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REVIEW ARTICLE

Methods for evaluating quality of life and vision in patients undergoing lens refractive surgery

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Abstract

Purpose Cataract surgery has evolved into a procedure that generally yields the best postoperative refractive result attainable. Patients with multifocal intraocular lenses (IOLs) present higher rates of spectacle independence, although reduced intermediate vision, dysphotopsias, and a loss of image quality might also be experienced. The aim of the study was to review the methods for assessing quality of life and vision in patients undergoing lens refractive surgery in randomized controlled trials.

Methods We reviewed the PubMed web platform to identify relevant studies using the following keywords: *quality of life*, *quality of vision*, *lens surgery*, *lens exchange*, *refractive lens exchange*, *cataract*, *cataract surgery*, *intraocular lens*, *IOL*, *multifocal*, and *monovision*.

Results An increasing number of studies have focused on patient-reported outcomes (PROs). Only a few of the available visual function questionnaires can be regarded as useful in lens refractive surgery with multifocal IOL implantation. Many self-developed questionnaires have emerged that have not been adequately validated or found to feature properly evaluated repeatability, hampering the possibility of comparing outcomes.

Conclusions This review describes the existing PROs instruments and informs the choice of an appropriate measure in lens refractive surgery. Rasch-developed tools should be utilized for measuring quality of life and vision in patients undergoing lens refractive surgery and there is a number of highly robust tools available.

Keywords Cataract surgery · Intraocular lens · Lens refractive surgery · Patient-reported outcomes · Quality of life · Visual function

Introduction

Cataract surgery has evolved from being primarily considered a method for opaque lens removal to a procedure capable of yielding high-quality postoperative refractive result. As the incidence of complications has significantly decreased, the use of lens removal as a refractive procedure has emerged. Small-incision techniques have led to minimizing surgically induced astigmatism, while toric intraocular lenses (IOLs) are available for management of higher grades of astigmatism. In order to accurately evaluate the outcomes of presbyopia-correcting IOLs, several measurements must be considered. Objective measures include uncorrected binocular acuity under multiple conditions and distances, residual refractive error, contrast sensitivity, glare disability, straylight levels, and halometry. Notably, two individuals may have the same objective visual function but perceive their quality of vision (QoV) differently. Thus, subjective measures should also be employed in order to assess patient-reported outcomes (PROs). These are numerous questionnaires evaluating spectacle independence, visual function across a range of distances and circumstances, and overall satisfaction with vision including preoperative expectations.

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The aim of this study was to review the methods for assessing quality of life (QoL) and vision in patients undergoing lens refractive surgery based on the currently available literature.

Methodology

PubMed and Medline were the main resources reviewed for medical literature, with an extensive search performed in order to identify relevant articles concerning QoL and vision in patients undergoing lens refractive surgery up to October 31, 2018. The following keywords were used in various combinations: *quality of life*, *quality of vision*, *lens surgery*, *lens exchange*, *refractive lens exchange*, *cataract*, *cataract surgery*, *intraocular lens*, *IOL*, *multifocal*, and *monovision*. The search identified 243 unique articles, but only articles written in the English language articles were ultimately selected. Randomized controlled trials (RCTs) analyzing PROs in people undergoing cataract surgery or refractive lens exchange and who received a multifocal intraocular lens were included. If a study on multifocal IOLs assessed PROs, but was not a RCT, the applied method was also investigated. Studies describing PROs instruments used in other conditions such as keratoconus or corneal refractive surgery were excluded. Other articles cited in the reference lists of identified publications were additionally considered as a potential source of information. No attempts to discover unpublished data were made.

Results

Methods for evaluating QoL and vision

Vision impairment has a considerable impact on the length of life [1] and QoL [2]. A long tradition in ophthalmology with respect to using objective psychophysical measures to evaluate outcomes has served the field well. With the current level of perfection objective measures possibly no longer be considered sufficient, more studies are focusing increasingly on PRO. The visual function questionnaires employed in current studies are presented in Table 1.

First-generation surveys include questions about difficulties in performing particular tasks and do not differentiate the importance of certain tasks based on the patient's lifestyle. This is consistent with the classical test theory for psychometric testing, using a simple summary scoring system. The National Eye Institute Visual Function Questionnaire (NEI-VFQ) was developed in order to test the level of visual impairment related to eye diseases including the following: age-related cataracts, age-related macular degeneration, diabetic retinopathy, primary open-angle glaucoma, cytomegalovirus retinitis, and/or low vision from any cause [4]. The questionnaire consists of 51 items that assess general vision problems and specific conditions, e.g., reading, work-related duties, and driving during the daytime and at night. The newer version features 25-items and may be more feasible in busy clinical settings [5]. Although some NEI-VFQ subscales have been found to not be psychometrically sound [26], the questionnaire overall was established as a reliable measure in patients with visual impairment related to age-related macular degeneration [27] and geographic atrophy [28]. Several questions regarding the QoV are strongly associated with objective measures [29].

The National Eye Institute Refractive Error Quality of Life Instrument-42 (NEI RQL-42) is a self-administered assessment tool designed specifically for use in those who through correction of refractive error have normal visual acuity but who may still be experiencing problems in vision-related functioning and well-being [6]. This 42-item questionnaire measures patients' satisfaction with distance vision, clarity of vision, and severity and frequency of glare symptoms along with the need for spectacles. Higher scores indicate better QoL and less dependence on corrective wear. Psychometric evaluation of the NEI RQL-42 showed that it has deficiencies in all of its tested aspects [30].

The Functional Assessment of Visual Tasks (VISTAS) questionnaire was created to assess the difficulties in near, intermediate, and distance tasks [31, 32]. The VISTAS test has sections relating to experiences when performing tasks at different distances, regarding using corrective wear, and an assessment of satisfaction for daytime and nighttime vision.

The Visual Function Index (VF-14) is a brief questionnaire that evaluates visual impairment owing to cataract and contains 18 questions covering 14 aspects regarding visual function [10]. The tasks most correlated with patient satisfaction, from best to worst, are nighttime driving; reading small print; watching television; seeing steps, stairs or curbs; reading traffic, street or store signs; cooking; and doing fine handwork [11]. Only the seven most important items were selected for inclusion in a new seven-item index (VF-7).

The second-generation tests involve Rasch analysis, consistent with item response theory. Analyzing data according to the Rasch model—that is conducting a Rasch analysis—supplies a range of details for checking whether or not adding the scores is justified in the data. Item values are calibrated and person abilities are measured on a shared continuum. This overcomes the drawbacks of summary scoring in classical test theory, which suffers from unknown spacing between scores. An example of a second-generation PROs instrument is the Catquest questionnaire, which was designed for determining the benefits of cataract surgery [8]. The questions cover four areas: frequency of performing activities, perceived difficulties in performing daily-life activities, global questions about difficulties in general, and satisfaction with vision as well as

Table 1 Questionnaires used in ophthalmic research for cataract outcomes

Purpose	Study	Name	Generation	Questions regarding
Visual function	Maxwell et al. 2017 [3]	Functional Assessment of Visual Tasks (VISTAS)	1st	Difficulties in near, intermediate, near-distance, and distance tasks (10, 12, 13, and 15 questions relatively). The use of corrective wear. Patient's satisfaction with vision.
Visual function in visually impaired persons	Mangione et al. 1998 [4]	NEI VFQ (National Eye Institute Visual Function Questionnaire)	1st	Description of vision and vision difficulties (reading, work-related duties, seeing in brightness, seeing movies, sports, seeing in low illumination, driving at night and in daytime, mood, seeing clearly). Impact of the impairment on daily activities
	Mangione et al. 2001 [5]	NEI VFQ-25 (National Eye Institute Visual Function Questionnaire)	1st	As above, shorter version
Visual function and impairment related to refractive errors	National Eye Institute 2001 [6]	NEI RQL-42 (National Eye Institute Refractive Error Quality of Life Instrument-42)	1st	Self-administered assessment tool designed specifically for those who through correction of refractive error have normal visual acuity, but may still be experiencing problems in vision-related functioning and well-being.
	Pesudovs et al. 2004 [7]	QIRC (Quality of Life Impact of Refractive Correction)	2nd	Impact of spectacles on daily life (their cost, maintenance, general look).
Visual impairment caused by cataract and evaluation of cataract surgery outcomes	Lundström et al. 1997 [8]	Catquest	2nd	Visual disabilities in daily life, activity level, cataract symptoms, and degree of independence.
	Lundström and Pesudovs 2009 [9]	Catquest-9SF	2nd	Frequency of performing activities (6 questions) Perceived difficulty in performing daily-life activities (7 questions). Global questions about difficulties in general and satisfaction with vision (2 questions). Cataract symptoms (2 questions).
	Steinberg et al. 1994 [10]	Visual Function Index (VF-14)	1st	Overall trouble and satisfaction with their vision; and scores on the Sickness Impact Profile, a measure of general health status.
	Uusitalo et al. 1999 [11]	The 7-item Visual Function Index (VF-7)	1st	7-items best correlated with patient satisfaction from VF-14: nighttime driving; reading small print; watching television; seeing steps, stairs, or curbs; reading traffic, street, or store signs; cooking; and doing fine handwork.
	Frost et al. 1998 [12]	VCM-1	1st	Ten broadly applicable items referring to physical, social, and psychological issues were selected for the core questionnaire.
	Sparrow et al. 2018 [13]	Cat-PROM5	2nd	Visual symptoms and quality of life (5-items)
Near visual function in patients with multifocal IOLs	Gupta et al. 2007 [14]	NAVQ (Near Activity Visual Questionnaire)	2nd	Various near-vision tasks (19-items). Near visual acuity and critical print size, an overall satisfaction rating.
	Buckhurst et al. 2012 [15]	NAVQ (Near Activity Visual Questionnaire)	2nd	Various near-vision tasks (26-items). Near visual acuity and critical print size, an overall satisfaction rating.
Spectacle independence after cataract surgery	NCT02203721, NCT02146599. Morlock et al. 2017 [16]	PRSIQ (Patient-reported Spectacle Independence Questionnaire)	1st	The need for glasses in particular situations, and particularly assessing the frequency of use within various time periods.
	NCT01510717 [17]	SILVER (Spectacle Independence Lens Vision Evaluation and Repurchase)	1st	Spectacle independence.
Assessment of benefits that patients perceive from being	Levy et al. 2010 [18] Berdeaux et al. 2010 [19]	FGVS (Freedom from Glasses Value Scale)	1st	21 items addressing improvement of practical issues without glasses (eight items); improvement of psychological constraints without

Table 1 (continued)

Purpose	Study	Name	Generation	Questions regarding
free of glasses after multifocal IOL surgery				glasses (five items); recommendation of surgery to others (two items); and global vision, impact of eye surgery on patients' lives, practical constraints related to wearing glasses, physical appearance/esthetic aspect (self-image), physical appearance/esthetic aspect (in the eyes of others), and eyesight problems left behind (one item each).
Quality of vision	McAlinden et al. 2010 [20]	QoV (Quality of Vision)	2nd	30-item questionnaire, rating the presence of 10 symptoms (including, e.g., glare, halos, blurred vision, focus difficulties), each of three scales (frequency, severity, and bothersome).
Evaluation of pseudophakic dysphotopsia	NCT01424189, Maxwell et al. 2017 [3]	APPLES (Assessment of Photic Phenomena and Lens EffectS)	1st	Frequency and severity of photic phenomena, i.e. glare, halos, starbursts, hazy vision, blurred vision (21-items).
	Kinard et al. 2013 [21]	Pseudophakic Dysphotopsia Questionnaire	1st	Problems with oncoming headlights, being bothered by halos around bright lights, presence of shadows to the side of vision, annoyance with bright lights off/to the side, presence of semi-circular shadows or moving flickering shadows when looking at lights.
Assessing problems in everyday visual tasks	Sloane et al. 1992 [22]	VAQ (Visual Activities Questionnaire)	1st	Assessment if difficulties elderly persons have in performing everyday visual activities; 33 items divided into 8 subscales.
Near vision	Javitt et al. 2003 [23]	Cataract TyPE Specification	1st	Visual functioning in 5 dimensions in cataract patients.
Activity imitation	Pesudovs and Coster 1998 [24]	Visual Disability Assessment and the Cataract Outcomes Questionnaire	1st	18-item questionnaire, 3 subscales. Modified into Cataract Outcomes Questionnaire with 12 items assessing mobility and activity limitation.
	Donovan et al. 2003 [25]	Visual Symptoms and Quality of Life Questionnaire (VSQ)	1st	Symptoms and visual dysfunction and vision-specific quality of life items.

Generation: 1st–summary scoring, 2nd–involving Rasch analysis

IOL, intraocular lens

cataract symptoms. After collection, the preoperative and postoperative data undergo Rasch analysis. A revised nine-item short-form version (Catquest-9SF) was also shown to be highly valid in measuring visual disability outcomes of cataract surgery [9]. In addition, the Cat-PROM5 questionnaire is a short, five-item measure suitable for use in high-volume surgical environments. As of the case of all questionnaires conducted regarding visual impairment due to cataract, the patients are instructed to describe their vision while wearing their best glasses. One should remember that none of these questionnaires evaluating vision impairment due to cataract are meant for use in evaluating the outcomes of multifocal IOLs.

The third-generation questionnaires use item banking, employing purposeful creation of an item database as a part of an intent to measure a predetermined set of constructs. This methodology results in significantly reduced administrative time for maintaining content and producing tests. Currently, however, item banking has not been implemented in any visual function questionnaires.

Methods for evaluating near vision and spectacle independence

The ultimate goal for presbyopic patients receiving premium IOLs is to achieve spectacle-free clear vision at all focal distances. The Near Activity Visual Questionnaire (NAVQ) is designed specifically to assess the near visual function and benefits of presbyopia-correcting IOLs. It was introduced and standardized for English speakers by Gupta et al. [14] and developed further by Buckhurst et al. [15] The NAVQ requires patients to indicate their level of difficulty in performing common near-vision and intermediate-vision tasks without the use of spectacles and to rate their overall satisfaction with their near vision. The preliminary version of the questionnaire included 19-items, while the modified one includes 26-items; both versions incorporate Rasch analysis. At this time, the NAVQ questionnaire is frequently employed and has been assessed as a superior quality measure [33–35].

A new tool, the Patient-reported Spectacle Independence Questionnaire (PRSIQ), was generated based on a literature review, expert clinical interviews, and patient interviews [16]. The need for glasses or contact lenses for various distances and the assessment of their frequency of use within the previous 7 days are surveyed. Three concepts of spectacle independence are employed: need, wear, and function. It could be considered as a valid tool for spectacle independence.

The Freedom from Glasses Value Scale (FGVS©) was released in 2010 in French and Spanish [18, 19]. Primarily it was applied to rank patients' experiences with multifocal ReSTOR IOLs (Alcon, Fort Worth, TX, USA) via a telephone interview [36]. It contains 21 items and a five-point Likert response scale is used. The questionnaire was subsequently linguistically validated in British English and Danish. Nevertheless, it was not evaluated psychometrically and has minimal content quality, as a consultation with patients is not performed [35].

Finally, self-developed questionnaires are commonly applied, with questions regarding the level of patient satisfaction with surgical outcome, level of spectacle independence, and difficulties performing vision-related activities after surgery [37–39]. For example, the Spectacle Independence Lens Vision Evaluation and Repurchase (SILVER) questionnaire is one example that was developed by a sponsor, but which cannot be determined as a valid assessment of "spectacle independence" [17]. All PROs instruments require validation and repeatability evaluation; thus, the utility of self-developed questionnaires is limited.

Methods for evaluating dysphotopsia

Dysphotopsias are a well-known problem with multifocal IOLs. Such visual phenomena are more common and troublesome in participants with multifocal IOLs versus those with monofocals [40]. Although pseudophakic dysphotopsias are considered to be an annoyance with little functional significance, they have been identified as an important factor correlating with patient satisfaction after cataract surgery [21].

The perception of dysphotopsias, as a subjective phenomenon, is difficult to measure and older questionnaires have not addressed these symptoms at all. In 2010, an instrument for assessing subjective QoV was developed [20]. The questionnaire features 10 items regarding the patient's perception of glare, halos, starburst, hazy vision, distortion, multiple images, fluctuation, focusing difficulties, and depth. Each item is scored for frequency and level of disturbance. The questionnaire involves Rasch analysis and is claimed to be suitable for all types of refractive correction, eye surgery, and eye diseases causing QoV problems.

The Assessment of Photic Phenomena and Lens Effects (APPLES) questionnaire is a 21-item self-rated tool aimed at addressing the frequency and severity of phenomena, including glare, halos, starbursts, hazy vision, blurred vision, distortion in which straight lines look tilted, distortion in which flat surfaces look curved, double vision, color distortion, and feeling sick to one's stomach based on visual distortions [3]. However, the APPLES questionnaire to date has not undergone psychometric evaluation, so its results should be interpreted with caution.

Apart from questionnaires using formal descriptions, the perceptions of halo and glare can be reported and adjusted by patients with computer software (Halo&Glare Simulator; Eyeland-Design Network GmbH, Vreden, Germany). This simulator utilizes a scale for intensity, size of the halo, and glare that ranges from zero (none) to 100 (extremely

disturbing). It also allows for classifying the halos into three types, as follows: T1 (diffuse halo ring), T2 (starburst type), and T3 (distinct halo ring) [41]. Another psychophysical test to measure halos is the MonCv3 vision monitor (Metrovision, Perencies, France) [42].

Discussion

Concepts to achieve multifocality

Multifocal IOLs can be divided into the following categories according to the number of focal points: bifocals (which incorporate a far and a near focus), trifocal IOLs (which include an additional intermediate distance point), and extended depth of focus IOLs (which boast an extended far focus area that reaches intermediate distances). According to the optical design and physical principles applied, multifocal IOLs employ diffractive optics, offer zones of differing refractive power, or induce spherical aberration [43]. A diffractive IOL generates multifocality based on light interference. It incorporates a pattern consisting of a series of annular concentric grooves less than one micron in depth, which are engraved around the optical axis on either the front or the back surface of a lens (the echelette technology). With this refractive design, multifocality is achieved with light refraction on the IOL surfaces based on Snell's law; specifically, the optical power decreases continuously from the center to the periphery of the lens, creating an infinite number of focal points and which is derived from the smooth hyperbolic shape of its optics. The performance of refractive design IOLs is dependent on pupil size and IOL centration, while those of a diffractive design operate independently of pupil size. Importantly, the IOL design might influence the PROs and, when analyzing outcomes, this factor should be taken into account. Diffractive designs are known to induce more dysphotopsia than refractive designs [44] With that, improving the diffractive pattern in newer IOL designs (Johnson & Johnson Vision Tecnis ZM900) influences the severity of dysphotopsia in comparison with in the case of older-generation multifocal IOLs (Johnson & Johnson Array SA40N and ReZoom) [45].

Some other optical concepts might also be utilized. A small-aperture design uses the pinhole effect in order to increase depth of focus. The IC-8 IOL (AcuFocus, Inc., Irvine, CA, USA) creates an extended and continuous range of functional vision, similar to as done by the KAMRA corneal inlay (AcuFocus, Inc., Irvine, CA, USA). An accommodative IOL attempts to adjust the focus for different distances by way of an axial shift of a fixed-power lens, change of lens curvature, or variable-focus optics with two optical elements [43]. An alternative to multifocal and accommodative IOLs for reducing spectacle dependence is monovision, where the distant eye is targeted for emmetropia, and the non-dominant eye for myopia. Historically, monovision is usually referred to as anisometropia of − 1.75 diopters (D) or greater [46]. However, with the large number of intermediate tasks, and the fact that most patients are unable to tolerate such a large refractive difference, a mini-monovision approach (with induced myopia ranging from − 0.75 to − 1.25 D) might be beneficial. Monovision provides complete spectacle independence in 25.8% to 31.4% of patients versus in 65.7% to 71.3% as in the case with multifocal IOLs [47, 48]. Patients with multifocal IOLs report more shadows, glare, or dazzle, than what is seen with monovision [47, 48]. With that, although IOL explantation is uncommon, most of the IOL exchanges performed in patients with multifocal IOLs was a result of dissatisfaction about the image quality; in comparison, no IOL exchanges were performed in the monovision arm of the study [47]. Nevertheless, when analyzing general outcomes of surgery (the VF-14 index), patients largely reported similar degrees of satisfaction with multifocal IOLs and monovision [48].

Importance of PROs

A Cochrane review revealed that patients receiving multifocal IOLs are less likely to be spectacle-dependent than those with monofocal IOLs with better near vision [40]. Near-distance spectacle independence might range from 38.4 to 86% in multifocal groups in comparison with between 9.8 and 32% in individuals with monofocal IOLs [49, 50]. Although postoperative patient satisfaction after MIOL implantation is correlated with better visual performance, spectacle independence, and less photic phenomena, personality characteristics also have an impact on subjective disturbances provoked by photic phenomena [51]. Specifically, the personality characteristics of compulsive checking, orderliness, competence, and dutifulness were statistically significantly correlated with subjective disturbance by glare and halos. This underlines the usefulness of PRO questionnaires. Another aspect to consider for multifocal IOLs is the process of neuroadaptation, with visual acuity tending to improve over time. With the formerly mentioned disadvantages, a patient's determination is an unmeasured factor of postoperative QoL and vision.

Currently, much stress is put on photopic phenomena in studies investigating multifocal IOLs. Although up to 80.0% of individuals with multifocal IOLs perceived some level of halos at 3 months after surgery, for most of the participants (77/82) they were not significantly bothersome [52]. One recent investigation suggested that there is no correlation between the optical properties of an IOL (including total or high-order aberrations) and QoV scores [53]. Patients reporting dysphotic symptoms had increased activity in several regions of the frontoparietal circuits of the brain, including the cingulate gyrus and caudate nucleus [53, 54]. Thus, particularly in the field of presbyopia correction, PROs

Table 2 Examples of randomized controlled trials comparing outcomes with multifocal vs monofocal intraocular lenses and methods of evaluating patient-reported outcomes

Study	Intraocular lenses	Method
Cillino et al. 2008 [45]	AMO AR 40 (AMO) vs Array SA40N (AMO) vs ReZoom (AMO) vs Tecnis ZM900 (AMO)	VF-7 questionnaire at the 1-, 6-, and 12-month postoperative visits. Questions that were not included in the VF-7 questionnaire: -overall satisfaction with vision -2 questions regarding difficulties with night and daylight vision related to the presence of halos and glare.
Zhao et al. 2010 [56]	AcrySof ReSTOR SA60D3 (Alcon) vs AcrySof SA60AT (Alcon)	VF-7 questionnaire at 1-, 3-, and 6- months postoperatively.
Peng et al. 2012 [57]	AcrySof ReSTOR SN6AD1 (Alcon) vs AcrySof IQ SN60WF (Alcon)	Patient questionnaire it was based on the survey distributed in the FDA clinical trials, including glare/flare; problems with night vision; halos; color perception or depth perception; distorted near or far vision; blurred near and far vision; and double vision.
Shah et al. 2015 [58]	non-toric AcrySof ReSTOR SN6AD1, toric AcrySof ReSTOR SND1T2-T5 (Alcon) vs AcrySof IQ (Alcon)	NEI RQL-42
Monaco et al. 2017 [59]	trifocal Panoptix TFNT00 (Alcon) vs EDOF Symfony ZXR00 (Tecnis) vs monofocal SN60WF (Alcon)	QoV for assessment of dysphotopsia. Spectacle dependence based on the reply to 4 questions to rate how often (always, sometimes, or never) they used spectacles for any purpose, for distance vision (driving, reading text on television), for intermediate vision (computer work, working with hands), and for near vision (reading, fine near work).

EDOF Extended depth-of-focus, *NEI RQL-42* National Eye Institute Refractive Error Quality of Life Instrument-42, *QoV* quality of vision, *VF-7* modified visual functioning index, *NAVQ* Near Activity Visual Questionnaire

might be of exceptional importantance. Another issue to consider in the influence of multifocal IOL on contrast sensitivity. The Cochrane review [52] presented that there is little evidence of any important difference in contrast sensitivity between monofocal and multifocal IOLs [40], while in the review by Wang et al., a disadvantage for multifocal IOLs was found under at least certain conditions [55]. To date, no study has reported a correlation between contrast sensitivity and patient satisfaction after surgery.

The utility of current methods

Current PRO tools are generally designed for patients with significant cataract with the primary goals of evaluating visual impairment prior to lens surgery and the outcomes after receiving a monofocal IOL, respectively. Examples of RCTs comparing PROs of multifocal and monofocal IOLs are presented in Table 2. After analyzing the information in this table, it might be concluded that within different studies completely different questionnaires were employed for reporting PROs. To date, none of the societies focused on refractive surgery, i.e., International Society of Refractive Surgery, European, American, or Asia-Pacific Societies of Cataract and Refractive Surgeons, has issued guidelines on methods of reporting PROs in patients with multifocal IOL.

Conclusions

This review describes the existing PROs instruments and informs the choice of an appropriate measure in lens refractive surgery. Rasch-developed tools should be utilized for measuring QoL and vision in lens refractive surgery, and a number of highly robust tools is already available for this purpose.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval This article does not contain any studies with human participants or animals performed by any of the authors. Thus, informed consent was not required.

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