

## Quality of Life in Glaucoma Patients

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### Abstract

Glaucoma affects the quality of life (QoL) of millions of people. Patients with glaucoma have a reduced QoL in early stage disease, which worsens as the disease progresses. Reduced visual function is the main determinant of poor QoL in glaucoma, however ocular surface discomfort, psychological factors, and social constraints contribute to the burden of disease. The assessment of QoL in glaucoma is important in clinical practice to assessing a patient's wellbeing, visual function and level of satisfaction with their care. It can be used to make important therapeutic decisions and allow clinician and patient to share common, realistic goals leading to better treatment outcomes. Quality of life assessment is increasingly important in clinical research. Various tools have been used to assess QoL in glaucoma, including general health-related questionnaires, vision-specific questionnaires, glaucoma-specific questionnaires, utility value assessments and objective visual function assessment. These tools are summarized and critically appraised in this article.

### Keywords

Glaucoma, Quality of life (QoL), Quality of life assessment, Visual loss, Ocular surface discomfort

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### Introduction

Despite advances in therapy the global burden of glaucoma remains high and will continue to rise. In 2010 an estimated 60.5 million people suffered from glaucoma; by 2020 this will reach 79.6 million, of whom 11.2 million will be bilaterally blind.<sup>1</sup> Glaucoma will impact the quality of life (QoL) of all patients with the disease.

Quality of Life is a reflection of a person's overall wellbeing: their ability to pursue a happy and fulfilled life. It includes dimensions of physical ability, mental health, general health perceptions, social functioning and independence.<sup>2,3</sup> Although the components of a good QoL differ among individuals and societies, vision has consistently been demonstrated as one of its key determinants.<sup>4,5</sup>

### Quality of Life for Glaucoma Patients— The Clinical Perspective

Reduced health-related QoL occurs with even early stage glaucoma.<sup>6</sup> Using both the National eye institute visual function questionnaire (NEI-VFQ) and the 12-item Short Form general health survey, glaucoma subjects in the Los Angeles Latino Eye Study (LALES) with early visual loss reported poorer QoL scores compared with healthy controls. As severity of field loss increased, the impact on health-related QoL rose in a linear fashion. Those with severe glaucoma had the lowest QoL scores. The negative QoL effects of visual field loss may be influenced by knowledge of the condition, but not entirely: reduced QoL related to visual field loss was present in individuals who were previously unaware that they had glaucoma.<sup>7</sup> Subgroup analysis between those who knew of their condition (one quarter) and those who were unaware (three quarters) did not reveal any significant difference in scores in those with

severe field loss. The detrimental impact of loss of visual function in one eye increases considerably when vision loss is bilateral.<sup>8</sup> Several QoL studies show that patients with glaucoma in both eyes had the poorest visual functioning.<sup>7-9</sup>

Loss of visual function is the main determinant of health-related QoL for glaucoma patients. This can impact driving, walking, venturing from home, reading, seeing at night, adjusting to different levels of illumination, judging distances, and seeing objects coming from the side.<sup>10-12</sup> Serious consequences of reduced vision include injuries from falling (typically among elderly patients) and automobile accidents.<sup>13,14</sup> Treatment-related issues such as ocular surface discomfort, regular clinical reviews with possibly time-consuming and costly treatment contribute to the overall burden of disease.<sup>15</sup> As vision decreases the psychological burden increases, together with a growing fear of blindness, social withdrawal from impaired vision and depression.<sup>16-18</sup> Other debilitating medical conditions, psychological and social constraints may influence patients' visual morbidity. All of these factors interact in a complex manner and can be reflected in holistic QoL assessment.

A thorough medical history allows QoL assessment for glaucoma patients in clinical practice. QoL is addressed when assessing a patient's wellbeing, visual function and level of satisfaction with their care. Quality of life concerns are frequently considered in making clinical decisions, such as determining a patient's suitability for glaucoma surgery, or whether a regular regime of topical medications is feasible.<sup>19</sup>

The aim of the therapeutic relationship between clinician and patient is to maximize the patient's QoL. Preserving vision by preventing glaucomatous

visual loss, treating other causes of visual morbidity and minimizing the impact of treatment-related discomfort are some of the means to achieve this end. Clinicians often focus on glaucomatous optic neuropathy with serial visual field testing and nerve fibre layer analysis as measures of success or failure of glaucoma therapy, yet these are just one aspect of the overall impact of glaucoma on a patient. From the patient's perspective, the main concerns are often blurred vision, ocular surface discomfort and the risk of going blind.<sup>17</sup> Addressing issues relating to QoL allows both clinician and patient to re-orientate towards common, realistic goals leading to a more harmonious relationship, better concordance with treatment programs and patient satisfaction.<sup>20</sup>

### Quality of Life Assessment for Glaucoma Patients

Formal QoL assessment can be used to ascertain patient satisfaction, detect increasing visual burden or changes in overall functional ability over time. It can aid the clinician and patient to make difficult clinical decisions, and can guide choices to individualize therapy. It allows the clinician to assess the impact of glaucoma on the patient's life and then guide interventions; it might prompt referral to a community organization to inspect the patient's home environment and to suggest changes to minimize obstacles, improve lighting, or to receive appropriate help. As more information is learnt from QoL analysis in severe glaucoma patients, it can be used to educate other patients meaningfully about the potential impact of glaucoma on their lives. A comprehensive assessment of QoL has become increasingly important in glaucoma clinical research. Recently the US Food and Drug Administration has endorsed that QoL assessment be included in all clinical trials evaluating disease impact and treatment assessment in glaucoma.<sup>21</sup>

A number of QoL assessment tools, also known as patient-reported outcome (PRO) questionnaires, are available to assess systematically the effects of glaucoma on patient activities and function. Most involve several items, grouped into factors or domains; each item is a question related to a specific functional ability, for which the respondent grades a response reflecting the severity of the problem. Subset scores reflect the impairment related to each domain and the total score reflects the overall QoL.

Each assessment tool has relative strengths and weaknesses and can be critically appraised. The ideal tool is a questionnaire that is easy to administer, understand and complete. It should focus on self-evaluation of function. It must be validated with sufficiently powered high-quality studies. It should have high test-retest reliability, indicating strong correlation (*r* value) between initial and subsequent administration of the questionnaire to the same respondent. The scores should correlate with disease severity. The questionnaire should be sensitive to the early stages of disease or disability, in both newly diagnosed and undiagnosed patients. Disease-specific tools should have a high internal consistency, such that there is a good inter-item correlation (Cronbach  $\alpha$  score); a high Cronbach  $\alpha$  score suggests that the items measure a single underlying condition. Most questionnaires have items grouped in several domains with corresponding subscales; factor analysis can be performed to detect the strength of relationships between each item. Increasingly Rasch analysis is being used to transform the raw scores into interval level data, allowing weighting of specific domains according to relevance and internal consistency.<sup>22,23</sup> This provides a greater understanding of the psychometric components of the questionnaire, and enables more robust statistical analysis of parametric data.

Generic health-related QoL questionnaires, vision-specific questionnaires, glaucoma-specific questionnaires and utility value assessments have been administered to patients with glaucoma in efforts to understand the disease's effects on their daily lives. These are summarised in *Table 1*.

### General Health-related Questionnaires

The initial QoL analysis tools reflected a global QoL assessment. Scores were determined by the sum of subsets reflecting several physical domains. These included the Sickness Impact Profile (SIP) and the 36-item Short-form Health Survey (SF-36)<sup>24,25</sup> which have been used to assess QoL and patient function in a wide range of diseases or health conditions, including glaucoma.<sup>26,27</sup> Notably a version of the SIP was modified for use in the Collaborative initial glaucoma treatment study (CIGTS) and showed good internal consistency and test-retest reliability.<sup>28,29</sup> Although these questionnaires identified general health domains affected by glaucoma, these were less sensitive than vision-specific QoL instruments in detecting differences between patients with glaucoma and normal health subjects.<sup>30-32</sup>

### Vision-specific Questionnaires

The activities of daily vision scale (ADVS) was the first vision-specific questionnaire.<sup>33</sup> Developed to assess visual disability due to cataract, it included 20 questions in five domains: distance vision, near vision, glare disability, night driving and daytime driving. In glaucoma patients visual acuity and field loss correlated with all ADVS subscales and differed significantly from normal controls.<sup>34</sup> The VF-14 was similarly developed for cataract assessment, and scores only moderately correlated with glaucomatous field loss with no significant difference in scores detected between glaucoma patients and healthy controls.<sup>30,35</sup> The visual activities questionnaire (VAQ) was designed as a broader ophthalmic QoL assessment tool, including a domain specific to peripheral vision.<sup>36</sup> This was also used in the CIGTS; the peripheral vision subscale correlated more strongly with visual field loss ( $p < 0.001$ ) than any other QoL instrument.<sup>27</sup> The 51-item NEI-VFQ was designed using items devised by low vision focus groups to measure the QoL impact of many conditions that can lead to reduced vision-dependent function.<sup>37</sup> It was later modified into a 25-item questionnaire with similar validity and reproducibility.<sup>38</sup> The NEI-VFQ is a widely used instrument measuring a broad range of visual functions and is the benchmark general vision-related QoL assessment tool. When used for glaucoma patients poorer scores for most subscale items correlated with visual field loss, especially in the better eye.<sup>30,31,39</sup>

### Glaucoma-specific Questionnaires

The glaucoma-specific questionnaires focus on functional impairment specific to glaucoma patients such tasks related to contrast discrimination, dark adaptation and peripheral vision. They are excellent discriminators between controls and glaucoma patients.

The glaucoma symptom scale (GSS) includes 10-items reflecting common concerns for glaucoma patients, including non-visual symptoms relating to ocular surface discomfort and problems with visual function (eg blurry/dim vision, difficulty seeing in daylight, difficulty seeing in darkness, and colored rings around lights). Patients with glaucoma had significantly lower scores than normal subjects on both the non-visual symptom and visual ability subscales of the GSS, with the visual ability subscale showing especially good discrimination between glaucoma patients and controls.<sup>40</sup>

**Table 1: Quality of Life Analysis Questionnaires Used For Glaucoma Patients**

Questionnaire	Overview	Use in Glaucoma Patients	References
<b>General Health-related</b>			
SIP	136 items in 12 categories; good validity with moderate-to-high correlations with clinical measures of disease.	Modified version used in the Collaborative initial glaucoma treatment study (CIGTS); good internal consistency (Cronbach $\alpha$ = 0.962) and test-retest reliability ( $r$ = 0.908), however weak correlation of QoL scores and clinical outcomes.	24,26,28,29
SF-36/MOS-20	The SF-36 is a widely used 36-item general health questionnaire over eight domains. The Medical Outcomes Study (MOS-20) is a shortened version.	Scores were low in glaucoma patients, higher in controls and intermediate in glaucoma suspects. Poor correlation with visual field indices.	25,27,30
<b>Vision-Specific</b>			
ADVS	20-item questionnaire in five subscale domains (distance vision, near vision, glare, night driving, daytime driving). High test-retest reliability ( $r$ = 0.87) and internal consistency (Cronbach $\alpha$ = 0.94).	Scores correlated with field loss in glaucoma patients and were significantly better in controls.	33,34
VF-14	A 14-item questionnaire with high internal consistency; good correlation with pre-operative visual acuity and patient satisfaction in cataract patients.	Moderate correlation between scores and glaucomatous field loss ( $r$ = -0.56 to -0.6); no difference detected between patients with glaucoma and healthy controls.	30,35
VAQ	33-items over 10 domains related to visual function: peripheral vision, contrast sensitivity, acuity, glare, low-illumination levels, and light/dark adaptation.	Used in the CIGTS with high internal consistency (Cronbach $\alpha$ = 0.958) and test-retest reliability ( $r$ = 0.932). Peripheral vision subscale scores highly correlated with visual field loss ( $p$ < 0.001).	29,36
NEI-VFQ	A 51-item instrument used in many ocular conditions to assess vision-dependent function and quality of life. A 25-item short form has a similar validity. Commonly used vision-specific QoL assessment tool in clinical trials.	Scores for most domains correlate with visual field loss, especially in the better eye.	30,31,37-39
<b>Glaucoma-Specific</b>			
GSS	A 10-item checklist of non-visual and visual symptoms common in patients with glaucoma. High internal consistency for the nonvisual symptom and visual ability subscales (Cronbach $\alpha$ = 0.83 and 0.74, respectively).	Patients with glaucoma had significantly lower scores than normal subjects on both the nonvisual symptom and visual ability subscales of the GSS.	40
GQL-15	A 15-item subscale related to central/near vision, darkness/glare, mobilising, cooking/cleaning/self-care, and peripheral vision. Items were chosen based on correlation with severity of visual field loss.	Well validated with high internal consistency and test-retest reliability.	10,11,15,16, 23,41
<b>Utility Value Assessments</b>			
TTO	Patients are asked how much life span to trade for perfect vision.	Poor sensitivity to early glaucoma; sensitive to glaucomatous progression.	45-48
Conjoint analysis	Patients rank various visual attributes as to how important they are to them.	Poor correlation to other QoL measures including time trade off.	47,49

Abbreviations: Sickness Impact Profile – SIP, Short Form Health Survey-36 – SF36, Medical Outcomes Study – MOS-20, Activities of Daily Vision Scale – ADVS, Visual Function Index – VF-14, Visual Activities Questionnaire – VAQ, National Eye Institute Visual Function Questionnaire – NEI-VFQ, Glaucoma Symptom Scale – GSS, Time trade-off (TTO).

The glaucoma quality of Life-15 (GQL-15) is a 15-item questionnaire initially developed by choosing questions whose responses correlated best with the severity of visual field loss. This statistical, post-hoc analysis is potentially a superior method of devising a glaucoma-specific QoL questionnaire than more traditional methods.<sup>35-37</sup> A pilot study began with 62 questions that covered 10 aspects of daily activities; this was later refined to 15 questions significantly predictive of visual field loss.<sup>39</sup> When completing the GQL-15, patients subjectively evaluate their own ability to perform visually-demanding tasks of daily living.<sup>10,41</sup> The tasks are subdivided into five domains: problems with reading/recognizing faces (central/near vision), problems with darkness/glare, problems with getting around outside/walking in the street, problems with cooking/cleaning/self-care, and problems with bumping into/tripping over objects (peripheral vision). The internal consistency and reproducibility of the assessment over time is high. Responses to the GQL-15 correlated

significantly with perimetric mean deviation values ( $r$  = -0.60), the Pelli-Robson contrast sensitivity values ( $r$  = -0.46), and the Esterman visual field test scores ( $r$  = -0.39).<sup>10</sup> It was well rated in a recent systematic review of PROs in glaucoma.<sup>42</sup> The GQL-15 has recently been evaluated using Rasch analysis; excellent measurement precision was detected with well-spaced category thresholds.<sup>23</sup>

## Utility Value Assessments

UVs are increasingly used as preference-based measurements of health-related QoL, ranging between zero (death) and one (perfect health). Utility values (UVs) are one component of quality-adjusted life-years (QALYs), the other being life expectancy.<sup>43,44</sup> As health resources are becoming constrained, QALYs are important for cost-utility analysis for treatment and other allocation of health funding. In glaucoma, the UVs that have been used include time trade-off (TTO) analysis<sup>45-48</sup> (asking patients how much lifespan

they would trade for perfect vision) and conjoint analysis<sup>47,49</sup> (in which patients have to rank various attributes eg peripheral vision, darkness vision and glare in terms of which matter most to them). High frequencies of ceiling effects, which can lead to underestimating QoL changes, have been reported for UV instruments among these studies; furthermore poor correlation between TTO and conjoint analysis has been reported.<sup>47,50</sup> TTO has been shown to correlate with moderate to severe glaucoma, while remaining relatively insensitive to early disease.<sup>45,46</sup>

## Objective Visual Function Assessment

The Assessment of Function Related to Vision (AFREV) is a more recently devised objective measure of visual tasks to address some of the weaknesses of subjective testing.<sup>51</sup> Patients are observed to perform visually demanding tasks in a controlled manner in both dark and light conditions. It has been found to correlate with clinical and subjective measures of glaucoma severity. Objective testing may prove to be an accurate gauge of a person's visual ability,<sup>52</sup> however current tools would benefit from further refinement.<sup>42</sup>

## Limitations of Quality of Life Assessment for Glaucoma Patients

Assessment of QoL with a questionnaire is subject to several limitations. Quality of life assessment is subjective; two patients with similar losses of visual ability from glaucoma may rate their QoL differently on a QoL

scale. Personality and other psychological factors may influence how questions are answered; some will have a tendency to minimize, while others may over-emphasize their functional impairment. Personality is usually constant; however other psychological factors such as mood may vary between appointments and produce changes in QoL score. The visual tasks assessed can be impaired by visual morbidity, but not specifically so; the tasks may be impaired by other physical as well as psychosocial constraints. This could be viewed as an inherent weakness of QoL assessment; alternatively it could be viewed as providing a holistic evaluation of the patient.

## Conclusion

Over the past few decades QoL research in glaucoma has made considerable progress, providing important insights. For clinicians, these insights can help counsel patients as they seek the most appropriate and individualized therapeutic regimen. Continued efforts to refine QoL assessment will further our understanding of the impact of glaucoma on the lives of millions of patients.<sup>23</sup> More work is needed to delineate better the systemic, psychological and ocular influences of QoL in glaucoma.<sup>15,16,53</sup> As we continue to improve our diagnostic and therapeutic techniques in glaucoma management as well as to optimize appropriate access to healthcare resources for all, we also must focus on real life concerns for our patients as individuals, understanding glaucoma and its impact in the context of their general well-being. ■

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