



The TNM classification of lung tumours

*Controversies in cancer staging and registration
in Belgium*

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10 years

OVERVIEW

Introduction: purpose of TNM-classification

Usefulness of TNM – data

Which problems are detected by BCR and how to avoid them ?



To ameliorate reporting TNM
(completeness / accuracy)



Introduction

INTRODUCTION – Classification systems



Classification of tumours can be done

According to

- localisation of primary tumour
- tumourtype (histology)
- specific characteristics such as hormonal status, mutations,
- presence/absence/duration of symptoms
- sex of the patient
- age of the patient
- **clinical assessment of the tumour (cTNM)**
- **histopathological assessment of the tumour (pTNM)**
-

→ All those factors have an influence on the prognosis of the patient

INTRODUCTION – Purpose of TNM



Based on the description of the **ANATOMICAL EXTENT OF THE DISEASE**

- to facilitate the choice of treatment
- to give an indication of the prognosis
- to make it possible to compare treatment results of different hospitals/countries
- to facilitate cancer research
- to sustain control activities (*eg evaluation of quality of care : feedback reports on process and outcome indicators*)

INTRODUCTION : is registration of TNM obligatory?



21 MARCH 2003. — Royal Decree concerning standards to be met by oncological care programs to be recognised

Art. 11. § 1. Every care program (...) has to participate in cancer registration

This cancer registration contains minimally following parameters :

- 1) Unique patient identification (...)
- 2) Diagnosis according to International Classification and incidence date
- 3) **Tumorstage (cTNM)**
- 4) **Conclusion of the pathological report (including pTNM);**
- 5) Treatment with reference to guidelines or justification of divergence
- 6) Follow-up plan
- 7) Side effects
- 8) Survival
- 9) Date of death

 **Yes**

INTRODUCTION : general principles



T : extent of the primary **Tumour**

N : presence/absence of regional lymph **Nodes metastasis**

M : presence/absence of distant **Metastasis**

With the 3 variables, groups are created with comparable prognosis or treatment modalities → so called **TNM-stages**

- cStage
- pStage / ypStage,
- BCR : combined TNM-stage (compilation of pTNM en cTNM. If both are present, pStage prevails over cStage except when clinical stage is IV)

TNM STAGES calculated with T, N, M



T/M	Subgroup	N0	N1	N2	N3
T1	T1a	Ia	IIa	IIIa	IIIb
	T1b	Ia	IIa	IIIa	IIIb
T2	T2a	Ib	IIa	IIIa	IIIb
	T2b	IIa	IIb	IIIa	IIIb
T3	T3 _{>7}	IIb	IIIa	IIIa	IIIb
	T3 _{Inv}	IIb	IIIa	IIIa	IIIb
	T3 _{Satell}	IIb	IIIa	IIIa	IIIb
T4	T4 _{Inv}	IIIa	IIIa	IIIb	IIIb
	T4 _{Ipsi Nod}	IIIa	IIIa	IIIb	IIIb
M1	M1a _{Contra Nod}	IV	IV	IV	IV
	M1a _{Pl Disem}	IV	IV	IV	IV
	M1b	IV	IV	IV	IV

7th edition
Lung
tumours

USEFULNESS of TNM variables/stages

ILLUSTRATION OF :

- Selection of treatment
- Composition of patient population
- Survival analysis according to T, N, M or stage
- Evaluation of Quality of Care



4.2. Treatment of NSCLC

4.2.1. Treatment of early stage NSCLC (stage cI-II and selected stage cIIIA cT3N1)

Criteria for operability

Assessment of lung function and exercise testing

Recommendations

Recommendation

Primary surgery in early stage NSCLC (stage cI-II selected stage cIIIA cT3N1)

Recommendation

(Neo)adjuvant chemotherapy in early stage NSCLC (stage cI-II, selected stage IIIA cT3N1 or unforeseen N2)

Recommendation

Postoperative radiotherapy in resected early-stage NSCLC

Recommendation

Multidisciplinair oncologisch handboek

- STADIUM IIIa:

- * T3N1M0: heelkundige resectie (indien medisch inoperabel: radiotherapie met curatieve intentie). Postoperatieve chemotherapie wordt aan patiënt voorgesteld.
- * T1-3N2M0: na bewezen mediastinoscopie of EBUS, niet massieve klieren: Inductiechemotherapie dan radiotherapie indien stabiele ziekte of progressieve ziekte, tenzij minimale N2, dan evt. heelkunde.
- * T4N0-1M0: indien chirurgisch reseceabel: Heelkunde anders concomitante chemotherapie overwegen.

- STADIUM IIIB

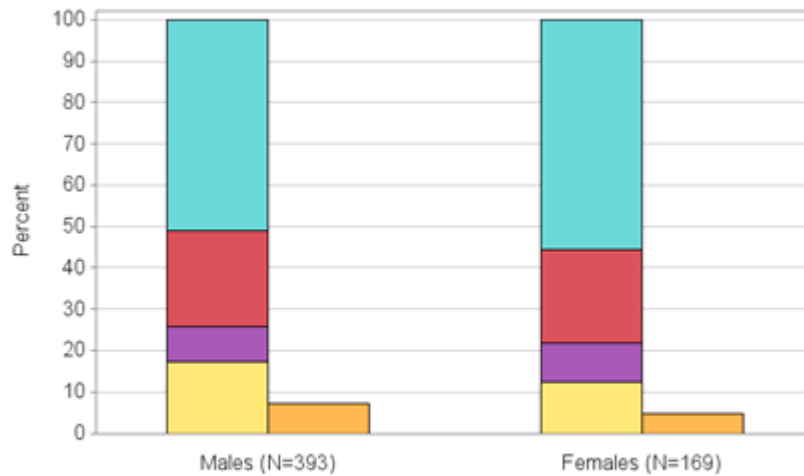
- * T4N2M0: indien fitte patiënt: Concomitante radiochemotherapie, zo niet: inductiechemo, dan radiotherapie.
- * T elke N3M0: overweeg concomitante radiochemotherapie (indien fitte patiënt), anders 'palliatieve' chemotherapie.

- STADIUM IV: T elke N elke M1

- * Indien symptomatische hersenmeta: eerst bestralen, als dan algemene toestand in orde is: palliatieve chemotherapie.
- * Indien andere meta: palliatieve chemotherapie, eventueel combinatie met radiotherapie op meta.

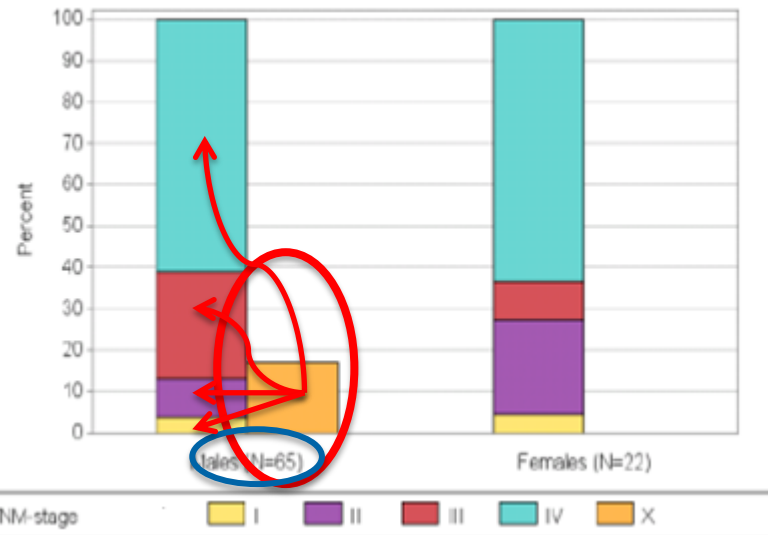
THE USE-FULLNESS OF TNM-VARIABLES

Lung Cancer (C34): TNM-Stage by Sex, 2012



HOSPITAL 1

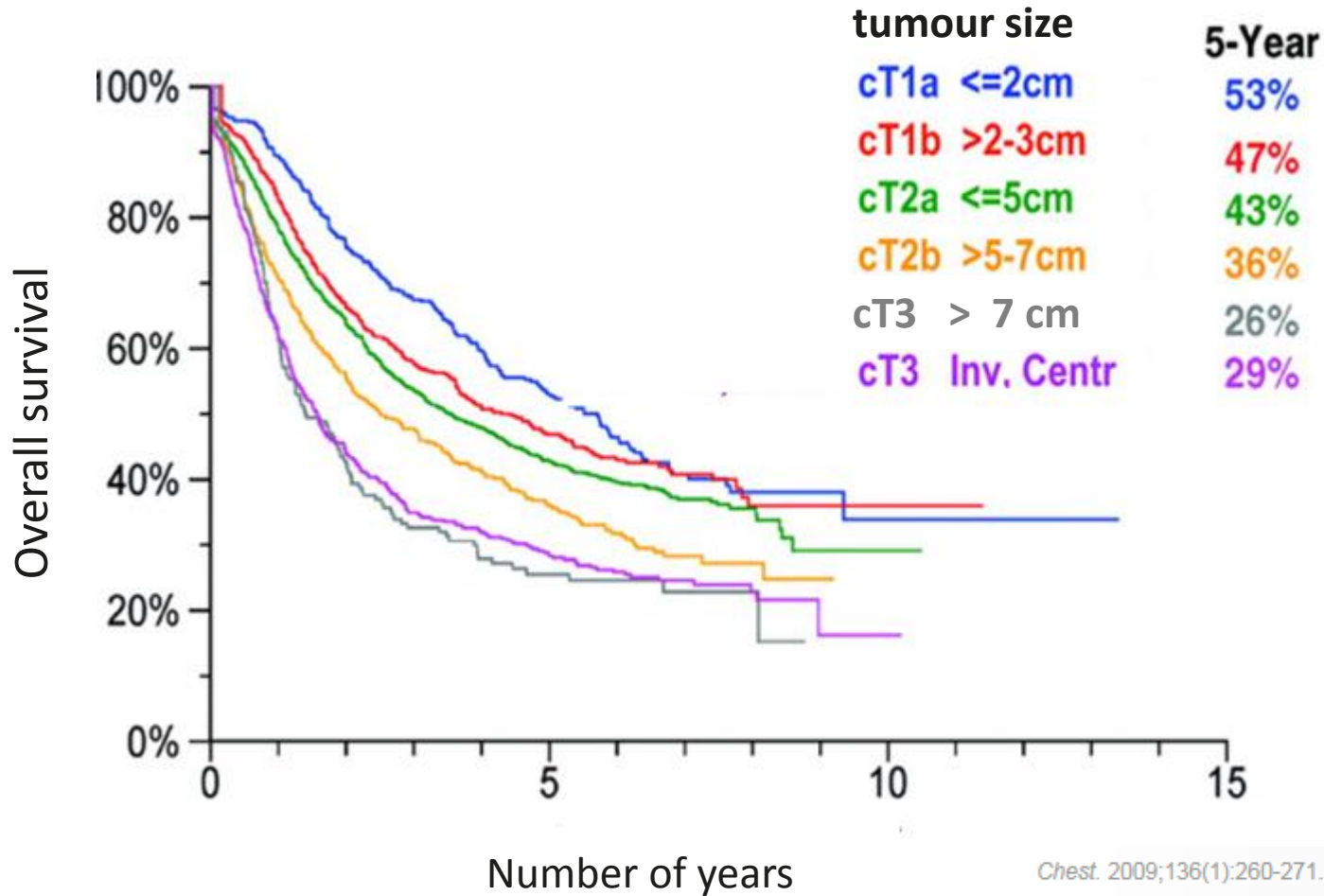
Lung Cancer (C34): TNM-Stage by Sex, 2012



HOSPITAL 2

Different patient-population in different hospitals

THE USE-FULLNESS OF TNM-VARIABLES

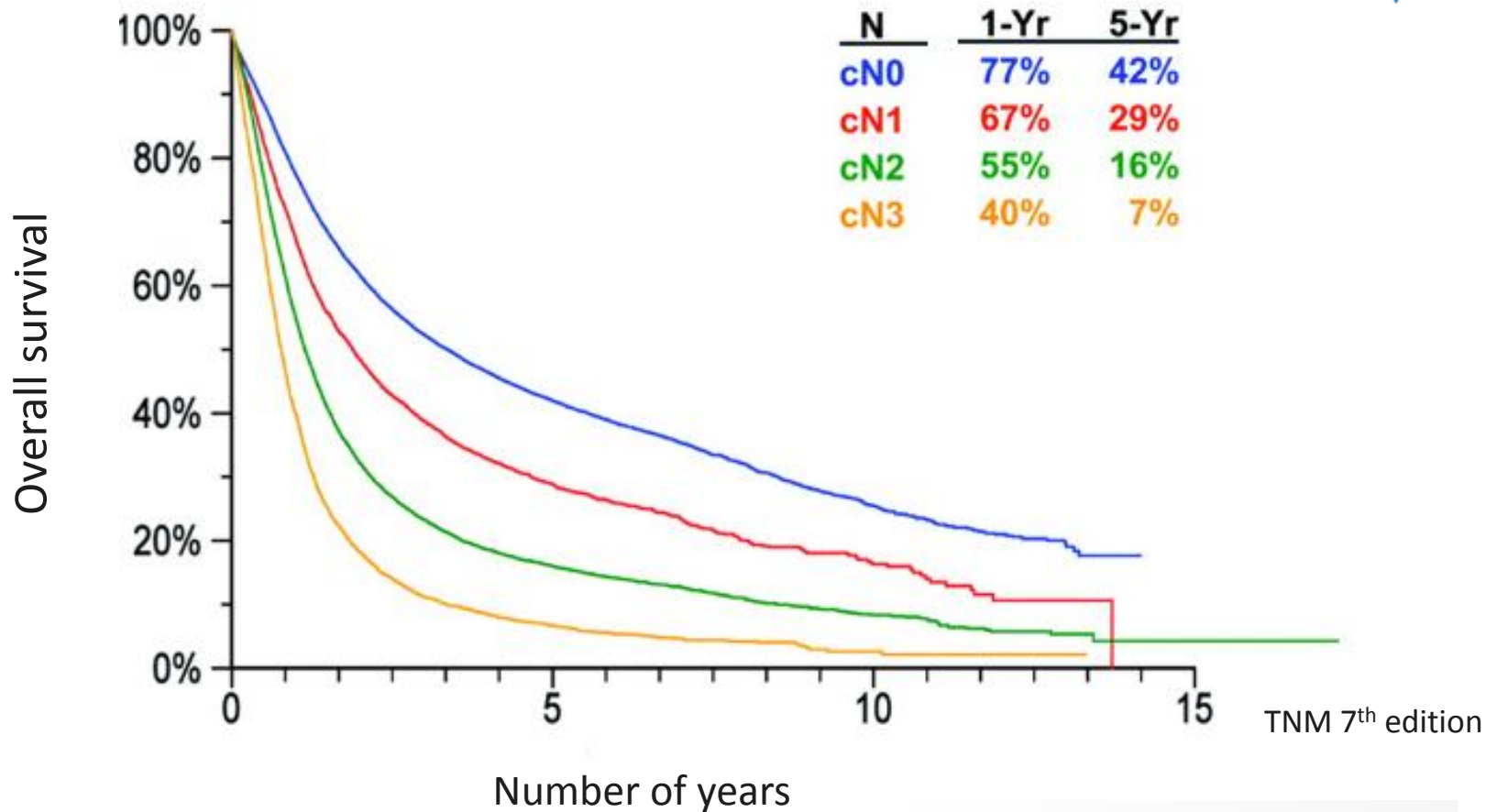


TNM 7th edition

Chest. 2009;136(1):260-271. doi:10.1378/chest.08-0978

Cases from 45 sources in 20 countries 1990-2000

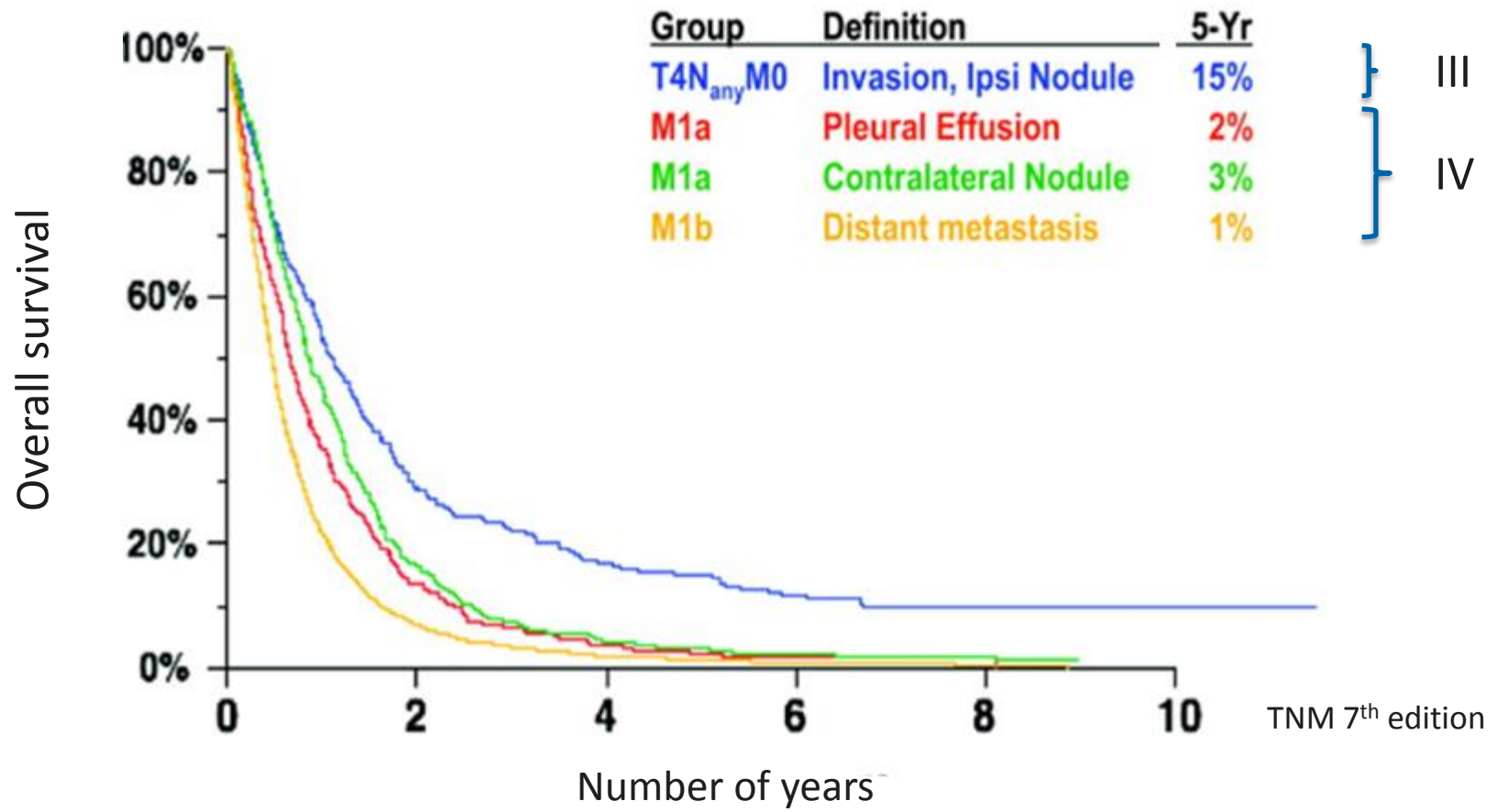
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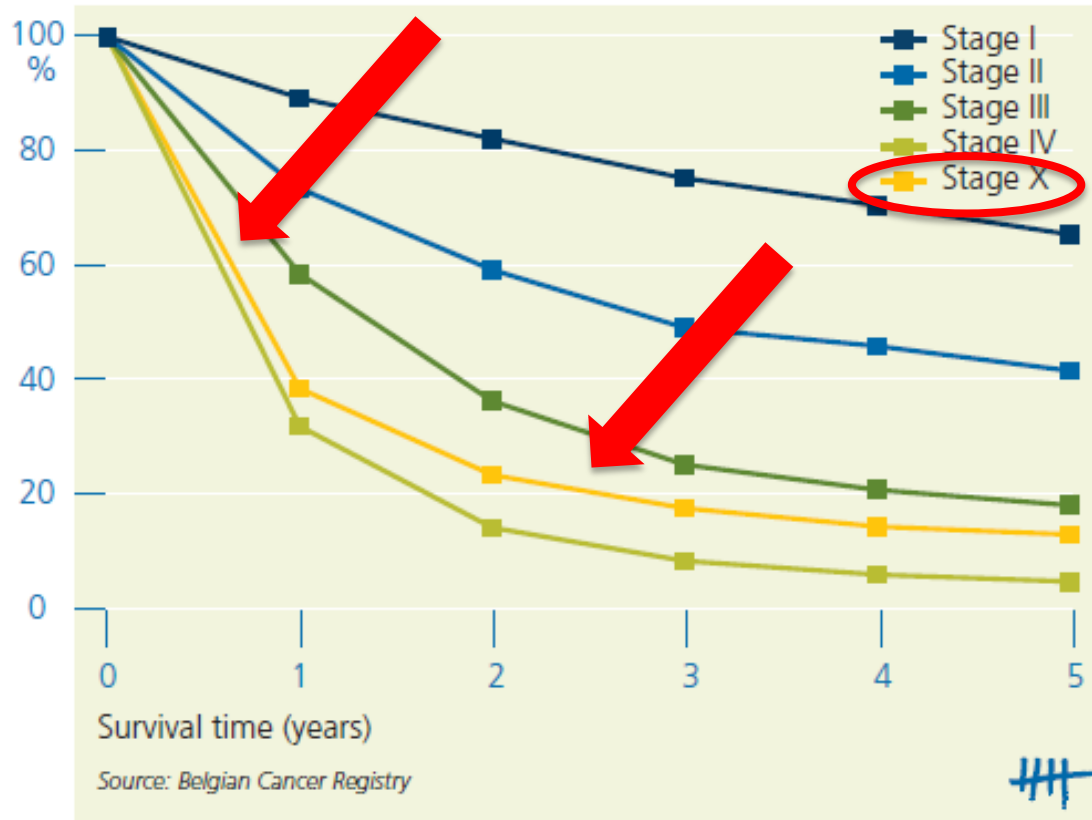
THE USE-FULLNESS OF TNM-VARIABLES



Chest. 2009;136(1):260-271. doi:10.1378/chest.08-0978
 Cases from 45 sources in 20 countries 1990-2000

THE USE-FULLNESS OF TNM-VARIABLES

FIGURE 71 - LUNG CANCER: RELATIVE SURVIVAL BY STAGE IN FEMALES (BELGIUM, 2004-2008)



THE USE-FULLNESS OF TNM-VARIABLES



Federaal Kenniscentrum voor de Gezondheidszorg
Centre Fédéral d'Expertise des Soins de Santé
Belgian Health Care Knowledge Centre

Quality indicators for the diagnosis and treatment of lung cancer

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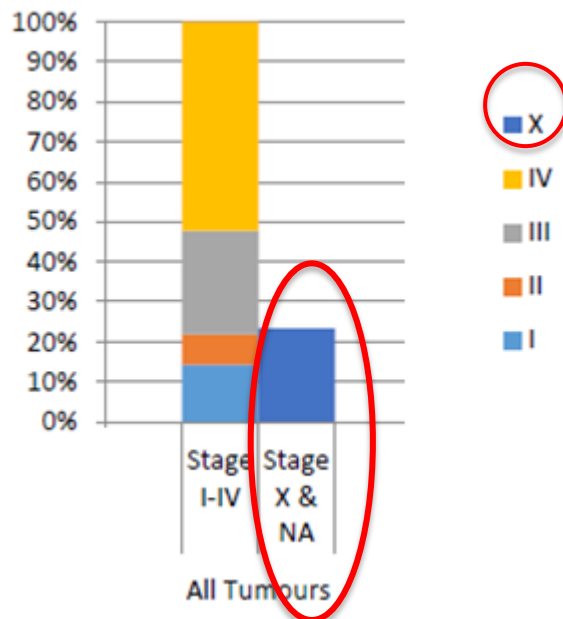
2016. KCE Reports 266Cs. D/2016/10.273/38.

Quality of data
reporting to BCR
(1)

Results

- Room for improvement:
 - Reporting to Belgian Cancer Registry suboptimal (e.g. 23% clinical stage missing)

Distribution of clinical stage (incidence 2010-2011)



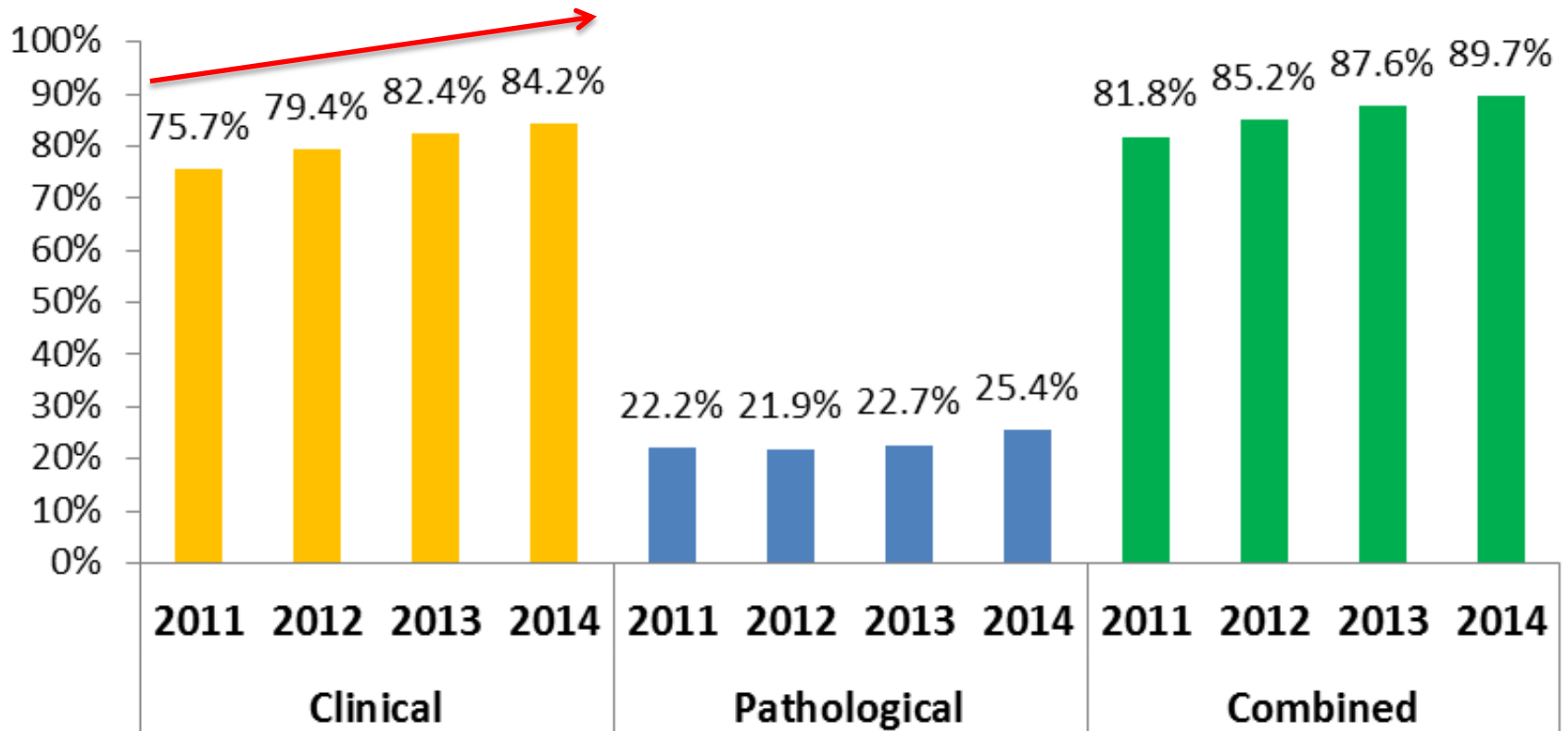
2016. KCE Reports 266Cs. D/2016/10.273/38.

Part of figure 23

GOOD NEWS : Clinical stage availability



Bronchus and lung (TNM stage avail.)



GOOD NEWS : availability of stage information

By adding “stage by source” to ‘stage calculated by BCR’

Field for ‘other classifications’ or ‘remark’ 

topo	histo /3	inc year	cT	cN	cM	pT	pN	pM	cStage by BCR	pStage by BCR	COMBstage by BCR	Stage by source
349	8000	2014	NS	NS	NS	NS	NS	NS	X	X	X	IV
349	8041	2014	NS	NS	NS	NS	NS	NS	X	X	X	IV
341	8041	2014	NS	NS	NS	NS	NS	NS	X	X	X	IV
343	8140	2014	x	0	x	NS	NS	NS	X	X	X	IV
349	8041	2014	NS	NS	NS	NS	NS	NS	X	X	X	IV
343	8481	2014	NS	NS	NS	NS	NS	NS	X	X	X	IV
341	8140	2014	NS	NS	NS	NS	NS	NS	X	X	X	IIIB
343	8041	2014	NS	NS	NS	NS	NS	NS	X	X	X	IV

GOOD NEWS : availability of stage information

topo	lat	histo	behaviour	cT	cN	cM	pT	pN	pM	other classification:stage
C34.0	2	8012	3	4	2	1b				
C34.0	2	8070	3	4	2	1b				4
C34.1	1	8140	3	2a	0	0				
C34.1	1	8041	3	4	3	1a				IV
C34.1	1	8140	3	1b	1	1b				4
C34.1	2	8140	3	2a	0	1b				4
C34.1	1	8140	3	3	2	1b				
C34.1	2	8140	3	3	0	x				IV
C34.1	1	8070	3	1a	2	x				
C34.1	1	8070	3	3	0	x				
C34.1	1	8140	3							4
C34.1	2	8070	3							IIA
C34.1	2	8550	3				1a	0	x	
C34.1	2	8140	3				1a	0	x	
C34.1	2	8140	3				2a	0	1b	

Stage IV → any T, any N, M1

Stage IIA → T2b N0 M0 or T1a/b N1 M0 or T2a N1 M0

Clinical stage or pathological stage ?

**Inc year 2014 :
LUNG TUMOURS
(stageable)**

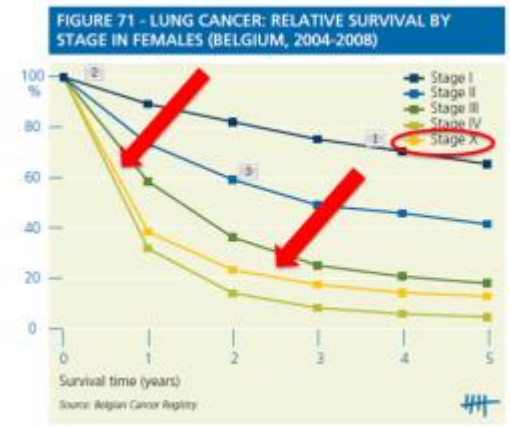
Missing comb stage

**CIB2014 with
stages
calculated by
BCR**

860 (10 %)

**% really
missing stages
after adding
TNM stage by
source**

790 (9,3 %)



Room for improvement:

- Reporting to Belgian Cancer Registry suboptimal (e.g. 23% clinical stage missing)

Added stages	
Stage I	5
Stage III	9
Stage IV	56

20 % not stage IV

RECURRENT PROBLEMS

RECURRENT PROBLEMS

1) No TNM variables



topo	lat	histo	behaviour	cT	cN	cM	pT	pN	pM
C34.0	2	8012	3	4	2	1b			
C34.0	2	8070	3	4	2	1b			
C34.0	1	8140	3	4	0	1b			
C34.1	2	8550	3				3	1	x
C34.1	2	8140	3	4	0	0			
C34.1	1	8140	3	2a	0	0			
C34.1	1	8041	3	4	3	1a			
C34.1	1	8140	3	1b	1	1b			
C34.1	2	8140	3	2a	0	1b			
C34.1	1	8140	3	3	2	1b			
C34.1	2	8140	3	3	0	x			
C34.1	1	8070	3	1a	2	x			
C34.1	1	8070	3	3	0	x			
C34.1	1	8140	3						
C34.1	2	8070	3						
C34.1	2	8550	3				1a	0	x
C34.1	2	8140	3				1a	0	x
C34.1	2	8140	3				2a	0	1b
C34.1	2	8140	3				2a	0	x
C34.1	1	8550	3				2b	2	x
C34.1	1	8140	3	4	3	1b			
C34.1	2	8070	3				3	0	x
C34.1	1	8140	3	1a	0	1a			
C34.1	2	8140	3	1b	3	1b			
C34.1	2	8140	3	4	3	1b			

RECURRENT PROBLEMS

1) No TNM variables

Problems :

- How to calculate QI (treatment following guidelines based on stage)?
- How to know your patient population ?
- How to interpret survival results ?

Solution :

- wait until staging examinations are done
- wait until surgery is executed and AP-report is available
- in case of referral to other centre : please mention !
- ask a question in case of difficulties to assign a TNM



RECURRENT PROBLEMS

2) No cTNM when pTNM is present

topo	lat	histo	behaviour	cT	cN	cM	pT	pN	pM
C34.0	2	8012	3	4	2	1b			
C34.0	2	8070	3	4	2	1b			
C34.0	1	8140	3	4	0	1b			
C34.1	2	8550	3				3	1	x
C34.1	2	8140	3	4	0	0			
C34.1	1	8140	3	2a	0	0			
C34.1	1	8140	3	3	2	1b			
C34.1	1	8140	3	1a	0	0			
C34.1	1	8140	3	1b	0	0			
C34.1	1	8140	3	2a	0	0			
C34.1	2	8140	3	3	0	x			
C34.1	1	8070	3	1a	2	x			
C34.1	1	8070	3	3	0	x			
C34.1	1	8140	3						
C34.1	2	8070	3						
C34.1	2	8550	3				1a	0	x
C34.1	1	8550	3				2b	2	x
C34.1	1	8140	3	4	3	1b			
C34.1	2	8070	3				3	0	x
C34.1	1	8140	3	1a	0	1a			
C34.1	2	8140	3	4	3	1b			

RECURRENT PROBLEMS

2) No cTNM when pTNM is present

Both are important !

- cTNM will help to decide if surgery is indicated (→ Quality Indicators)
- pTNM will help to decide if adjuvant treatment is necessary and gives more accurate prognostic information

- cTNM maybe different from pTNM
 - preop understaging
 - preop overstaging ...



if cTNM = pTNM ... 'rather suspicious' for



RECURRENT PROBLEMS

3) No pTNM in case of surgical resection of primary tumour



topo	lat	histo	behaviour	cT	cN	cM	pT	pN	pM	treatment (done or planned)
C34.0	2	8012	3	4	2	1b				
C34.0	2	8070	3	4	2	1b				
C34.0	1	8140	3	4	0	1b				
C34.1	2	8550	3				3	1	x	
C34.1	2	8140	3	4	0	0				
C34.1	1	8140	3	2a	0	0				
C34.1	1	8140	3	3	2	1b				
C34.1	1	8140	3	1a	0	0				10
C34.1	1	8140	3	1b	0	0				10
C34.1	1	8140	3	2a	0	0				10
C34.1	2	8140	3	3	0	x				
C34.1	1	8070	3	1a	2	x				
C34.1	1	8070	3	3	0	x				
C34.1	1	8140	3							
C34.1	2	8070	3							
C34.1	2	8550	3				1a	0	x	
C34.1	1	8550	3				2b	2	x	
C34.1	1	8140	3	4	3	1b				
C34.1	2	8070	3				3	0	x	
C34.1	1	8140	3	1a	0	1a				
C34.1	2	8140	3	4	3	1b				

RECURRENT PROBLEMS



3) No pTNM in case of surgical resection of primary tumour

Solution :

- wait until surgery is executed and AP-report is available
- in case of referral to other centre : please mention !
- use “10” in correct manner : only for surgery of the primary tumour, **not for** staging surgical procedures (mediastinoscopy, thoracoscopy, lymph node removal,...) : *surgical* staging is part of *clinical* staging !

RECURRENT PROBLEMS



4) Presence of pTNM without evidence of surgical procedure is (rarely) possible

pT = only possible after resection of the primary tumour **OR** a biopsy allowing to evaluate the highest T-category

eg : CT-scan : lung tumour possibly invading oesophagus
 Biopsy of nodule in oesophagus = ingrowth of lung tumour
 → cT4

Even when no surgery → pT4 can be registered because of microscopic proof of the highest pT category

RECURRENT PROBLEMS

5) pN without pT

Information about lymph nodes obtained by

- physical examination
- imaging
- endoscopy (EBUS/EUS)
- mediastinoscopy, mediastinotomy, thoracoscopy, surgical exploration,...

} APD

And no further surgical intervention on primary tumour



pN or cN ?



7th edition of TNM, page 8:

An excisional biopsy of a lymph node without pathological assessment of the primary is insufficient to fully evaluate the pN category and is a clinical classification, in other words: **no pN without pT.**

Thus, in this cases cN should be used.

RECURRENT PROBLEMS

6) Copy-paste of cTNM \Leftrightarrow pTNM



RECURRENT PROBLEMS

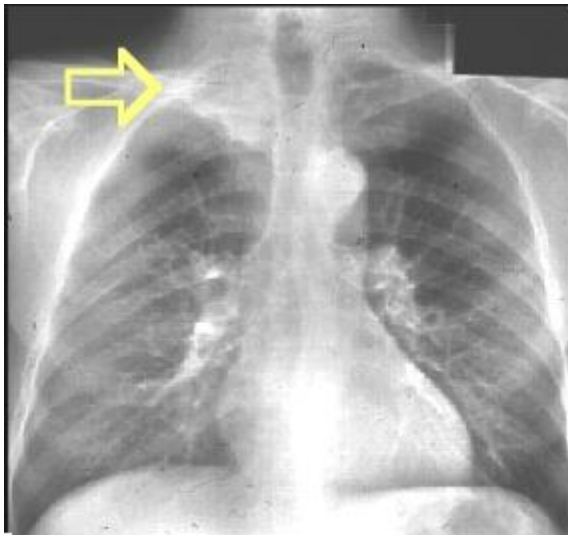


7) Wrong TNM-variables

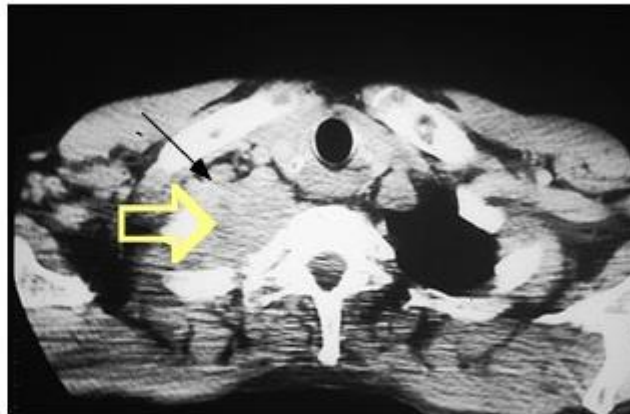
- Not existing values (eg T3a, T4b,...)
- Wrong choice of value

RECURRENT PROBLEMS

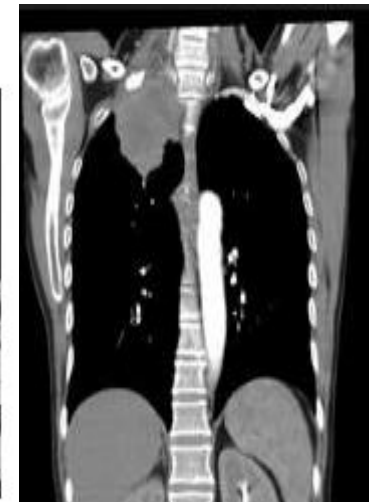
- **PANCOAST tumour** : tumour in the apex of the lung = tumour located in the **sulcus superior**, with destructive lesions and involvement of brachial plexus and cervical sympathetic nerves → at least **cT3** (regardless of diameter of the tumour)



Chest X-ray



CT Scan



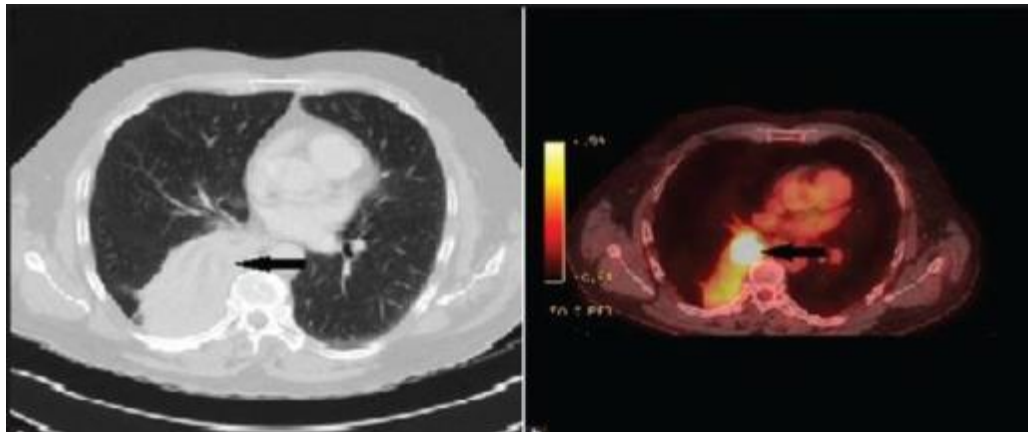
RECURRENT PROBLEMS

- Do not forget **ATELECTASIS OR OBSTRUCTIVE PNEUMONITIS !**

Regardless diameter of lung tumour :

In 7th edition :

- atelectasis/pneumonitis extending to the hilus but not involving entire lung
→ at least cT2/pT2
- atelectasis/pneumonitis involving entire lung
→ at least cT3/pT3 (changed in 8th edition → also T2)



RECURRENT PROBLEMS



- Be careful with **SYNCHRONOUS BILATERAL LESIONS** !
 - 1) Bilateral lesions with PROVEN same histology
 - 1 tumour in a metastatic setting
 - at least cM1a **AND** pM1a
 - 2) Bilateral lesions but histology of one or both lesions unknown
 - considered to be the same histology
 - 1 tumour in a metastatic setting
 - at least cM1a
 - 3) Bilateral lesions but PROVEN different histology (histological FAMILY)
 - 2 primary tumours
 - each with own TNM stage

VERY IMPORTANT IMPLICATIONS FOR TREATMENT / PROGNOSIS

RECURRENT PROBLEMS



- **Make a clear difference between NEW LESIONS AND RECURRENT LESIONS !**
 - 1) New lesion in lung after previous one and PROVEN same histology (regardless laterality)
 - 1 tumour with recurrent lesion (no New Diagnosis)
 - maybe rTNM (not asked by BCR)
 - 2) New lesion in lung after previous one and PROVEN \neq histology (regardless laterality)
 - New Diagnosis
 - 3) New lesion in lung after previous one and no histology available (regardless laterality)
 - histology considered to be the same
 - 1 tumour with recurrent lesion (no New Diagnosis)
 - maybe rTNM (not asked by BCR)
- **Make a clear difference between METASTASIS IN LYMPH NODES (REGIONAL → N) AND AT A DISTANCE** (non-regional LN included → M) Eg. metastatic ipsilateral hilar LN = N1, not M1

TNM : a fascinating but never ending story.....



CASE 1 :



CT-scan :

- Tumour of 2,5 cm in upper lobe of right lung + nodule of 1 cm in lower lobe of right lung
- Enlarged mediastinal lymph nodes
- No other lesions observed
- Bronchoscopy + biopsy of nodule in upper lobe
- EUS : puncture of ipsilateral mediastinal lymph nodes

APO lung biopsy : adenocarcinoma

APO EUS : compatible with metastasized adenoca of lung

How to stage this tumour ?

1) *cT1N2M1*

2) *cT4NxM0 + pT_ N2M_*

3) *cT4N2M0*

4) *cT4N2M1 + pT_ N_ M1*

ANSWER TO CASE 1 :



CT-scan :

- Tumour of 2,5 cm in upper lobe of right lung + nodule of 1 cm in lower lobe of right lung → **cT4 (no pT4 since no microscopic proof of second nodule)**
 - Enlarged mediastinal lymph nodes
 - No other lesions observed → **cM0**
- Bronchoscopy + biopsy of nodule in upper lobe
→ EUS : puncture of ipsilateral mediastinal lymph nodes

APO lung biopsy : adenocarcinoma

*APO EUS : compatible with metastasized adenoca of lung → **cN2 (regional node metastasis)***

How to stage this tumour ?

- 1) **cT1N2M1 (wrong : no metastasis at a distance)***
- 2) **cT4NxM0 + pT_ N2M_ (wrong : EUS provides information for clinical staging)***
- 3) **cT4N2M0 = correct***
- 4) **cT4N2M1 + pT_ N_ M1 (wrong = no proof of distant metastasis)***

CASE 2 :



CT-scan :

- Pneumonitis of left upper lobe due to obstruction by tumour of 2,5 cm
 - Enlarged mediastinal lymph nodes
 - No other lesions observed
- Bronchoscopy + biopsy of tumour : *APO : spinocellular carcinoma*
- Mediastinoscopy : biopsy of multiple LN
- APO : 1 node paratracheal right positive for meta of spinocellular ca*

How to stage this tumour ?

- 1) *cT1N0M1*
- 2) *cT2N2M0*
- 3) *cT1N3M0*
- 4) *cT2N3M0*

Answer to CASE 2 :



CT-scan :

- **Pneumonitis** of left upper lobe due to **obstruction** by tumour of 2,5 cm
- Enlarged mediastinal lymph nodes → **at least cT2, regardless 2.5 cm**
- No other lesions observed → **M0**

→ Bronchoscopy + biopsy of tumour : *APO : spinocellular carcinoma*

→ Mediastinoscopy : biopsy of multiple LN

*APO : 1 node **paratracheal right** positive for meta of spinocellular ca*

→ = **contralateral mediastinal**

How to stage this tumour ?

- 1) cT1N0M1 (wrong : pneumonitis overrules size ; no distant metastasis)*
- 2) cT2N2M0 (N3 because of contralateral mediastinal)*
- 3) cT1N3M0 (wrong : pneumonitis overrules size)*
- 4) cT2N3M0 (in the TNM 8th edition cT2aN3M0)*