

XXII CONGRESSO
AIRO
ROMA 2012
17-20 novembre
Ergife Palace Hotel



Associazione
Italiana
Radioterapia
Oncologica



Il futuro della radioterapia oncologica: la 'Knowledge Based Oncology'

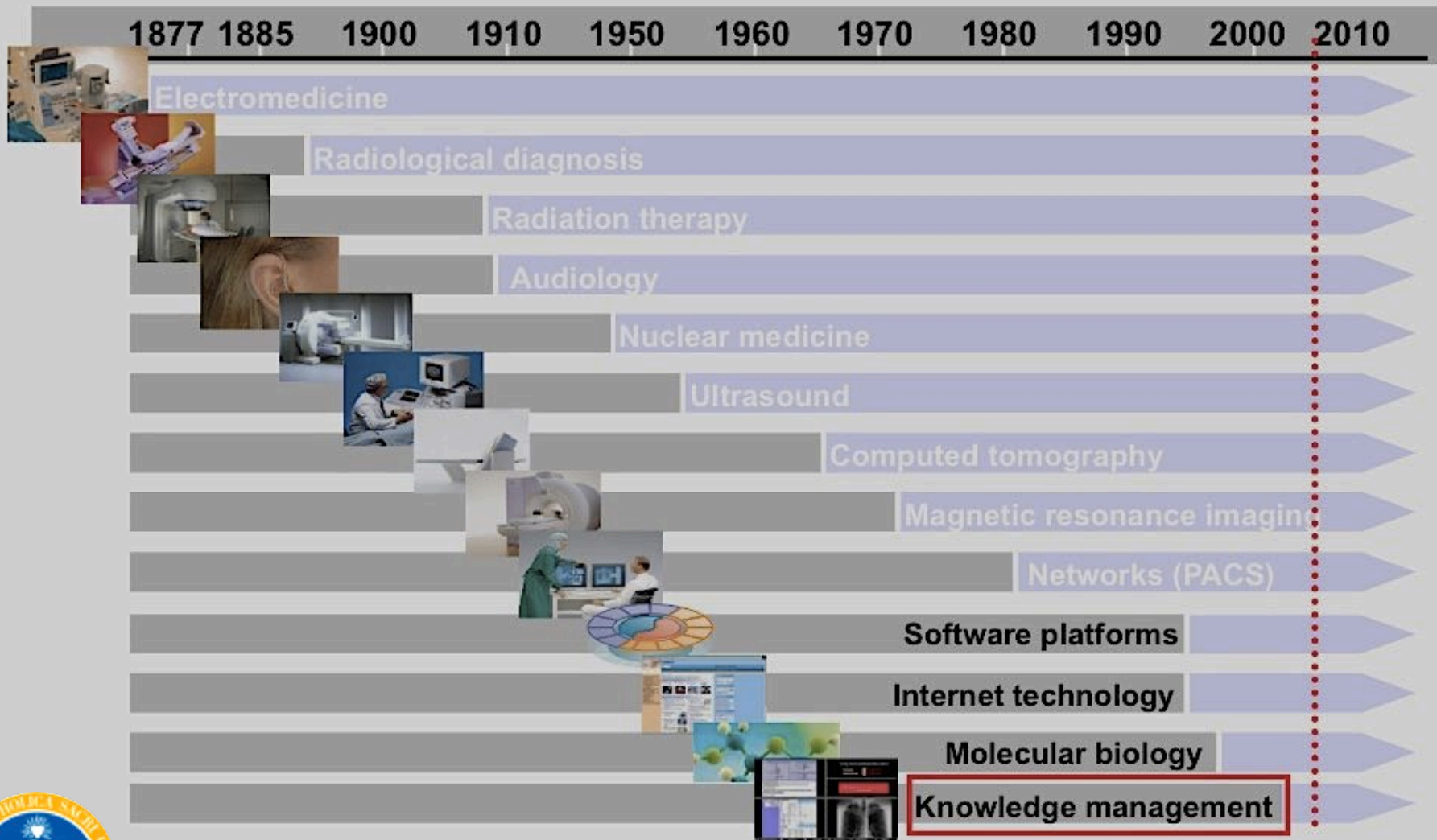


V. Valentini
Università Cattolica S. Cuore – Rome

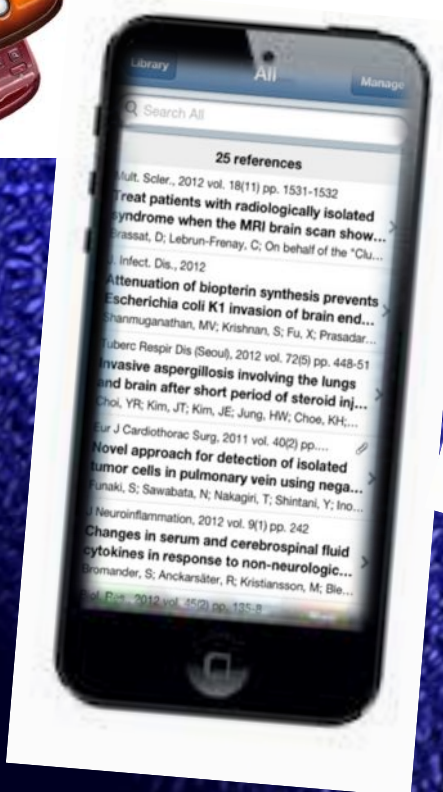


Accredited Center
2008-2011

Knowledge Based Technology

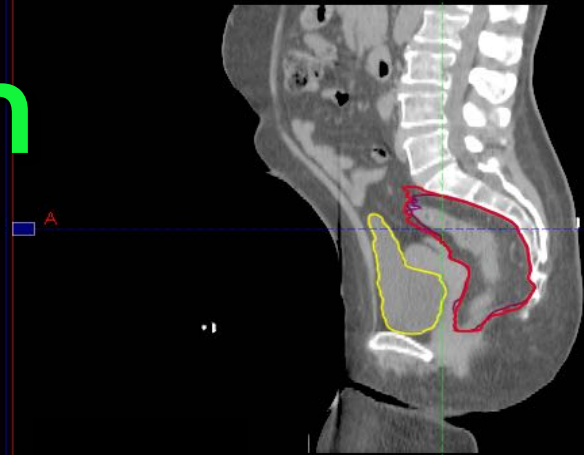
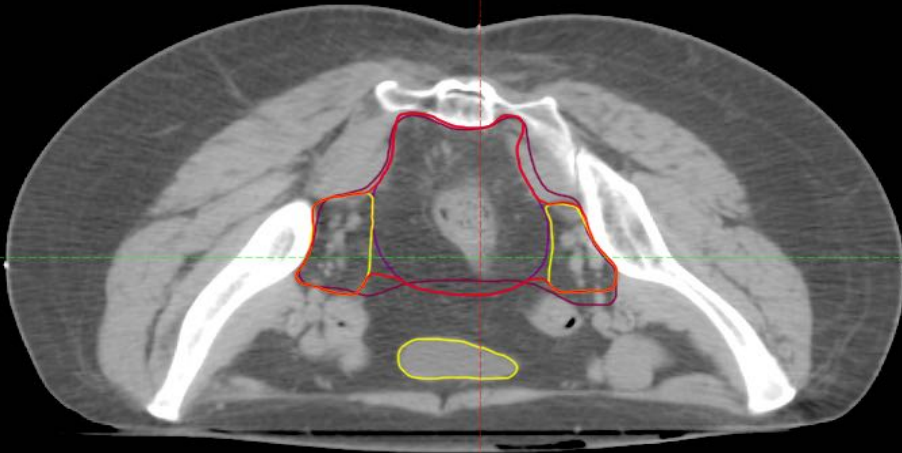


Knowledge Based Technology

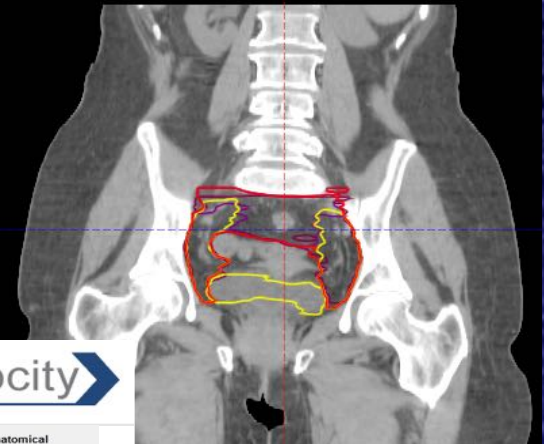


Knowledge Based Technology

Autodelineation



Frontal - CT 1 - 4/16/2012 14:59



ABAS

Atlas-based Autosegmentation



VARIAN | A partner for life
medical systems

Smart Segmentation™

Velocity

Automated Anatomical Segmentation

- Deformable atlas-based segmentation
- Advanced contouring platform
- Automated PET contouring

Knowledge Based Technology

Static vs dynamic Knowledge



Knowledge Based Technology

Ontology

Atlas Segmentation Wizard

Segmentation Options (Step 2 of 2)

Cancer Site: + OR

Cancer Subsite: + OR

Cancer Stage: e.g. Tx + OR
 e.g. Nx + OR
 e.g. Mx + OR

Cancer Laterality: All v

Subject Name: + OR

Keywords: +

Creator:

Atlas Mirroring: Atlas does not support Mirroring

of Atlas Matches:

Available Contours

- BRACHIAL PLEXUS + Add Contour
- BRAIN - Subjects
- BRAINSTEM - Subjects
- INFERIOR CONSTRUCTORS - Subjects
- LARYNX - Subjects
- LEFT COCHLEA - Subjects
- LEFT LENS - Subjects
- LEFT LEVEL IB - Subjects

Expert Case Browser

Search Tumor Site: Free Text Search Your Favorites

Tumor Site: Larynx

Current Filter: Larynx, T2, N2a

12 results found

ID	Tumor Staging	Node Staging	Metastasis
V001729	T2	N2a	M1
V001730	T2	N2a	M1
V001785	T2	N2a	M0
V001786	T2	N2a	M0
V001829	T2	N2a	M1
V001830	T2	N2a	M1
V005987	T2	N2a	M0
V005988	T2	N2a	M0
V006033	T2	N2a	M1
V006034	T2	N2a	M1
V006103	T2	N2a	M1
V006104	T2	N2a	M1

Tumor Staging

T1 T2 T3 T4a T4b

Node Staging

N0 N1 N2a N2b N2c N3


Metastasis

M0 M1

Tumor Side

Left Right

Preview: ID V001786



Structures

- BODY
- Bones
- Brain
- Brainstem
- Cochlea L
- Cochlea R
- CTV2
- CTV3
- Eye L
- Eye R
- Lung L
- Lung R

Personal

Case Desc

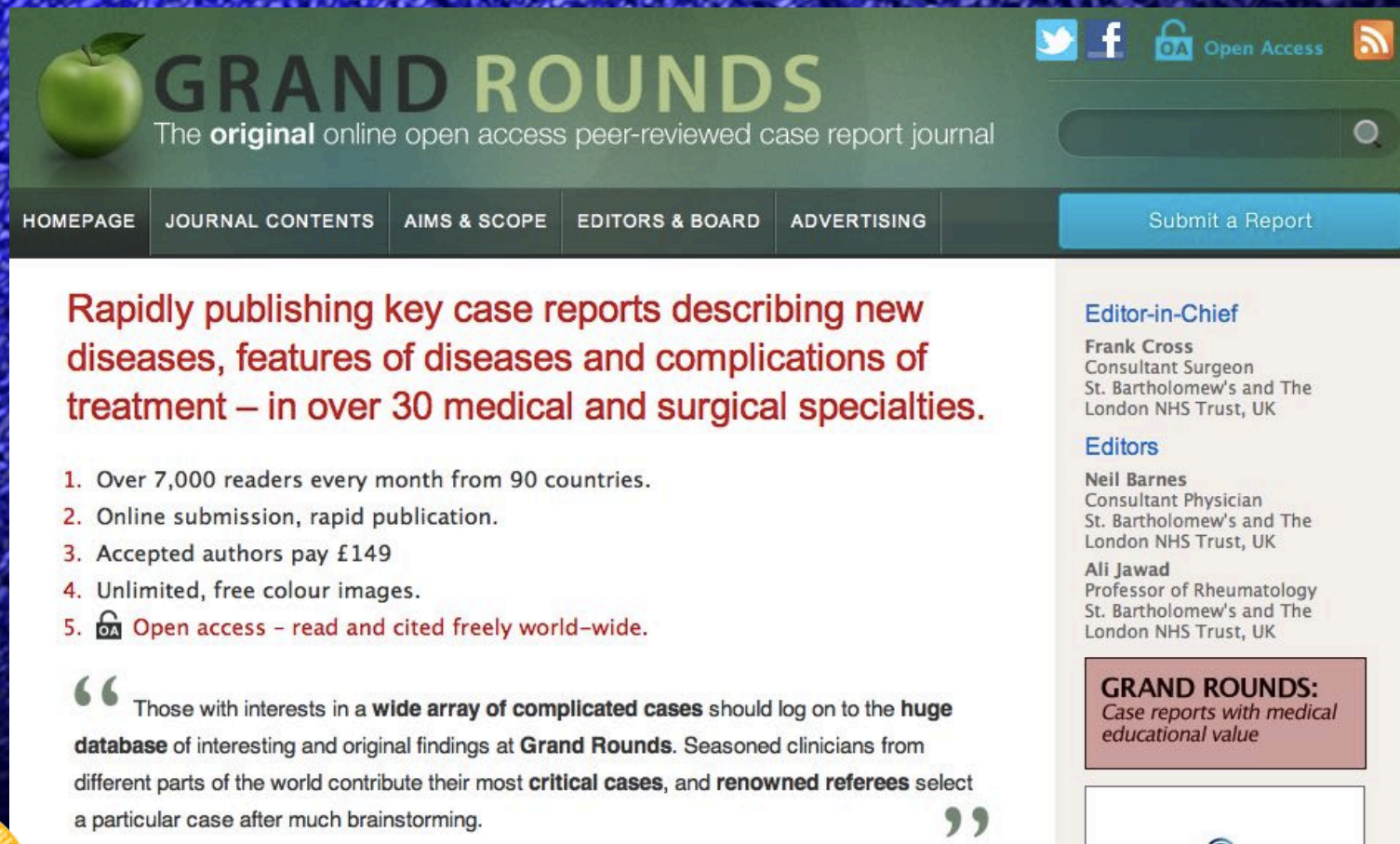
Expert A

Add to Favorites...



Knowledge Based Technology

Static vs dynamic Knowledge




The screenshot shows the homepage of the Grand Rounds journal. At the top left is a green apple logo. The main title "GRAND ROUNDS" is in large, bold, green letters. Below it, the subtitle reads "The original online open access peer-reviewed case report journal". To the right of the title are social media icons for Twitter, Facebook, and Open Access, along with an RSS feed icon. A search bar is located to the right of the subtitle. Below the title and subtitle is a navigation menu with links for "HOMEPAGE", "JOURNAL CONTENTS", "AIMS & SCOPE", "EDITORS & BOARD", and "ADVERTISING". A blue button labeled "Submit a Report" is positioned to the right of the navigation menu. The main content area features a large red headline: "Rapidly publishing key case reports describing new diseases, features of diseases and complications of treatment – in over 30 medical and surgical specialties." Below this headline is a list of five bullet points: 1. Over 7,000 readers every month from 90 countries. 2. Online submission, rapid publication. 3. Accepted authors pay £149. 4. Unlimited, free colour images. 5. Open access – read and cited freely world-wide. To the right of the main content area, there is a section for the "Editor-in-Chief" and "Editors". The Editor-in-Chief is Frank Cross, Consultant Surgeon at St. Bartholomew's and The London NHS Trust, UK. The Editors are Neil Barnes, Consultant Physician at St. Bartholomew's and The London NHS Trust, UK, and Ali Jawad, Professor of Rheumatology at St. Bartholomew's and The London NHS Trust, UK. At the bottom right of the main content area, there is a quote in a brown box: "GRAND ROUNDS: Case reports with medical educational value".

GRAND ROUNDS
The original online open access peer-reviewed case report journal

Twitter Facebook Open Access RSS

HOMEPAGE JOURNAL CONTENTS AIMS & SCOPE EDITORS & BOARD ADVERTISING Submit a Report

Rapidly publishing key case reports describing new diseases, features of diseases and complications of treatment – in over 30 medical and surgical specialties.

1. Over 7,000 readers every month from 90 countries.
2. Online submission, rapid publication.
3. Accepted authors pay £149
4. Unlimited, free colour images.
5.  Open access – read and cited freely world-wide.

“ Those with interests in a **wide array of complicated cases** should log on to the **huge database** of interesting and original findings at **Grand Rounds**. Seasoned clinicians from different parts of the world contribute their most **critical cases**, and **renowned referees** select a particular case after much brainstorming. ”

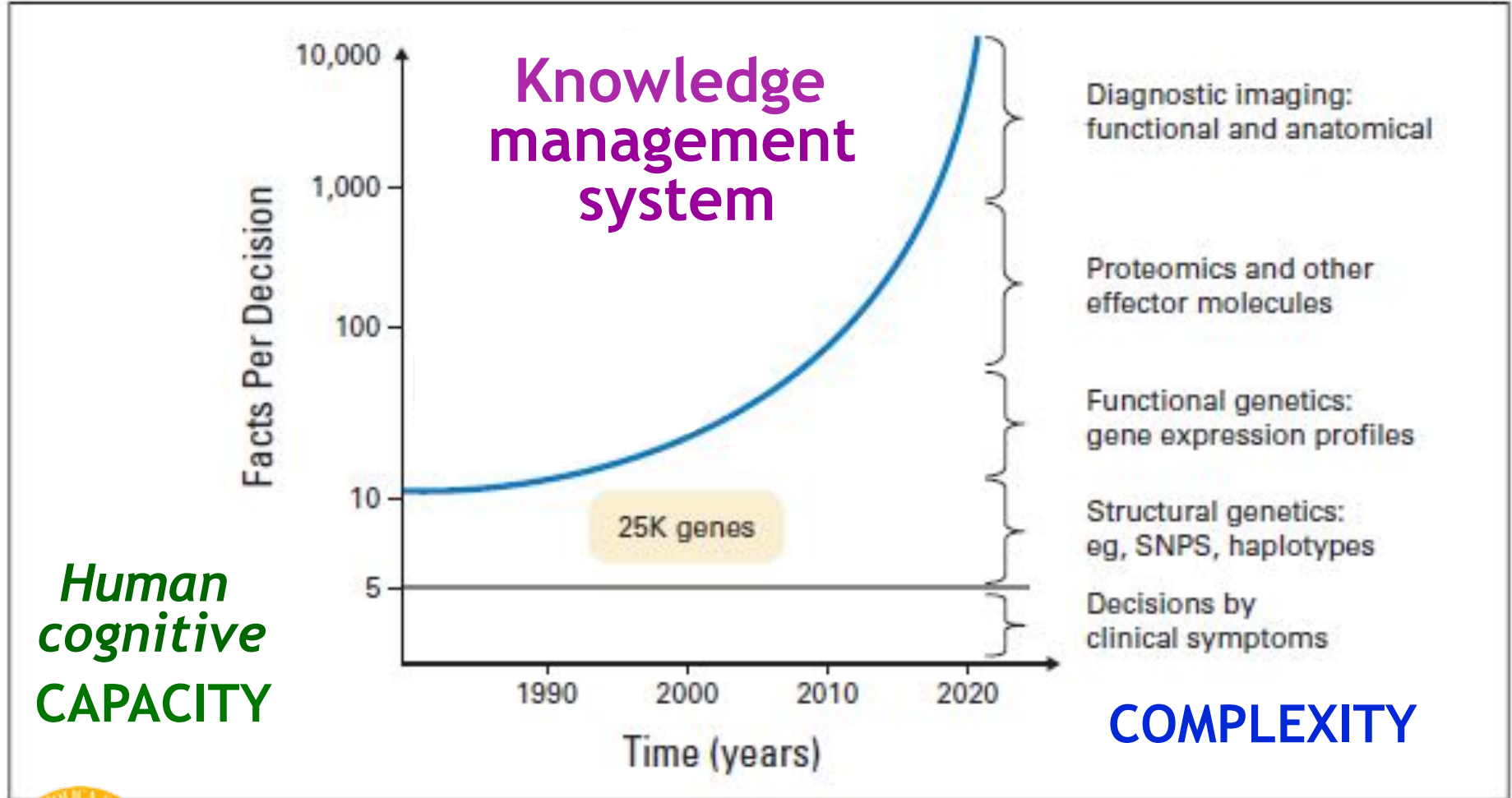
Editor-in-Chief
Frank Cross
Consultant Surgeon
St. Bartholomew's and The London NHS Trust, UK

Editors
Neil Barnes
Consultant Physician
St. Bartholomew's and The London NHS Trust, UK
Ali Jawad
Professor of Rheumatology
St. Bartholomew's and The London NHS Trust, UK

GRAND ROUNDS:
Case reports with medical educational value



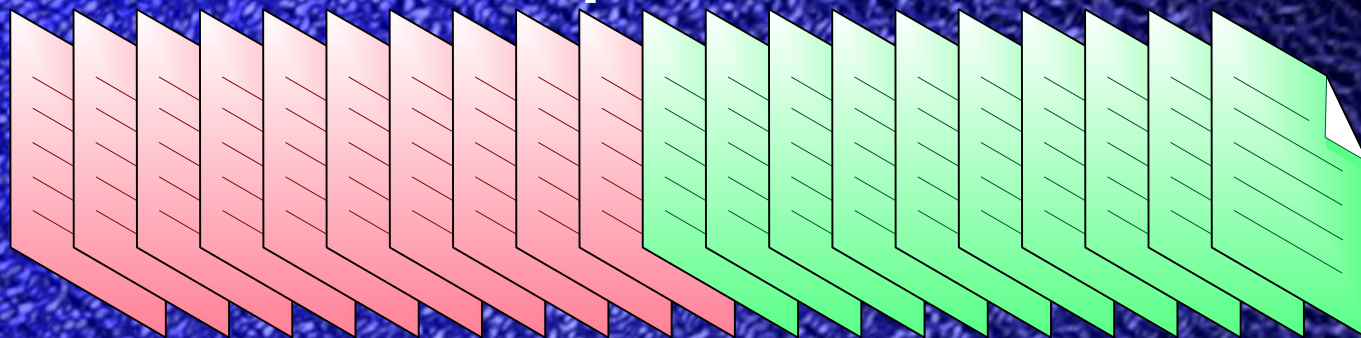
Complexity and Prediction



Complexity and Prediction

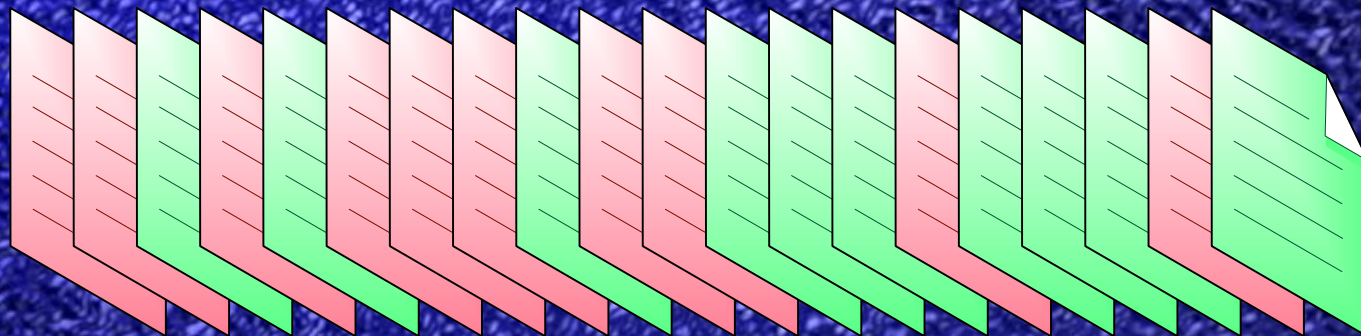
Experiment

A



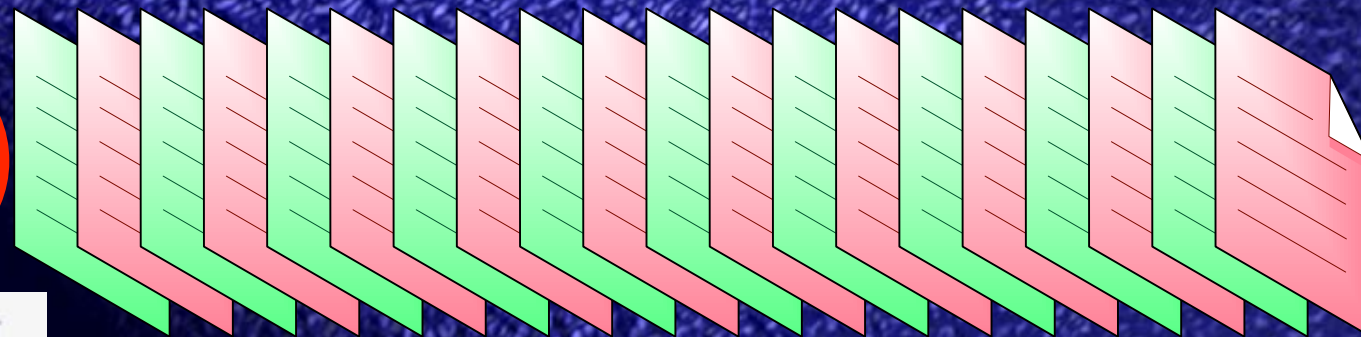
AUC
1.0

B



AUC
0.7

C



AUC
0.5

Knowledge Based Oncology

INDIVIDUALIZED

- Tailoring treatments by prognostic/predictive features

Clinical
decision

ADAPTIVE

- Tailoring treatments by continuous monitoring

MODELLING

- Prediction by multidimensional large databases



Clinical decisions (adaptive era)

INTENSIFICATION

Neoadjuvant^A
regimen

ADAPTIVE 1

Surgery procedure

ADPTIVE 2

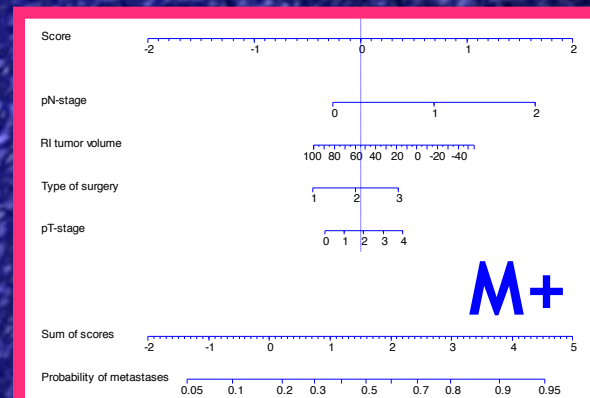
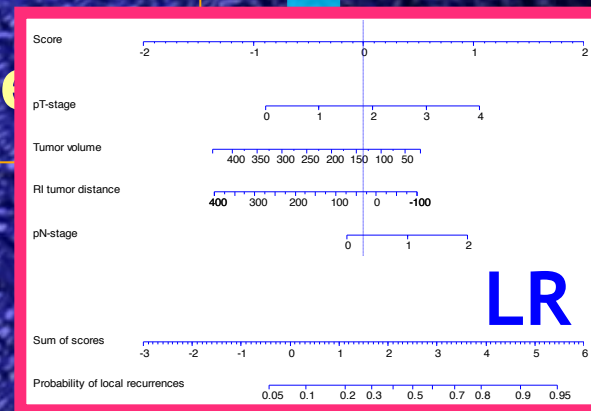
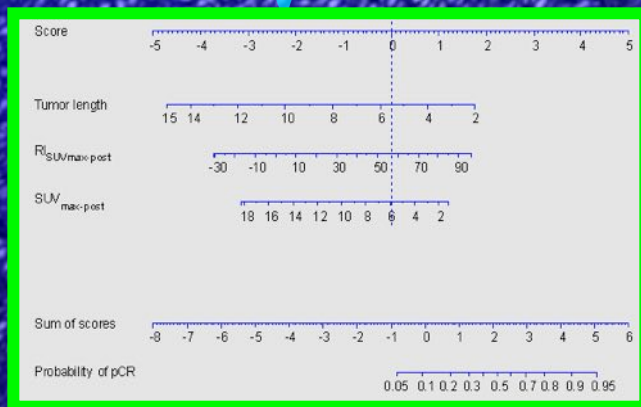
Adjuvant Chemo
Follow-up density

RT±CT

Surge

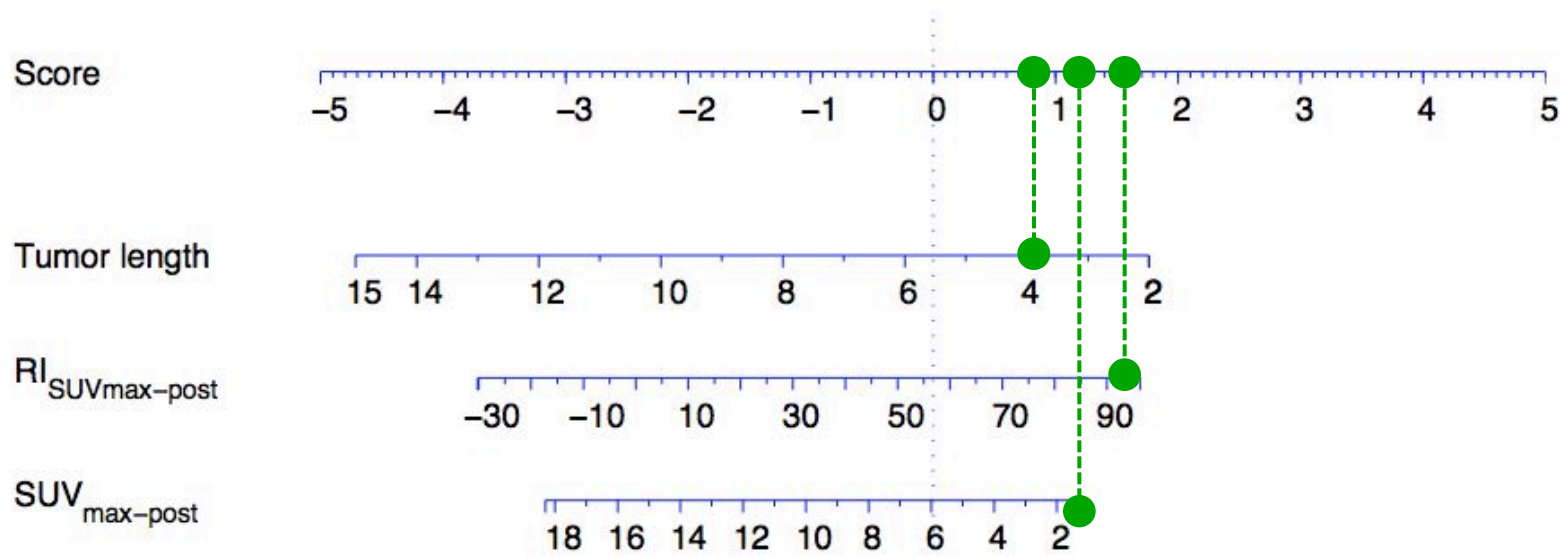
cStad

Imaging



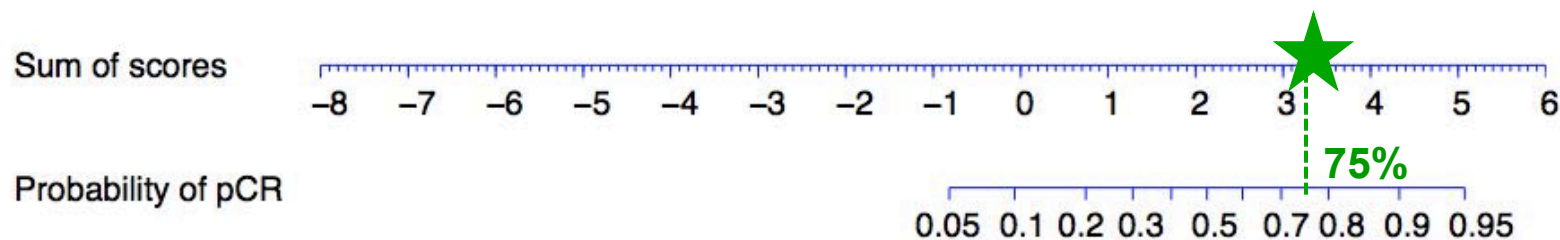
Nomogram

CR



Sum of scores 3.3

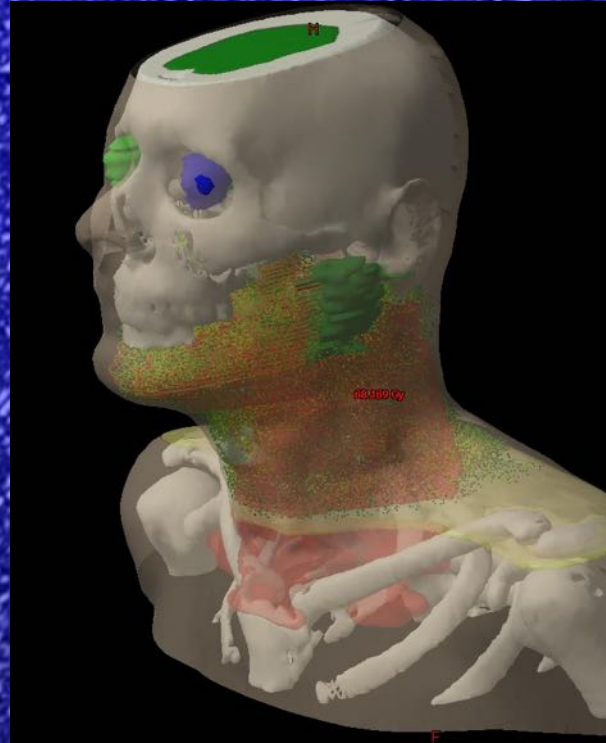
AUC = 0.86



Van Stiphout R, V.Valentini et Al - *Radioth Oncol* – 2011

Knowledge Based Oncology

The Radiation Oncology privilege

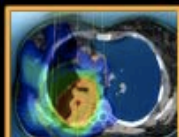


Knowledge Based Oncology

Clinical case data



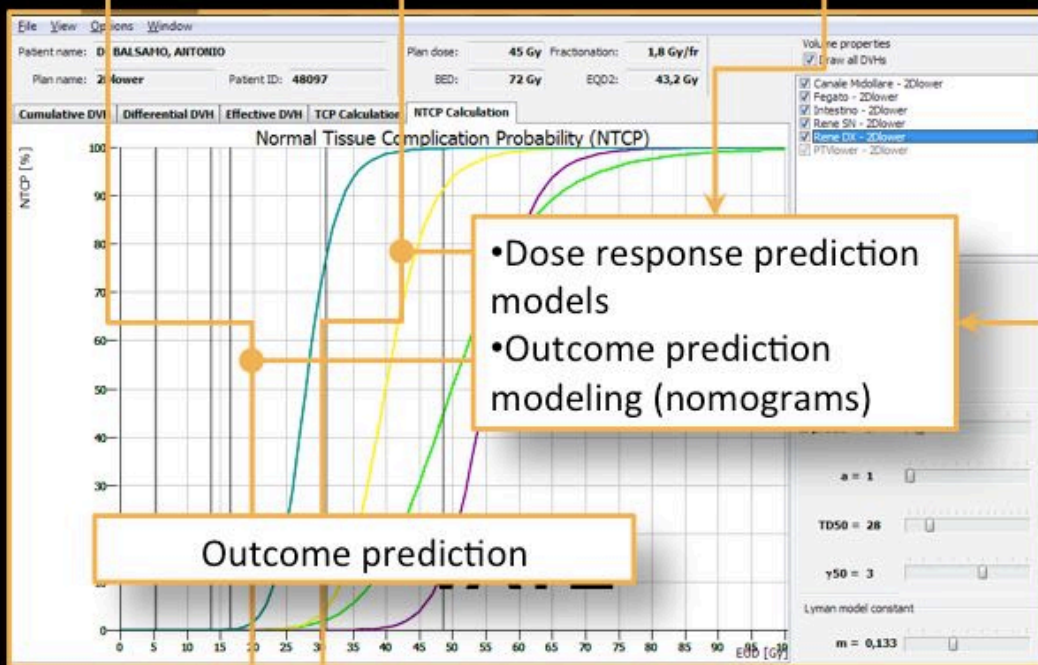
Physical dose distribution



Single center (on site) database



Multicenter (reference) database

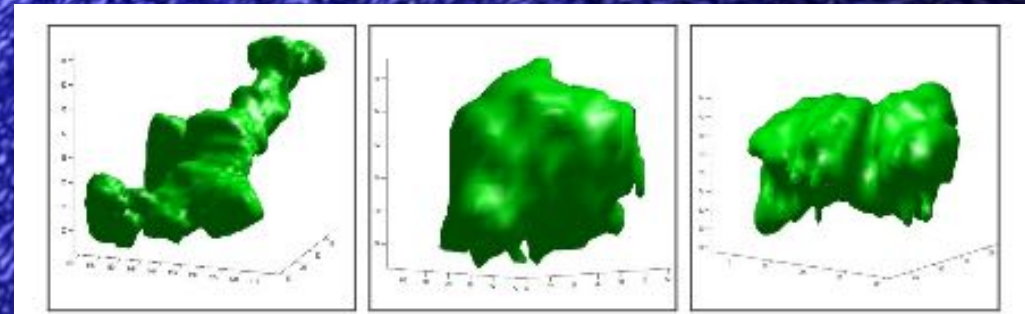


Radiomics: Imaging Feature Extraction

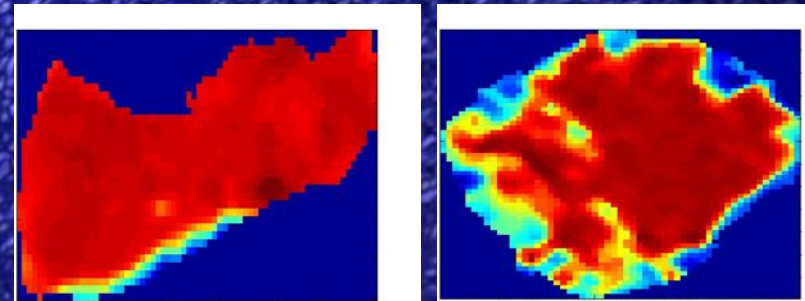
First order statistics



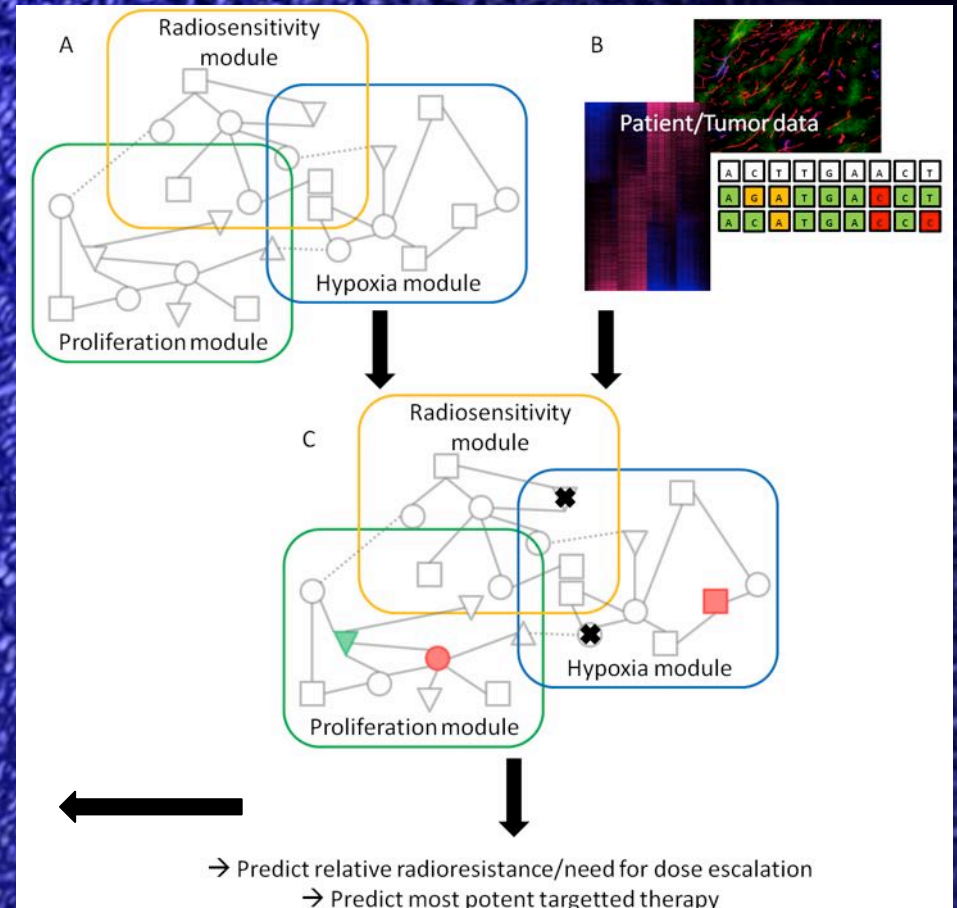
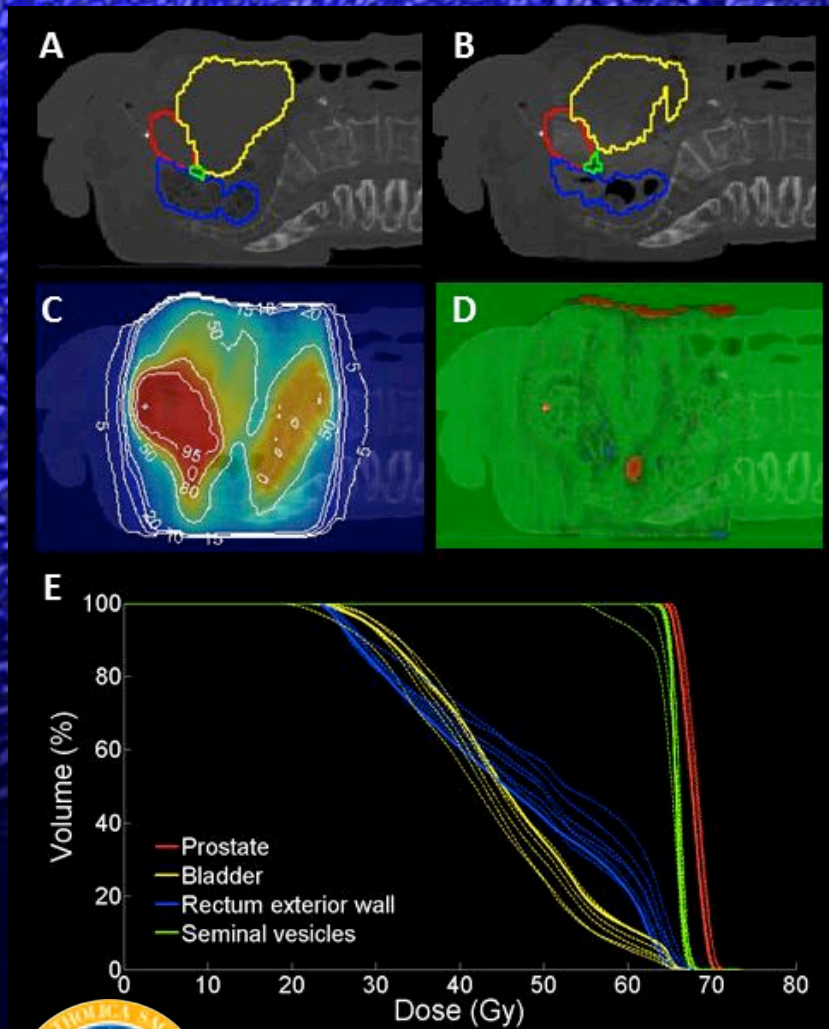
Shape based features



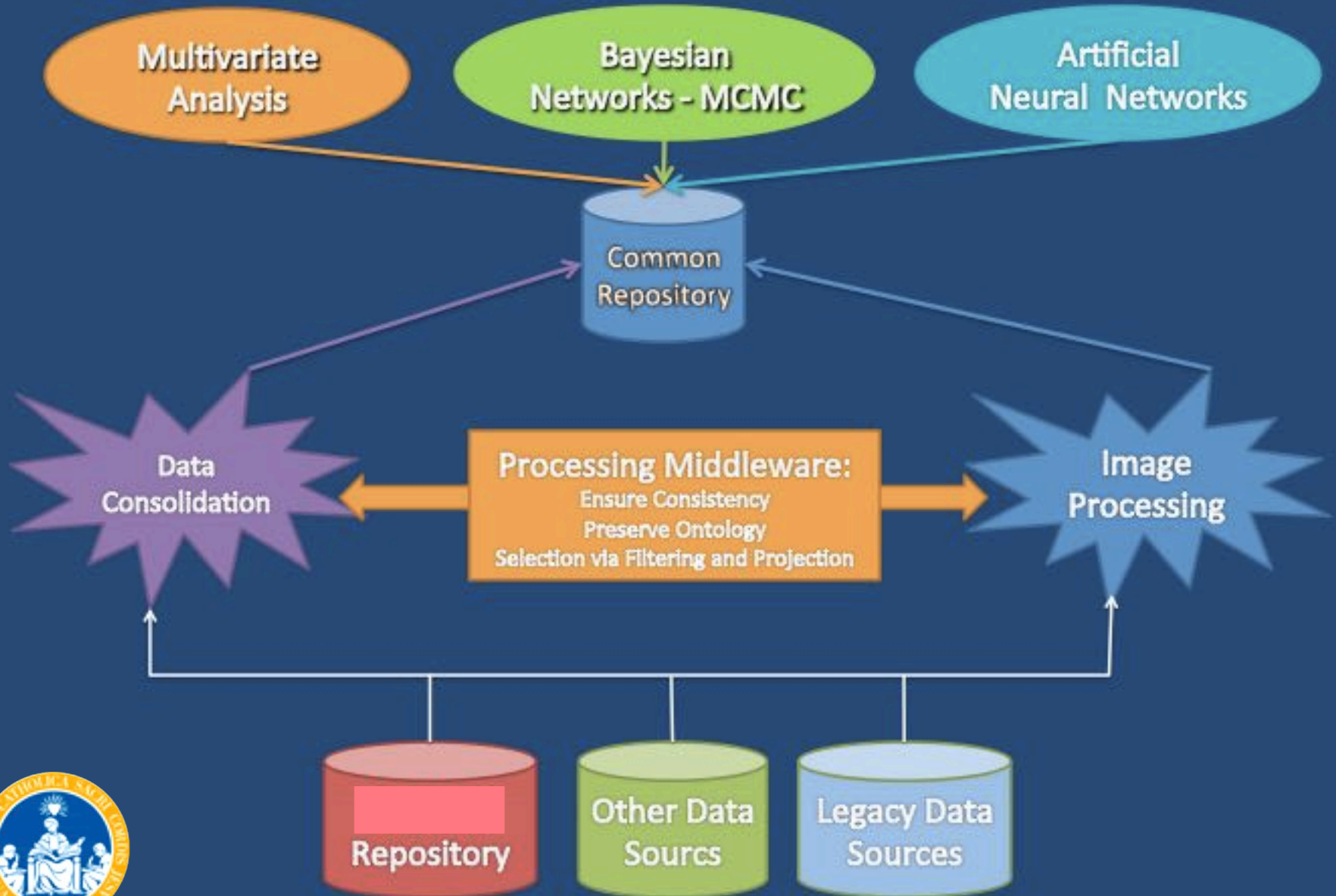
3D texture analysis



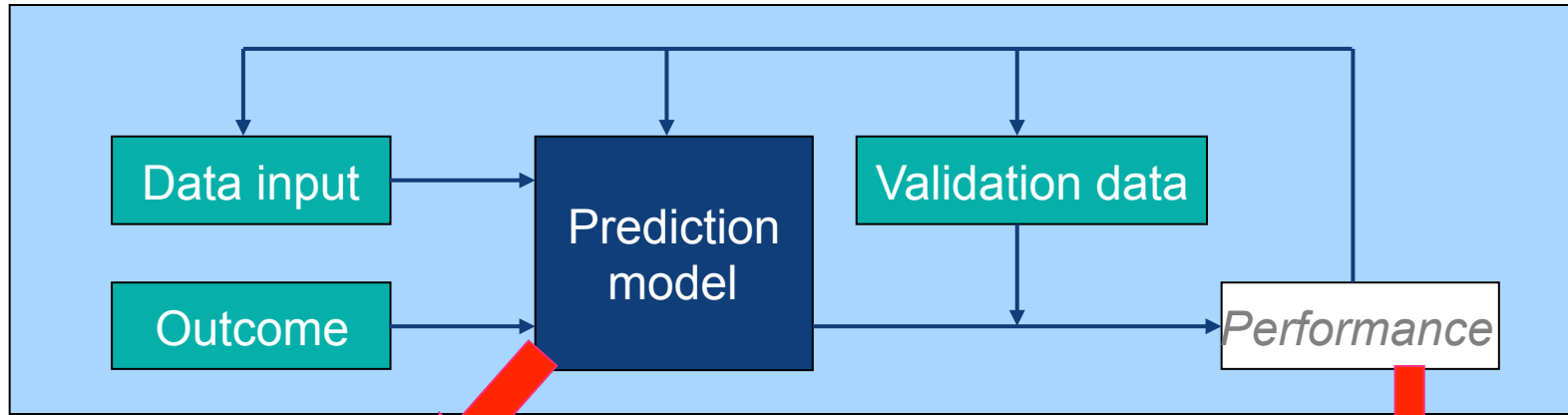
Radiomics: Imaging Feature Extraction



Knowledge Based Oncology

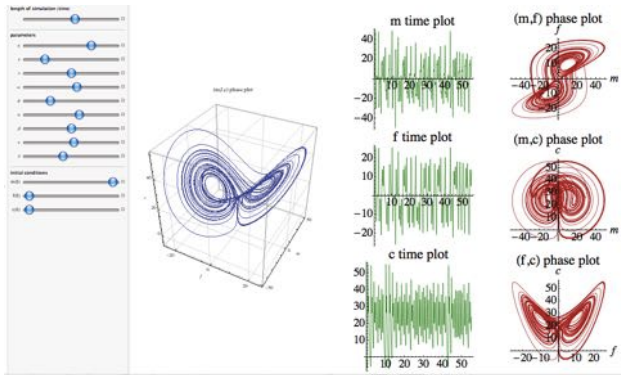


Knowledge Based Oncology

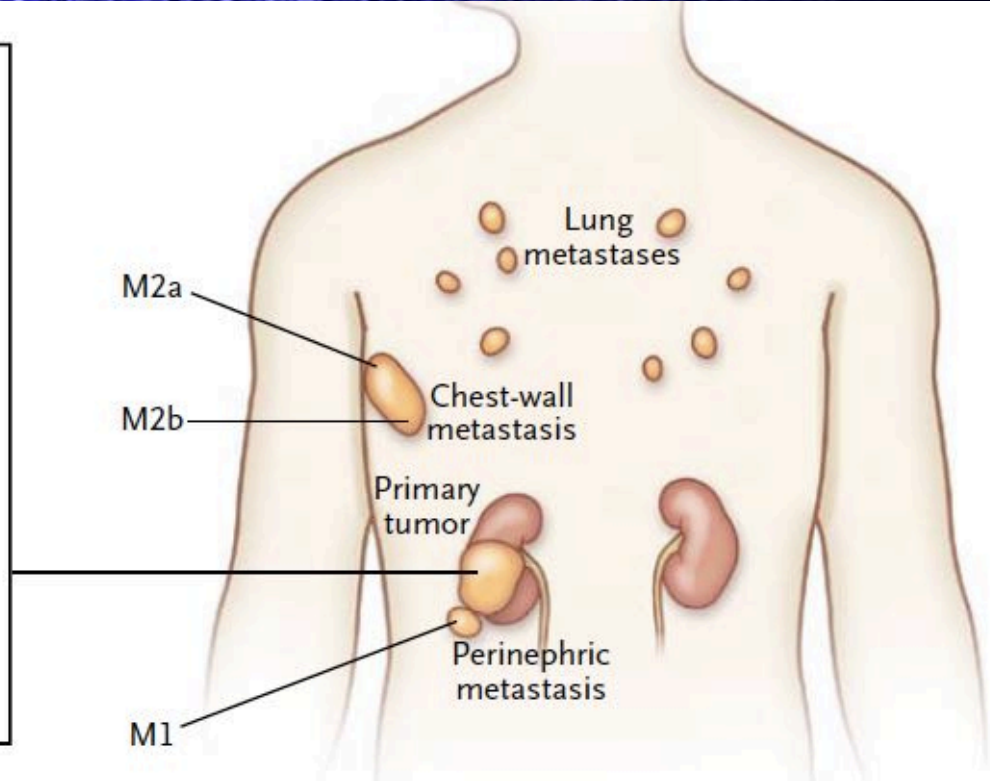
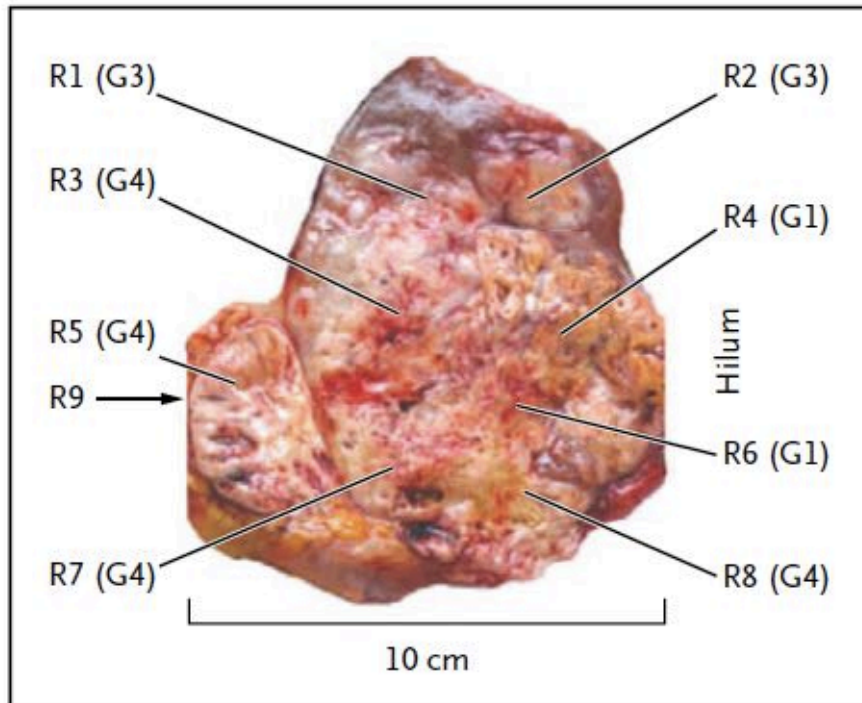


Modelling framework:

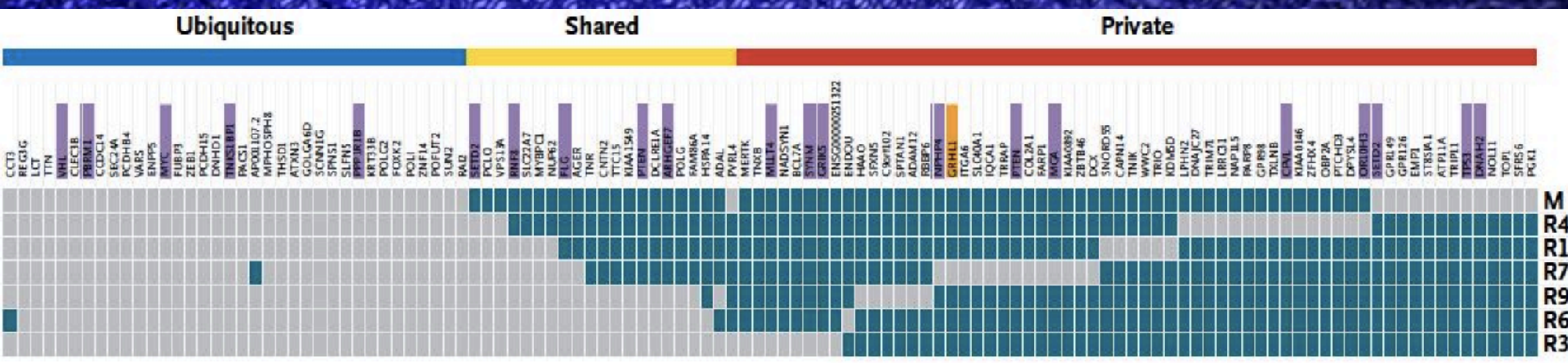
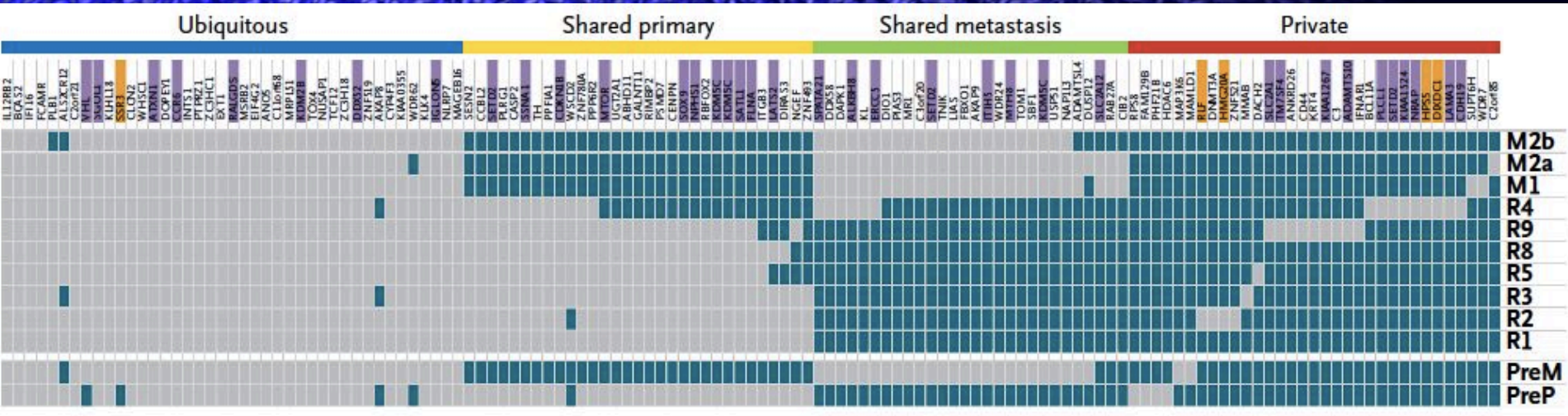
Chaos Theory



Knowledge Based Oncology

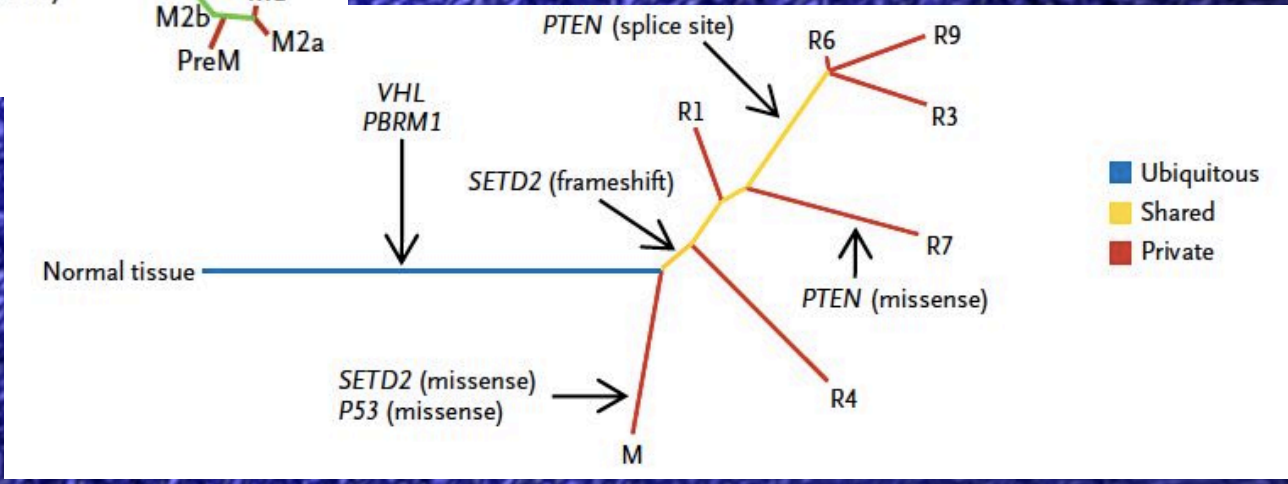
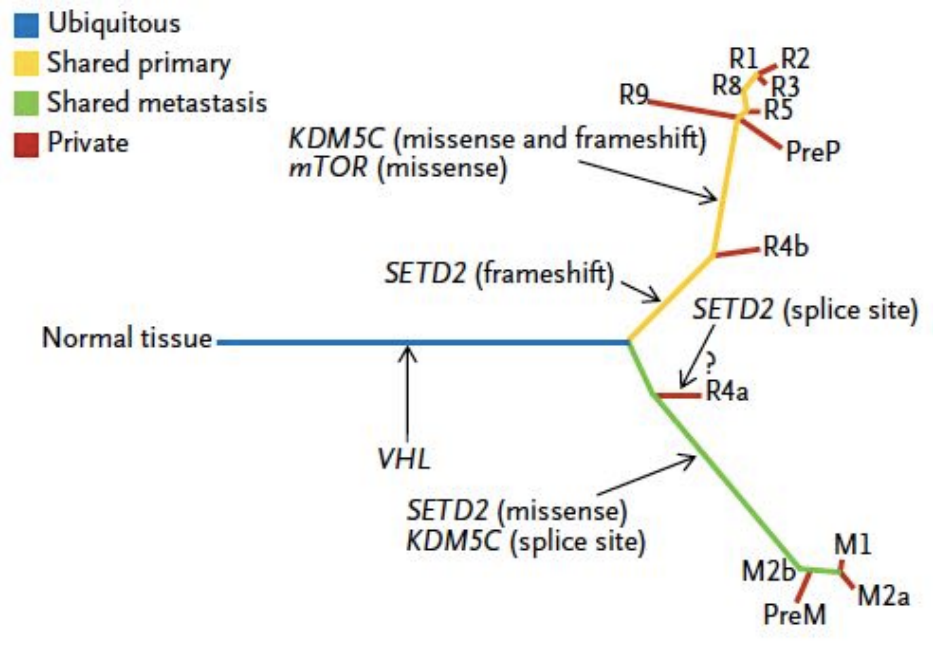


Knowledge Based Oncology

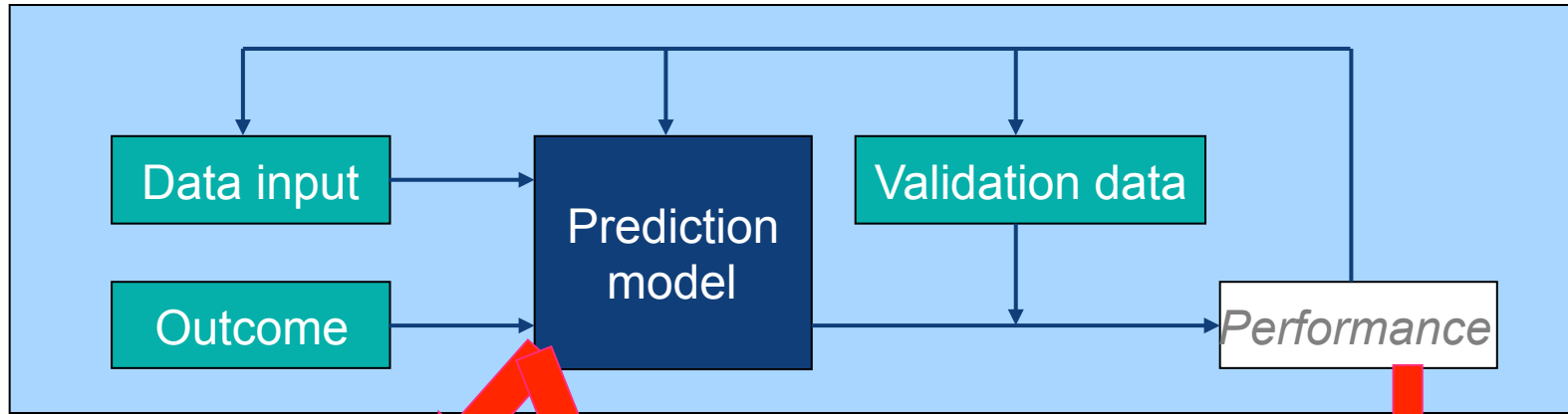


Gerlinger M et al – NEJM - 2012

Knowledge Based Oncology



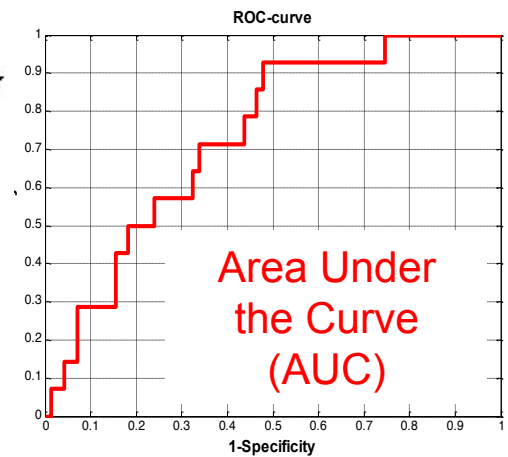
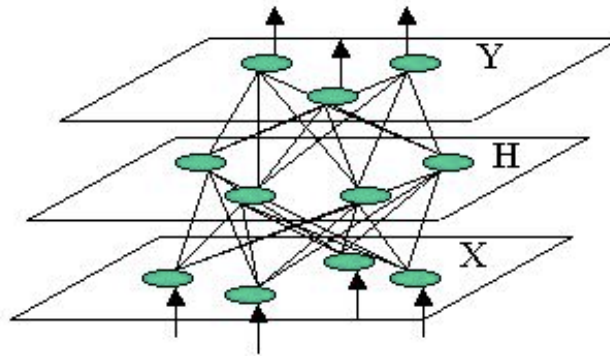
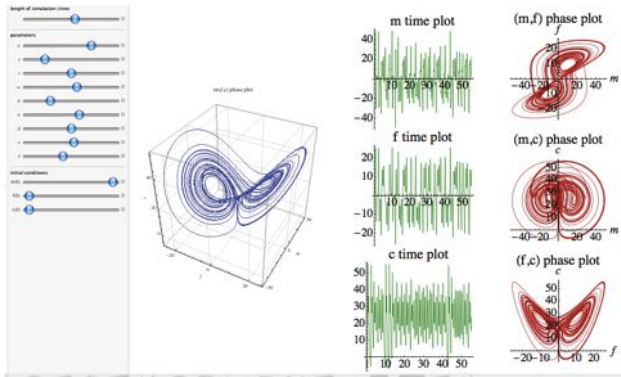
Knowledge Based Oncology



Modelling framework:
Chaos Theory

Evolutionary model:
Simulated Neural Network

Performance evaluation:
ROC curve

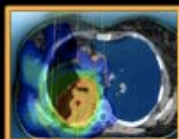


Knowledge Based Oncology

Clinical case data



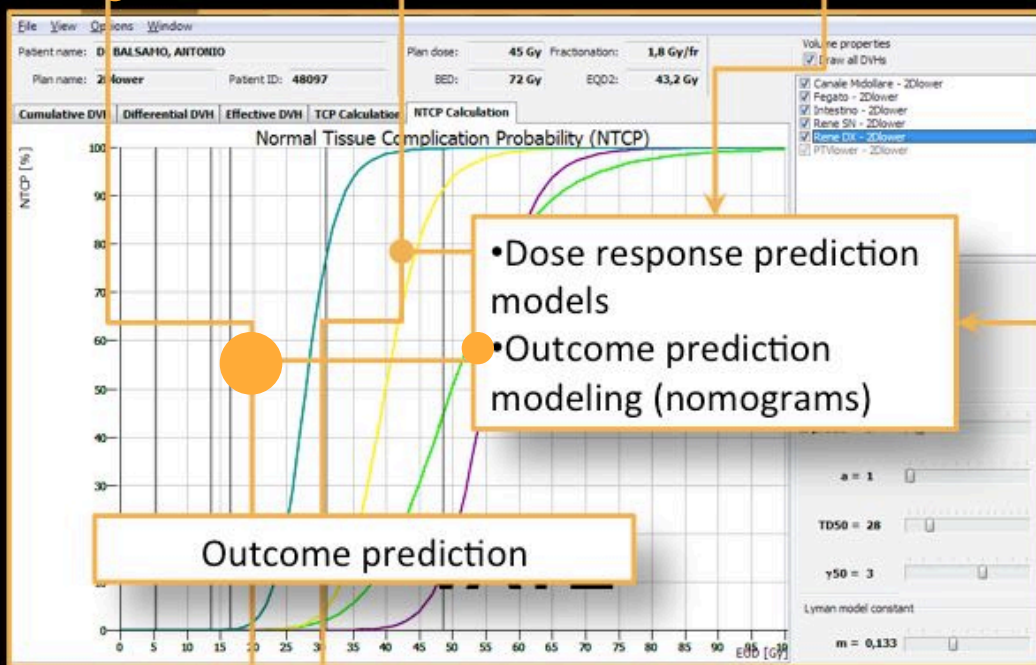
Physical dose distribution



Single center (on site) database



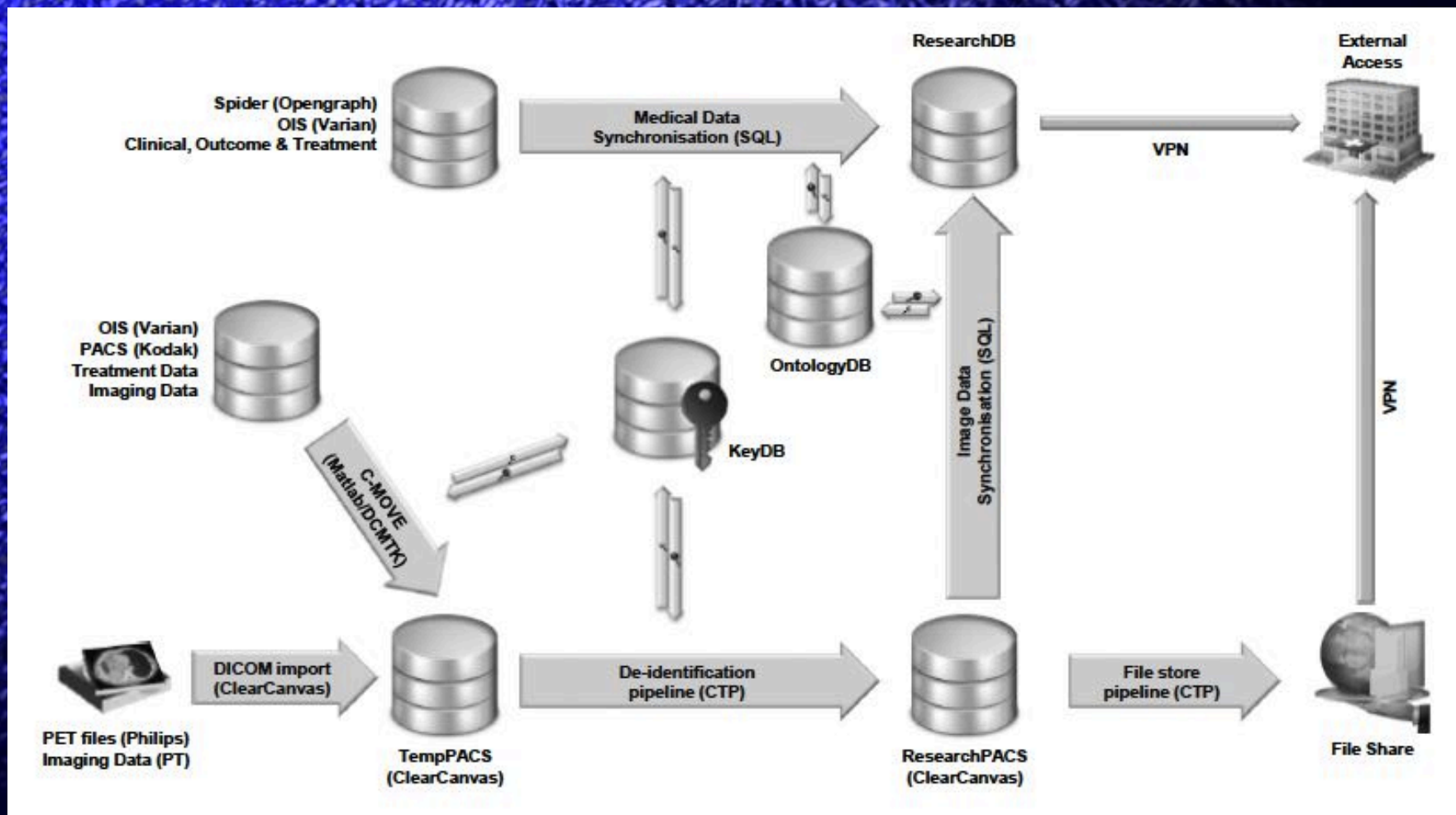
Multicenter (reference) database



87 ± 7 %



Facilitated data transfer

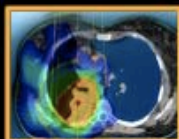


Knowledge Based Oncology

Clinical case data



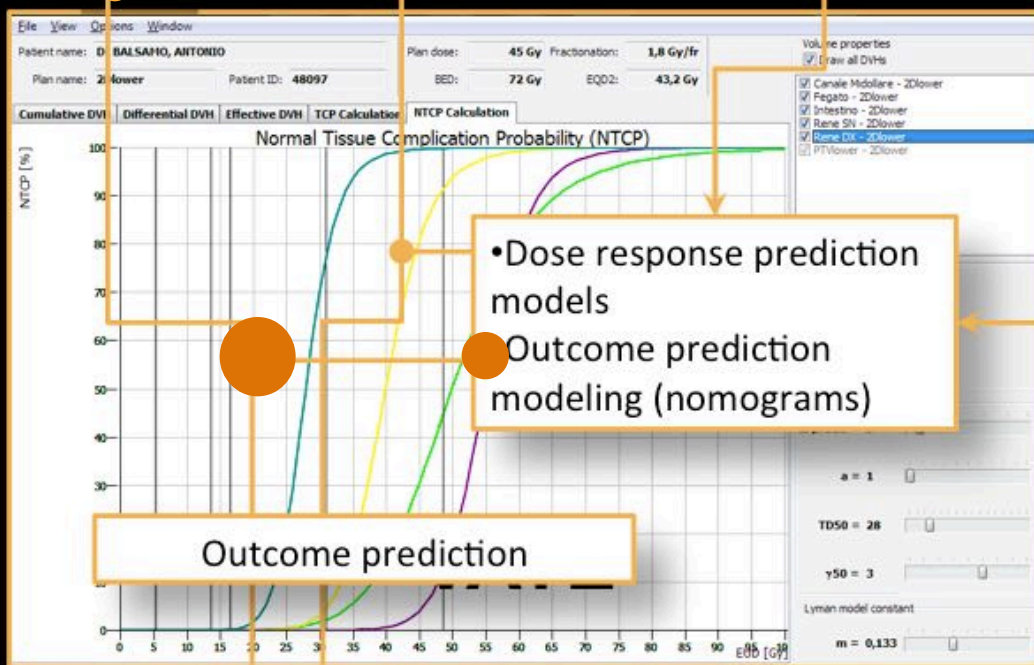
Physical dose distribution



Single center (on site) database



Multicenter (reference) database



$94 \pm 5 \%$



The meaning of a decision

We can distinguish between
«**weak evaluations**»,
when it is about the **results of the action**,
and «**strong evaluations**».
about **the quality of its motivations**.

(Ch. Taylor)



The meaning of a decision

The **diagnostic and therapeutic** actions, but also the **cooperative and managerial** ones, **insert the element of will, of choice,** of direct engagement in the exercise of the **scientific and technical competence.**



The meaning of a decision

Such elements answer to questions like:

what was the meaning of our looking for
the most efficient therapeutic line?

- Avoiding **legal troubles**?
- Displaying **personal excellence** to the colleagues?
- Looking for **career advancements**?
- Being faithful to human **dignity of the medical profession**?
- Living up to certain meanings of the relationship with **the needs and suffering of other people**?



Classic Ethics

By "ethics" we mean the reflection

on man's freewill in various fields

(politics, economics, medicine, etc..),

aiming at a responsible behavior,

consistent with principles and values

related to a particular conception of man and society.



ESTRO Strategy Meeting

Radiotherapy and Oncology 103 (2012) 99–102



Contents lists available at SciVerse ScienceDirect

Radiotherapy and Oncology

journal homepage: www.thegreenjournal.com



ESTRO Vision 2012

ESTRO 2012 Strategy Meeting: Vision for Radiation Oncology

Vincenzo Valentini^{*,1,4,5}, Jean Bourhis^{2,4,5}, Donal Hollywood^{3,4,5}

European Society for Radiotherapy and Oncology (ESTRO), Brussels, Belgium

ARTICLE INFO

Article history:

Received 23 March 2012

Accepted 23 March 2012

Available online 3 April 2012

⁴ On behalf of ESTRO Board of Directors (*Board of Directors*: Claus Belka, Mary Coffey, Alessandro Cortese, Christine Haie-Meder, Karin Haustermans, Jens Overgaard, Corrie Marijnen, Dag Rune Olsen, Fiona Stewart, Dirk Verellen).

⁵ On behalf of Strategy Meeting Participants (*Strategy Meeting participants*: Cai Grau, Joanna Kazmierska, Vincent Khoo, Tommy Knöös, Yolande Lievens, Ben Mijnheer, Filipe Moura, Ludvig Muren, Richard Pötter, Umberto Ricardi, Christine Verfaillie, Brad Wouters, Daniel Zips).



ESTRO Vision

Every cancer patient in Europe will have access to state of the art radiation therapy, as part of a multidisciplinary approach where treatment is individualised for the specific patient's cancer, taking account of the patient's personal circumstances.