EE543

The Impact of Different Utility Values to Cost-Effectiveness Model in Diabetic Macular Edema

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Background

- Currently, the majority of the cost-effectiveness models in ophthalmology use the utility values that were elicited from Czoski-Murray et al.[1,4,7]
- However, these utility values have been criticized for their accuracy since they fail to fully capture the expected effects of vision loss and the bilateral nature of the disease[2,6]
- New regression analyses that account for bilateral vision loss have been published to calculate utility estimates[2]

Objective

- Evaluate the impact of different utility values (one-eye utility value, two-eye utility value) on the cost-effectiveness model in diabetic macular edema

Conclusion

- **Our preliminary results suggest that using one-eye utility value in cost-effectiveness analysis may overestimate the value of the intervention, as shown by the differences in the incremental QALMs between two scenarios**
- **For further analysis, we suggest building a two-eye model that reflects the actual treatment procedure and allows for an accurate comparison between the two different utility values**

Methods

- Using the protocol T head-to-head study[8], cost-effectiveness model was built for aflibercept and ranibizumab under two different scenarios:
  1. *Using worse-seeing eye utility values*
  2. *Using better-seeing eye and worse-seeing eye interaction utility values*
- Both utility values were calculated based on the defined visual acuity levels using regression analyses[2]
- Treatment-related costs, adverse event management, and visual acuity related healthcare resource costs were based on the precious model after adjusting for current inflation (2022 US dollars)[4]
- One-way sensitivity analysis (OWSA) and probabilistic sensitivity analysis were conducted

Figure 1. Markov Model

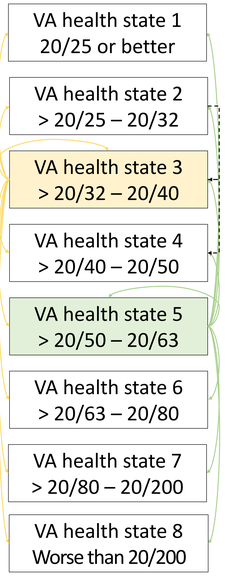


Table 1. Two Scenarios

	Scenario 1	Scenario 2
Transition probabilities	Identical (*transition probability for aflibercept and ranibizumab was different*)	
Comparator	Aflibercept vs Ranibizumab	
Costs	Identical (*costs for aflibercept and ranibizumab was different*)	
Utility values[a]	$TTO = \beta_0 + \beta_2 VA_{WSE}$ β_0 0.817 β_2 −0.320	$TTO = \beta_0 + \beta_1 VA_{BSE} + \beta_2 VA_{WSE} + \beta_3 VA_{WSE} VA_{BSE}$ β_0 0.769 β_1 −0.039 β_2 −0.079 β_3 −0.113
Perspective	United States	
Time horizon	2 years	
Results	ICER	

BSE: Better-seeing Eye, TTO: Time trade-off, WSE: Worse-seeing Eye, VA: Visual Acuity in LogMAR scale

[a]*Visual acuity (Snellen scale) in health states was converted to LogMAR scale to calculate utility values*

VA: Visual Acuity in Snellen scale
Treated eye → Untreated eye following natural progression[5]
Used for Scenario 2 (two-eye utility values)

Preliminary Results

Table 2. Base Case Results

	Aflibercept		Ranibizumab		Incremental		
	Costs (USD, $)	QALMs	Costs (USD, $)	QALMs	Costs (USD, $)	QALMs	ICER (USD per QALM)
One-eye utility value	218,801	18.49	222,378	18.40	3,578	-0.09	**Dominant** -40,208
Two-eye utility value	218,557	17.67	222,794	17.64	4,237	-0.03	**Dominant** -135,915
Difference in QALM	**0.82**		**0.76**				

- In the base case of a 2-year time horizon, the total quality-adjusted life month (QALM) differences between the two scenarios were 0.82 for aflibercept and 0.76 for ranibizumab (Table 2).
  - Aflibercept QALMs: 18.49 (one-eye utility value), 17.67 (two-eye utility value)
  - Ranibizumab QALMs: 18.40 (one-eye utility value), 17.64 (two-eye utility value)
- The incremental QALM differences between aflibercept and ranibizumab were -0.09 and -0.03 for one-eye utility value and two-eye utility value, respectively (Table2).

Sensitivity Analyses

Figure 2. OWSA Tornado Diagram

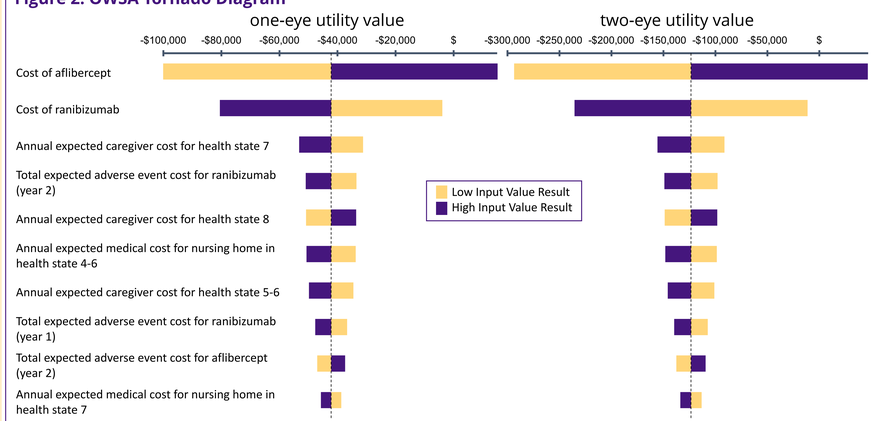
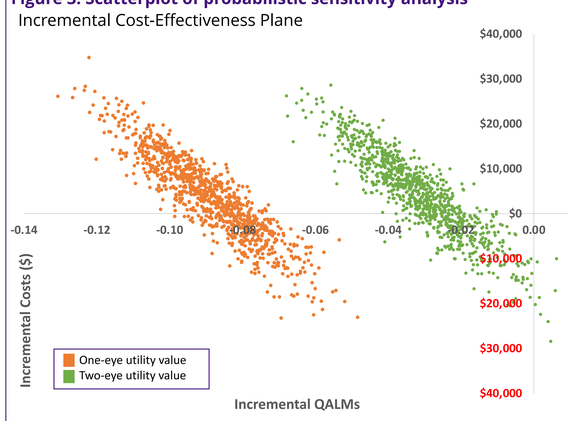


Figure 3. Scatterplot of probabilistic sensitivity analysis



Discussion

- Our preliminary results suggest that when not accounting for the natural progression of the disease, using the one-eye utility value may overestimate the value of the medication compared to the two-eye utility value (Table 2).
- **Limitations of our model are as follows:**
  - The accuracy of the two-eye utility value is still questionable due to the limited data on the visual acuity level of the fellow-eye.[5,8,10]
  - Due to insufficient data, our model assumed that the fellow-eye has a better visual acuity than the treated eye and follows the natural progression of the disease at a rate to a previous observational study.[5]
  - We assumed that the fellow eye does not receive treatment. However, this is not an accurate representation of the real clinical practice.[8]
  - The time horizon of our model was only two years. Previous model showed that the results of cost-effectiveness can change when extending the time horizon from 1-year to 10-years.[9]

References 1. Poku E, Brazier J, Carlton J, Ferreira A. Health state utilities in patients with diabetic retinopathy, diabetic macular oedema and age-related macular degeneration: a systematic review. *BMC Ophthalmol*. 2013;13:74. **2.** Hodgson et al. Challenges associated with estimating utility in wet age-related macular degeneration: a novel regression analysis to capture the bilateral nature of the disease. *Adv Ther.* 2017;34:2360-70. **3.** Ferrante N, Ritrovato D, Bitonti R, Furneri G. Cost-effectiveness analysis of brolucizumab versus aflibercept for the treatment of neovascular age-related macular degeneration (nAMD) in Italy. *BMC Health Serv Res*. 2022;22(1):573. **4.** Nancy Holekamp, Steven B. Duff, Yamina Rajput & Vincent Garmo (2020) Cost-effectiveness of ranibizumab and aflibercept to treat diabetic macular edema from a US perspective: analysis of 2-year Protocol T data, Journal of Medical Economics, 23:3, 287-296. **5.** Lent-Schochet D, Lo T, Luu KY, et al. NATURAL HISTORY AND PREDICTORS OF VISION LOSS IN EYES WITH DIABETIC MACULAR EDEMA AND GOOD INITIAL VISUAL ACUITY. *Retina*. 2021;41(10):2132-2139. **6.** Butt T, Crossland MD,West P, et al. Simulation Contact Lenses for AMD Health State Utility Values in Nice Appraisals: A Different Reality. Br J Ophthalmol 2015; 99:540–4. **7.** Czoski-Murray C, Carlton J, Brazier J, Young T, Papo NL, Kang HK. Valuing condition-specific health states using simulation contact lenses. *Value Health*. 2009;12(5):793-799. **8.** Wells JA, Glassman AR, Ayala AR, et al. Aflibercept, Bevacizumab, or Ranibizumab for Diabetic Macular Edema: Two-Year Results from a Comparative Effectiveness Randomized Clinical Trial. *Ophthalmology*. 2016;123(6):1351-1359. **9.** Ross EL, Hutton DW, Stein JD, et al. Cost-effectiveness of Aflibercept, Bevacizumab, and Ranibizumab for Diabetic Macular Edema Treatment: Analysis From the Diabetic Retinopathy Clinical Research Network Comparative Effectiveness Trial. *JAMA Ophthalmol*. 2016;134(8):888-896. **10.** National Institute for Health and Care Excellence (NICE). Ranibizumab and pegaptanib for the treatment of age-related macular degeneration. Technology appraisal guidance [TA155]. 2008. https://www.nice.org.uk/guidance/ta155/resources/ranibizumab-and-pegaptanib-for-the-treatment-of-agerelated-macular-degeneration-82598316423109.