

Decision making in radiotheranostics

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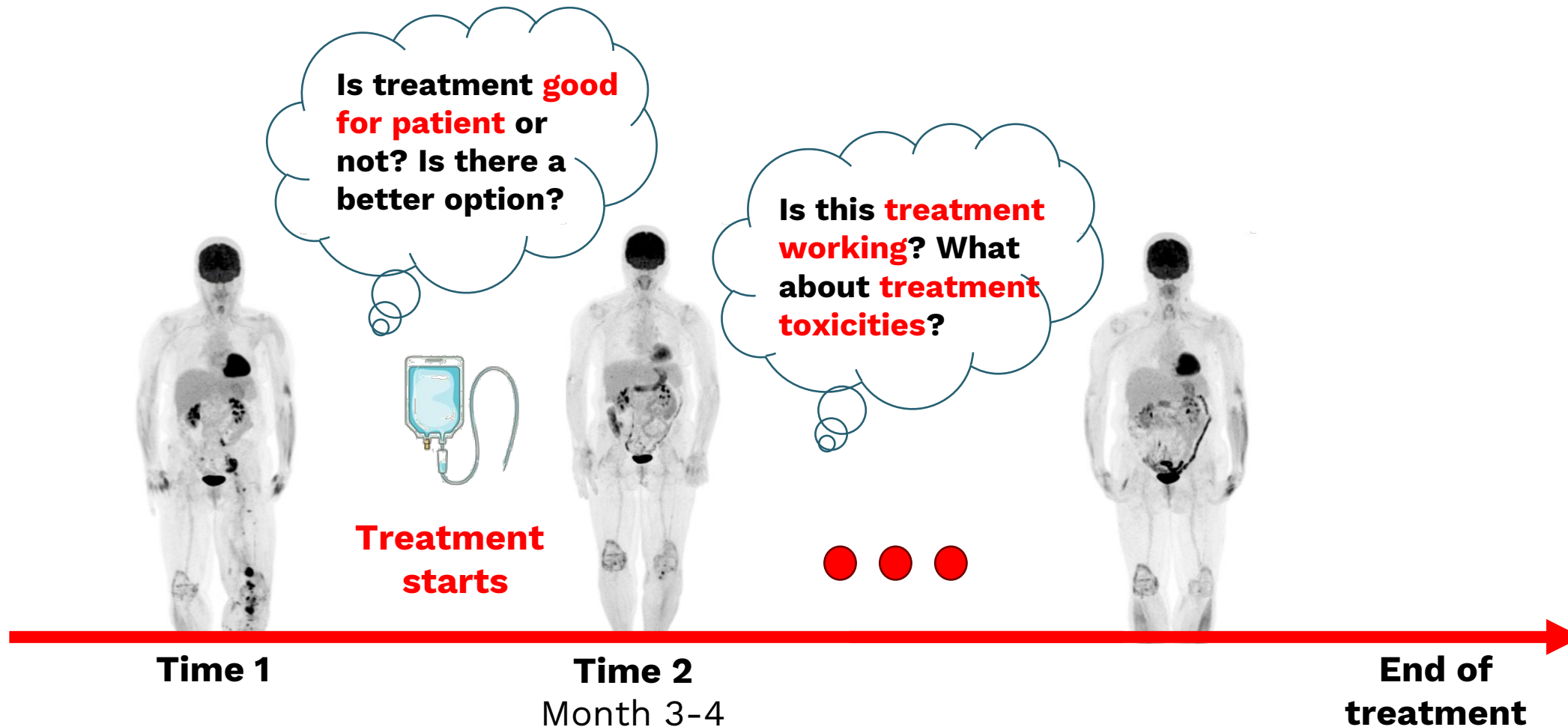
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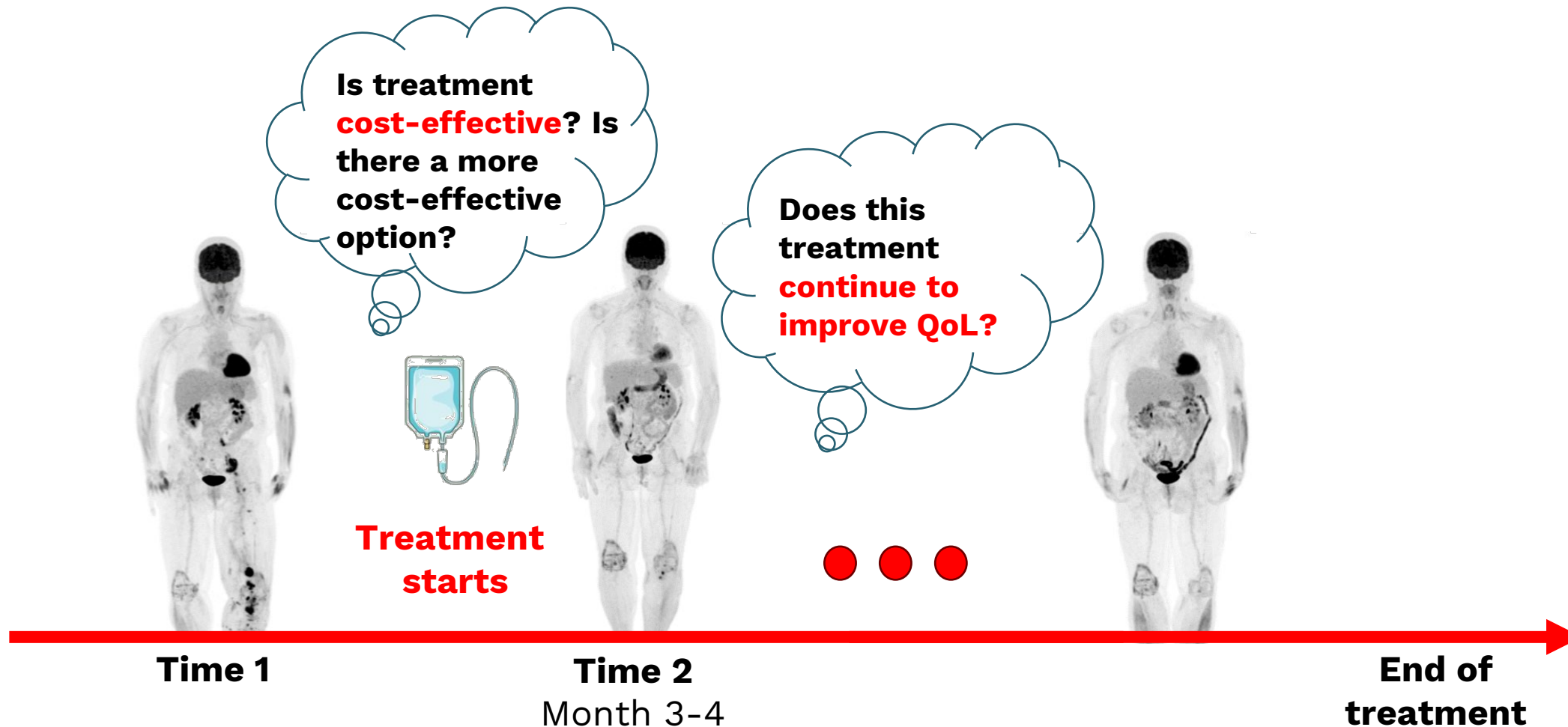
Disclosure

- Founder and CSO of AIQ Solutions

Patient journey



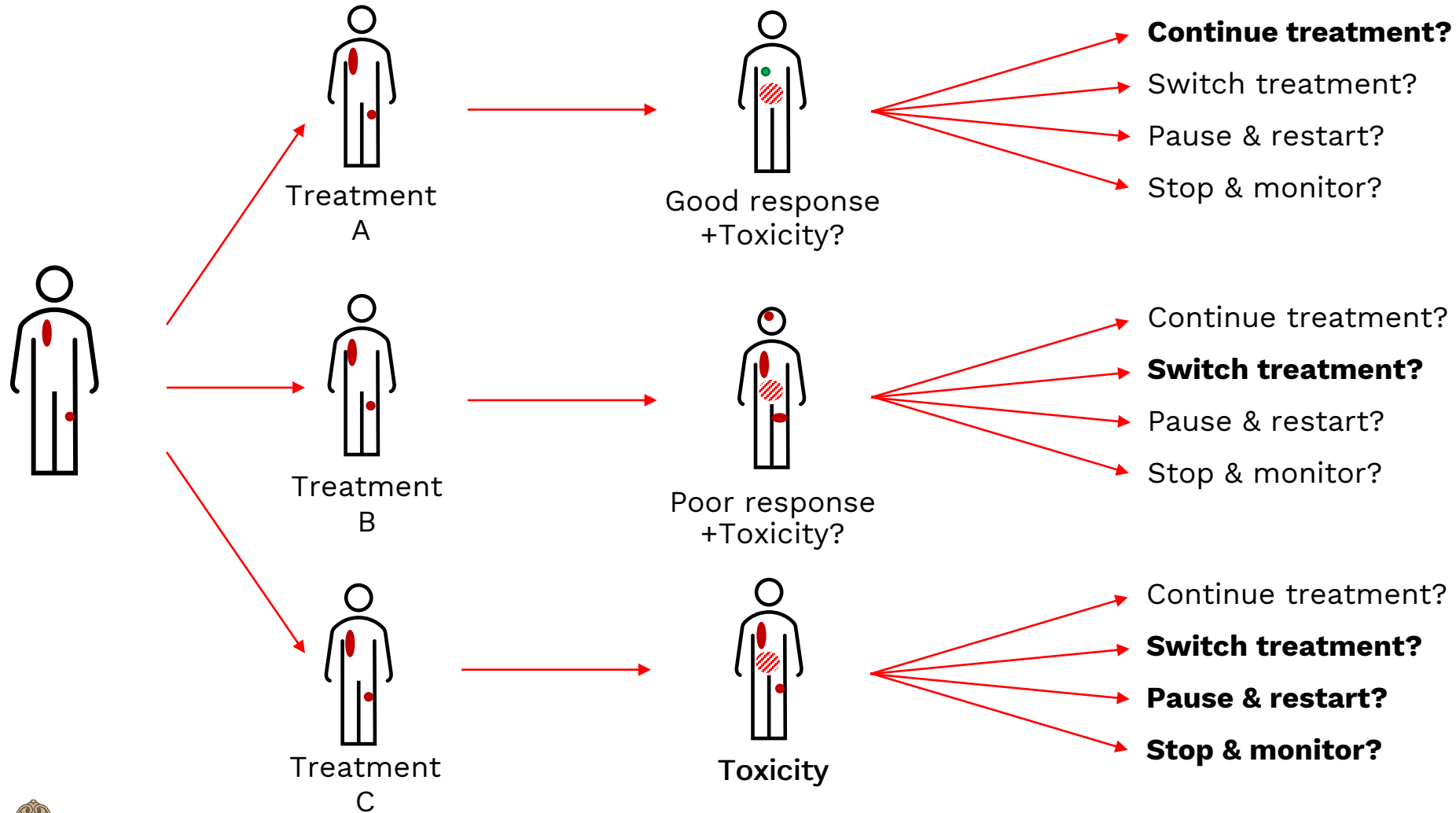
HTA perspective



Adapting treatment schedules

Treatment selection

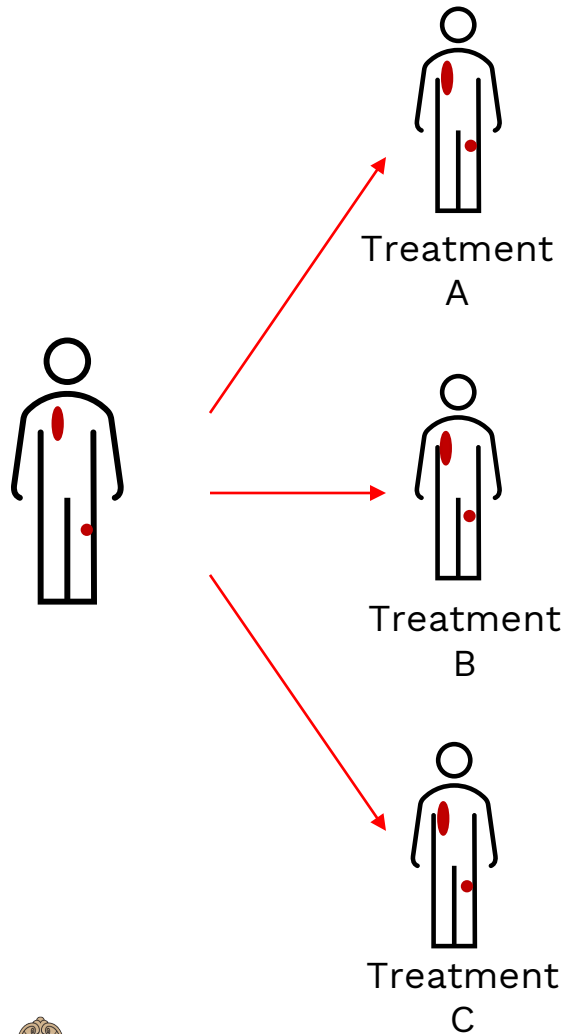
Response Assessment



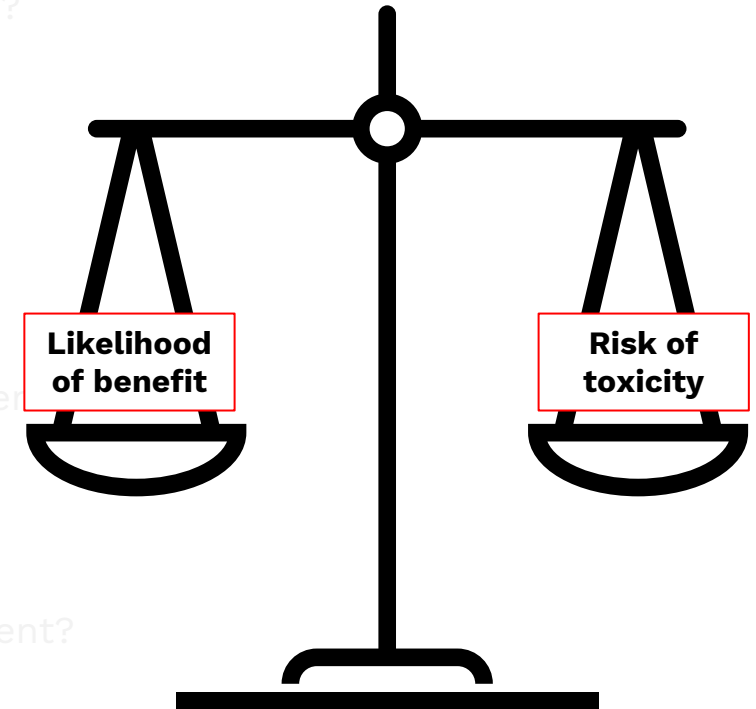
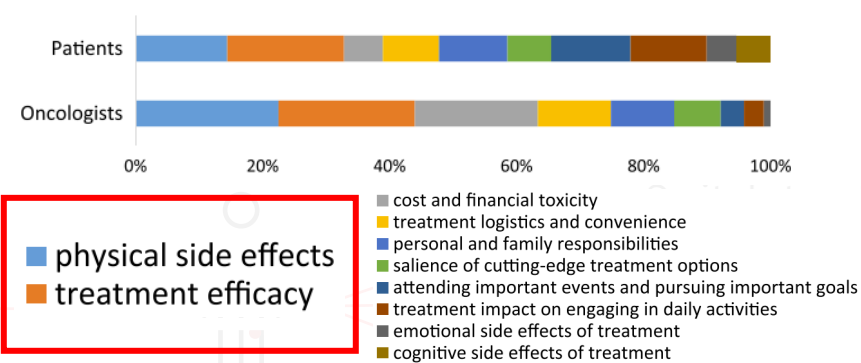
Balancing risks and benefit

Treatment selection

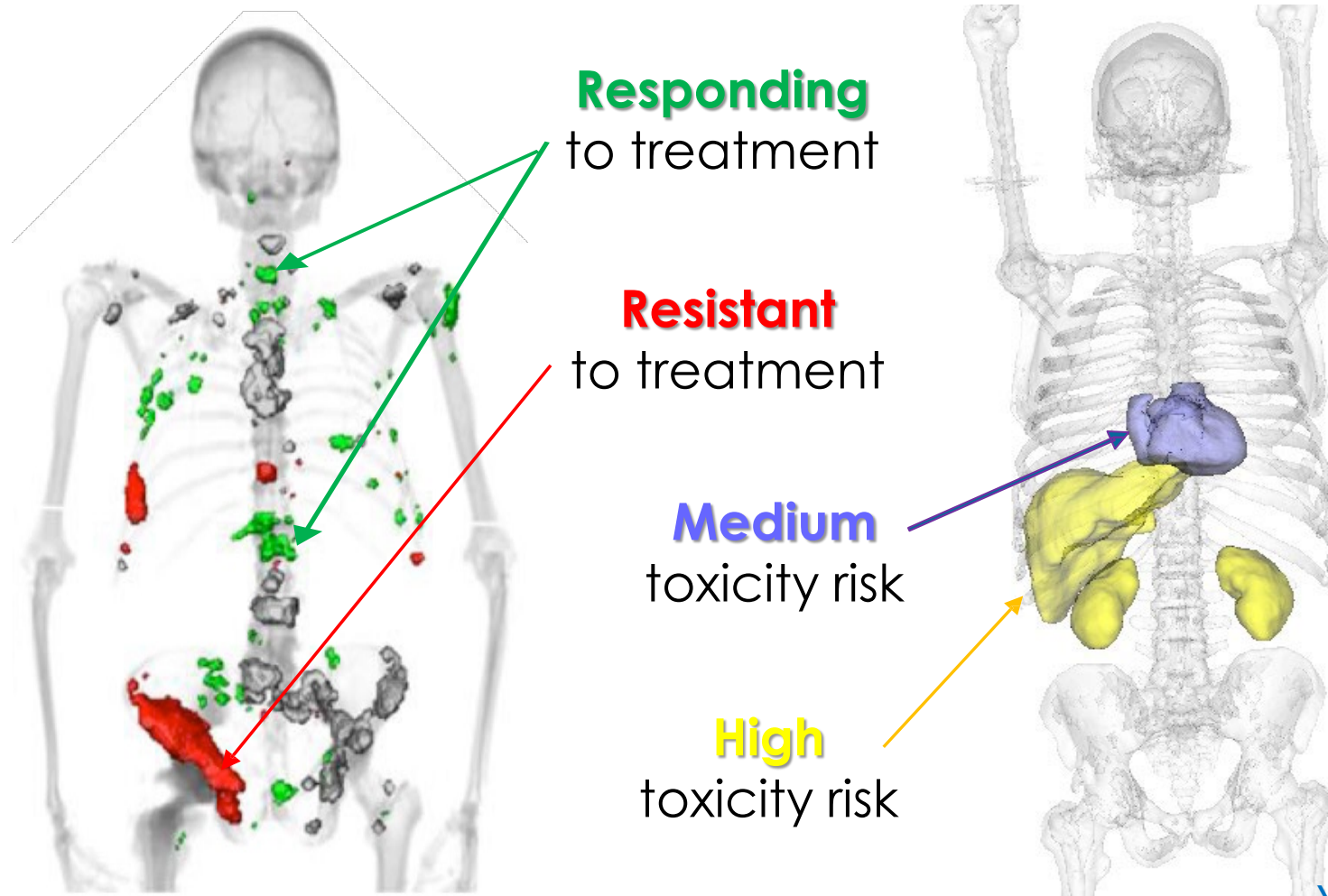
Response Assessment



The percentage of thematic references referring to specific themes.



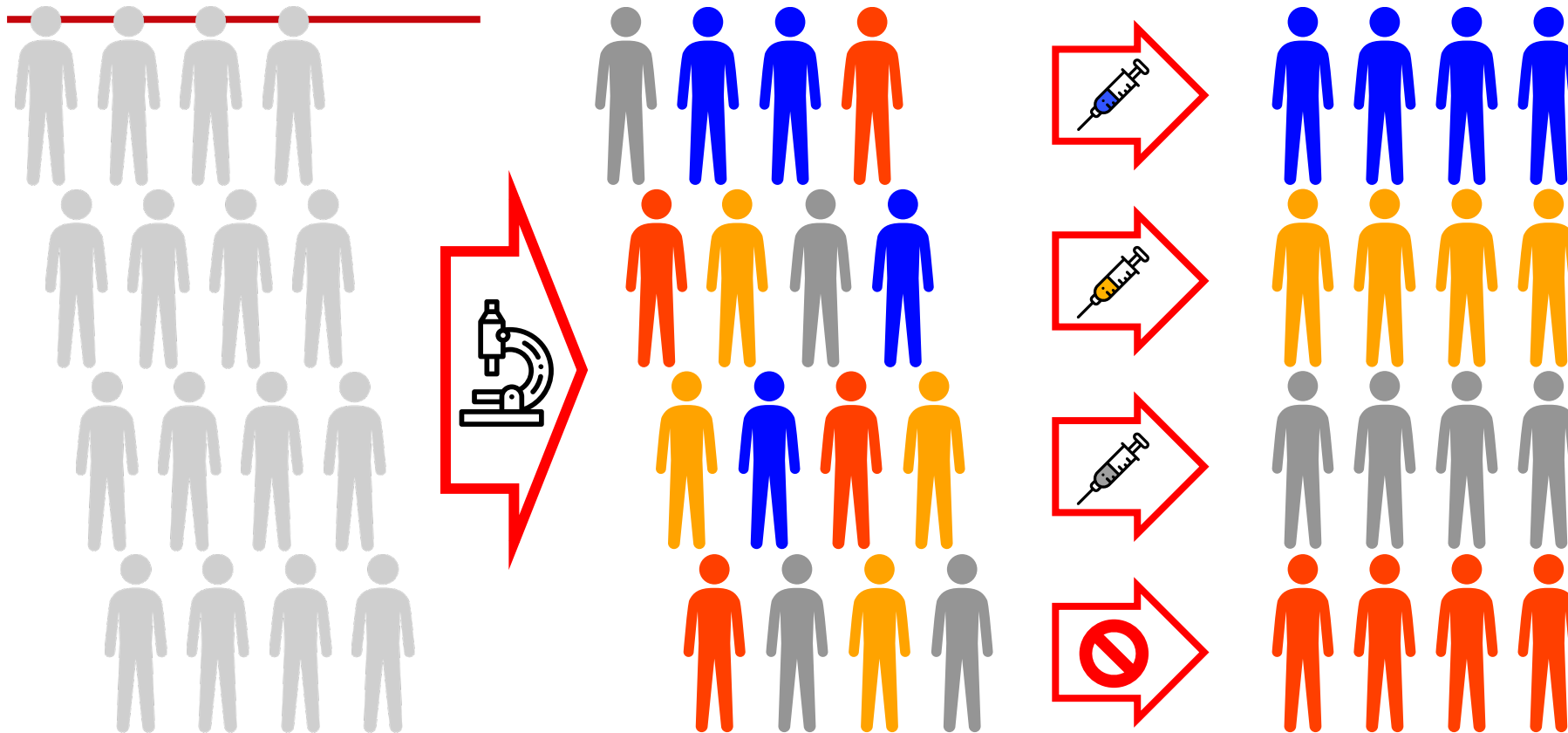
Assessment of risks and benefit: AI-based Quantitative Imaging Biomarkers



PRECISION MEDICINE

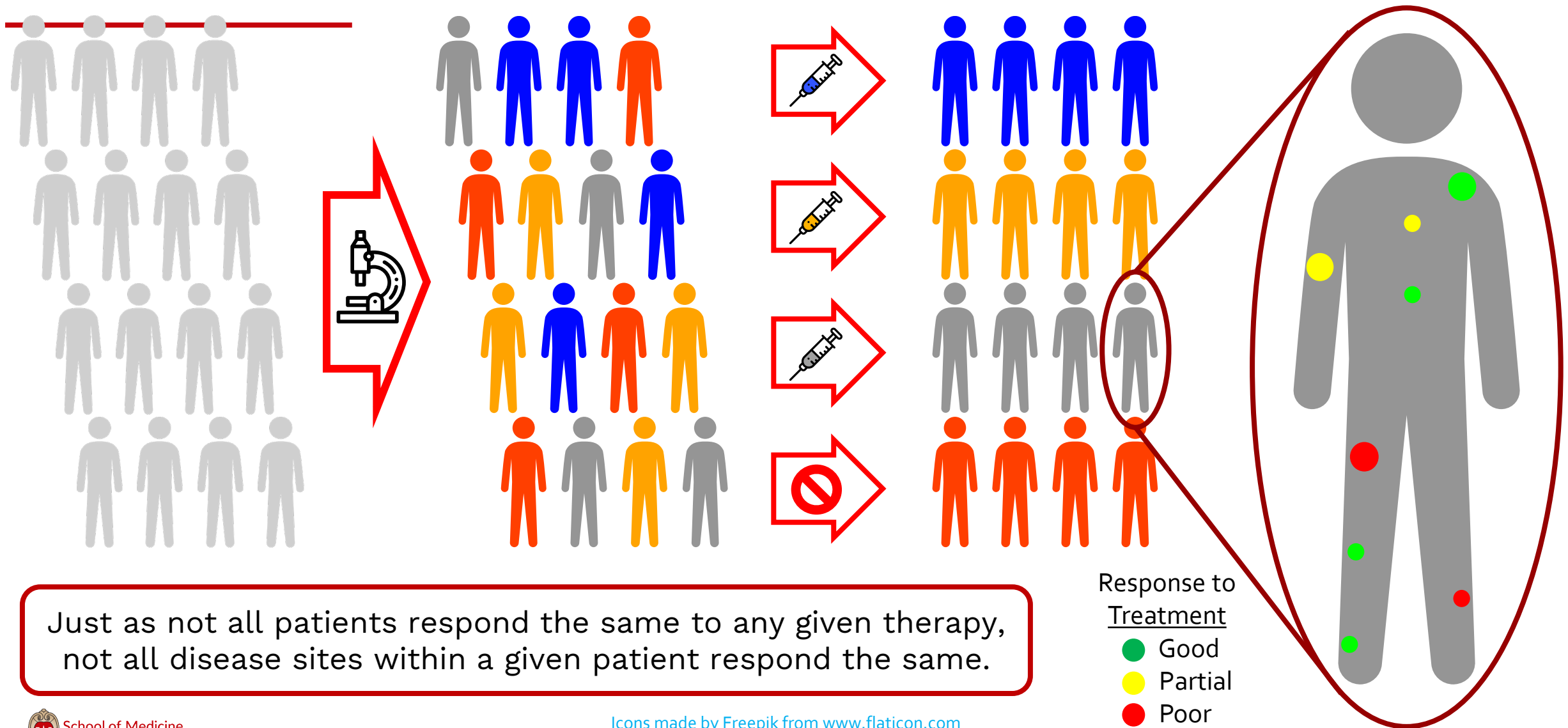
- The problem of response heterogeneity
- The problem of treatment resistance

Precision medicine aims for this...



Not all patients respond the same to any given therapy,
therefore different treatments need to be chosen

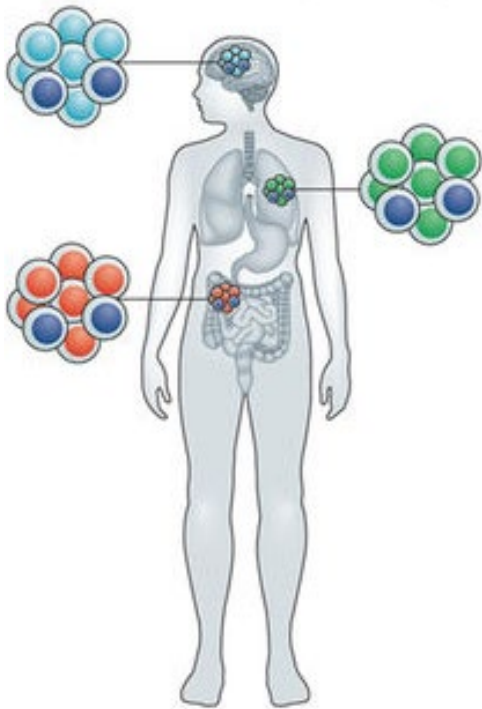
...but there is a big problem!



Why heterogeneity?

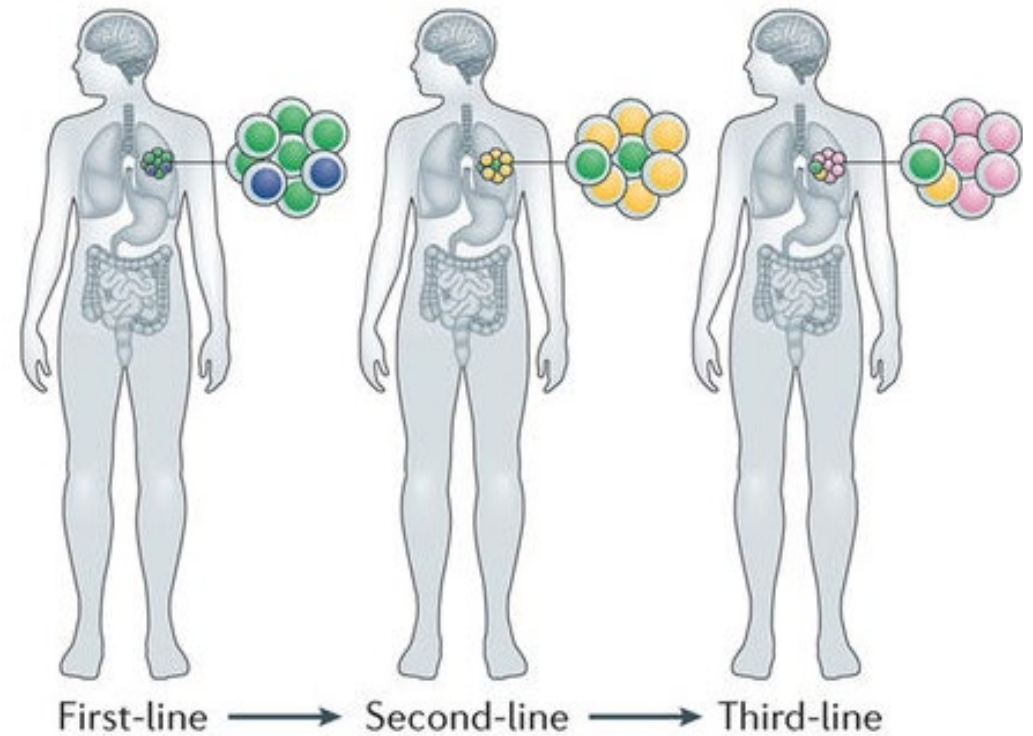
Spatial Heterogeneity

Different disease sites have different responses to therapy at a given point in time

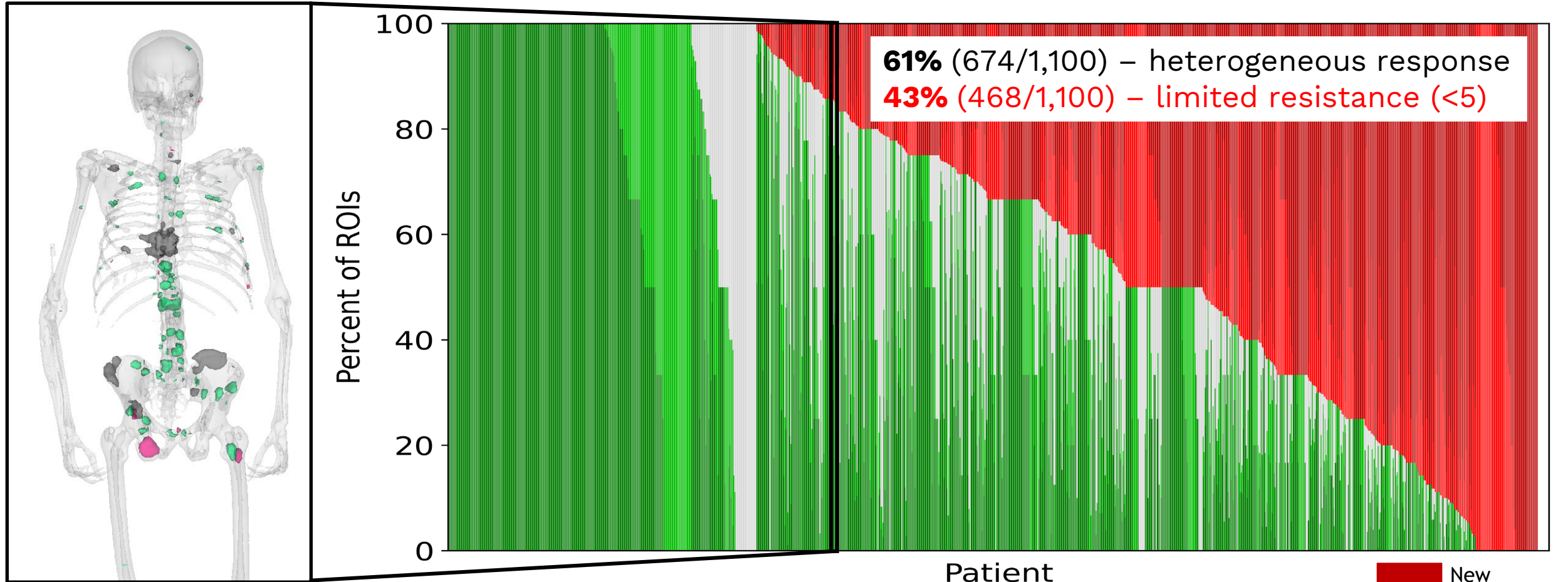


Temporal Heterogeneity

The same disease site may respond differently at different points in time



Treatment response heterogeneity

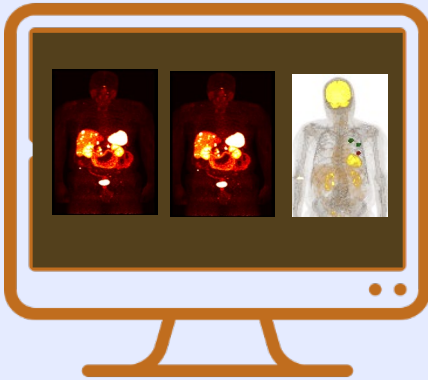


Cancers included (**n=1,100**): prostate, bladder, renal, testicular, penile
H&N, NSCLC, NET, melanoma, ACC

Miyahira and Soule 2024, Prostate, 1-19
Sartoro-Fernandes 2025, J Nuc Med

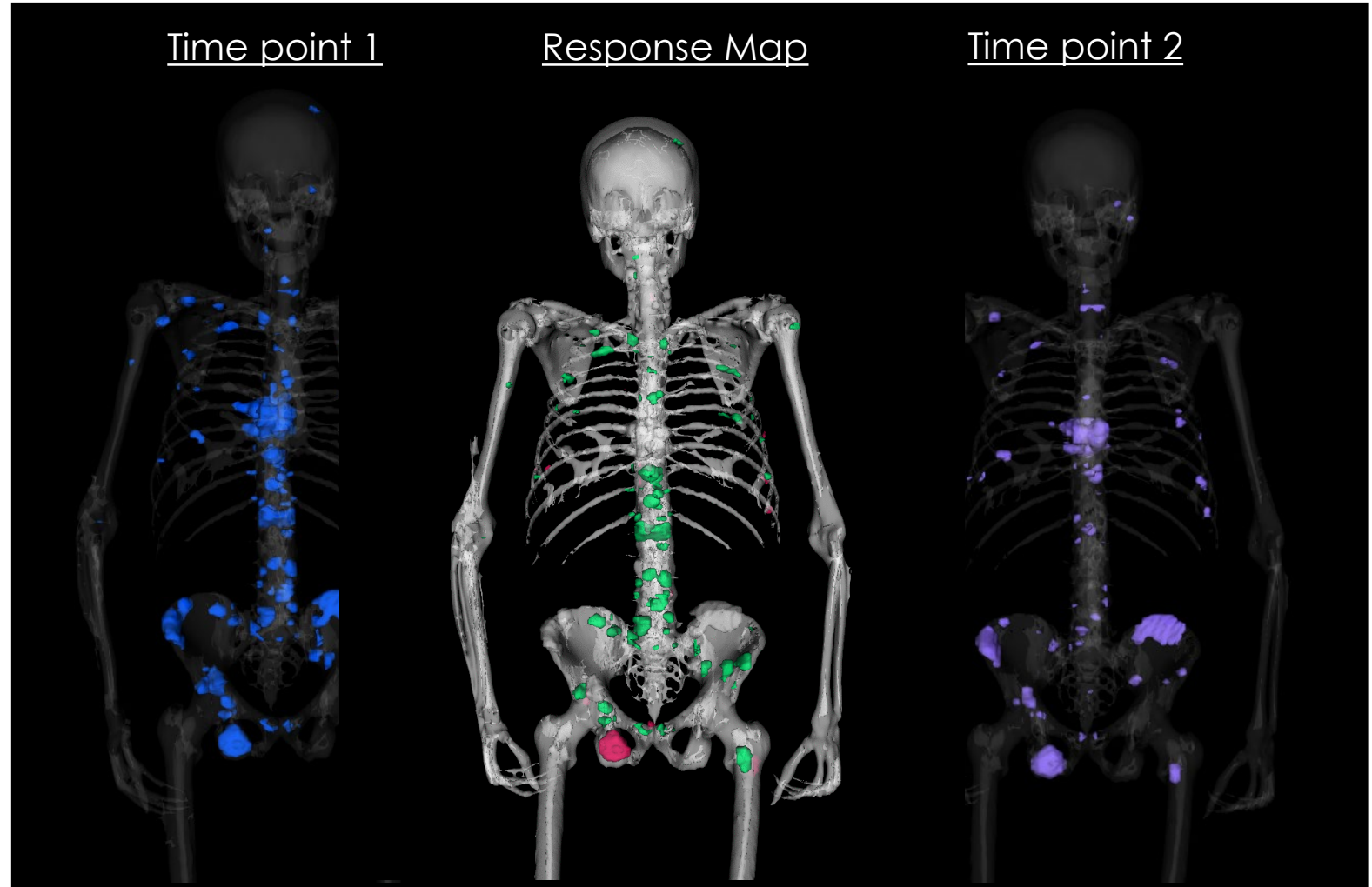
Treatment response assessment – AI-based approach

Automatic and Quantitative
Assessment



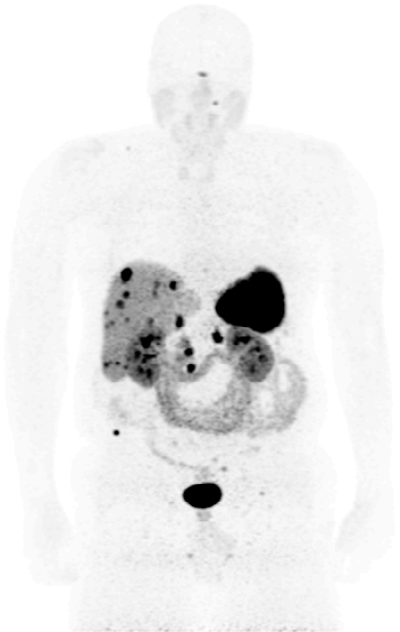
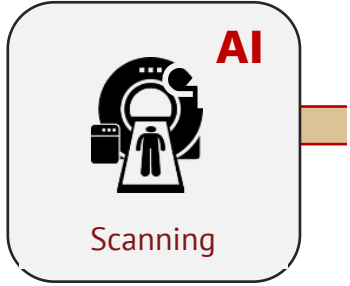
Our software automatically detects
and classifies all lesions

US Patents 9603567, 10445878
Licensed to our spin-off:
AIQ Solutions

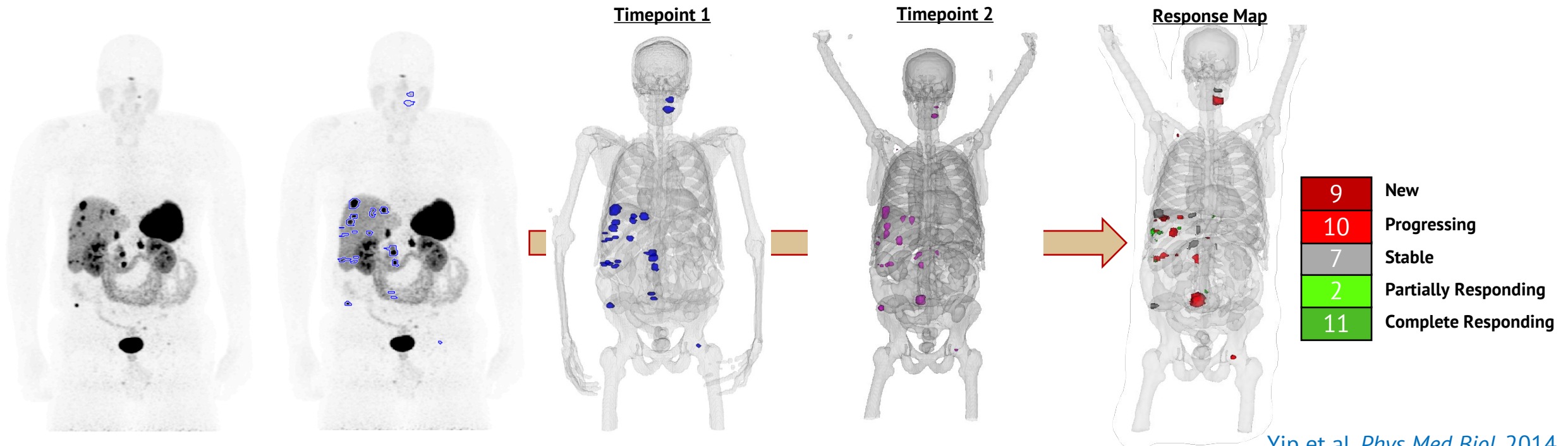


 Responding  Progressing  Stable

Treatment response assessment – AI-supported workflow



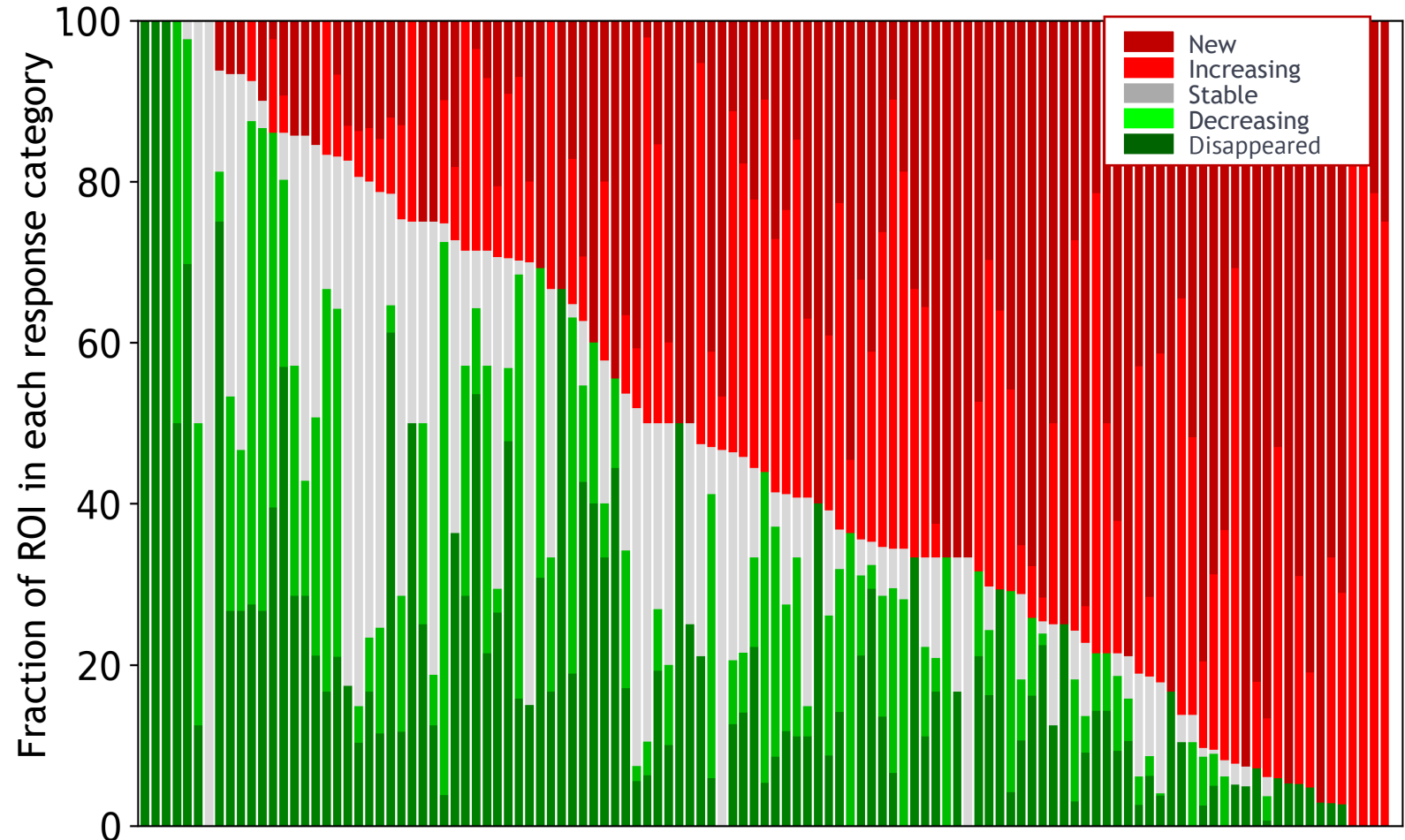
Treatment response assessment – AI-supported workflow



Treatment response heterogeneity

Spatial heterogeneity

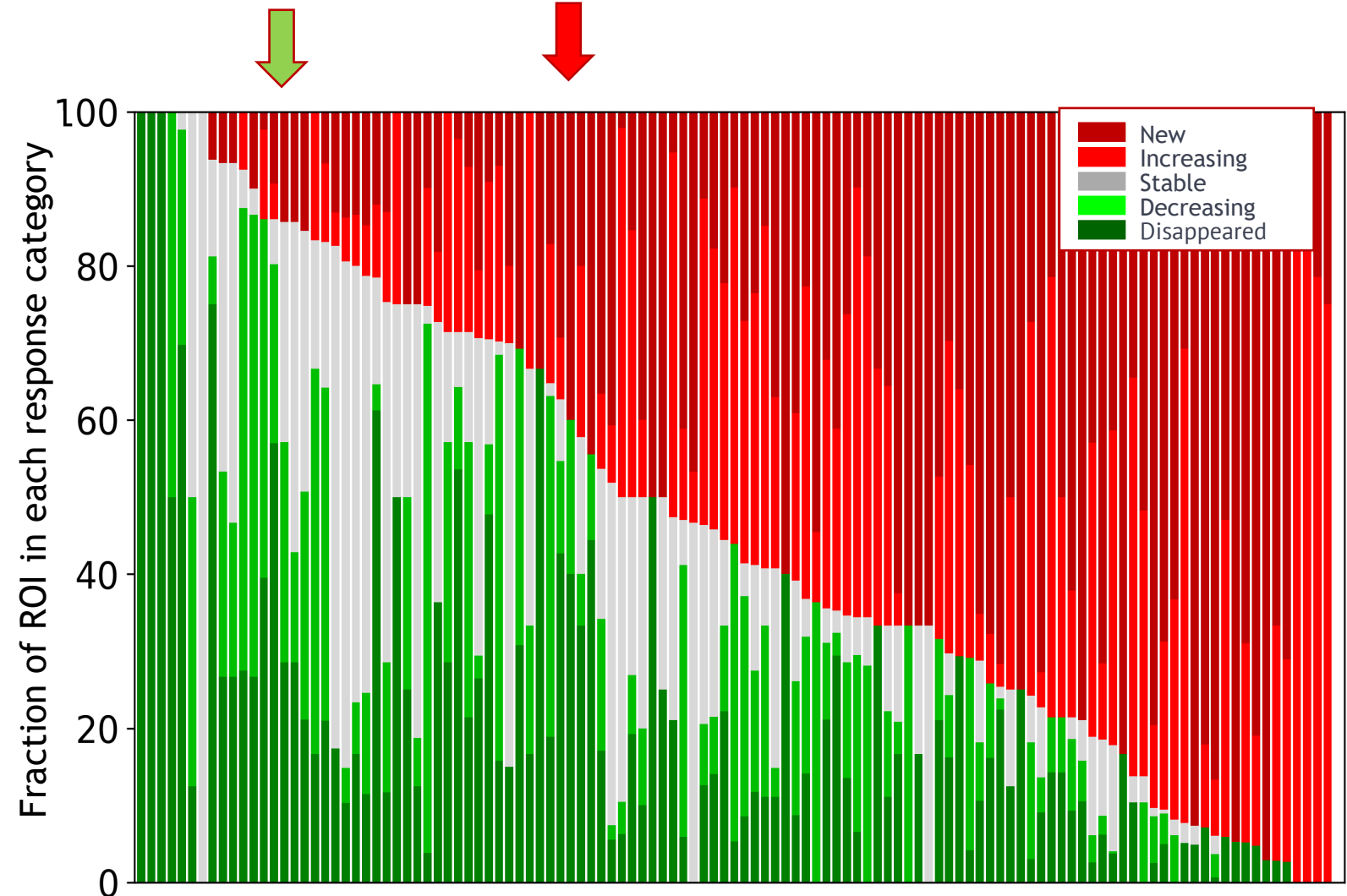
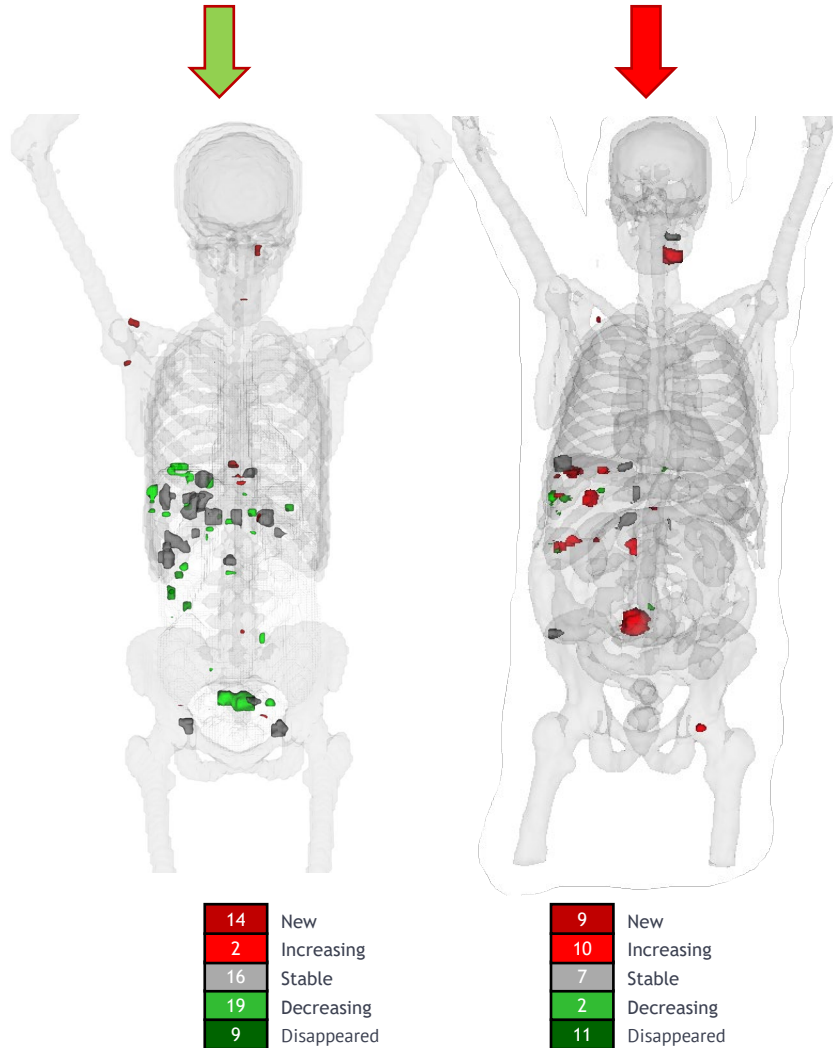
- Retrospective theranostics study of 118 patients
- Sequential ^{68}Ga -DOTATATE PET/CT imaging during ^{177}Lu -DOTATATE therapy
- Imaging per standard of care
- **91%** (107/118) of patients simultaneously had increasing and decreasing lesions



Each bar represents an individual patient (n=118)

Treatment response heterogeneity

Spatial heterogeneity

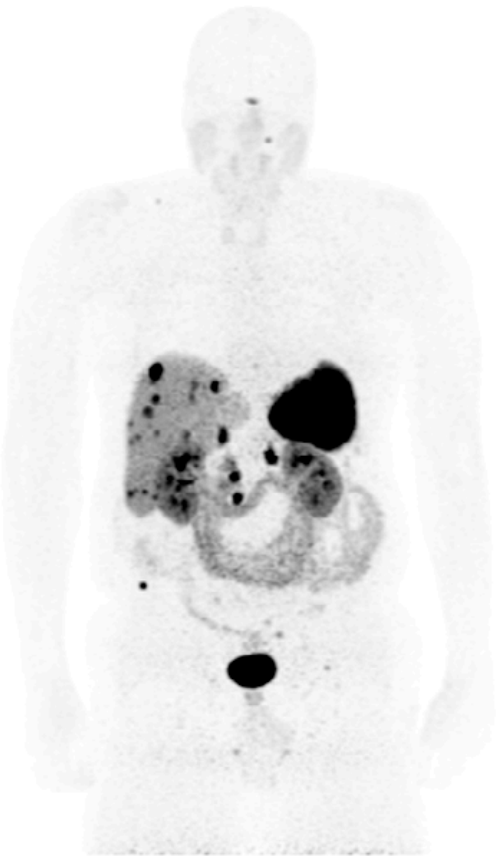


Each bar represents an individual patient (n=118)

Treatment response heterogeneity

Temporal heterogeneity

Scan1



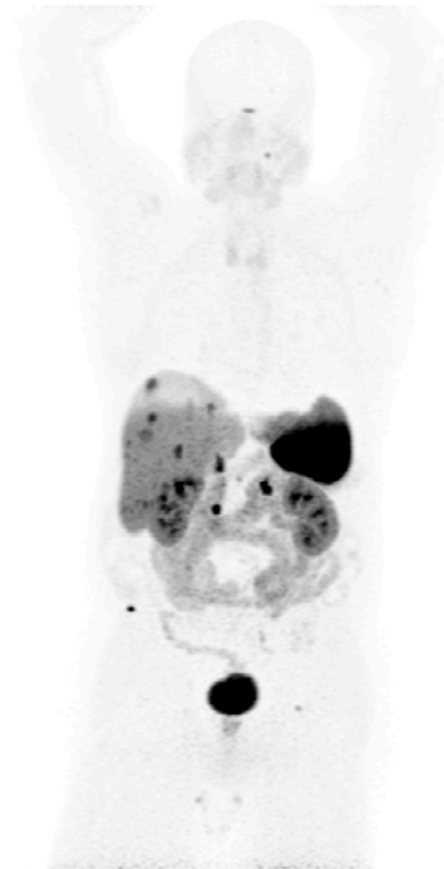
Scan2



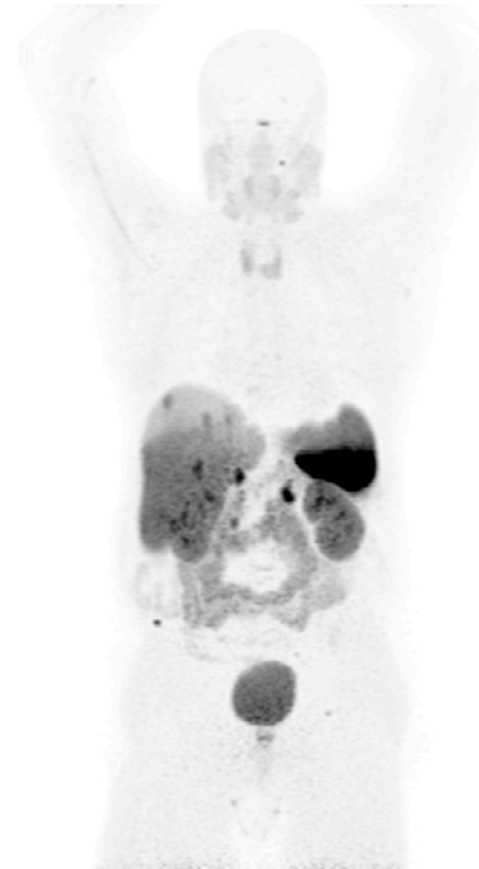
Scan3



Scan4



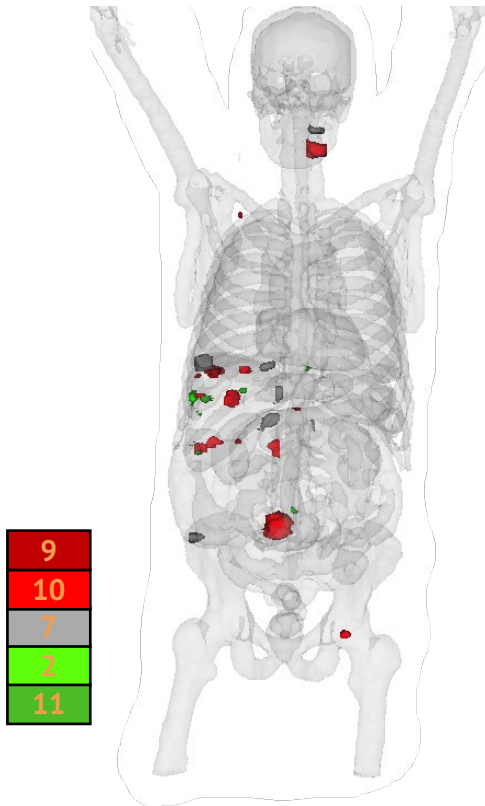
Scan5



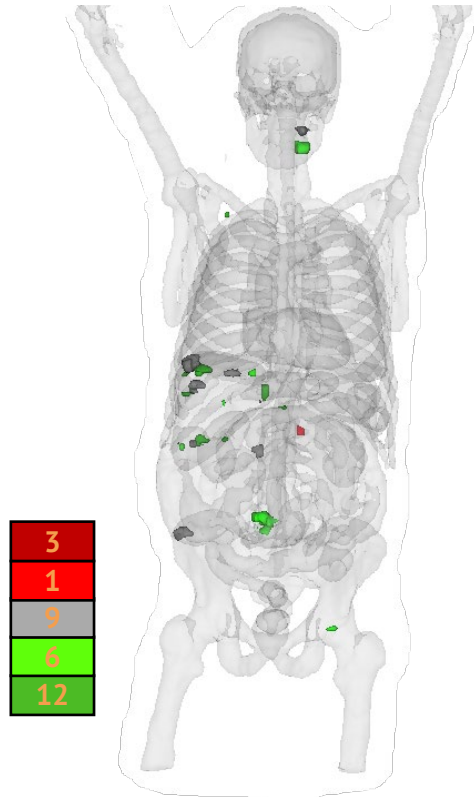
Treatment response heterogeneity

Temporal heterogeneity

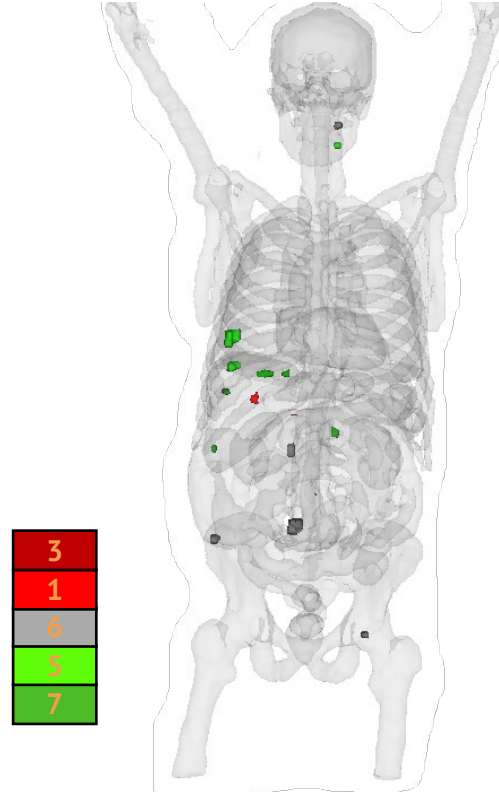
Scan1 to Scan2
Response



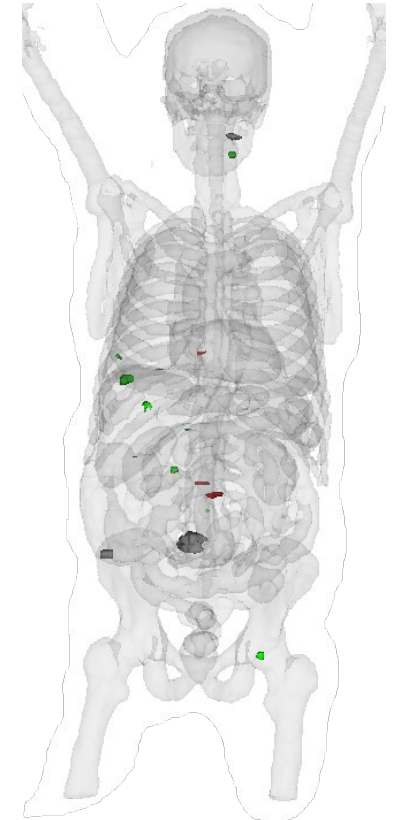
Scan2 to Scan3
Response



Scan3 to Scan4
Response

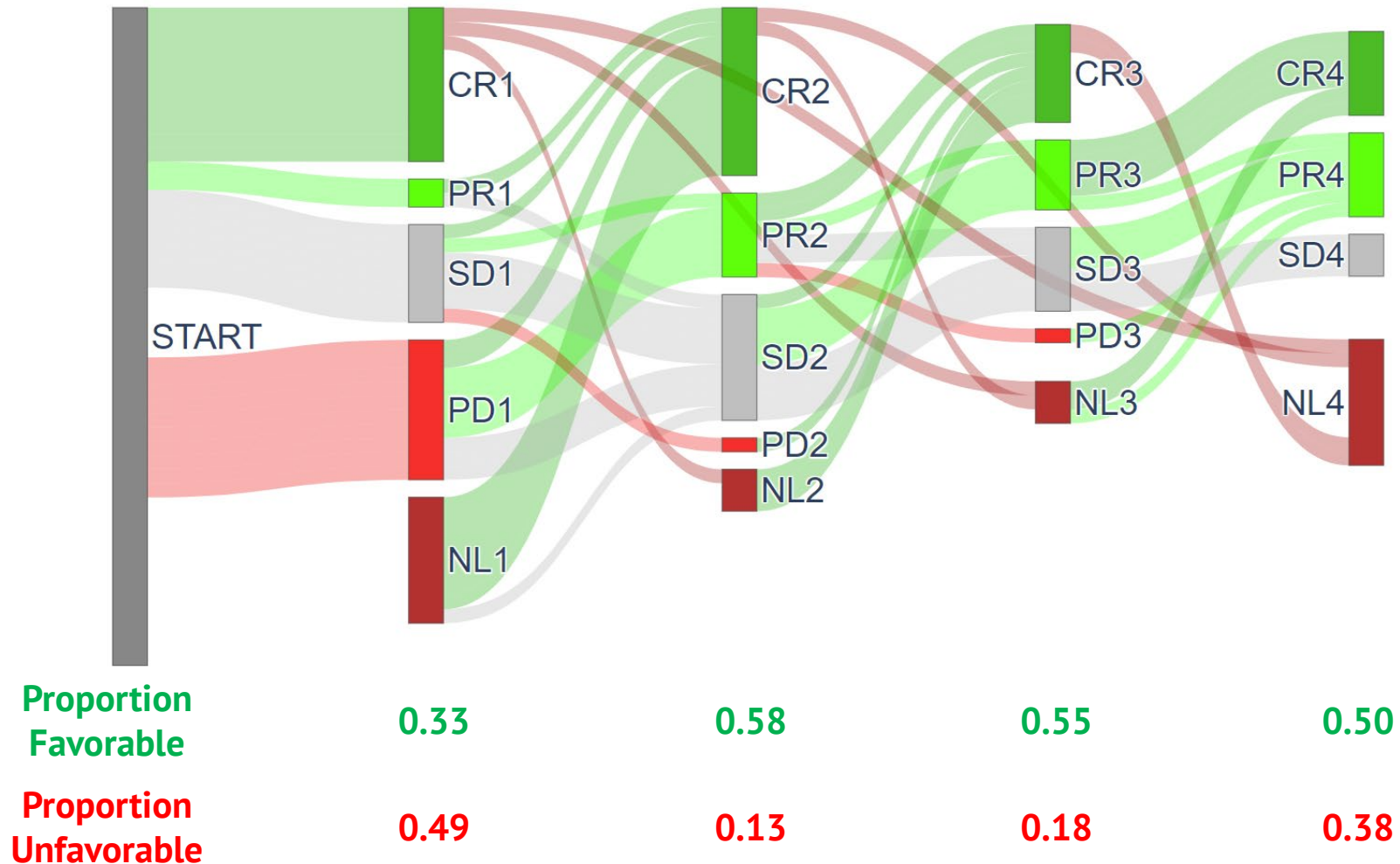


Scan4 to Scan5
Response



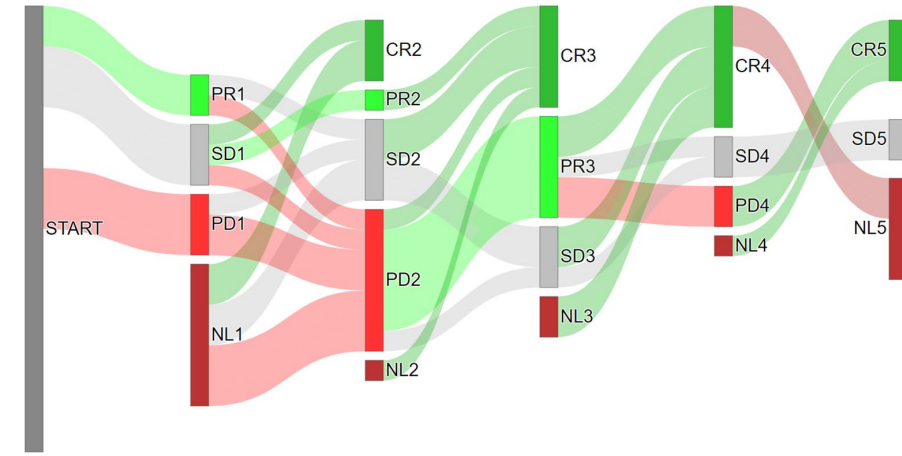
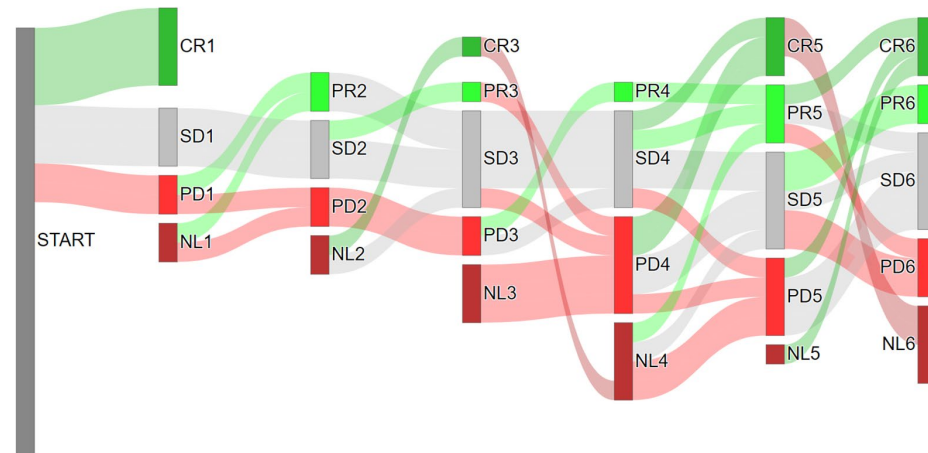
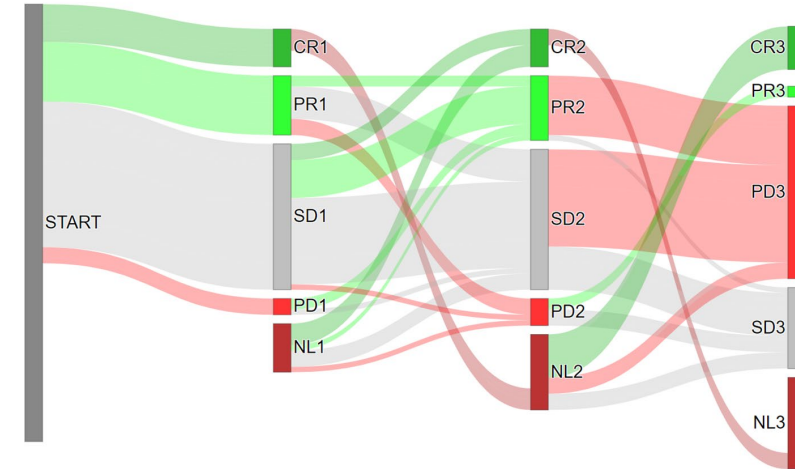
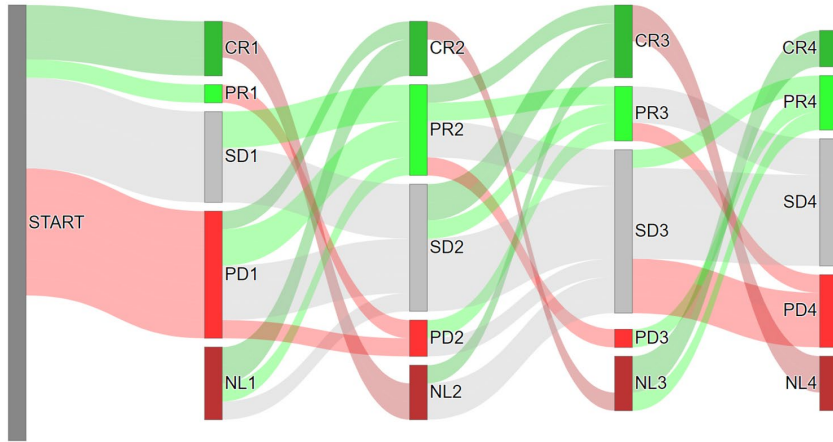
Treatment response heterogeneity

Temporal heterogeneity



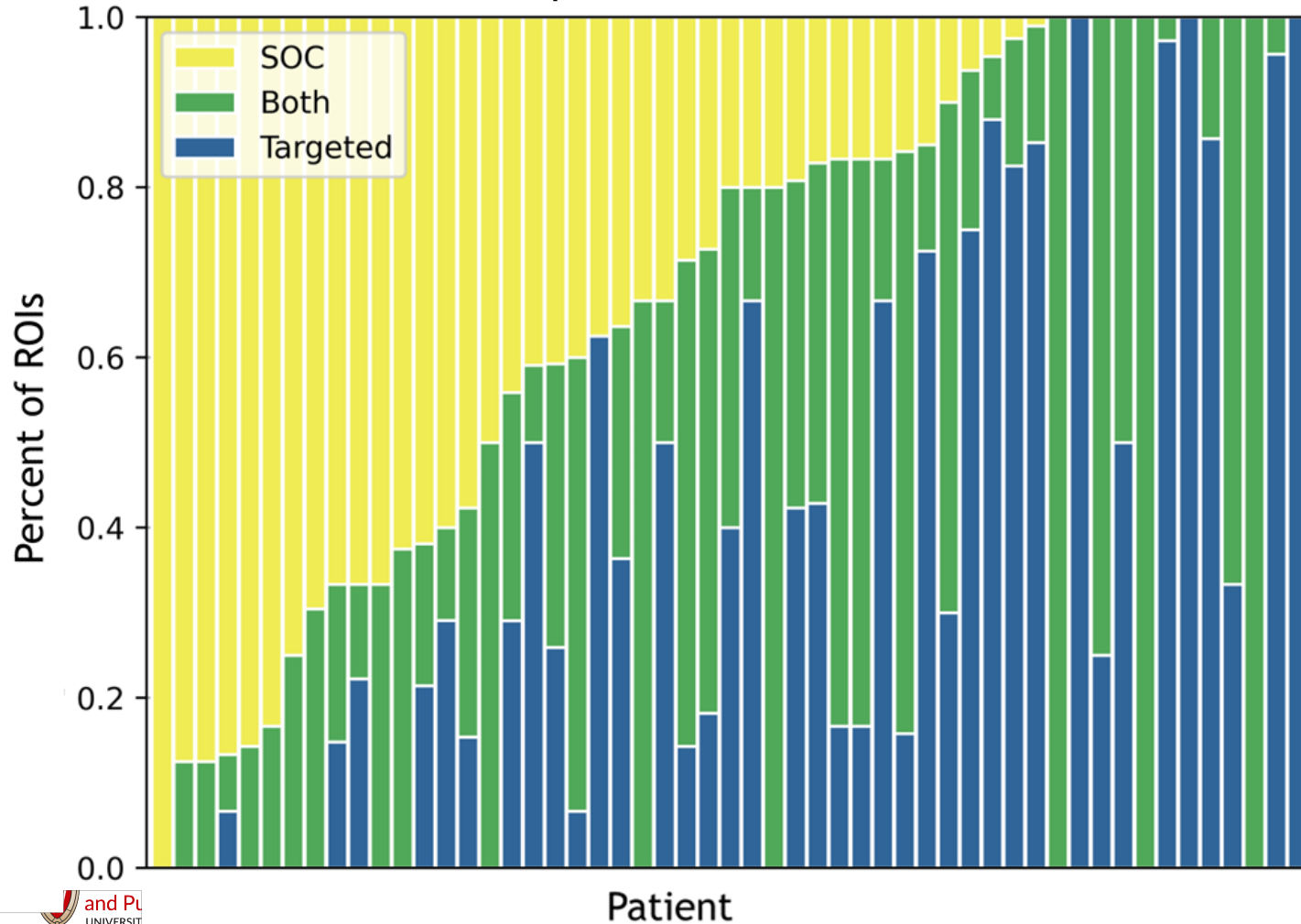
Treatment response heterogeneity

Temporal heterogeneity



Why is this?

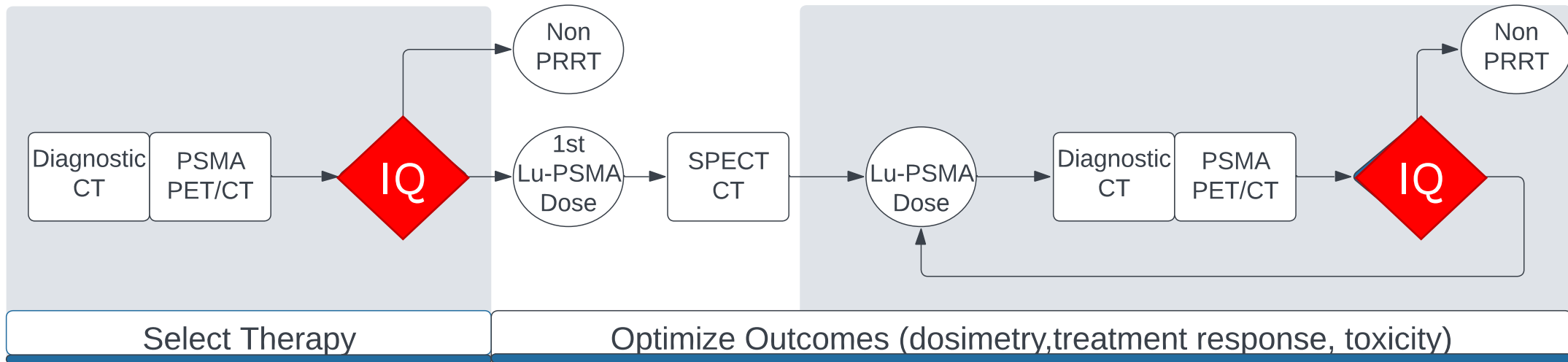
Cu-DOTATATE, Ga-DOTATATE, FES, PSMA, or FArA G with CT or FDG (53 patients)



- **Only 23%** of patients all lesions identified by the targeted tracer
- **77%** of patients have lesions found by standard of care imaging, missed by targeted tracers
- **66%** of patients have 5 or fewer lesions missed by the targeted tracer

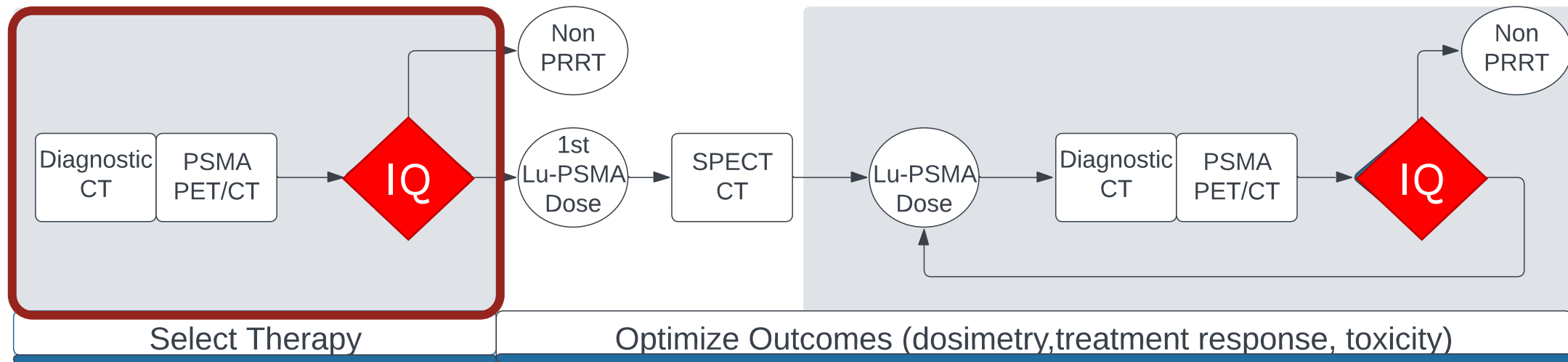
How can we optimize treatments?

Theranostics example



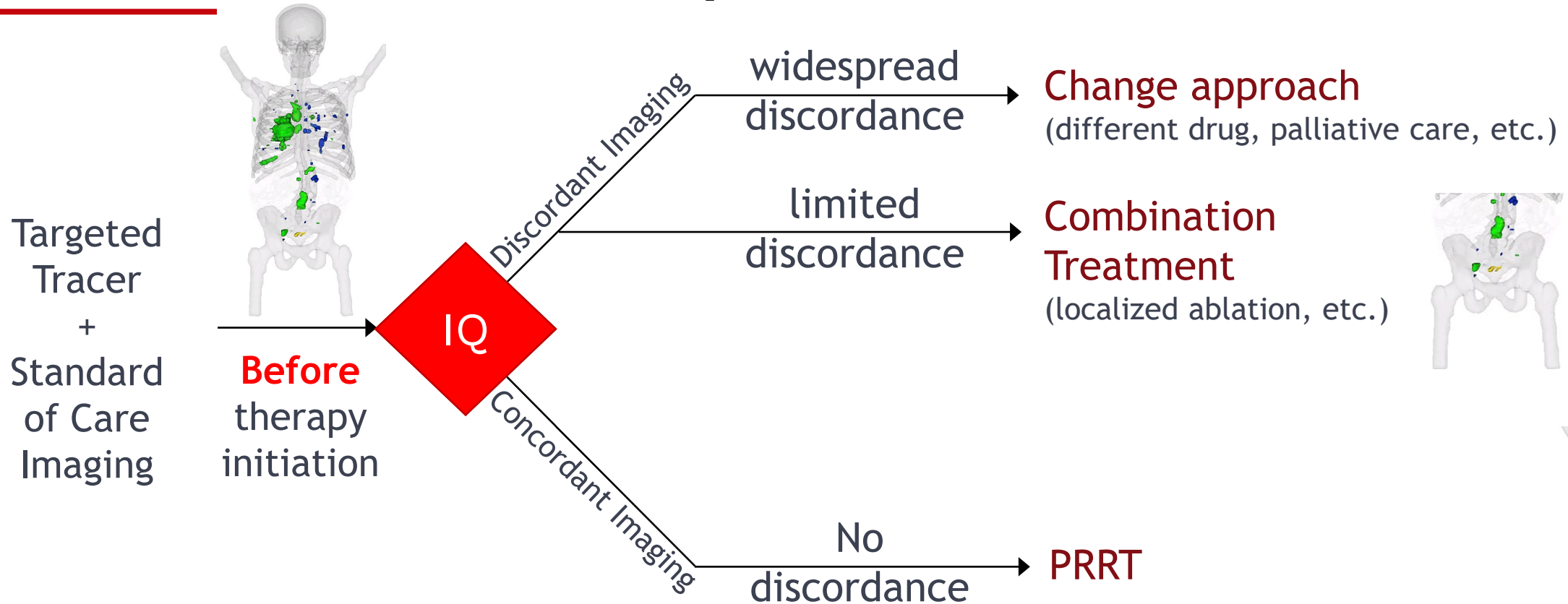
How can we optimize treatments?

Theranostics example



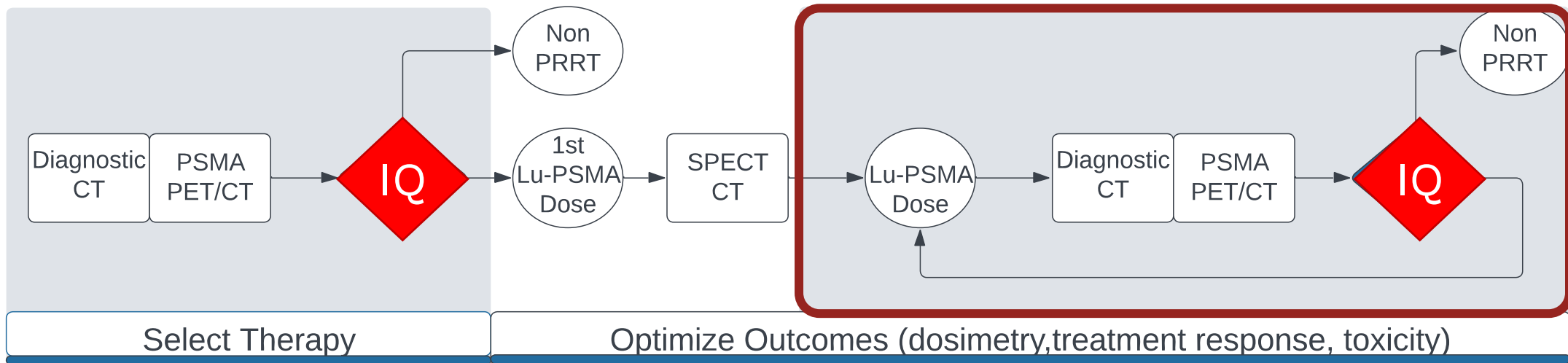
How can we optimize treatments?

Theranostics example



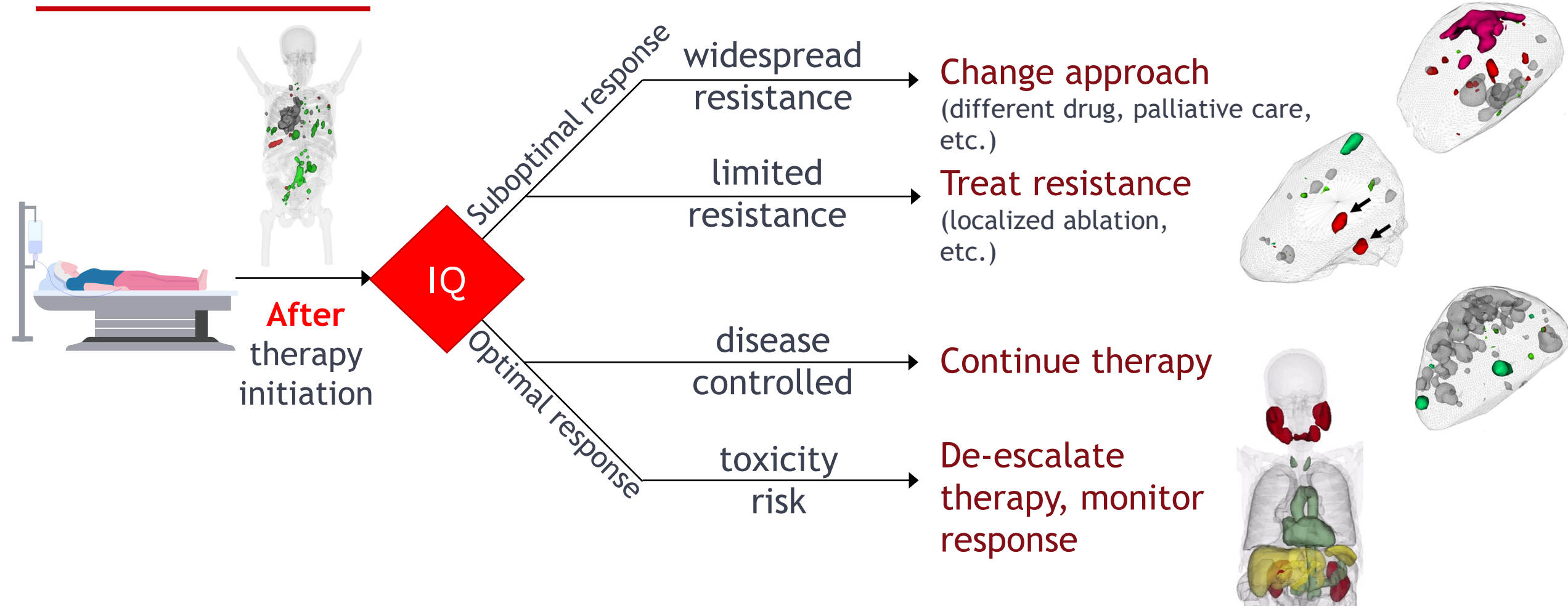
How can we optimize treatments?

Theranostics example

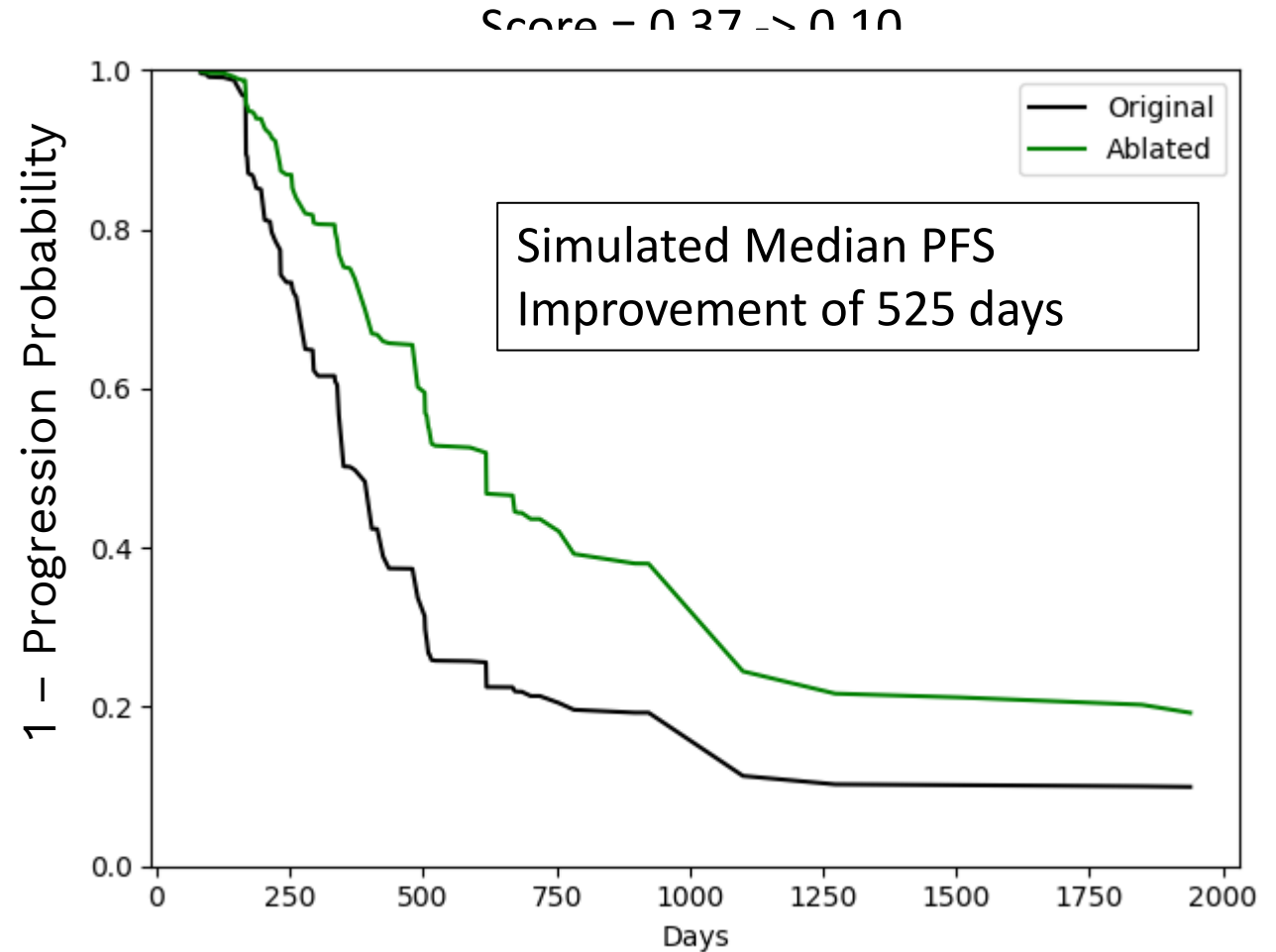
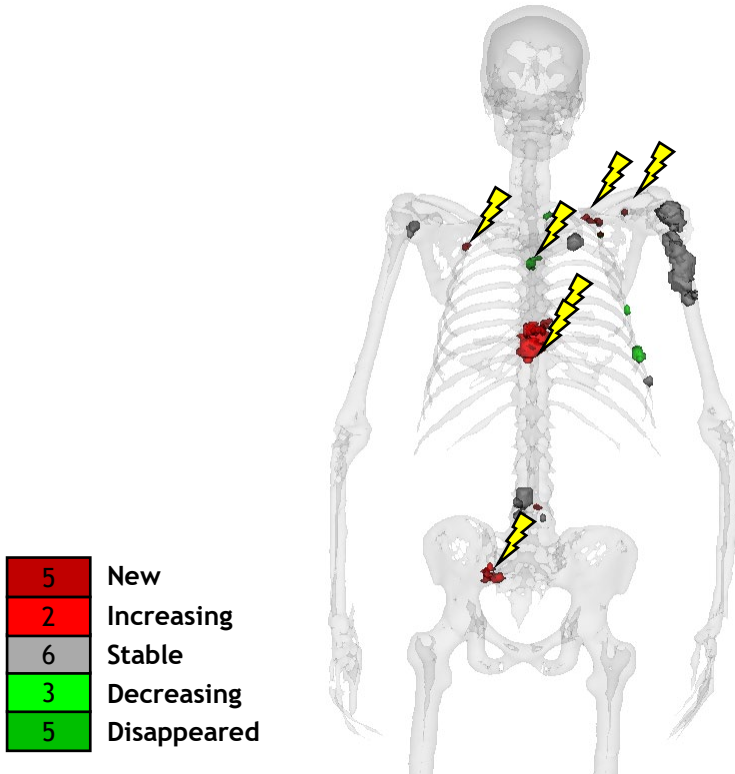


How can we optimize treatments?

Theranostics example



Targeting individual lesions



Summary

- **Optimizing cancer treatments** is complex:
 - Balancing risks and benefits of individual patients
 - Accounting for spatial and temporal (response) heterogeneity
- **Decision making in radiotheranostics** has two critical points:
 - Treatment selection – is patient a good candidate (concordance analysis)
 - Treatment optimization – how much/how long to treat (response analysis)
- **Impact on HTA:**
 - Treatment selection – radiotheranostics is not cost effective for all patients!
 - Treatment optimization – more RPT does not always mean improved QoL!

Thanks to:

Research groups:



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University of Ljubljana, Slovenia

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Thank you
for your attention