Budget Impact Analysis of the Introduction of a Novel Gene Expression Biomarker Test for Early-Stage Breast Cancer Patients in Cyprus

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Introduction and Objectives

Nowadays, gene expression tests can provide personalized, prognostic and predictive information of chemotherapy benefits to the early-stage breast cancer patients. The main objective of this study is to assess the economic impact of the introduction of a novel second generation gene expression test that integrates a molecular signature with the clinical factors tumor size and nodal status (12-gene assay) for this subgroup of patients to the public payer of Cyprus.

Methods

Direct and indirect costs were assessed from healthcare and societal perspectives for the first year of diagnosis of the genomic testing with the 12-gene assay (new scenario) compared to no testing and particularly standard clinical practice (base scenario). Clinical and population data were retrieved from the literature. Cost data were primarily obtained from Cyprus data, except from adverse events management costs which were retrieved from the literature. Main outcomes were the economic impact and cost-savings.

Table 1. Population

Sub-group	Total number of patients (n)
Breast cancer incidence, 2020	761
HER2-, all cases	594
ER+, HER2-, (N0)	381
ER+, HER2-, (N+)	213

Table 2. Model utilities

Sub-groups	Utilities
ER+, HER2-, (N0)	
Low-risk	
Current clinical practice	0.08
12-gene assay breast cancer test	0.78
High-risk	
Current clinical practice	0.92
12-gene assay breast cancer test	0.22
ER+, HER2-, (N+)	
ER+, HER2-, (N+)	
Low-risk	
Current clinical practice	0.08
12-gene assay breast cancer test	0.3
High-risk	
Current clinical practice	0.92
12-gene assay breast cancer test	0.7

Table 3. Cost inputs

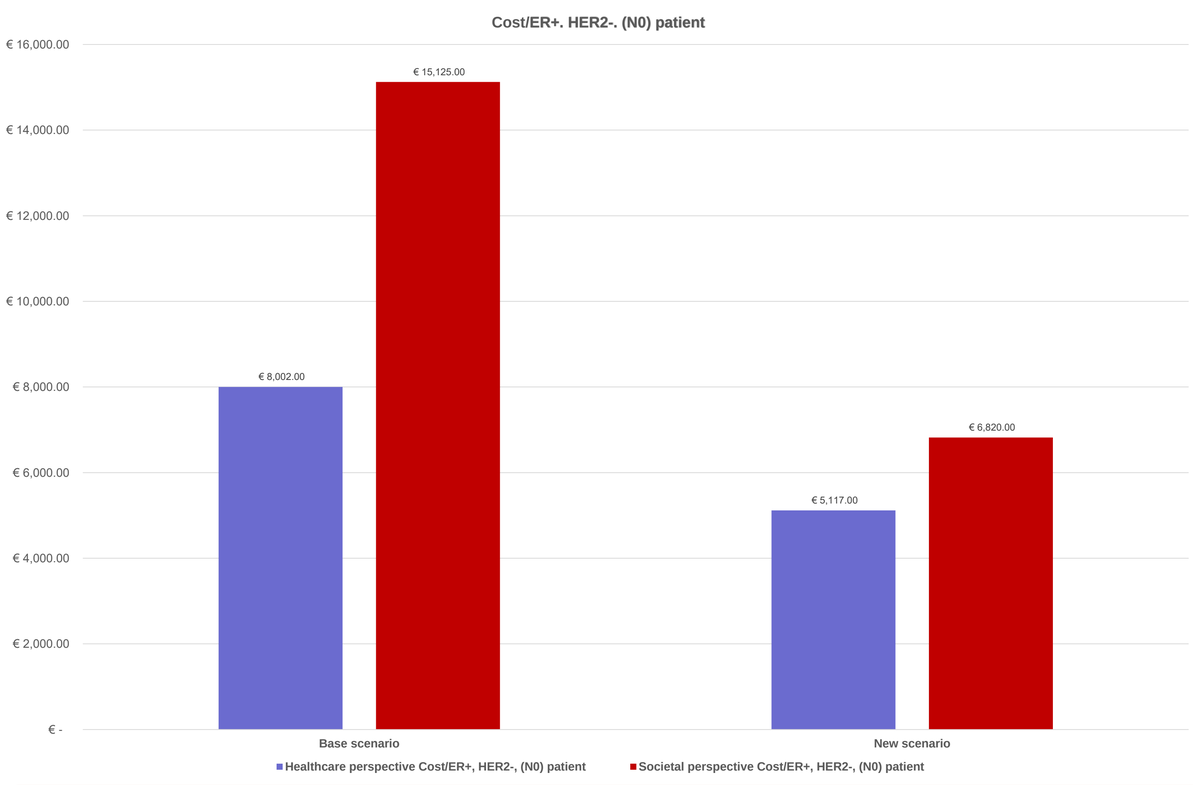
Cost inputs	Cost/unit(€)
Gene biomarker breast cancer test	2,900
Chemotherapy	
Epirucibin 100ml	267.86
Epirucibin 50ml	133.93
Cyclophosphamide 1000mg	15.88
Paclitaxel 100mg	177.61
Paclitaxel 30mg	56.73
Additional medication	
Uromitexan 100mg/ml	41.35
Ondasetron 8mg	15.8
Dexamethasone tablet 1.5mg	10.14
Dexamethasone vial 4mg/ml	19.54
Aprepitant 125+80mg	71.3
Pegfilgrastim 6mg	803.88
Ranitidine 300mg	21.39
Hormonotherapy	
Tamoxifen 20mg/day	151.68
Letrozole 2.5 mg	42.43
Exams and testing	
Blood test	2.88
Echocardiogram	14.23
Chemotherapy port	150
Valve change on the catheter	25
Visit to specialist doctors and performing imaging tests	80
Adverse events	
Myalgia/Arthralgia (0.5% of patients)	2.53
Stomatitis (0.3% of patients)	1,792.11
Anemia (0.2% of patients)	907.4
Thrombocytopenia (0.40% of patients)	2,265.66
Leukopenia (4.7% of patients)	2,265.66
Aches (7% of patients)	13.26
Infection (5% of patients)	2,265.66
Thrombosis (1% of patients)	1,617.87
Neuropathy (7% of patients)	29.48
Societal cost	60.17
Productivity loss (per day)	69.12

Results

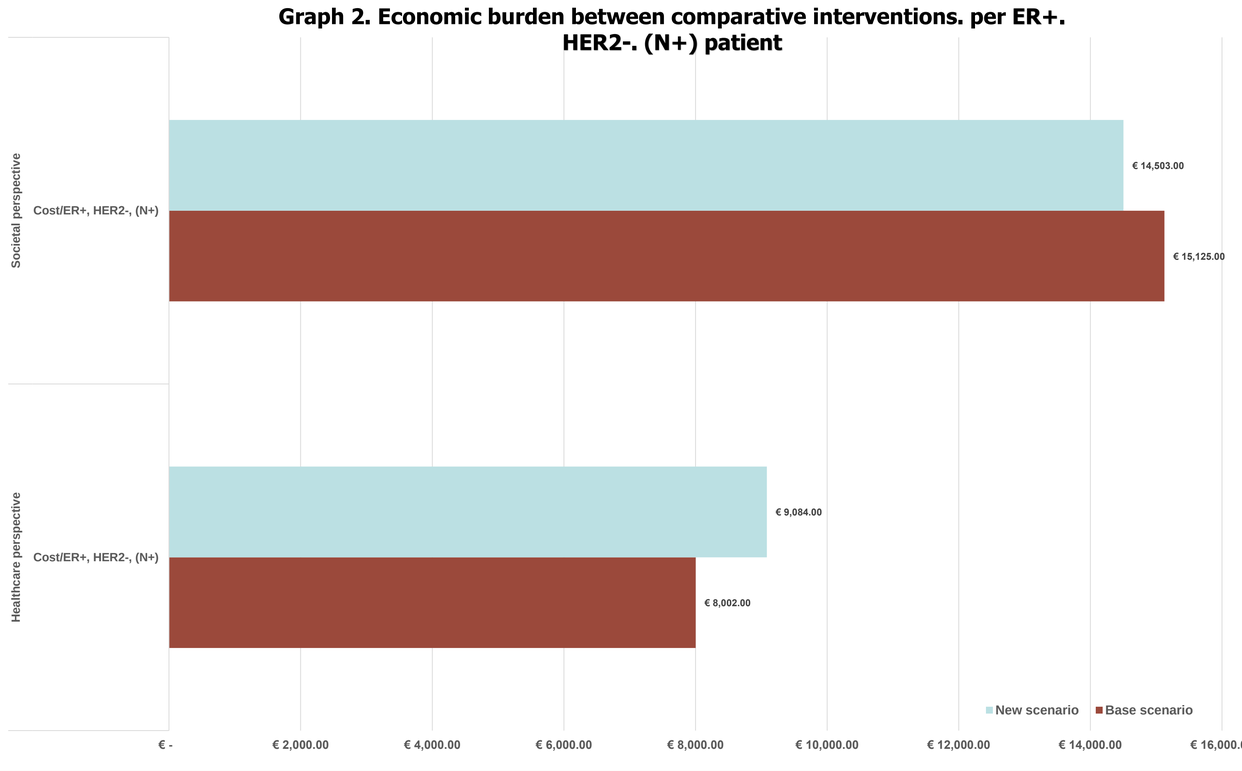
Compared to the current clinical practice and non-testing. this gene expression test was associated with substantial cost-savings per patient for healthcare public payer and for ER+, HER2-, (N0) patients (2,885 €) while the cost-savings are even higher via societal perspective (8,304 €) for this sub-group (graph 1).

On the other hand, and in regards to the ER+, HER2-, 1-3 N+ patients, the introduction of the genomic testing was associated with more costs per patient compared to current clinical practice for the payer (1,082 €) but with slight cost-savings of 622 € via societal perspective (graph 2).

Graph 1. Economic burden between comparative interventions. per ER+. HER2-. (N0) patient



Graph 2. Economic burden between comparative interventions. per ER+. HER2-. (N+) patient



Conclusions

This is the first study assessing the economic burden of 12-assay genomic breast cancer testing compared with current clinical practice for Cyprus. The present study highlighted the economic value, in terms of costs reduction, of genomic testing with the novel second generation 12-gene assay for these sub-groups, taking into account both payer and societal perspectives and only for the first year after diagnosis, and showed that in addition to the well-known clinical benefit of genomic testing for providing prognostic information of the chemotherapy benefits for this subgroup, it reduces costs in most scenarios versus current standard care in Cyprus.

References: 1) International Agency for Research on Cancer. 2) Siskou O. et al. (2020). 3) Dubsky P. et al. 2013

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