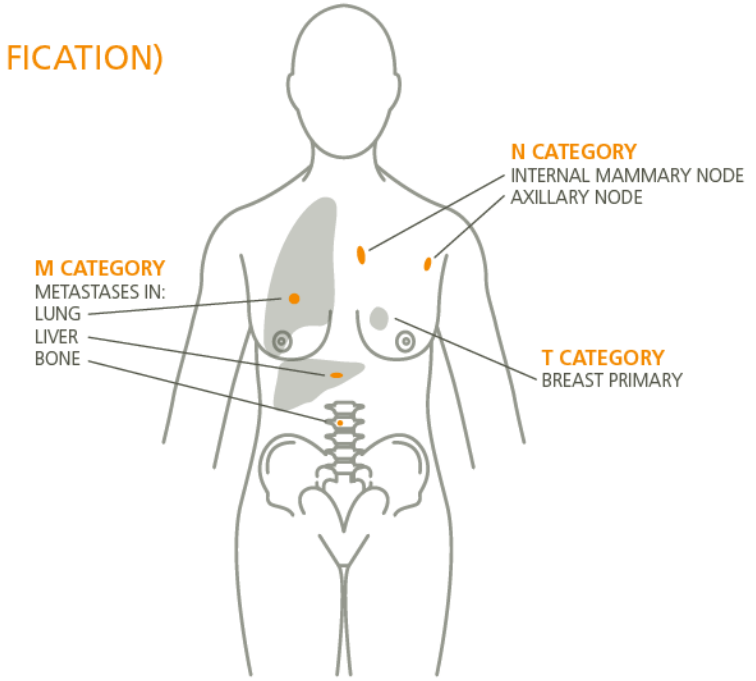
Evolution in TNM-classification

- *refining/disappearing subgroups*
- *changes within subgroups*
- *changes in stages*

Some STABILITY over time is a prerequisite → only modifications in case of major progress

DOCUMENT the moment of adoption of a new version in a cancer registry

The TNM system



- Descriptors: T-, N- and M-categories
  - T = Tumours (extension and/or size)
  - N = Nodes (regional lymph nodes)
  - M = Metastasis (distant metastasis, also non-regional lymph nodes)

- Staging basis
  - **Clinical**: all information prior to start of treatment (including surgical exploration before the resection of the primary tumour)
  - **Pathological**: requires resection of the primary tumour / regional lymph nodes

The TNM system – **STAGE** grouping

- Combine T, N and M-category into a “Stage”
  - = Tumor specific

- “Stage grouping” => “Stage” (8th edition)
  - **Stage 0**: (Tis) e.g. Stage 0 breast cancer (Tis)
    - => e.g. bladder Stage 0a (Ta), Stage 0is (Tis)
  - **Stage I-III**: localized/regional
    - Colon and rectum T2N0M0= stage I
    - Breast T2N0M0 = stage IIA
    - SCC of skin: T2N0M0 = stage II
  - **Stage IV**: distant metastasis
    - Breast T2N1M1 = stage IV
    - Larynx T4bN0M0 =stage IVB

- TNM does not mention ‘unknown stage’ but if T and/or N are unknown it is in general not possible to classify as a specific stage => Avoid missing data as much as possible

Availability of cTNM stage for lung cancer in Belgium, 2010-2011

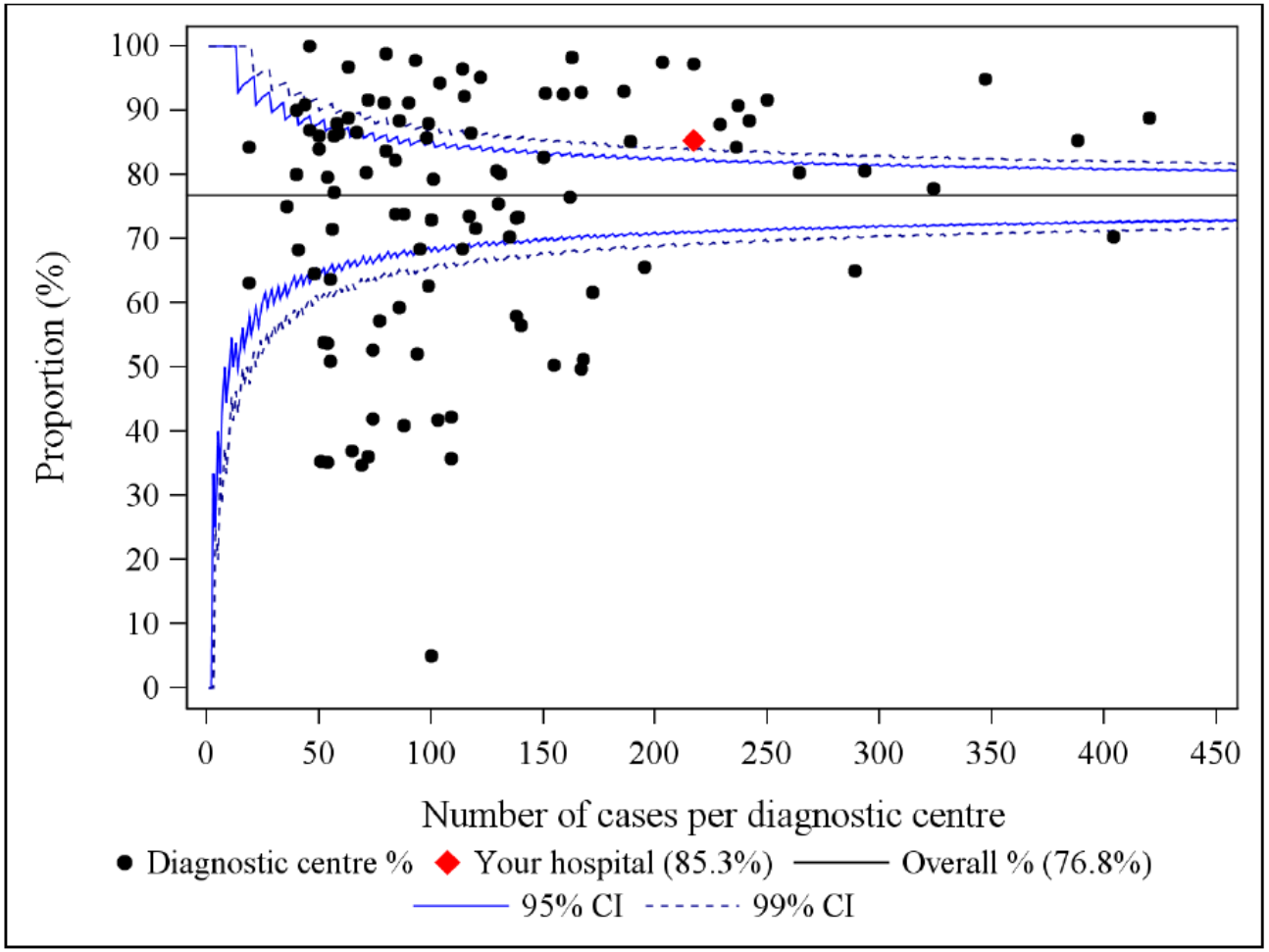
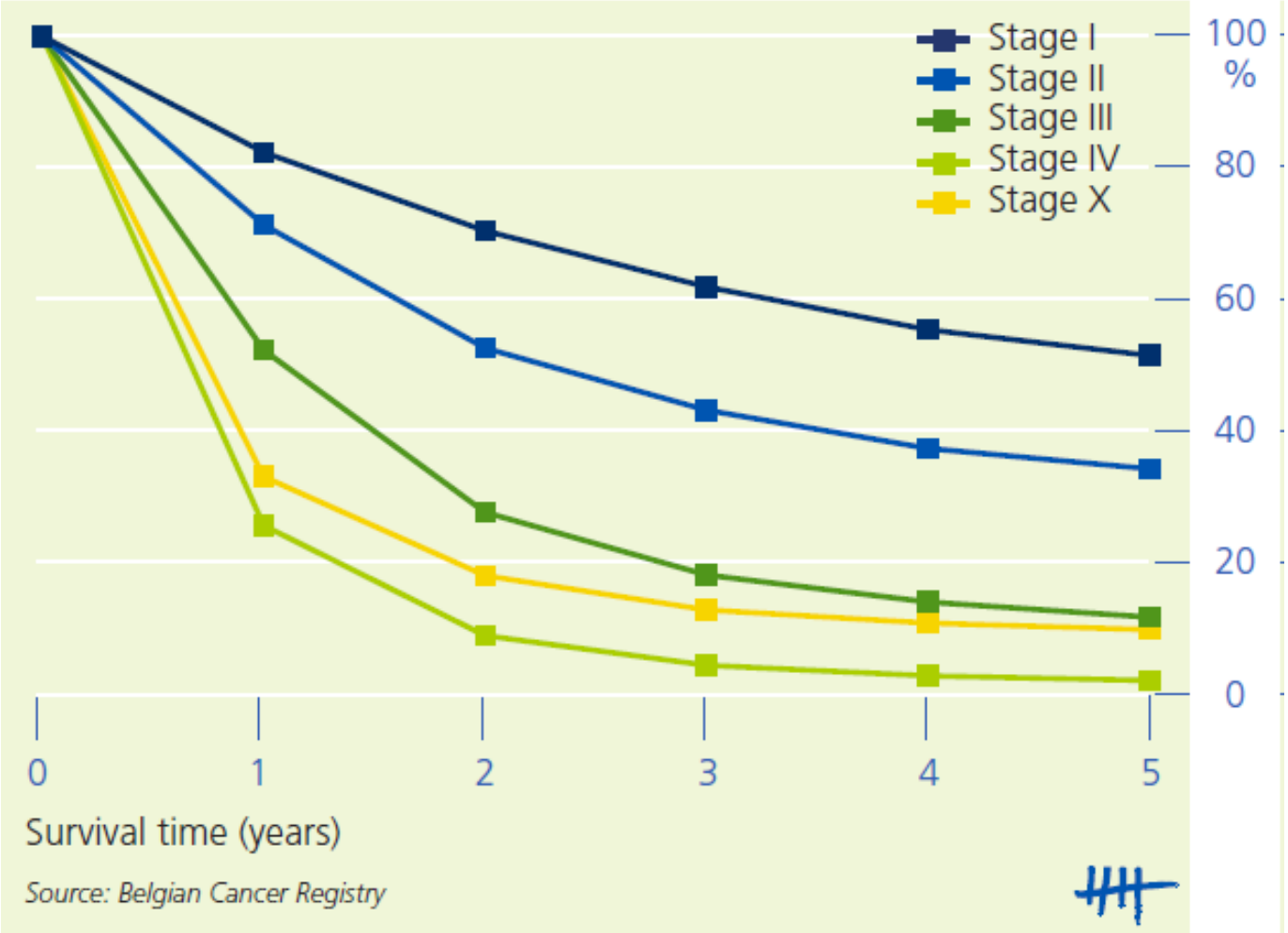


FIGURE 70 - LUNG CANCER: RELATIVE SURVIVAL BY STAGE IN MALES (BELGIUM, 2004-2008)



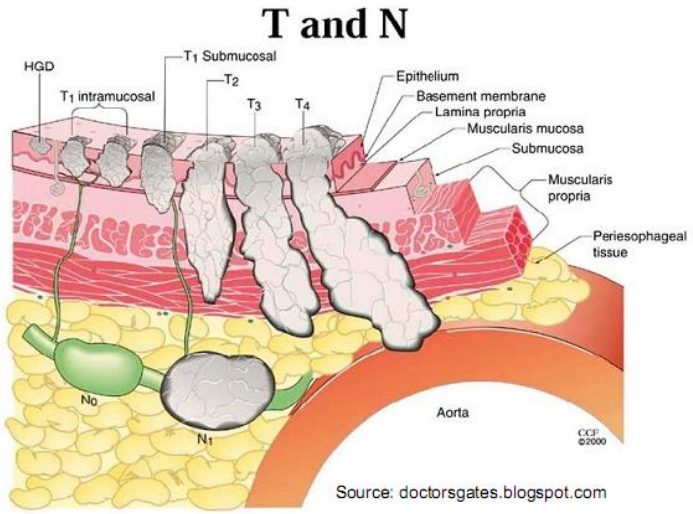
Source: Belgian Cancer Registry

Staging basis: prefixes

- **c**TNM – clinical stage: essential to select and evaluate therapy options
- **p**TNM – pathologic stage: provides most precise data to estimate prognosis and plan further therapy
- **y**TNM – post-therapy classification, measures response to neoadjuvant treatment

- **r**TNM – recurrence stage: extent of tumor after recurrence
- **a**TNM – autopsy stage: determined at autopsy, no previous diagnosis of cancer

The TNM system – **prognostic** grouping example: Esophagus



Stage Grouping

Carcinomas of the oesophagus and oesophagogastric junction

Stage 0	Tis	N0	M0
Stage IA	T1	N0	M0
Stage IB	T2	N0	M0

Prognostic Grouping

Squamous Cell Carcinoma

	T	N	M	Grade	Location*
Group 0	Tis	0	0	1	Any
Group IA	1	0	0	1, X	Any
Group IB	1	0	0	2, 3	Any
	2, 3	0	0	1, X	Lower, X

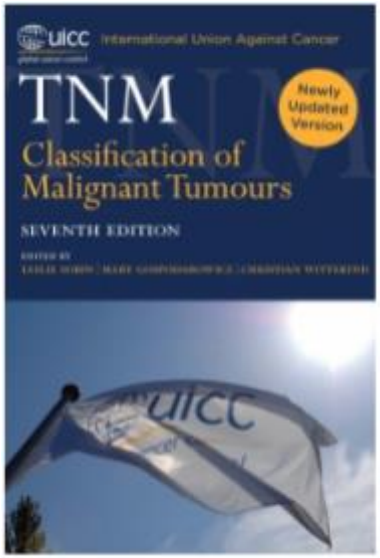
Adenocarcinoma

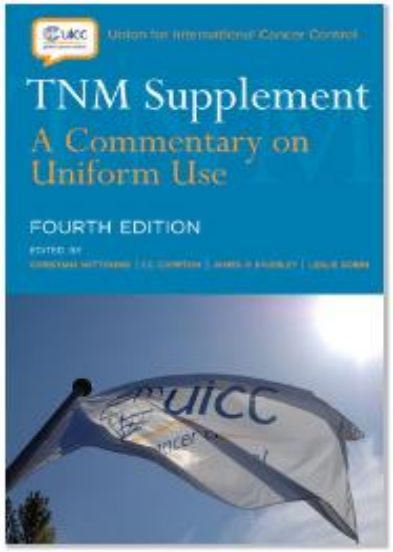
	T	N	M	Grade
Group 0	Tis	0	0	1
Group IA	1	0	0	1, 2, X
Group IB	1	0	0	3
	2	0	0	1, 2, X

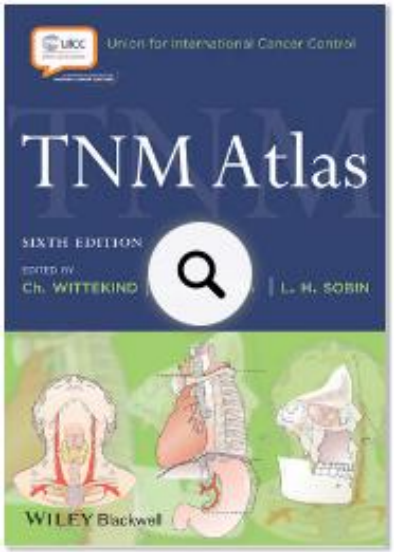
TNM PUBLICATIONS

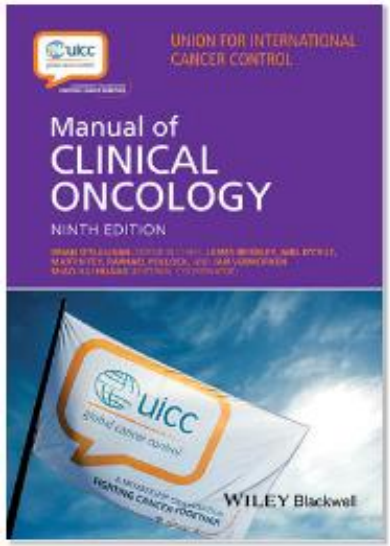
TNM HELP DESK

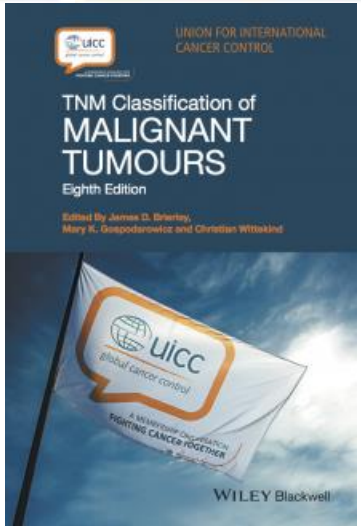
Learn more about TNM activities and resources.











UICC TNM E-LEARNING MODULES

http://www.uicc.org/resources/tnm/publications-resources

8th edition ==========➔

Introduction, Lip, oral cavity

Breast, Colorectal, cervix, prostate, lung

CONTACT US

Please contact UICC for any questions

A new Cancer Staging Tool is now available for free access

An NICR, IARC and UICC collaboration.

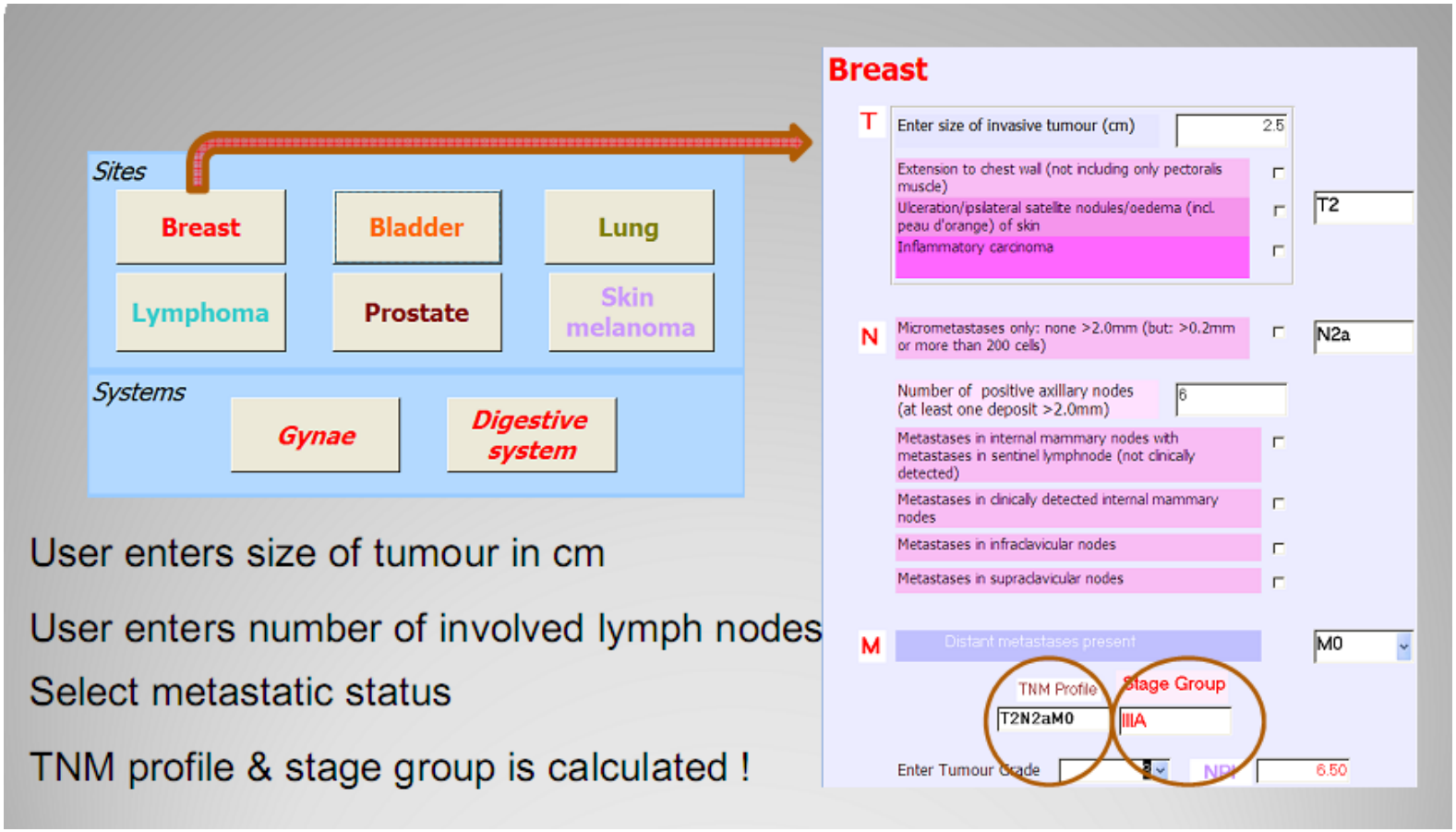
A collaboration of the **Northern Ireland Cancer Registry (NICR)** and the **International Agency for Research on Cancer (IARC)** with the **Union for International Cancer Control (UICC)** has led to a new tool, **CanStaging** - a supportive web-based staging tool for cancer registrars.

The tool is designed to maximise the availability of TNM staging rules in order to aid standardisation and comparability of cancer staging internationally. The tool calculates the TNM staging classification from the basic factors on extent of disease, entered by the user in a controlled fashion. The tool implements UICC's TNM Classification of Malignant Tumours (7th edition) and is available for non-profit use.

Find out more about the tool by reading the **quick guide PDF**.

Breast, cervix, colorectal, prostate, lung

NICR Staging tool



User enters size of tumour in cm

User enters number of involved lymph nodes

Select metastatic status

TNM profile & stage group is calculated !

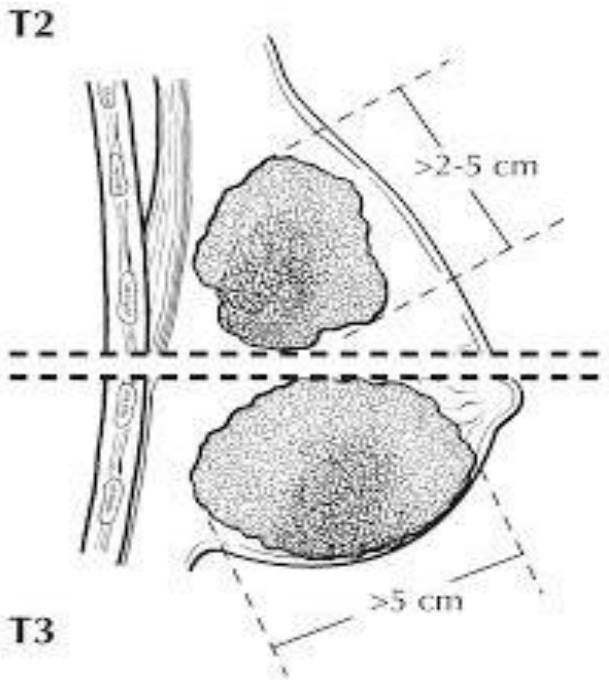
How to code TNM and other staging systems

T-tumor
Different criteria for different cancers

- Mostly T1-T4 (ovary T1-T3)
- Sub classifications (T1a, T1b, etc.) are often used
- Tumor **size**
  - Breast, parotid gland, oral cavity
- **Depth** of invasion through wall of organ
  - Colon, bladder, melanoma
- Location and **extension**
  - Lung, larynx, pancreas
- Other factors
  - Tumor multiplicity (thyroid, liver)
  - Grade (sarcomas)
  - Prognostic factors (prostate, testis)

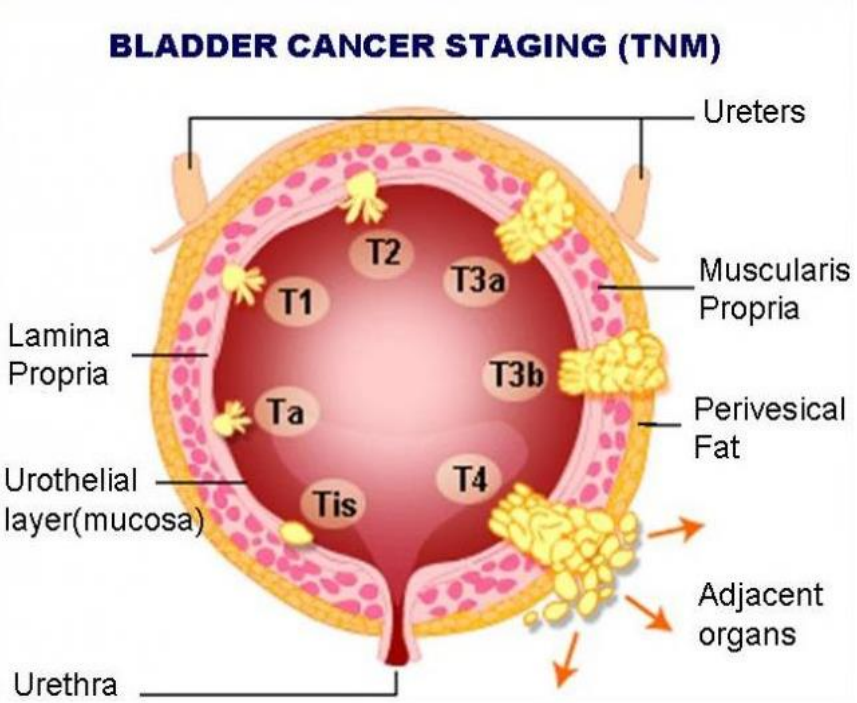
T-CATEGORIES: SIZE

- Example: **Breast**
  - **T1** ≤ 20 mm
  - **T2** >20 mm, ≤ 50 mm
  - **T3** >50 mm
  - **T4** involving chest wall and/or skin



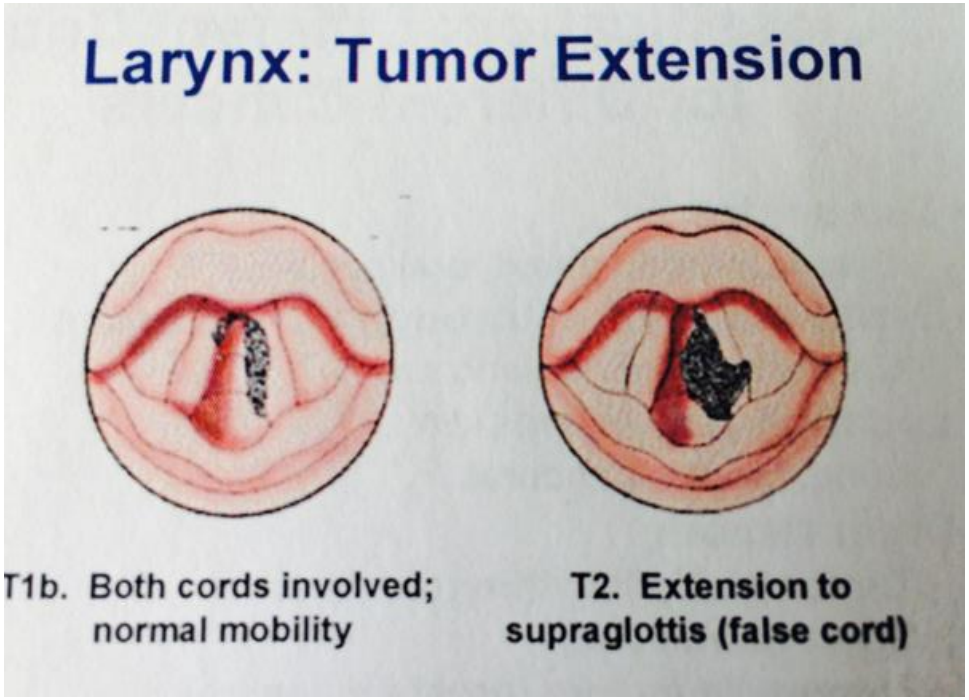
T-CATEGORIES: DEPTH OF INVASION

- Example: **Bladder**
  - **T1** subepithelial connective tissue
  - **T2** muscularis propria
  - **T3** perivesical tissue
  - **T4** beyond bladder



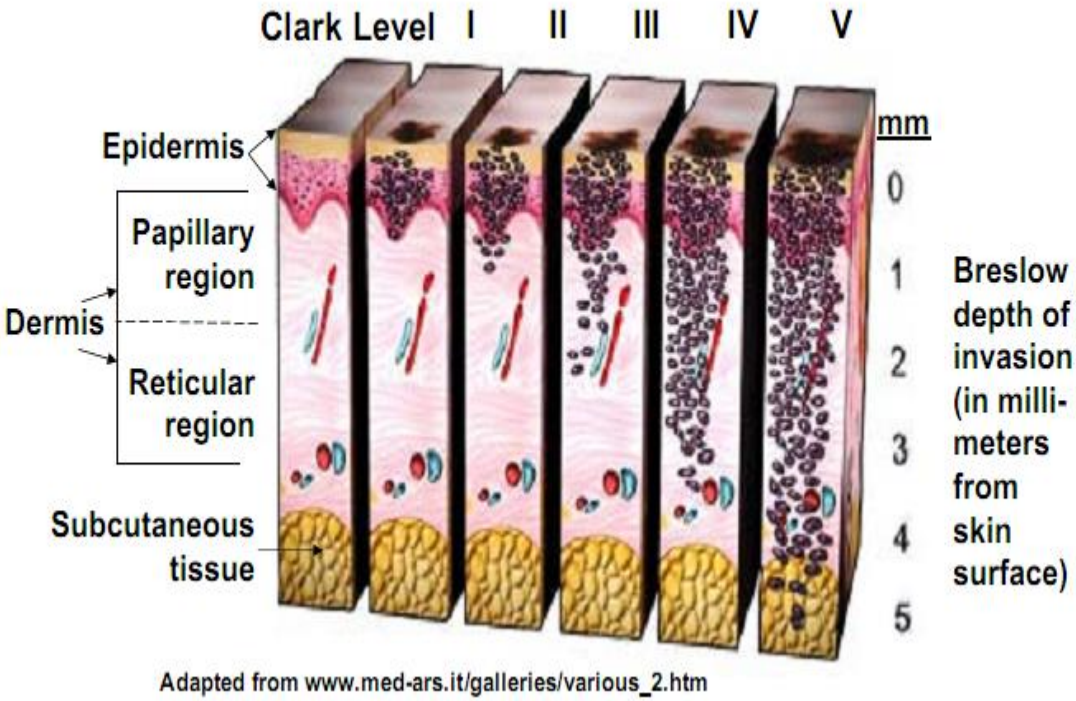
T-CATEGORIES: EXTENSION

- Example: **Larynx**
  - **T1** One/both vocal cords, normal mobility
  - **T2** Extension to supraglottis
  - **T3** Confined to larynx with vocal cord fixation
  - **T4a** Moderately advanced local disease
  - **T4b** Very advanced local disease



T-categories: combination of Clark level and Breslow depth of invasion

- **Clark Level and Breslow Depth of Invasion**



Adapted from www.med-ars.it/galleries/various_2.htm

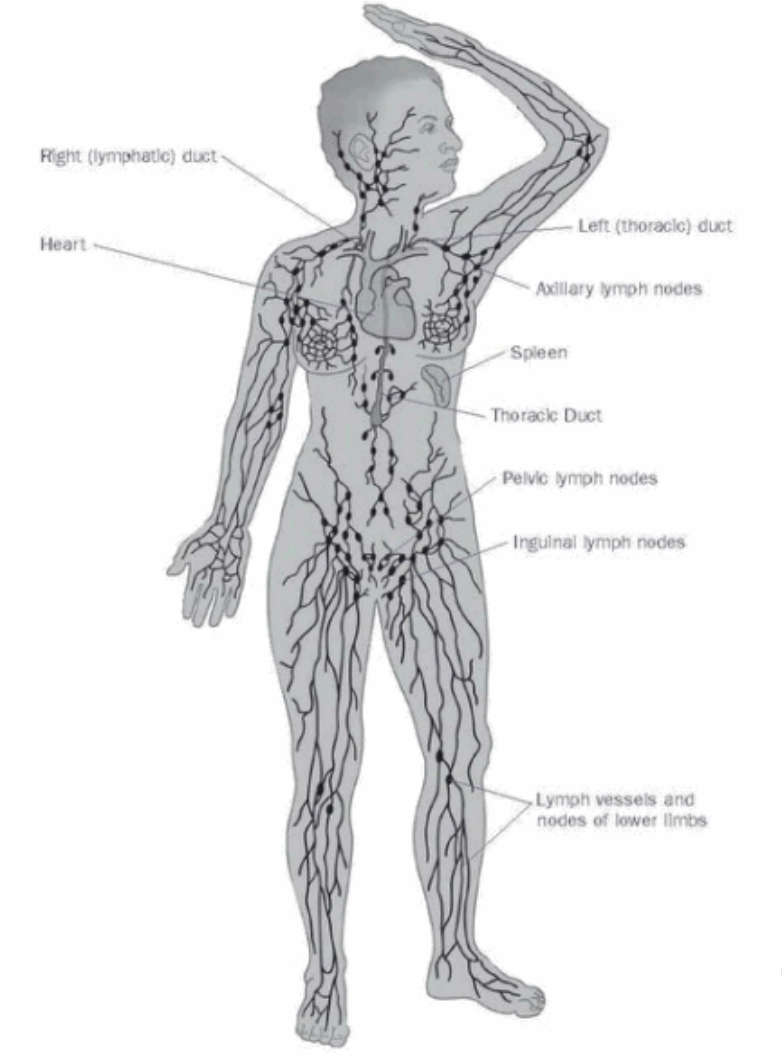
TX	Primary tumor cannot be assessed
T0	No evidence of primary tumor
Tis	Melanoma in situ
T1	Melanomas 1.0 mm or less in thickness
T2	Melanomas 1.01–2.0 mm
T3	Melanomas 2.01–4.0 mm
T4	Melanomas more than 4.0 mm

Other T-categories

- **Tis** – carcinoma in situ
  - All epithelial cancers
- **Ta** – non-invasive papillary carcinoma
  - Bladder, renal pelvis, ureter, urethra
  - Penis
- **T0** – no evidence of primary tumor
  - Occult breast carcinoma
  - Accidental finding in a surgical specimen (gall bladder resection because of gall stones)
- **TX** – primary tumor cannot be assessed
  - It is impossible to assign the highest T-category
  - Do not code TX in case of doubt between 2 consecutive T-categories (code the lower one)

N – Regional lymph nodes
Lymph node involvement

- Absence or presence of metastases in primary lymph node drainage area of cancer



N – Regional lymph nodes

- **N0**

  Regional lymph nodes have been clinically or pathologically proven to be **free of metastatic disease**

- **N1-N3**

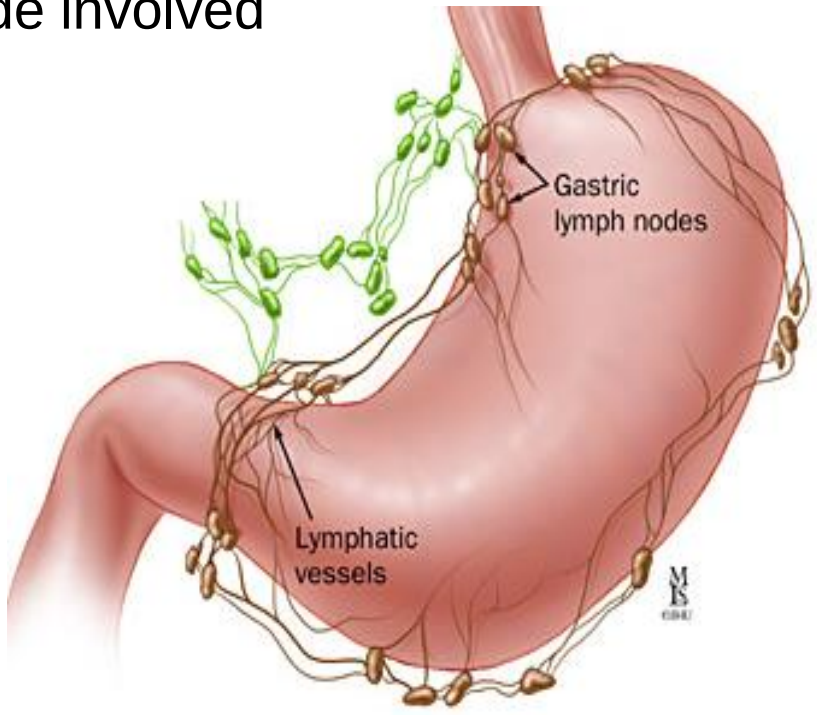
  Increasing involvement of regional lymph nodes by **number**, **location** or **size**

- **NX** – regional nodes cannot be assessed

  No clinical or pathological investigations have been performed

N-CATEGORIES: NUMBER

- Example: **Stomach**
  - **N1** 1-2 regional nodes involved
  - **N2** 3-6 regional nodes involved
  - **N3** 7 or more node involved



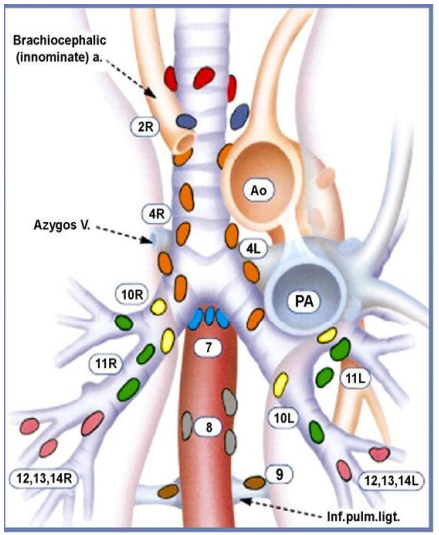
N-CATEGORIES: LOCATION

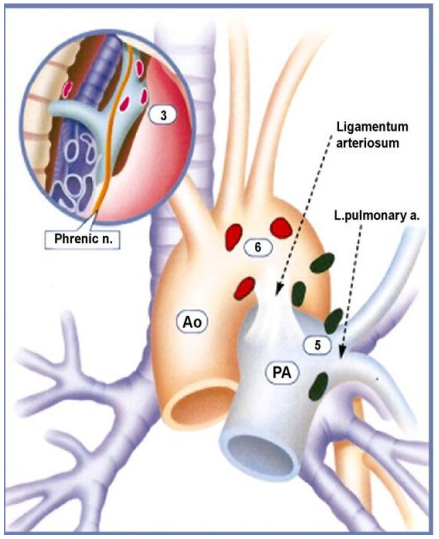
- Example: **Lung**

N1 peribronchial and/or hilar and intrapulmonary nodes

N2 mediastinal and/or subcarinal nodes

N3 contralateral mediastinal, hilar, scalene or supraclavicular nodes





Superior Mediastinal Nodes

- 1 Highest Mediastinal
- 2 Upper Paratracheal
- 3 Pre-vascular and Retrotracheal
- 4 Lower Paratracheal (including Azygos Nodes)

N_2=single digit, ipsilateral
N_3=single digit, contralateral or supraclavicular

Aortic Nodes

- 5 Subaortic (A-P window)
- 6 Para-aortic (ascending aorta or phrenic

Inferior Mediastinal Nodes

- 7 Subcarinal
- 8 Paraesophageal (below carina)
- 9 Pulmonary Ligament

N_1 Nodes

- 10 Hilar
- 11 Interlobar
- 12 Lobar
- 13 Segmental
- 14 Subsegmental

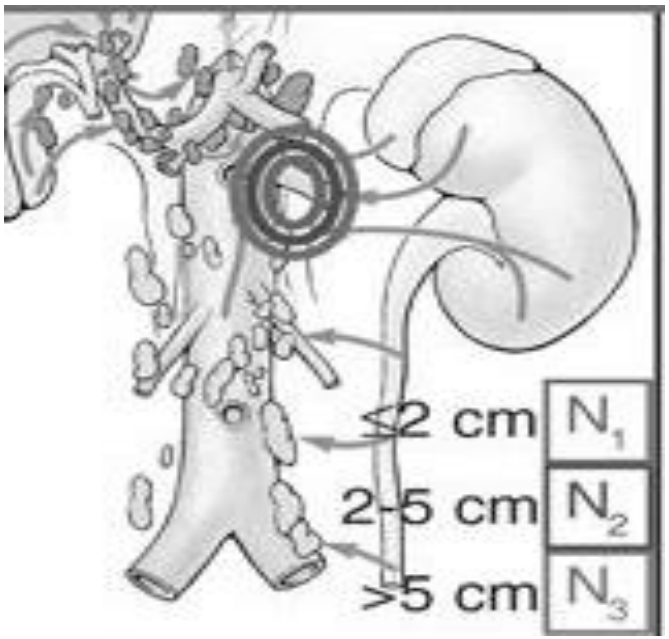
N-CATEGORIES: SIZE AND NUMBER

- Example: **Renal pelvis and ureter**

N1 single node, 2 cm or less

N2 single node 2-5 cm or multiple nodes <5 cm

N3 any node >5 cm



M – DISTANT METASTASES: SYSTEMIC INVOLVEMENT

- Categories
  - **M0** absence of metastatic disease
  - **M1** presence of at least one distant metastasis
- M1 subcategory, example: prostate
  - M1a non-regional lymph nodes
  - M1b bone(s)
  - M1c other site(s)

  In case of multiple metastatic sites: always code to the highest value (M1c)

(Not any more available since TNM 7th edition

- **MX** – distant metastasis cannot be assessed)

Other staging systems

- Condensed TNM → essential TNM
- Extent of disease
- Dukes stage (obsolete)
- FIGO stage (almost equivalent to TNM)
- Ann Arbor stage (lymphoma)
- International Prognostic Scoring System (haematological malignancies)

Essential TNM

- When T, and/or N, and/or M have not been explicitly recorded in the clinical/pathological records, the cancer registry should attempt to score essential TNM according to the following scheme:
- **T**: L (localized) or A (advanced)*
- **N**: R- or R+
- **M**: M- or M+
- Stage:
  - I: TL R- M-
  - II: TA R- M-
  - III: anyT R+ M-
  - IV: any T any R M+

**Subcategories L1/L2 and A1/A2 are also available*

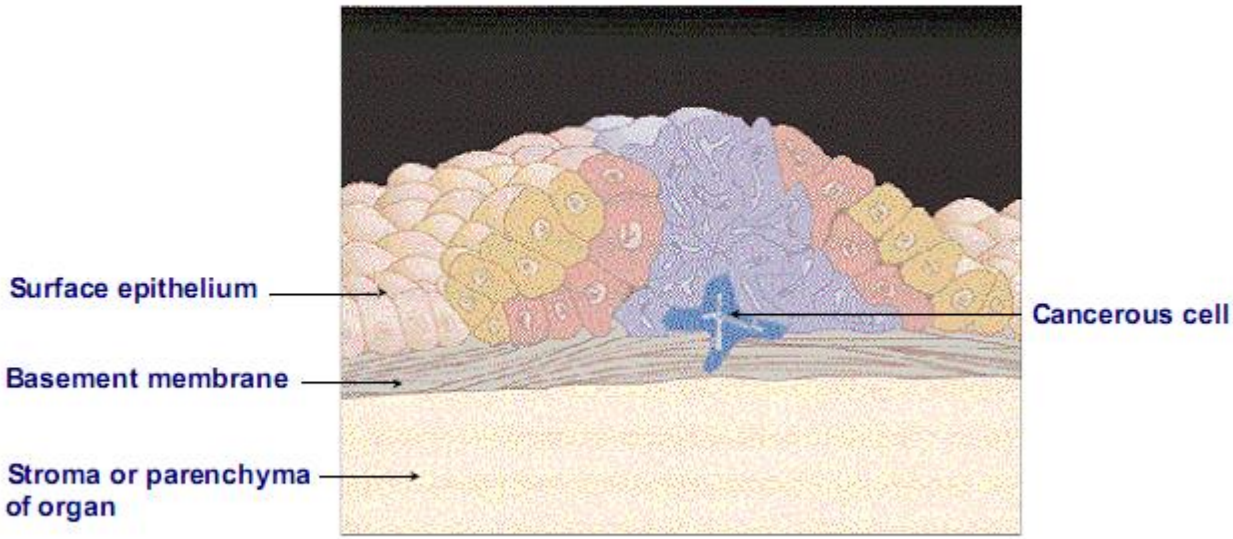
Extent of disease (summary stage)

- Simple to learn and use
- Requires minimal information
- Uses all information in record
- In widespread use since 1970s
- Applies to solid tumors
- Good for national surveillance

- Five main categories
  - In situ
  - Localized
  - Regional
    - to lymph nodes
    - by direct extension
    - to lymph nodes and direct extension
  - Distant
  - Unknown

Extent of disease: in situ

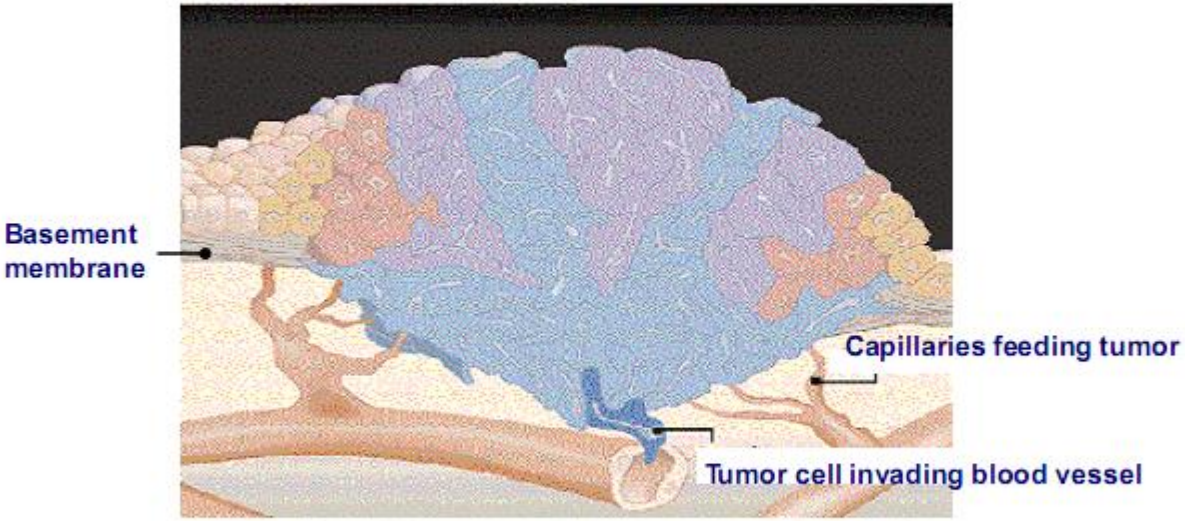
- "In place"
- No stromal invasion; no penetration of basement membrane



Source: Scientific American. Illustration by Brian Shellito, in "Cancer In Michigan: searching for answers." Detroit News, 11/1/98 via the internet

Extent of disease: localized

- Confined to organ of origin
- Can be widely invasive within organ of origin
- Names of anatomic substructures important

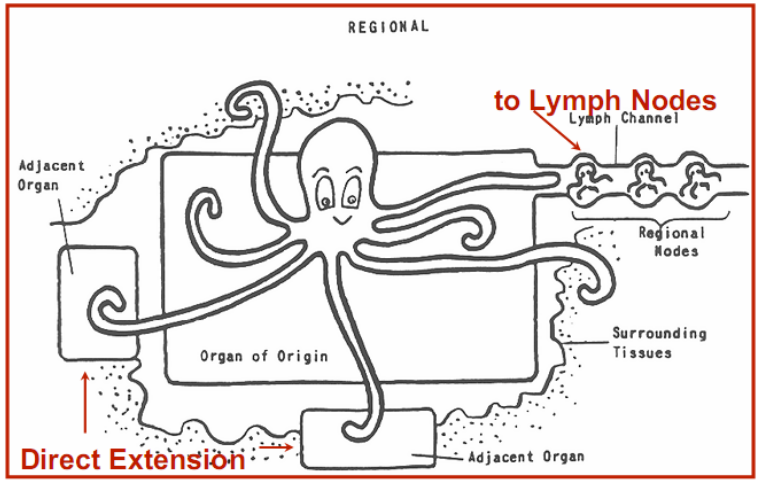


A Localized Tumor with Vascular Invasion

Source: Scientific American. Illustration by Brian Shellito, in "Cancer In Michigan: searching for answers." Detroit News, 11/1/98 via the internet

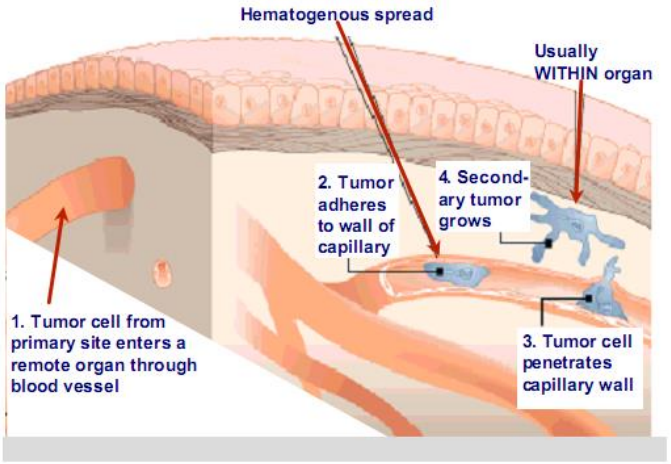
Extent of disease: regional

- Difficult to categorize properly
- Tumor beyond limits of organ of origin
- Potential for spread by more than one vascular or lymphatic route
- Subcategories
  - Regional direct extension
  - Regional to lymph nodes
  - Regional both direct extension and lymph nodes
  - Regional, NOS



Extent of disease: distant

- Tumor spread to remote area of body
- Four methods of spread
  - Distant direct extension
  - Distant lymph nodes
  - Hematogenous metastases
  - Implantation metastases
- Common sites of spread for solid tumors
  - Liver
  - Lung
  - Bones
  - Brain



Source: Scientific American. Illustration by Brian Shellito, in "Cancer In Michigan: searching for answers." Detroit News, 11/1/98 via the internet.

Extent of disease: unknown

- No investigations were performed
- No information of the staging procedures is available

Other staging systems – gynecological cancers

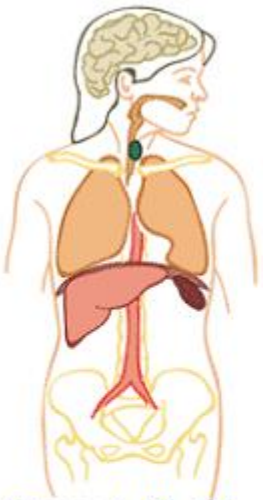
Ovary – 7th ed TNM and Ovary, Fallopian Tube and primary peritoneal carcinoma FIGO 2014

TNM	7th	1988 FIGO
T3 and/or N1	Peritoneal metastasis beyond pelvis and/or regional lymph node metastasis	III
T3a N0	Microscopic peritoneal metastasis	IIIA
T3b N0	Macroscopic peritoneal metastasis ≤ 2 cm	IIIB
T3c or N1	Peritoneal metastasis >2 cm and/or regional lymph node metastasis	IIIC
M1	Distant metastasis (excludes peritoneal IV metastasis)	IV

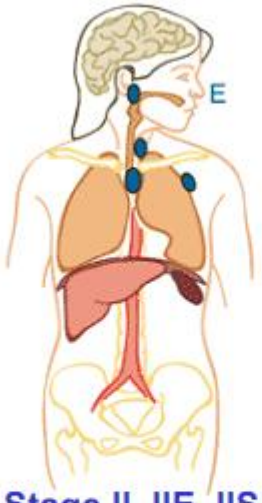
TNM Proposal 8th (2016)		2014 FIGO
T3 and/or N1	Peritoneal metastasis beyond pelvis and/or regional lymph node metastasis	III
T1/T2 N1	Retroperitonal lymph nodes only	IIIA1
T1/T2 N1a	≤ 10mm	IIIA1i
T1/T2 N1b	> 10mm	IIIA1ii
T3a N0/N1	Microscopic peritoneal metastasis	IIIA2
T3b N0/N1	Macroscopic peritoneal metastasis ≤ 2 cm	IIIB
T3c N0/N1	Peritoneal metastasis >2 cm	IIIC
M1	Distant metastasis (excludes peritoneal)	IV
M1a	Pleural effusion positive cytology	IVA
M1b	Parenchymal metastases	IVB

Other staging systems - lymphoma

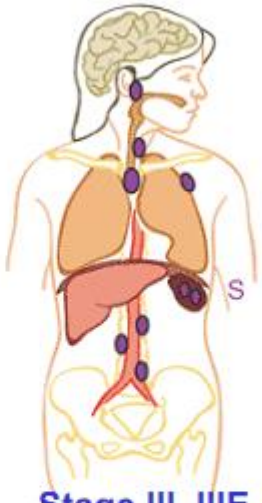
- **Ann Arbor Staging**



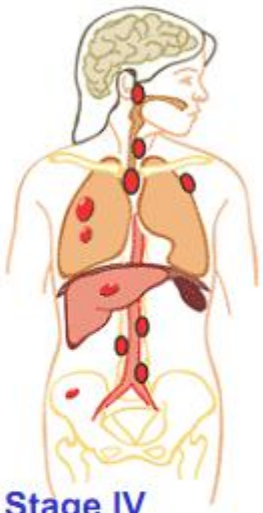
Stage I, IS, IE
1 nodal region or one extra-lymphatic site



Stage II, IIE, IIS, IIES
≥ 2 nodal regions or 1 extra-lymphatic site and its regional nodes, one side of diaphragm



Stage III, IIIE, IIIS, IIIES
Nodal regions/ sites on both sides of diaphragm



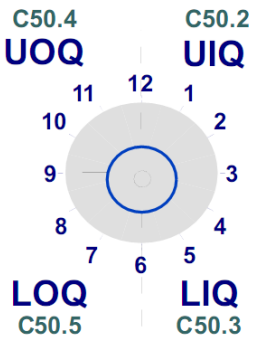
Stage IV
Dissemination to extralymphatic visceral sites

How to assign T, N and M?

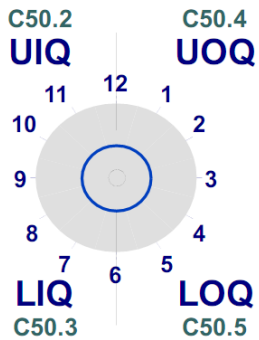
- Determine primary site and histology
- Look up site chapter
- Is histology included in this chapter?
- Review list of regional lymph nodes
- Clinical versus pathologic stage
- Find staging information in the tables
- Determine T, N, M
- (Assign stage on the basis of the T, N and M)

Coding TNM- example

- 2.5 cm mass UOQ R Breast. No palpable axillary nodes. Remainder of exam within normal limits.
- Lumpectomy and axillary dissection: 1.8 cm ductal carcinoma. None of four nodes involved.



RIGHT BREAST



LEFT BREAST

ANATOMIC STAGE/PROGNOSTIC GROUPS			
Stage 0	Tis	N0	M0
Stage IA	T1*	N0	M0
Stage IB	T0	N1mi	M0
	T1*	N1mi	M0
Stage IIA	T0	N1**	M0
	T1*	N1**	M0
	T2	N0	M0
Stage IIB	T2	N1	M0
	T3	N0	M0
Stage IIIA	T0	N2	M0
	T1*	N2	M0
	T2	N2	M0
	T3	N1	M0
	T3	N2	M0
Stage IIIB	T4	N0	M0
	T4	N1	M0
	T4	N2	M0
Stage IIIC	Any T	N3	M0
Stage IV	Any T	Any N	M1

T1	Tumor ≤20 mm in greatest dimension
T1mi	Tumor ≤1 mm in greatest dimension
T1a	Tumor >1 mm but ≤5 mm in greatest dimension
T1b	Tumor >5 mm but ≤10 mm in greatest dimension
T1c	Tumor >10 mm but ≤20 mm in greatest dimension
T2	Tumor >20 mm but ≤50 mm in greatest dimension

N0	No regional lymph node metastases

cTNM: T2N0M0 = clinical stage IIA
pTNM: T1cN0M0 = stage IA