



COST-EFFECTIVENESS ANALYSIS OF THE USE OF MICROINVASIVE SURGERY WITH ISTENT® IN COMBINATION WITH PHACOEMUSIFICATION FOR GLAUCOMA AND CATARACT PATIENTS IN THE MEXICAN PUBLIC HEALTH SYSTEM.

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BACKGROUND

Glaucoma is considered the leading cause of blindness in the world due to increased

intraocular pressure (IOP), affecting more than 60 million individuals, with a higher incidence in Hispanics than in non-Hispanics (Tham, 2014) (Secretaría de Salud, 2013). Therefore, the goal of treatment is to reduce basal IOP by 25% (bring baseline IOP to less than or equal to 21mmHg), reduce symptoms of the disease and inhibit the rate of glaucoma progression (American Academy of Ophthalmology, 2016) (Bindel, 2001).

OBJECTIVE

To perform a cost-effectiveness analysis in terms of incremental costs for incremental years of blindness-free gained for all surgeries currently in use, in combination with phacoemulsification compared with phacoemulsification alone due to the differences found in clinical terms, between treatments, from scientific evidence and a network meta-analysis; in order to support the request for inclusion of iStent® into the National Formulary of the General Health Council in Mexico.

METHODS

Model comparators

All surgeries currently employed in the Mexican public sector for adult patients with mild to moderate glaucoma (primary open angle, pseudoexfoliative or pigmentary), who are candidates for cataract surgery include minimally invasive surgery using iStent® cannuloplasty, trabeculectomy, viscochanalostomy or sclerotomy, in combination with phacoemulsification or phacoemulsification alone.

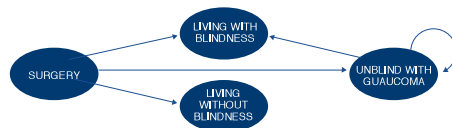
A systematic review of the literature was conducted for each of the comparators. Due to the lack of direct comparative evidence among the alternatives under study, a Network Meta-Analysis was performed to make indirect comparisons. The analysis supported that with the exception of iStent®, no statistically significant differences were observed between the comparators included in the analysis and phacoemulsification.

All comparators, other than iStent®, will be as effective and more expensive than phacoemulsification due to their additional surgeries. A cost-effectiveness model was, therefore, developed to compare the primary benefits of iStent® + phacoemulsification versus phacoemulsification in clinical and economic terms.

Model Structure: A Four State Markov Model

Figure 1 describes the schematic clinical flow of disease progression in the cost-effectiveness model. In both treatment options, patients face the probability of success (i.e., the surgery in question succeeds in establishing the IOP $\leq$ 21mmHg). Those patients who successfully pass the initial surgery are supposed to remain in a glaucoma-free state that will incur only a maintenance cost. All patients where glaucoma persists, stay in a recurrent state of health where they can: 1) continue with glaucoma or 2) progress to blindness. This health state is characterized as a "Markov chain" because it generates the two possible disease progression pathways. The state of health without blindness necessitates reintervention and associated costs.

Figure 1. Diagram of the Cost-Effectiveness Model



Time Horizons

It was considered a time horizon of 5 years in order to capture the costs and health benefits of the treatments included in the cost-effectiveness analysis. This temporality was approved by the General Health Council in Mexico.

Table 1. Transition probabilities

Treatment options	Probability
Probability of success	
iStent® + phacoemulsification	72%
Phacoemulsification	51,42%
Other transition probabilities	
Probability of blindness associated with glaucoma	1,6%
Probability of reintervention for both treatments	20%

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Table 2. Cost of events and supplies.

Events/Supplies	Cost
iStent®	MXN 21,150,00
Phacoemulsification (surgery)	MXN 27,385,87
Surgery after failure	MXN 27,385,87
Blindness	MXN 20,902,29
Clinical glaucoma	MXN 20,902,29
Adverse events	
Phacoemulsification	MXN 3,505,93
iStent® + phacoemulsification	MXN 1,606,18

Costs

Total costs involve: the stent (iStent inject®), cost of surgery, cost of blindness, cost of surgery after failure, cost of clinical glaucoma and cost of adverse events. All the costs were obtained from publicly available sources (IMSS, 2019) (IMSS, 2014) and updated at present value if necessary.

Outcomes

The outcomes considered are incremental costs and life years free of blindness represented as incremental cost effectiveness ratio by life years gained free of blindness.

RESULTS

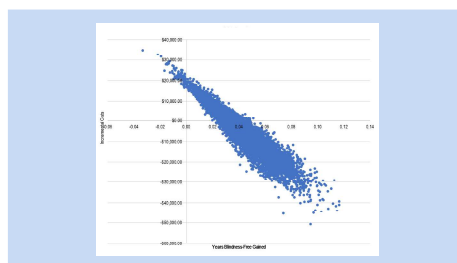
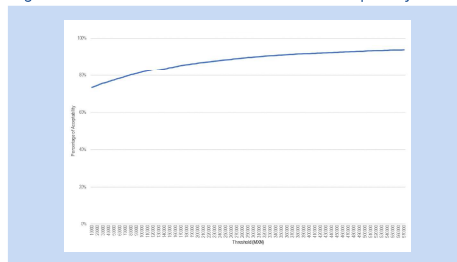
Over the time horizon of 5 years, the treatment with iStent®, in combination with phacoemulsification yielded the savings of 5,638 MXN per patient and 0,049 years of life free of blindness, compared with phacoemulsification alone.

Table 3. Base Case Results.

Treatment Options	Cost MXN (2019)	Incremental cost (savings, MXN)	Effectiveness (life years without blindness)	Incremental Effectiveness
iStent® + phacoemulsification	MXN 81,819	Δ5,638	4,27	Δ0,04
Phacoemulsification	MXN 87,457		4,23	

The rigor of the model was tested through deterministic univariate, multivariate and through a Probabilistic Sensitivity Analysis (PSA). Figure 2 shows that most of the 10,000 iterations are located in the south-east quadrant of the cost-effectiveness plane, indicating that it is cost saving and effective. Figure 3 shows the cost-effectiveness acceptability curve where with the various thresholds of Gross Domestic Product (GDP) per capita. For instance, with the GDP per capita of MX\$181,280 in 2019 year, in more than 85% of iterations, iStent® + phacoemulsification would be a cost-effective treatment option.

Figure 2. PSA Results and Cost-Effectiveness Acceptability Curve



CONCLUSIONS

iStent® in combination with phacoemulsification would generate economic savings for the institutions, while offering health benefits to the patients in terms of additional years free of blindness. iStent® technology in combination with phacoemulsification should be the first treatment choice for patients with glaucoma and cataract in Mexico.

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