건강보험공단 자료를 이용한 임상연구 사례

박소정
서울아산병원 호흡기내과

국내 보건의료 2차 자료원

표 1-1 국내 보건의료 이차자료원 현황

순서	자료원명	자료담당기관	자료원 홈페이지
1	건강보험청구자료	건강보험심사평가원	http://www.hira.or.kr
2	중앙암등록자료	국립암센터	http://www.ncc.re.kr/manage/manage03_04.jsp
3	국민건강보험공단 건강검진자료	국민건강보험공단	http://www.hnic.or.kr
4	사회조사	통계청	http://mdss.kostat.go.kr
5	통계청 사망원인자료		http://mdss.kostat.go.kr
6	국민구강건강실태조사	보건복지부	http://www.khealth.or.kr/Index.do
7	국민건강영양조사	질병관리본부	http://knhanes.cdc.go.kr
8	지역사회건강조사		http://chs.cdc.go.kr
9	청소년건강행태온라인조사		http://yhs.cdc.go.kr
10	퇴원손상심층조사		http://injury.cdc.go.kr
11	노인실태조사	한국보건사회연구원	http://hawelsis.kihasa.re.kr
12	베이비부머의 생활실태 및 복지욕구		
13	장애인실태조사		
14	전국다문화가족 실태조사		
15	전국출산력 및 가족보건복지실태조사		
16	영아모성사망조사		
17	차상위계층 실태조사		

국내 보건의료 2차 자료원

표 1-2 국내 보건의료 이차자료원 특성

자료원명	자료수집 목적	자료제공 대상	자료제공 방법	자료수집 주기
건강보험 청구자료	건강보험법 제55조에 의해 요양급여심사 및 요양급여 적정성 평가를 위하여 청구된 자료	기관 (개인은 사전 상담)	기관접촉 (국가환자표본 자료는 온라인 신청)	매년
중앙암등록자료	전국단위의 암발생 자료를 구축하는 등록자료	기관/ 개인 제공	온라인 신청	매년
건강보험공단 건강검진자료	공공건강검진 자료	정책연구 등 제한적 제공	기관접촉	매년
사회조사	국민 삶의 수준과 사회적 변동을 파악	기관/ 개인 제공	온라인 신청	매년 (각부문별 2년주기)
통계청 사망원인자료	국민의 정확한 사망원인 구조 파악	기관/ 개인 제공	기관접촉 온라인 신청	매년
국민구강건강 실태조사	국가차원의 체계적인 구강보건 사업목표 개발과 사업계획 및 구강보건사업 우선순위 결정에 필요한 기초자료 확보	기관/ 개인 제공	온라인 신청	3년
국민건강 영양조사	국민의 건강수준, 건강관련 의식 및 행태, 식품 및 영양섭취 실태에 대한 국가 및 시도 단위의 통계 산출	기관/ 개인 제공	온라인 신청	매년

https://nhiss.nhis.or.kr

자료 조사항목

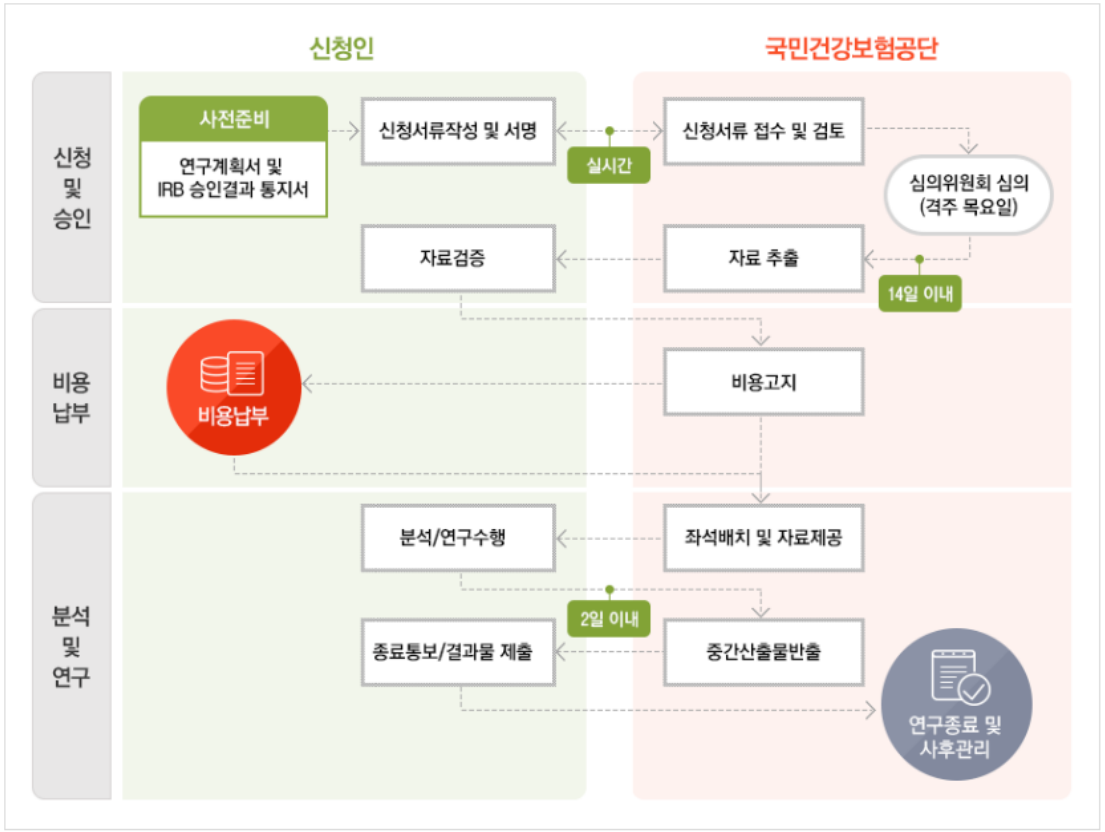
표 1-3 이차자료원별 조사항목 비교

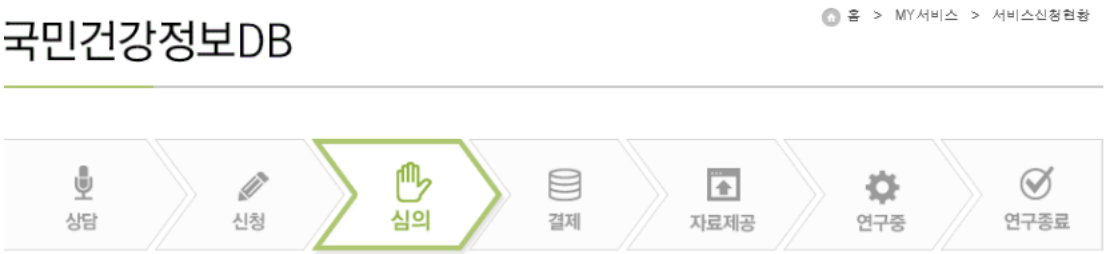
조사항목	자료원	건강보험청구자료		중앙	국민		통계청
		건강보험 청구자료 (2011)	국가환자 표본자료 (2009)	암등록 자료 (2009)	건강보험공단 건강검진자료 (2012)	사회조사 (2011)	사망원인 자료 (2010)
인구 사회학적 특성	성별	✓	✓	✓	✓	✓	✓
	연령	✓	✓	✓	✓	✓	✓
	교육수준/학력					✓	✓
	경제상태					✓	
	의료보장	✓	✓		✓		
	경제활동					✓	✓
	가구정보				✓	✓	
	혼인상태					✓	✓
	종교						
	거주지역				✓	✓	✓
의료이용	의료기관이용	✓	✓		✓	✓	
	의료비용	✓	✓				
질병이환	검진결과				✓		
	신체계측						
	정신보건	✓	✓		✓		
	구강보건	✓	✓		✓		
	사고/중독	✓	✓			✓	
	만성질환	✓	✓		✓	✓	
	장애						
	흡연				✓	✓	
	음주				✓	✓	
	약물						

맞춤형 건강정보자료란?

"맞춤형 건강정보자료"란 공단이 수집, 보유, 관리하는 건강정보자료를 정책 및 학술 연구목적으로 이용할 수 있도록 수요맞춤형 자료로 가공하여 제공하는 데이터를 말하며, 맞춤형 건강정보자료를 열람 및 연구 분석할 수 있는 PC가 설치된 공단 내의 장소인 "데이터분석실"에서 통계분석 툴(Tool)을 이용하여 제공한다.

업무흐름도





필요서류

신청단계

1) 연구계획서
2) 연구요약서
3) IRB 심의 통지서
4) 개인정보수집동의서

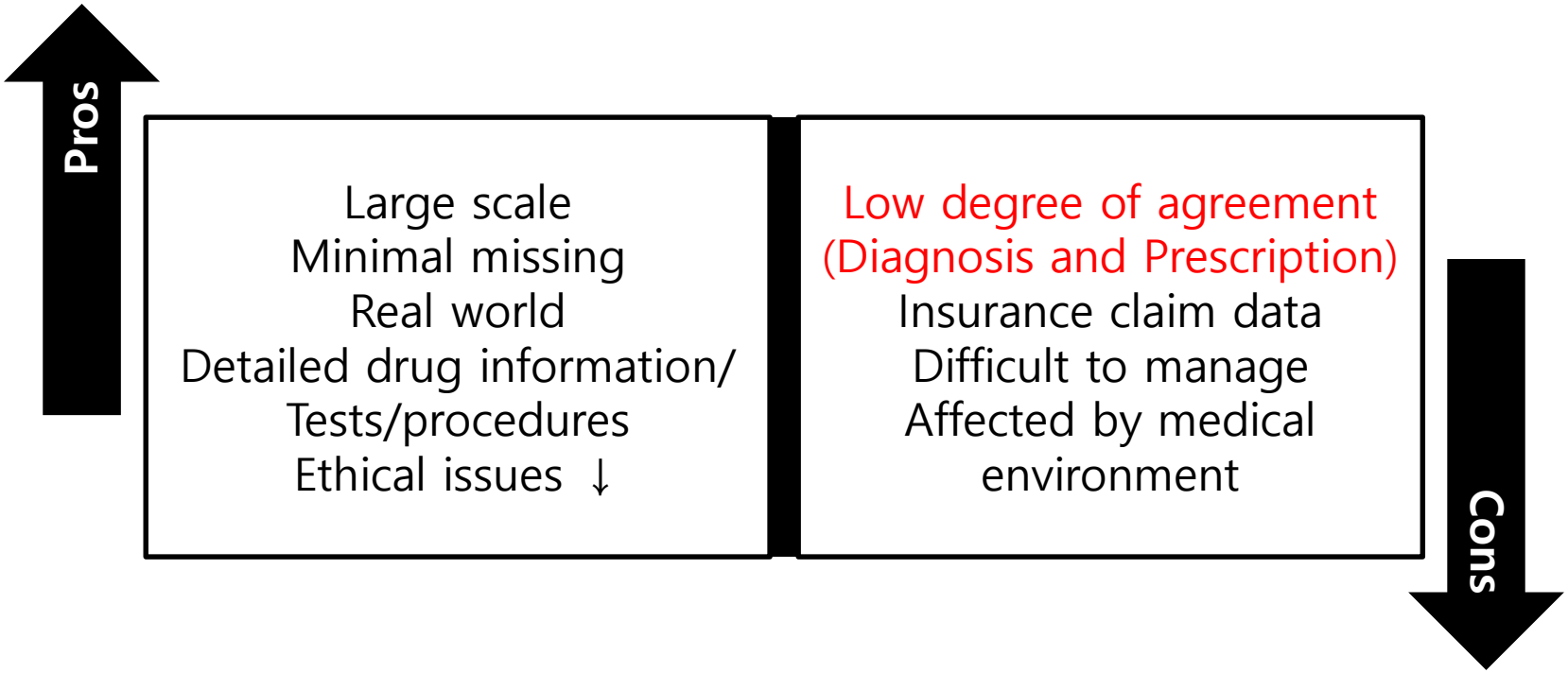
심의 후

1) 보안각서
2) 서약서
3) 보안서약서

연구 중

1) 진행보고서 (1회/년)
2) 공문 (진행보고서 제출 시)

장단점


Pros
Large scale
Minimal missing
Real world
Detailed drug information/
Tests/procedures
Ethical issues ↓
Low degree of agreement
(Diagnosis and Prescription)
Insurance claim data
Difficult to manage
Affected by medical
environment
Cons

자료 조사항목

연계자료			☑진료자료 ☑건강검진자료 ☑자격자료	
진료자료	추출조건	진료기간	2002-2013 (2002-2003년은 wash out 기간) (신청가능한 연도 : 2002~2013년)	
		보험자종별구분	☑4: 건강보험 ☑5: 의료급여 ☑7: 국비보훈	
		요양기관종별구분	포함 / 요양종별명칭 / 포함 / 요양종별명칭 ☑ 종합병원 / ☐ 보건지소 ☑ 일반병원, 정신병원 / ☐ 보건진료소 ☑ 요양병원(노인전문병원 포함) / ☐ 모자보건센타 ☐ 의원 / ☑ 약국 ☐ 치과병원 / ☐ 한방병원 ☐ 치과의원 / ☐ 한의원	
		서식구분	포함 / 서식구분명칭 / 포함 / 서식구분명칭 ☑ 일반입원 / ☐ 정신과낮병동 ☑ 일반외래 / ☐ 정신과입원 ☐ 치과입원 / ☐ 정신과외래 ☐ 치과외래 / ☐ 한방입원 ☐ 보건기관 외래 / ☐ 한방외래 ☐ 보건기관 입원 / ☑ 약국조제(약국) ☐ 조산원 입원 / ☑ 처방조제(약국)	
		요양기관 지역	전체	
		상병코드 조건	상병정의	폐암
			상병코드	폐암-C34%
			상병순위	
		청구자료 상세 (포함변수 기술)		수술 I입시, 수술청구코드) 방사선 치료 I치료시작일, 방사선 청구코드) 항암제 I치료시작일, 성분명, 기간) 진단전 CT 시행 이력 ICT 시행일)- CT 청구코드: HA434001, HA464005, HA434005 호르몬제 (치료시작일, 성분명, 기간)
		약품코드 조건 (성분명코드)		폐암 항암제 성분명: Erlotinib I477401ATB, 477402ATB), Gefitinib I459001ATB), Crizotinib I617501ACH,617502ACH), Afatinib I626101ATB, 626102ATB, 626103ATB), Carboplatin I123702BIJ, 123704BIJ), Cisplatin I134501BIJ, 134503BIJ), Pemetrexed I481201BIJ, 481202BIJ), Gemcitabine I164901BIJ, 164902BIJ), etoposide I157101BIJ, 157102ACH), navelbine I248202BIJ) 호르몬제 : Tamoxifen I234501ATB), Toremifene I242101ATB), Anastrozole I108001ATB), Letrozole I182201ATB), Exmestane I358401ATB), Leuprolide I182602BIJ, 182604BIJ), Goserelin I167201BIJ, 167202BIJ)
		행위코드 조건 (처치,수술,검사)		폐암 수술 청구코드: O01401, O01402, O01410 O01421, O01422, O01423, O01424, O01431, O01432 폐암 방사선 청구코드: HD051, HD054, HD052, HD055, HD053, HD056, HD057, HD058, HD059, HD051, HD110, HD111, HD112, HD211, HD212, HD113, HD114, HD115, HD121, HD271
		기타 조건		폐암환자 - 선정기준: 폐암진단(C34%)을 받고, 항암제나 방사선

				치료나 수술을 받은 기록이 있는 여성 환자 - 제외기준: 1) 이전이나 동일한 진단년도에 C34% 이외의 C 코드가 있는 환자 제외, 2) 진단일 이전에 C34% 가 있는 환자 제외, 3)동반암이 있는 경우 제외
		추출변수 (o,x 표기)	명세서 일반	개인식별번호( ), 요양개시일자( ), 요양기관식별대체번호(), 요양기관종별코드(), 청구월태코드(), 서식코드(), 진료과목코드(), 상세전문과목코드(), 상해외인구분( ), 특정기호구분( ), 진료결과구분(),조산횟( ),부산횟( ), 수술여부(),입원경로구분(),급삭구분( ),요양일수( ),내원일수( ),청구요양급여비용총액( ), 청구본인부담금( ), 청구보훈자부담금( ), 청구CT총액( ), 청구MRI총액( ), 청구구분( ), 심결가산율( ), 심결요양급여비용총액( ), 심결본인부담금( ), 심결보훈자부담금( ), 심결CT총액( ), 심결MRI총액( ), 최초입원일( )
			진료내역	개인식별번호( ), 요양개시일자(●), 요양기관식별대체번호(●), 종별호( ), 요양기관종별코드(●), 청구월태코드(●), 서식코드( ), 항코드(●), 목코드(●), 분류유형코드(●), 분류코드(●), 건가( ), 금액( ), 청일투여량 또는실시횟수(●), 총투여일수또는실시횟수(●), 1회투약량(●)
			상병내역	개인식별번호( ), 요양개시일자(●), 요양기관식별대체번호(●), 일련번호(●), 요양기관종별코드(●), 청구월태코드(●), 서식코드(●), 진료과목코드(●), 상병기호(●), 수술여부(●), 상해외인구분( ), 특정기호구분( ), 상세전문과목코드(●), 상병분류구분코드(●), 주상병(●), 부상병(●)
			처방전교부 상세내역	개인식별번호( ), 요양개시일자(●), 처방전발행기관식별대체번호(●), 종별호( ), 요양기관종별코드(●), 청구월태코드(●), 서식코드(●), 분류유형코드(●), 분류코드(●), 분류코드유형(●), 일반명코드(●), 1회투약량(●), 1일투약량(●), 총투여일수또는실시횟수(●), 건가( ), 금액( )
건강검진자료	추출조건		검진종류	일반건강검진(1차)
			수검년도	2002-2013 (신청가능한 연도 : 2002~2013년, 연도별 변수차이 있음)
			보험자종별구분	☑4: 건강보험 ☑5: 의료급여 ☑7: 국비보훈
			지역	☑ 전체 ☐ 특정 지역(시도 단위)
			수검자 성별	☐ 전체 ☐1:남 ☑2:여
			수검연령	☑ 전체 ☐ 특정연령( )
			기타 조건	
		추출변수 (o,x 표기)		개인식별번호( ), 검진년도(●), 검진일자(●), 연령(●), 성별(●), 가구원( ), 가족력( ), 음주빈도( ), 음주량( ), 현재흡연여부(●), 현재흡연량(●), 현재흡연기간(●), 금연전흡연기간(●), 금연전 흡연량(●), 신체증등 빈도( ), 신체증등 고강도( ), 신체증등 중강도( ), 신체증등 걷기( ), 신장(●), 체중(●), 허리둘레( ), 체질량지수(●), 시력(좌, 우)( ), 청력(좌, 우)( ), 혈압(수축기)( ), 혈압(이완기)( ), 요단( ), 요단백( ), 요잠혈( ), 요PH( ), 혈색소( ), 공복혈당( ), 총콜레스테롤( ), 트리글리세라이드( ), AST(SGOT)( ), ALT(SGPT)( ), 감마GPT( ), HDL 콜레스테롤( ), LDL 콜레스테롤( ), 혈청크레아티닌( ), 신사구체여과율( ), 흉부방사선검사 판정구분( ), 흉부방사선검사 결과( )

임상연구사례

1. Cancer stage prediction using treatment history

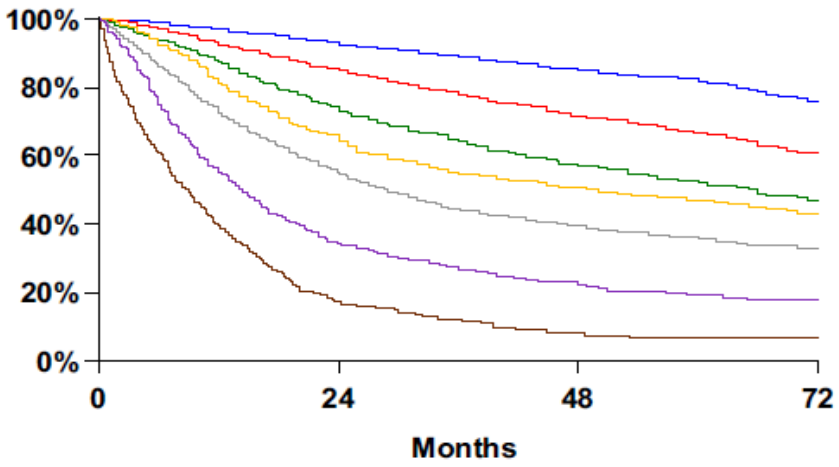
2. Impact of EGFR-TKI in real-world

3. Role of chest X-ray for early detection of lung cancer

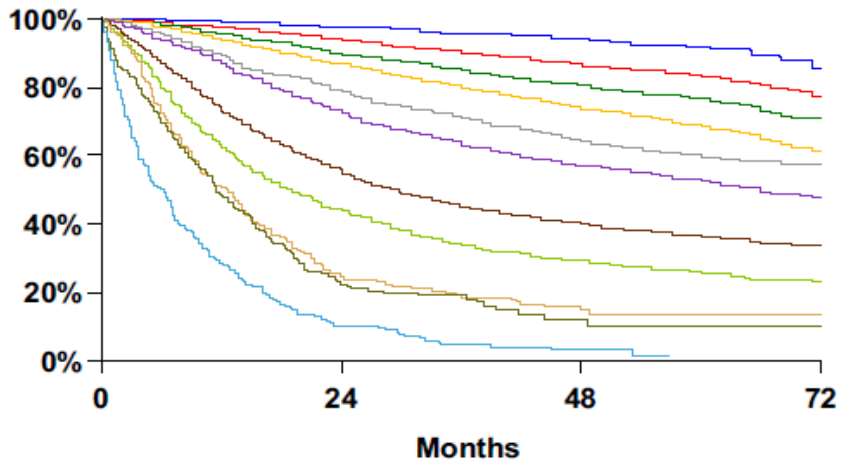
Cancer stage prediction using treatment history

TNM staging 8th edition

A



B



7th Ed.	Events / N	MST	24 Month	60 Month
IA	1119 / 6303	NR	93%	82%
IB	768 / 2492	NR	85%	66%
IIA	424 / 1008	66.0	74%	52%
IIB	382 / 824	49.0	64%	47%
IIIA	2139 / 3344	29.0	55%	36%
IIIB	2101 / 2624	14.1	34%	19%
IV	664 / 882	8.8	17%	6%

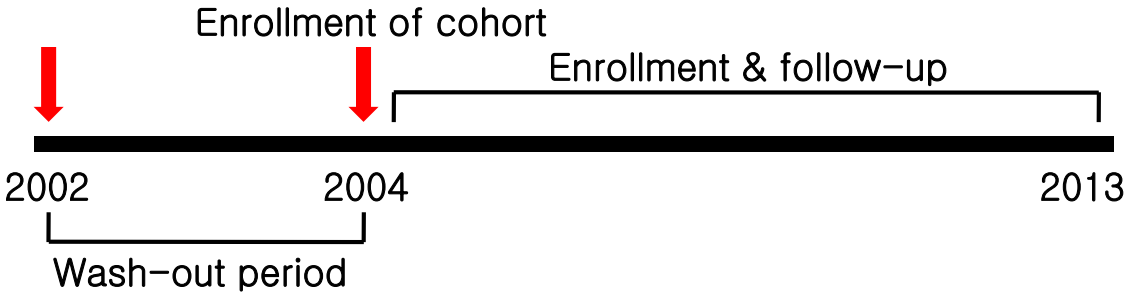
Proposed	Events / N	MST	24 Month	60 Month
IA1	68 / 781	NR	97%	92%
IA2	505 / 3105	NR	94%	83%
IA3	546 / 2417	NR	90%	77%
IB	560 / 1928	NR	87%	68%
IIA	215 / 585	NR	79%	60%
IIB	605 / 1453	66.0	72%	53%
IIIA	2052 / 3200	29.3	55%	36%
IIIB	1551 / 2140	19.0	44%	26%
IIIC	831 / 986	12.6	24%	13%
IVA	336 / 484	11.5	23%	10%
IVB	328 / 398	6.0	10%	0%

연구설계

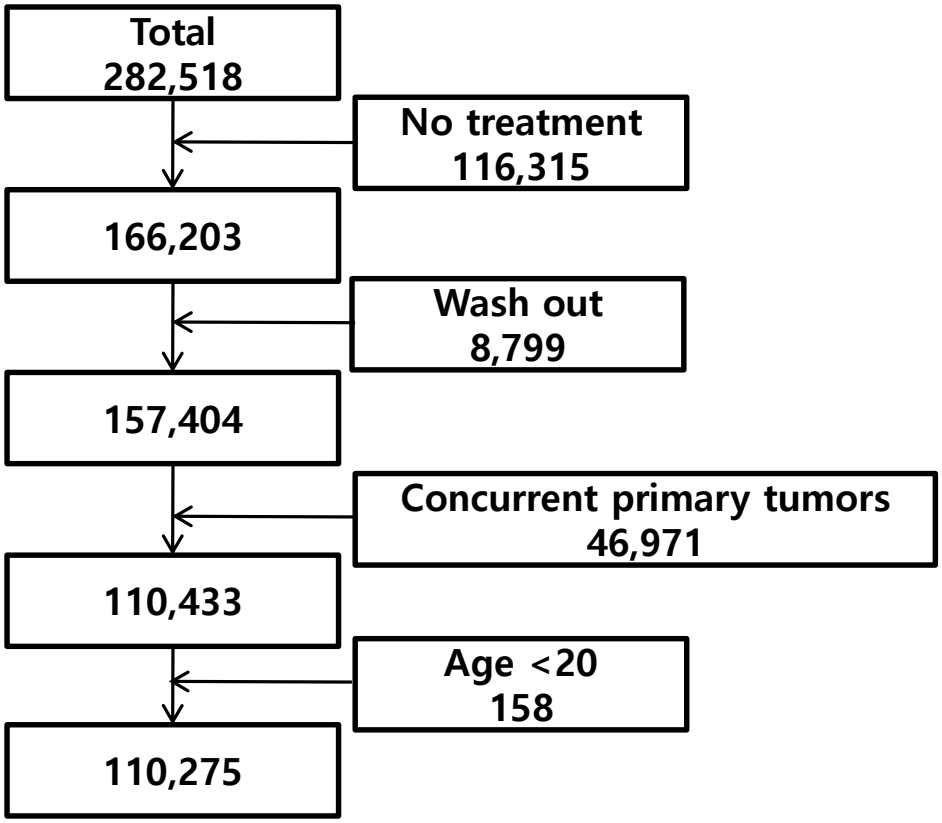
- 2004-2013
- ICD-10 C34
- At least, one treatment claim code

Exclusion

- Only having claim codes for chest CT
- Concurrent malignancies
- Age <30 years
- No available survival data
- Wash-out period



대상자 선정


Total
282,518
No treatment
116,315
166,203
Wash out
8,799
157,404
Concurrent primary tumors
46,971
110,433
Age <20
158
110,275

조작적 정의

	Treatment modality		
1	Surgical resection		
2	Surgical resection	Adjuvant RT	
3	Surgical resection	Adjuvant CT	
4	Surgical resection	Adjuvant CT	Adjuvant RT
5	Surgical resection	Adjuvant RT	Adjuvant CT
6	Neoadjuvant CT	Surgical resection	
7	CCRT		
8	Palliative CT		
9	Neoadjuvant CCRT	Surgical resection	
10	SBRT		
11	Conventional RT		

검색 조건

O1401	폐쐐기절제술(단일쐐기절제)
O1401001	폐쐐기절제술(단일쐐기절제)
O1401200	폐쐐기절제술(단일쐐기절제)
O1401201	폐쐐기절제술(단일쐐기절제)
O1401202	폐쐐기절제술(단일쐐기절제)
O1402	폐쐐기절제술(2개이상쐐기절제)
O1402001	폐쐐기절제술(2개이상쐐기절제)
O1402200	폐쐐기절제술(2개이상쐐기절제)
O1402201	폐쐐기절제술(2개이상쐐기절제)
O1410	폐구역절제술
O1410001	폐구역절제술
O1410200	폐구역절제술
O1410201	폐구역절제술
O1421	단일폐엽절제술
O1421001	단일폐엽절제술
O1421002	단일폐엽절제술
O1421050	단일폐엽절제술
O1421200	단일폐엽절제술
O1421201	단일폐엽절제술
O1421202	단일폐엽절제술
O1421210	단일폐엽절제술
O1421250	단일폐엽절제술
O1422	쌍폐엽절제술
O1422200	쌍폐엽절제술
O1423	폐엽과 폐구역절제술
O1423200	폐엽과 폐구역절제술
O1424	소매폐엽절제술
O1424200	소매폐엽절제술
O1431	소매폐엽절제술
O1431200	소매폐엽절제술

HD051	체외조사[1회당]-저에너지방사선치료-1문조사
HD052	체외조사[1회당]-중에너지방사선치료-1문조사
HD053	체외조사[1회당]-고에너지방사선치료-1문조사
HD054	체외조사[1회당]-저에너지방사선치료-2문대향(2문조사)부터
HD055	체외조사[1회당]-중에너지방사선치료-2문대향(2문조사)부터
HD056	체외조사[1회당]-고에너지방사선치료-2문대향(2문조사)부터
HD058	회전조사-중에너지방사선치료
HD061	입체조형치료[1회당]
HD110	정위적방사선분할치료[1회당]

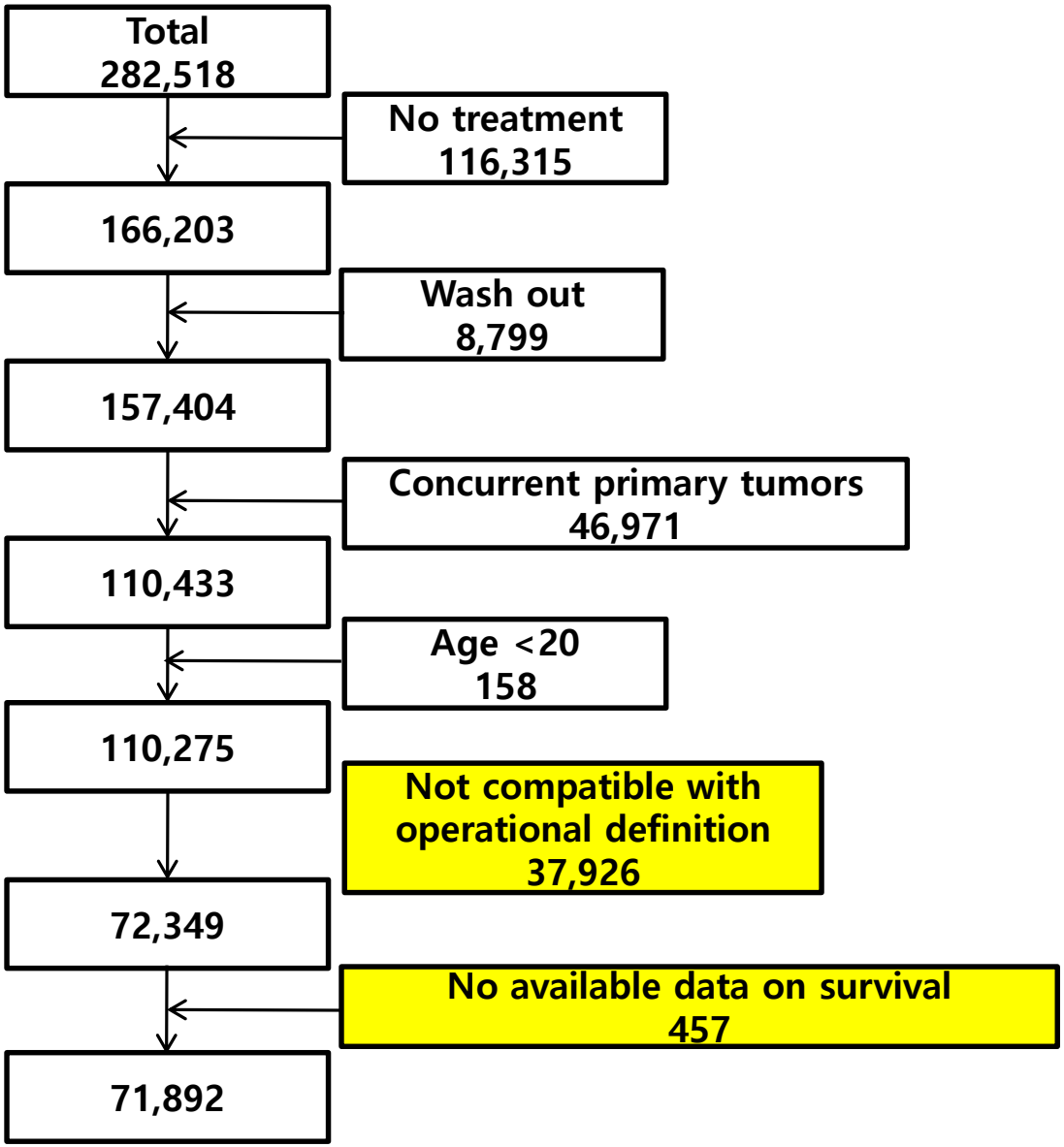
123701BIJ	carboplatin 150mg
123702BIJ	carboplatin 450mg
123703BIJ	carboplatin 50mg
123704BIJ	carboplatin 600mg
123706BIJ	carboplatin 1g
123707BIJ	carboplatin 550mg
123708BIJ	carboplatin 650mg
134501BIJ	cisplatin 10mg
134502BIJ	cisplatin 25mg
134503BIJ	cisplatin 50mg
148301BIJ	docetaxel 23.6mg
148302BIJ	docetaxel 94.4mg
148304BIJ	docetaxel 179.6mg
148305BIJ	docetaxel 136mg
148306BIJ	docetaxel 164.4mg

⋮

조작적 정의

	Treatment modality		
1	Surgical resection		
2	Surgical resection	Adjuvant RT	
3	Surgical resection	Adjuvant CT	
4	Surgical resection	Adjuvant CT	Adjuvant RT
5	Surgical resection	Adjuvant RT	Adjuvant CT
6	Neoadjuvant CT	Surgical resection	
7	CCRT		
8	Palliative CT		
~~9~~	~~Neoadjuvant CCRT~~	~~Surgical resection~~	
~~10~~	~~SBRT~~		
~~11~~	~~Conventional RT~~		

대상자 선정


Total
282,518
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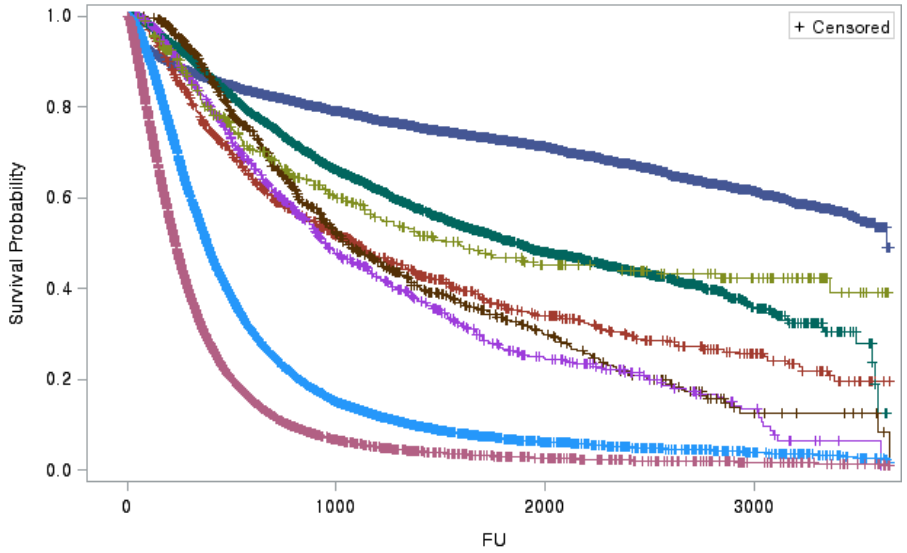
116,315
166,203
Wash out
8,799
157,404
Concurrent primary tumors
46,971
110,433
Age <20
158
110,275
Not compatible with
operational definition
37,926
72,349
No available data on survival
457
71,892

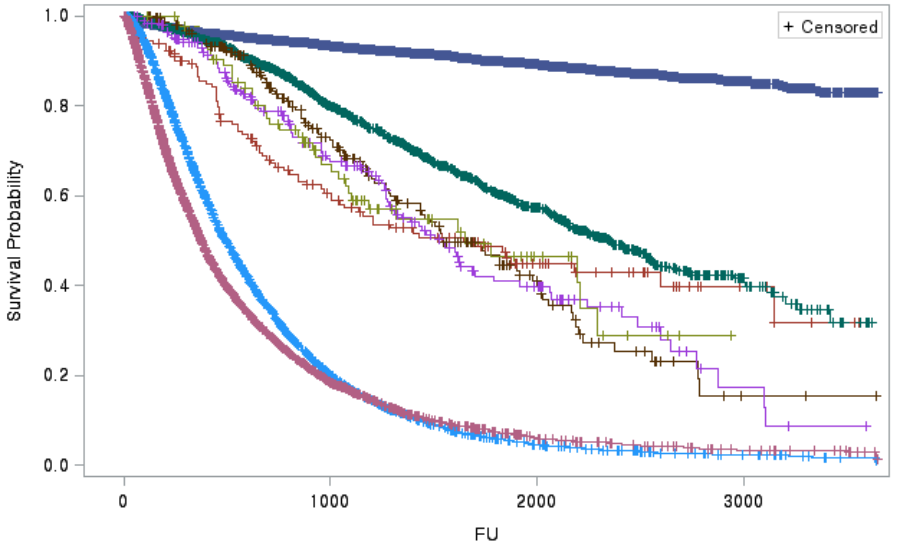
Survival

	Treatment modality		
1	Surgical resection		
2	Surgical resection	Adjuvant RT	
3	Surgical resection	Adjuvant CT	
4	Surgical resection	Adjuvant CT	Adjuvant RT
5	Surgical resection	Adjuvant RT	Adjuvant CT
6	Neoadjuvant CT	Surgical resection	
7	CCRT		
8	Palliative CT		

Male (n=52,629)



Female (n=19,263)



stage

1 2 3 4 5 6 7 8

조작적 정의

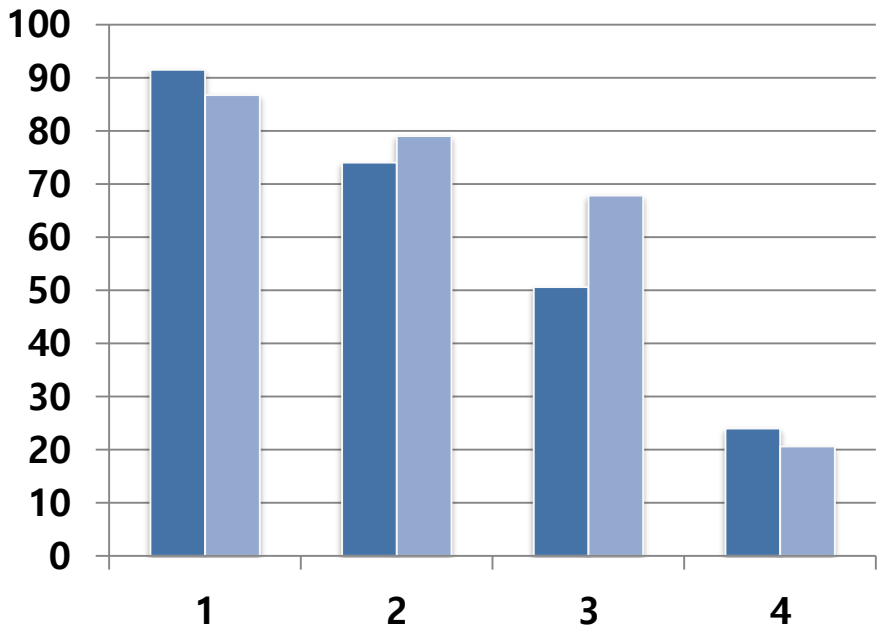
TNM 8th					NHI									
Stage	event	total	24M	60M	Model-1	event	total	24M	60M	Model-2	event	total	24M	60M
IA1	68	781	0.97	0.92	1	3011	17324	0.866	0.789					
IA2	505	3105	0.94	0.83										
IA3	546	2417	0.90	0.77										
IB	560	1928	0.87	0.68										
IIA	215	585	0.79	0.60	2	611	1065	0.790	0.539					
IIB	605	1453	0.72	0.53	3	2378	6467	0.698	0.366					
IIIA	2052	3200	0.55	0.36	4	554	1001	0.647	0.297					
					5	572	977	0.698	0.482					
IIIB	1551	2140	0.44	0.26	6	203	444	0.698	0.468					
IIIC	831	986	0.24	0.13	7	17895	21047	0.264	0.068					
IVA	336	484	0.23	0.10	8	19669	23106	0.153	0.040					
IVB	328	398	0.10	0										

조작적 정의

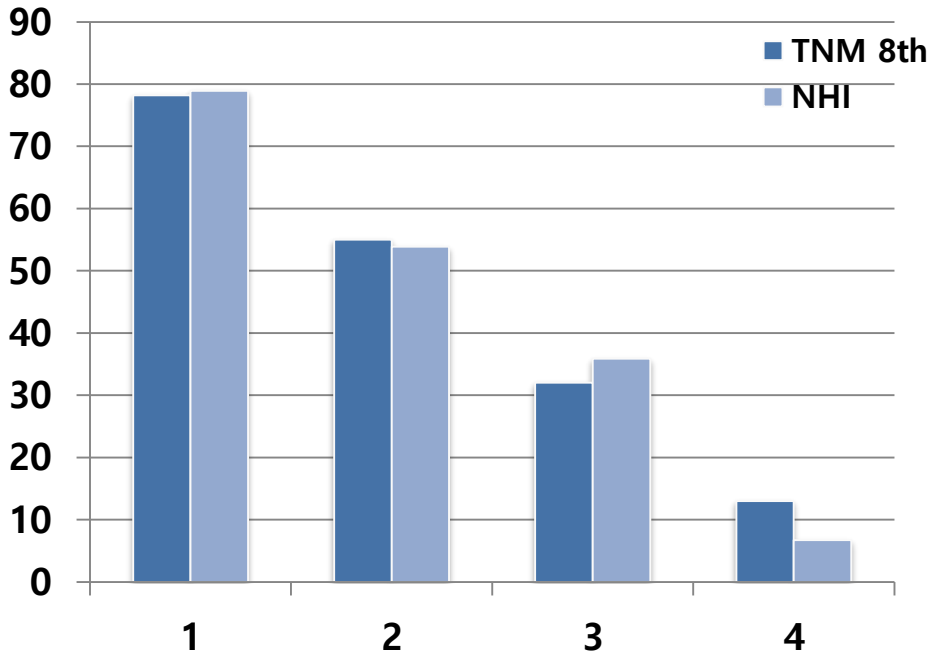
TNM 8th					NHI									
Stage	event	total	24M	60M	Model-1	event	total	24M	60M	Model-2	event	total	24M	60M
IA1	68	781	0.97	0.92	1	3011	17324	0.866	0.789	1	3011	17324	0.866	0.789
IA2	505	3105	0.94	0.83										
IA3	546	2417	0.90	0.77										
IB	560	1928	0.87	0.68										
IIA	215	585	0.79	0.60	2	611	1065	0.790	0.539	2	2378	6467	0.790	0.539
IIB	605	1453	0.72	0.53	3	2378	6467	0.698	0.366					
IIIA	2052	3200	0.55	0.36	4	554	1001	0.647	0.297	3	1329	2422	0.678	0.359
					5	572	977	0.698	0.482					
IIIB	1551	2140	0.44	0.26	6	203	444	0.698	0.468					
IIIC	831	986	0.24	0.13	7	17895	21047	0.264	0.068	4	37564	44153	0.206	0.053
IVA	336	484	0.23	0.10	8	19669	23106	0.153	0.040					
IVB	328	398	0.10	0										

Survival

Male

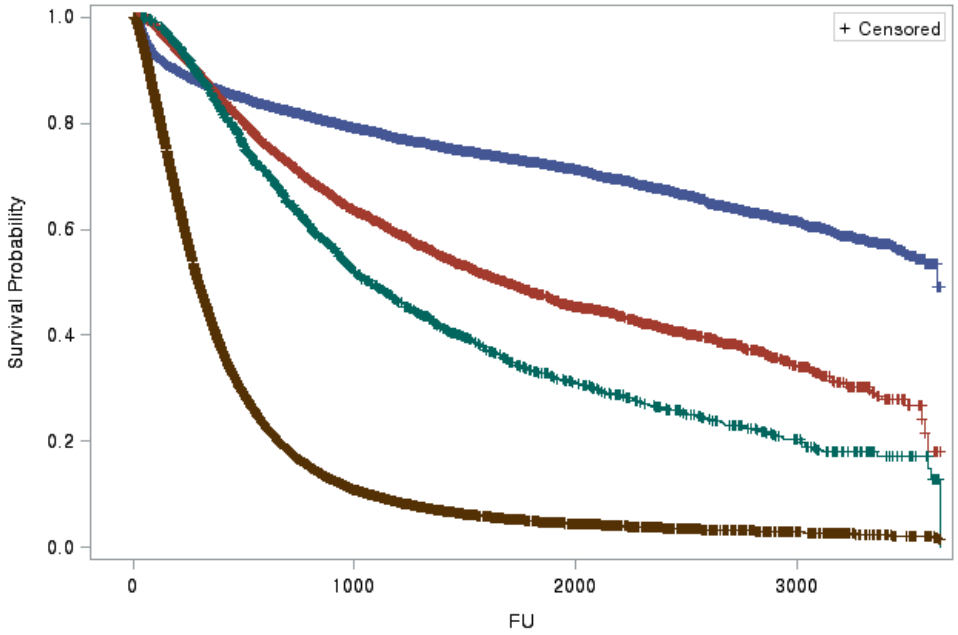


Female

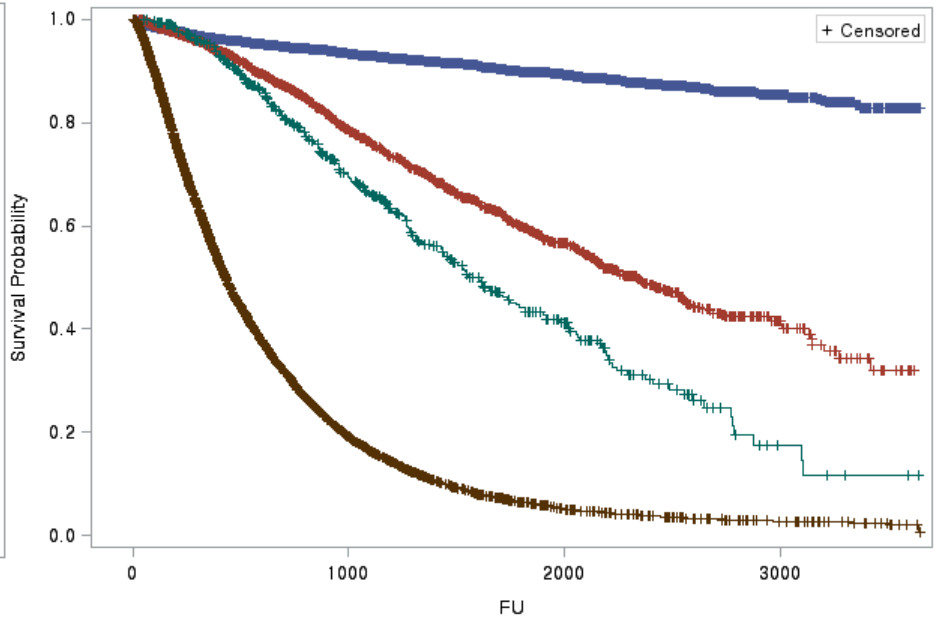


Survival

Male



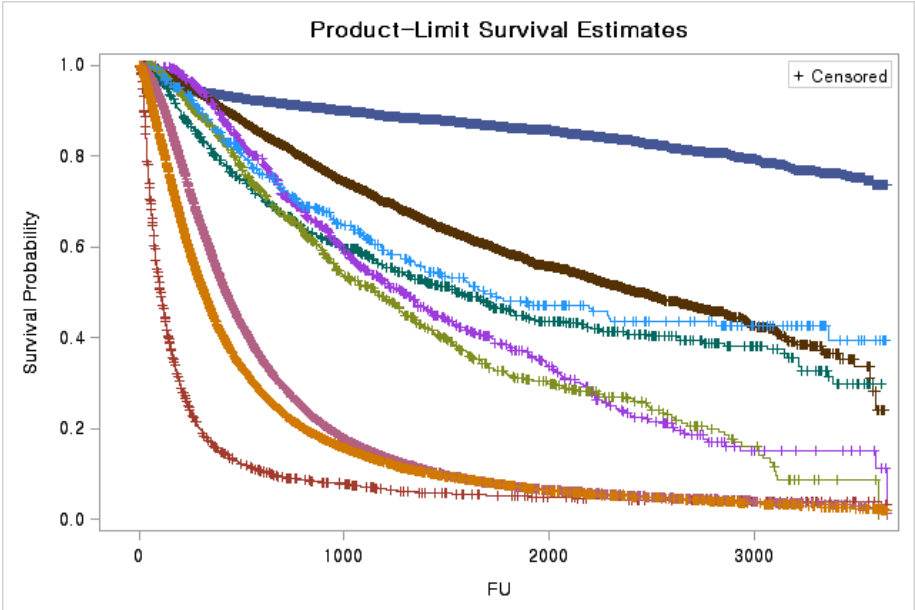
Female



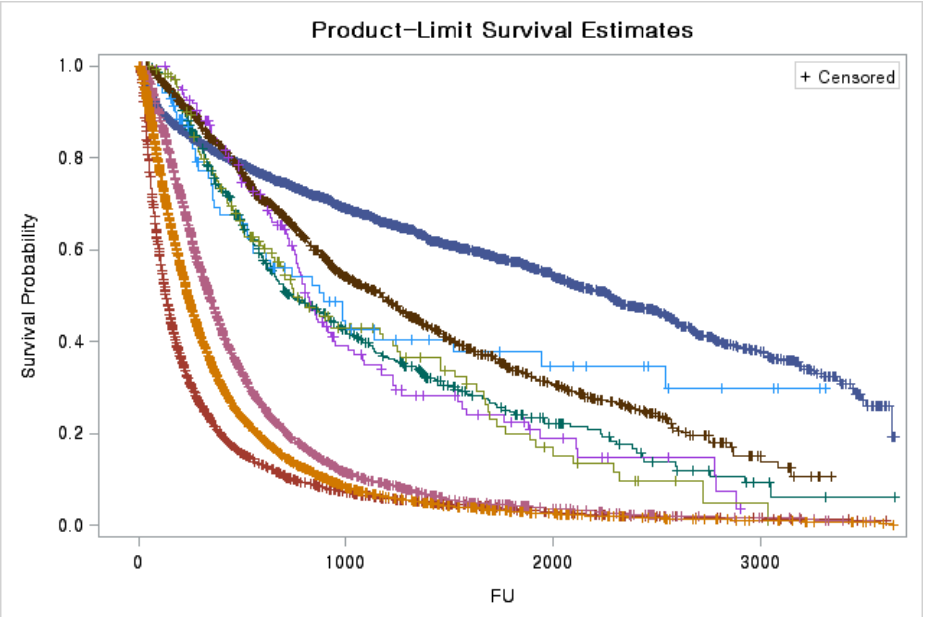
1 2 3 4

Survival - age

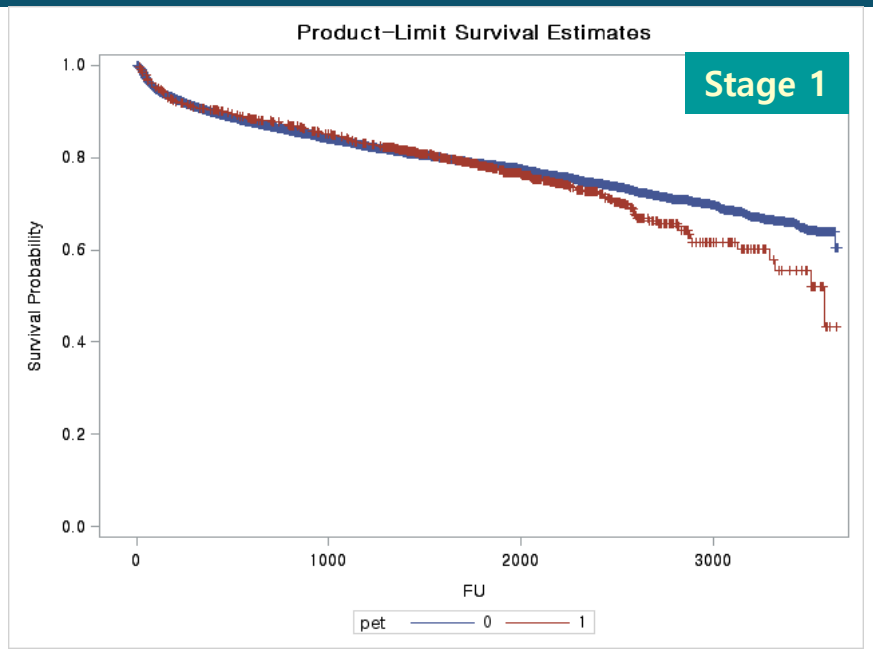
Age <70 years

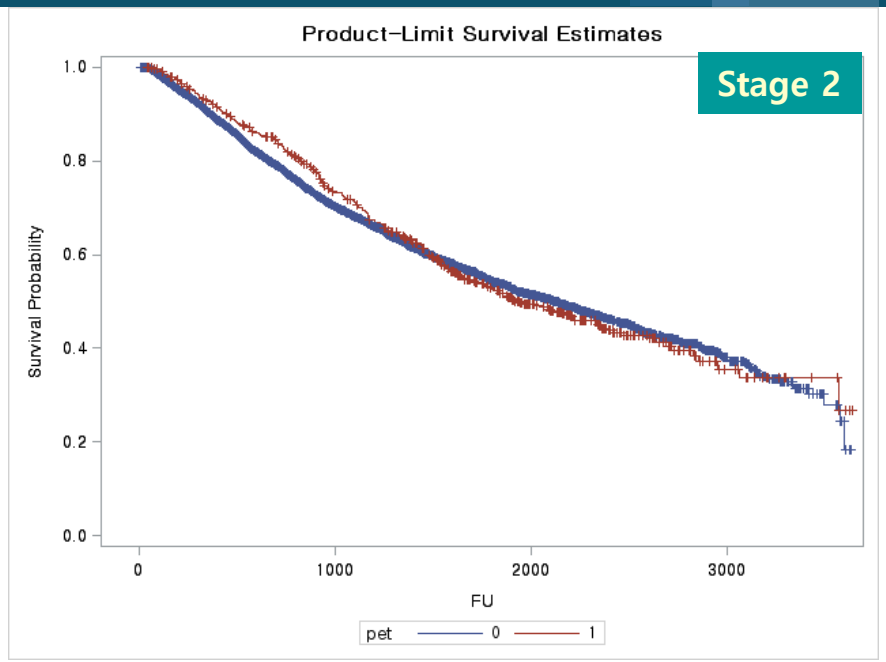


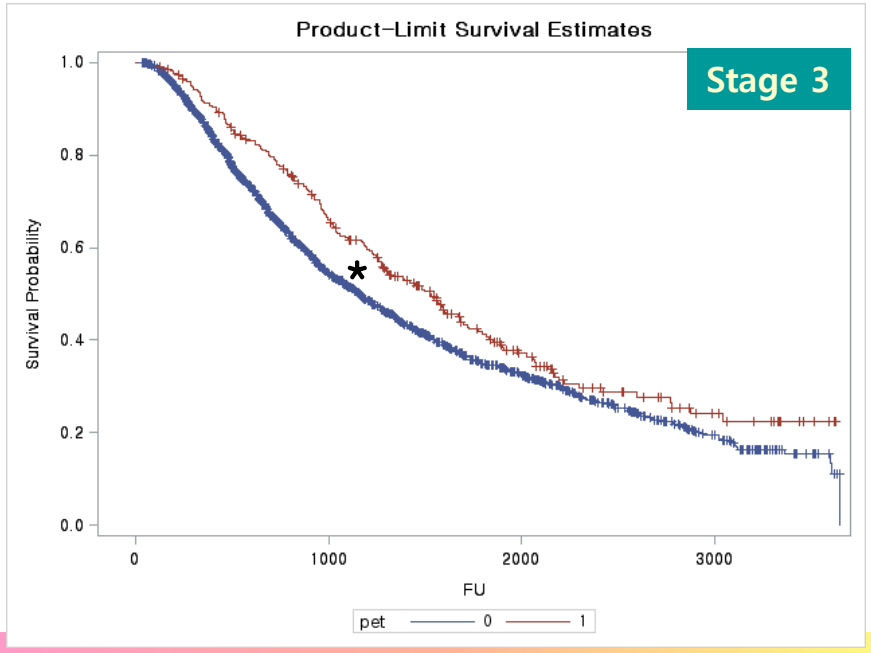
Age ≥70 years

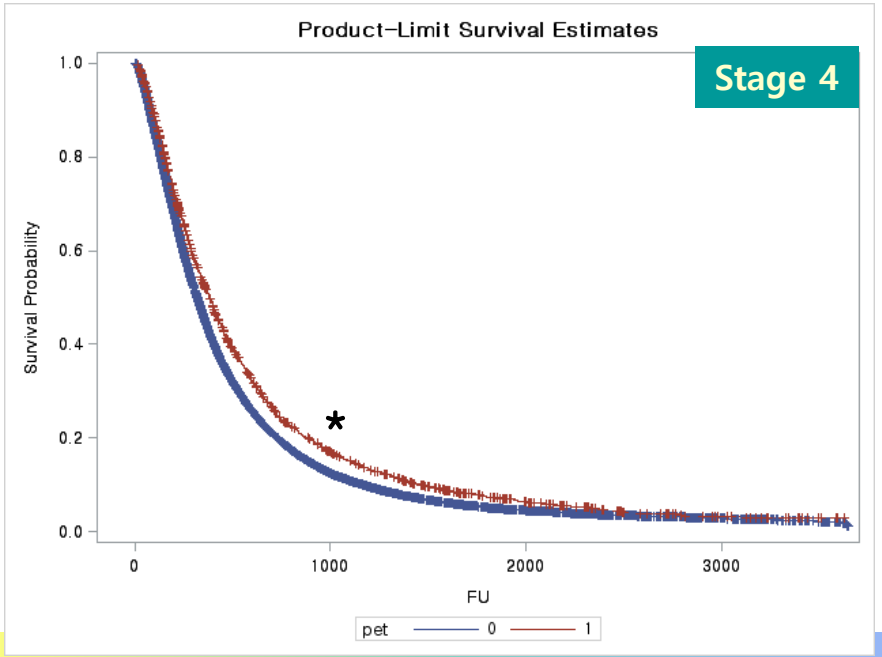


Survival - PET









Impact of EGFR-TKI in real-world

연구설계

- 2004-2013
- ICD-10 C34
- Erlotinib (477401ATB, 477402ATB)
- Gefitinib (453001ATB)

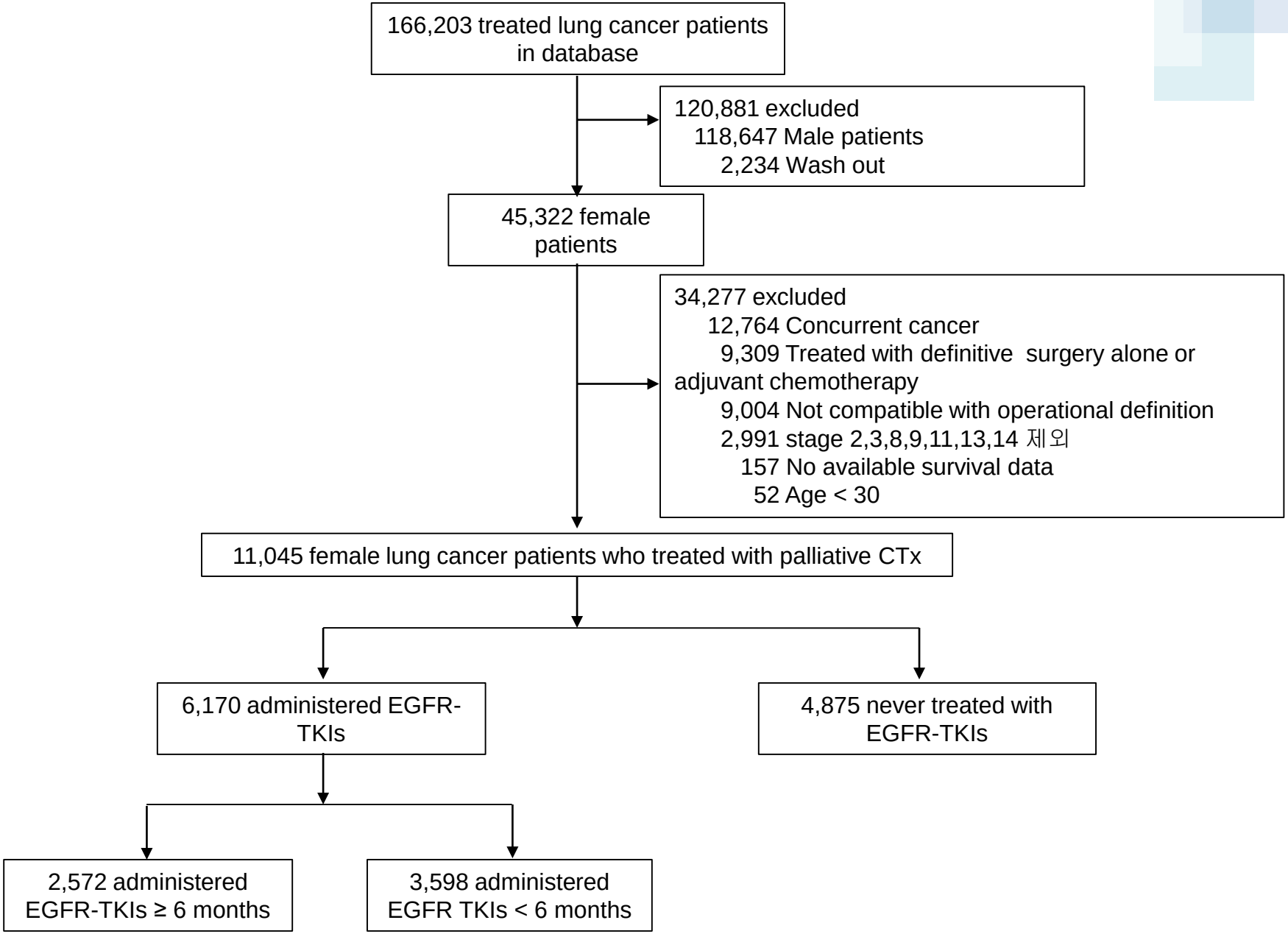
Exclusion

- Concurrent malignancies
- Undergone definitive surgery or radiotherapy
- No available survival data

약품코드자료의 제한점

- ✓ User vs. Non-user
- ✓ Adherence
  MPR (medication possession ratio)
  = Total duration of prescription/ total follow-up period
- ✓ Duration, window, dose

연구설계

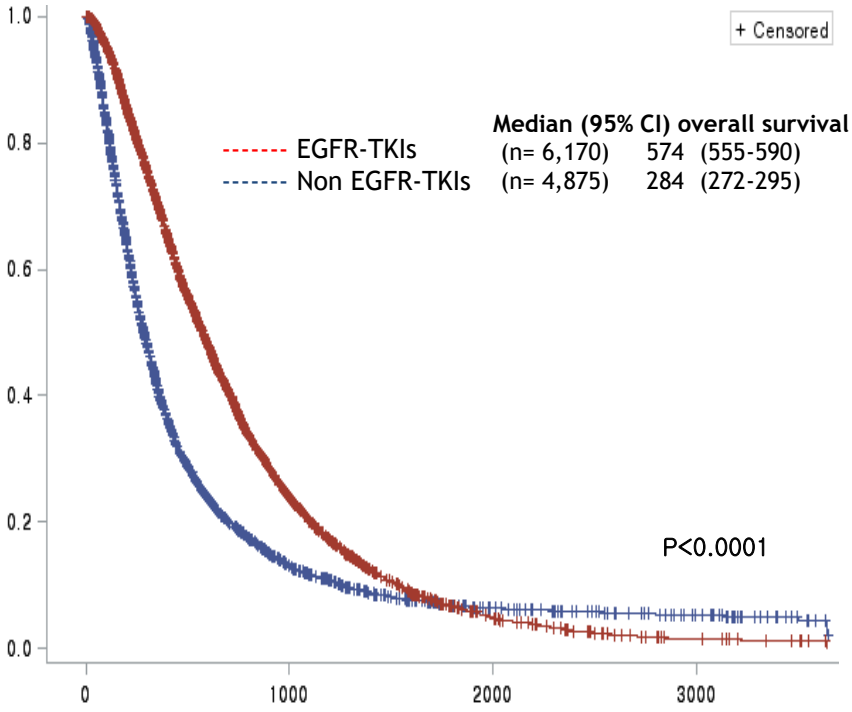

166,203 treated lung cancer patients in database
120,881 excluded
118,647 Male patients
2,234 Wash out
45,322 female patients
34,277 excluded
12,764 Concurrent cancer
9,309 Treated with definitive surgery alone or adjuvant chemotherapy
9,004 Not compatible with operational definition
2,991 stage 2,3,8,9,11,13,14 제외
157 No available survival data
52 Age < 30
11,045 female lung cancer patients who treated with palliative CTx
6,170 administered EGFR-TKIs
4,875 never treated with EGFR-TKIs
2,572 administered EGFR-TKIs ≥ 6 months
3,598 administered EGFR TKIs < 6 months

Baseline characteristics

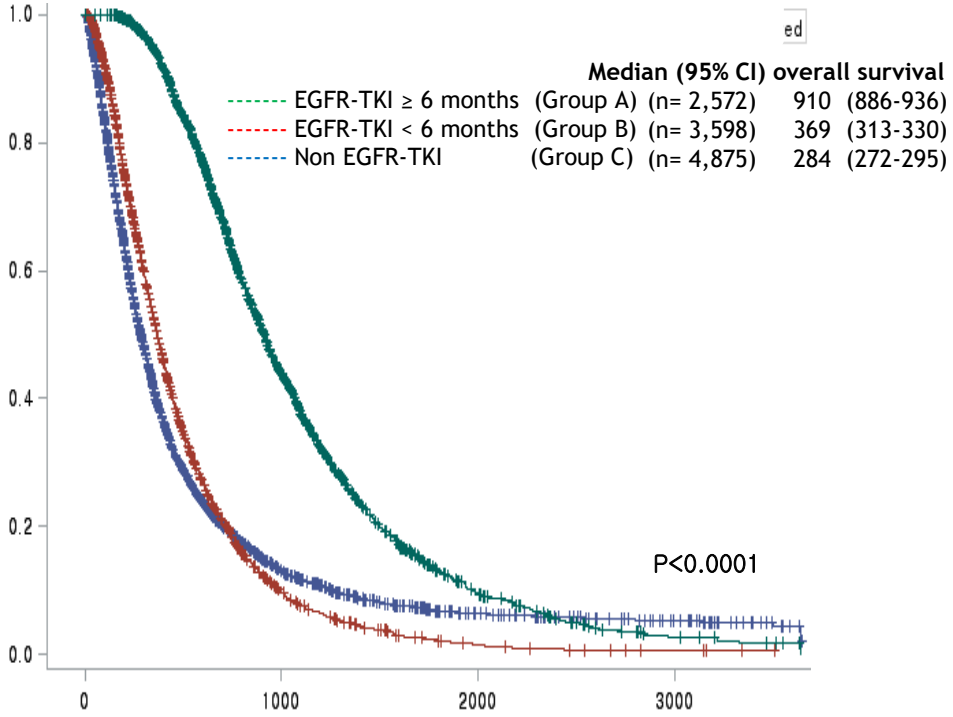
	EGFR-TKIs (n=6,170)			Non EGFR-TKIs (n=4,875)	p-value
	≥ 6 months	< 6 months	p-value		
Patients, n	2,572 (41.7%)	3,598 (58.3%)		4,875	
Age, years					
Median (range, IQR)	63 (55-71)	64 (54-72)	<0.001	67 (58-73)	<0.001
Type of therapy					
EGFR-TKIs					
Gefitinib	2033 (32.9%)	2557 (41.4%)	<0.0001	0	<0.0001
Erlotinib	594 (9.6%)	1074 (17.4%)		0	
Chemotherapy					
Pemetrexed	1316 (34.2%)	1521 (39.5%)	<0.0001	1012 (26.3%)	<0.0001
Gemcitabine	1187 (25.8%)	1877 (40.8%)		1540 (33.4%)	
Docetaxel	693 (27.4%)	1096 (43.3%)		740 (29.3%)	

Kaplan-Meier plot of overall survival

EGFR-TKIs vs chemotherapy



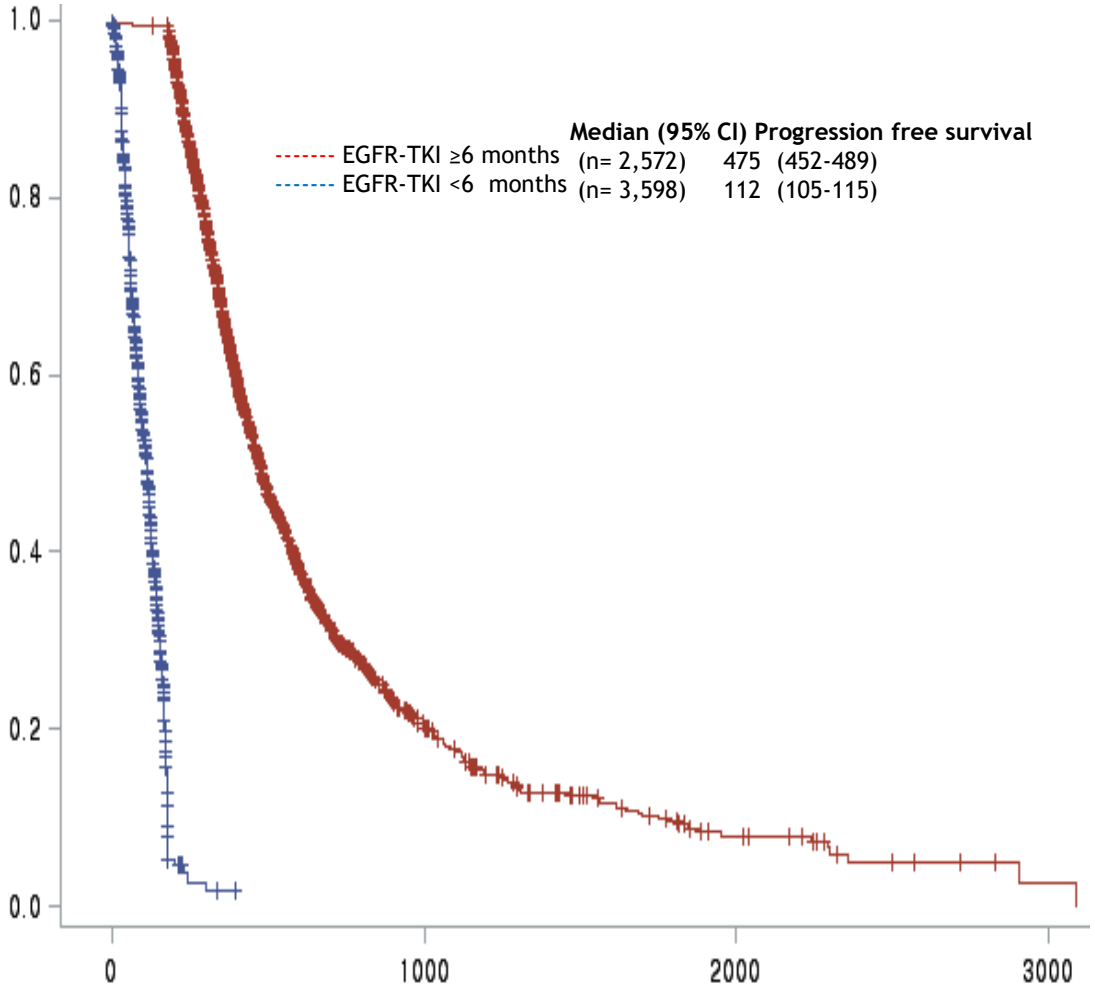
Subgroup analysis of OS according to treatment duration



Univariate and multivariate analysis of survival

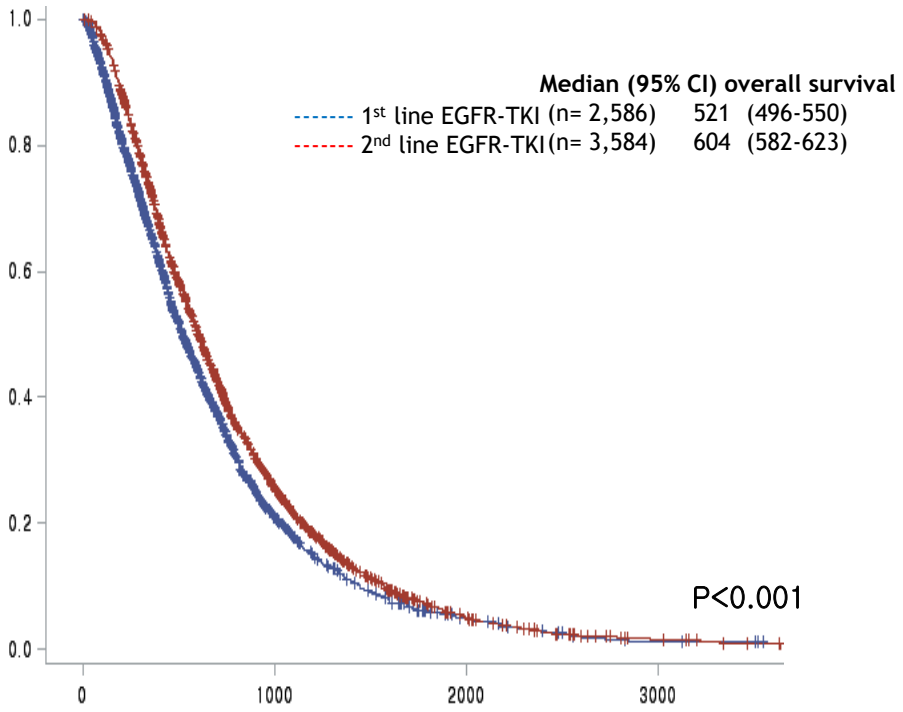
	Univariate analysis		Multivariate analysis	
	HR(95% CI)	**p-value**	**HR(95% CI)**	**p-value**
Age (≥ 65 years / < 65 years)	1.393 (1.336-1.453)	<0.001	1.29 (1.235-1.347)	0.002
Regimen of therapy				
(EGFR-TKI/ CTx)				
EGFR-TKIs (gefitinib or erlotinib)				
≥ 6 months	0.356 (0.336-0.377)	<0.001	0.407 (0.383-0.431)	<0.001
< 6 months	0.957 (0.913-1.003)		1.119 (1.062-1.179)	<0.001
Conventional chemotherapy				
Docetaxel	0.723 (0.689-0.759)	<0.001	0.809 (0.769-0.852)	<0.001
Gemcitabine	0.853 (0.817-0.890)	<0.001	1.027 (0.981-1.075)	0.256
Pemetrexed	0.623 (0.596-0.651)	<0.001	0.773 (0.736-0.811)	<0.001

Kaplan-Meier plot for progression free survival

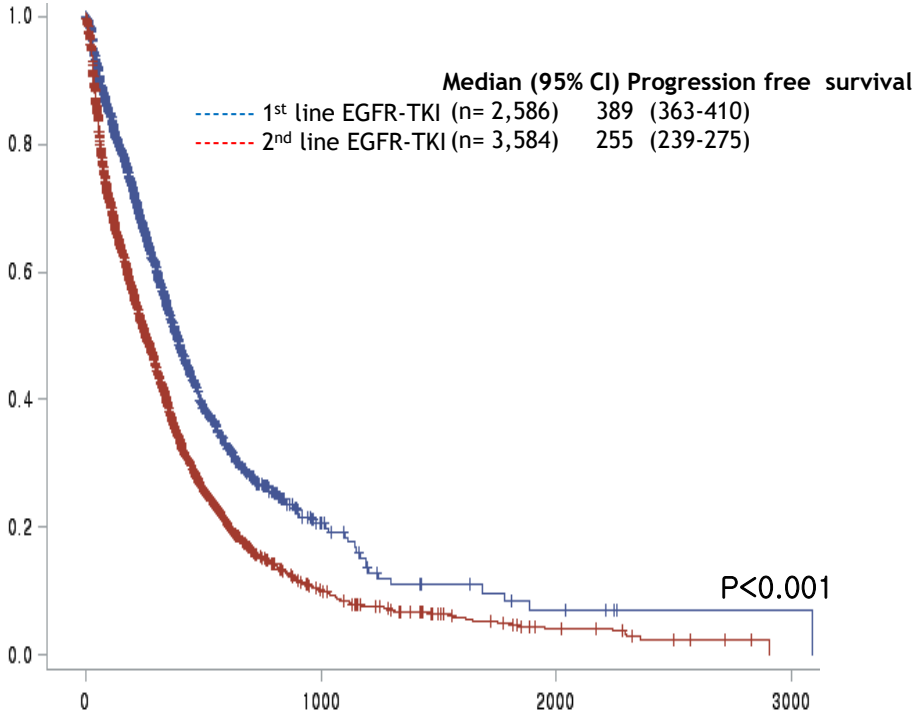


First EGFR-TKI vs. second-line EGFR-TKI

Overall survival



Progression free survival



First EGFR-TKI vs. second-line EGFR-TKI

Characteristics

	1st-line EGFR-TKI	2nd-line EGFR-TKI
No. of CTx		
0	1,675 (64.8%)	0
1	518 (20.0%)	1,552 (43.3%)
2	254 (9.8%)	1,299 (36.2%)
3	139 (5.4%)	733 (20.5%)
Age		
< 65*	1,209 (46.8%)	2,160 (60.3%)
≥ 65	1,377 (53.3%)	1,424 (39.7%)

Hazard ratio of OS

	HR(95% CI)	P-value
Age		
< 65 years	1	0.002
≥ 65 years	1.1 (1.04 – 1.17)	
No. of CTx		
0	1	<0.001
1	0.77 (0.7 – 0.86)	
2	0.59 (0.53 – 0.66)	
3	0.44 (0.39 – 0.49)	
EGFR-TKIs		
1st-line	1	0.001
2nd-line	1.15 (1.06 – 1.25)	

Role of chest X-ray for early detection of lung cancer

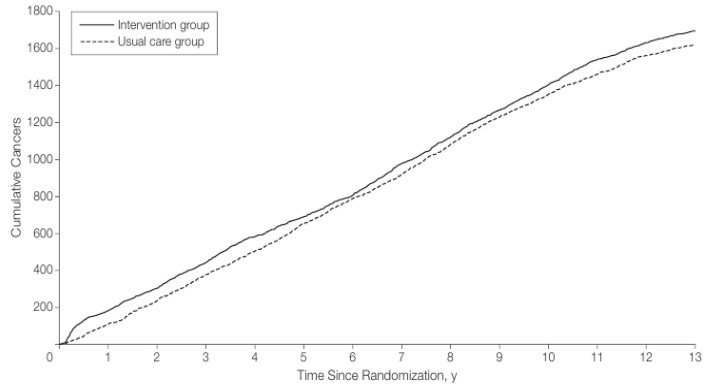
ONLINE FIRST

Screening by Chest Radiograph and Lung Cancer Mortality

The Prostate, Lung, Colorectal, and Ovarian (PLCO) Randomized Trial

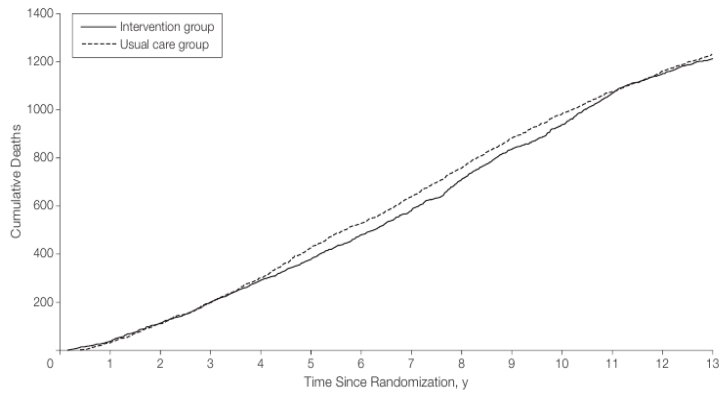
154,901 participants
(77,445 in annual screening group vs. 77,456 in usual care group)
Aged 55-74 years, between 1993 and 2001
Cumulative incidence: 20.1/10,000 PY vs. 19.2/10,000 PY (RR; 1.05)
Lung cancer deaths: 1213 vs. 1230 (RR; 0.99)

Figure 2. Lung Cancer Incidence by Year



Intervention group													
Cumulative cancers	181	304	441	583	692	808	981	1124	1268	1405	1544	1633	1696
Cumulative person-years	76617	152416	227322	301309	374374	446481	517521	587405	655538	718389	771188	812963	844011
Usual care group													
Cumulative cancers	109	235	377	504	653	790	923	1084	1232	1358	1465	1563	1620
Cumulative person-years	76597	152495	227549	301699	374873	446975	517940	587701	655718	718398	771147	812834	843762

Figure 3. Lung Cancer Mortality by Year



Intervention group													
Cumulative deaths	36	113	196	292	378	480	582	711	838	937	1070	1150	1213
Cumulative person-years	77268	154053	230270	305833	380691	454773	527937	600004	670274	735098	789540	832441	864227
Usual care group													
Cumulative deaths	30	111	198	301	426	527	639	761	884	987	1076	1162	1230
Cumulative person-years	77286	154116	230348	305902	380725	454719	527804	599790	669955	734523	788854	831678	863330

JAMA 2011;306:1865-73

연구설계

- 2004-2013
- ICD-10 C34
- G210, G230

- Concurrent malignancies
- Age <30 years
- No available survival data
- Washout period; 6 months before diagnosis

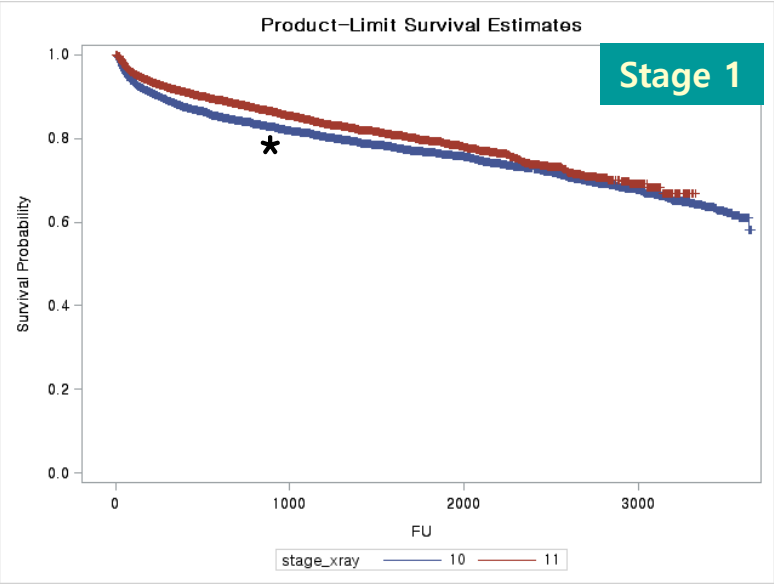
조작적 정의

	Treatment modality			
1	Surgical resection			1
2	Surgical resection	Adjuvant RT		2
3	Surgical resection	Adjuvant CT		
4	Surgical resection	Adjuvant CT	Adjuvant RT	3
5	Surgical resection	Adjuvant RT	Adjuvant CT	
6	Neoadjuvant CT	Surgical resection		
7	Definitive CCRT			4
8	Palliative CT			

조작적 정의

	Treatment modality				X-ray		Male		Female	
					present	absent	present	absent	present	absent
1	Surgical resection			1	11,432 (27.9%)	6,111 (20.0%)	7,242 (24.2%)	3,816 (17.8%)	4,190 (37.8%)	2,295 (25.0%)
2	Surgical resection	Adjuvant RT		2	4,185 (10.2%)	2,448 (8.0%)	2,859 (9.6%)	1,598 (7.5%)	1,326 (12.0%)	850 (9.3%)
3	Surgical resection	Adjuvant CT								
4	Surgical resection	Adjuvant CT	Adjuvant RT	3	1,476 (3.6%)	992 (3.2%)	1,154 (3.9%)	764 (3.6%)	322 (2.9%)	228 (2.5%)
5	Surgical resection	Adjuvant RT	Adjuvant CT							
6	Neoadjuvant CT	Surgical resection								
7	CCRT			4	23,888 (58.3%)	21,061 (68.8%)	18,641 (62.4%)	15,263 (71.2%)	5,247 (47.3%)	5,798 (63.2%)
8	Palliative CT									
				Total	40,981	30,612	29,896	21,441	11,085	9,171

Survival


Product-Limit Survival Estimates
Stage 1
Survival Probability
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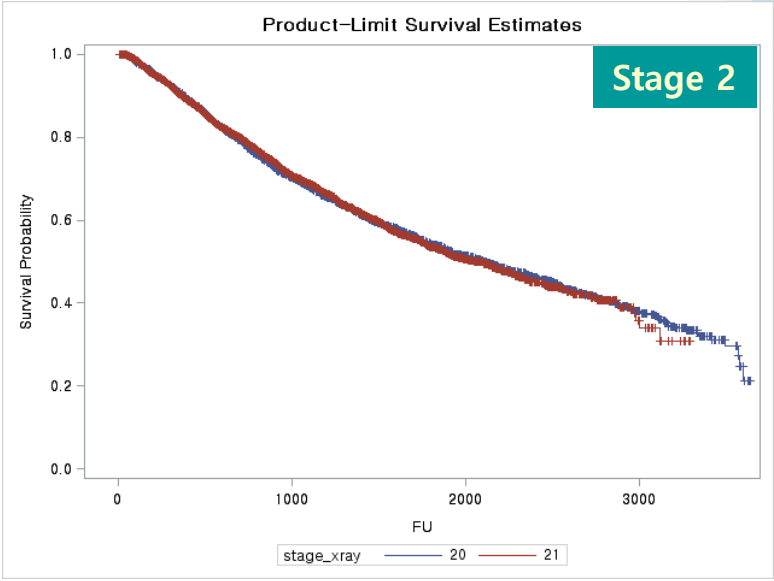
0.6
0.4
0.2
0.0
0
1000
2000
3000
FU
stage_xray
10
11
*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Survival Probability
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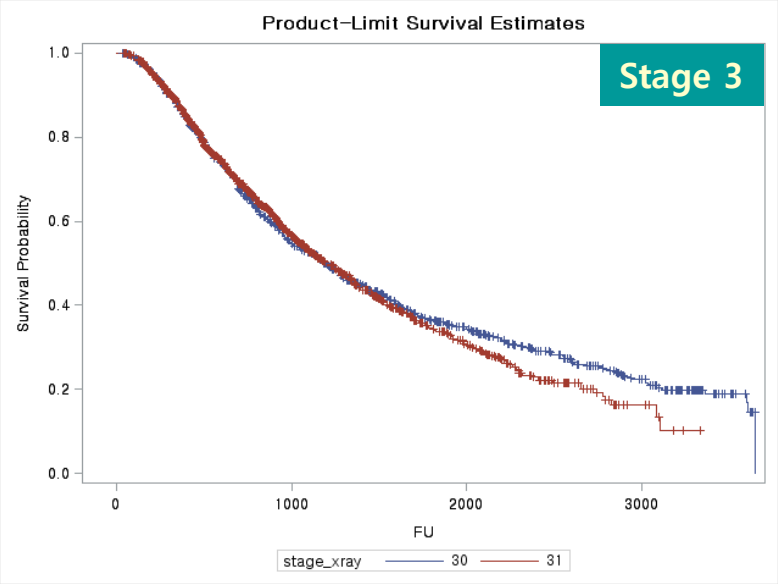
21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stage_xray
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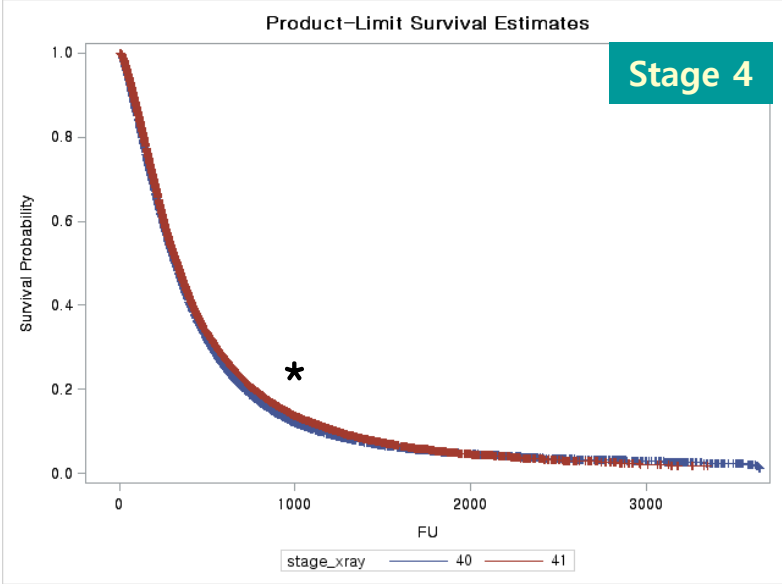
31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Stage 4
Survival Probability
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0.2
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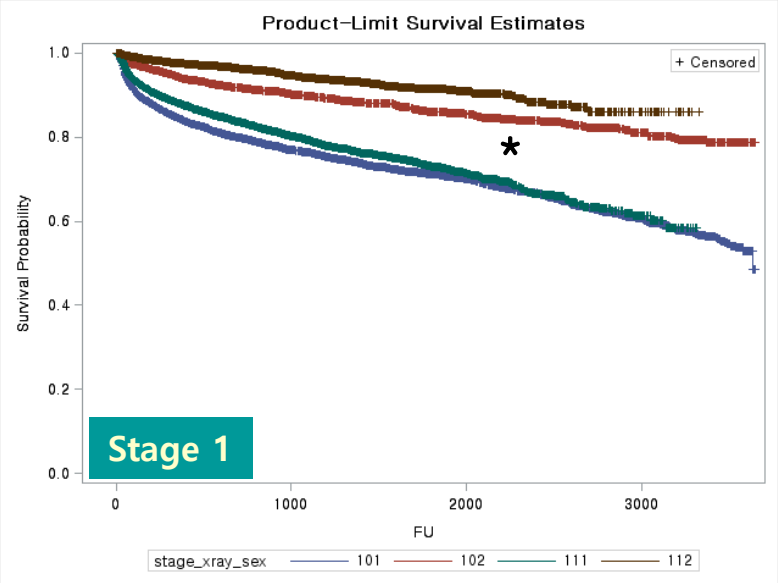
3000
FU
stage_xray
40
41
*

Survival


Product-Limit Survival Estimates
+ Censored
Survival Probability
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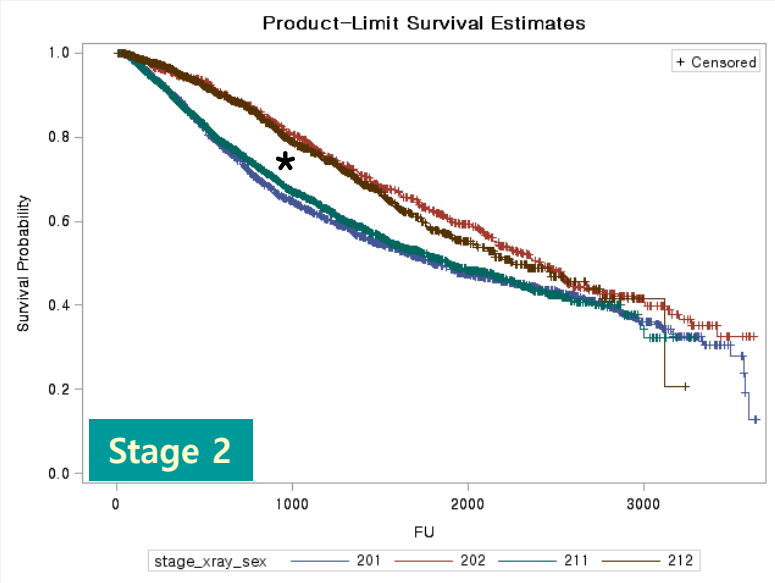
0.2
0.0
0
1000
2000
3000
FU
Stage 1
stage_xray_sex 101 102 111 112


Product-Limit Survival Estimates
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Survival Probability
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0
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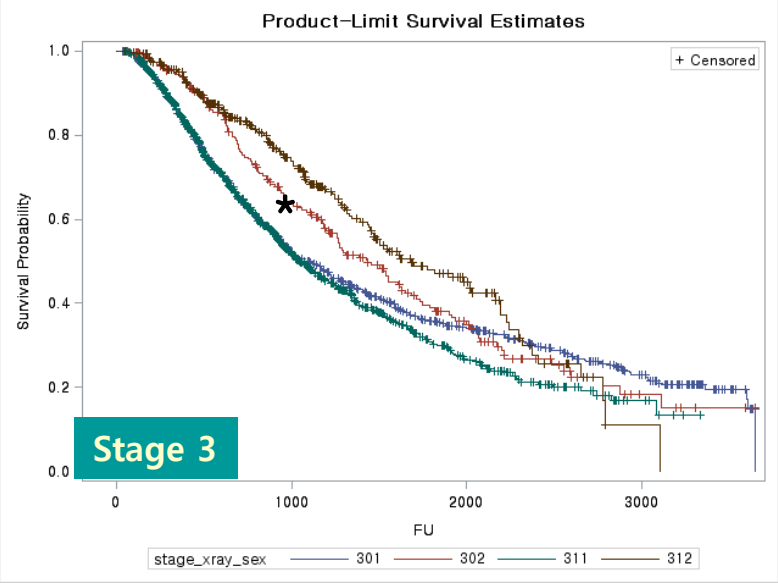
2000
3000
FU
Stage 2
stage_xray_sex 201 202 211 212


Product-Limit Survival Estimates
+ Censored
Survival Probability
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0.4
0.2
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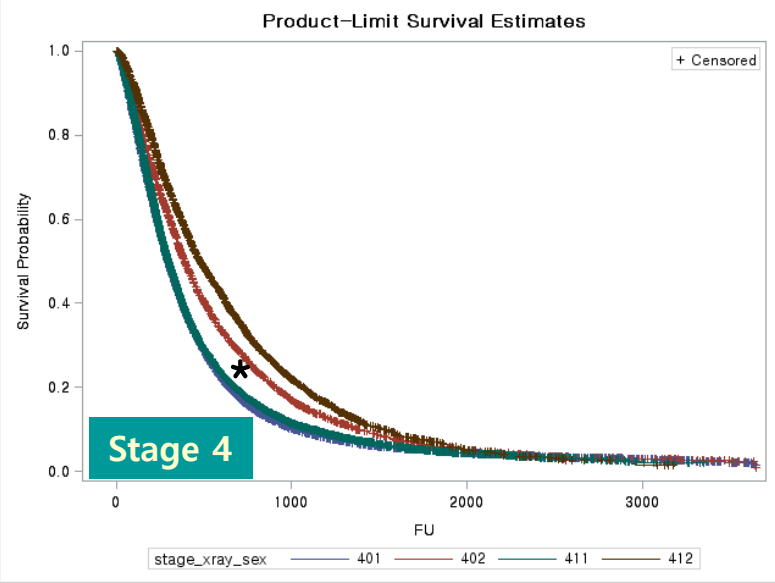
0
1000
2000
3000
FU
Stage 3
stage_xray_sex 301 302 311 312


Product-Limit Survival Estimates
+ Censored
Survival Probability
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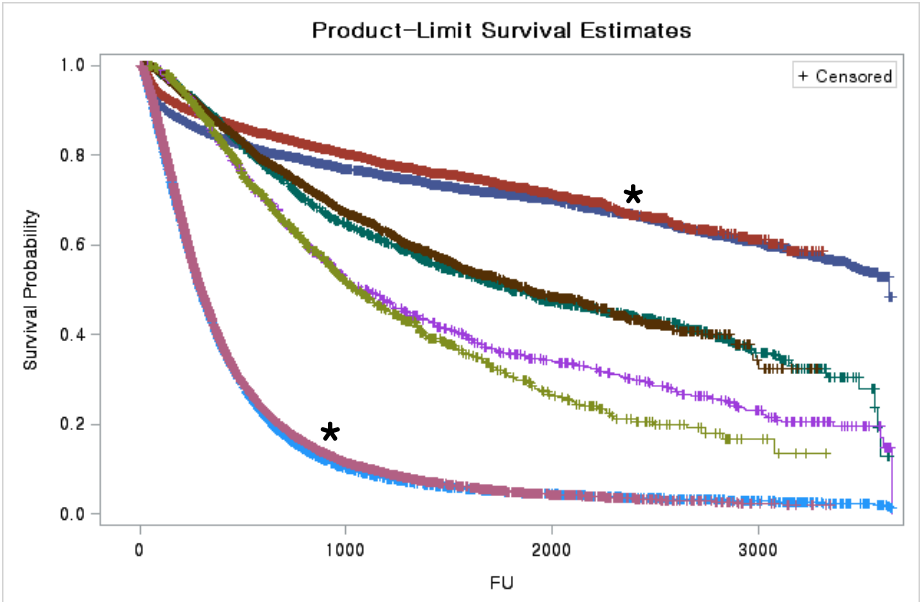
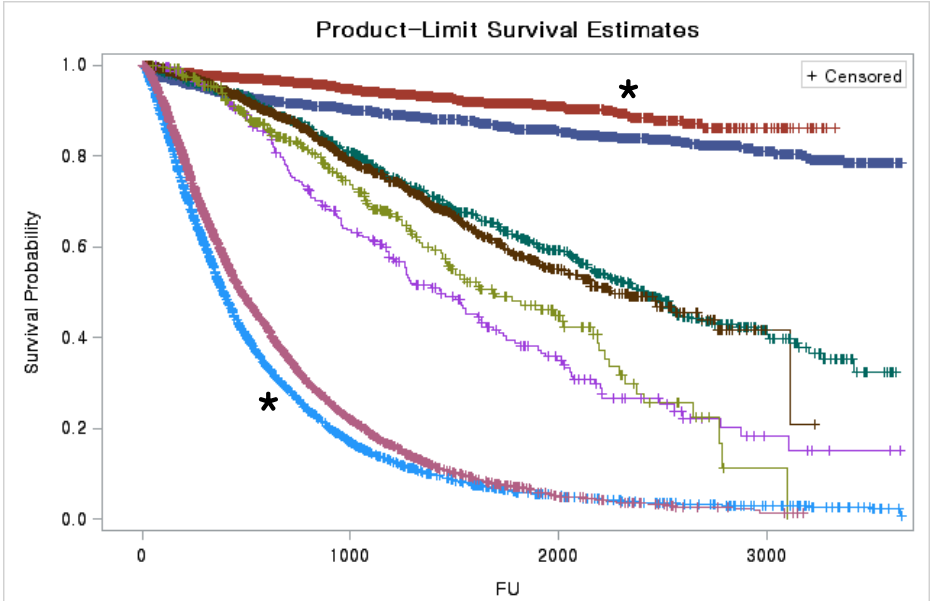
0.6
0.4
0.2
0.0
0
1000
2000
3000
FU
Stage 4
stage_xray_sex 401 402 411 412

Survival



Male



Female

Summary

- Disagreement between claim code and real-world practice seems not to be severe as it has been concerned

- It might need for caution in interpreting big-data analysis on elderly because it might be affected by their co-morbidities and social-economic environment

- EGFR-TKIs showed similar efficacy in Korean patients, compared with phase III trials

- Long-term screening by chest radiograph might be helpful for detection of lung cancer in early stage

감사합니다