



# Prediction Models

Gemelli

Fondazione Policlinico Universitario A. Gemelli  
Università Cattolica del Sacro Cuore



ART  
Advanced Radiation Therapy



V. Valentini  
Università Cattolica S. Cuore - Rome



# No disclosure

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# The case for extending Fields and Dose

## The state fo ART

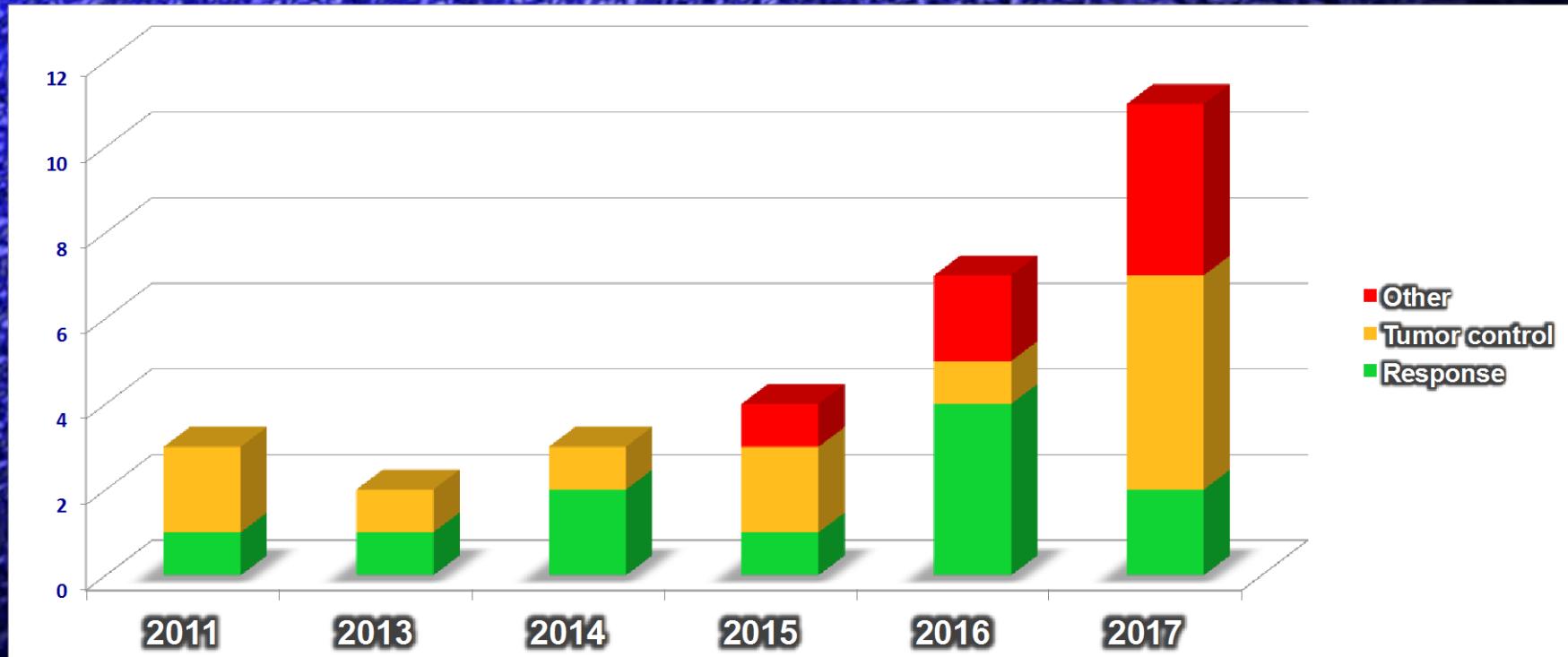
- Facts and figures
- Quality

## Emerging questions

- Mathematical issues
- Radiomics
- Omics

## Take home message

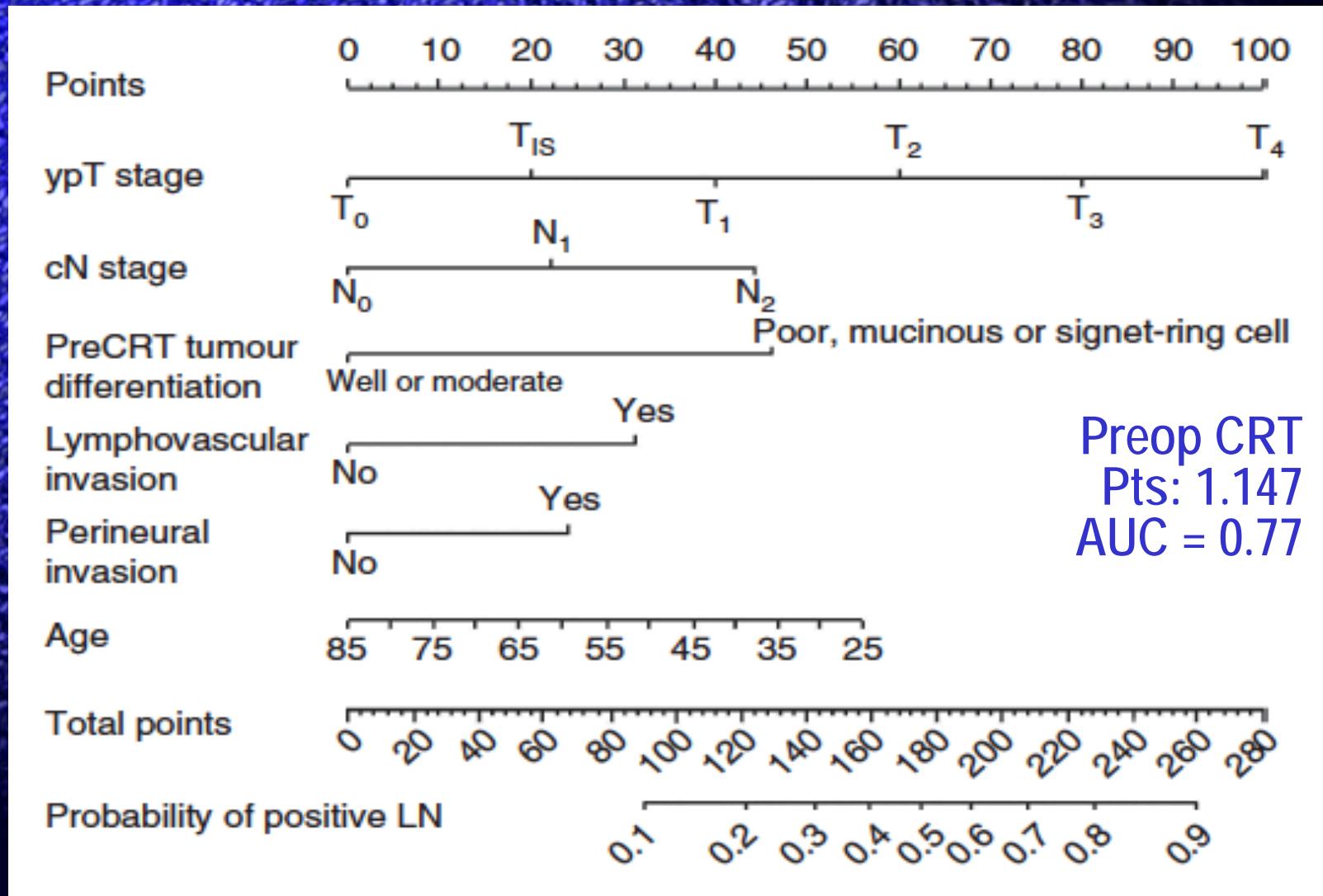
# *Prediction Models: 2011-2017*



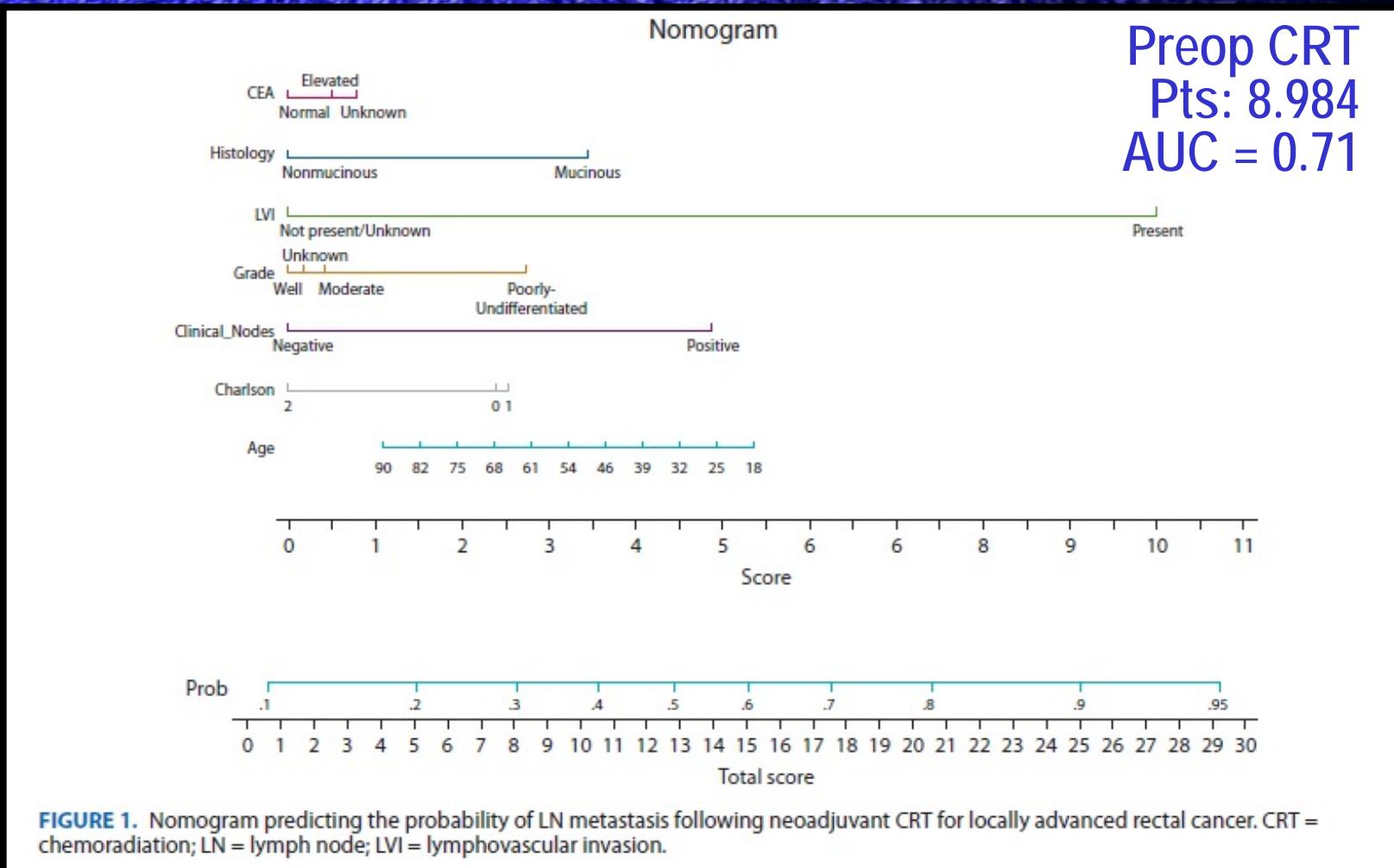
# *Prediction Models: 2011-2017*

- **RESPONSE:** pCR, R-, ypN
- **TUMOR CONTROL:** LC, DFS, SVV
- **OTHER:** Bowel disfunction,  
readmission in the elderly,  
postoperative complications, leakage

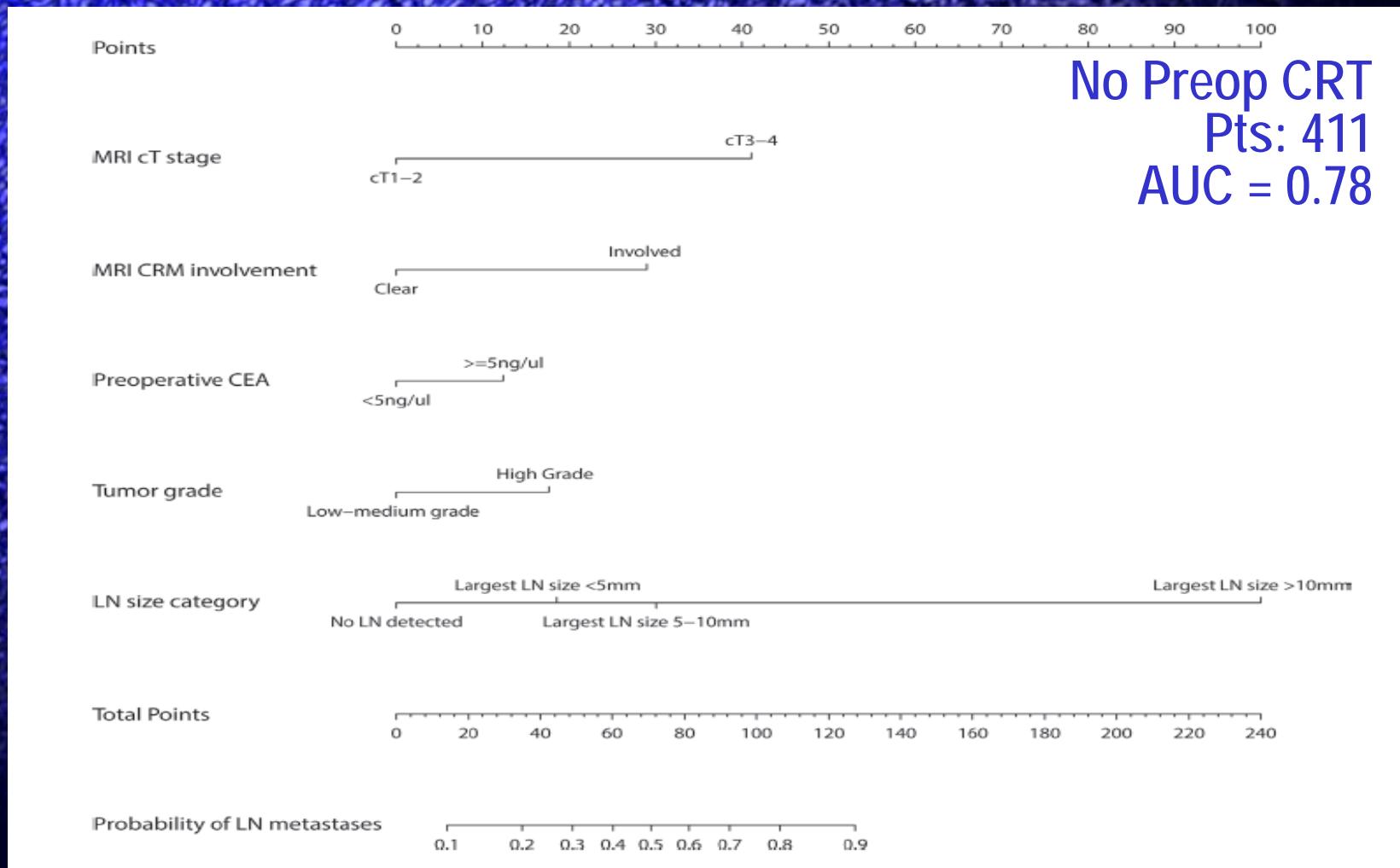
# *Prediction Models: ypN*



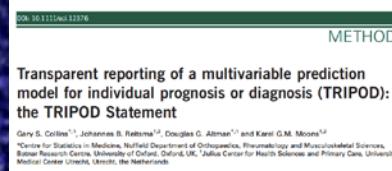
# *Prediction Models: ypN*



# *Prediction Models: ypN*



# Prediction Models: TRIPOD

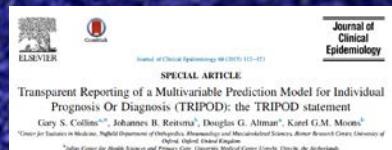
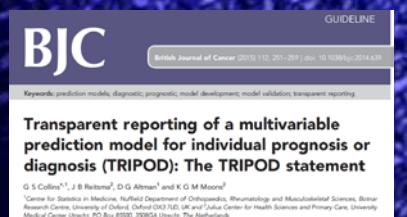
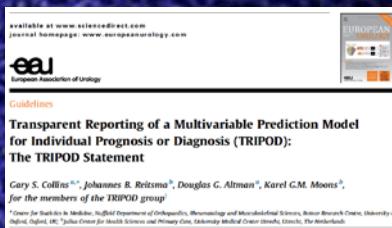
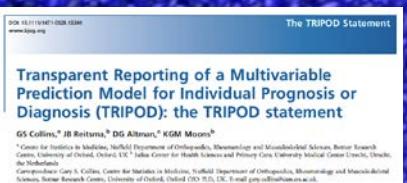


thebmj  
BMJ 2014;350:g7594 doi: 10.1136/bmj.g7594 (Published 7 January 2015)  
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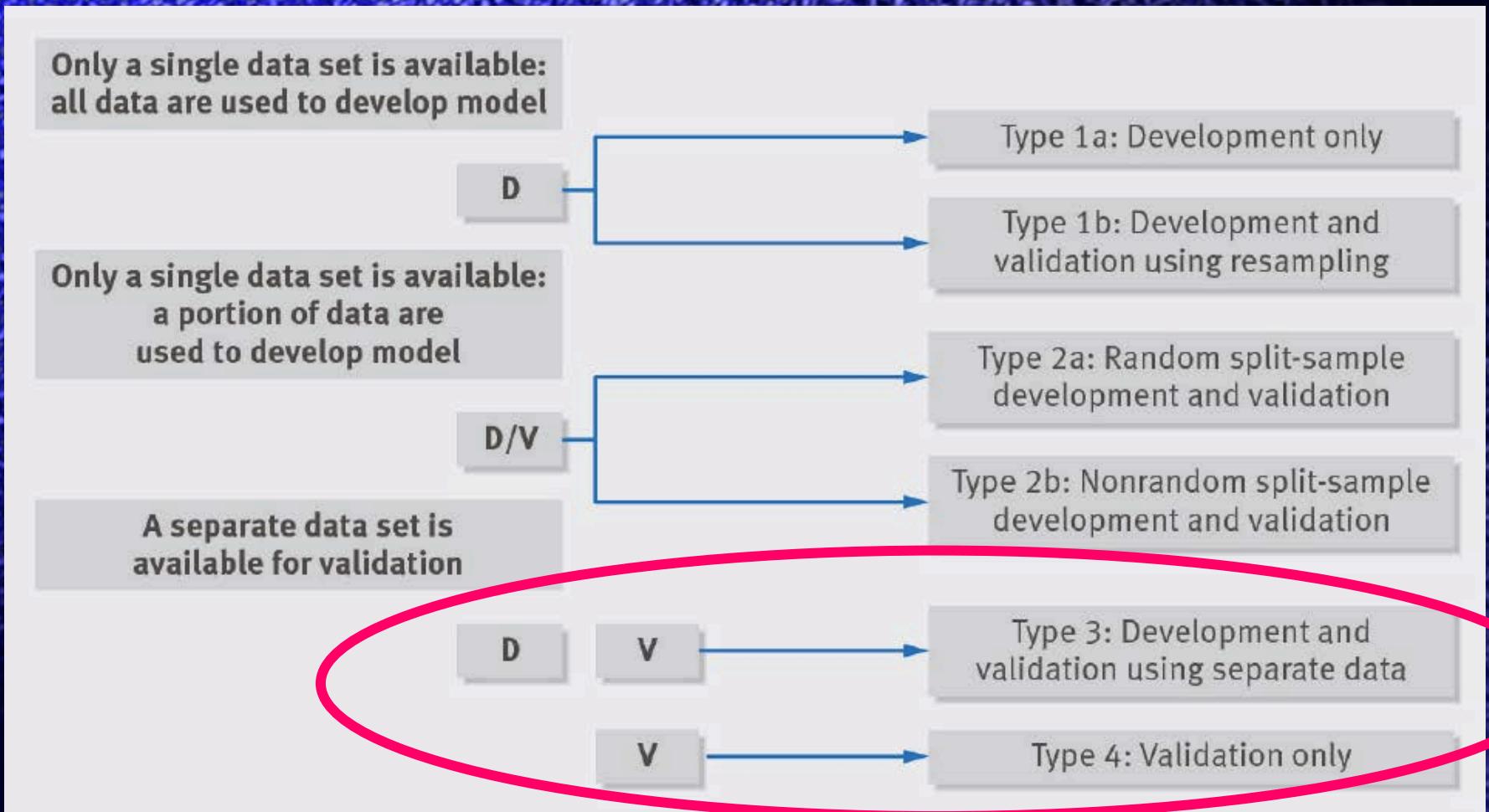
## RESEARCH METHODS & REPORTING

### Transparent reporting of a multivariable prediction model for individual prognosis or diagnosis (TRIPOD): the TRIPOD statement

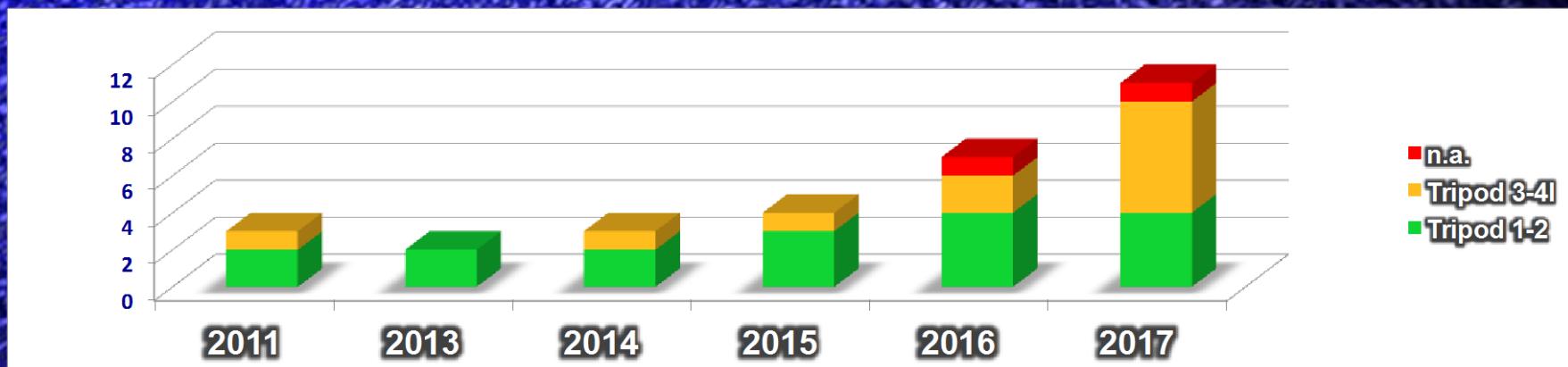
Gary S Collins associate professor<sup>1</sup>, Johannes B Reitsma associate professor<sup>2</sup>, Douglas G Altman professor<sup>1</sup>, Karel G M Moons professor<sup>2</sup>



# *Prediction Models: TRIPod*



# *Prediction Models: TRIPOD*



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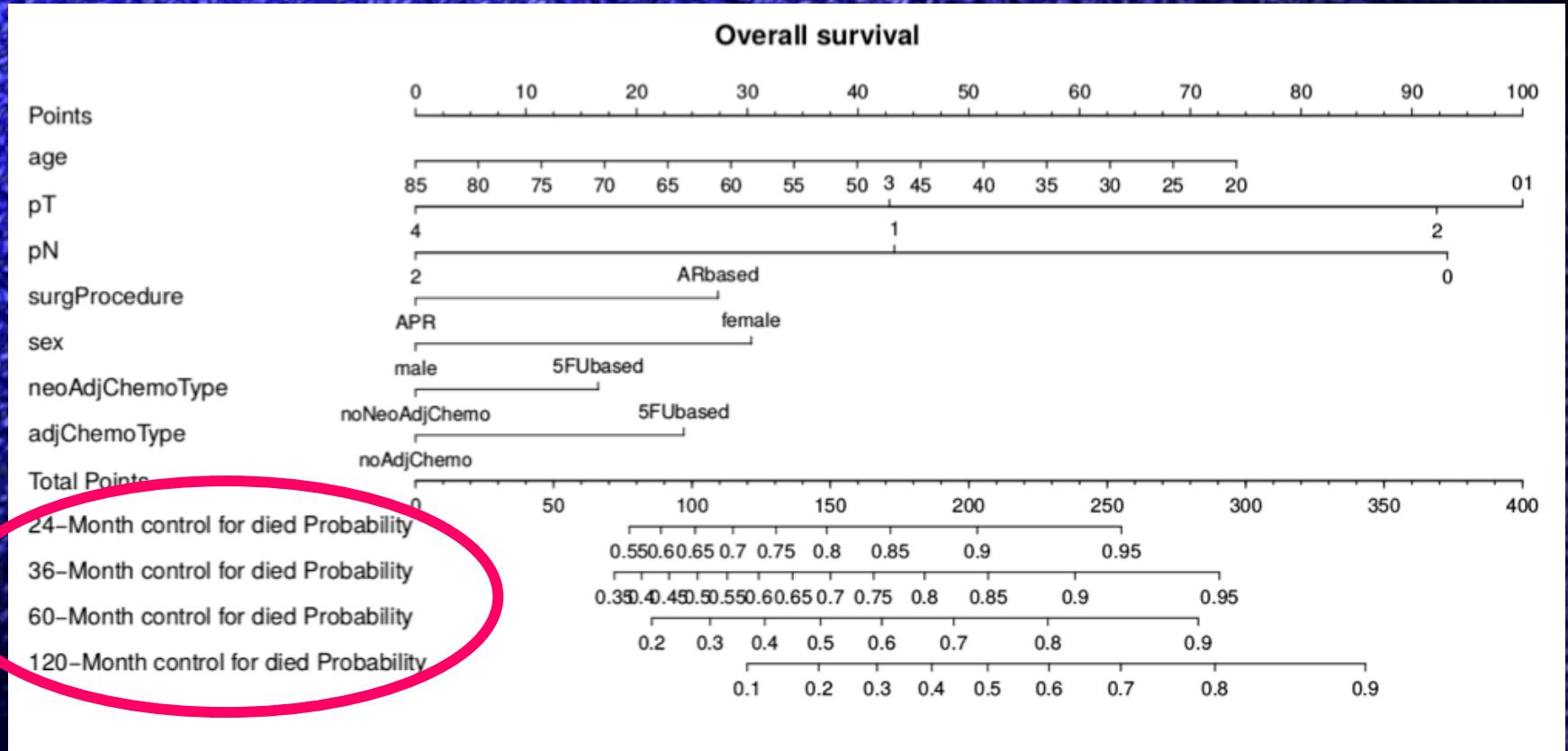
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## Take home message

# *Accuracy and Generalizability*

Measurement	Possible method	Measures?
Accuracy	Brier score	Predicted outcomes match observed?
Discrimination	Area under ROC	How well can we threshold predicted outcomes?
Calibration	Hosmer-Lemeshow	How do predicted values compare to subgroups of patients? (low/medium/high probability)
Generalizability	DDM	Can we apply it to other datasets?
Reproducibility	DDM approx. 0.5	Similar population
Transferability	DDM < 0.5 >	Different population

# Assumption consistency

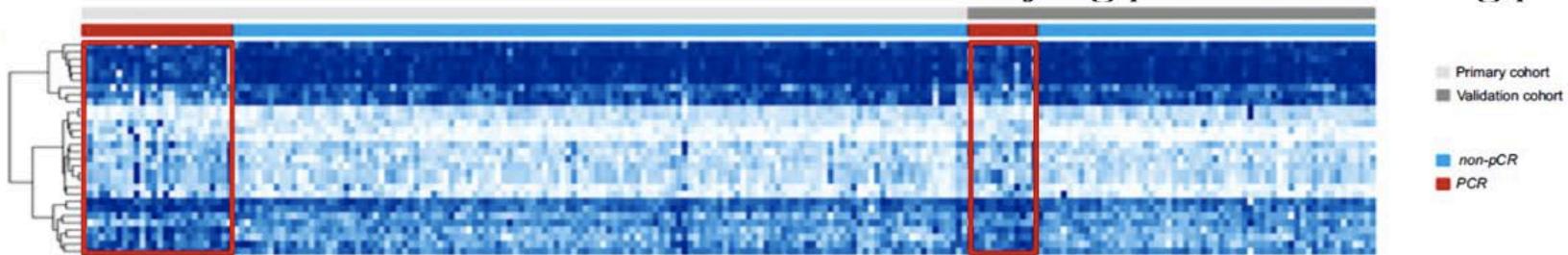


# *Prediction Models: Radomics*

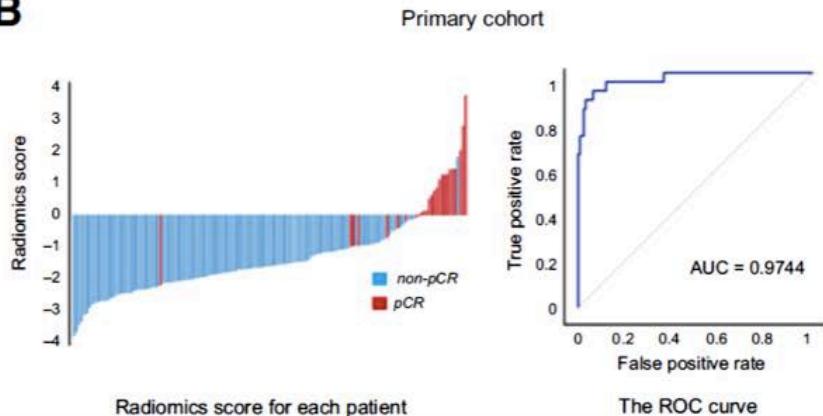
## Rectal Cancer Radiomics: MRI

- Definition of a radiomics score for identifying patients showing pCR

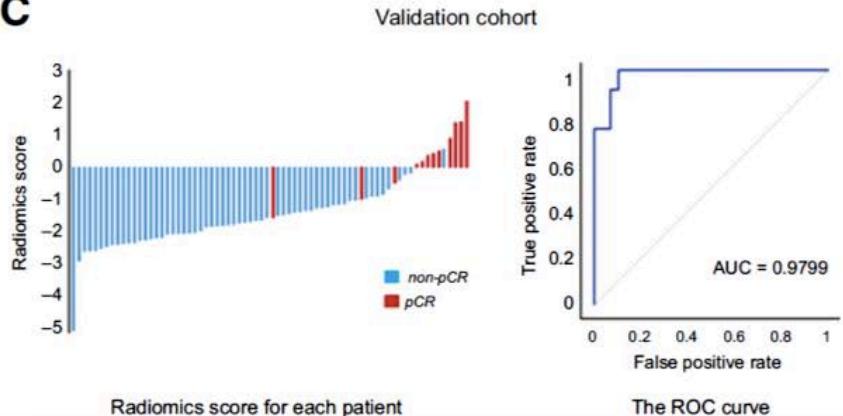
A



B

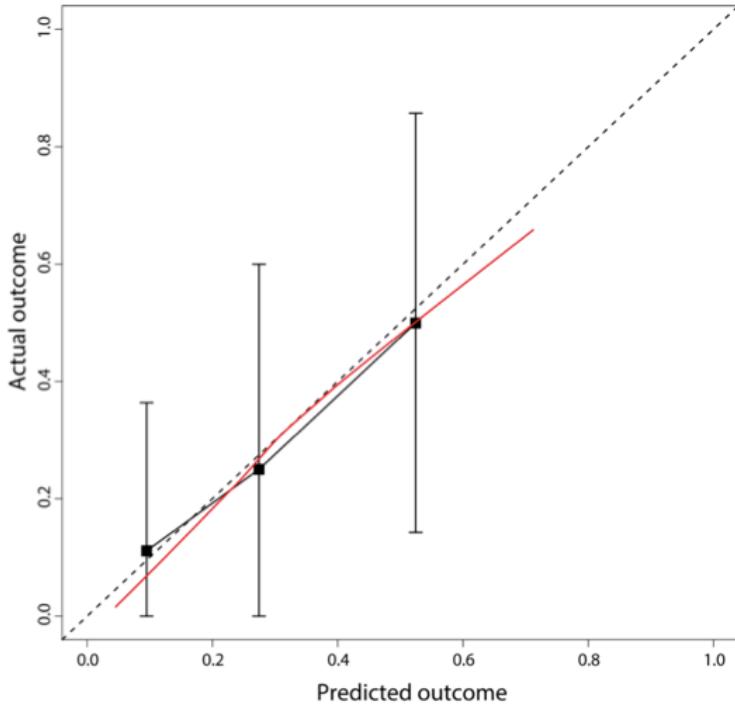
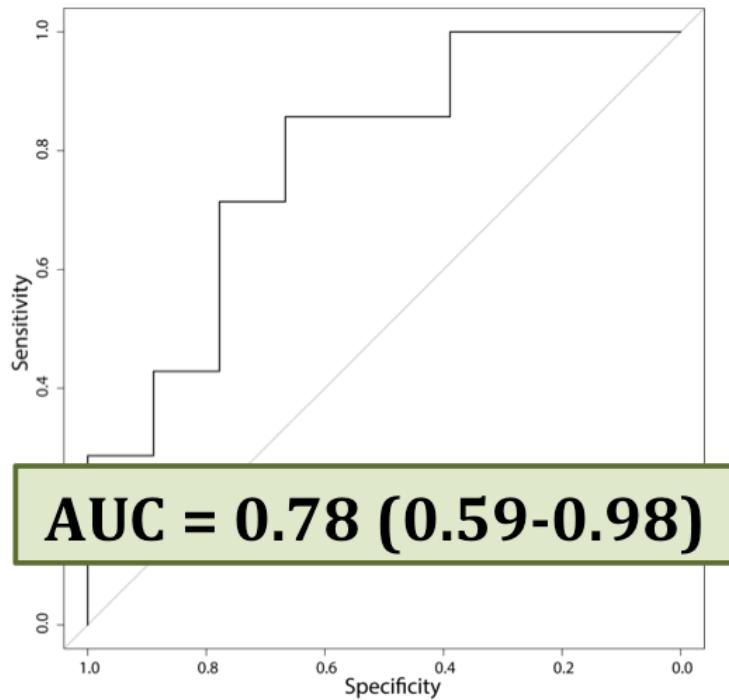


C



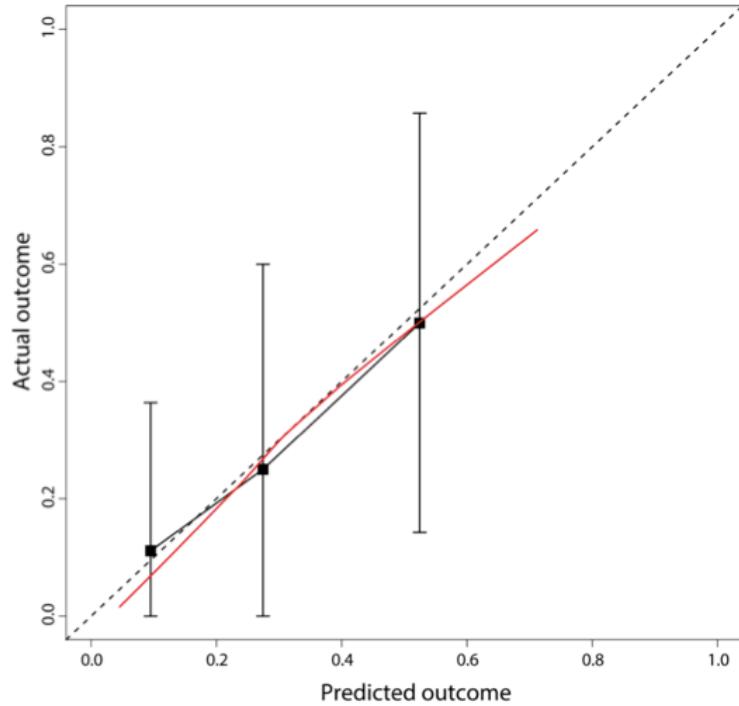
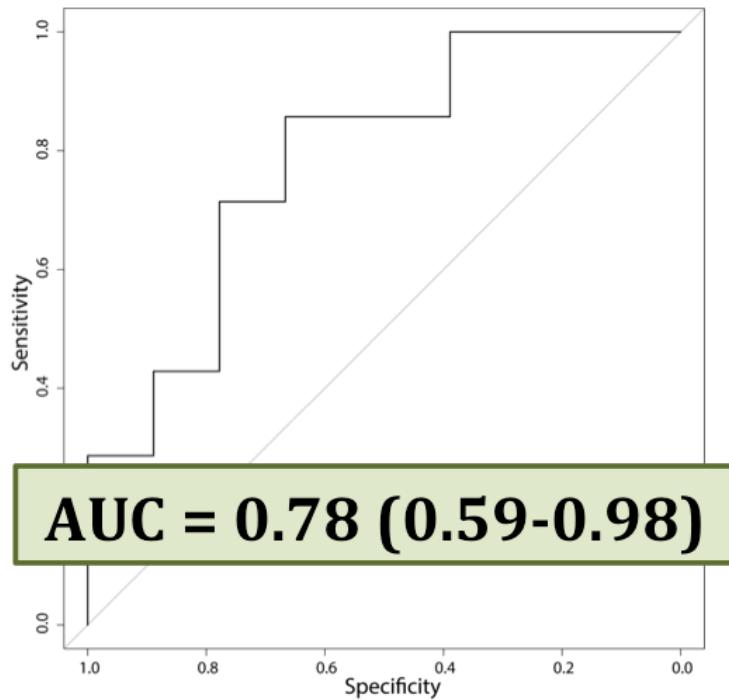
# *Prediction Models: Radomics*

## Rectal Cancer Radiomics: MRI External validation

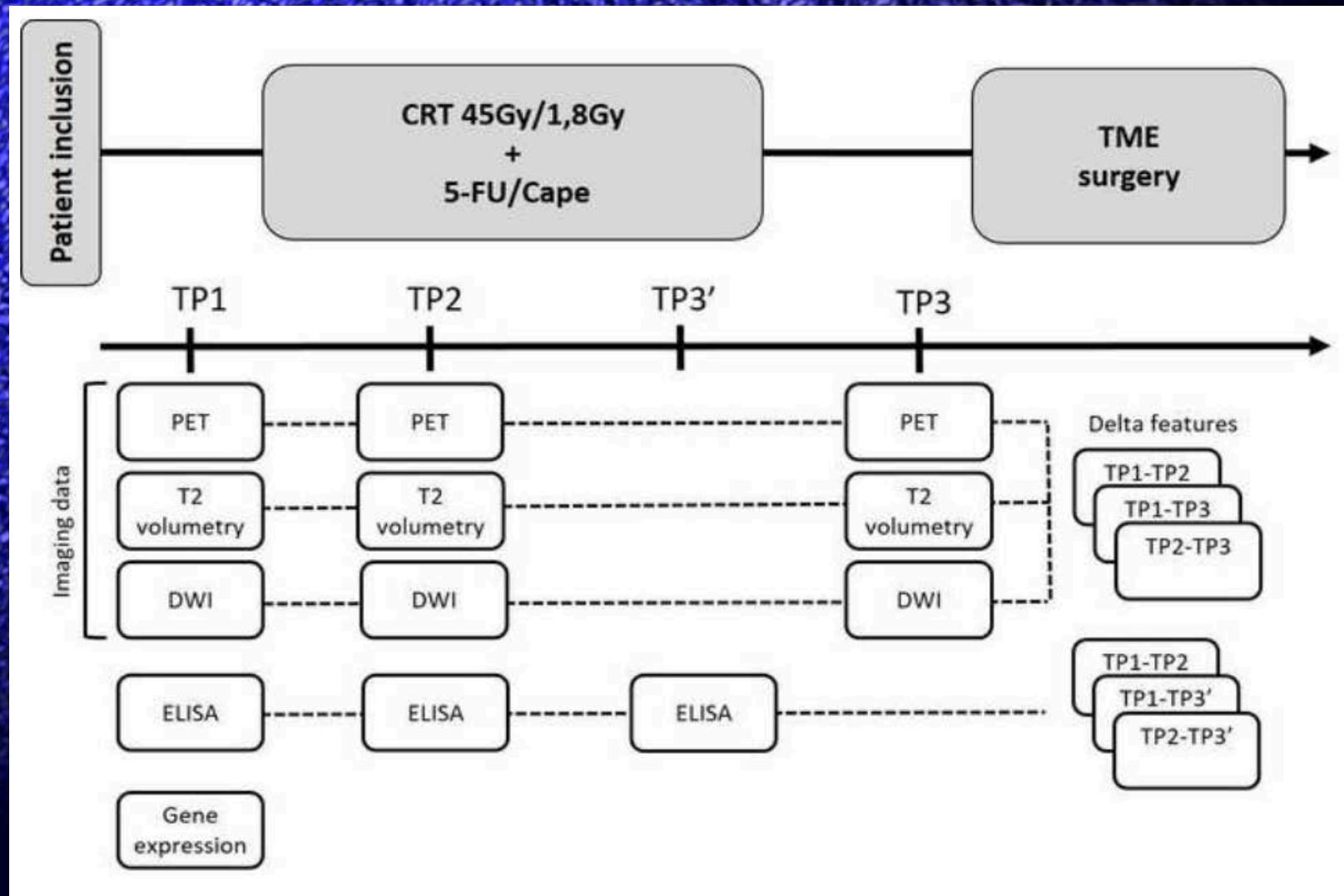


# *Prediction Models: Radomics*

## Rectal Cancer Radiomics: MRI External validation



# Prediction Models: Radomics + omics



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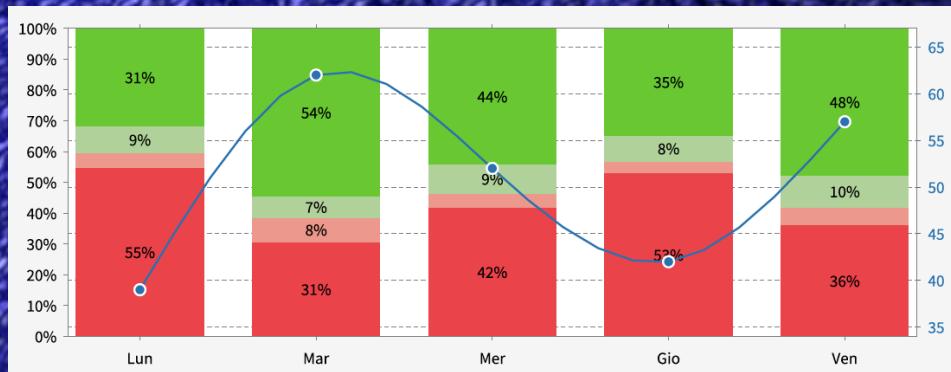
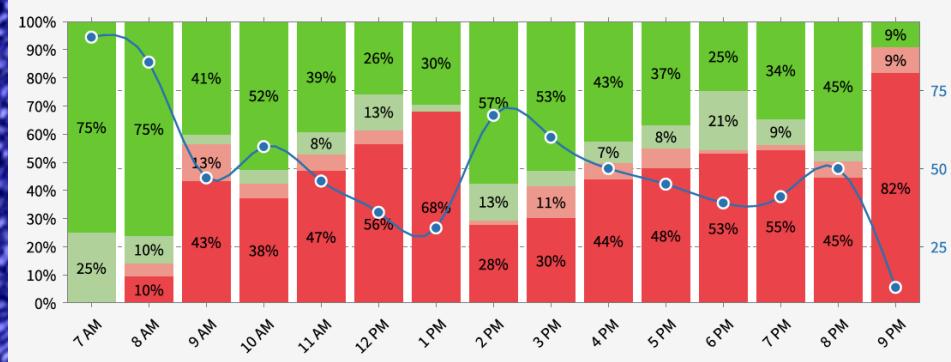
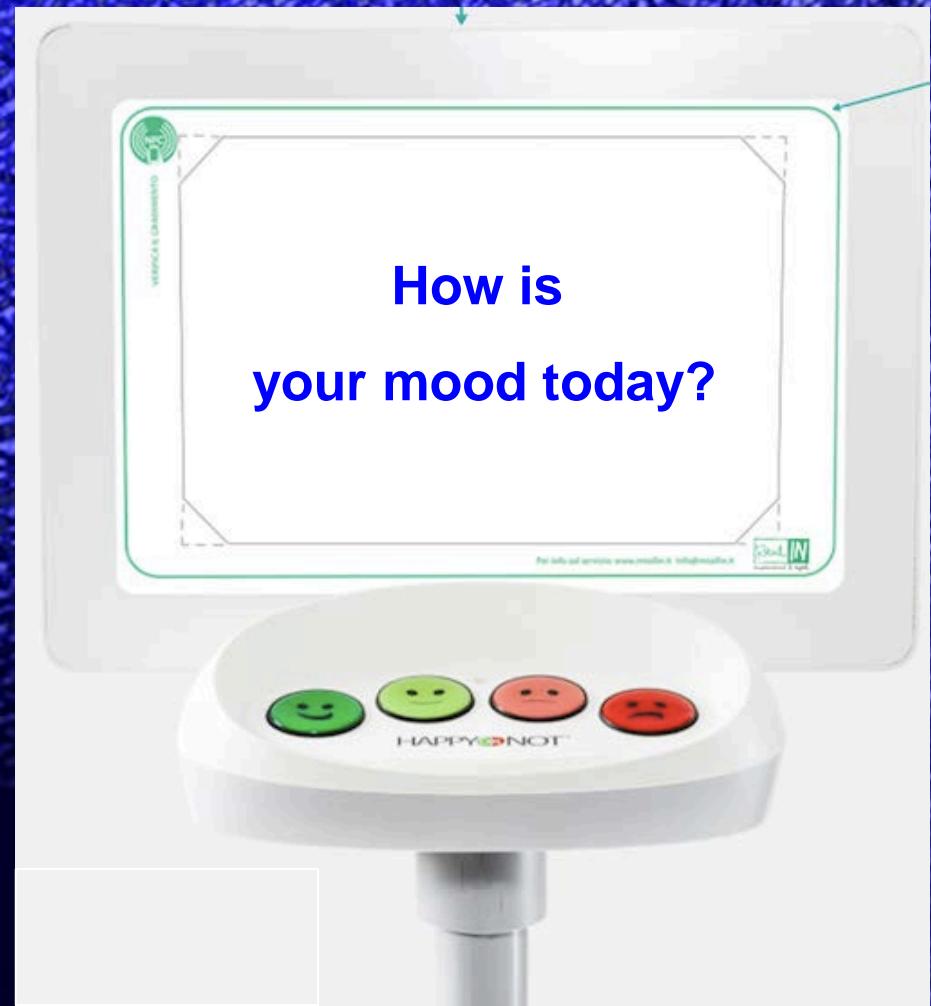
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## Take home message

# PROM & PREM



# Multidisciplinary team

*Multidisciplinary teams (MDTs) are an alliance of all medical and health care professionals related to a specific tumour disease whose approach to cancer care is guided by their willingness to agree on evidence-based clinical decisions and to co-ordinate the delivery of care at all stages of the process, encouraging patients in turn to take an active role in their care.*

# Studies generating hypothesis

*Align and repositioning*



*Much more than bony anatomy*

# Acknowledgements

## KBO LABS

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### Coordinators

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### PhD

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### Collaborations

- P.Lambin, A.Dekker, J Van Soest

