

Letter to the Editor: Cost-analysis of Surgical Intraocular Pressure Management in Glaucoma

We write in reference to “Cost analysis of surgical intraocular pressure management in glaucoma” by Elhusseiny et al.¹ The authors address an important issue, aiming to quantify the value of clinically effective glaucoma surgical procedures. However, they present average cost-effectiveness ratios (ACERs), not incremental cost-effectiveness ratios (ICERs), which is what Health Technology Assessment (HTA) agencies consider when making coverage decisions. Confusion between ACERs and ICERs is common but can lead to inappropriate policy recommendations.

As an example of the ICER concept, every product is positioned in relation to its next most costly alternative, and a decision is made as to whether the additional benefits are worth the costs. Figure 1 provides a graphical example of the per-person cost and effectiveness in terms of quality-adjusted life years (QALYs) saved of usual care and 5 interventions, ordered from lowest to highest cost. The slope of the line segments illustrates the ICERs for each strategy. The figure demonstrates that Strategy 1 should never be employed; at a cost of \$7000, one could obtain greater QALYs by offering a mix of usual care and

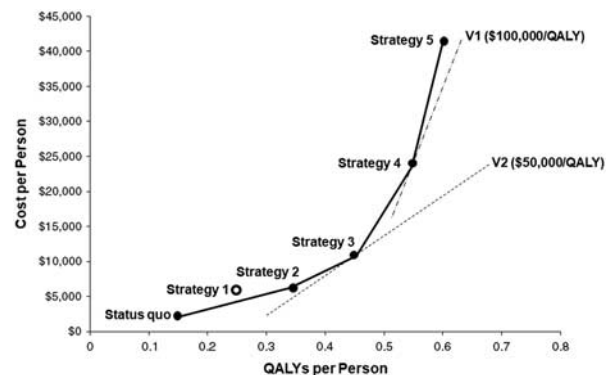


FIGURE 1. Example cost-effectiveness frontier. QALY indicates quality-adjusted life year.

Strategy 2. Importantly, this holds true even though Strategy 1 has a better ACER than Strategies 4 and 5. This example is how HTA agencies make decisions about the value of new medical products.

Elhusseiny and colleagues conclude that “conventional glaucoma surgeries and SLT surgery were the most cost-efficient surgical methods to lower intraocular pressure (IOP) compared with the various micro-invasive glaucoma surgery options.” However, this conclusion can only be made with knowledge of ICERs and a decision-maker’s willingness-to-pay for additional health gains. This can be illustrated using lines V1 and V2 in Figure 1. If the decision-maker were willing to pay a maximum of \$50,000 for a unit gain in QALYs (in the case of V2), then Strategy 3 would be the preferred option. In the case of V1 (\$100,000/QALY), where the decision-maker has a higher willingness-to-pay for 1 U of QALYs, as shown by its steeper slope than that of V1, Strategy 4 would be preferred.

Elhusseiny and colleagues present health gains in term of reductions in IOP. HTA agencies almost universally rely on QALYs because there are well-established benchmarks for what represents good value for money using this metric; no such benchmark exists for cost per IOP reduction. Since policymakers understand cost/QALY, it is important to convert the cost/IOP into cost/QALY and consider a lifetime perspective. A long-term perspective is needed as the benefits of better IOP in the short term may be outweighed by some of

the secondary complications and subsequent treatments that may not materialize until years later with conventional glaucoma surgeries.

HTA agencies also recognize that some procedures may be more clinically appropriate than others and that this decision depends on severity of glaucoma, baseline IOP (as IOP goals differ by glaucoma severity²) as well as other factors specific to the individual patient, such as patient’s age, employment status, and lifestyle. Given the importance of the topic, future studies regarding the relative merits of options should build on the excellent work of Elhusseiny and colleagues to produce ICERs using cost/QALY while taking a lifetime perspective and with analyses for select subgroups of patients.

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REFERENCES

1. Elhusseiny AM, Yannuzzi NA, Kho-deiry MM, et al. Cost-analysis of surgical intraocular pressure management in glaucoma. *J Glaucoma*. 2021; 30:947–951.

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2. Gedde SJ, Vinod K, Wright MM, et al. Primary open-angle glaucoma preferred practice pattern. *Ophthalmology*. 2020;128:71–150.

Response to Letter to the Editor: Cost-analysis of Surgical Intraocular Pressure Management in Glaucoma

We appreciate the thoughtful attention of Finkelstein and Khouri to our recent publication regarding cost analysis of surgical glaucoma management.¹ We fully agree that the incremental cost-effectiveness ratio (ICER) is superior to an average cost-effective ratio (ACER). However, our analysis has a limitation that is inherent to evaluating effectiveness in glaucoma management and applying the ICER to our data has at least 2 flaws.

The Figure in the Letter presumes an abscissa scale of quality adjusted life years per person. Those data are not available, at least not in a fully verified and standardized manner for glaucoma severity parameters. The most verified ocular covariate is visual acuity which is convertible in a general sense to utility units. Visual acuity is not a good covariate for the effectiveness of glaucoma management although, as our manuscript cites, there have been some attempts to capture the utility of intraocular pressure reduction. It is this very discordance that we hoped to advance with our analysis, well aware of the limitations to standard cost-utility analyses.

The potential flaws in calculating ICERs (and ACERs, for that matter) in our analysis are that these are most effectively applied when there is a standard comparison of multiple therapeutic options- ideally in the same study. We pooled data from several studies, so it would seem deceptively precise for us to have made such calculations even if we used intraocular pressure as the utility surrogate.

A second flaw implicit in Finkelstein and Khouri's letter is that the willingness-to-pay is a maximum price,

not necessarily a target price. If the ICER is excessive, the therapeutic option is generally considered not valued enough to reimburse (theoretically). If the comparative therapy offers more utility, then a higher price might be justified as long as it does not exceed the (somewhat arbitrary) willingness-to-pay value of the payer. This is nicely illustrated in their figure. Parenthetically, while our analysis was not a rigorous comparative study, the incremental utility offered by the more expensive treatments was not intuitively obvious.

Again, the devil is in the details of ascertaining the true utility gained, something that is more subtle than current methods can apply, and the reason to stimulate new approaches for glaucoma (or other nonvisual acuity-driven outcomes). We thank the authors for making these points and hope it will further energize that stated goal.

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1. Elhusseiny AM, Yannuzzi NA, Khodeiry MM, et al. Cost-analysis of surgical intraocular pressure management in glaucoma. *J Glaucoma*. 2021;30:947–951.

Letter to the Editor: Cost-analysis of Surgical Intraocular Pressure Management in Glaucoma

We read with great interest the article entitled “Cost Analysis of Surgical Intraocular Pressure Management in Glaucoma” and commend the authors on investigating this area as research is quite limited.¹ The authors investigate a parameter, cost per mm Hg intraocular

pressure (IOP) reduction as a method to compare different treatment options in glaucoma. This parameter has been used in previous glaucoma cost-analyses.^{2,3} They conclude that selective laser trabeculoplasty and incisional glaucoma surgeries are the most cost-efficient methods to lower IOP as compared with the newer generation of minimally invasive glaucoma surgeries over a 1-year period. Compiling cost and outcome data in the landscape of the US health care system is difficult given the wide variation in insurance coverage, reimbursement rates, and practice patterns. Given the rise in health care costs in conjunction with a higher projected burden of glaucoma, it is necessary to investigate cost-effectiveness and develop standardized methods to evaluate cost-effectiveness in glaucoma.

While the parameter introduced by the authors (mm Hg IOP reduction/US\$) is helpful in evaluating cost-efficiency on some level, more robust methods can be integrated to address nuances and uncertainty in glaucoma management algorithms and track how various interventions affect disease progression. IOP reduction values reported in clinical studies are variable depending on each study's methodology. For example, was medication wash-out performed uniformly? This significantly affects the quantitative value reported, which in turn, will impact the results and conclusions of studies that do not perform some type of sensitivity analysis.

In recent years especially, there have been multiple cost-effectiveness analyses published in a US context.^{4–6} Cost-utility analyses, a type of cost-effectiveness study, are regarded as superior to other methods among health economists and clinicians as they incorporate quality of life measures afforded by the various treatment options as well as clinical outcomes and costs. Such robust investigations provide the highest quality data to make comparisons and conclusions and support policy recommendations.⁷ Given rising interest in cost-effectiveness analyses, US researchers should develop a consistent methodology, including an agreed upon and appropriate estimation of quality-of-life measures to create robust models. As Elhusseiny and colleagues rightfully note that utility values are difficult to assess in glaucoma given that visual acuity is not a sufficient indicator of treatment efficacy. Perhaps we should revisit how commonly used utility values in studies were obtained and whether this is the best means of estimating the impact of visual loss.

The methodology of cost analyses is important and influences how the results are interpreted. In the context of the US's

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