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& ONCOLOGY
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brussels airlines – we fly you to the home of Magritte
magritte

3° Taller Internacional Multidisciplinario de Cáncer de Mama

&

1° Simposio de Cáncer Ginecológico

&

1° Taller de Planificación y Control de Calidad para Radiocirugía

"De la práctica a las bases teóricas"

Nuevas modalidades de radioterapia respectando el principio Pareto

No tengo ningún conflicto de interés.

Instituto Zunino

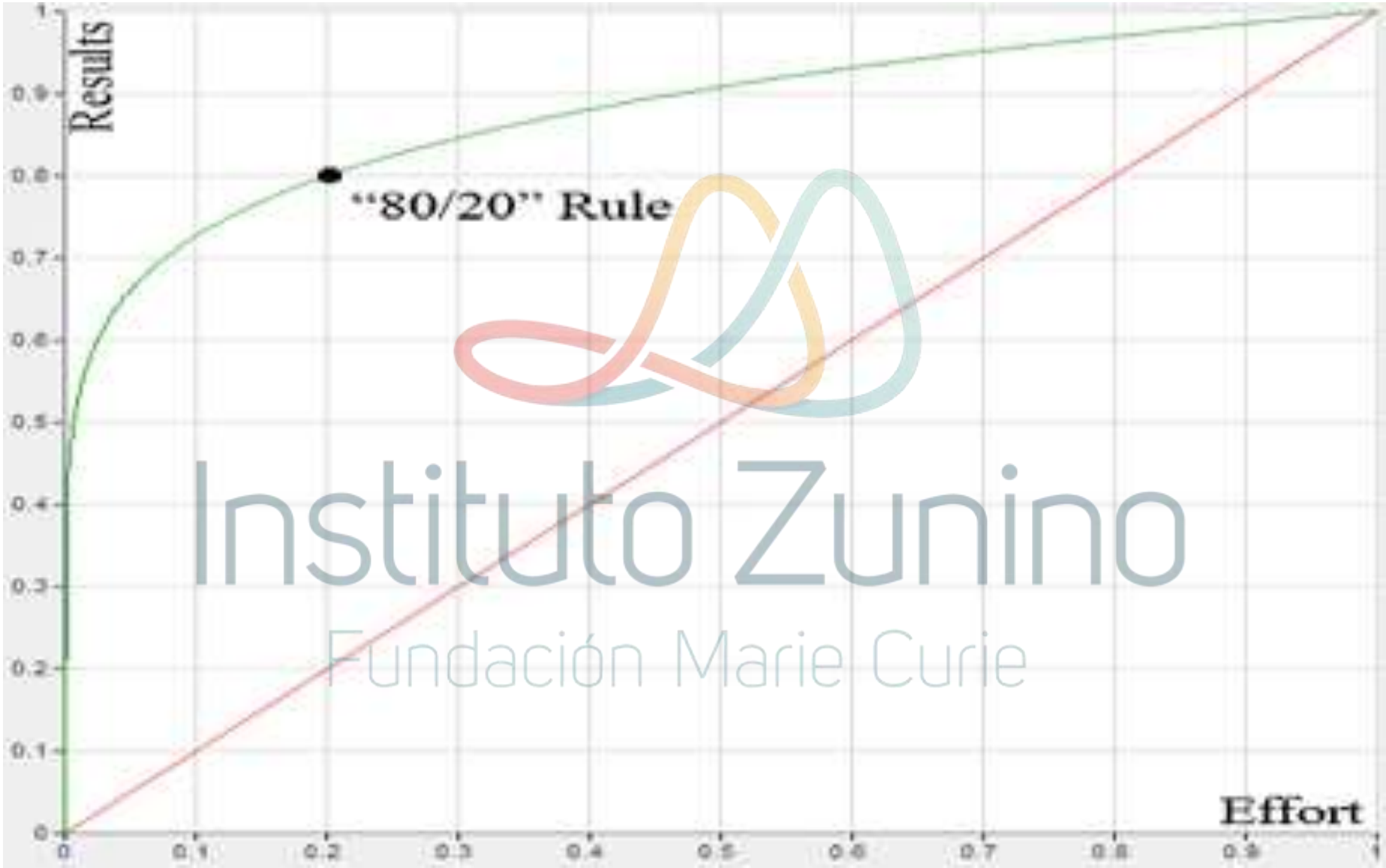
Fundación Marie Curie

RT developments & the Pareto principle

1. Introduction
2. Developments
3. Challenges
4. Discussion
5. Conclusions

RT developments & Pareto: *Introduction*

RT developments & Pareto: *Introduction*



RT developments & Pareto: *Introduction*

Estimated "optimal" utilisation rate of RT in % of diagnosed patients during the entire course of their cancer (HERO-project)

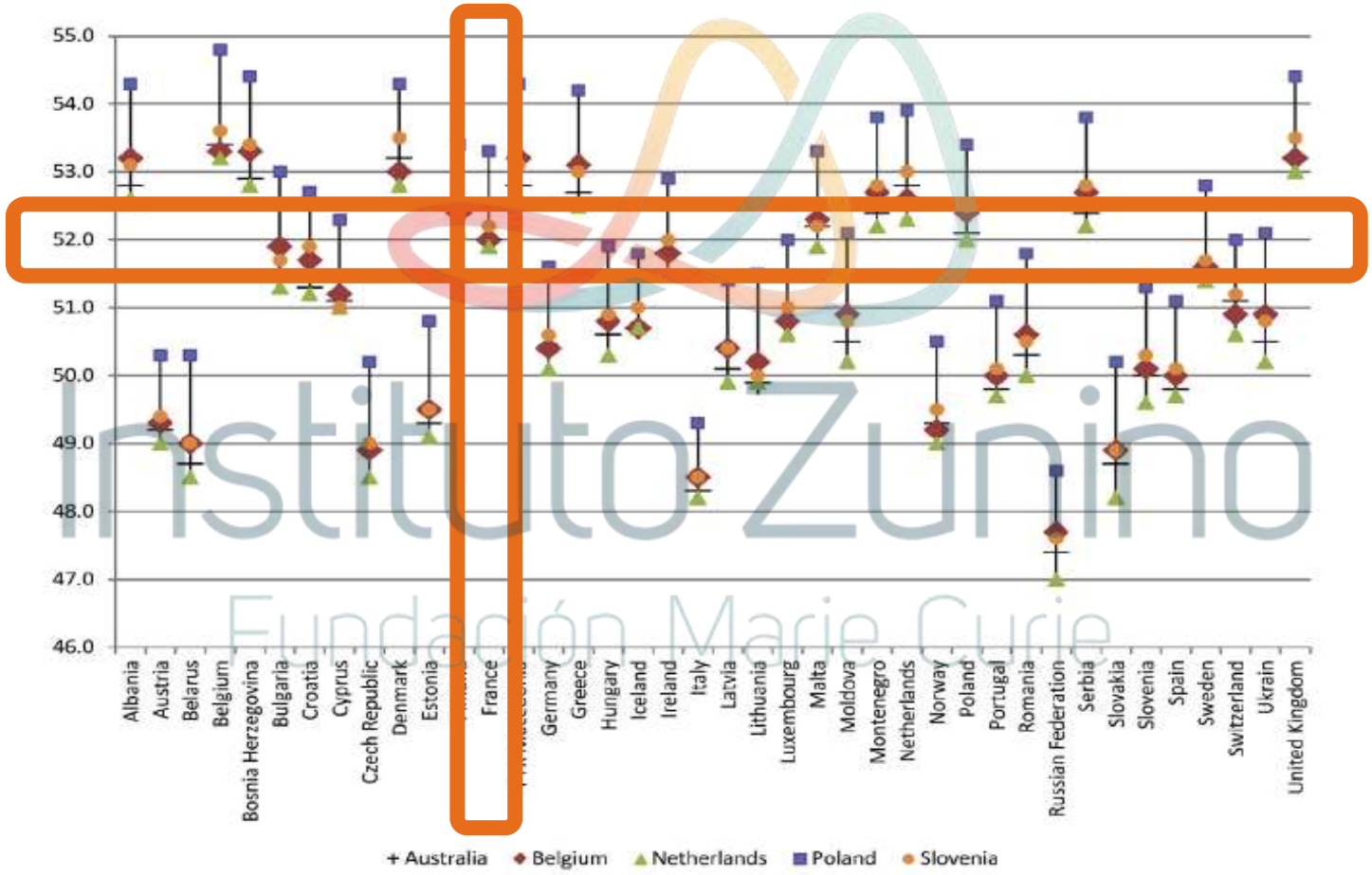


Fig. 1. Range of values for overall optimal utilization proportion by country (in percentages of total cancer incidence).

RT developments & Pareto: *Introduction*

% of patients treated per European country divided by the estimated "optimal" utilisation rate of RT (HERO-project)

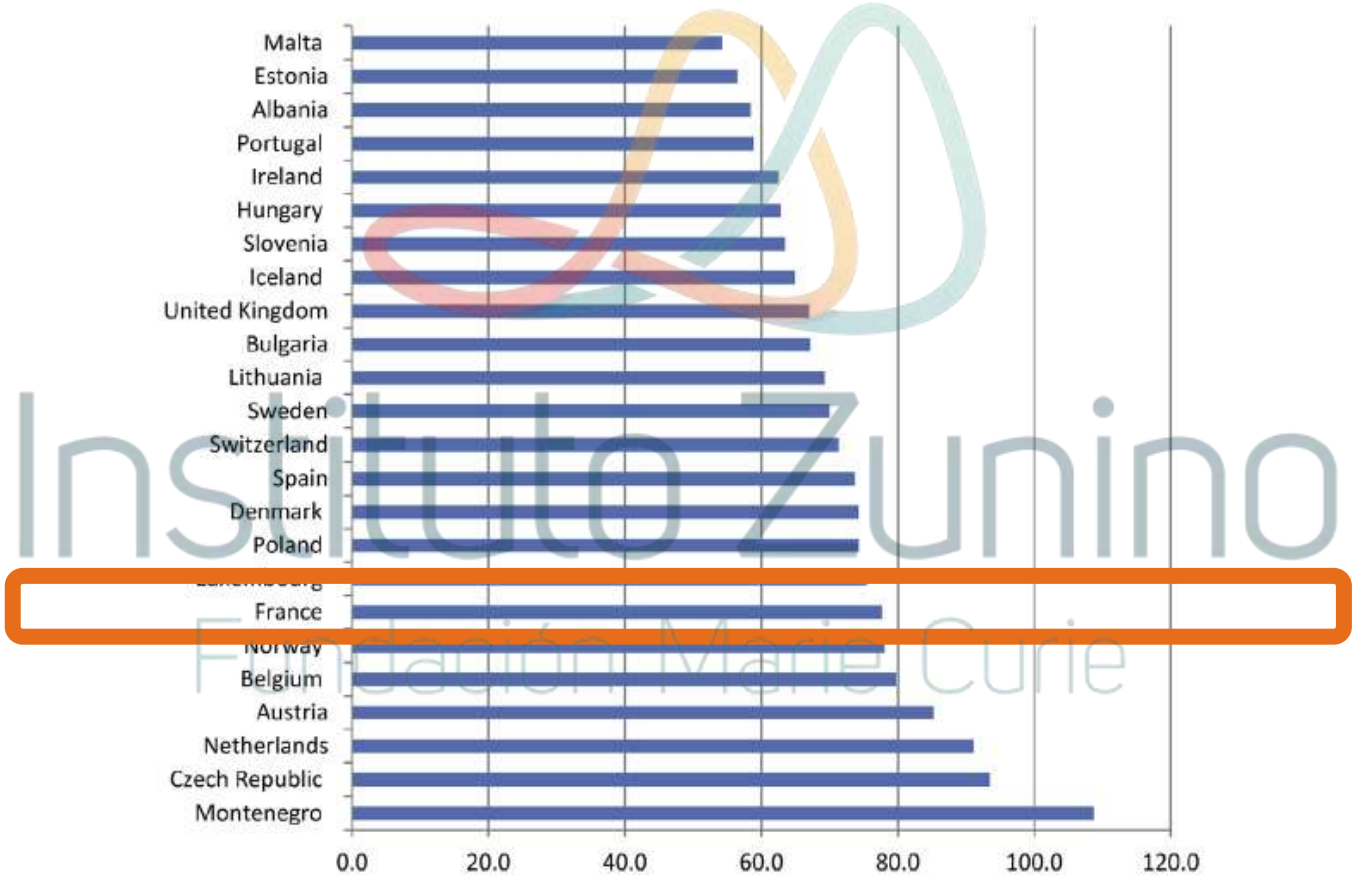


Fig. 2. Comparison between actual and optimal utilization of radiotherapy by country (expressed as a percentage of the actual and the optimal number of patients, excluding retreatments).

RT developments & Pareto: *Introduction*

Estimated increase in utilisation rate for RT between 2012 and 2025 (HERO-project)

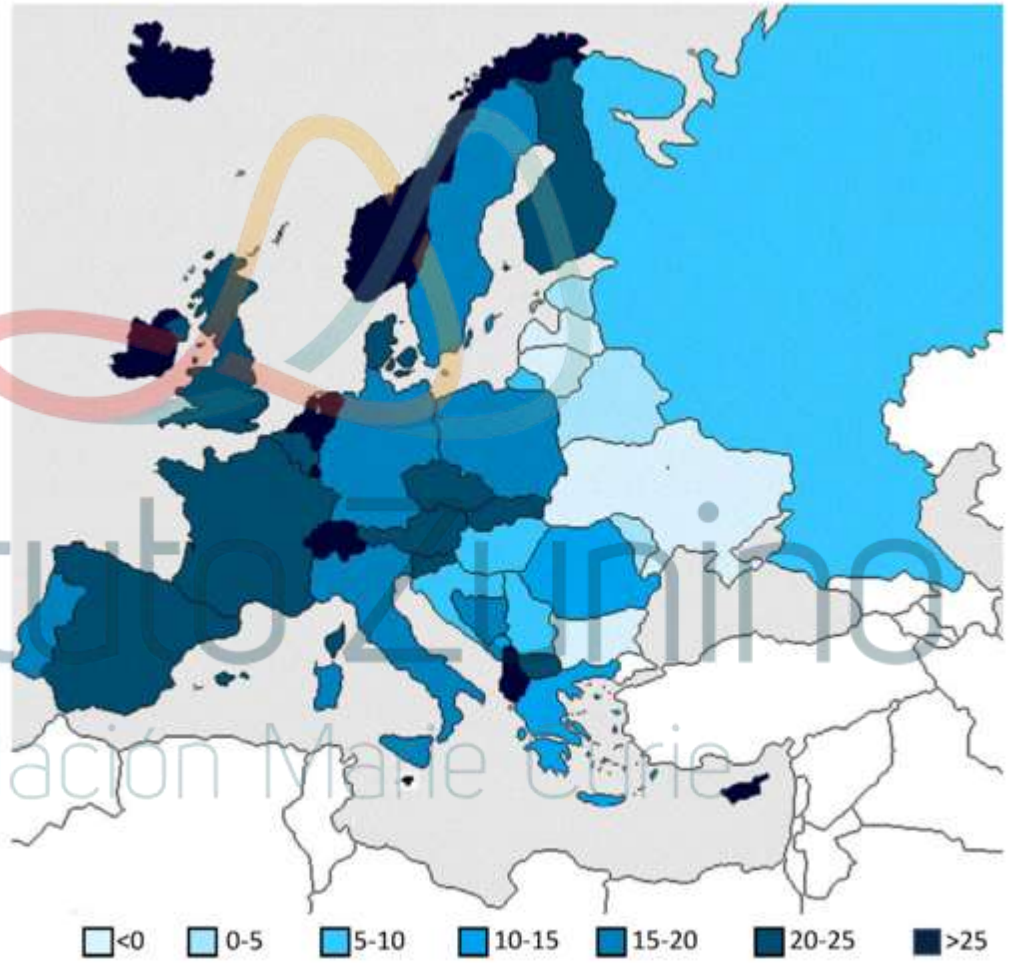


Fig. 1. Increase in new cancer patients that would require radiotherapy by 2025 by country (%).

RT developments & Pareto: *Introduction*

Estimated increase in utilisation rate for RT between 2012 and 2025 per European country and per indication (HERO-project)

Country	First	Second	Third	Fourth	Fifth
Albania	Lung	Breast	Head&Neck	Brain	Stomach
Austria	Breast	Prostate	Lung	Head&Neck	Bladder
Belarus	Breast	Lung	Head&Neck	Prostate	Rectum
Belgium	Breast	Lung	Prostate	Bladder	Head&Neck
Bosnia Herzegovina	Lung	Breast	Head&Neck	Prostate	Rectum
Bulgaria	Breast	Lung	Rectum	Head&Neck	Prostate
Croatia	Lung	Breast	Prostate	Rectum	Head&Neck
Cyprus	Breast	Prostate	Lung	Bladder	Lymphoma
France	Prostate	Breast	Lung	Head&Neck	Lymphoma
Greece	Lung	Breast	Prostate	Bladder	Brain
Hungary	Lung	Breast	Head&Neck	Rectum	Prostate
Iceland	Breast	Prostate	Lung	Rectum	Bladder
Ireland	Breast	Prostate	Lung	Lymphoma	Head&Neck
Italy	Breast	Lung	Prostate	Rectum	Lymphoma
Latvia	Breast	Lung	Prostate	Head&Neck	Bladder
Lithuania	Breast	Lung	Prostate	Head&Neck	Rectum
Luxembourg	Breast	Prostate	Lung	Rectum	Head&Neck
Macedonia	Lung	Breast	Prostate	Head&Neck	Bladder
Malta	Breast	Lung	Prostate	Bladder	Head&Neck
Moldova	Lung	Breast	Head&Neck	Rectum	Prostate
Montenegro	Lung	Breast	Prostate	Head&Neck	Rectum
Norway	Prostate	Breast	Lung	Rectum	Bladder
Poland	Lung	Breast	Prostate	Head&Neck	Bladder
Portugal	Breast	Prostate	Lung	Head&Neck	Rectum
Romania	Lung	Breast	Head&Neck	Prostate	Cervix
Russian Federation	Breast	Lung	Prostate	Head&Neck	Rectum
Serbia	Lung	Breast	Prostate	Head&Neck	Rectum
Slovakia	Breast	Lung	Prostate	Rectum	Head&Neck
Slovenia	Lung	Prostate	Breast	Rectum	Head&Neck
Spain	Lung	Breast	Prostate	Rectum	Head&Neck
Sweden	Prostate	Breast	Lung	Rectum	Lymphoma
Switzerland	Prostate	Breast	Lung	Lymphoma	Head&Neck
The Netherlands	Breast	Lung	Prostate	Rectum	Lymphoma
Ukraine	Breast	Lung	Head&Neck	Rectum	Prostate
United Kingdom	Breast	Lung	Prostate	Lymphoma	Rectum
Global	Breast	Lung	Prostate	Head&Neck	Rectum

Fig. 3. Top 5: Ranking by absolute number of cancer patients requiring radiotherapy by 2025 (using min OUP).

Medical Radiology | Diagnostic Imaging

Seymour H. Levitt
James A. Purdy
Carlos A. Perez
Philip Poortmans
Editors

Technical Basis of Radiation Therapy
Practical Clinical Applications
Fifth Edition

This well-received book, now in its fifth edition, is unique in providing a detailed description of the technological basis of radiation therapy. Another novel feature is the collaborative writing of the chapters by North American and European authors. This considerably broadens the book's perspective and increases its applicability in daily practice throughout the world. The book is divided into two sections. The first covers basic concepts in treatment planning, including essential physics and biological principles related to time-dosefractionation, and explains the various technological approaches to radiation therapy, s
as intensity-modulated radiation therapy, tomotherapy, stereota
radiotherapy, and high and low dose rate brachytherapy. Iss
to quality assurance, technology assessment, and cost
also reviewed. The second part of the book discu
tical clinical applications of the different radi
in a wide range of cancer sites. All of th
leaders in the field. This book will
ers, students, and practitioner
basic technological facto

ISSN 0942-5
ISBN 978-3-64
9 783642 11157

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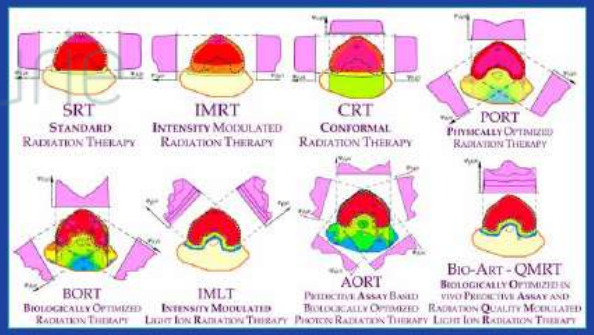
diation Therapy

5th Ed.

Springer



Technique serve the goal –
not the other way around!

RT developments & the Pareto principle

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2. Developments
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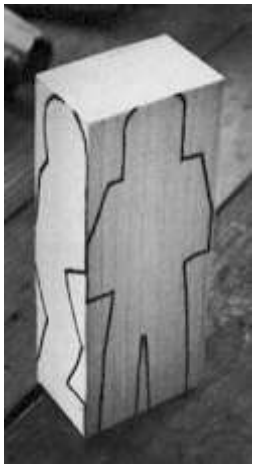
5. Conclusions

RT developments & Pareto: *Developments*



RT

3D-RT

IMRT

IG-RT

IG-IMRT

3D-IG-IMRT

SRS

S-RT

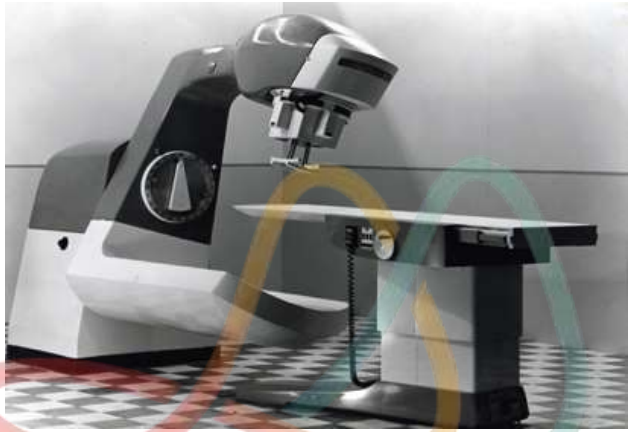
S-IMRT

S-hRT

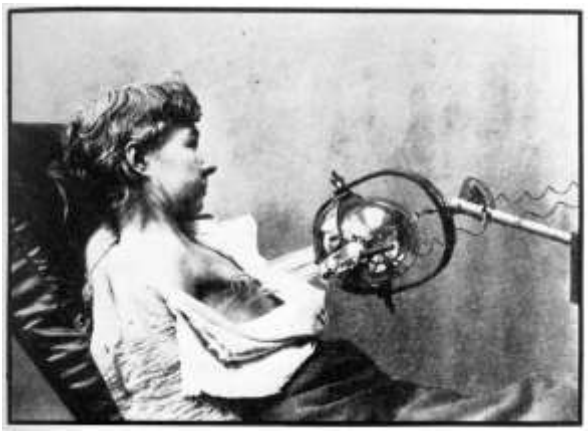
S-IG-IMRT

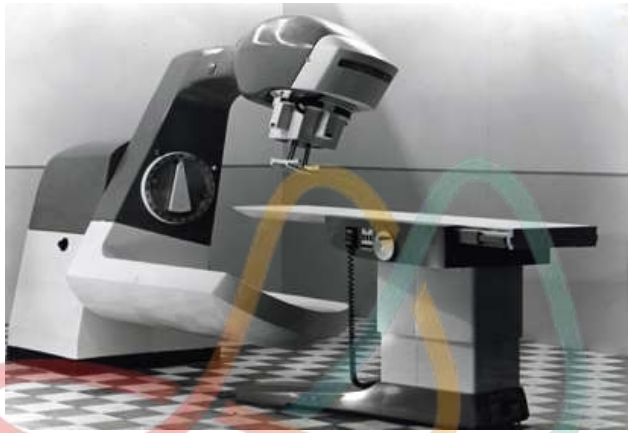
S-h-IG-IMRT

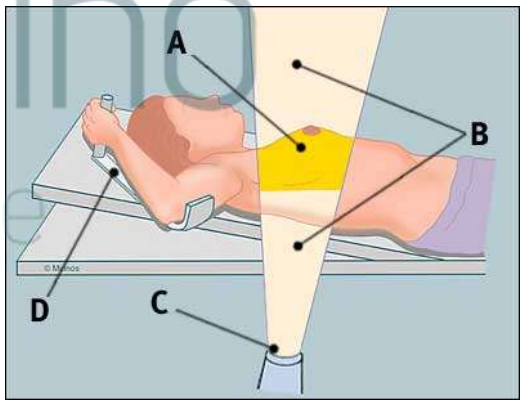
RT developments & Pareto: *Developments*



RT developments & Pareto: *Developments*







RT developments & Pareto: *Developments*

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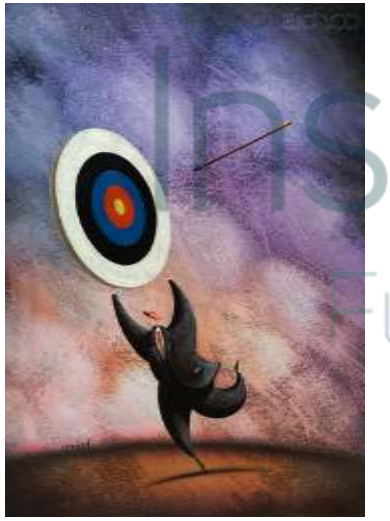
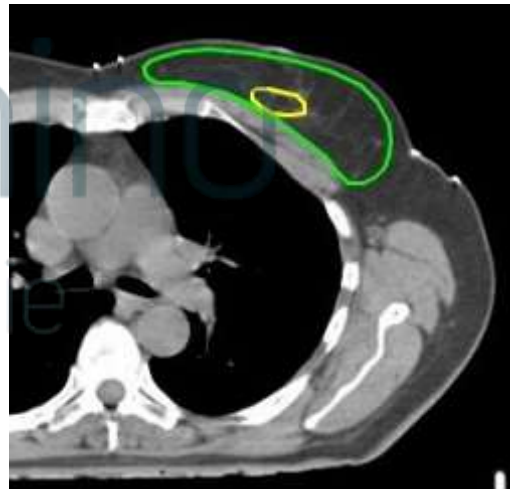
RT developments & Pareto: *Developments*



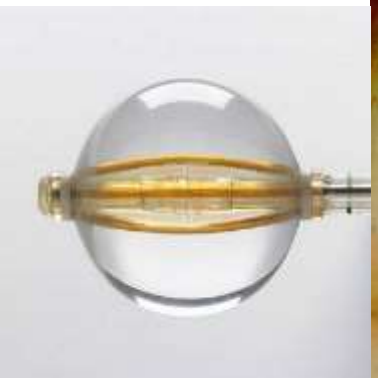


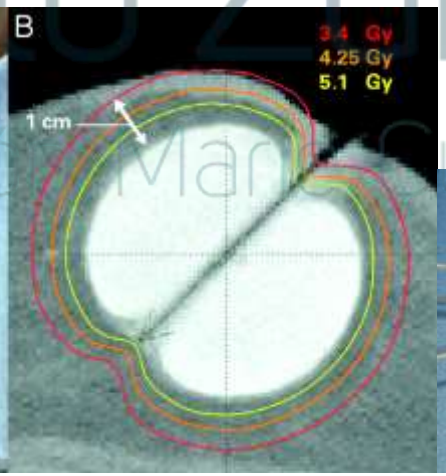
RT developments & Pareto: *Developments*

1. Mammosite & alike

HDR e.g 34 Gy/10 fractions/5 days

Strengths	Challenges
(Mammosite Registry Trial)	Marketing
Immediately following surgery	Target volume coverage
(Pathology = available)	Hospitalisation
Can be given as boost	Multidisciplinarity (ASBS)
	Skin toxicity



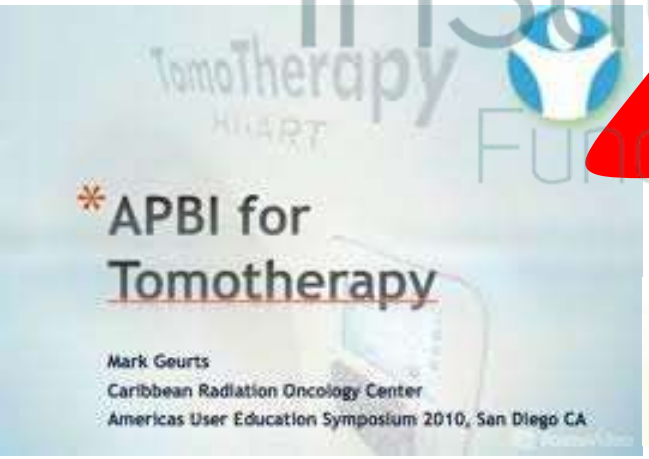


RT developments & Pareto: *Developments*

Patient wishes …

RT developments & Pareto: *Developments*

… or marketing?

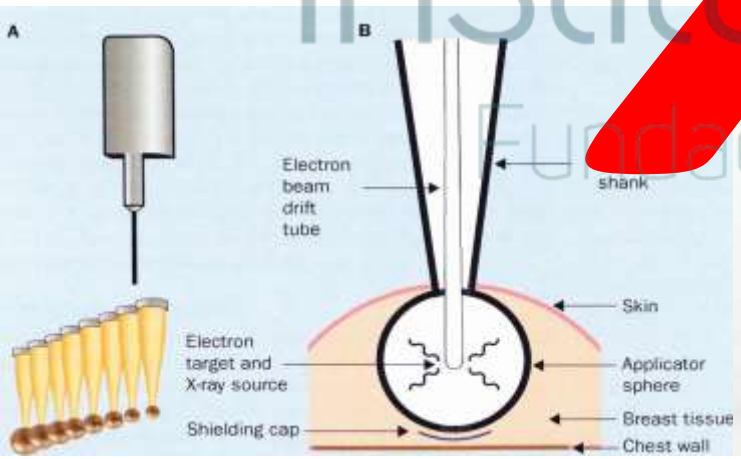


RT developments & Pareto: *Developments*

2. IntraBeam

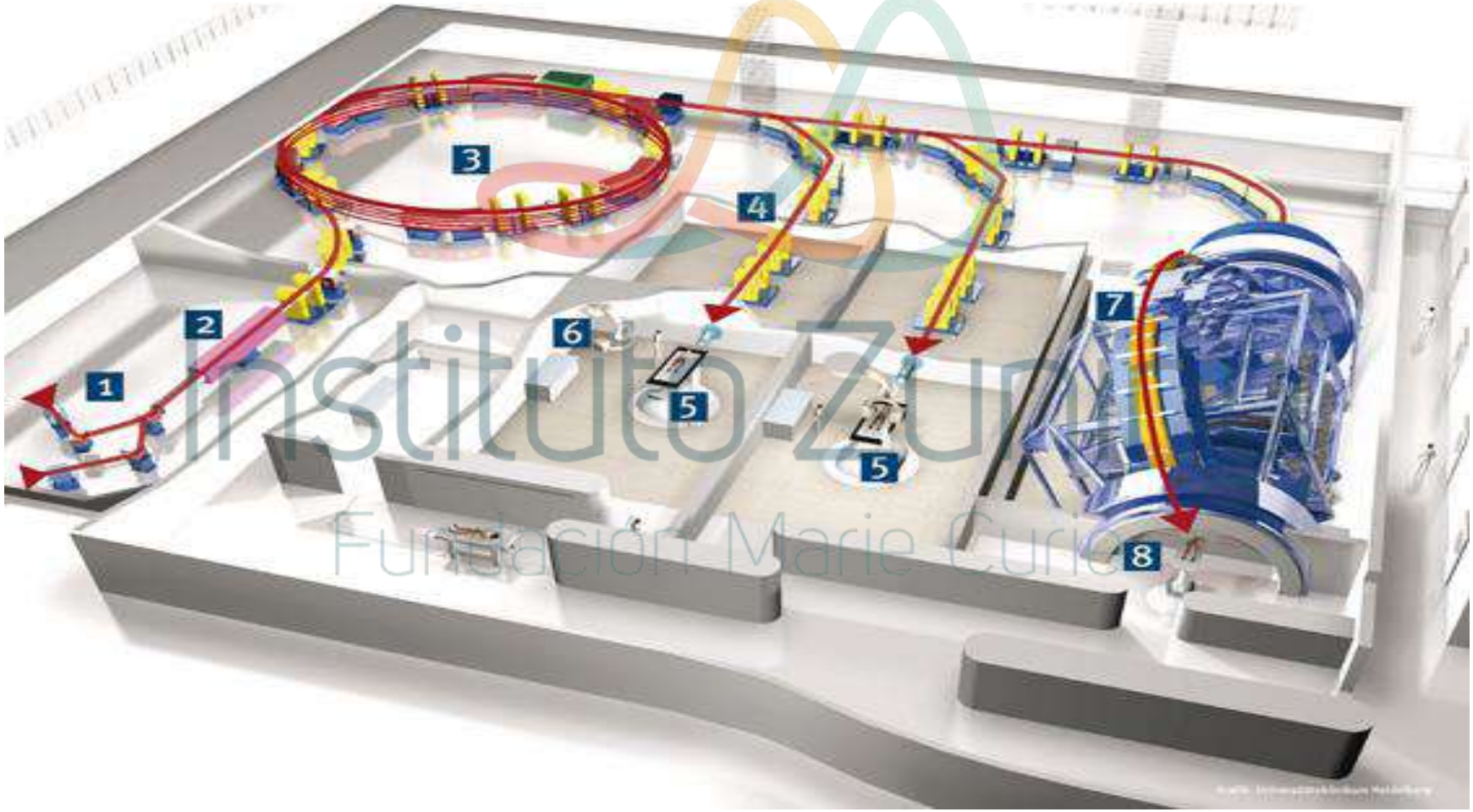
Applicato[illegible]0 kV e.g. [illegible]0 Gy

Strengths	Challenges
~~(Targit international trial)~~	Single low dose (BED ?)
1-day treatment (surgery & RT)	Lack of final pathology results
Can be given as boost	Target volume coverage
Low doses (also) to OAR	Multidisciplinarity
	QA = difficult



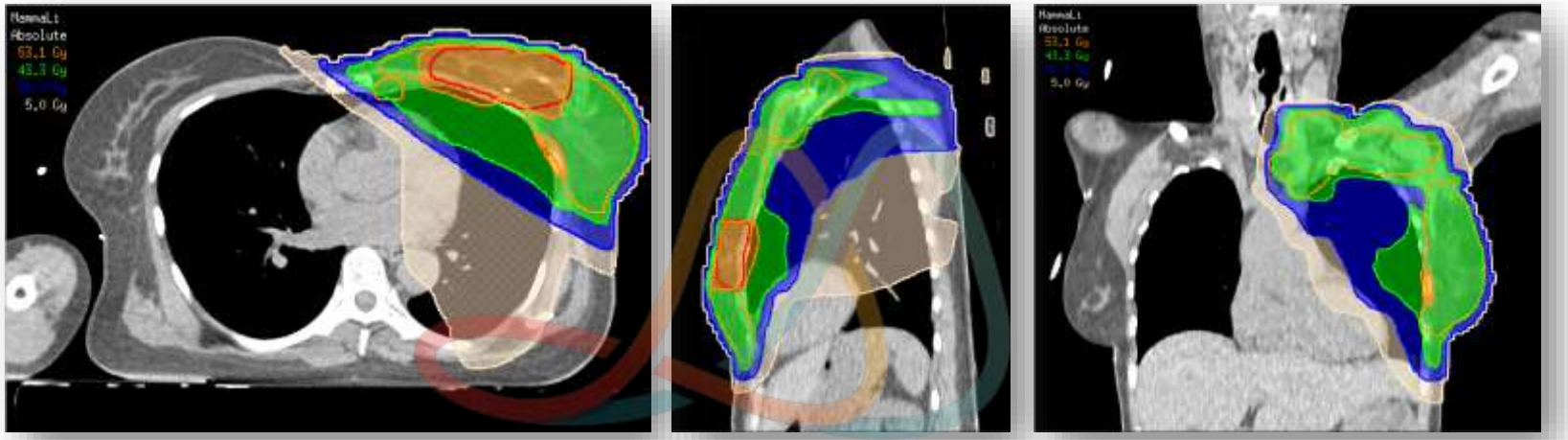
RT developments & Pareto: *Developments*

3. Particle Therapy

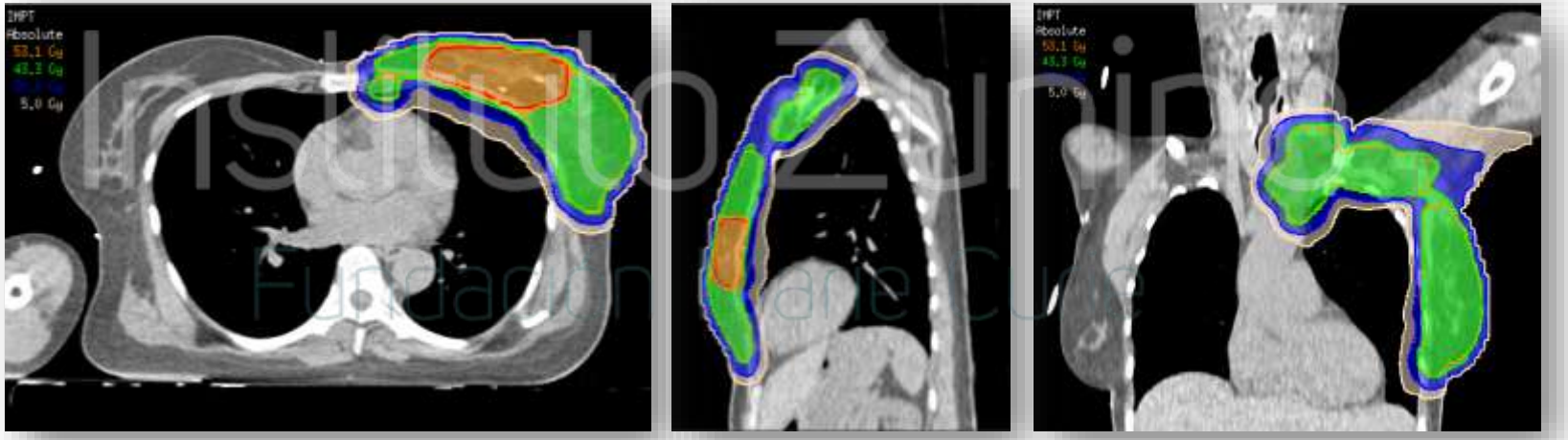


RT developments & Pareto: *Developments*

Photon IMRT



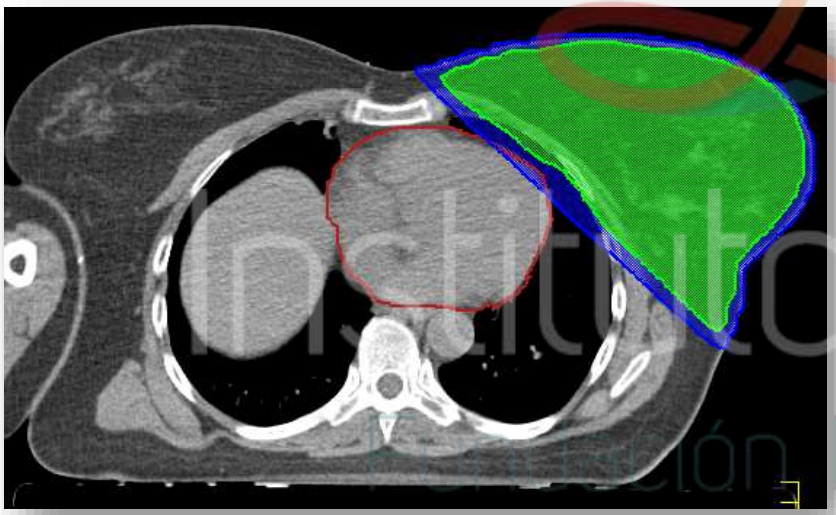
Proton IMPT



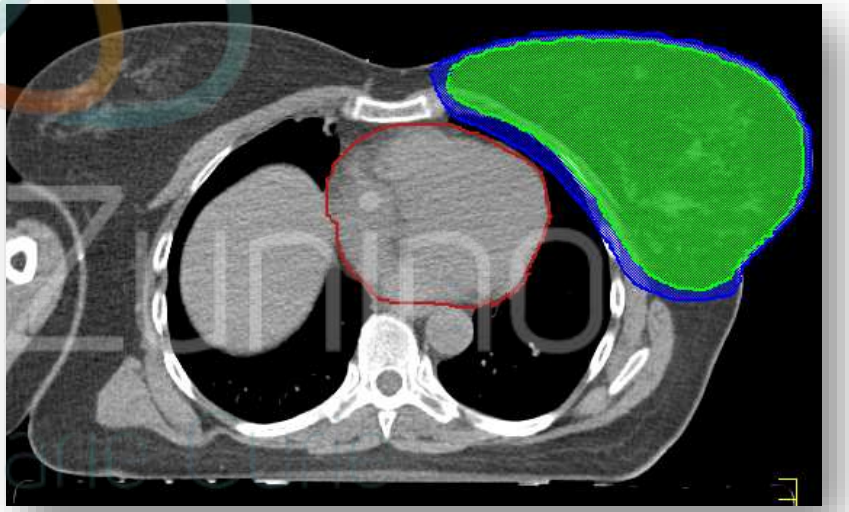
RT developments & Pareto: *Developments*

Breast cancer: no benefit for the majority of the patients

Photon IMRT



Proton IMPT



Courtesy Virtual Proton Centre UMCG.

RT developments & Pareto: *Developments*

Patients with unfavourable anatomy: *e.g. pectus excavatus*

IMRT

IMPT

But wouldn't breath hold +/- vIMRT be a better solution?

RT developments & Pareto: *Developments*

What are the benefits of proton therapy for breast cancer [illegible]nts?

Proton therapy is a relatively newer **cancer treatment** for early stage bre[illegible] has already shown remarkable promise and advantages over conventio[illegible]ment of breast cancer. The accuracy and low impact of **proton radia[illegible]**ve and low-risk option for **breast cancer treatment** used to dest[illegible]. Proton radiation treatment is extremely precise and therefo[illegible]ng cancerous cells without causing damage to surrounding b[illegible]

Proton therapy is not a substitute for a l[illegible]lternative to traditional radiation therapy. After the lumpe[illegible]breast cancer patient would receive 10 days of proton trea[illegible]weeks of traditional radiation therapy.

Evidence???

Untruths!!!

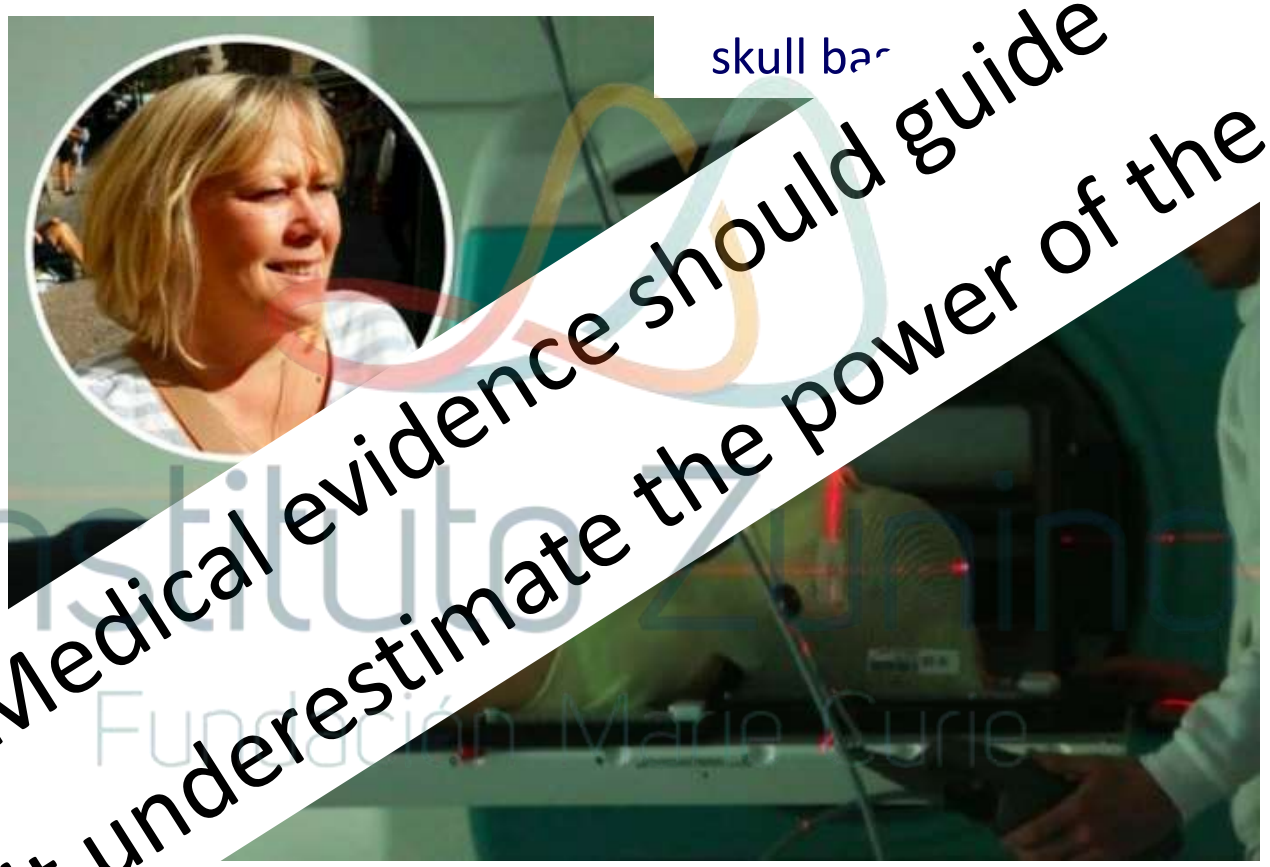
Breast cancer pati[illegible]nvasive proton therapy treatment.

- Proton treat[illegible]ness
- Proton t[illegible]ng early stage breast cancer
- Tre[illegible]very times with minimal side effects
- [illegible]age compared with the burn marks caused by regular radiation
- [illegible]nd precise than other kinds of radiation
- [illegible]ovided in an outpatient setting
- Pr[illegible]iation has little to no impact on patient energy level

RT developments & Pareto: *Developments*

RT developments & Pareto: *Developments*

Proton therapy and the media



Medical evidence should guide

But don't underestimate the power of the media!

… woman's Prague trip for proton therapy
… r brain tumour diagnosis threatened blindness

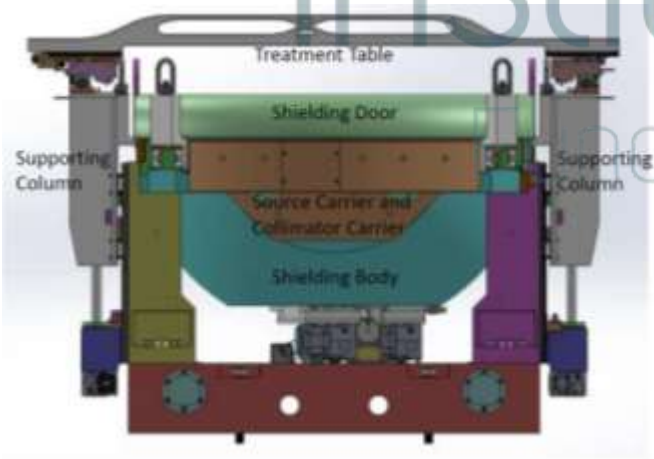
RT developments & Pareto: *Developments*

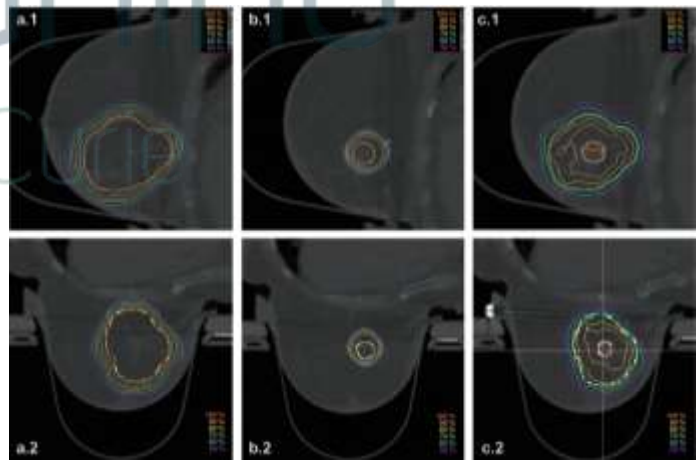
RT developments & Pareto: *Developments*

4. Ga d

36 rotating non-coplanar Co t-60 sources

Strengths	Challenges
Conformal TV coverage	Use of Cobalt
Homogeneous dose distribution	Investment only for APBI
Can be given as boost	Learning curve
Dedicated device	





RT developments & Pareto: *Developments*

5. Fully integrated linac system

RT developments & Pareto: *Developments*

6. Organisation

For 1[illegible]0 patients:

2200	Con[illegible]tations NP	1150
20’	Co[illegible]lt time	45-60’
2000	[illegible]CT’s	1050
2500	Treatm[illegible] pla[illegible]ngs	1100
5-6	Consultat[illegible]s[illegible]ring RT	1-2
15-35’	R[illegible]e	10-15’
Full	Report end RT	Short *additional*
4-8 weeks	Referral → 1st RT	1.5-4 weeks

RT developments & the Pareto principle

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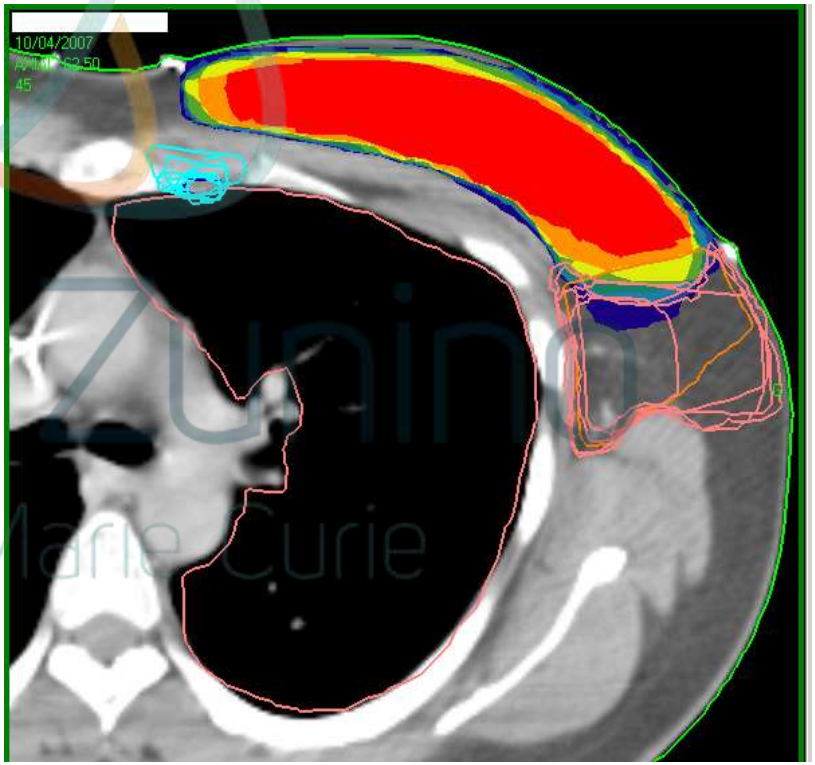
RT developments & Pareto: *Challenges*

Large inter-observer variation, especially at cranial, posterior and medial borders

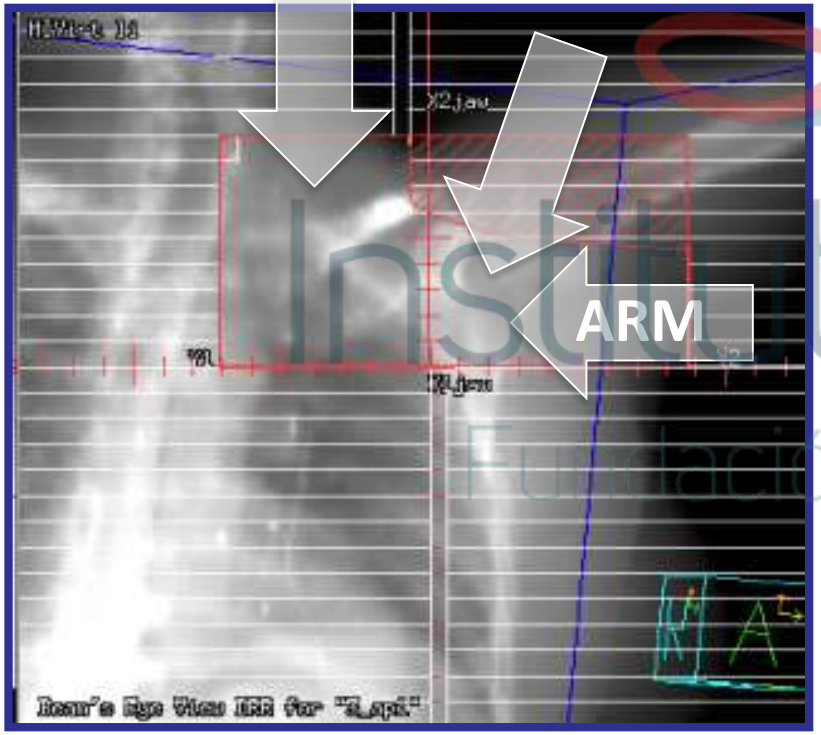


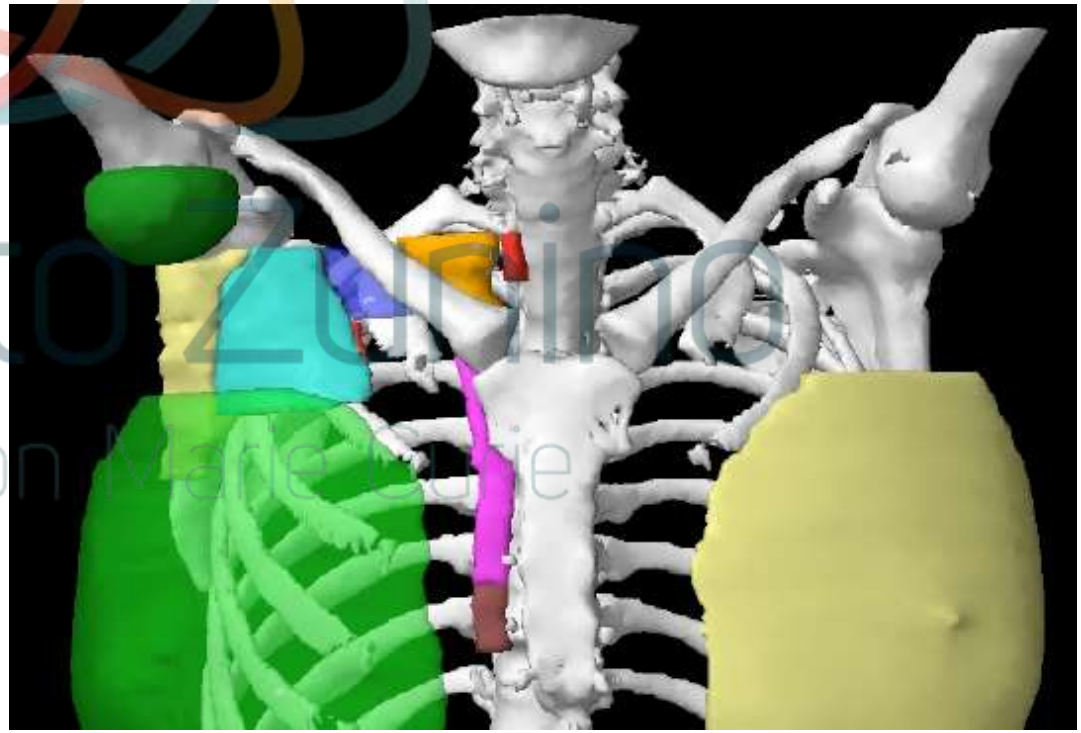
RT developments & Pareto: *Challenges*

RT developments & Pareto: *Challenges*

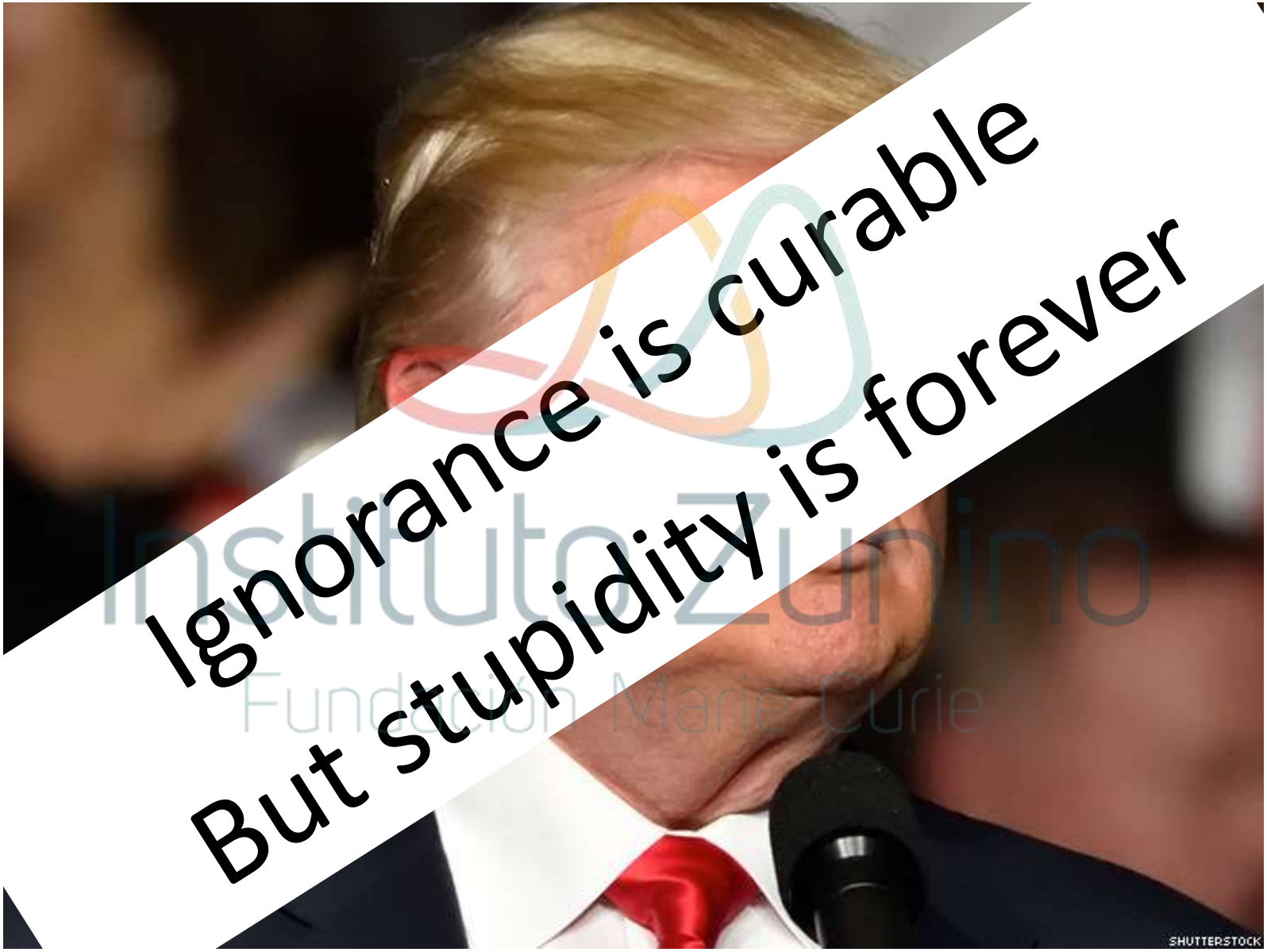
EORTC 10981-22023 "AMAROS"

RT-fields: inappropriate (not CTV-based; too large)!!!





RT developments & Pareto: *Challe*



RT developments & Pareto: *Challenges*

Radiotherapy and Oncology 114 (2015) 3–10

Contents lists available at ScienceDirect

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journal homepage: www.thegreenjournal.com

ESTRO consensus guidelines

ESTRO consensus guideline on target volume delineation for elective radiation therapy of early stage breast cancer

Birgitte V. Offersen [a,*], Liesbeth J. Boersma [b], Carine Kirkove [c], Sandra Hol [d], Marianne C. Aznar [e], Albert Biete Sola [f], Youlia M. Kirova [g], Jean-Philippe Pignol [h], Vincent Remouchamps [i], Karolien Verhoeven [j], Caroline Weltens [j], Meritxell Arenas [k], Dorota Gabrys [l], Neil Kopek [m], Mechthild Krause [n], Dan Lundstedt [o], Tanja Marinko [p], Angel Montero [q], John Yarnold [r], Philip Poortmans [s]

Radiotherapy and Oncology 118 (2016) 205–208

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ESTRO breast cancer consensus guidelines

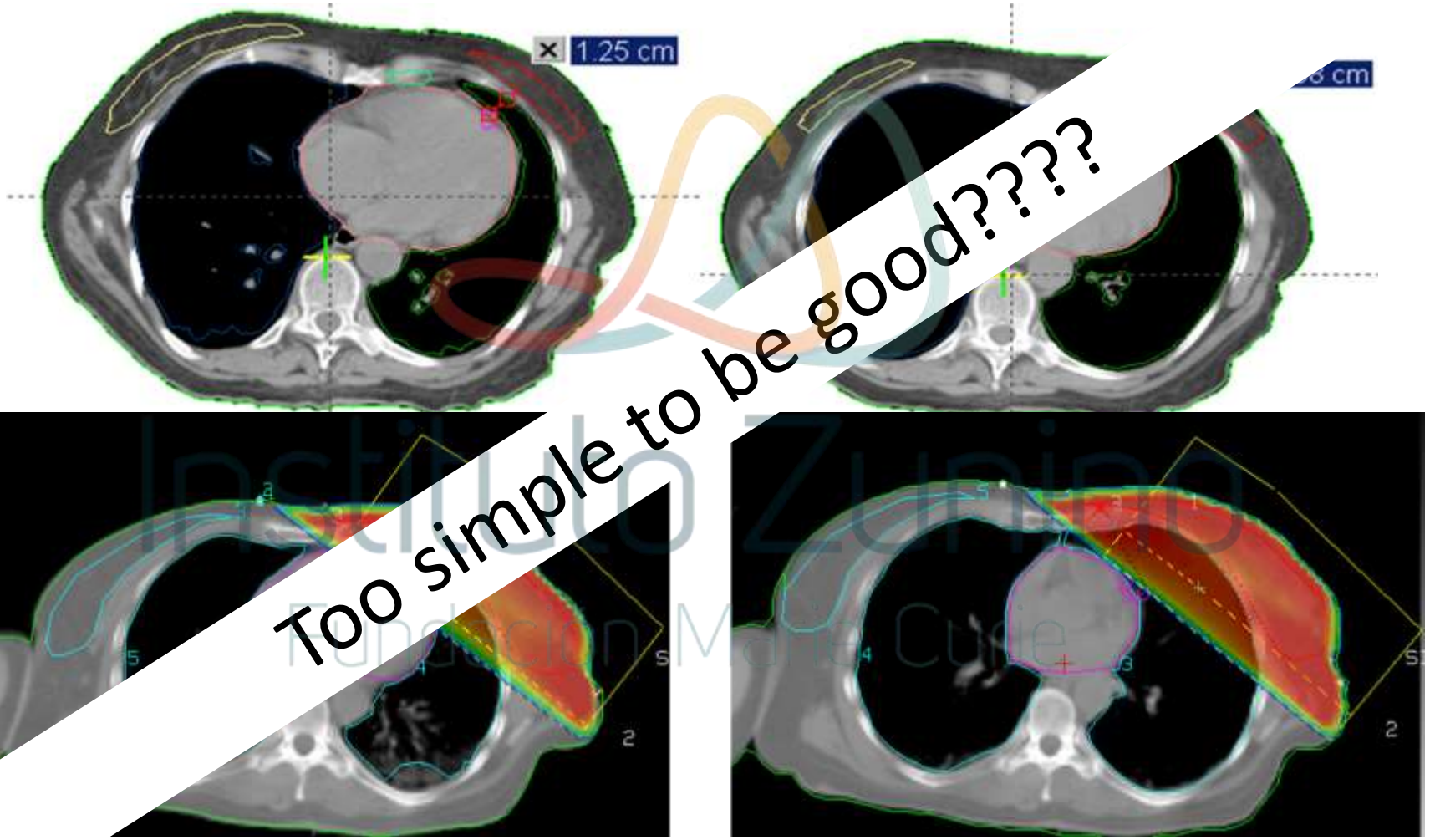
RT developments & Pareto: *Challenges*

Respiratory movement control

RT developments & Pareto: *Challenges*

Free respiration

Breath hold



Courtesy of Marianne Aznar, Rigshospitalet, Copenhagen

RT developments & Pareto: *Challenges*

Dutch protocol:

- Hypofractionation (CAN – 42.56/16) gradually introduced around 2009
- Hypofractionation generalised early 2011
- Transition to UK schedule (40/15) in 2018

RT developments & Pareto: *Challenges*

Current French/German/US/many others protocol:

- Repopulation
- Redistribution
- Reoxygenation
- Repair
- Resistance

RT developments & Pareto: *Challenges*

Current French/German/US/many others protocol:

- Repopulation
- Redistribution
- Reoxygenation
- Repair
- Resistance
- Reimbursement

RT developments & Pareto: *Challenges*

Current French/German/US/many others protocol:

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RT developments & the Pareto principle

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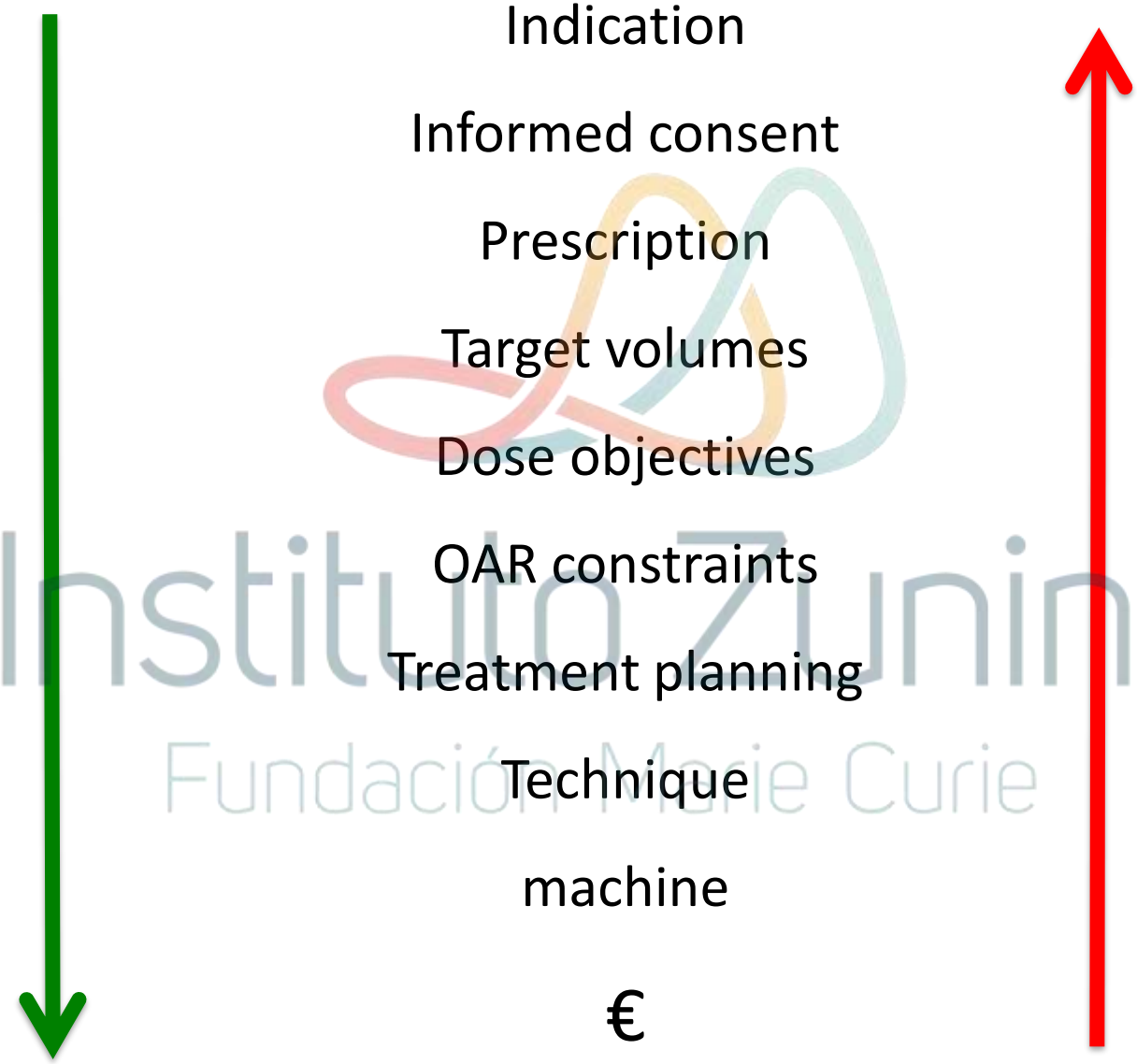
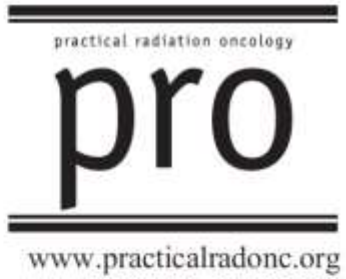
RT developments & Pareto: *Discussion*



RT developments & Pareto: *Discussion*

Practical Radiation Oncology (2017) 7, 183–189

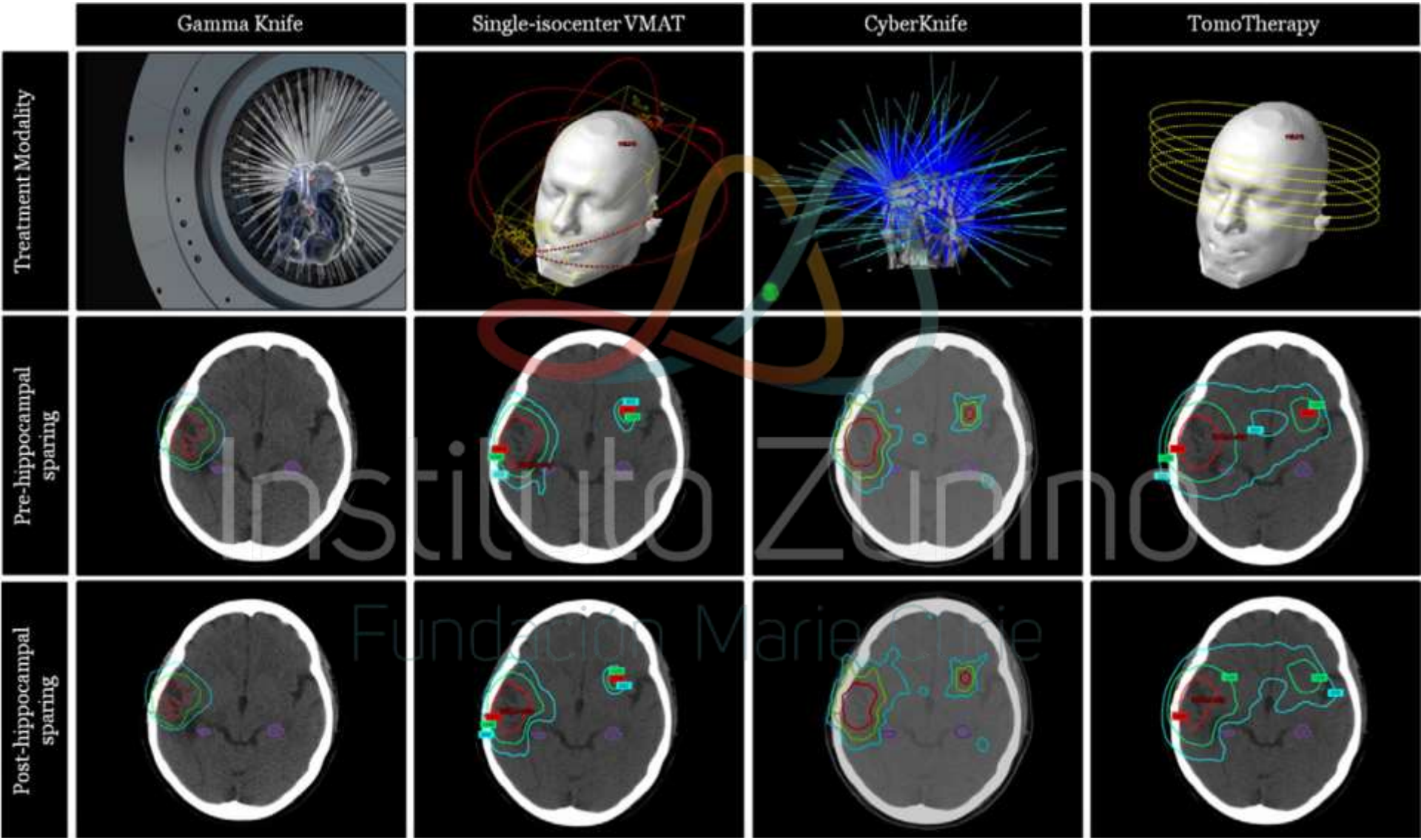


Basic Original Report

Hippocampal-sparing and target volume coverage in treating 3 to 10 brain metastases: A comparison of Gamma Knife, single-isocenter VMAT, CyberKnife, and TomoTherapy stereotactic radiosurgery

Isabella Zhang MD [a,*], Jeff Antone CMD [a], Jenny Li MS [a], Shyamali Saha MS [a], Adam C. Riegel PhD [a], Lili Vijeh CMD [a], Joe Lauritano CMD [a], Mihaela Marrero MS [a], Sussan Salas MD [b], Michael Schulder MD [b], Heather Zinkin MD [a], Anuj Goenka MD [a], Jonathan Knisely MD [a]

RT developments & Pareto: *Discussion*



RT developments & Pareto: *Discussion*

Significant difference in the "beam-on" times:

- Gamma Knife → averaging 155.0 minutes
- CyberKnife → averaging 100.4 minutes
- TomoTherapy → averaging 49.3 minutes
- VMAT → averaging 9.4 minutes

RT developments & Pareto: *Discussion*

Radiotherapy

Dosimetric Comparison and Evaluation of 4 Stereotactic Body Radiotherapy Techniques for the Treatment of Prostate Cancer

Jan Seppälä, PhD[1], Sami Suilamo, PhLic[2], Mikko Tenhunen, PhD[3], Liisa Sailas, MD[4], Heli Virsunen, MD[1], Erna Kaleva, PhD[3,5], and Jani Keyriläinen, PhD[2,3]

Technology in Cancer Research & Treatment
2017, Vol. 16(2) 238–245

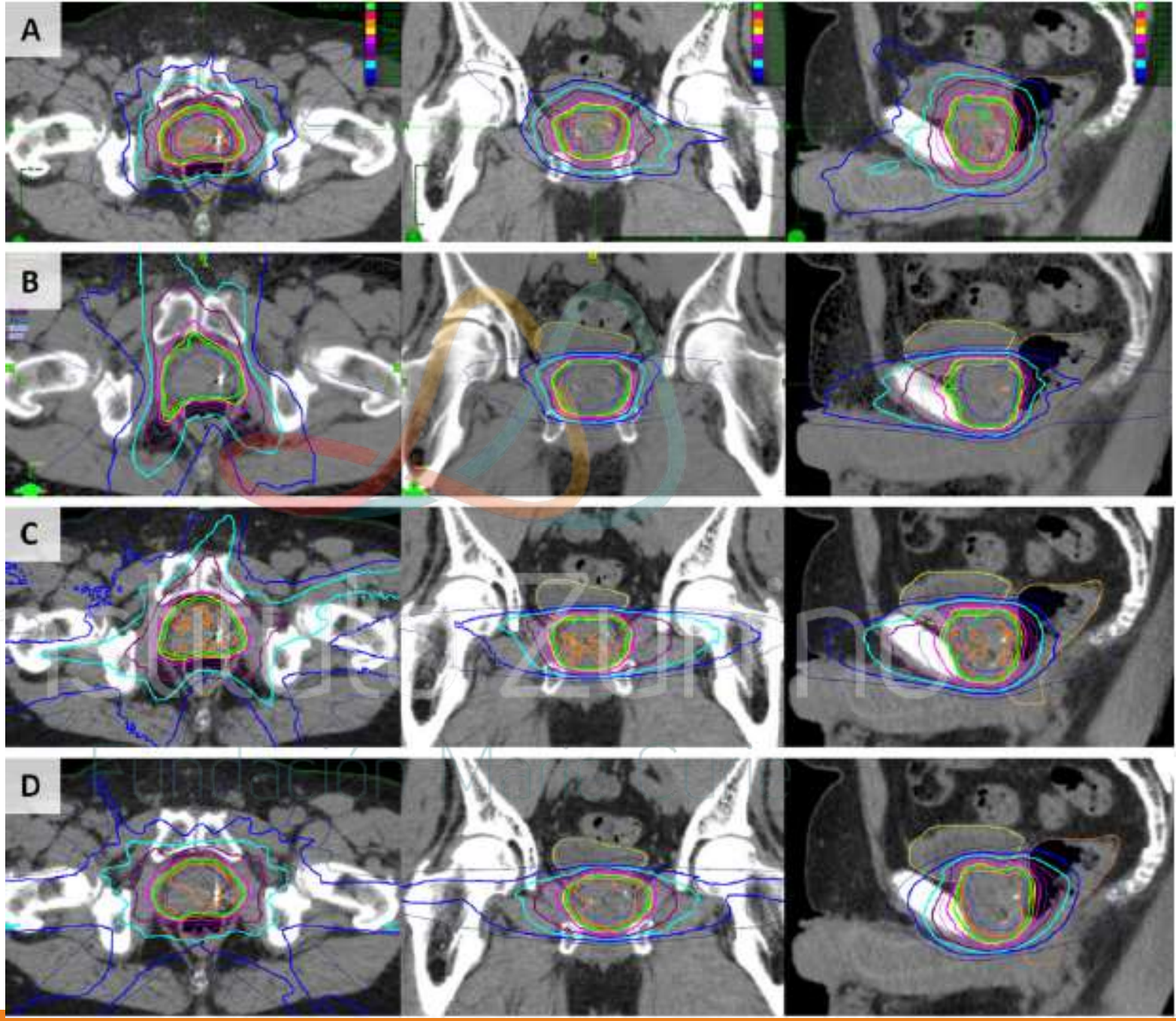
DOI: 10.1177/1533034616682156
journals.sagepub.com/home/tct
SAGE

CK

RA

VMAT

ncplIMRT



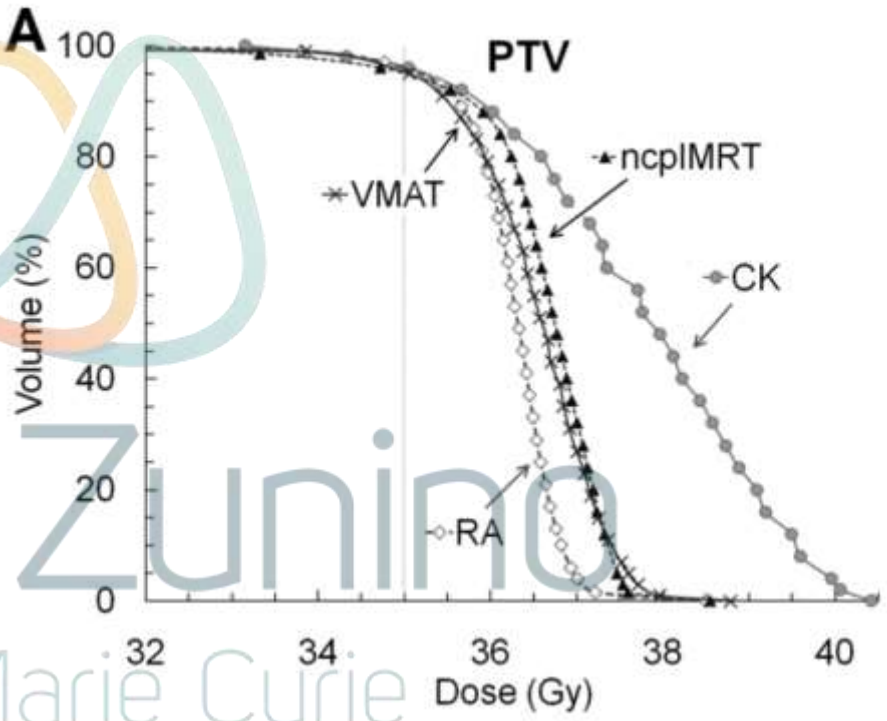
RT developments & Pareto: *Discussion*

CK 34.0 ± 5.0 minutes

RA 4.6 ± 0.9 minutes

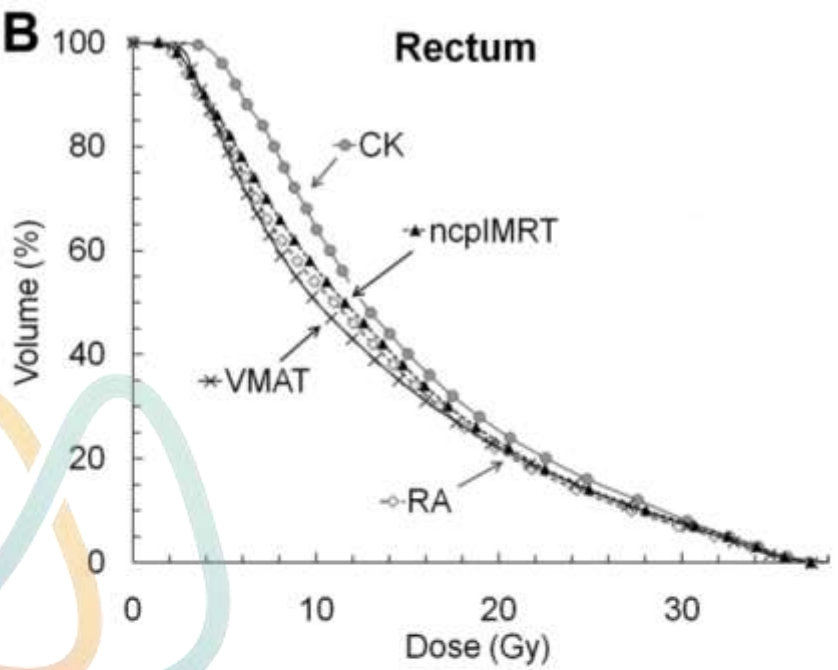
VMAT 5.5 ± 1.8 minutes

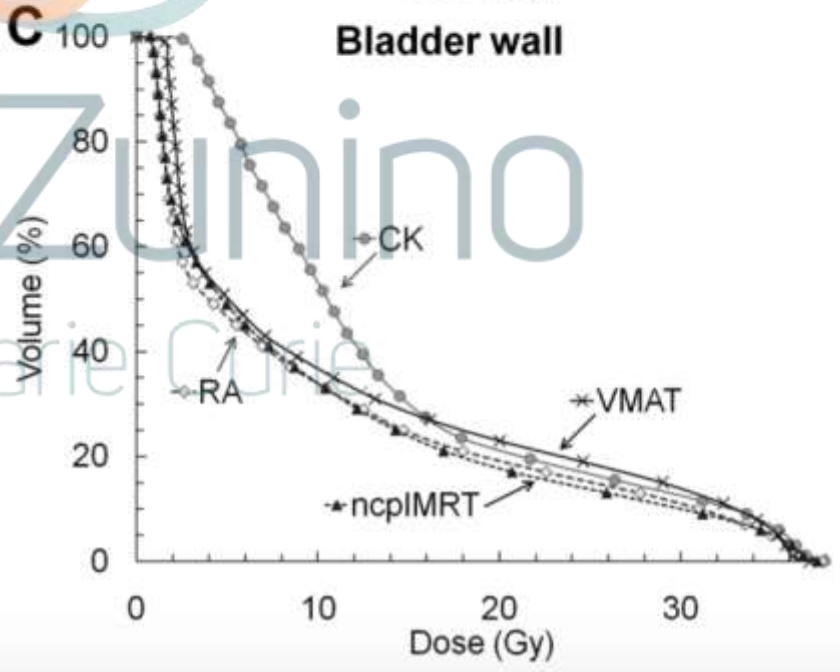
ncplIMRT 6.2 ± 1.0 minutes



RT developments &

CK	34.0 ± 5.0 minutes
RA	4.6 ± 0.9 minutes
VMAT	5.5 ± 1.8 minutes
ncplIMRT	6.2 ± 1.0 minutes





RT developments & Pareto: *Discussion*

Received: 10 October 2017 | Revised: 17 December 2017 | Accepted: 21 December 2017

DOI: 10.1002/acm2.12271

RADIATION ONCOLOGY PHYSICS

WILEY

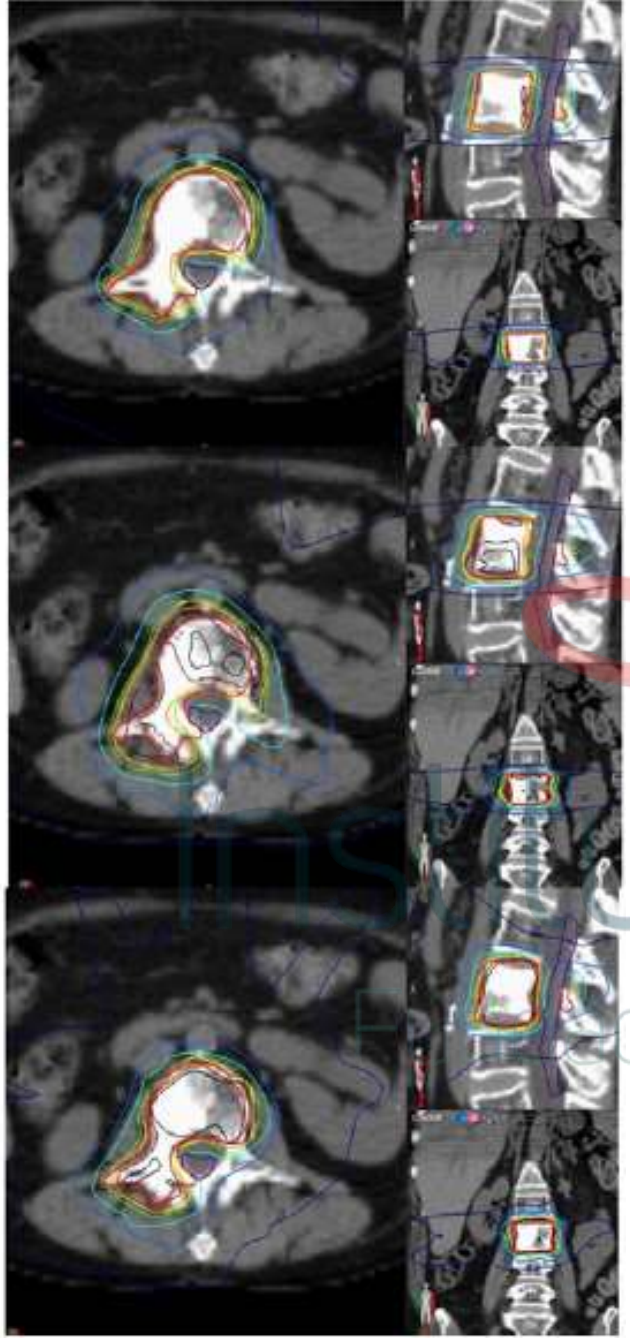
Comparison of four techniques for spine stereotactic body radiotherapy: Dosimetric and efficiency analysis

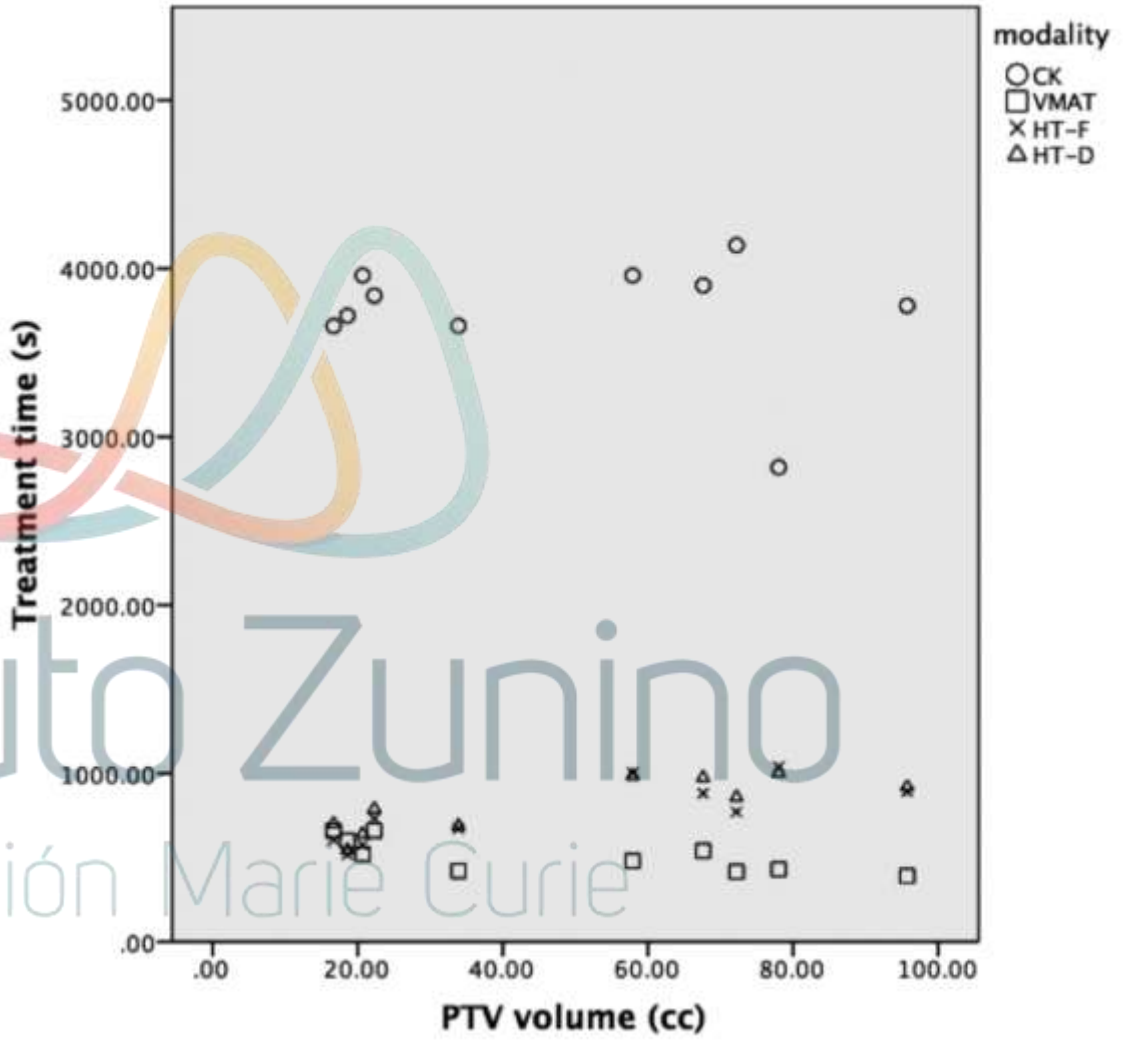
Saif Aljabab[1] | Balamurugan Vellayappan[5] | Eric Vandervoort[1] | Jamie Bahm[1] | Robert Zohr[1] | John Sinclair[4] | Jean-Michel Caudrelier[1,2,3] | Janos Szanto[1] | Shawn Malone[1,2,3]

HT

VMAT

CK



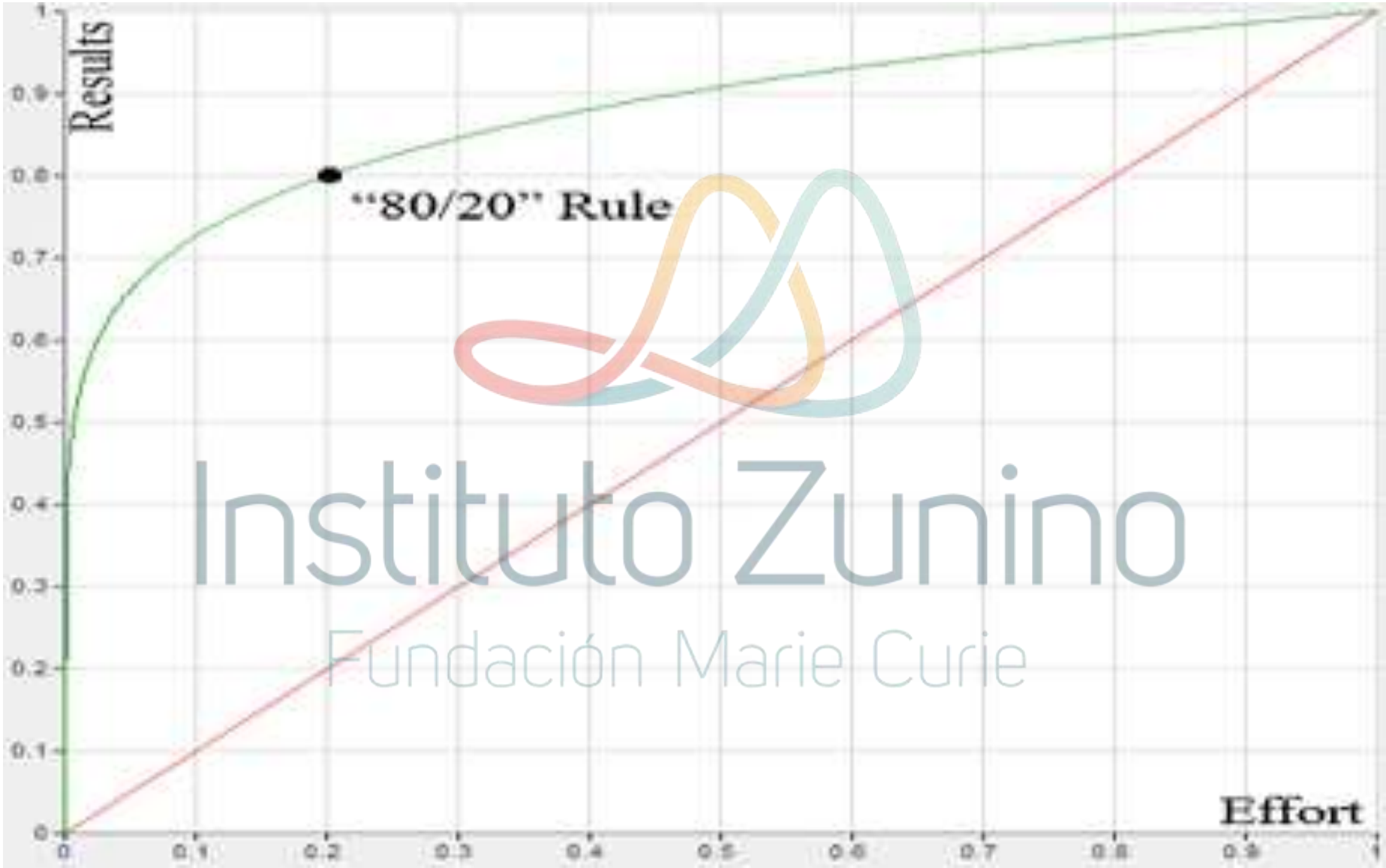


RT developments & the Pareto principle

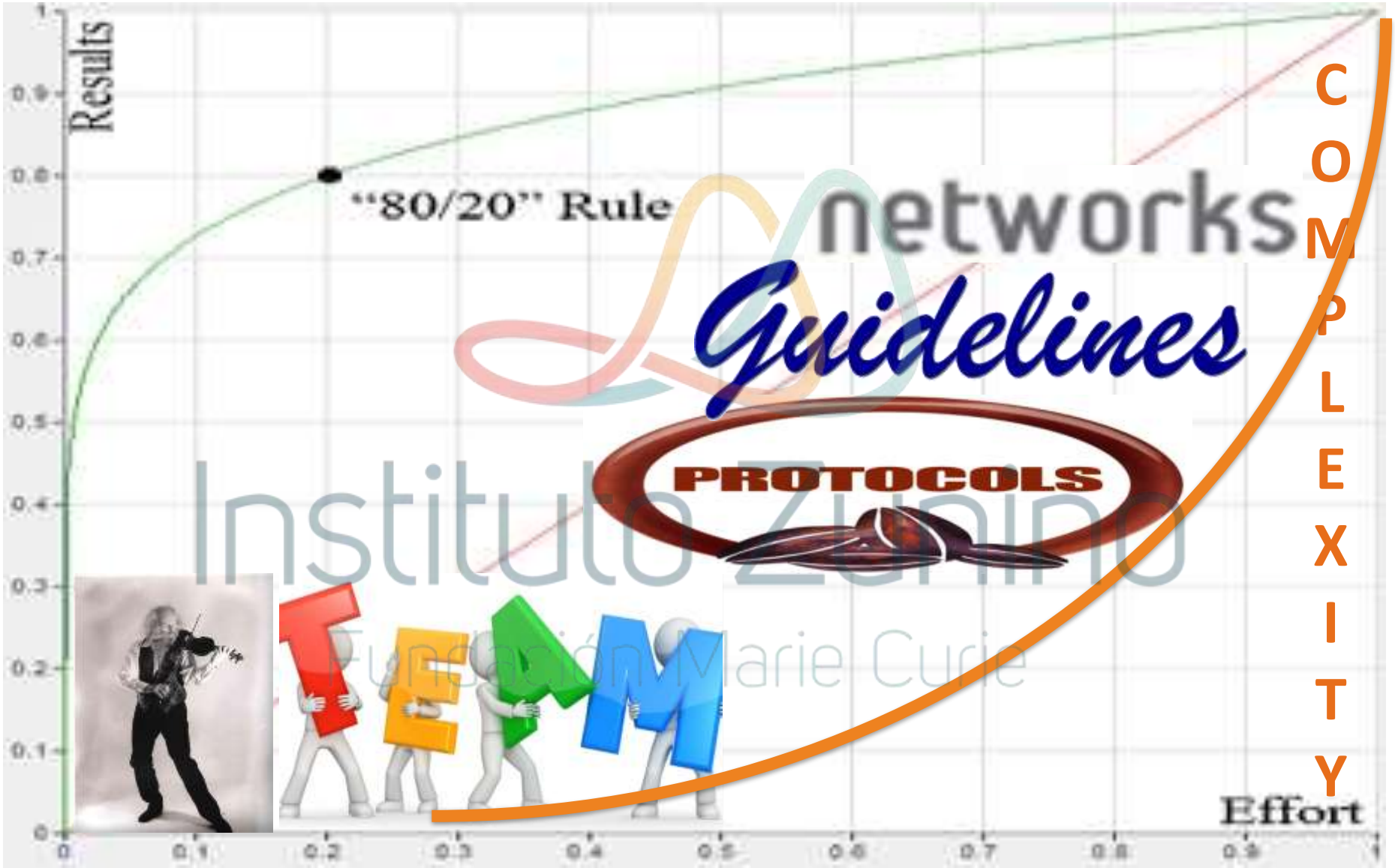
1. Introduction
2. Developments
3. Challenges
4. Discussion
5. Conclusions

RT developments & Pareto: *Conclusions*

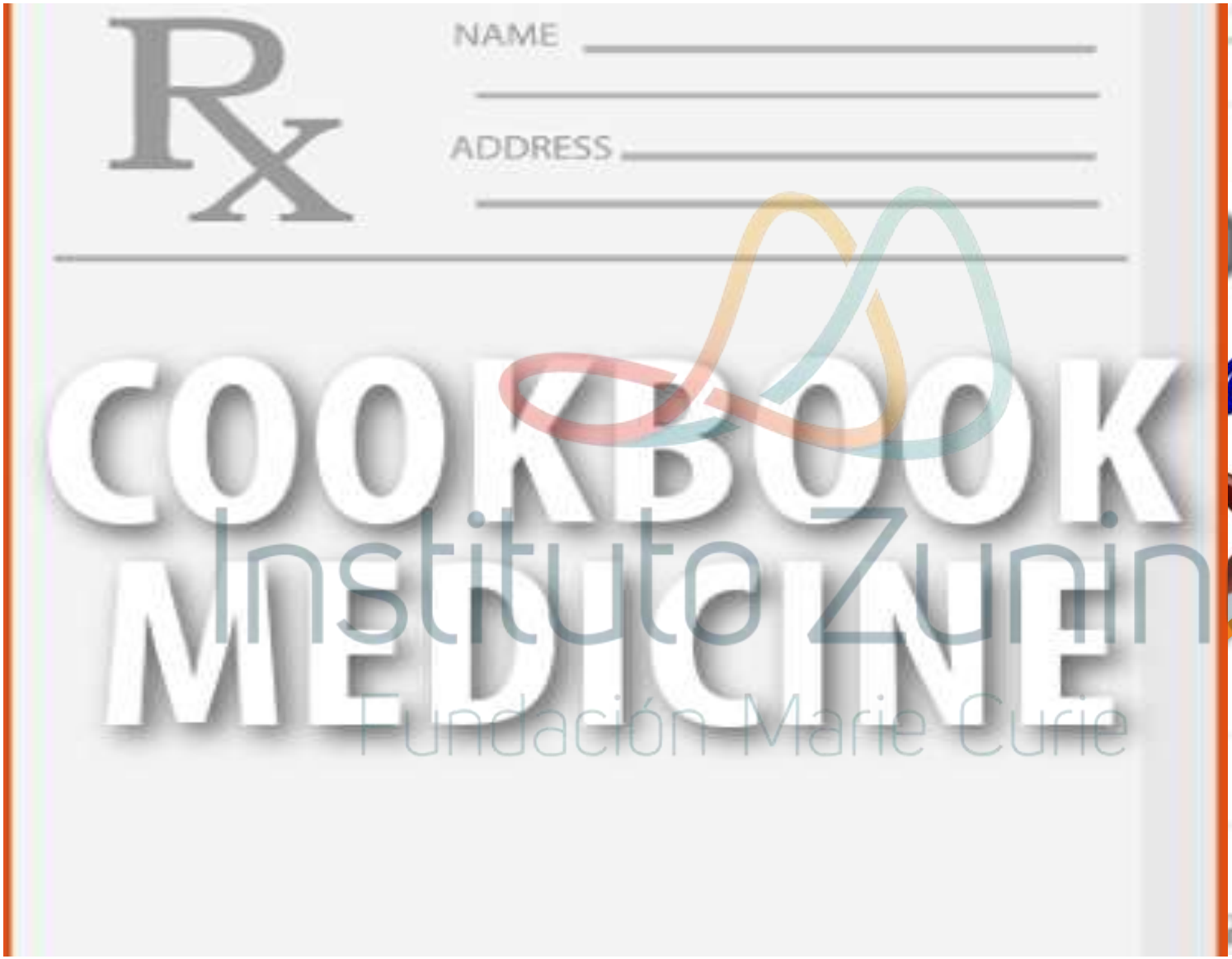
RT developments & Pareto: *Conclusions*



RT developments & Pareto: *Conclusions*



RT developments & Pareto: *Conclusions*



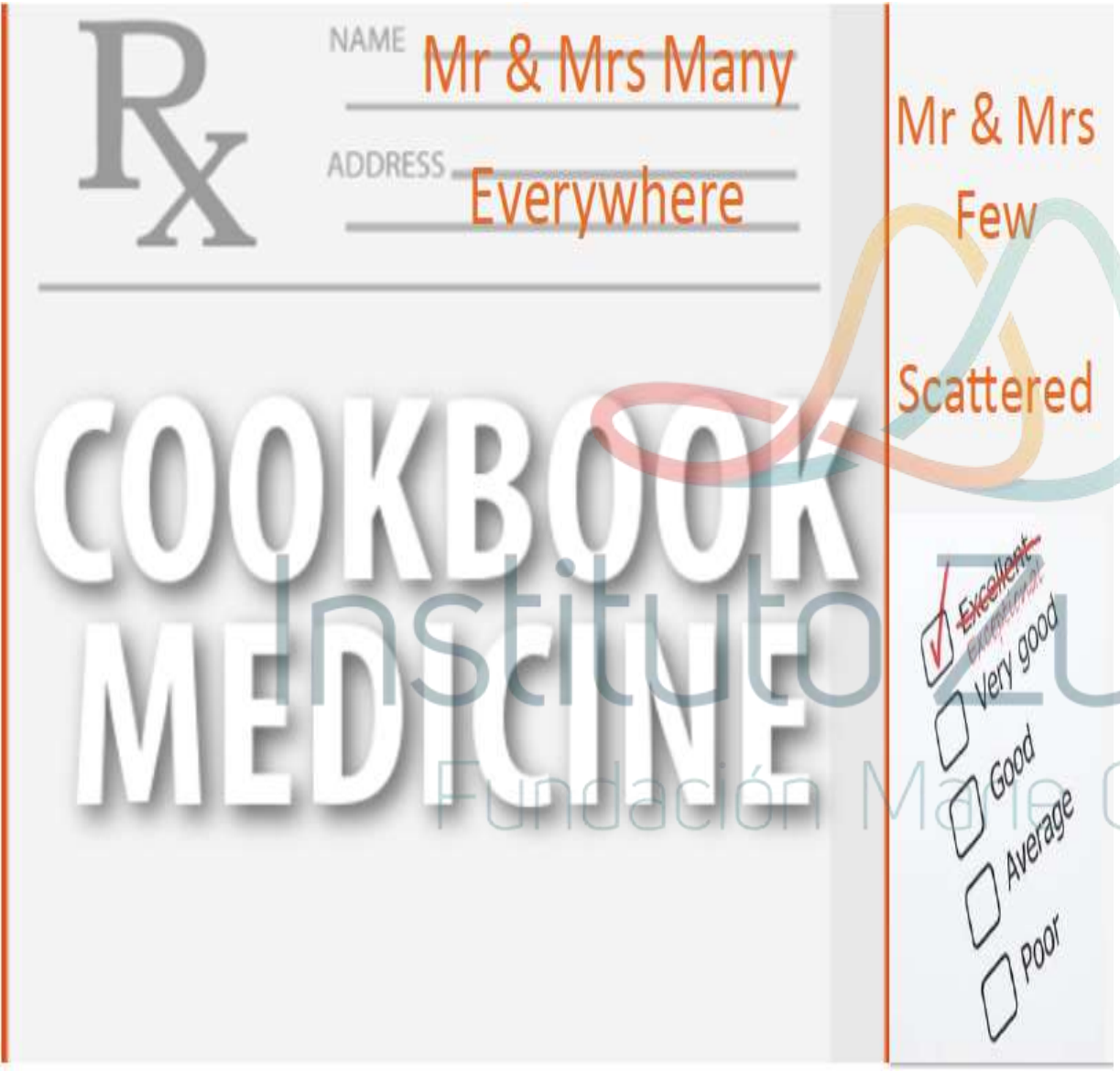
RT developments & Pareto: *Conclusions*

Mr & Mrs Many Everywhere

Mr & Mrs Few

Scattered

RT developments & Pareto: *Conclusions*



Solutions:

-Expertise

-Individualisation

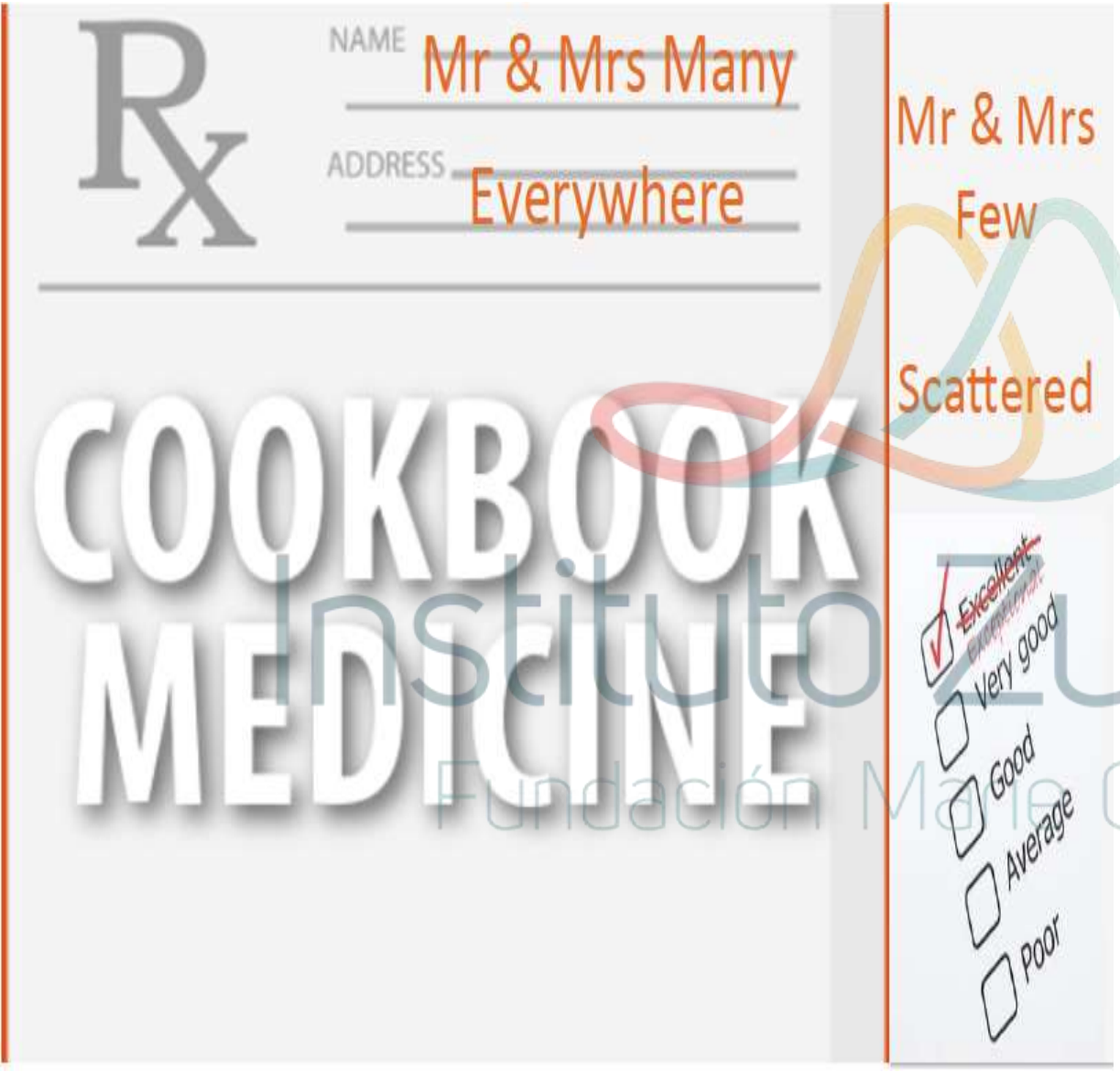
-Personalisation

-Out-of-the box

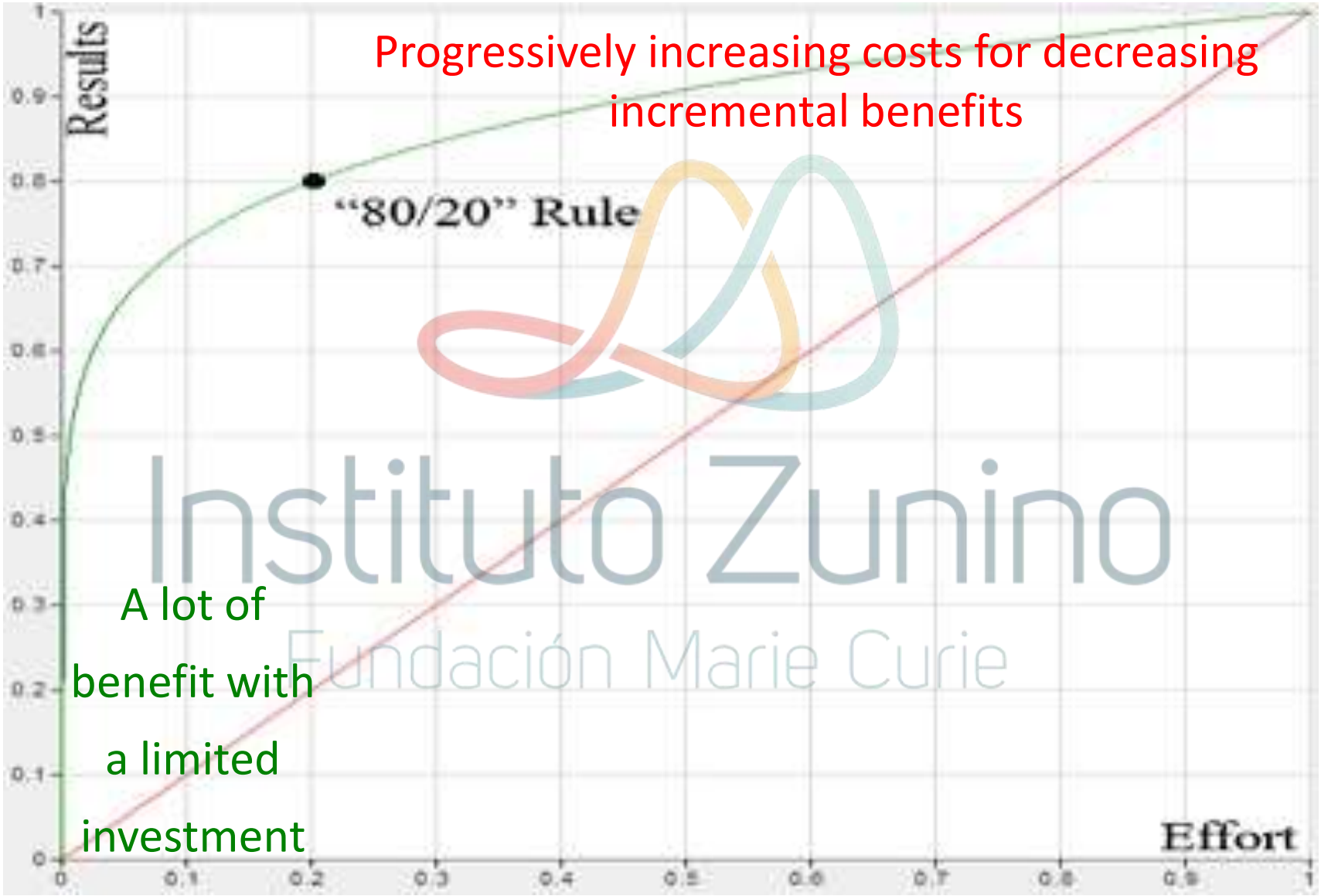
-Extra-protocolled

-…

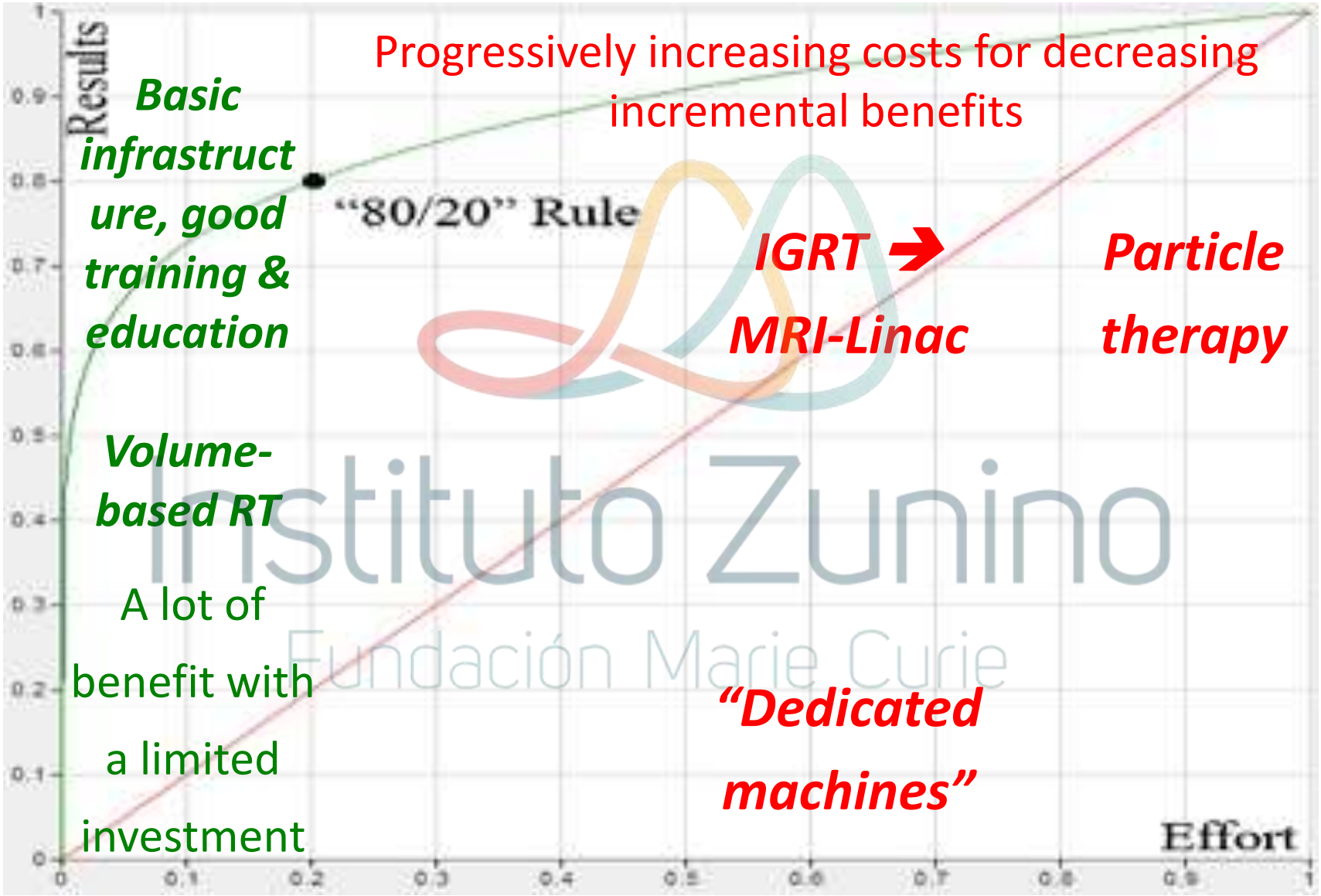
RT developments & Pareto: *Conclusions*



RT developments & Pareto: *Conclusions*



RT developments & Pareto: *Conclusions*



RT developments & Pareto: *Conclusions*

Technology, drugs & techniques:

A fool with a tool is still a fool!

RT developments & Pareto: *Acknowledgements*

The entire ESTRO & ECCO families.

All the colleagues I worked with.

All the patients I had the privilege to treat.

In fact: all of you who are active in the field of oncology in general and radiation oncology in particular!


Ceci n'est pas Paris


institutCurie