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Vision-Related Quality of Life Associated with Unilateral and Bilateral Ocular Conditions

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Purpose: To present ophthalmic patient time-tradeoff vision utilities for quantifying vision-related quality-of-life when the fellow eye still has good vision. These utilities are important for performing reliable cost-utility analyses.

Design: Consecutive time-tradeoff vision utilities were obtained from ophthalmic patients with good vision (20/20–20/25) in one eye and vision ranging from 20/20 to no light perception in the fellow eye over a 15-year period from 2000 through 2014.

Participants: Five hundred eighty-six ophthalmic participant interviews from Wills Eye Hospital, New York Eye and Ear Hospital, and ophthalmology office practices in Pennsylvania and New Jersey.

Methods: Participants underwent a full ophthalmic examination, after which time-tradeoff vision utilities were obtained by personal interview by the authors using a standardized, validated instrument.

Main Outcome Measures: Time-tradeoff vision utilities.

Results: Mean time-tradeoff vision utilities were as follows in participants with good vision (20/20–20/25) in at least one eye and the following visions in the fellow eyes: no light perception, 0.79; counting fingers to light perception, 0.87; 20/200 to 20/400, 0.88; 20/60 to 20/100, 0.88; 20/30 to 20/50, 0.87; and 20/20 to 20/25, 0.94.

Conclusions: In people with good vision (20/20–20/25) in one eye, the associated mean time-tradeoff vision utility is a remarkably consistent 0.87 to 0.88 when vision in the fellow eye ranges from 20/30 to light perception. Vision of 20/20 to 20/25 in the fellow eye results in a significantly higher associated utility of 0.94 ($P < 0.01$), whereas vision of no light perception in the fellow eye results in a significantly lower utility of 0.079 ($P < 0.01$). These utilities are important for calculating reliable patient value (quality-adjusted life-year) gains in ophthalmic cost-utility analysis populations in which there is unilateral and bilateral disease involvement. *Ophthalmology 2018;■:1–7 © 2018 by the American Academy of Ophthalmology*

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Utilities quantify the quality of life associated with a health state, typically with anchors ranging from normal health (utility, 1.00) to death (utility, 0.00).[1] They are used in cost-utility analysis, an instrument that quantifies the cost associated with the human value gain[1] (improvement in quality of life, length of life, or both) derived from healthcare interventions. Cost-utility analysis increasingly is used in many countries to help make healthcare interventional coverage decisions. Global pharmacoeconomic guidelines have been gathered by the International Society of Pharmacoeconomics and Outcomes Research.[2] Thirty-four countries have formal guidelines for pharmacoeconomic analysis for a drug to be covered for payment, whereas 10 others have pharmacoeconomic guidelines or recommendations that are not officially recognized by decision-making bodies for payment.[2]

Cost-utility analysis measures interventional human value gain in terms of quality-adjusted life-years (QALYs) gained.[1] The QALY integrates improvement in quality of life, length of life, or both. Because few ophthalmic interventions increase length of life, the QALY gain associated with ophthalmic therapies typically occurs because of quality-of-life improvement.[3]

It is estimated that more than 27 million different inputs (different utility instruments, dissimilar utility respondents, disparate costs, unlike cost perspectives, and so forth) can go into a single cost-utility analysis. Even 1 different variable, such as unlike utility instruments, disparate utility respondents (patients, general public, physicians, etc.),[4,5] or differences in elicitation technique can make cost-utility analyses mismatched. For example, ophthalmologists underestimated the utility loss associated with various levels of age-related macular degeneration (AMD) by 95% to 750%[5] compared with AMD patients. Thus, the vast majority of cost-utility analyses currently in the literature are not comparable, many because of utility differences, not to mention different costs included, cost bases, discounting, currency issues, year of the study, and so forth.[1,6]

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Ophthalmic interventions often differ from those involving single body organs (heart, liver, stomach, spleen, brain) in that one or both eyes can be involved. Even in organs that are bilateral (lungs, kidneys, ovaries, testes), loss of an organ still can result in the same function measurement as quantified by laboratory tests (serum creatinine for kidneys, sperm count for testes, blood oxygen saturation for lungs, and so forth).

It has been shown that ophthalmic vision utilities differ depending on whether one or both eyes have decreased vision. For example, 20/20 to 20/25 vision bilaterally in conjunction with ocular disease has been associated with a utility of 0.97 (not 1.0 because of concern over possible future vision loss).[7-9] When one eye has 20/20 vision and the fellow eye has 20/40, the associated utility has been measured at 0.92. If the vision drops to 20/40 bilaterally, the utility decreases to 0.80.[7] Vision utilities most closely correlate with vision in the better-seeing eye.[4,5,7−14]

Researchers have treated the unilateral and bilateral ocular utility situation in diverse ways. Some studies assume the overall utility gain from therapy is equal for both eyes, although only one eye has been treated.[15] Others have attempted to use combinations of the utility associated with vision in each eye (e.g., 75% worst-vision eye utility, 25% best-vision eye utility, 50%−50%, and so forth),[12] Other investigators have used Markov modeling to predict the conversion of a normal fellow eye to a diseased eye.[16] Because quantifying vision utilities enables more reliable cost-utility analyses,[17-19] the authors believed it important to derive a patient-based methodology to ascertain a vision utility when an untreated fellow eye has good vision or better vision than the treated eye.

Methods

Ophthalmic patient participants from vitreoretinal and general ophthalmology practices at Wills Eye Hospital, other offices in Pennsylvania and New Jersey, and the New York Eye and Ear Hospital were interviewed. Interviews were conducted, along with systemic utility acquisition, by the authors over approximately 200 sessions during a 15-year period from 2000 through 2014. Interviews were conducted in a consecutive, cross-sectional fashion throughout the day, typically on days with a lighter patient load to allow consecutive patients to be interviewed. After a complete ophthalmic examination, the purpose of the study was explained and those who agreed to participate signed an informed consent form. The study was approved by the Wills Eye Hospital Institutional Review Board and the New York Eye and Ear Hospital Institutional Review Board. It adhered to the tenets of the 1983 revision of the Declaration of Helsinki, as well as Health Insurance Portability and Accountability Act regulations.

Inclusion and Exclusion Criteria

Inclusion criteria encompassed an age of 21 years or older and the presence of at least 1 ophthalmic disease (cataract, diabetic retinopathy, AMD, and so forth). When utilities were obtained, sessions were conducted for a day and included consecutive participants who met inclusion criteria and lacked exclusion criteria. Exclusion criteria included dementia; declining to participate after study explanation (typically for religious reasons); stated inability to answer because they did not understand the questions, even when explained; and the inability to understand the utility concepts by trading more years than the patient estimated that he or she would live. As soon as the utilities were obtained, participants with 20/20 to 20/25 best-corrected vision in at least 1 eye were selected for further examination.

Utility Methodology

Our cross-sectional 2-question methodology of obtaining the time-tradeoff vision utilities has been described at length in peer-reviewed articles.[4,5,7−14] Briefly, participants were asked: (1) How long do you theoretically expect to live? and (2) How much of your theoretical time of remaining life—if any—would you hypothetically trade in return for an intervention that would return your vision to normal in each eye permanently? The utility was calculated by subtracting the proportion of remaining hypothetical time traded from 1.0. Our time-tradeoff utility acquisition methodology integrated: (1) standardized questions, (2) only utilities from ophthalmic patients who had experienced the condition of interest, and (3) direct participant interviews to allow explanation if participants had questions.[4,5,7−14] Demonstrated to be reliable on both a short-term and long-term basis,[18,19] these vision utilities have been shown to have construct validity[20] and typically are not influenced by comorbidities, age, ethnicity, level of education, gender, or income.[4,5,7−14] With anchors of death (0.00) and normal vision bilaterally (1.00), they are readily comparable with utilities acquired across all specialties in medicine.[1,21] Our utilities have been demonstrated to be comparable with those from Canada and Western Europe.[22,23] It is uncertain whether they are comparable with those in other cultures on other continents. Schmier and Hulme-Lowe[24] noted in their review that most studies concerned with the cost effectiveness associated with AMD therapies have used our utilities obtained with this methodology.

Six cohorts were created, according to best-corrected Snellen vision in the poorer-seeing eye, in the participants with 20/20 to 20/25 vision in at least 1 eye. These cohorts were as follows: cohort 1, no light perception; cohort 2, counting fingers to light perception; cohort 3, 20/200 to 20/400; cohort 4, 20/60 to 20/100; cohort 5, 20/30 to 20/50; and cohort 6, 20/20 to 20/25. In eyes with best-corrected vision further improved by pinhole, pinhole vision was used because such individuals often squint to obtain their best vision.

Statistical Analyses

Statistical analyses were performed with Microsoft 10 Excel (Microsoft, Inc., Bellingham, WA). Multiple regression analysis was performed with the Analyze-it add-in to Microsoft 10 Excel (Leeds, United Kingdom). One-way analysis of variance and the Tukey honest significant difference test for post hoc analysis of analysis of variance were performed with Vassar Stats (www.vassarstats.net; Accessed 2017). Significance was presumed to occur with a P value of less than 0.05.

Results

Demographics

The demographic features of the participants are shown in Table 1. There were 322 women (54.9%) and 264 (45.1%) men. The mean age was 60.5 years, with a range from 21 to 94 years. There were 526 white subjects (89.8%), 54 black subjects (9.2%), and 6 Asian subjects (1.0%).