Economic evaluation of the breast thermal activity indicator plus clinical breast examination

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Introduction

In Mexico, breast cancer (BC) is one of the leading causes of death in women, and in recent years the number of deaths caused by this disease has increased, mainly due to delays in starting treatment, either because women delay seeking medicalattentionafter experiencingpossible symptomsof breast cancer, or becauseof delays in the healthsystem, particularlyin providinga definitivediagnosis 1
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Clinical Breast Examination (CBE) is performedon women without any signs or symptoms of breast cancer so that the disease can be detected as early as possible, allowing for early treatment to reduce mortality and morbidity associated with the disease . A diagnostic evaluation is a breast exam used to evaluate an existing problem(e.g., palpable mass, nipple discharge) 2.
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The breast thermal activity indicator (BTAI; Celbrea®) and its application in conjunction with clinicalbreast examination is a valid criterion for selecting women witha greater or lesser need for mammography 3.

Objectives

To perform a comprehensive economic evaluation of the BTAI in conjunction with CBE, from a public health perspective in Mexico.

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Methodology

A systematic review (SR) was conducted to answer the question: Is the use of the BTAI (Celbrea®) plus CBE superior in sensitivity and specificity vs. CBE in the early detection of possible breast disease?

Based on the available clinical evidence, a full economic evaluation was conducted using a cost-effectiveness analysis (CEA). The measure of effectiveness considered in the model was the sensitivity and specificity values reported for each diagnostic test. To estimate the results, a decision tree model was constructed incorporating the probabilities described in the study by Barros and colleagues3.

The analysis was carried out from the perspective of the public health sector in Mexico. The model was structured around two main branches representing the possible actions of the patient. In each case, two mutually exclusive events were considered: obtaining a positive or negative result, conditional on whether or not the patient had breast cancer.

The time horizon used to estimate costs and health outcomes was 15 minutes, an interval sufficient to measure and detect thermal variations in the breasts through the use of the BTAI Celbrea® device. In the base case, the costs associated with the intervention included only the total acquisition cost of the BTAI device and the cost of the CBE performed at the primary care level by a family physician. For the comparator, only the cost of the initial medical consultation was considered. The results are expressed in U.S. dollars (USD)4.

Since the time horizon of the analysis was less than one year, no annual discount rate was applied, in accordance with the Guideline for Conducting Economic Evaluation Studies in Mexico issued by the General Health Council5.

Finally, to ensure the robustness of the cost-effectiveness results against variations in model parameters, both deterministic and probabilistic sensitivity analyses were performed. These procedures allowed for the assessment of the stability of results and the uncertainty associated with cost and effectiveness estimates.

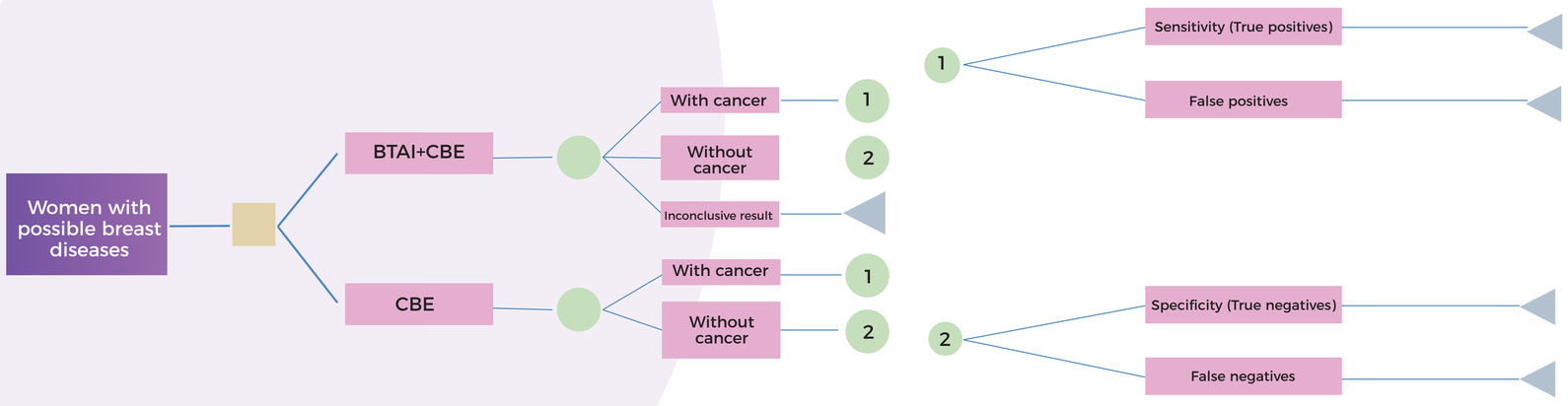

Figure 1. Model structure

Results

In the SR only 1 study met the established inclusion and exclusion criteria, in which the comparison with CBE was addressed, it was estimated that BTAI (Celbrea®) plus CBE represents a 14% increase in the probability of detecting BC vs CBE for each woman with breast Cancer analyzed, who obtained a positive result.

To complement the robustness of the study, the efficacy of BTAI plus CBE vs. biopsy as the gold standard was analyzed and the results were: sensitivity 94%, specificity 98%.

The CEA demonstrated that BTAI plus CBE is a cost-effective option versus CBE, with an Incremental Cost-Effectiveness Ratio (ICER) ranging from $288.25 to $438.78 USD, per true positive and true negative result, respectively, values below the willingness-to-pay threshold in Mexico (one GDP per capita, corresponding to $13,168 USD for 2024)6.

ICER – in terms of the incremental cost and the sensitivity of the test.

Alternative	Average cost per patient	Incremental cost	Effectiveness	Incremental effectiveness	ICER
CBE	$49.14		85%		
BTAI + CBE	$88.63	$39.49	99%	14%	$288.25

ICER – in terms of the incremental cost and the specificity of the test.

Alternative	Average cost per patient	Incremental cost	Effectiveness	Incremental effectiveness	ICER
CBE	$49.14		89%		
BTAI + CBE	$88.63	$39.49	98%	9%	$438.78

Figure 2. Results of the Cost-Effectiveness Analysis

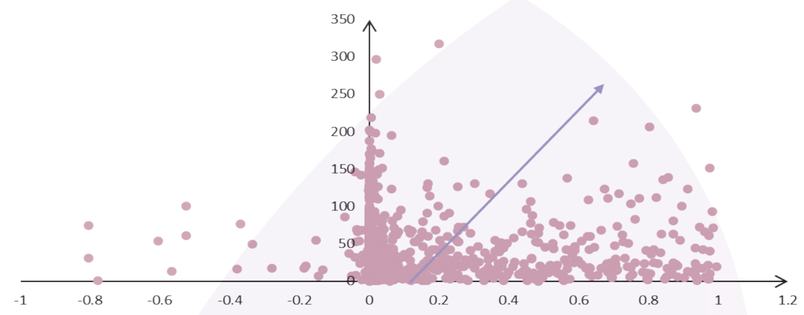

Figure 3. Cost-Effectiveness Plane of the ICER in terms of the incremental cost and the sensitivity of the test

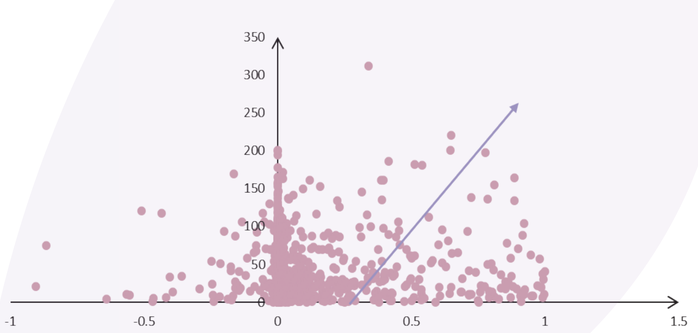

Figure 4. Cost-Effectiveness Plane of the ICER in terms of the incremental cost and the specificity of the test

Conclusions

The results of the cost-effectiveness analysis showed that BTAI (Celbrea®) combined with CBE is a cost-effective option for the early detection of potential breast diseases.

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