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Use Of Biomarkers In Health Care: What Health Economic Methods Are Used To Evaluate Them?

Background & Objective

- Diagnostic tests and patient monitoring are essential to medical care. As the benefits of these procedures are inevitably linked to the resulting therapeutic interventions, diagnostic accuracy (i.e. sensitivity, specificity) and the consecutive medical decisions are of key interest.
- The decision whether to use or reimburse a new healthcare intervention relies in large part on health economic assessments.
- For this reason, it is essential that health economic analyses are carried out in a transparent and comprehensible manner.
- To answer the question of how many of the economic analyses meet the requirements of a transparent and comprehensible methodology, a literature-based evaluation was conducted (following the approach of Oosterhoff, 2015[1a]).
- To evaluate the quality and usefulness of these studies the EUnetHTA methods for health economic evaluations were applied[1b].
- The following criteria were used for the assessment:
  - economic analyses consider not only the costs of the marker but also the interventions associated with the diagnosis, and
  - there is a statement of "conflict of interest“ and / or a statement as to whether the study was financially supported.

Methods

To identify health economic studies of biomarkers to diagnose or monitor patients with a non-transmissible disease, i.e.,

- cardiovascular and chronic respiratory diseases, cancer, diabetes, and obesity-related diseases.
- A systematic search in Medline was conducted between 2010 and September 2022 by applying the PICOS as listed in Table 1.
- Systematic reviews identified in this search were used to search for grey literature.

Table 1. PICOS

Criteria	Description
Population	Patients with a non-communicable disease (cardiovascular, chronic respiratory, cancer, diabetes, and obesity)
Intervention	Methods for detecting diseases by using biomarkers and generating treatment recommendations (population-based primary screenings were excluded)
Comparator	Any
Outcome	All kinds of health economic results
Study type	All types of health economic analyses (model- and non-model-based evaluations)

- The findings were reviewed with regard to the health economic method applied, the transparency of any funding and conflict of interest of the authors, and the results reported.
- The information in each article is collected using a standardized data extraction form collecting the following information:
  - Bibliography (Authors, title, journal, date).
  - Type of economic analysis (e.g. Cost-effectiveness analysis Cost utility analysis,
  - Test associated with the treatment decision.

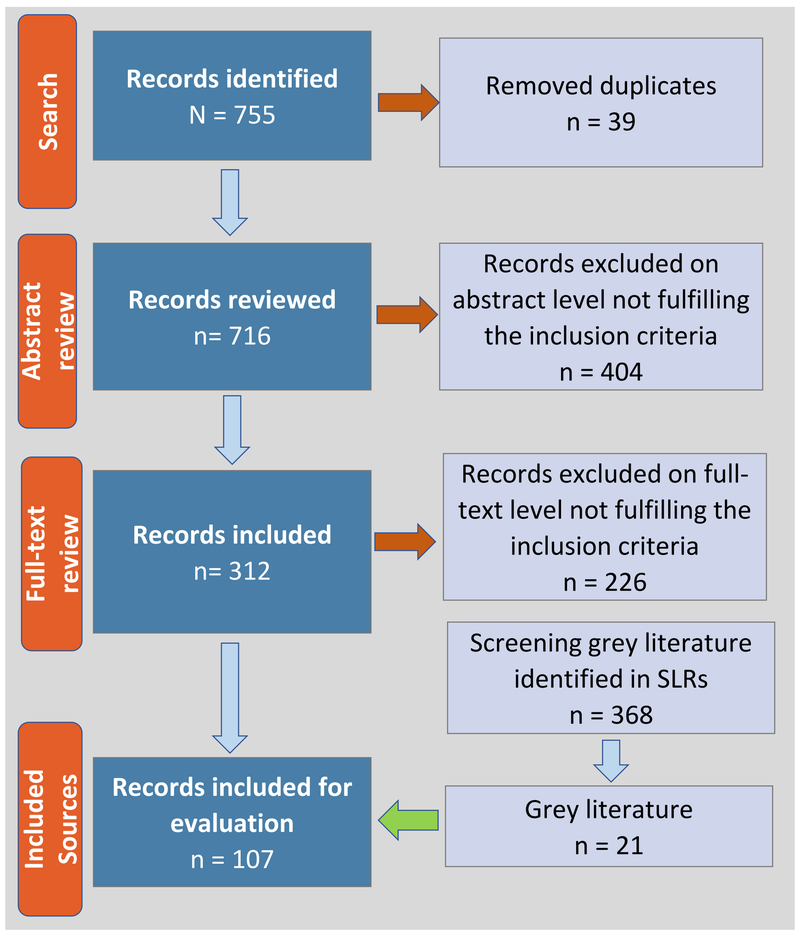
Methods (continued)

- Funding (e.g., reported, not reported, unclear).
- Conflicts of interests (e.g., reported, not reported, unclear).

Results

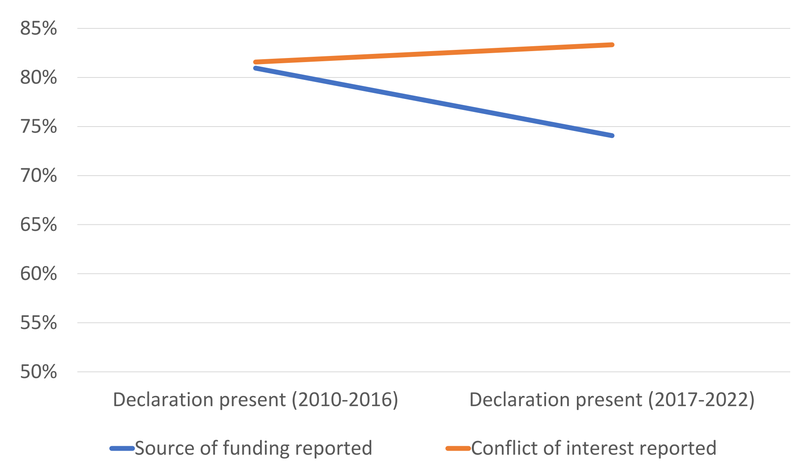
- In the bibliographic search, 755 abstracts were identified, 312 of which were screened for full texts review and 86 of which were included.
- Additionally, 368 references were screened within the grey literature process, 21 from which were included.
- In total 107 publications were included (Figure 1).

Figure 1: PRISMA chart of the abstract and full-text selection



- Funding and conflict of interest were reported for 77% and 83% of the identified studies, respectively.
- Comparing the two time periods from 2010 to 2016 and 2017 to 2022, information about funding tends to decrease from 81% to 74%, while reporting conflict of interests tends to increase from 82% to 83%, respectively. However, these effects were not significant (Figure 2).

Figure 2: Trend of reporting funding and conflict of interest



- More than 90% of the economic analyses put the economic outcomes of testing or monitoring in a relation to a treatment decision.
- The remaining 10% of studies examined the costs of a diagnostic procedure/monitoring system.

Results (continued)

- The most applied (90%) type of economic analyses were: Cost-utility analysis (CUA) and cost-effectiveness analysis (CEA).
- With 62%, oncological diseases were the most frequent type of the disease identified, while lung (20%), colorectal (12%) and prostate (9%) being the most often reported organs.
- Most economic analyses came from the USA (35%), followed by the UK (13%), Spain (7%) and the Netherlands (6%).

Table 2. Economic methods applied to analyse biomarker studies

Type of economic analysis	N	%
Cost comparison / Cost saving (2-21)	19	18
Budget impact analysis (BIM) (11, 22-25)	5	5
Cost-effectiveness analysis (CEA; ΔCost/ΔLY gained) (6, 7, 13, 14, 18, 24, 26-63)	44	41
Cost utility analysis CUA (CUA; ΔCost/ΔQALY gained) (9, 22, 24, 28, 33, 36, 41-46, 48, 50, 51, 55, 60, 64-99)	53	50
Both CEA and CUA (24, 28, 33, 36, 41-46, 48, 50, 51, 60)	14	13
Other economic results 2, 3, 6, 9,10, 11, 12, 13, 30, 32, 33, 40, 41, 42, 47, 49, 54, 67, 74, 80, 85, 86, 100, 101, 102, 103, 104	27	25
Test outcome associated with treatment decision (2-7, 9, 11, 13-15, 17-19, 22-38, 41-56, 58-79, 81-100, 102, 104-108)	95	89

Discussion

- Although most diagnostics and tests have a short period of use, more than 90% of health economic analyses have considered lifetime effects and QALYs in addition to costs.
- In recent years, it has been shown that comprehensible and transparent reporting in the medical environment is essential in order to reproduce and validate study results.
- Due to the large number of new drugs and medical technologies that are introduced into the healthcare sector each year with a promise of benefit, study design, study conduct, data analysis and reporting must be transparent. This is the only way to compare the benefits and safety of a new intervention with existing applications.
- In particular, the dependency and connection of the study management plays an important role in viewing the presented findings from all sides. Therefore, full disclosure of funding and conflicts of interest is essential.
- Of importance will be the planned analysis by Catalá-López, which will examine the reproducibility and transparency of health economic evaluations for the periods 2012-2019 and 2019-2022 [1c].

References

1a) Oosterhoff M., van der Maas M. E., Steuten L. M. A Systematic Review of Health Economic Evaluations of Diagnostic Biomarkers. Appl Health Econ Health Policy. 2016;14(1):51-65.

1b) EUnetHTA JA3WP6B2-5 Authoring Team. Practical considerations when critically assessing economic evaluations. Guidance document. Diemen (The Netherlands): EUnetHTA; 2020.

1c) Catalá-López F,Caulley L, Ridao M, et al.Reproducible research practices, openness and transparency in health economic evaluations: study protocol for a cross-sectional comparative analysis. BMJ Open 2020;10

A list including the 107 references of the considered studies is available in the appendix

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