

Biomarkers from pre-therapy PET scans predict prostate cancer treatment response

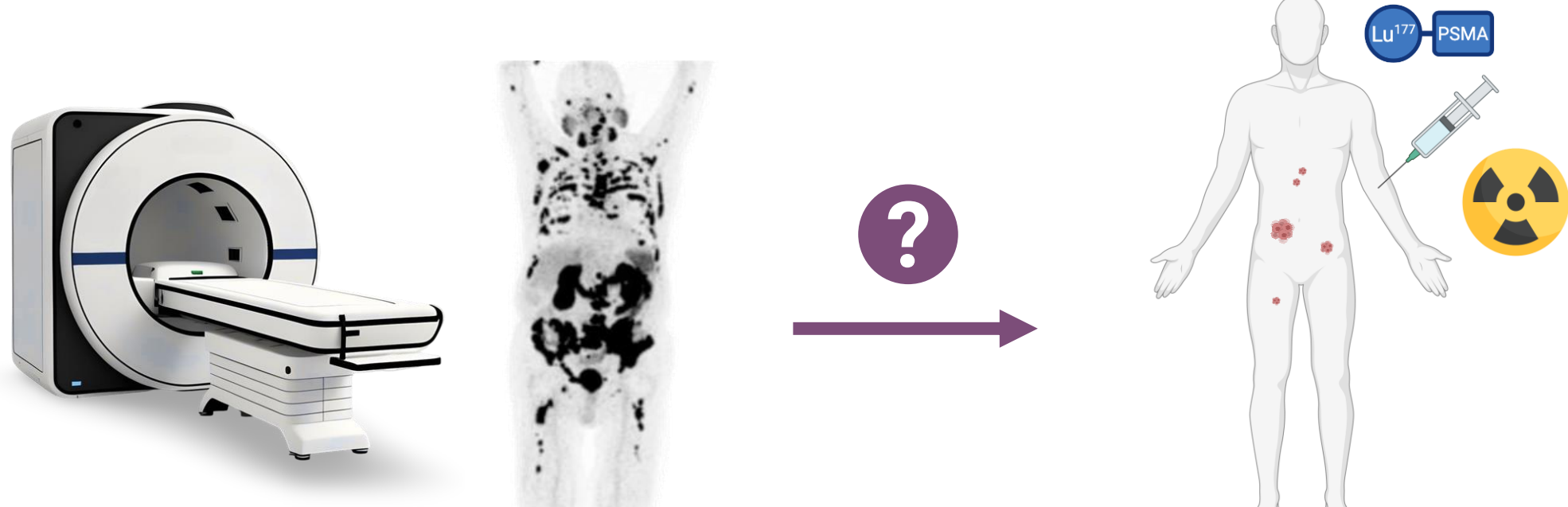
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BACKGROUND

- Metastatic castration-resistant prostate cancer (mCRPC) is an advanced form of prostate cancer that continues to grow and spread despite conventional treatment.
- When other treatments stop working, [¹⁷⁷Lu]Lu-prostate-specific membrane antigen (PSMA) therapy can extend survival and improve quality of life.
- Unfortunately, only ~50% of patients respond, with many experiencing unnecessary side effects without any benefit.

RESEARCH QUESTION

Can we identify patients who are likely to respond to treatment from their pre-therapy PSMA PET scan?



METHODS

We conducted a systematic review and meta-analysis. PubMed, EMBASE, Web of Science and Scopus were searched. Studies were screened and effect estimates extracted.

Correlations between **IMAGING BIOMARKERS** and **ENDPOINTS** are assessed by pooling effect estimates.

IMAGING BIOMARKERS	ENDPOINTS
SUV _{max} Max standardised uptake value	How long patients survived
SUV _{mean} Mean standardised uptake value	How long patients remained free from cancer progression
PSMA-TV Tumour volume	Whether prostate-specific antigen levels fell by at least 50%
PSMA-TLU Total lesional uptake	
PSMA-TLQ Total lesional quotient	

Right now, 50% of patients receiving [¹⁷⁷Lu]Lu-PSMA therapy see clinical benefit. A pre-therapy PET scan could help identify them, before treatment starts.

RESULTS

Study screening

560 studies identified for screening → 523 excluded as not relevant → 37 studies included in the review → 4 did not have extractable data → 33 studies included in the meta-analysis

Correlations between biomarkers and survival time

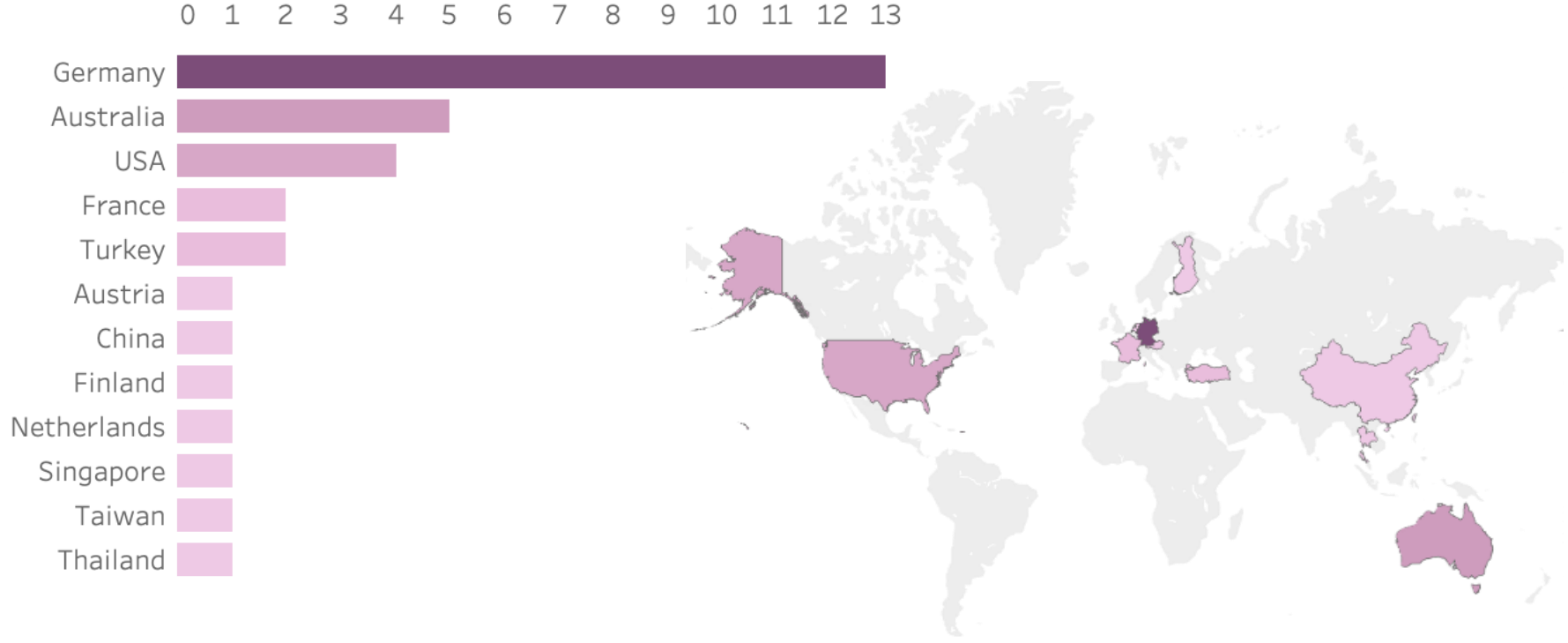
SUV_{mean} Hazard ratio: 0.88
“For every 1 unit increase in SUV_{mean} on baseline PET scan, there is a 12% reduction in the risk of mortality.”

PSMA-TV Hazard ratio: 1.15
“For every 100 mL increase tumour volume on baseline PET scan, there is a 15% increase in the risk of mortality.”

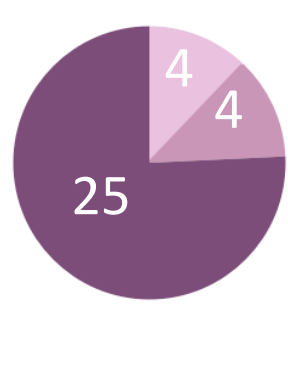
PSMA-TLQ Hazard ratio: 1.20
“For every double in PSMA-TLQ on baseline PET scan, there is a 20% increase in the risk of mortality.”

Characteristics of included studies

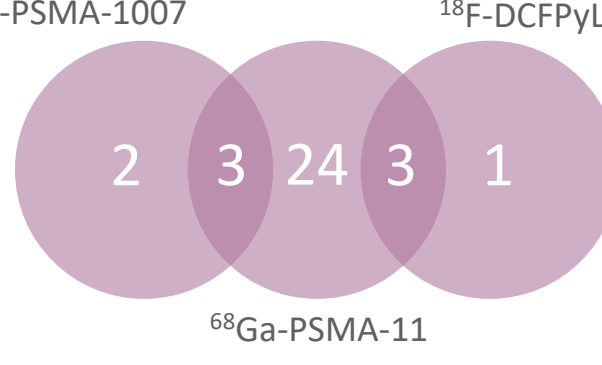
Where did the studies come from?



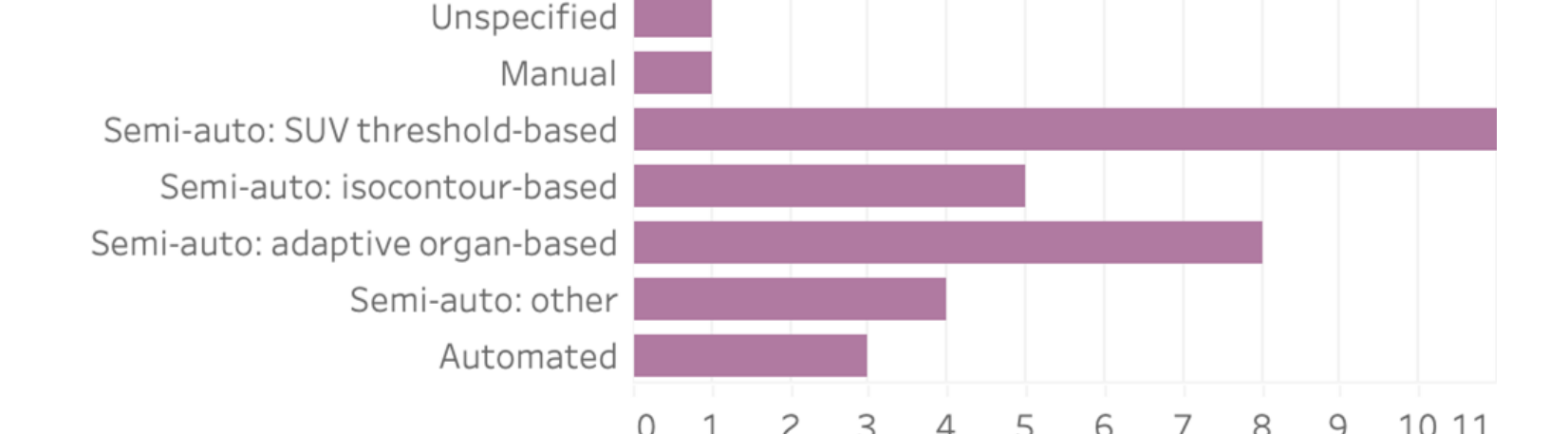
Study design



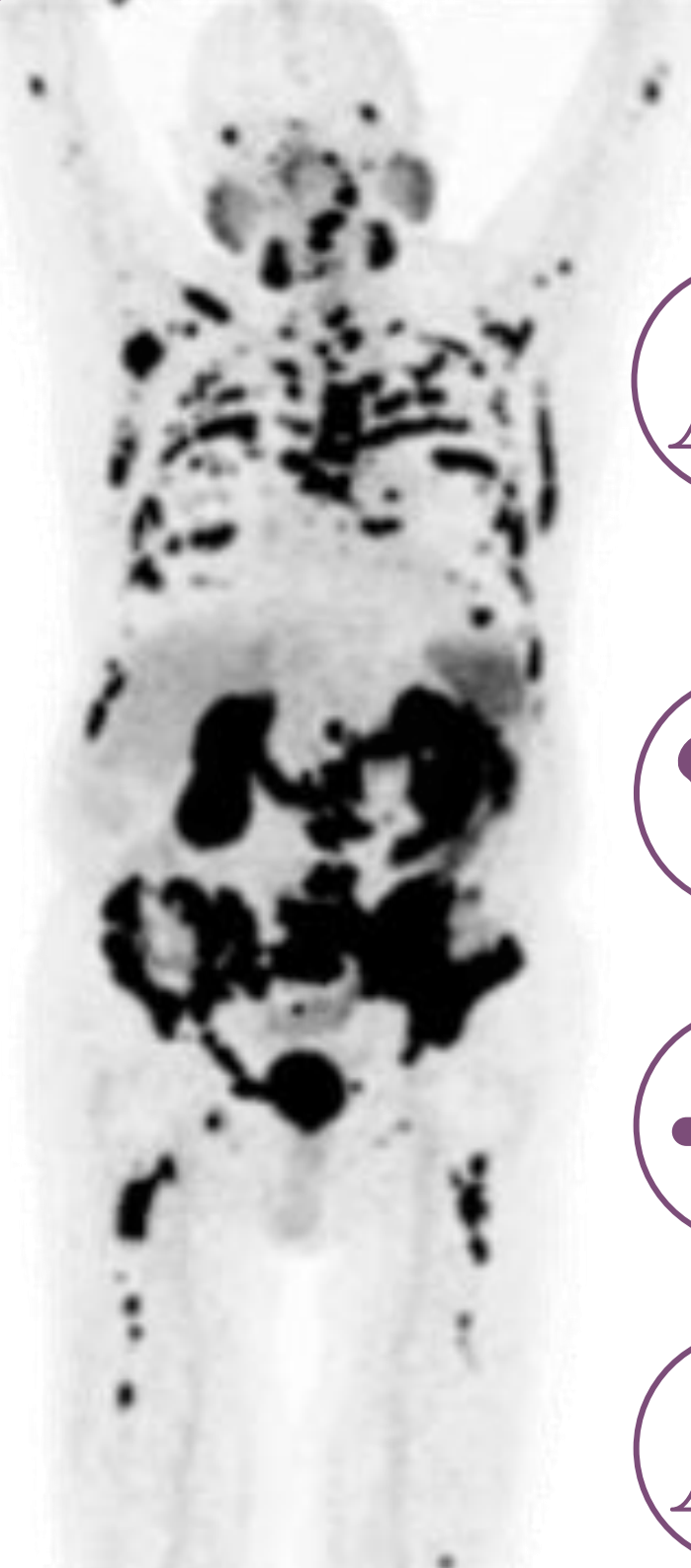
PET imaging tracer



How were lesions segmented on the PET scan?



KEY FINDINGS



- ↑SUV_{mean} on pre-therapy PET scan → **better patient outcomes**
 - Longer survival
 - More time before cancer progressed
 - Greater chance of reduction in cancer blood marker
- ↓Tumour volume on pre-therapy PET scan → **longer survival**
- ↓PSMA-TLQ on pre-therapy PET scan → **longer survival**
- SUV_{max} has limited value for predicting patient outcomes

USE CASE

Combine imaging biomarkers with known clinical markers to identify who is most likely to benefit from treatment.

Imaging biomarkers	Clinical markers
↑SUV _{mean} ✓ ↓PSMA-TV ✓	⊘ No liver mets ✓ ⊘ No prior chemo ✓
= Likely to benefit from treatment ✓	

CONCLUSION

- Pre-treatment PSMA PET scans contain useful clues about who is most likely to benefit from [¹⁷⁷Lu]Lu-PSMA treatment.
- When combined with known clinical markers, these clues can **help doctors choose the right treatment for the right patient**, giving more people the chance of longer, better-quality lives.