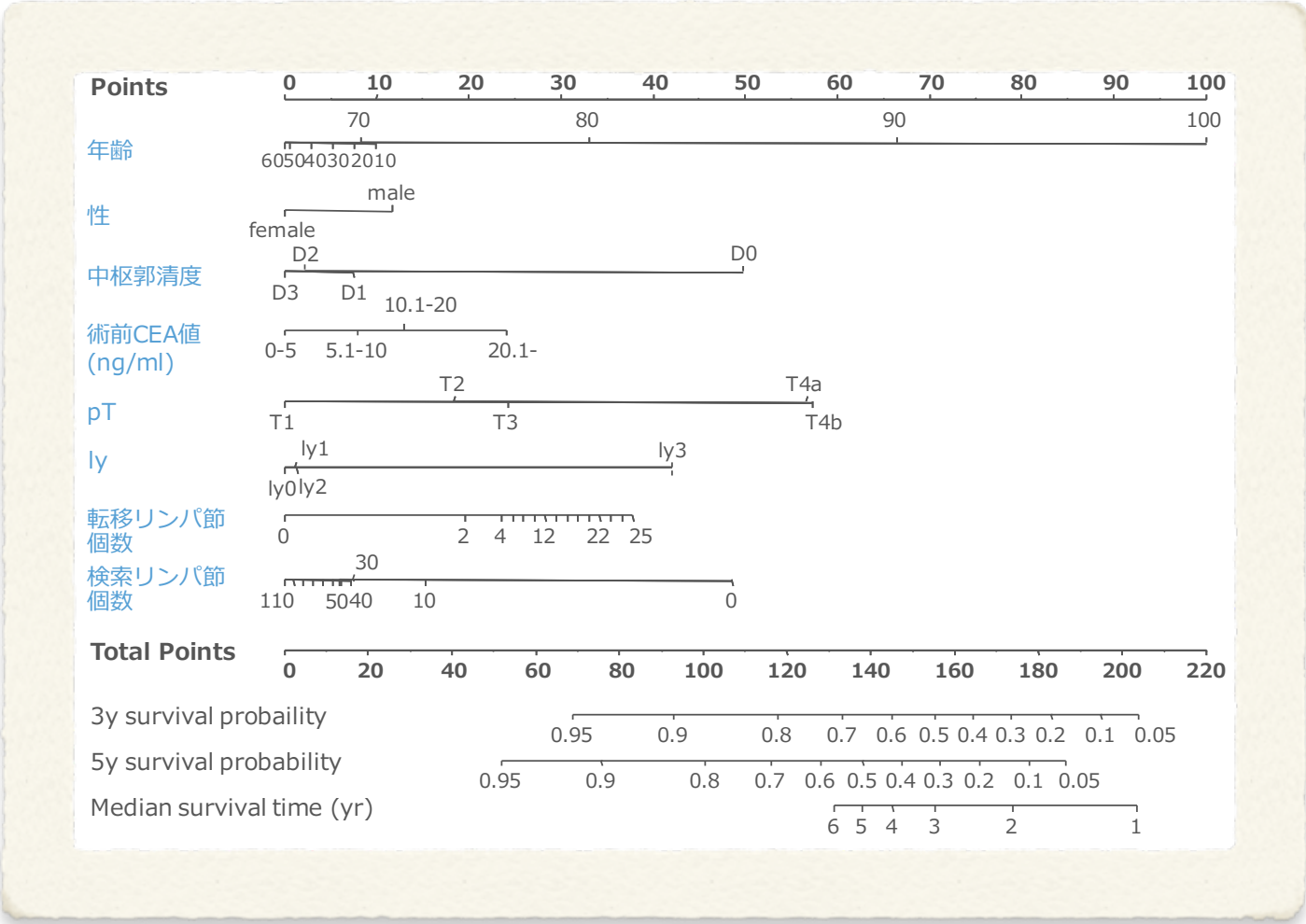
プロジェクト研究報告

『大腸癌治癒切除後の予後予測ノモグラムの開発』



国立がん研究センター中央病院大腸外科

金光幸秀

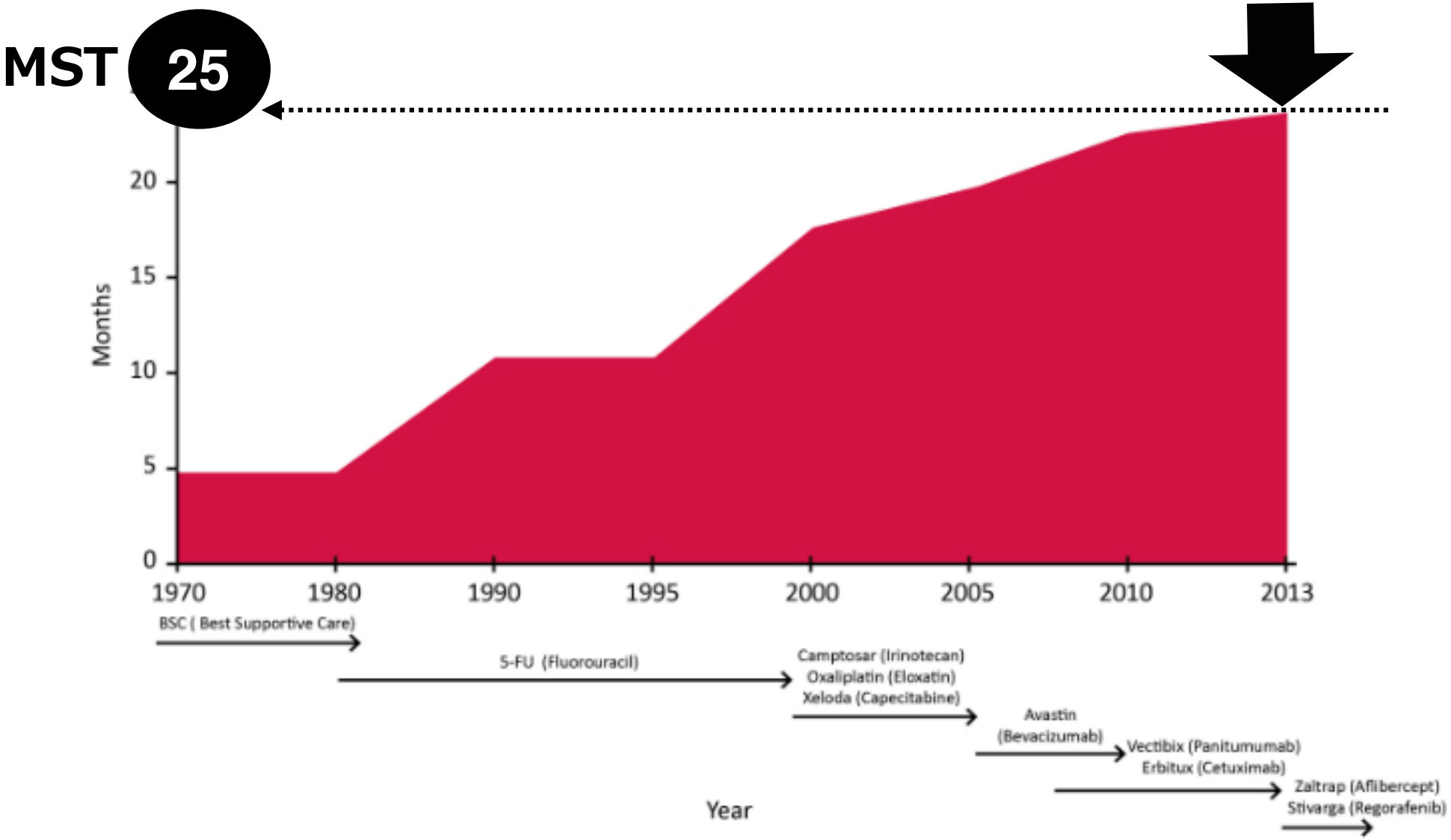
National Cancer Center

1

研究提案の背景

化学療法の急激な進歩も律速段階に入っている

Therapeutic progress in metastatic colorectal cancer



ASCO University
LIFELONG LEARNING

2013 Educational Book

Biologic Agents in the Treatment of Colorectal Cancer: The Last Decade; the Lost Decade?

Authors: Alan P. Venook, MD, and Leonard B. Saltz, MD

「今後は、より個別化治療に向かうだろう」

個別化治療の一つ _ Precision medicine

個別化医療

均一な患者集団への層別

層別マーカー　●予後予測 (prognostic factor)
●治療応答性予測 (predictive factor)

個別化医療

均一な患者集団への層別

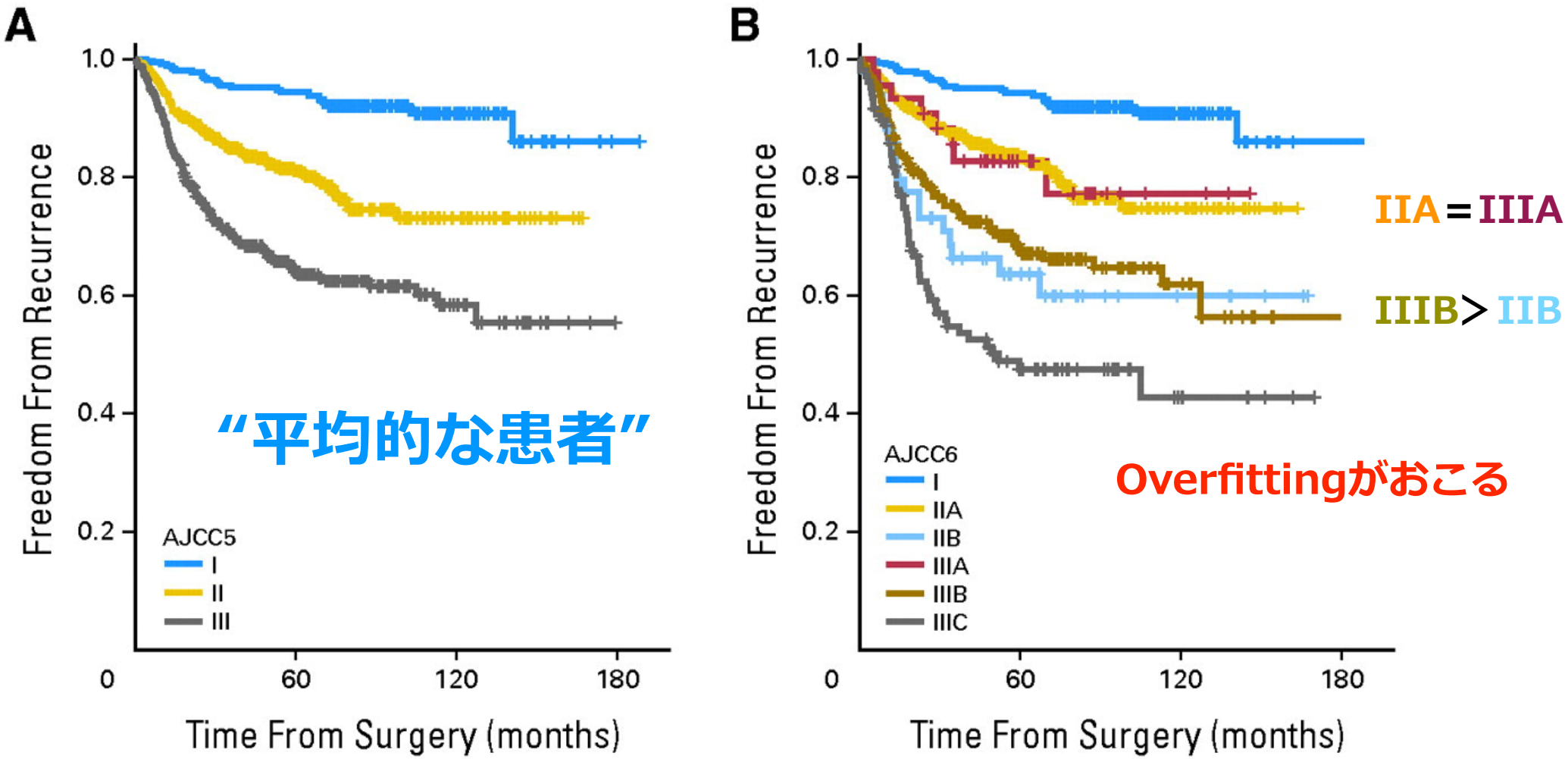
層別マーカー

- **予後予測 (prognostic factor)**
- **治療応答性予測 (predictive factor)**

“One-size-fits-all”型の予後予測

SEER data

●しかし、情報量を増やせば....



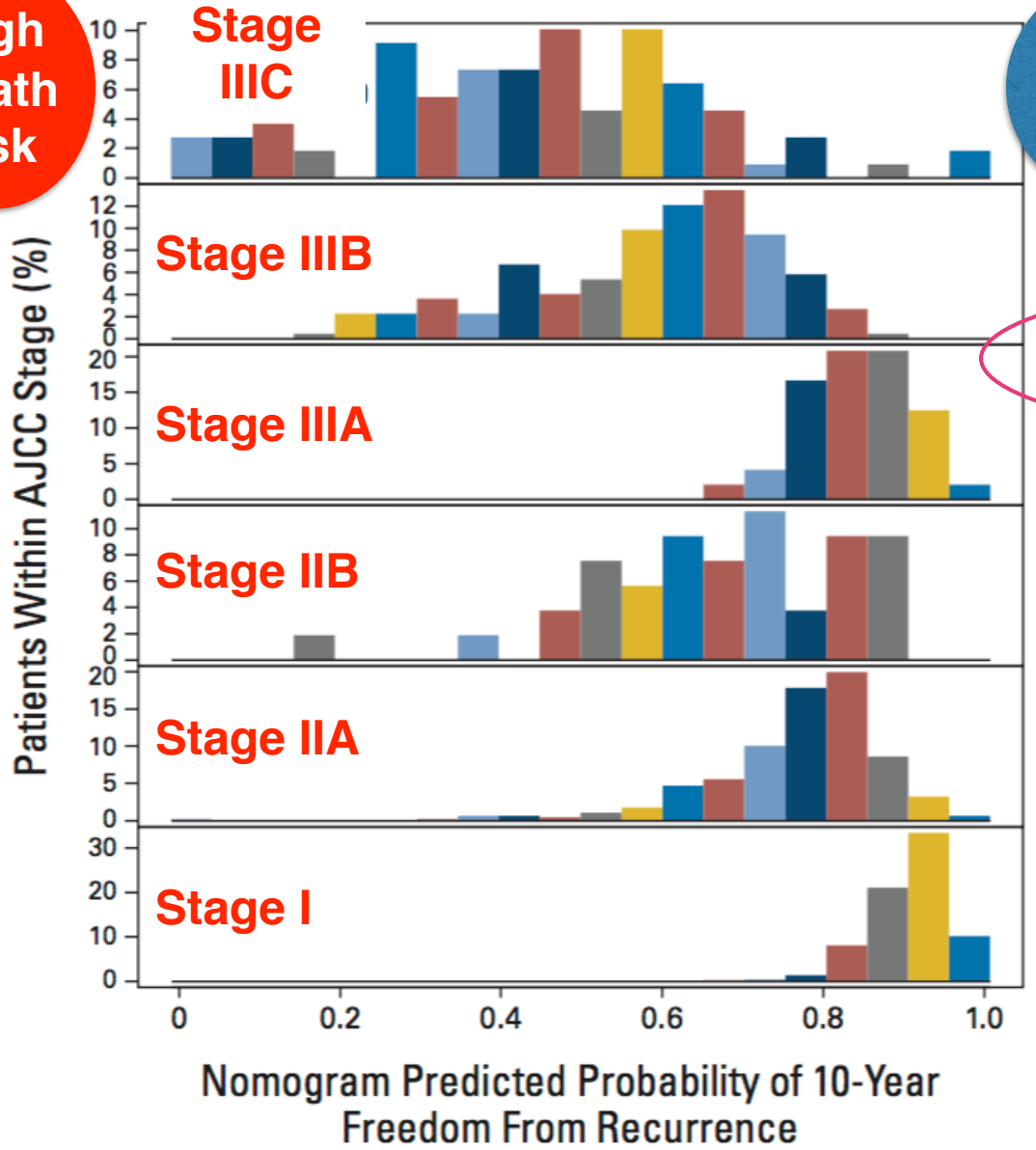
Martin R. Weiser et al：
J Clin Oncol 2008;26:380-385

●Overfittingの原因として.....

(Stagingは）ヘテロな集団を、仮想ホモ集団で代理させている

high death risk

low death risk



homogenousな集団ではない!

Histogram of nomogram-predicted freedom from recurrence. Note the heterogeneity of predicted probabilities of time to recurrence within each American Joint Committee on Cancer (AJCC) stage.

Martin R. Weiser et al：
***J Clin Oncol* 2008;26:380-385**

個別化医療

均一な患者集団への層別

層別マーカー

- 予後予測 (prognostic factor)
- 治療応答性予測 (predictive factor)

Oncotype DXによるリスク評価

VOLUME 31 · NUMBER 14 · MAY 10 2013

JOURNAL OF CLINICAL ONCOLOGY

ORIGINAL REPORT

Biologic Determinants of Tumor Recurrence in Stage II Colon Cancer: Validation Study of the 12-Gene Recurrence Score in Cancer and Leukemia Group B (CALGB) 9581

Alan P. Venook, Donna Niedzwiecki, Margarita Lopatin, Xing Ye, Mark Lee, Paula N. Friedman, Wendy Frankel, Kim Clark-Langone, Carl Millward, Steven Shak, Richard M. Goldberg, Najjia N. Mahmoud, Robert S. Warren, Richard L. Schilsky, and Monica M. Bertagnolli

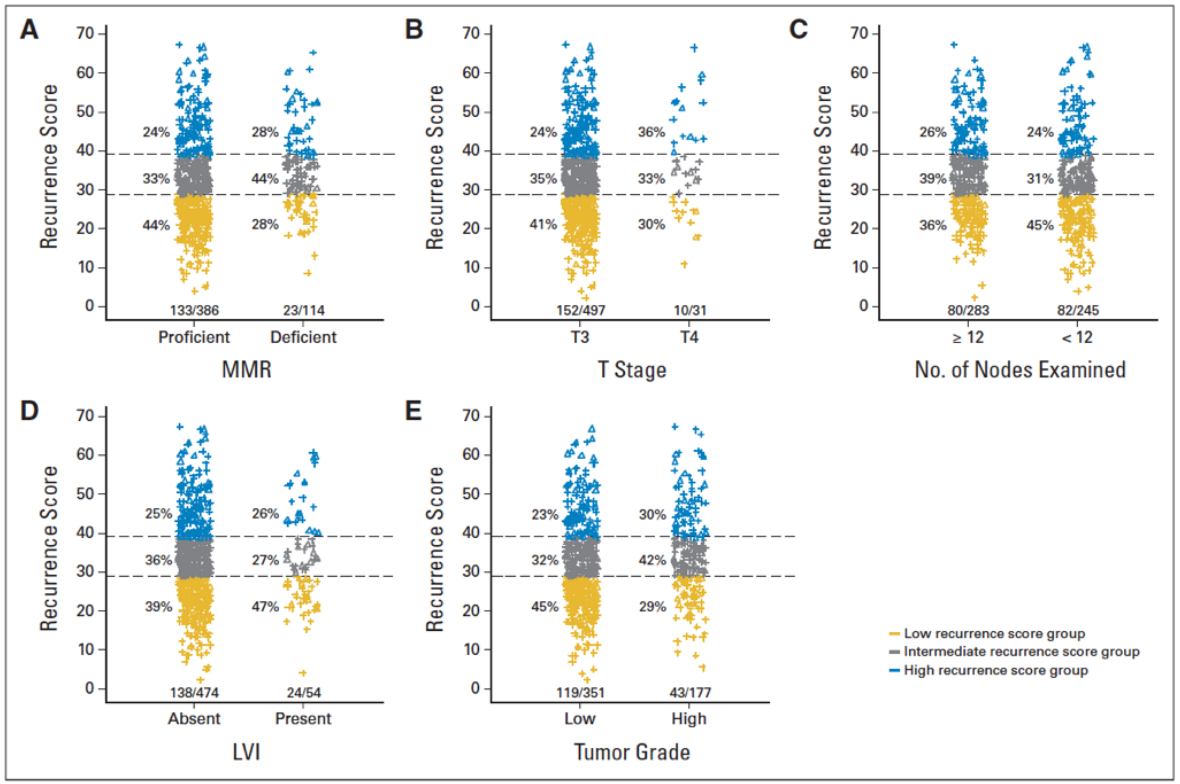
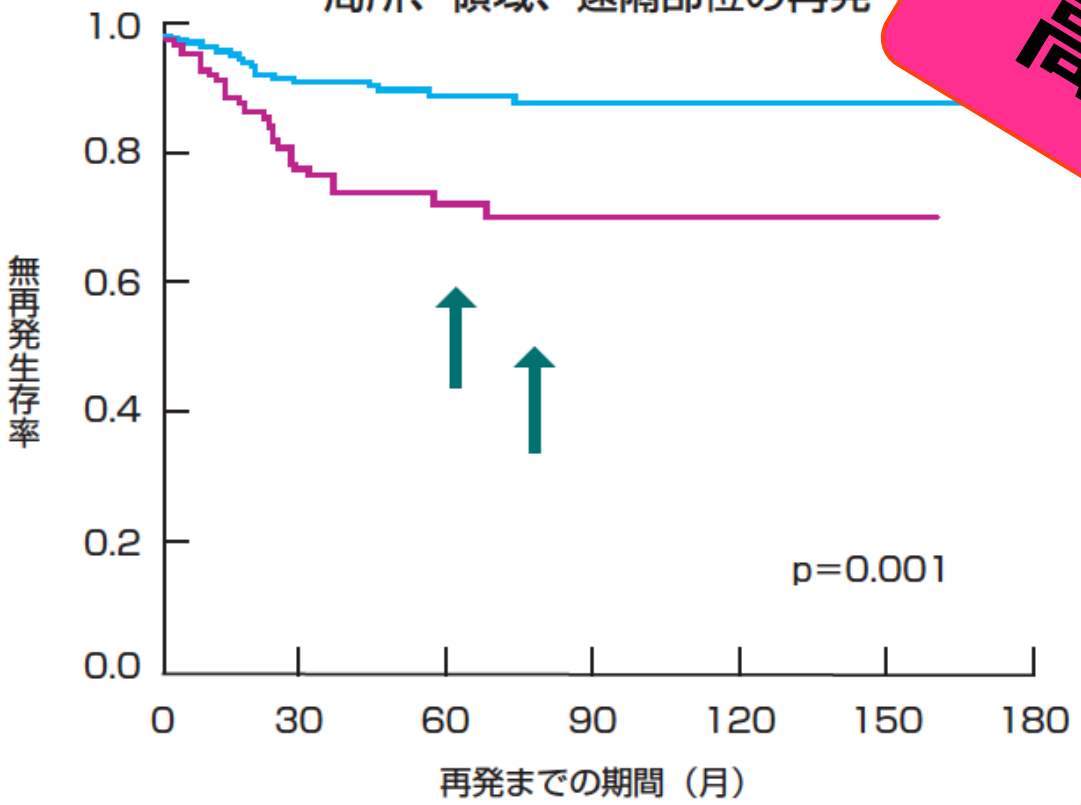


Fig 2. Distribution of the recurrence score by levels of covariates. Distribition of recurrence score values by (A) levels of mismatch repair (MMR) status, (B) T stage, (C) number of nodes examined, (D) lymphovascular invasion (LVI), and (D) tumor grade. Triangles represent recurrence scores for patients experiencing recurrence and plus signs represent recurrence scores from patients not experiencing recurrence. The numbers under each bar (X/Y) represent the number of recurrences/nonrecurrences for each level of the covariate.

「Oncotype Dxによる再発スコアは、従来の臨床病理学的因子と比較して、術後再発リスクを予測する最も有効な独立した因子である。」

***J Clin Oncol* 31:May, 2013**

ColoPrintによるリスク評価



高価

スク　65.3%

リスク　34.7%

3年無再発生存率
低リスク　91%（86-95%）
高リスク　74%（64-83%）

5年無再発生存率
低リスク　88%（83-93%）
高リスク　71%（62-80.5%）

(Tabernero J, et al., ASCO GI 2012 #384)

個別化医療

均一な患者集団への層別

安価

層別マーカー　●予後予測 (prognostic factor)

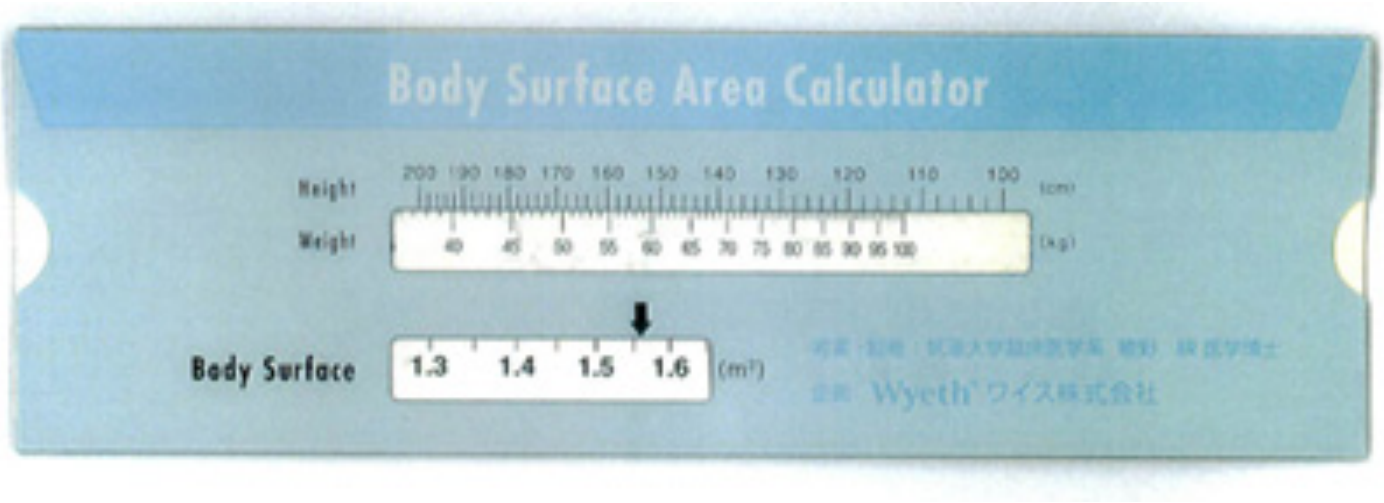
●治療応答性予測 (predictive factor)

安価で信頼のおける手法がある

ノモグラム (nomogram, 計算図表)

ある関数の計算をグラフィカルに行うために設計された二次元の図表

【例】身長と体重から体表面積を算出するノモグラム



欧米では、前立腺癌、乳癌をはじめとする癌診療の分野において、
ノモグラムを用いて**複数の臨床病理学的因子を総合して**
特定のイベント（再発など）の予想リスク値を算出し、
１つの数値(%)として示す ツールが開発されている。

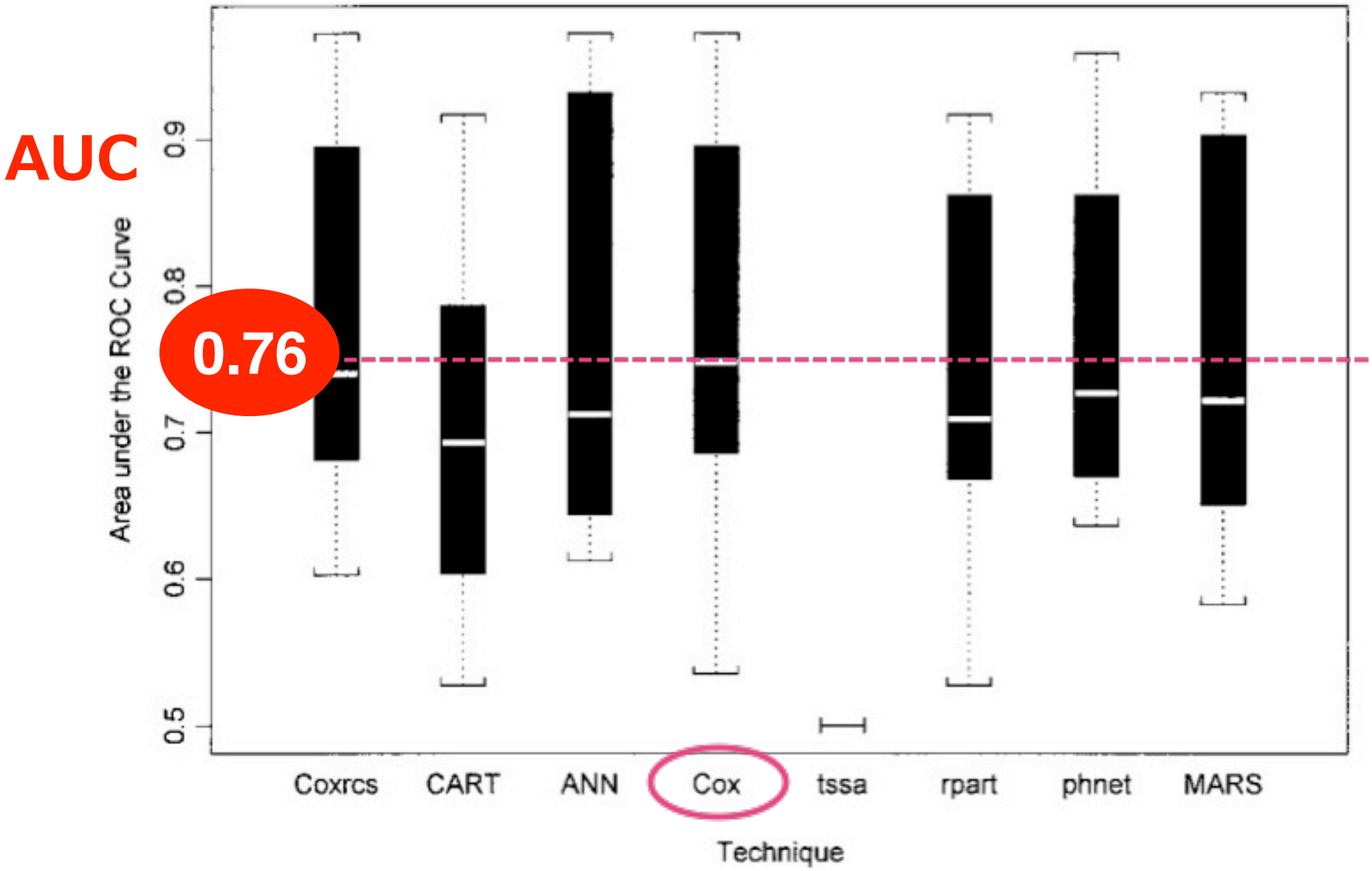
ノモグラムでできること

1

2

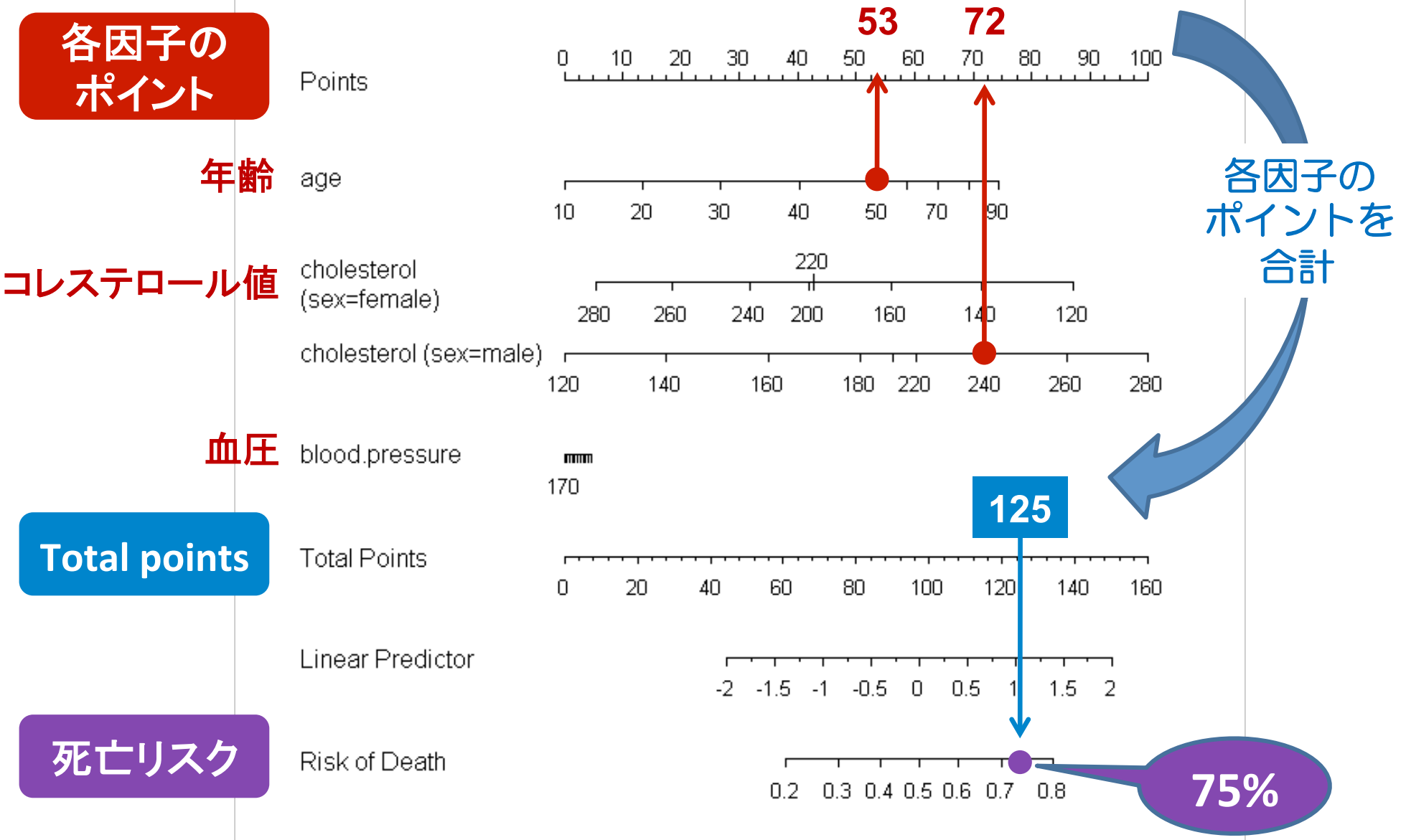
研究提案の背景

ノモグラム＝多くの因子から一つの正確な予測値を出す数学的モデル

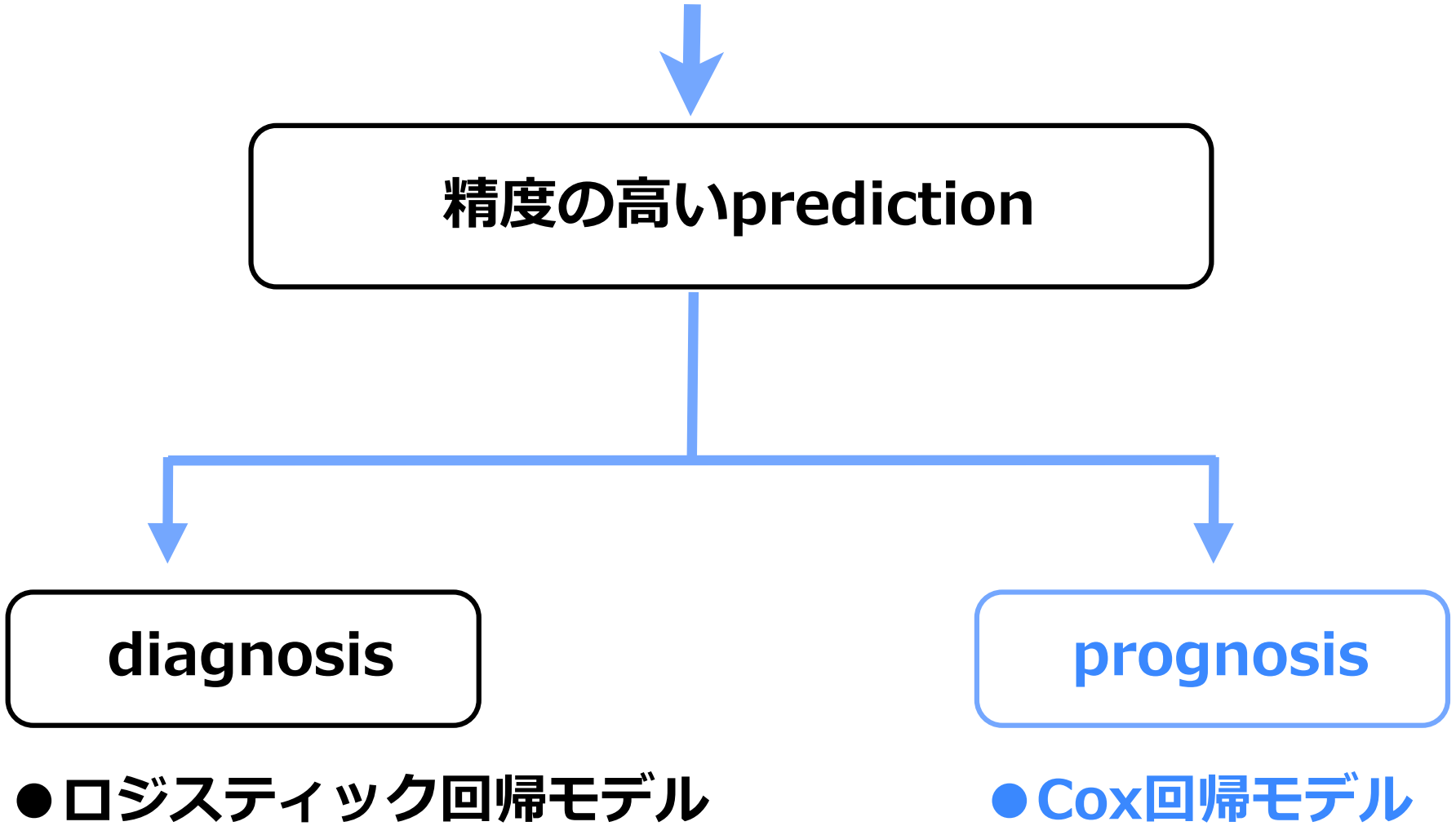


Kattan MW et al：*J Urology* 2001;166:63-67

ノモグラム (nomogram)



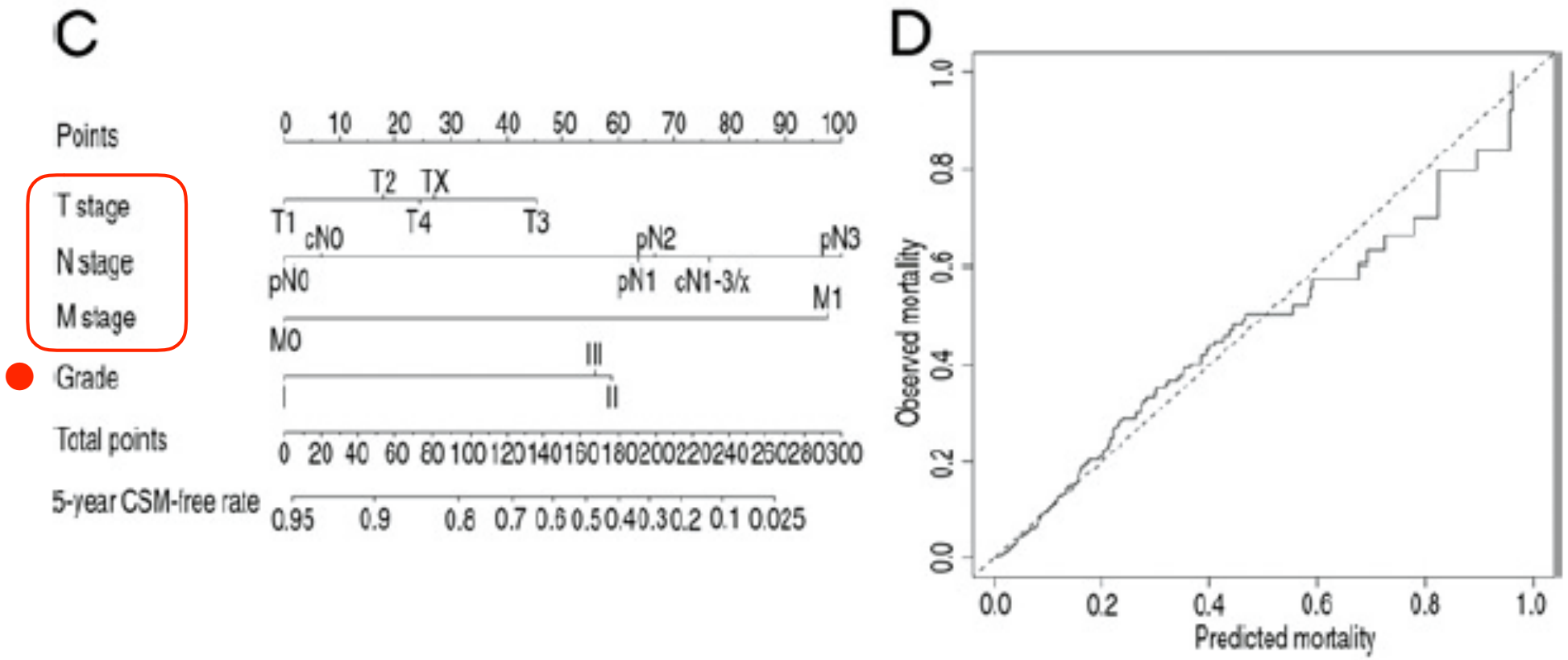
Nomogramで出来ること



他の有望な予後因子を簡単に組み込むことができる

Tumor Grade Improves the Prognostic Ability of American Joint Committee on Cancer Stage in Patients With Penile Carcinoma

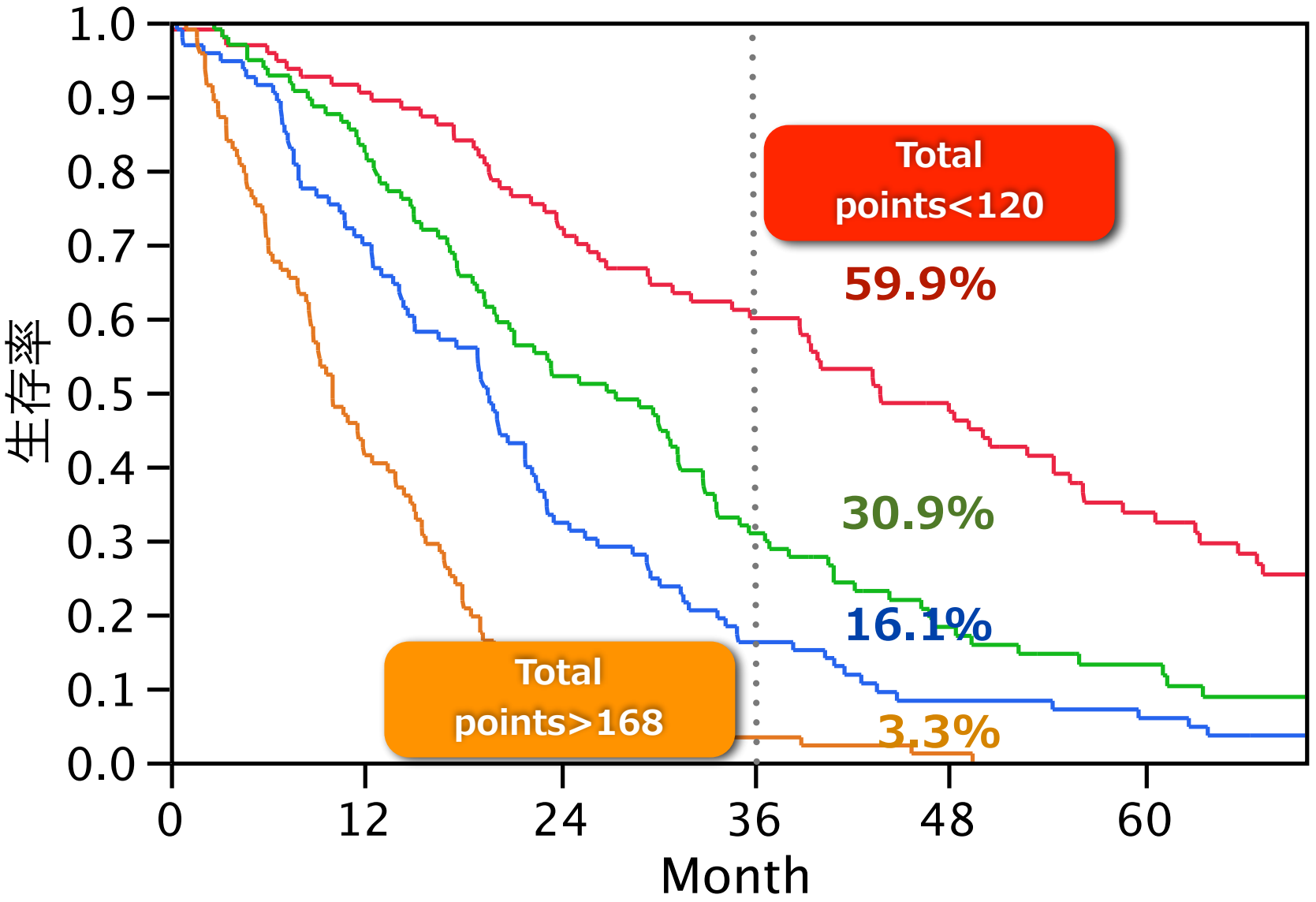
Rodolphe Thuret,* Maxine Sun,* Firas Abdollah, Lars Budaus, Giovanni Lughezzani, Daniel Liberman, Monica Morgan, Rupinder Johal, Claudio Jeldres, Mathieu Latour, Shahrokh F. Shariat, François Iborra, Jacques Guiter, Jean-Jacques Patard, Paul Perrotte and Pierre I. Karakiewicz†



J Urol 2011;185:501-7

よりhomogenousなgrouping

→臨床試験のeligibility決定、decision makingに利用が可能



臨床試験のeligibility決定

● CALGB90203

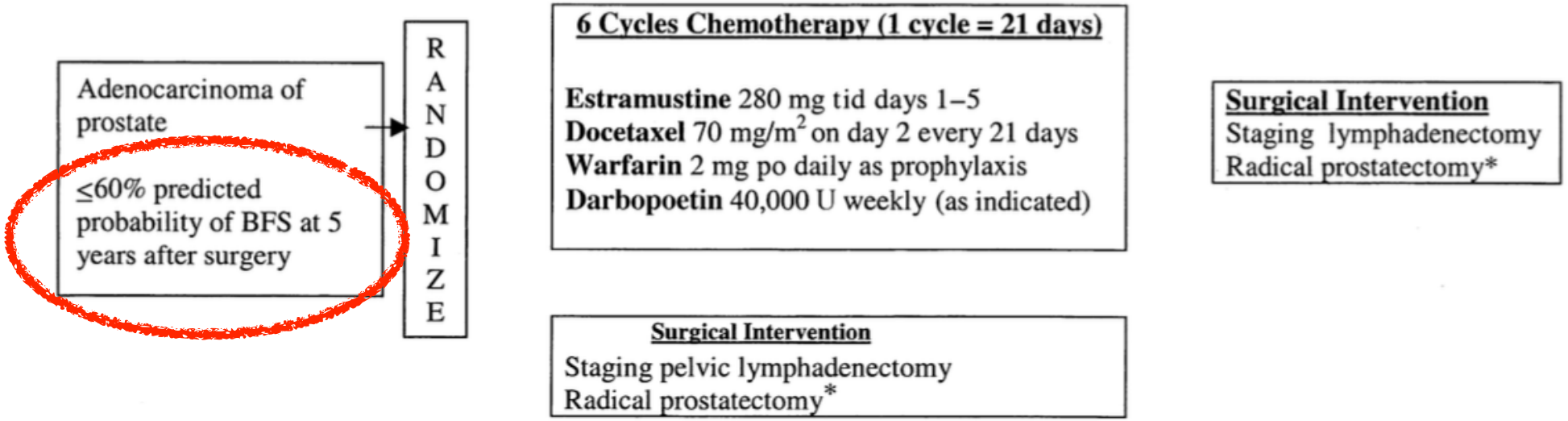


FIGURE 1. *Treatment schema for men with clinically localized prostate cancer with a ≤60% predicted probability of remaining free from disease recurrence at 5 years after surgery. *Patients with positive margins will be allowed to receive immediate adjuvant external-beam radiation to the prostatic fossa at the discretion of the treating physician. Adjuvant radiation must be initiated within 6 months of the date of surgery. BFS = biochemical-free survival; po = orally.*

***Urology* 2003;62:55-62**

AJCC からの、TNM stagingの方向性に関するコメント

Ann Surg Oncol (2010) 17:1471–1474
DOI 10.1245/s10434-010-0985-4

Annals of
SURGICAL ONCOLOGY
OFFICIAL JOURNAL OF THE SOCIETY OF SURGICAL ONCOLOGY

EDITORIAL

The American Joint Committee on Cancer: the 7th Edition of the *AJCC Cancer Staging Manual* and the Future of TNM

「Cancer stagingのgoal先にあるのは、ノモグラムなどの各症例の個別の情報を提供できるprediciion modelの作成である。」

ABSTR

…latasets and the …ng, and tumor–node–metastasis (TNM) cancer staging system periodically. The most recent revision is the 7th edition, effective for cancers diagnosed on or after January 1, 2010. This editorial summarizes the background of the current revision and outlines the major issues revised. Most notable the enhanced use of nonanatomic prognostic factors in defining the stage grouping. The future of cancer staging lies in the use of enhanced registry data standards to support personalization of cancer care through cancer outcome prediction models and **nomograms**

confidence intervals) that a patient with a certain clinical stage, Gleason score, and PSA will have a cancer of each pathologic stage.

To quantify risk more accurately, one can devise a nomogram that incorporates the interactive effects of multiple prognostic factors to make accurate predictions about stage and prognosis for the individual patient. A nomogram is any predictive instrument that takes a set of input data (variables) and makes predictions about an outcome.

nomograms predict more accurately for the individual patient than risk groups, because they combine the relevant prognostic variables, regardless of value. With risk group assignment, a cancer could be considered intermedi risk or high risk based on a single adverse prognostic factor omograms, discordant values (e.g., high PSA inical stage) can be incorporated into a model, the more clinically relevant ation of time to PSA failure, the

他の予測モデルよりも正確な予測値を得ることができる

treatment decision-making for men nce,[12] radical prostatectomy,[13-15] neurovascular bundle preservation[16-18] or omission of pelvic lymph node dissection during radical prostatectomy,[19] brachytherapy[13, 20, 21] or external beam radiation therapy (EBRT).[13, 22] Biochemical progression-free survival can be reassessed post-operatively using age, diagnostic serum PSA, and pathologic grade and stage.[6, 23] Potential success of adjuvant or salvage radiation therapy after unsuccessful radical prostatectomy can be assessed using a nomogram.[13, 24]

None of the current models predict with perfect accuracy, and only some of these models predict metastasis[6, 13, 25, 26] and cancer-specific death.[15, 27] New independent prognostic factors are being developed.[28] Given the competing causes of mortality, many men who sustain PSA failure will not live long enough either t distant metastases or to die from PSA doubling time are at grea clinically relevant; thus, PSA measure of risk of death.[29] F recurrent cancer is being inve markers and other radiologic eva these approaches remain investigationa or validated for routine application. The N uideline panel **recommends** that NCCN risk categories a e used to begin the discussion of options for the treatment of clinically localized prostate cancer and nomograms be used to provide additional and more individualized information.

各症例個別の情報を提供できる

Active Surveillance

Active surveillance (also referred to as observation, watchful waiting, expectant management or deferred treatment) involves actively monitoring the course of the disease with the expectation to intervene if the cancer progresses. The advantages of active surveillance include (1) avoiding the side effects of definitive therapy that may not be necessary; (2) quality of life and normal activities are retained; (3) small indolent cancers do not receive unnecessary treatment; and (4) decreased initial costs. The disadvantages of active surveillance are (1) chance of missed opportunity for cure; 2) the cancer may progress or metastasize before treatment; (3) treatment of a larger, more aggressive cancer may be more complex with greater side effects; 4) nerve sparing at subsequent prostatectomy may be more difficult, which may reduce the chance of potency preservation after surgery; 5) the increased anxiety of living with an untreated cancer;[30] (6) the requirement for frequent medical examinations and periodic prostate biopsies; (7) the uncertain long-term natural history of untreated

VOLUME 26 · NUMBER 8 · MARCH 10 2008

JOURNAL OF CLINICAL ONCOLOGY

REVIEW ARTICLE

Nomogram作成用ガイドライン

How To Build and Interpret a Nomogram for Cancer Prognosis

Alexia Iasonos, Deborah Schrag, Ganesh V. Raj, and Katherine S. Panageas

STEP 1. IDENTIFY THE PATIENT POPULATION

STEP 2. DEFINE THE OUTCOME

STEP 3. IDENTIFY POTENTIAL COVARIATES

STEP 4. CONSTRUCT THE NOMOGRAM

STEP 5. FINALIZE THE MODEL: VALIDATION

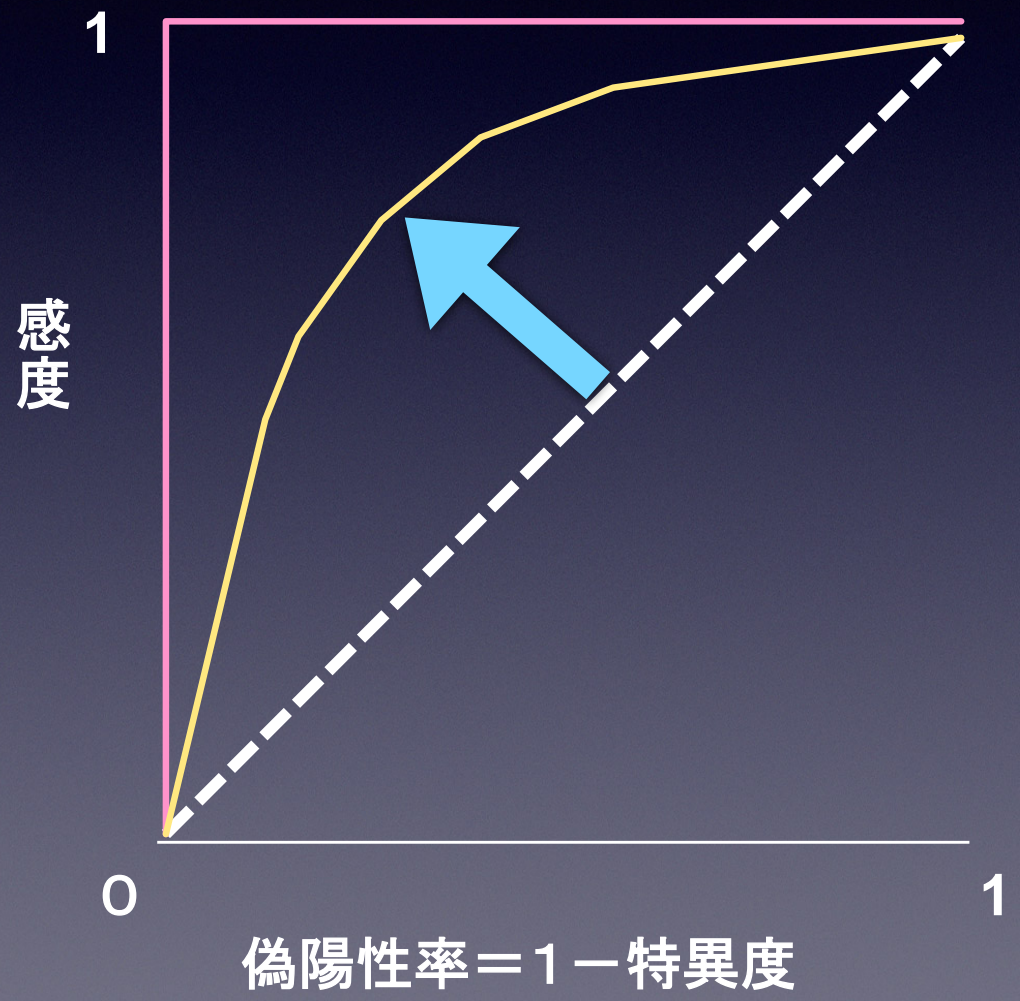
STEP 6. INTERPRET THE FINAL NOMOGRAM

STEP 7. APPLY THE NOMOGRAM

***J Clin Oncol* 2013;26:1364-1370**

予測性能の指標

- Discrimination
- C-index＝ROC曲線下面積(AUC)



理想的な検査
(C-index=1.0)

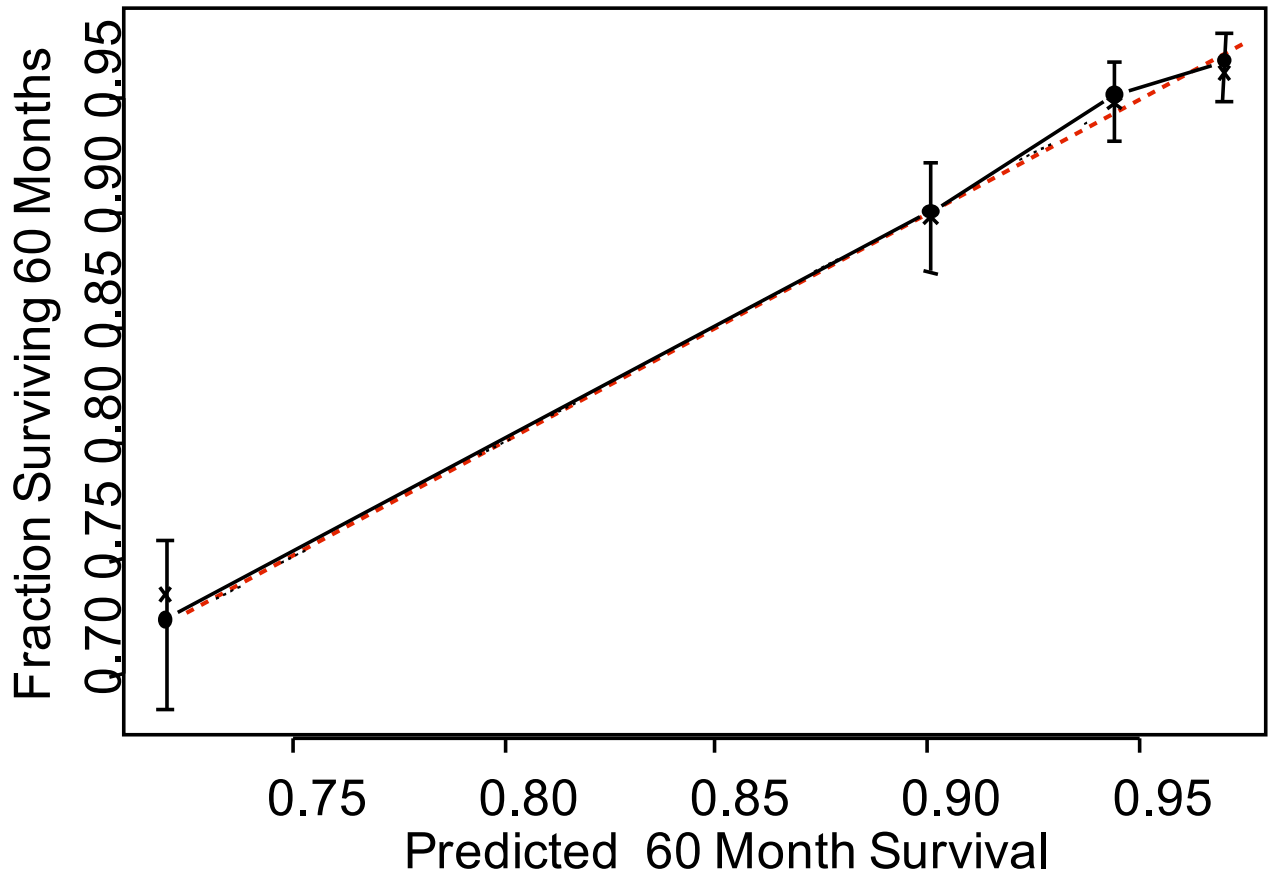
有用な検査

>0.7

役に立たない検査
(C-index=0.5)

予測性能の指標

- **Calibration curve**



n=2746 d=310 p=24, 600 subjects per group

X - resampling optimism added, B=199 Based on observed-predicted

VOLUME 26 · NUMBER 3 · JANUARY 20 2008

JOURNAL OF CLINICAL ONCOLOGY

ORIGINAL REPORT

Colon

Individualized Prediction of Colon Cancer Recurrence Using a Nomogram

Martin R. Weiser, Ron G. Landmann, Michael W. Kattan, Mithat Gonen, Jinru Shia, Joanne Chou, Philip B. Paty, José G. Guillem, Larissa K. Temple, Deborah Schrag, Leonard B. Saltz, and W. Douglas Wong

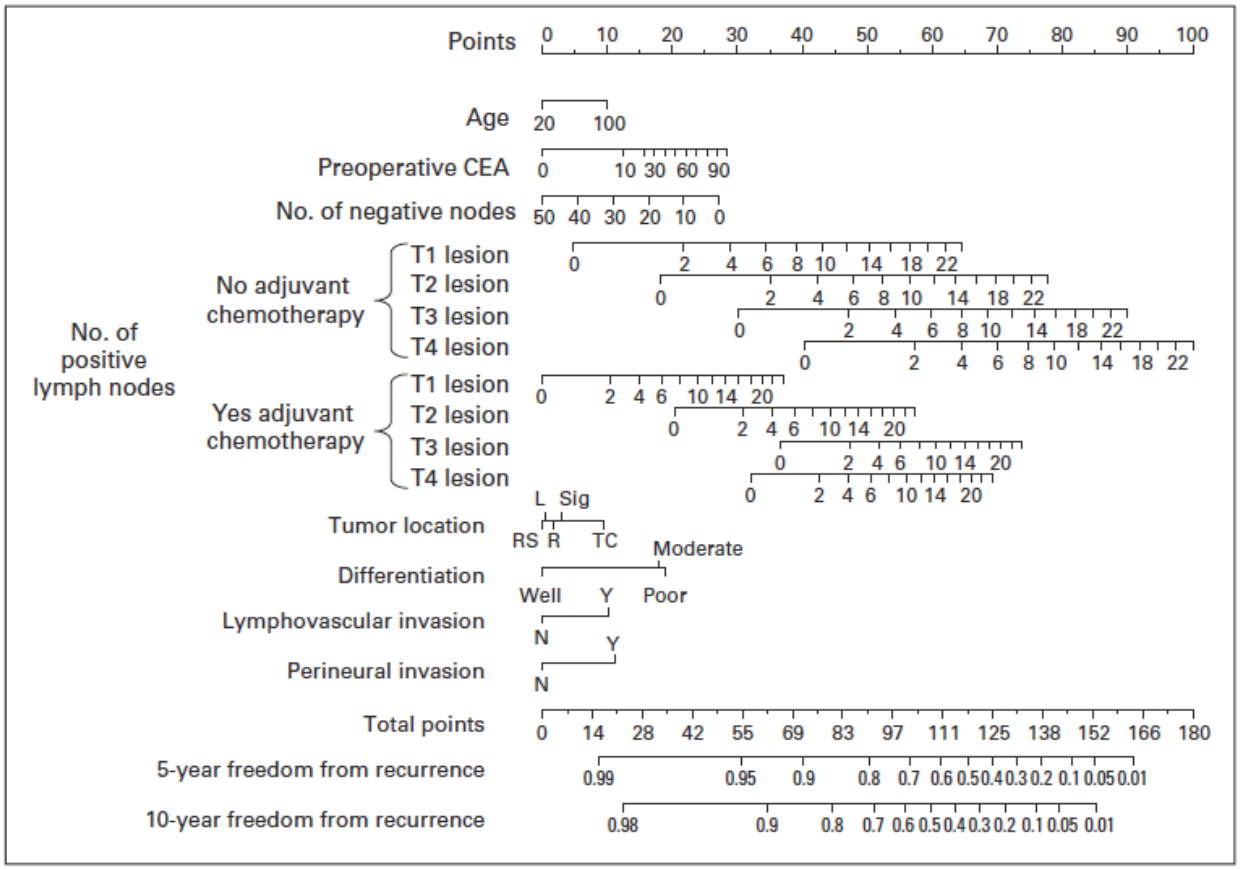


Fig 2. Colon cancer nomogram for recurrence-free survival. Instructions for users: Locate the patient's preoperative carcinoembryonic antigen (CEA; in ng/mL) on the CEA axis. Draw a straight line up to the points axis to determine how many points toward recurrence the patient should receive. Repeat this process for each of the remaining axes, drawing a straight line each time to the points axis. Sum the points received from each prognostic variable and locate this number on the total points axis. Draw a straight line down from the total points to the 5-year or 10-year freedom from recurrence axis to ascertain the patient's specific risk of remaining free from recurrence for either 5 or 10 years. RS, rectosigmoid colon; L, left colon; R, right colon; Sig, sigmoid colon; TC, transverse colon.

VOLUME 29 · NUMBER 23 · AUGUST 10 2011

JOURNAL OF CLINICAL ONCOLOGY

ORIGINAL REPORT

Rectum

Nomograms for Predicting Local Recurrence, Distant Metastases, and Overall Survival for Patients With Locally Advanced Rectal Cancer on the Basis of European Randomized Clinical Trials

Vincenzo Valentini, Ruud G.P.M. van Stiphout, Guido Lammering, Maria Antonietta Gambacorta, Maria Cristina Barba, Marek Bebenek, Franck Bonnetain, Jean-Francois Bosset, Krzysztof Bujko, Luca Cionini, Jean-Pierre Gerard, Claus Rödel, Aldo Sainato, Rolf Sauer, Bruce D. Minsky, Laurence Collette, and Philippe Lambin

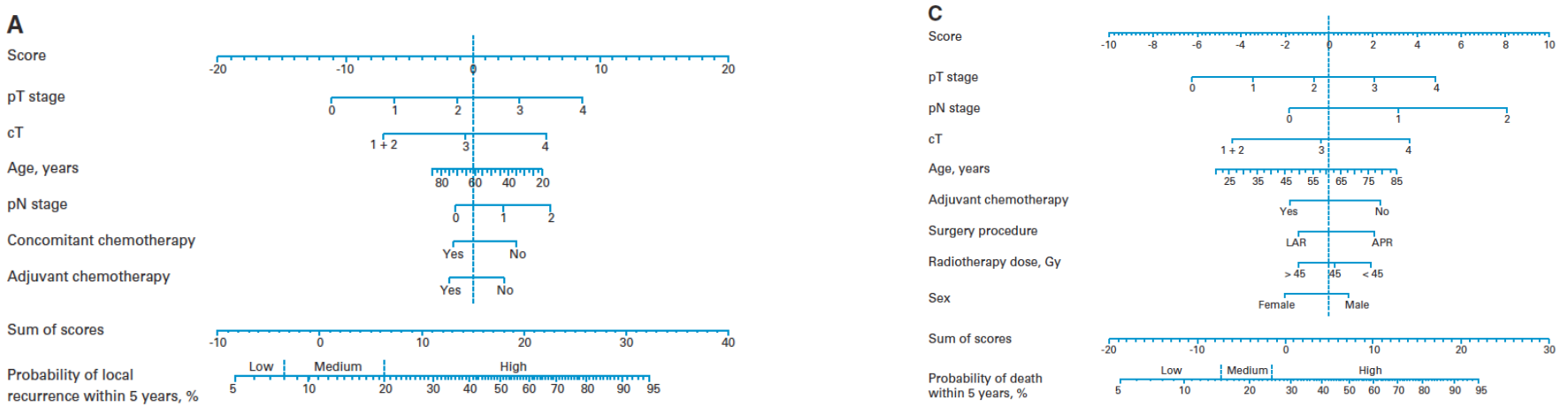


Fig 2. Nomograms developed for 5-year prediction of (A) local recurrence, (B) distant metastases, and (C) overall survival. Each variable value is assigned a score, and the sum of scores is converted to a probability in the lowest scale. Calculated probabilities are assigned to a risk group (low, medium, high). APR, abdominoperineal resection; cT, clinical tumor [stage]; LAR, low anterior resection; pN, pathologic nodal [stage]; pT, pathologic tumor [stage] (see also http://www.predictcancer.org).

既成品ノモグラムの問題点

- すべてが、western databaseから作られている
- 当然、 validationもwestern populationに対してのみ

日本独自(east)のノモグラム作成が求められている

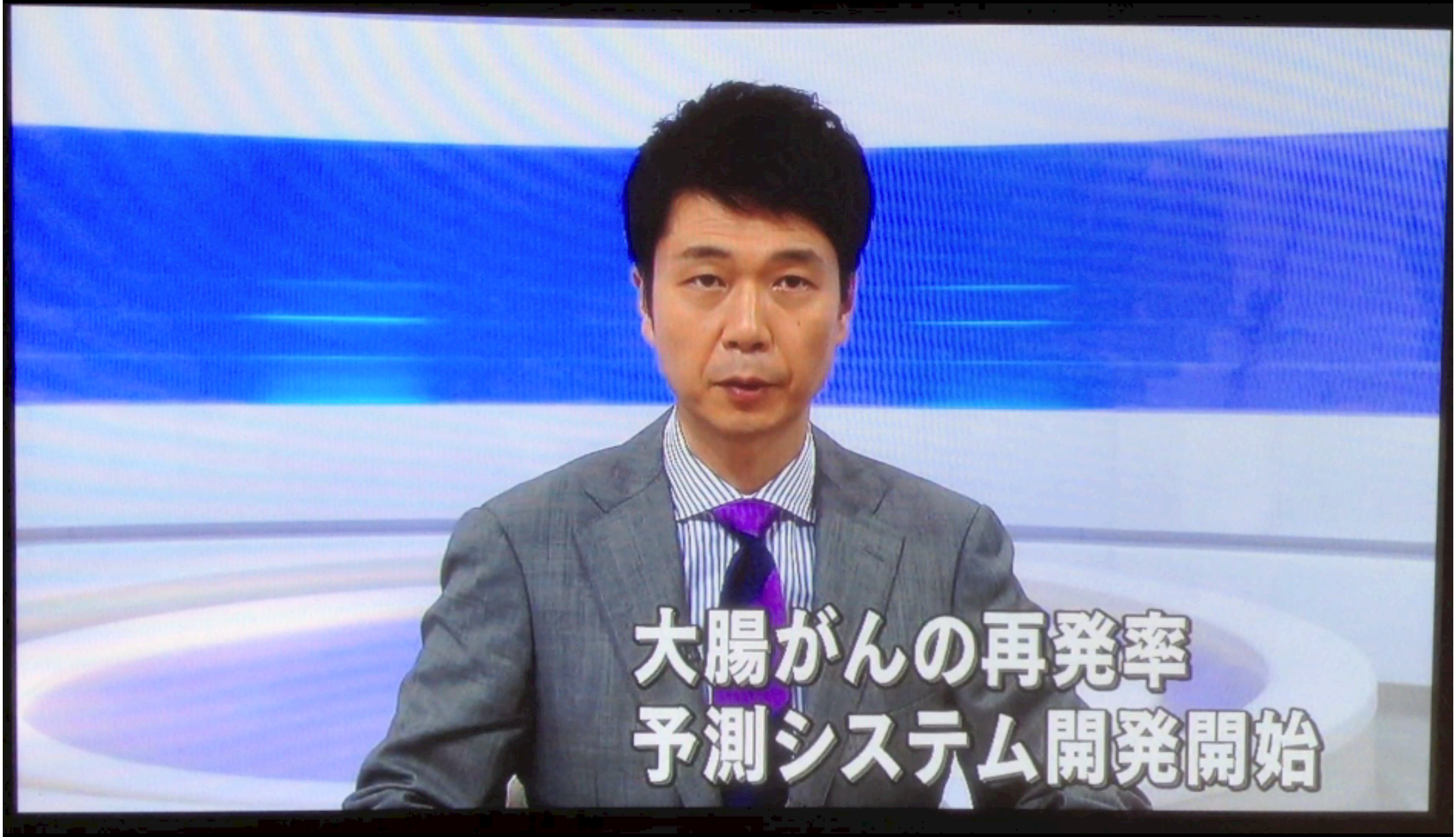

ノモグラムでできること
1
2
3
研究提案の背景
日本版ノモグラムの作成

本プロジェクト研究の目的

日本のデータをもとに、日本独自の
「大腸癌治癒切除後の予後予測のためのノモグラム」
を作成する

＋

将来的な展望として、
作成したノモグラムの自動計算コンテンツをWeb等で公開することによる、実地臨床への導入の実現可能性とその問題点を検討する。

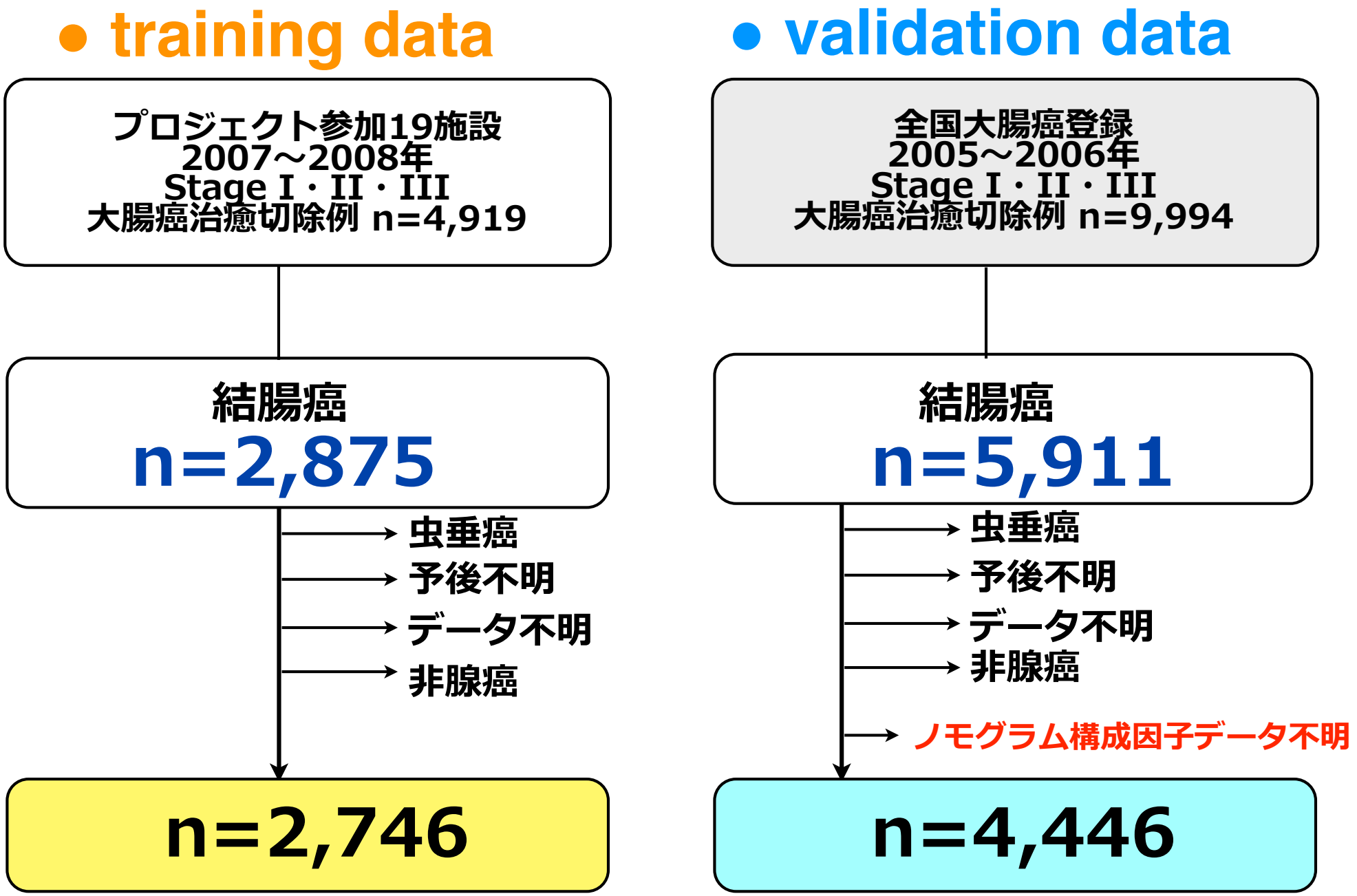

大腸がんの再発率
予測システム開発開始
NHK

研究参加施設

国立がん研究センター中央病院　大腸外科	東京医科歯科大学　大腸・肛門外科
防衛医科大学校　外科	帝京大学　外科
愛知県がんセンター中央病院　消化器外科	杏林大学　消化器・一般外科
札幌医科大学　第一外科	慶応義塾大学　一般・消化器外科
新潟大学　消化器・一般外科	藤田保健衛生大学　消化器外科
栃木県立がんセンター　大腸外科	京都大学　消化管外科
東京女子医科大学　第二外科	大阪府立成人病センター　消化器外科
国立国際医療研究センター戸山病院　下部消化管外科	久留米大学　外科
東京大学　腫瘍外科	がん・感染症センター　都立駒込病院　外科
兵庫医科大学　下部消化管外科	

19 施設

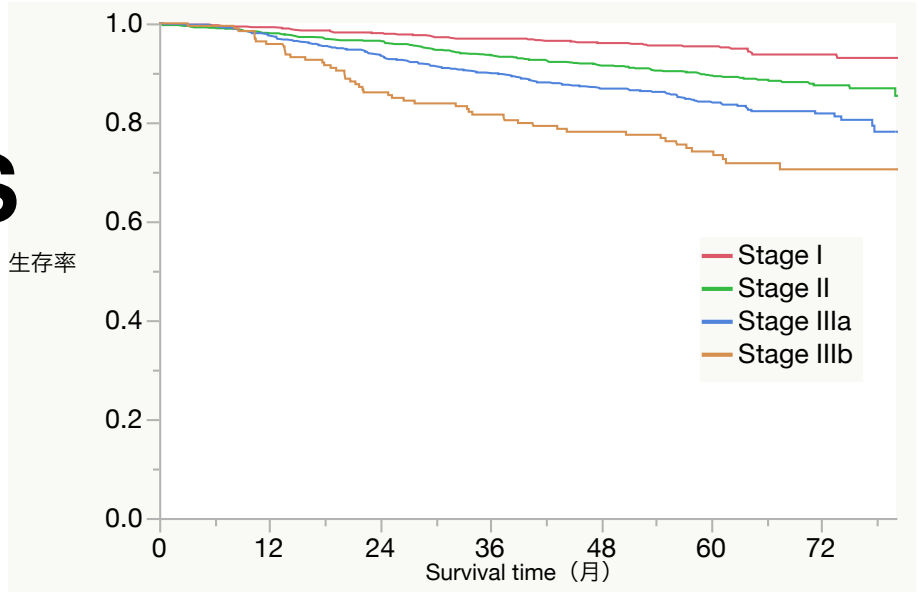
結腸癌ノモグラム

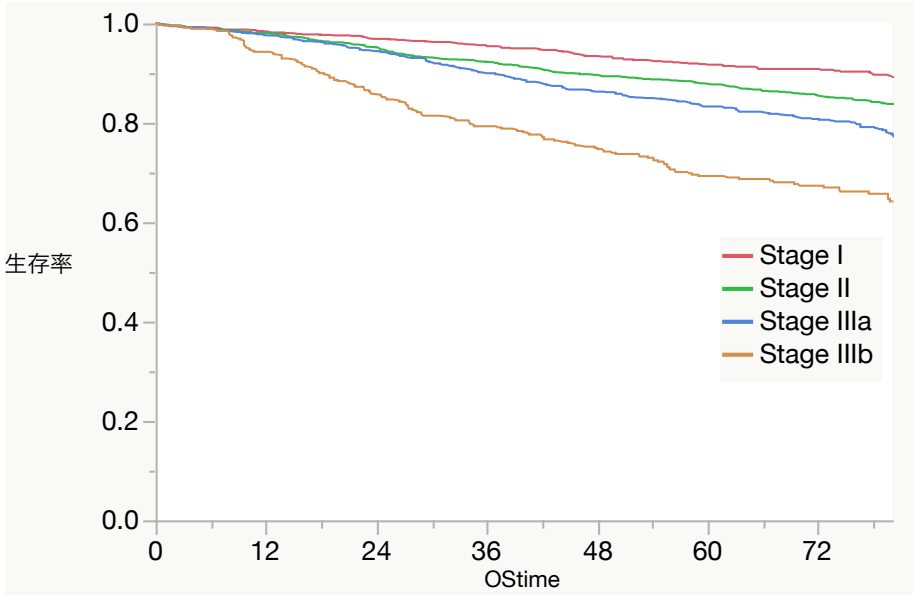

● training data
プロジェクト参加19施設
2007～2008年
Stage Ⅰ・Ⅱ・Ⅲ
大腸癌治癒切除例 n=4,919
結腸癌
n=2,875
虫垂癌
予後不明
データ不明
非腺癌
n=2,746
● validation data
全国大腸癌登録
2005～2006年
Stage Ⅰ・Ⅱ・Ⅲ
大腸癌治癒切除例 n=9,994
結腸癌
n=5,911
虫垂癌
予後不明
データ不明
非腺癌
ノモグラム構成因子データ不明
n=4,446

結腸癌ノモグラム

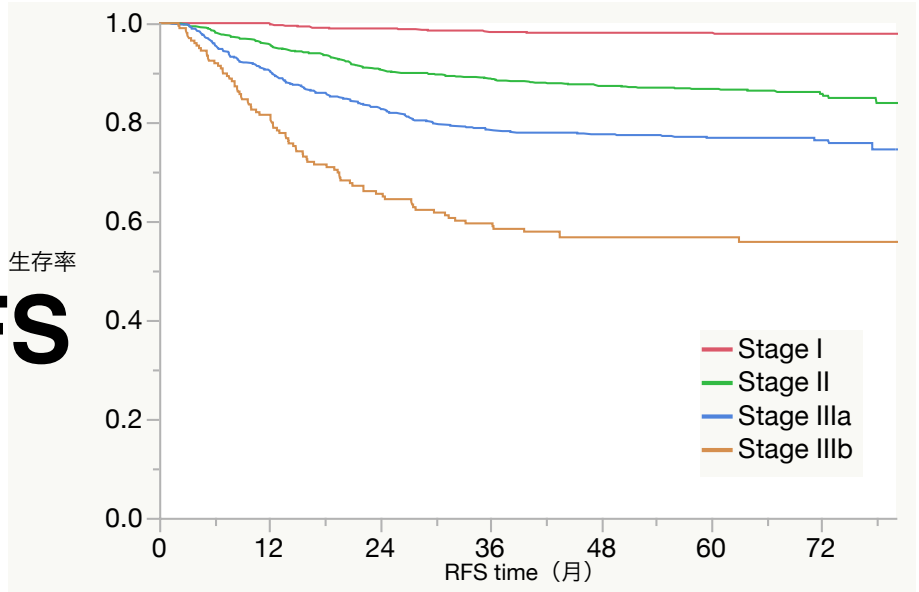
- training data
- validation data

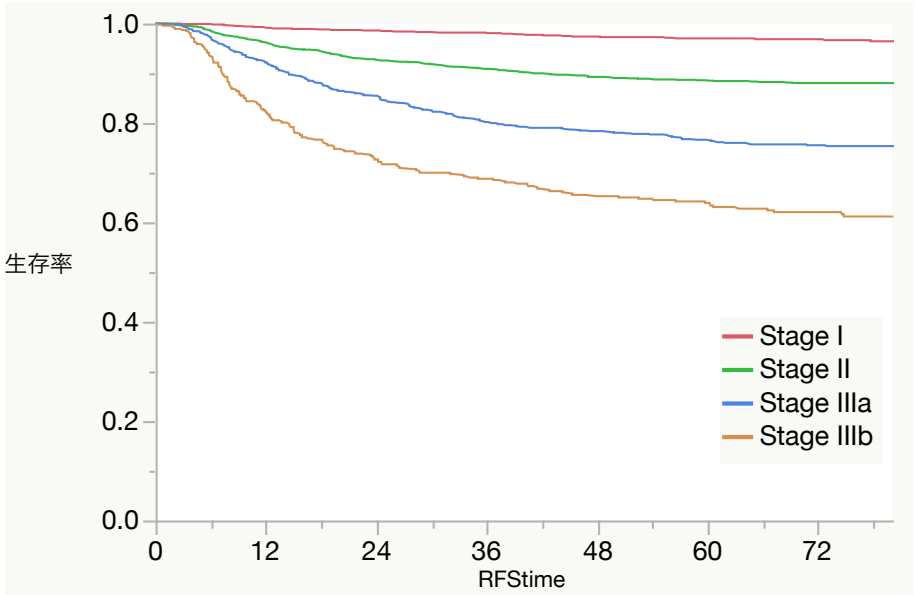
OS





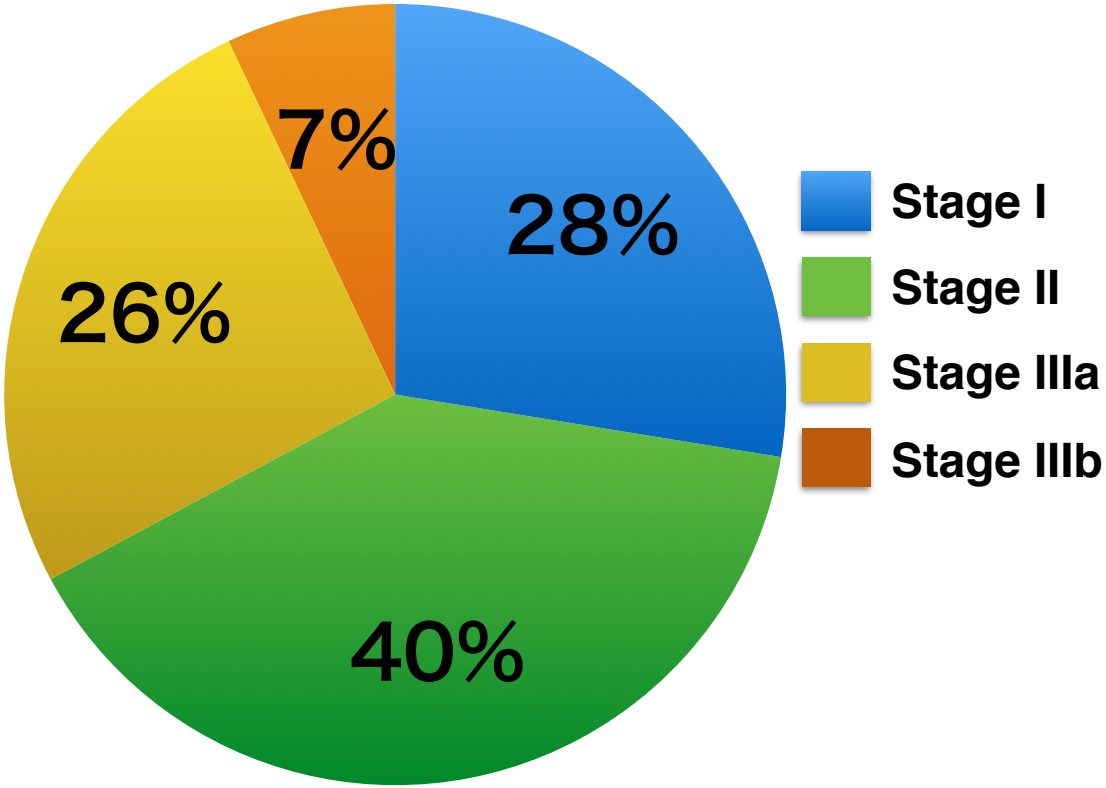
RFS



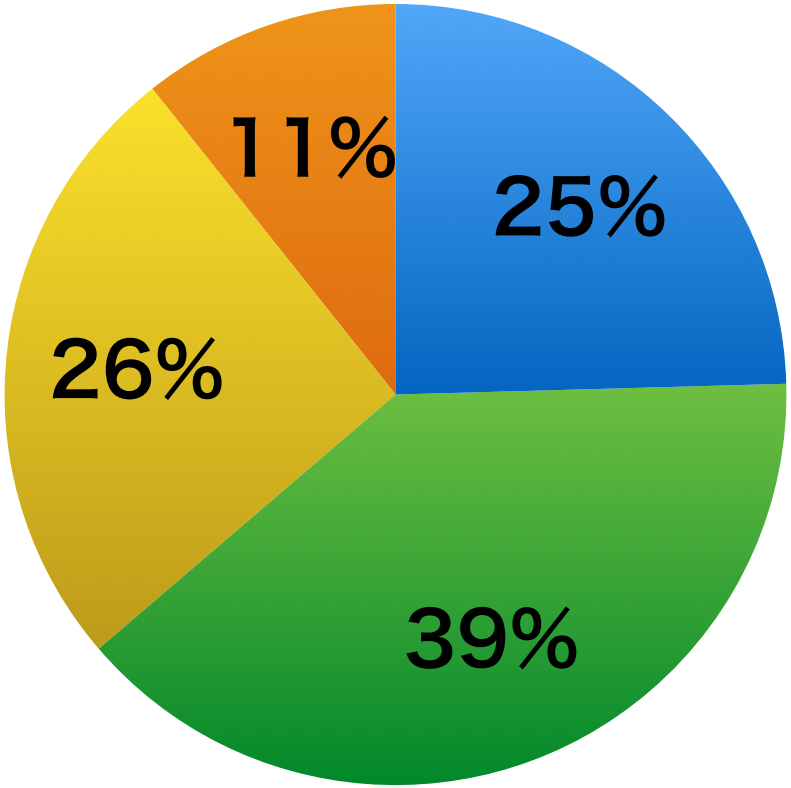


結腸癌 ノモグラム

● training data



● validation data



●結腸癌OS の予後因子

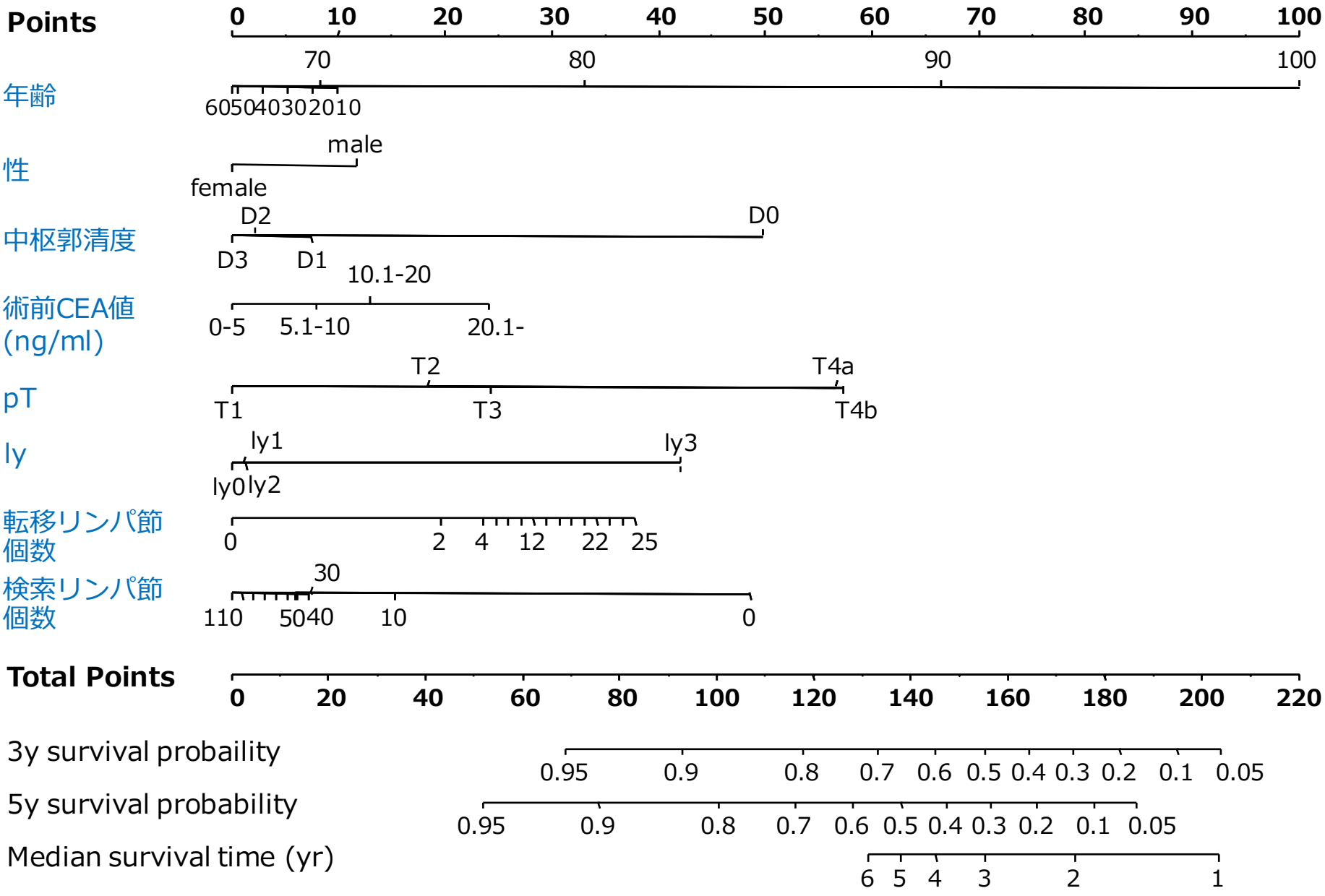
効果に対するWald検定

要因	パラメータ数	自由度	Waldカイ2乗	p値(Prob>ChiSq)
手術時年齢	1	1	49.4176284	<.0001*
性別	1	1	8.38614352	0.0038*
中枢方向の郭清度	3	3	13.6767479	0.0034*
CEAカテゴリー	2	2	11.1984752	0.0037*
病理：深達度　取扱い規約7版	4	4	88.0484038	<.0001*
病理：転移陽性リンパ節個数　合計	1	1	12.6694559	0.0004*
病理：リンパ管侵襲	3	3	17.653999	0.0005*
病理：検索リンパ節個数【total】	1	1	4.58406504	0.0323*

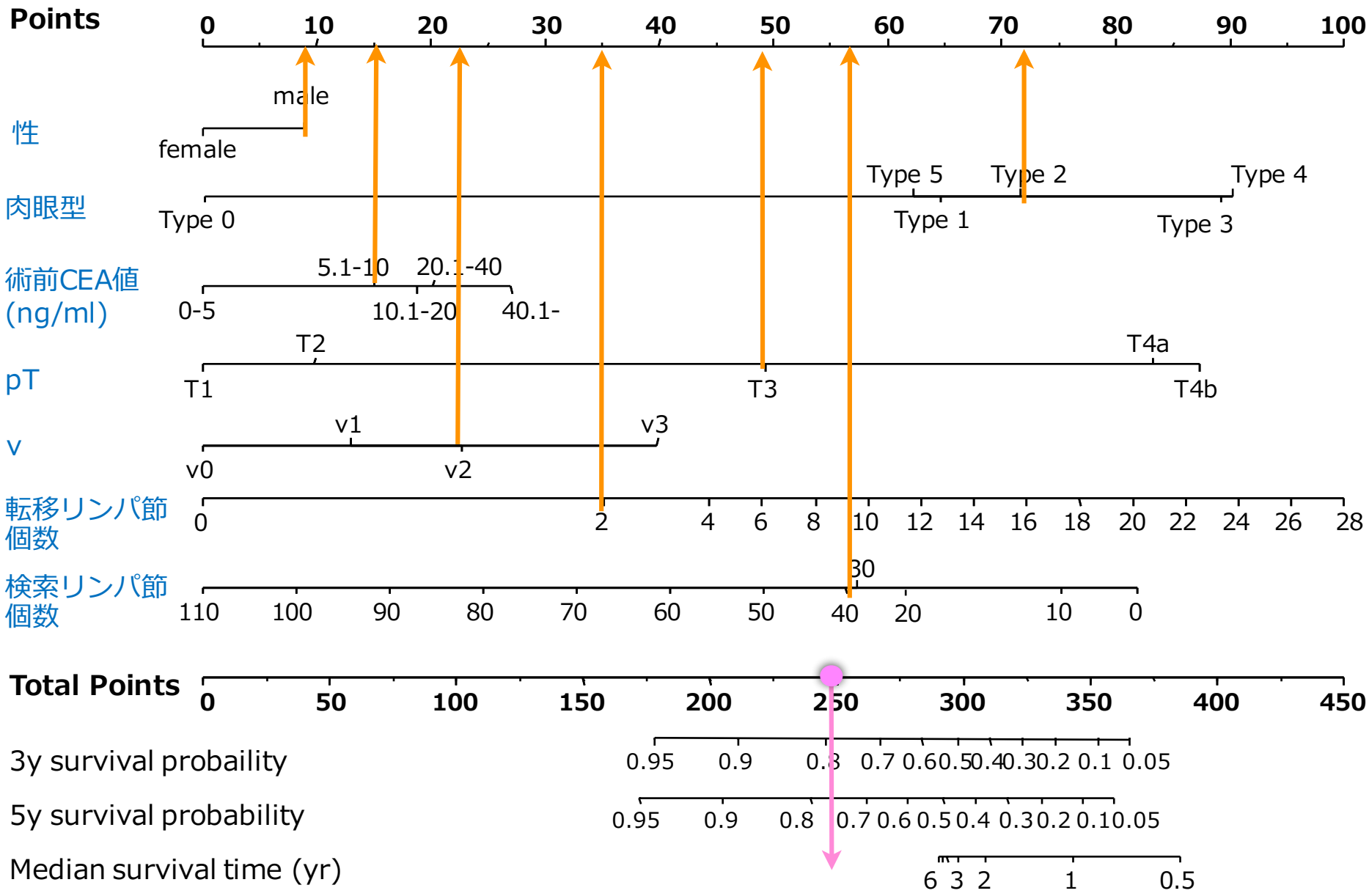
●結腸癌RFS の予後因子

要因	パラメータ数	自由度	Waldカイ2乗	p値(Prob>ChiSq)
CEAカテゴリー	2	2	13.5388625	0.0011*
病理：深達度　取扱い規約7版	4	4	90.1797853	<.0001*
病理：静脈侵襲	5	5	32.0139707	<.0001*
病理：検索リンパ節個数【total】	1	1	10.5012475	0.0012*
病理：転移陽性リンパ節個数　合計	1	1	59.4893104	<.0001*
病理：肉眼型	5	5	10.9050622	0.0533
~~病理：腫瘍の最大径~~	~~1~~	~~1~~	~~2.90446738~~	~~0.0883~~
性別	1	1	3.32617864	0.0682

結腸癌OS ノモグラム


Points
0 10 20 30 40 50 60 70 80 90 100
年齢
70 80 90 100
60 50 40 30 20 10
性
male
female
中枢郭清度
D2 D0
D3 D1
術前CEA値 (ng/ml)
10.1-20
0-5 5.1-10 20.1-
pT
T2 T4a
T1 T3 T4b
ly
ly1 ly3
ly0 ly2
転移リンパ節個数
0 2 4 12 22 25
検索リンパ節個数
30
110 50 40 10 0
Total Points
0 20 40 60 80 100 120 140 160 180 200 220
3y survival probaility
0.95 0.9 0.8 0.7 0.6 0.5 0.4 0.3 0.2 0.1 0.05
5y survival probability
0.95 0.9 0.8 0.7 0.6 0.5 0.4 0.3 0.2 0.1 0.05
Median survival time (yr)
6 5 4 3 2 1

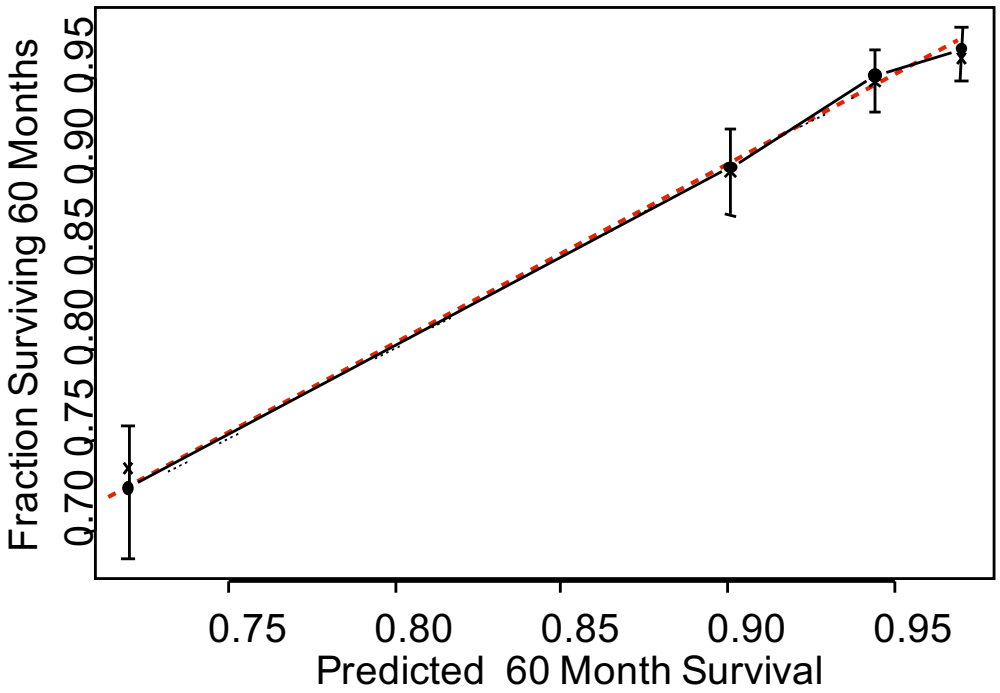
結腸癌RFS ノモグラム



結腸癌OSノモグラムの予測精度

Calibration curve

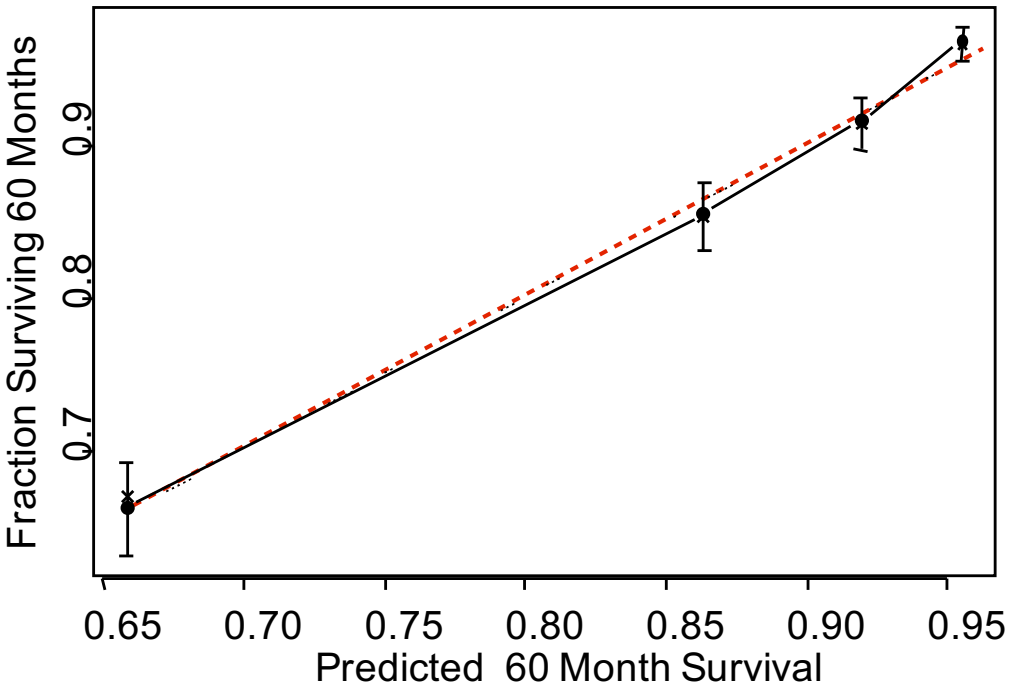
- training data



n=2746 d=310 p=24, 600 subjects per group
X - resampling optimism added, B=199 Based on observed-predicted

C-index=0.747

- validation data



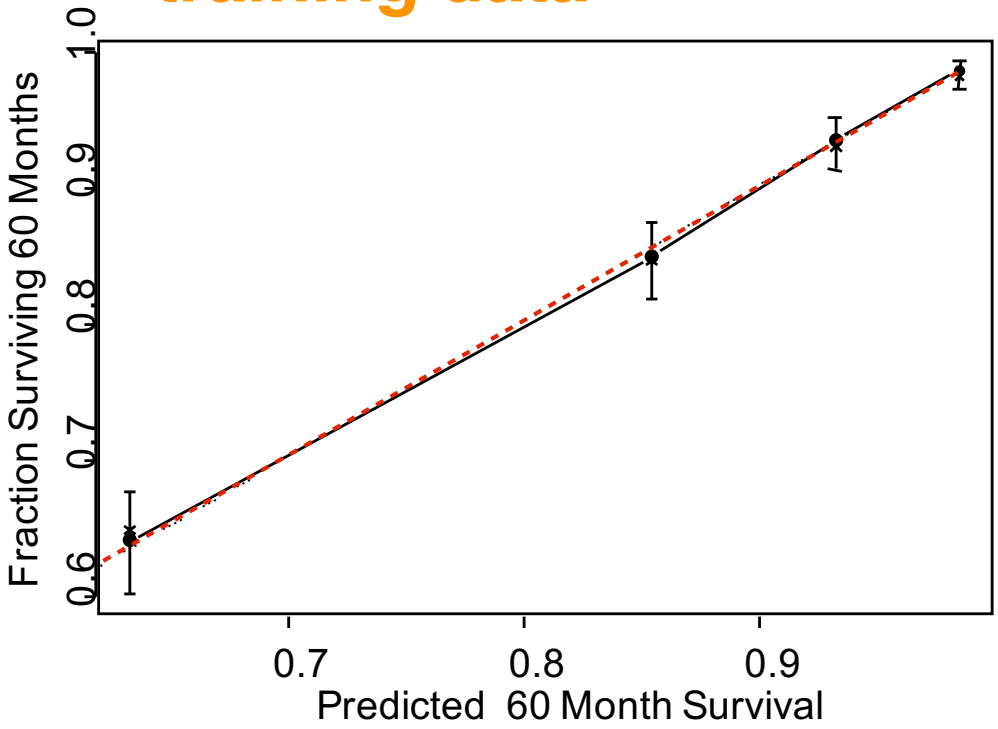
n=4446 d=706 p=23, 900 subjects per group
X - resampling optimism added, B=200 Based on observed-predicted

C-index=0.738

結腸癌RFSノモグラムの予測精度

Calibration curve

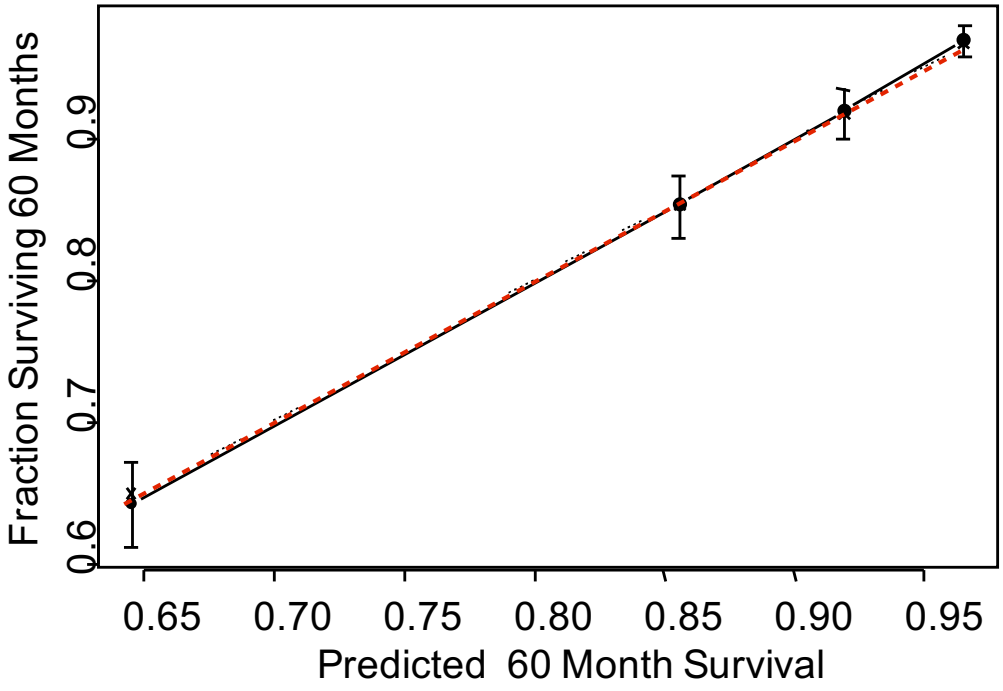
● training data



n=2746 d=384 p=23, 600 subjects per group
X - resampling optimism added, B=191 Based on observed-predicted

C-index=0.781

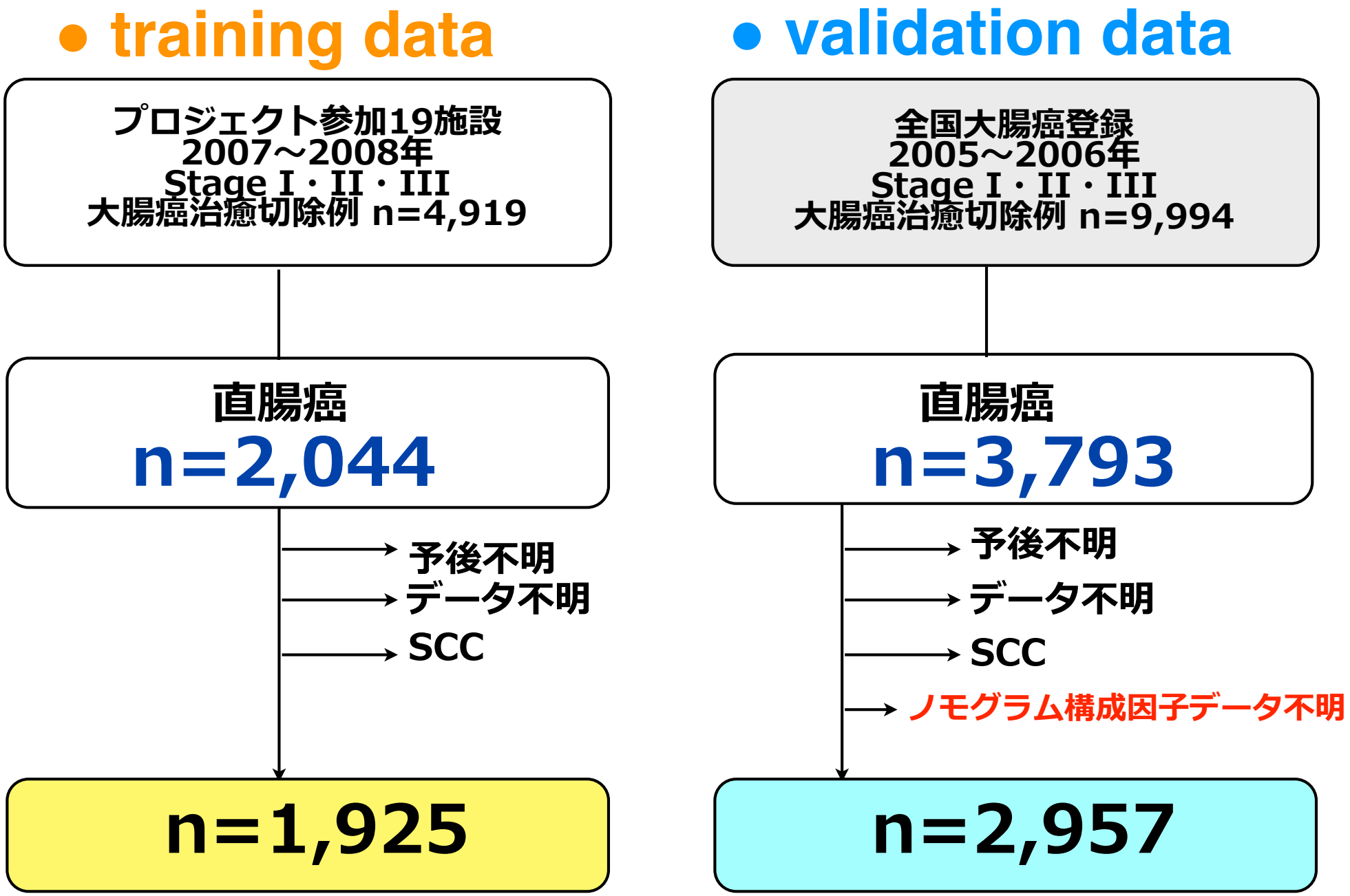
● validation data



n=4446 d=631 p=23, 900 subjects per group
X - resampling optimism added, B=200 Based on observed-predicted

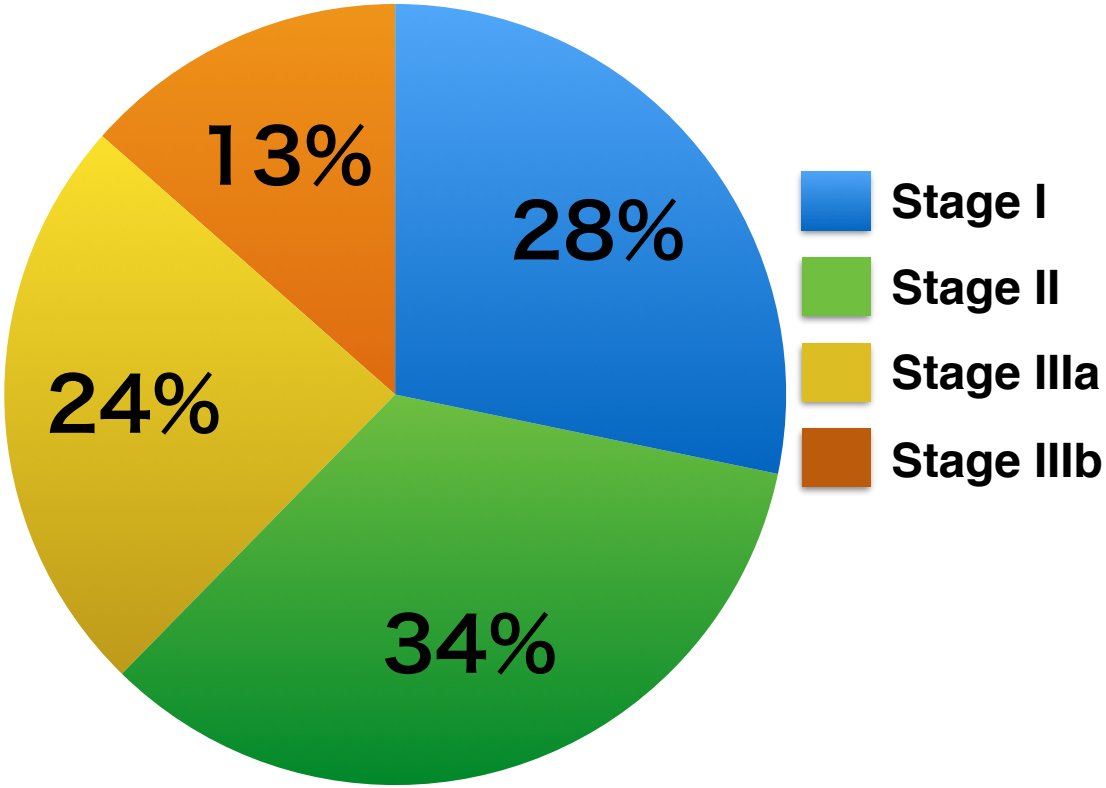
C-index=0.752

直腸癌ノモグラム

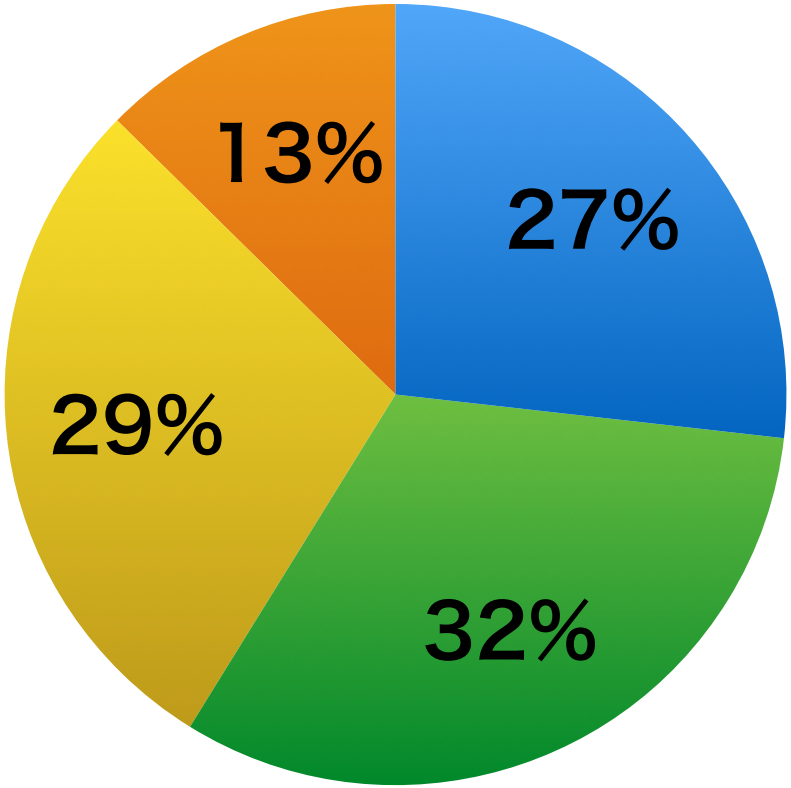

● training data
プロジェクト参加19施設
2007～2008年
Stage Ⅰ・Ⅱ・Ⅲ
大腸癌治癒切除例 n=4,919
直腸癌
n=2,044
予後不明
データ不明
SCC
n=1,925
● validation data
全国大腸癌登録
2005～2006年
Stage Ⅰ・Ⅱ・Ⅲ
大腸癌治癒切除例 n=9,994
直腸癌
n=3,793
予後不明
データ不明
SCC
ノモグラム構成因子データ不明
n=2,957

直腸癌ノモグラム

● training data



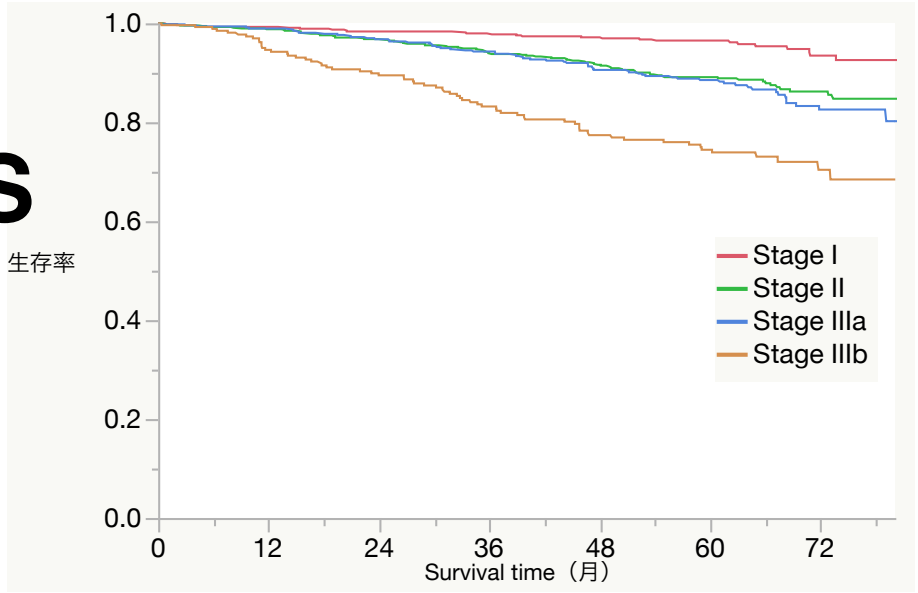
● validation data

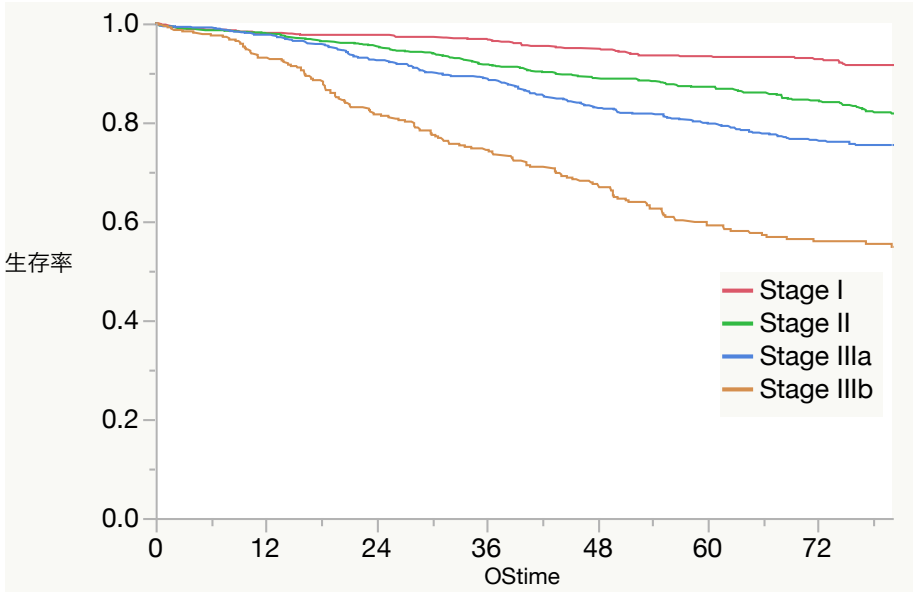


直腸癌ノモグラム

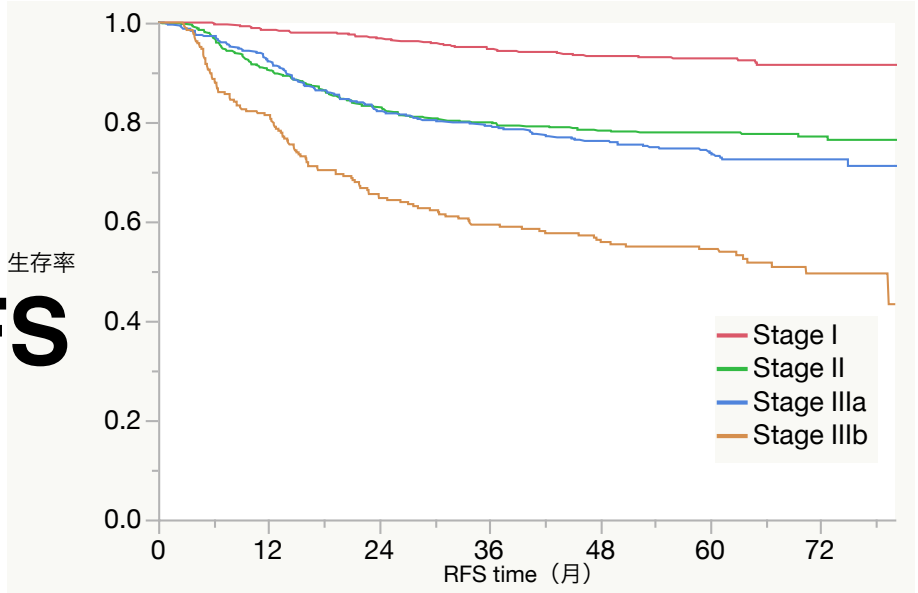
- training data
- validation data

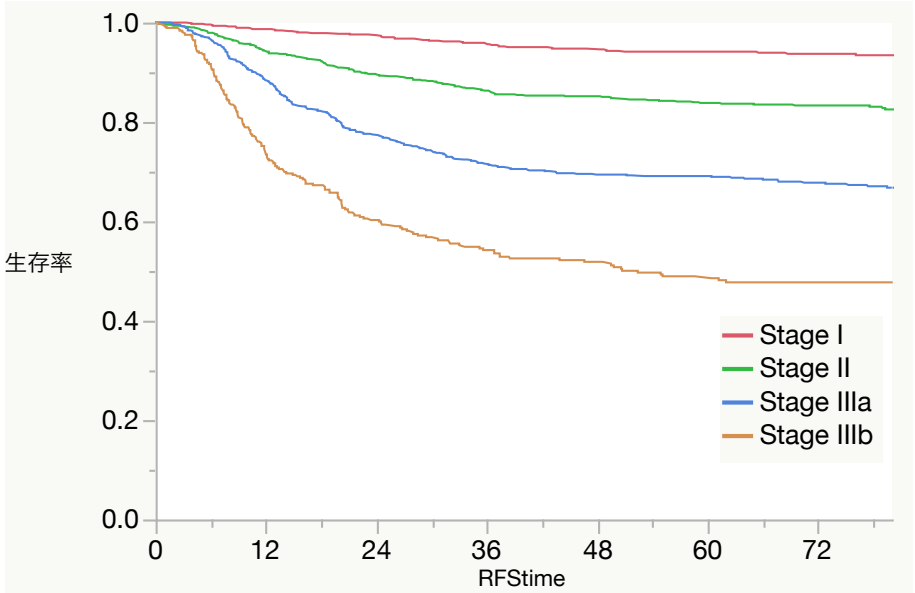
OS





RFS





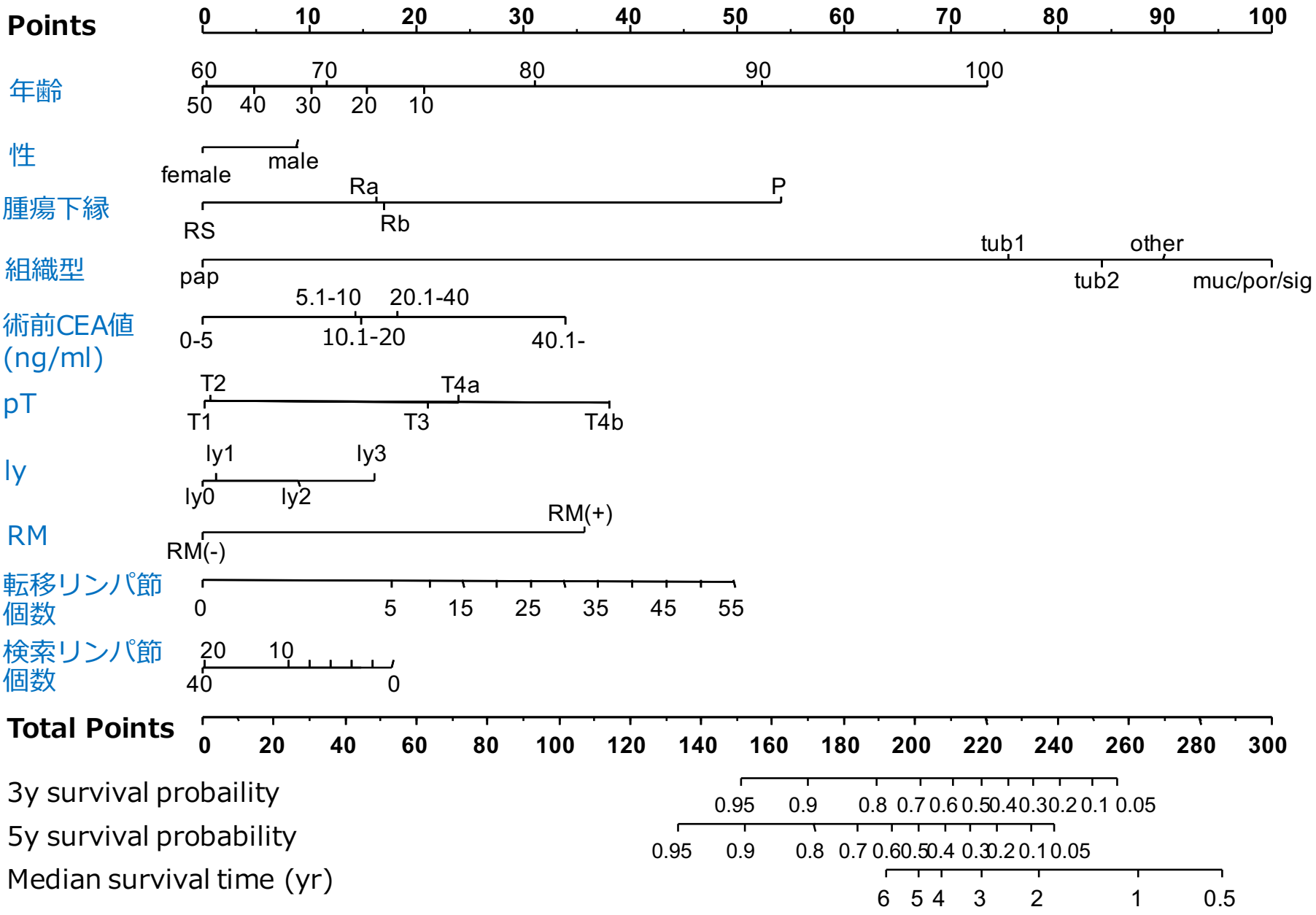
●直腸癌OS の予後因子

手術時年齢	1	1	22.5322959	<.0001*
腫瘍下縁	3	3	37.3738323	<.0001*
CEAカテゴリー	2	2	29.5735728	<.0001*
病理：深達度　取扱い規約7版	4	4	28.3950755	<.0001*
pathology	4	4	15.3936602	0.0040*
病理：検索リンパ節個数【total】	1	1	3.66895555	0.0554
病理：転移陽性リンパ節個数　合計	1	1	12.3868741	0.0004*
病理：RM	1	1	11.4519132	0.0007*
病理：リンパ管侵襲	3	3	9.56563493	0.0226*
性別	1	1	3.09654526	0.0785

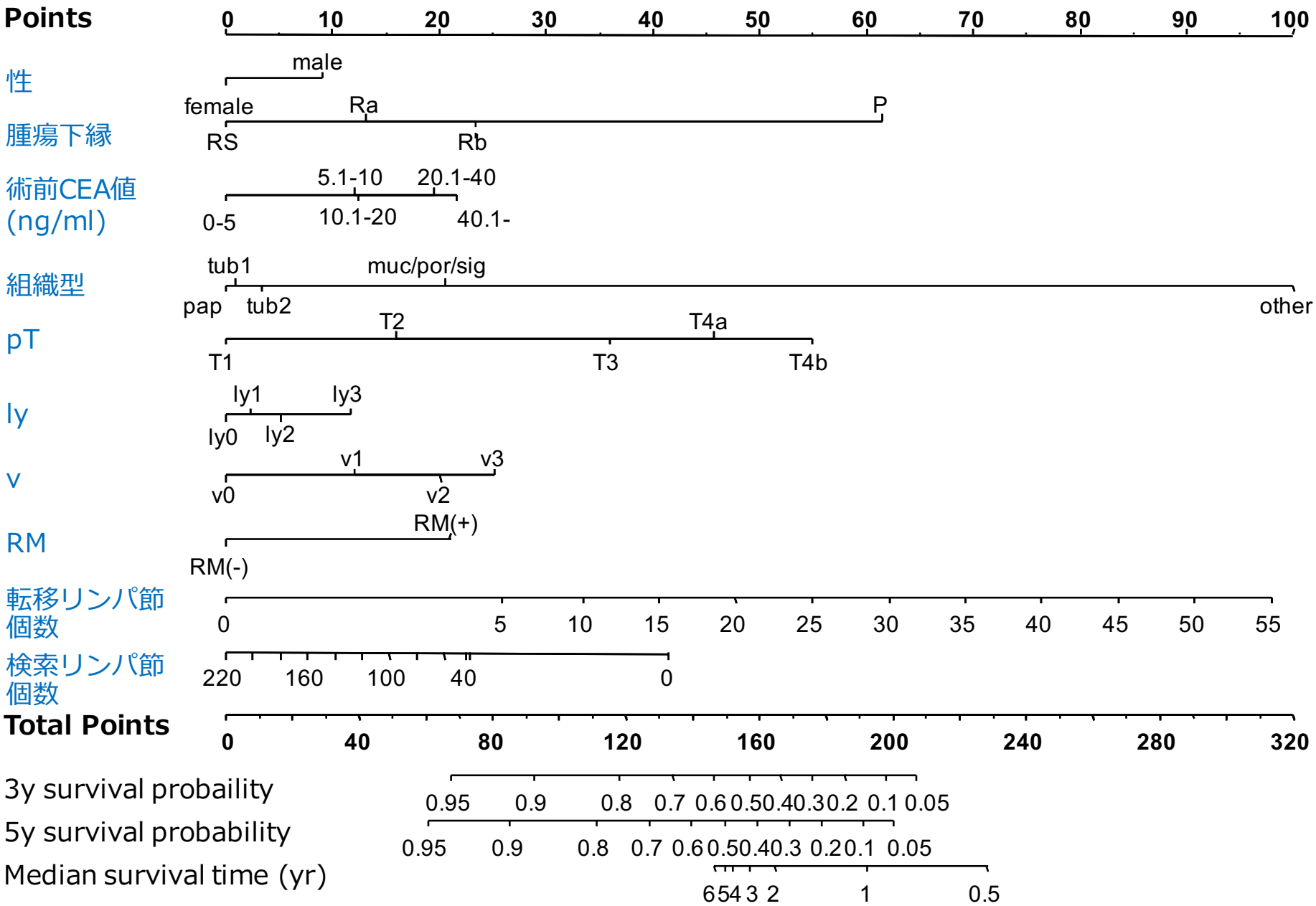
●直腸癌RFS の予後因子

要因	パラメータ数	自由度	Waldカイ2乗	p値(Prob>ChiSq)
性別	1	1	5.42439107	0.0199*
腫瘍下縁	3	3	47.2546541	<.0001*
CEAカテゴリー	2	2	21.1414127	<.0001*
病理：深達度　取扱い規約7版	4	4	43.4576237	<.0001*
pathology	4	4	35.3678983	<.0001*
病理：リンパ管侵襲	3	3	11.0027726	0.0117*
病理：静脈侵襲	3	3	19.9020162	0.0002*
病理：転移陽性リンパ節個数　合計	1	1	33.8434088	<.0001*
病理：検索リンパ節個数【total】	1	1	9.2240142	0.0024*
病理：RM	1	1	2.85849274	0.0909

直腸癌OSノモグラム


Points
0 10 20 30 40 50 60 70 80 90 100
年齢
60 70 80 90 100
50 40 30 20 10
性
female
male
腫瘍下縁
Ra
P
RS
Rb
組織型
tub1
other
pap
tub2
muc/por/sig
術前CEA値 (ng/ml)
5.1-10 20.1-40
0-5
10.1-20
40.1-
pT
T2
T4a
T1
T3
T4b
ly
ly1
ly3
ly0
ly2
RM
RM(+)
RM(-)
転移リンパ節個数
0 5 15 25 35 45 55
検索リンパ節個数
20 10
40
0
Total Points
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
3y survival probaility
0.95 0.9 0.8 0.7 0.6 0.5 0.4 0.3 0.2 0.1 0.05
5y survival probability
0.95 0.9 0.8 0.7 0.6 0.5 0.4 0.3 0.2 0.1 0.05
Median survival time (yr)
6 5 4 3 2 1 0.5

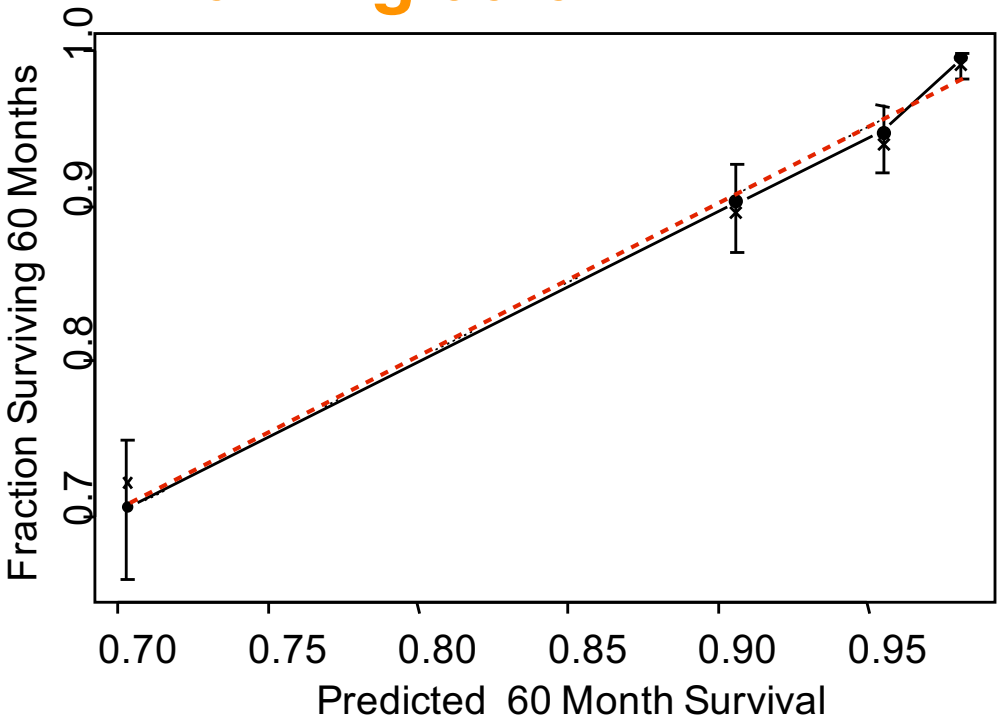
直腸癌RFSノモグラム



直腸癌OSノモグラムの予測精度

Calibration curve

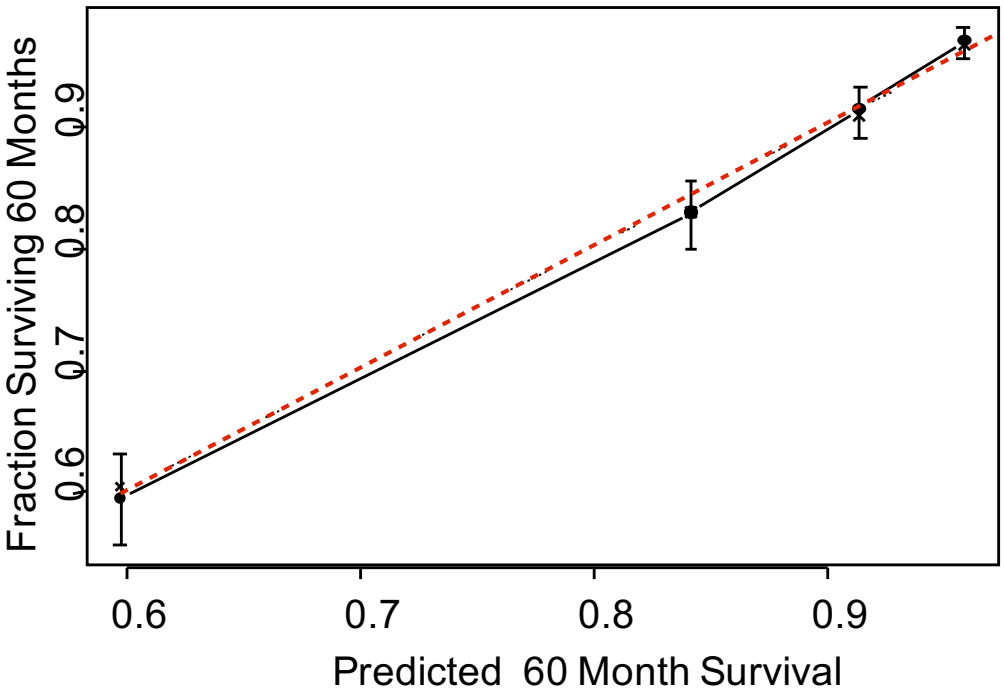
● training data



n=1925 d=220 p=29, 400 subjects per group
X - resampling optimism added, B=188 Based on observed-predicted

C-index=0.775

● validation data



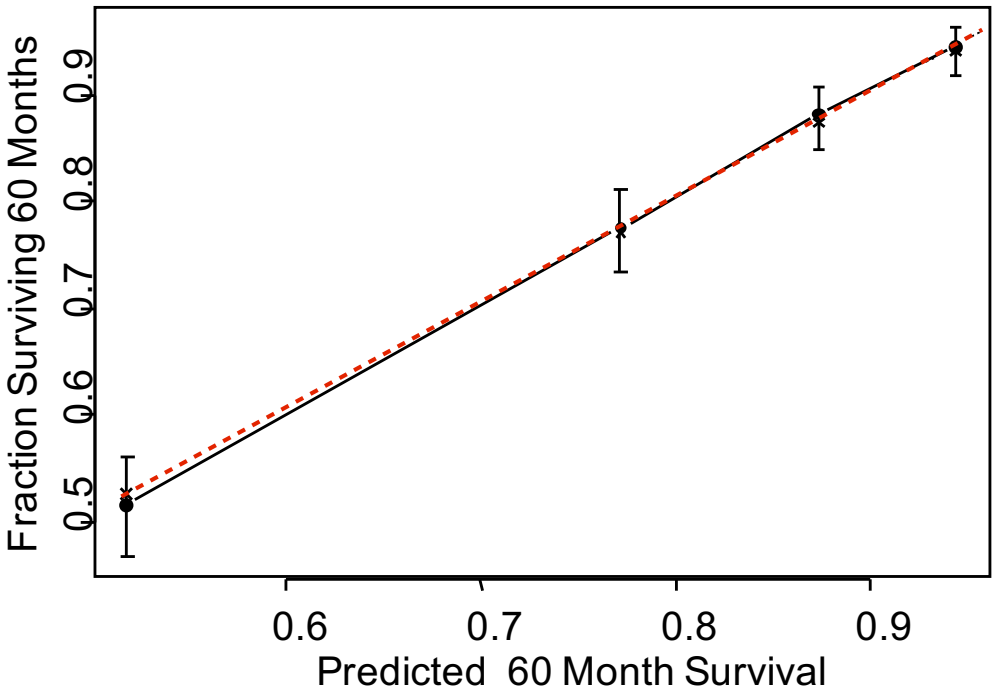
n=2957 d=543 p=29, 700 subjects per group
X - resampling optimism added, B=168 Based on observed-predicted

C-index=0.754

直腸癌RFSノモグラムの予測精度

Calibration curve

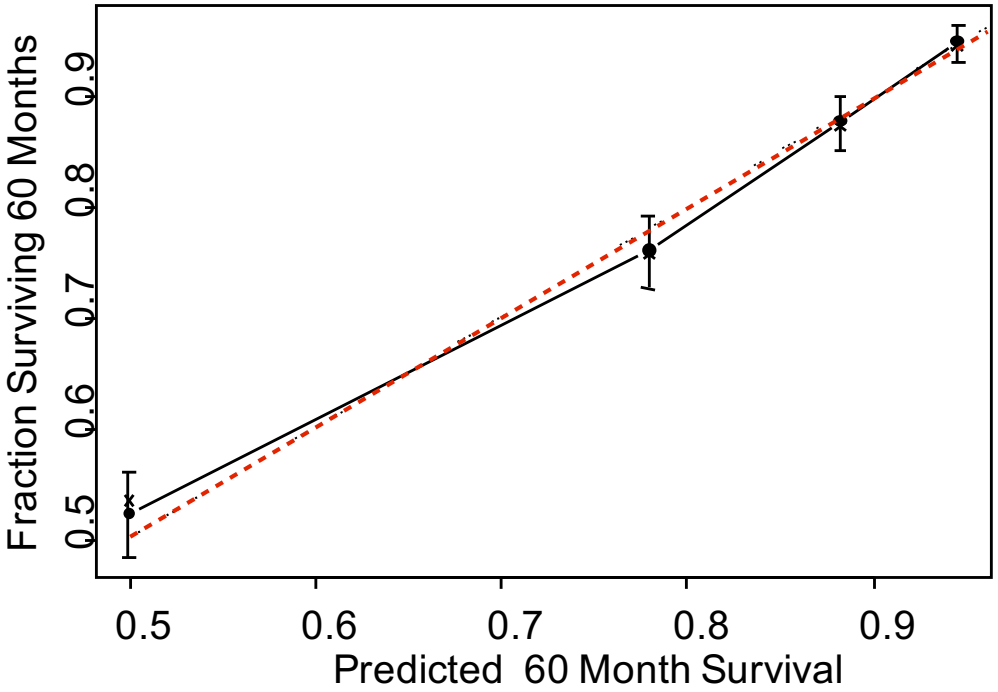
- training data



n=1925 d=413 p=22, 400 subjects per group
X - resampling optimism added, B=200 Based on observed-predicted

C-index=0.750

- validation data



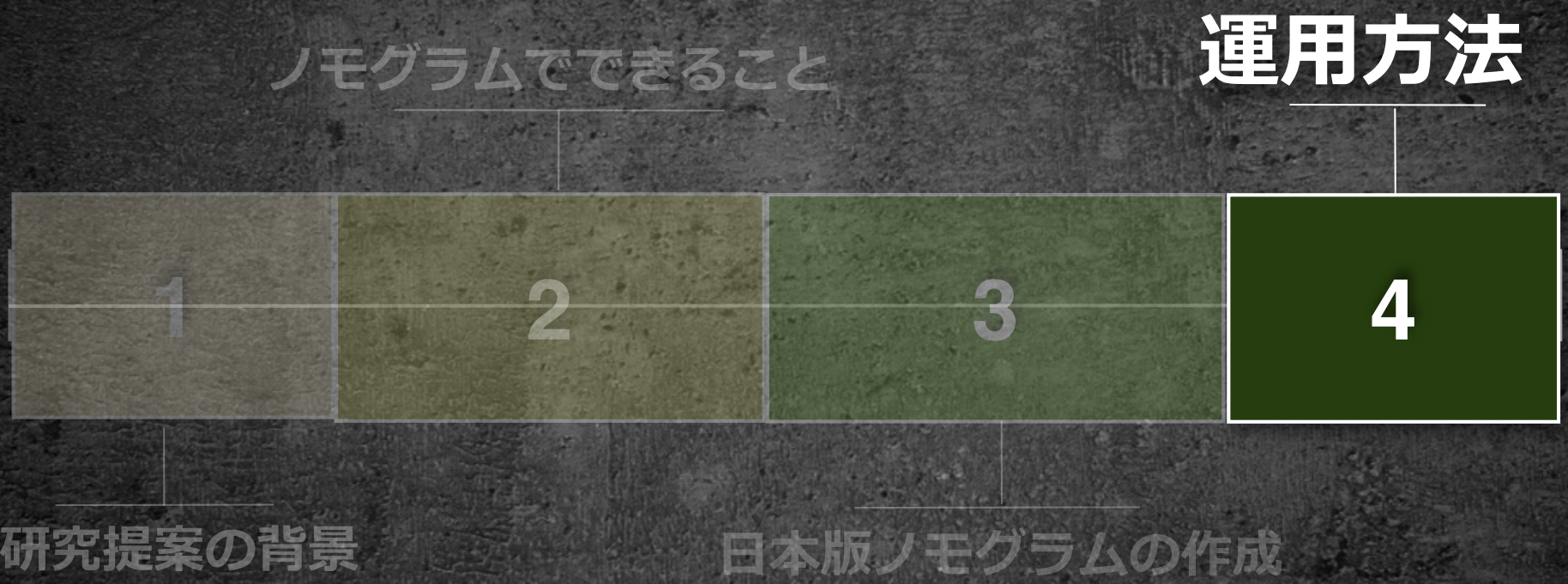
n=2957 d=626 p=29, 700 subjects per group
X - resampling optimism added, B=182 Based on observed-predicted

C-index=0.747

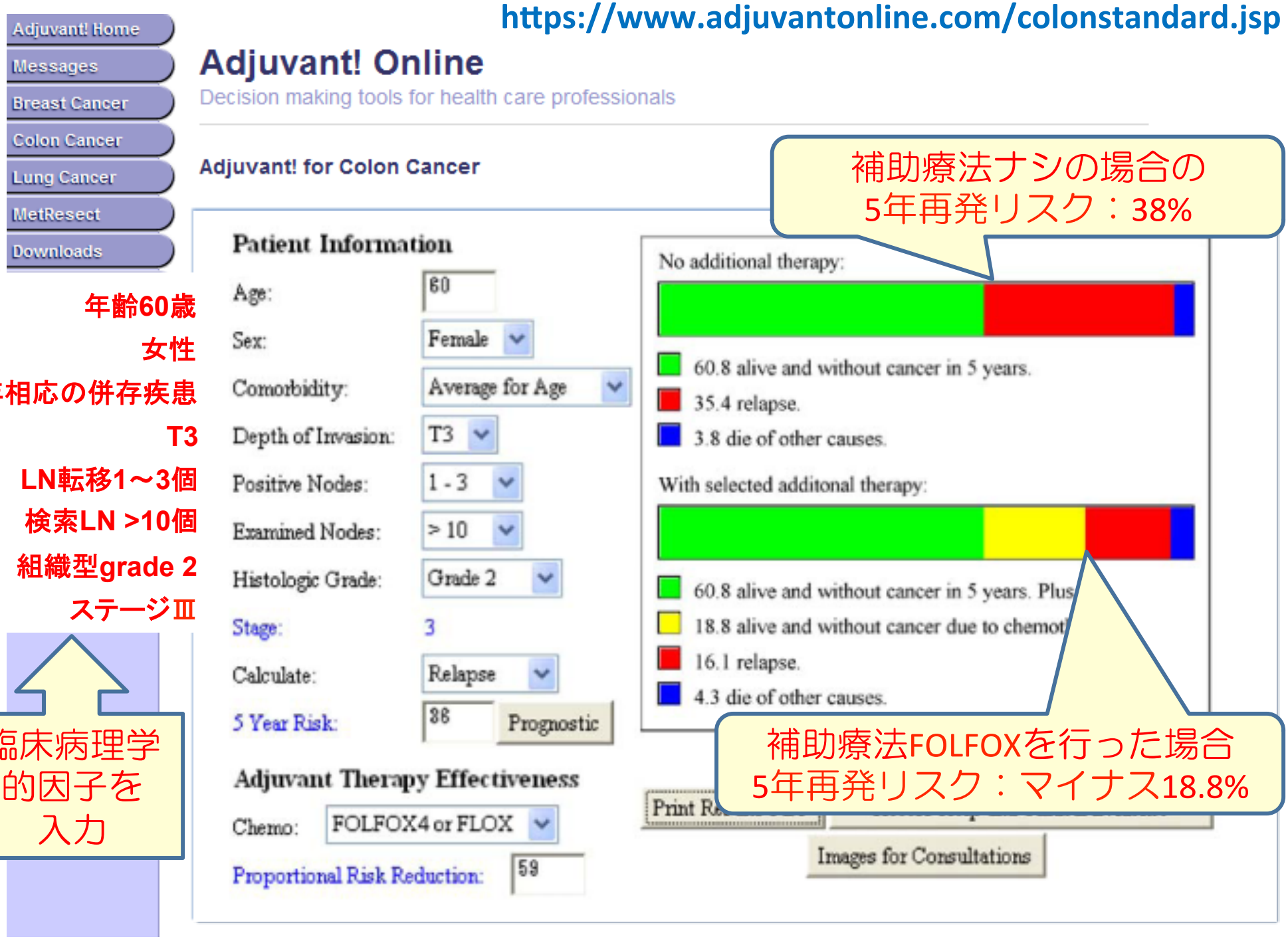
プロジェクト研究のまとめ

- **個々の患者**について**より正確な予後予測**が可能になる「大腸癌治癒切除後の予後予測のためのノモグラム」を作成した。

- 高い**内的＋外的妥当性**を検証することができ、臨床使用可能なノモグラムであることが確認された。


ノモグラムでできること
運用方法
1
2
3
4
研究提案の背景
日本版ノモグラムの作成

https://www.adjuvantonline.com/colonstandard.jsp



補助療法ナシの場合の
5年再発リスク：38%

年齢60歳
女性
年相応の併存疾患
T3
LN転移1～3個
検索LN >10個
組織型grade 2
ステージⅢ

臨床病理学的因子を入力

補助療法FOLFOXを行った場合
5年再発リスク：マイナス18.8%

Colorectal Cancer Nomogram: Post-Surgery

TEXT SIZE

This tool can be used to predict the probability of being disease-free of colon cancer five to ten years following surgical removal of all cancerous tissue. It is designed to help patients and physicians to better understand the long-term outcome following colon cancer surgery.

Enter Your Information

Clear | Calculate ▸

Age
Patient's age at the time of the surgery
45 (20 to 100 yrs)

Gender
Male

Location
Where in the colon is the tumor? This tool is only for tumors found in the colon -- between the pouch that forms the first part of the large intestine (known as the cecum) and the S-shaped section of the colon that connects to the rectum (the rectosigmoid, or sigmoid, colon).
Rectosigmoid

CEA (colorectal biomarker)
CEA value from the laboratory report before surgery.
15 (0 to 64)

Tumor Stage
Based upon the TNM staging system.
T2

Differentiation
Select whether tumor is poor, moderate, or well differentiated.
Moderate

Lymphatic or Vascular Structure Involvement (LymphovascularInvasion)
Was one or more tumor cells found in the lymphatic or vascular structure?
☑ YES

Perineural Invasion (PerineuralInvasion)
Was one or more tumor cells found in or around the nerves?
☐ YES

Number of Positive Lymph Nodes
2 (0 to 24)

Number of Negative Lymph Nodes
12 (0 to 42)

Chemotherapy After Surgery
Treated with chemotherapy after surgery?
☑ YES

Clear | Calculate ▸

Your Results

Learn more about your results below.

Probability of Being Disease-Free Five to Ten Years After Surgery	5 Year	73%
	10 Year	65%

Print These Results

Make an Appointment

Call us to schedule an appointment or contact us online

Contact Us ▸

Learn More About Your Results

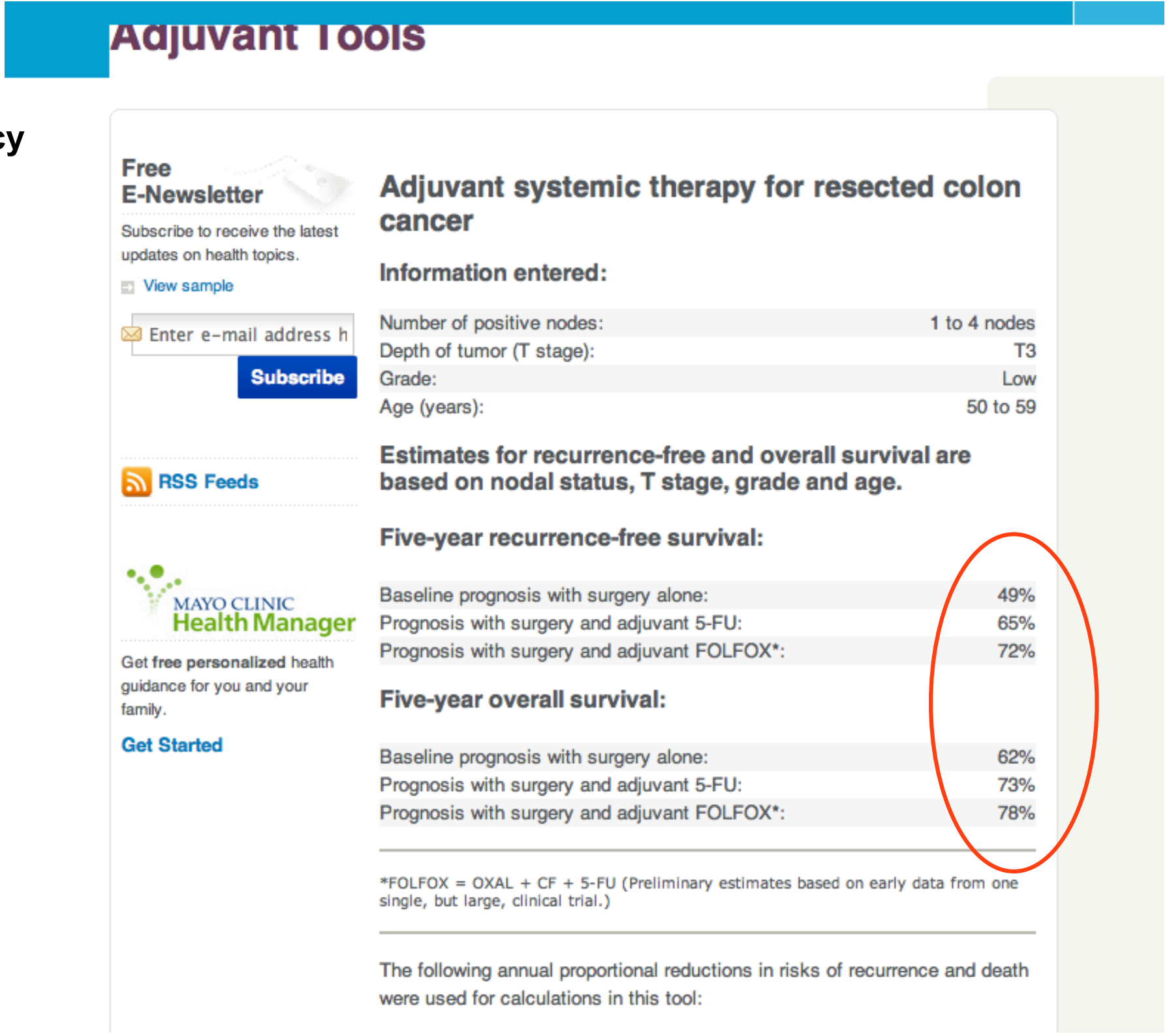
Probability of Being Disease-Free Five to Ten Years After Surgery

This tool predicts the probability of being disease-free from colon cancer after surgery, assuming that all of the primary cancer was completely removed during the original surgery.

Supporting Publication

Individualized prediction of colon cancer recurrence using a nomogram. Weiser MR, Landmann RG, Kattan MW, Gonen M, Shia J, Chou J, Paty PB, Guillem JG, Temple LK, Schrag D, Saltz LB, Wong WD. J Clin Oncol. 2008 Jan 20;26(3):380-5.

Numeracy



Adjuvant Tools

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RSS Feeds

MAYO CLINIC Health Manager

Get **free personalized** health guidance for you and your family.

Get Started

Adjuvant systemic therapy for resected colon cancer

Information entered:

Number of positive nodes:	1 to 4 nodes
Depth of tumor (T stage):	T3
Grade:	Low
Age (years):	50 to 59

Estimates for recurrence-free and overall survival are based on nodal status, T stage, grade and age.

Five-year recurrence-free survival:

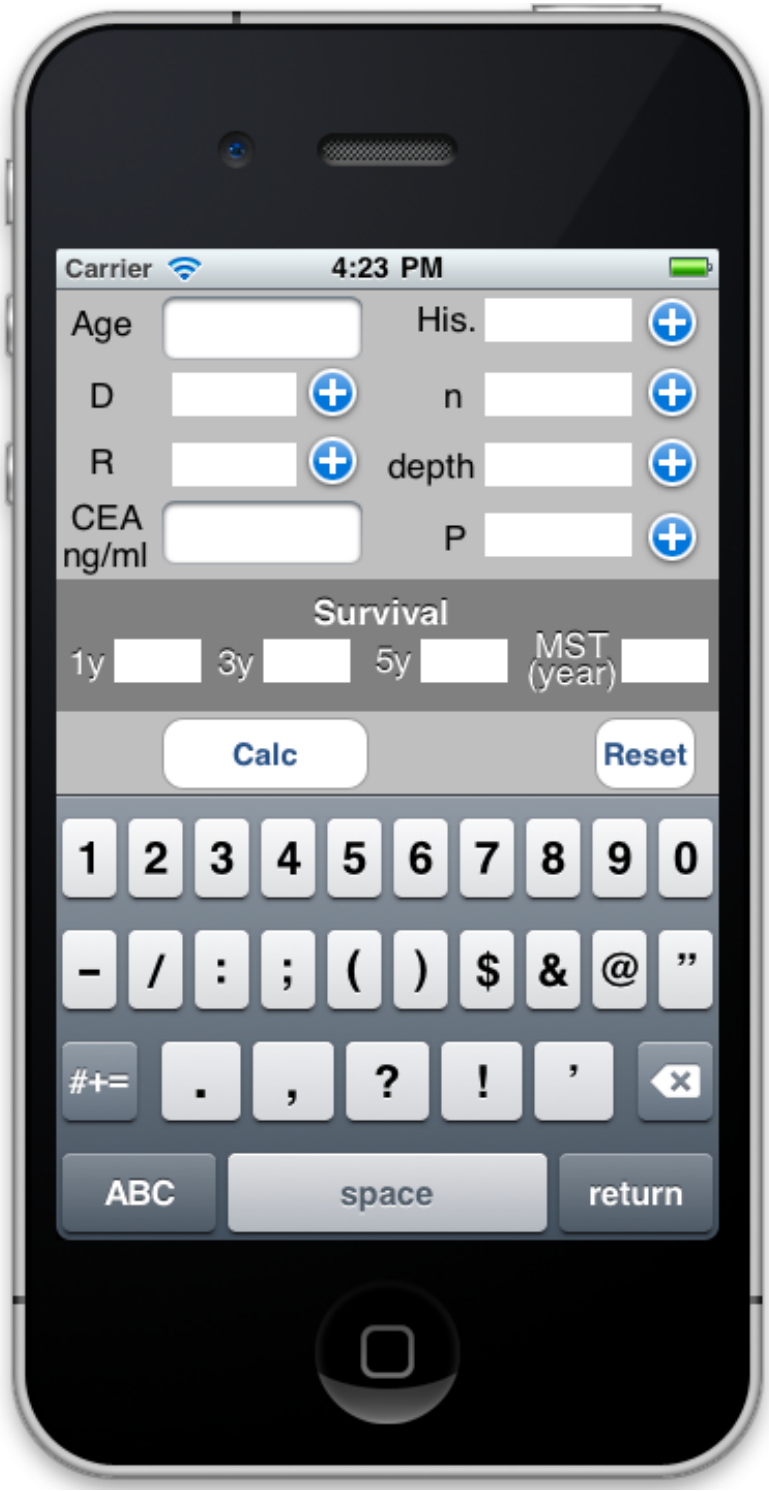
Baseline prognosis with surgery alone:	49%
Prognosis with surgery and adjuvant 5-FU:	65%
Prognosis with surgery and adjuvant FOLFOX*:	72%

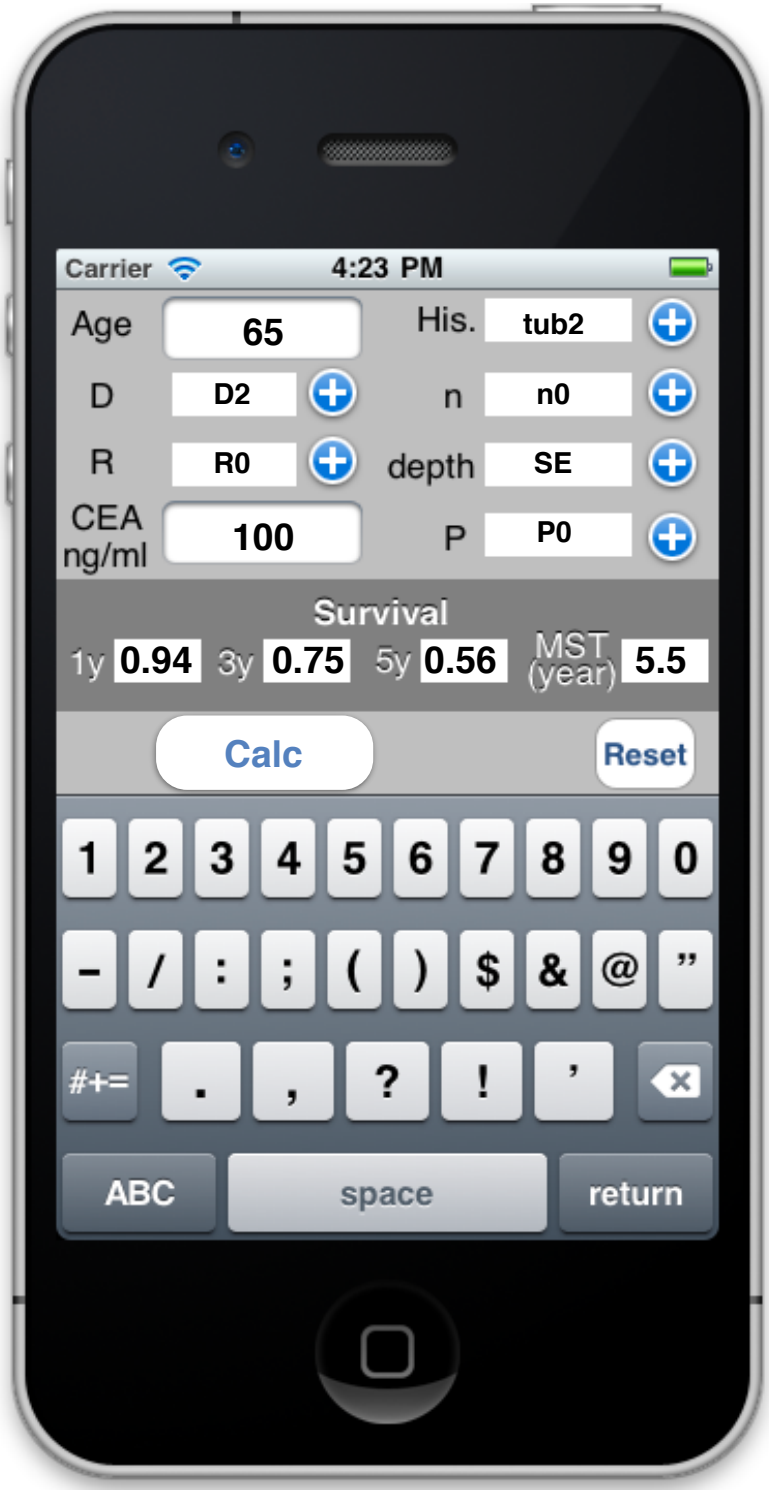
Five-year overall survival:

Baseline prognosis with surgery alone:	62%
Prognosis with surgery and adjuvant 5-FU:	73%
Prognosis with surgery and adjuvant FOLFOX*:	78%

*FOLFOX = OXAL + CF + 5-FU (Preliminary estimates based on early data from one single, but large, clinical trial.)

The following annual proportional reductions in risks of recurrence and death were used for calculations in this tool:


Carrier
4:23 PM
Age
His.
D
n
R
depth
CEA
ng/ml
P
Survival
1y
3y
5y
MST
(year)
Calc
Reset
1 2 3 4 5 6 7 8 9 0
- / : ; ( ) $ & @ ”
#+=
. , ? ! ’
ABC
space
return


Carrier
4:23 PM
Age
65
His.
tub2
D
D2
n
n0
R
R0
depth
SE
CEA ng/ml
100
P
P0
Survival
1y 0.94
3y 0.75
5y 0.56
MST (year)
5.5
Calc
Reset
1 2 3 4 5 6 7 8 9 0
- / : ; ( ) $ & @ ”
#+=
. , ? ! ’
ABC
space
return

説明

同意・選択

医師の裁量

ノモグラム

手術後に予想される生存確率・生存期間を提供

リスクに対する患者の寛容性

治療方針決定

Demo