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AIM

- To pragmatically scope the available literature on health economic evaluations of theranostics.

BACKGROUND

- Theranostics is a novel approach of precision medicine which combines diagnostic imaging and targeted therapy to personalize treatment (Figure 1)¹.
- In theranostics, radiolabeled drugs are used to target cancer cells or their microenvironment for diagnostic imaging. The image is used to guide the choice of targeted therapy^{2,3}.
- Theranostics utilizes advanced, high-cost technologies and is expected to improve patient outcomes compared to current standard of care. However, the evidence on the cost-effectiveness of theranostic interventions is limited.

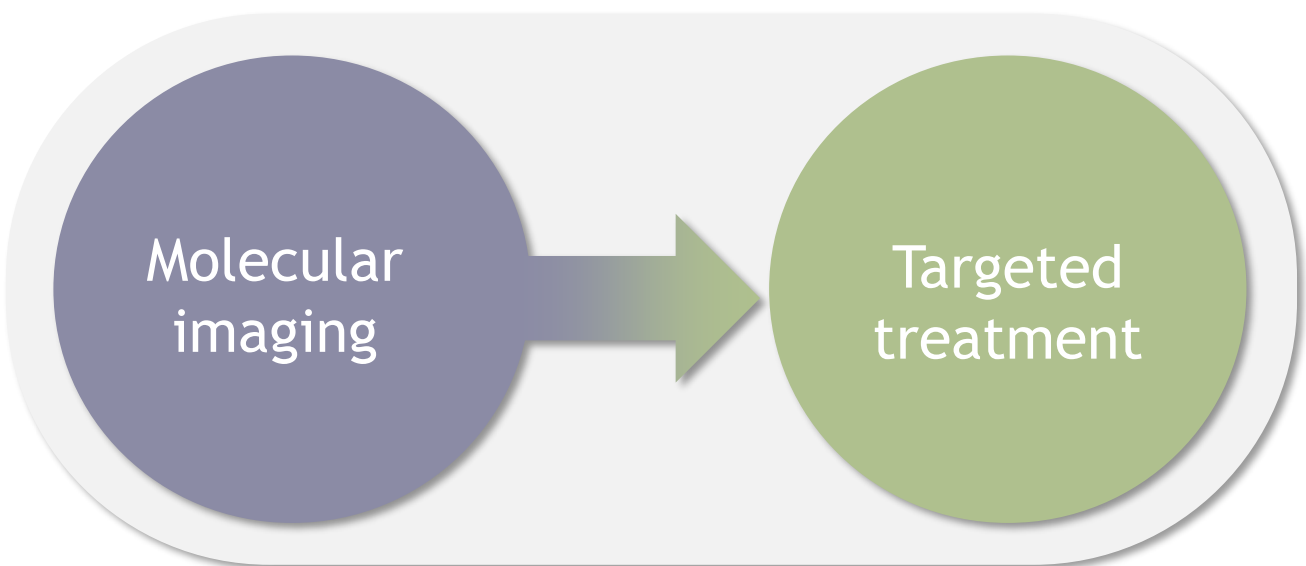
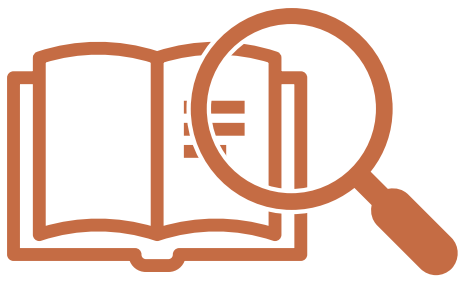


Figure 1. Precision medicine by theranostics

METHODS

- Scoping review of the available health economic literature covering effectiveness analyses of theranostics.
- Snow-ball approach was used to identify additional publications that report economic evaluations of theranostics from bibliographies or reference list at the end of articles.
- The search string was iteratively constructed and included three main search blocks:
 - economic evaluation,
 - model based, and
 - theranostics
- Only publications from 2015 or later were considered.
- Blinded screening of titles and abstracts was conducted by two independent reviewers.
- Discrepancies or disagreements were resolved through adjudication by a third reviewer.
- Full text review was conducted by the same methodology followed by data extraction.



RESULTS

1. Literature search and selection

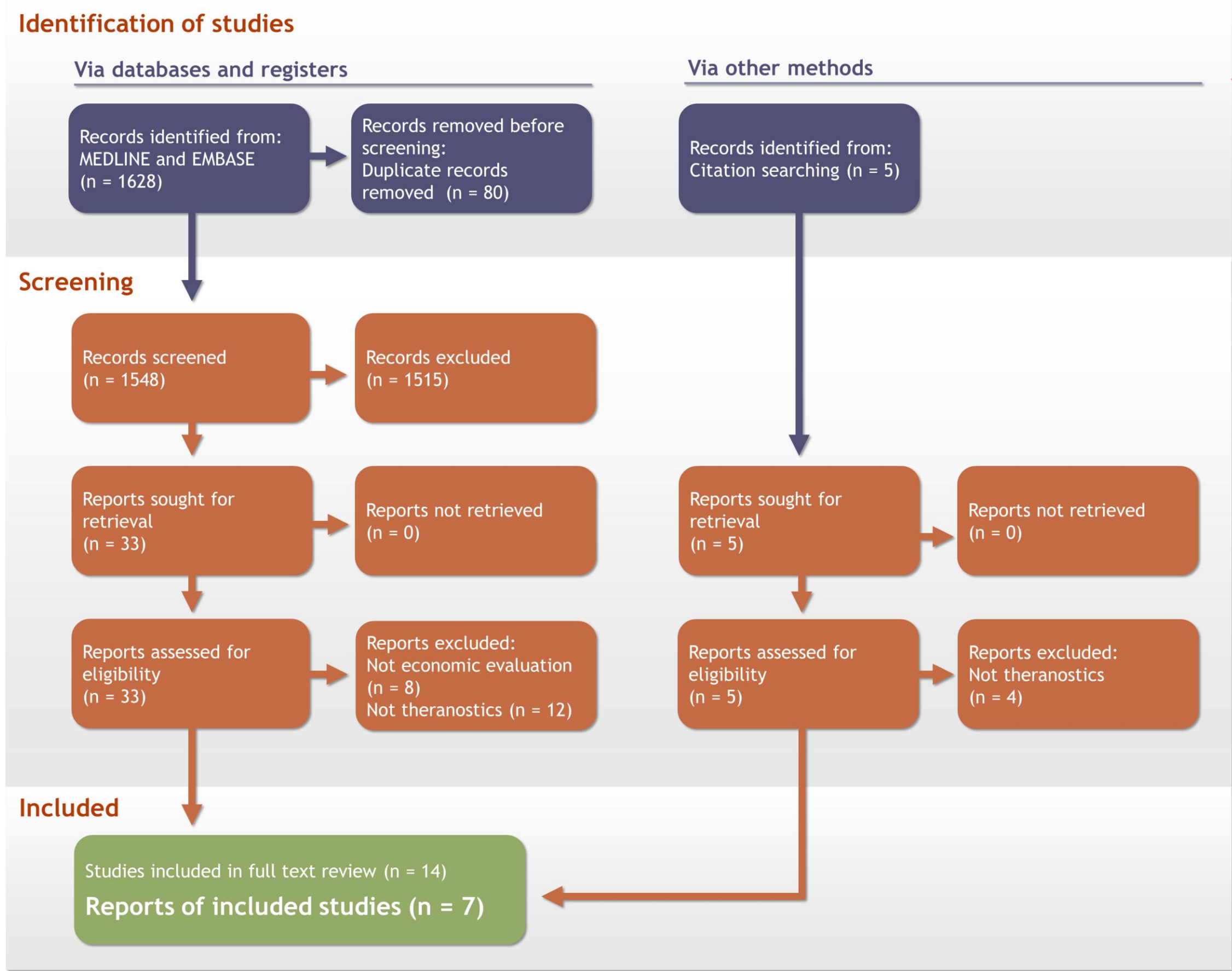


Figure 2. PRISMA 2020 flow diagram showing the process of literature selection

2. Review

Table 1. Summary of included studies

Author; year	Palmer; 2020 ⁵	Smith-Palmer; 2021 ⁶	Mehrens; 2023 ⁷	Mileva; 2024 ⁸	Munter-Young; 2024 ⁹	Brinkmann; 2025 ¹⁰	Holzgreve; 2025 ¹¹
Analysis	CEA and BIA; Model-based	CEA; Model-based	CEA; Model-based	CEA; Trial based	CEA and BIA; Model-based	CEA; Model-based	CEA; Model-based
Condition	Unresectable or metastatic progressive gastroenteropancreatic neuroendocrine tumors	Unresectable or metastatic progressive gastroenteropancreatic neuroendocrine tumors	Metastatic castration-resistant prostate cancer	HER2-positive breast cancer	Metastatic and recurrent breast cancer	Metastatic castration-resistant prostate cancer	Advanced gastroenteropancreatic neuroendocrine tumors
Model	Partitioned survival model	Partitioned survival model	Partitioned survival model	Not applicable	Decision tree combined with a Markov model	Cohort discrete-time state-transition model	Partitioned survival model
Outcomes	ICER, QALY, total cost	ICER, QALY, total cost	ICER, total cost, QALYs, net monetary benefit, acceptability at willingness-to-pay threshold	ICER, total cost	ICER, total cost, QALYs, life years	ICER, QALY, total cost	ICER, total cost, QALYs, net monetary benefit, acceptability at willingness-to-pay threshold

CEA: Cost-effectiveness analysis; BIA: Budget Impact analysis; ICER: incremental cost-effectiveness ratio; QALY: quality-adjusted life year

CONCLUSIONS

- Theranostics holds the potential to improve patient outcomes by tailoring treatment based on immediate information on expected treatment effectiveness.
- Theranostics is a complex medical approach, this is accentuated by varying and sometimes lacking description of what it entails.
- There is a need for alignment and standardization of terminology used for describing theranostics in the literature in general and in economic evaluations of theranostic methods in particular.
- The available literature indicate a requirement for consolidation harmonization of methodological choices and evaluation of these technologies.

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