Impact of clinical and patient-reported outcomes on patient satisfaction with cataract extraction

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Abstract

Background To date, factors that influence satisfaction with cataract surgery have not been broadly explored.

Objective To identify variables related to patient satisfaction after cataract extraction by phacoemulsification and to determine the relationship between satisfaction and visual acuity (VA) and visual function (VF).

Design Prospective cohort study.

Setting Five hospitals belonging to the Basque Health Care Service.

Participants 4335 consecutive patients undergoing cataract extraction.

Interventions Clinical data on vision were collected before the intervention and 6 weeks afterwards. Before cataract extraction, patients answered a global question about their expectations for the procedure, answered three questions related to specific activities (reading, going out and recognizing people, and doing housework) and completed the Visual Function-14 (VF-14) and Short-Form-36 (SF-36) instruments. Three months after cataract extraction, they again completed the VF-14 and SF-36 along with questions about global satisfaction with the procedure and satisfaction with the three specific activities.

Main outcome measures Three months after cataract extraction, they again completed the VF-14 and SF-36 along with questions about global satisfaction with the procedure and satisfaction with the three specific activities.

Results Pre-intervention VA and VF-14 scores and their post-intervention changes were associated with both global satisfaction and satisfaction with the ability to perform specific activities. Unresolved ocular complications were related to global satisfaction with cataract extraction ($OR_{95\%} = 0.39_{(0.27, 0.55)}$, $P < 0.001$). Both the mental and physical component scales of the SF-36 were related to global satisfaction. A group of patients were not satisfied with the intervention in spite of achieving similar vision-related improvements as patients who were quite satisfied with the procedure.

Conclusion Satisfaction with cataract extraction is related to clinical outcomes and is also associated with patients' expectations of their improvement in visual function.

Introduction

In developed countries, improved functional status and quality of life are making it increasingly possible for older adults to perform activities that require good vision.¹ This trend is lowering the threshold for cataract extraction.² At the same time, safer, simpler techniques for cataract extraction^{3,4} are increasing the number of cataract extractions performed each year. More and more, patients seeking better vision are driving the decision to undertake cataract extraction. Indeed, recent guidelines say that visual function defined by the patient is a key indicator for cataract surgery.^{5,6}

Patient-reported outcomes (PROs) provide the patient's perspective about the success or failure of an intervention. They can help clinicians understand the effects of disease and treatment on symptoms, functioning and other outcomes.^{7–11} The use of patient-reported outcomes (PROs) as a complement to classical clinical outcomes is increasing in elective surgery and other domains. In the United Kingdom, for example, the National Health Service has developed a project to measure PROs in elective surgery. Using pre- and post-operative surveys, its aim is to explore health gains after surgical treatment to repair groin hernia, replace hips and knees and repair varicose veins.¹² To our knowledge, no similar effort to measure PROs following cataract surgery is underway, despite the interest by the international scientific and health policy communities.

Visual acuity (VA) and visual function (VF) have traditionally been employed as the main outcomes for assessing cataract surgery. Patient-reported outcomes (PROs) are increasingly being used to evaluate this procedure.^{2,13} Because visual function is usually the main reason to seek care by cataract, visual acuity may

not be reflecting the true advantages of surgery.¹⁴

Nevertheless, little is known about the relationship between patient satisfaction and clinical outcomes following cataract extraction. One study suggests this relationship is not linear.¹ To date, factors that influence satisfaction with cataract surgery have not been broadly explored.¹

The main goal of this study was to identify the main predictors of patient satisfaction following cataract extraction and to explore how satisfaction is related to key visual outcomes such as visual acuity and vision-related quality of life.

Methods

Design

We recruited consecutive patients who were advised to have cataract removal by phacoemulsification from five different hospitals between October 2004 and July 2005. All five hospitals are part of the network of public hospitals of the Basque Health Care Service, which provides free unrestricted care to nearly 100% of the population.

To be included in the study, patients had to be older than 18 years and give informed consent. Patients were excluded if they underwent additional intraocular procedures; had malignant processes or serious organic or psychiatric disorders that would prevent them from collaborating in the study; or had serious difficulties with reading or understanding. All study procedures were approved by the institutional review boards of the participating hospitals. Personal data were collected only for tracking patients during the period before and after surgery, and all data were kept confidential. The

institutional review board of participating centres approved the study.

Ophthalmologists and nurses collaborating in the study collected data during the office visit prior to the intervention and approximately 6 weeks after surgery. These included sociodemographic information (sex, age, level of education, marital status, social support), pre-intervention clinical data (VA in the affected eye, laterality of cataract, contralateral VA, ocular pathology, visual function (VF) and technical complexity of the cataract extraction), surgical technique, and information regarding post-intervention VA, and complications experienced during cataract extraction and up to 6 weeks after the procedure. A variable called surgical complexity was created for each patient from 14 possible complications that were recorded in the clinical data.

Patients were mailed three questionnaires before undergoing cataract extraction. One asked about expectations for the procedure in reading, going out and recognizing people, and doing housework. Possible answers were presented on an ordinal scale, ranging from low expectations to high expectations. The second was the Visual Function-14 (VF-14) questionnaire. This (validated) index measures the difficulty patients have performing 14 vision-dependent activities of daily living, such as day-time and night-time driving, reading traffic signs or small print and engaging in recreational activities. Scores on the VF-14 range from 0 (unable to do any activities) to 100 (able to do all activities without difficulty).¹⁵ The VF-14 has been translated and showed good performance in Spanish.¹⁶ The third questionnaire was the Medical Outcomes Study Short-Form-36 (SF-36). This instrument is designed to assess generic health-related quality of life.¹⁷ The instrument's 36 items cover eight domains (physical function, role physical, bodily pain, general health, vitality, social function, role emotional and mental health) and can be condensed into two summary scales: the physical component scale and the mental component scale. The SF-36 has been translated and showed good performance in Spanish.¹⁸ To

increase the response rate to the mailed questionnaires, up to two reminder letters were mailed at scheduled times to patients who had not returned their questionnaires; telephone calls were made when necessary to collect this information.

Approximately 3 months after the intervention, the VF-14 and SF-36 were again sent to patients along with additional questions on the clinical aspects of their disease and questions regarding satisfaction with the outcomes of their cataract surgery. One of these was a question about global satisfaction with the results of the intervention. It had five possible answers, ranging from very satisfied to not satisfied. We collapsed the answers into three categories: very satisfied, satisfied and not satisfied. Patients were also asked about changes in specific vision-related activities such as doing housework, reading or recognizing people. These were scored as an ordinal variable with seven categories ranging from a great deal worse to a great deal better.

Statistical analysis

We calculated descriptive statistics of the main sociodemographic variables. These data are shown as frequencies and percentages.

The association between visual outcomes (pre- and post-intervention VA and pre- and post-intervention VF-14 scores) and overall satisfaction with cataract surgery was explored by means of ANOVA. These data are shown as frequencies and percentages in the case of categorical variables and as means and standard deviations in the case of continuous variables.

To explore the relationship between pre-intervention VA and VF-14 groups and improvement in VA and VF-14, we first determined the minimal clinically important difference (MCID). This is the smallest difference in a score in the domain of interest that patients perceive as beneficial and which would cause clinicians to consider a change in patient management. We calculated gains in VA and VF-14 that were greater or smaller than their MCID values¹⁹ stratifying by overall satisfaction levels.

Significance was determined using the chi-square test. We then created two variables based on pre-intervention VA and VF-14 scores, and the change in both parameters was considered to be clinically important: greater than or equal to 0.4 for VA and greater than or equal to 15 for the VF-14 score.¹⁹ We did this to specify a set of clinical situations that could better define improvement or deterioration in visual outcome. The new variables were named 'status after intervention for VA' and 'status after intervention for VF.' They were categorized into six levels for each independent variable.

A logistic regression model was used to explore variables influencing global satisfaction as well as satisfaction with the ability to perform specific activities. Results of these analysis were presented as an odds ratio (OR) and confidence interval at the 95% level. We calculated c-statistics for each of the models created.

Statistical analyses were performed using SAS for Windows statistical software, version 9.1 (SAS Institute Inc, Cary, NC, USA). Graphs were designed in R, version 2.14 release (a free software available in web).

Results

A total of 7438 patients were recruited for the study. Of these, 907 (12.20%) were excluded: 377 did not meet the eligibility criteria, 470 had a second intervention performed, and 60 suffered from corneal dystrophy. Of the remaining 6531 patients, 5512 (84.4%) completed the pre-intervention questionnaires. Participating ophthalmologists completed clinical questionnaires for 5257 (95.37%) of these patients. After the intervention, 4335 (78.64%) completed the final questionnaires.

The mean age of our patients was 73 years, 41.87% were males, 63.32% were married, and 80.85% lived with a partner. As this was an older population, only 7.37% were employed. More than half (55.96%) had little education, and only 16.38% had secondary education. Most of the interventions (76.61%) were on simple cataracts with no complications after intervention (70.89%).

The vast majority of our sample (91.35%) reported being generally satisfied with the outcome of cataract surgery, and more than 90% of the patients were satisfied with their ability to perform specific activities. No statistically significant differences were observed in sociodemographic variables between the group of patients who reported being satisfied with the results of cataract extraction and those who were not satisfied (Table 1).

The mean pre-intervention VA was 0.28 (0.17). There were no statistically significant differences in mean pre-intervention VA across satisfaction groups. The mean pre-intervention VF-14 score was 61.02 (22.47). Statistically significant differences in pre-intervention VF-14 scores were observed between patients who reported being quite satisfied with the intervention and those who were not satisfied ($P = 0.002$). Those who were satisfied with their cataract extraction had higher pre-intervention

Table 1 Sociodemographic variables stratified by patient satisfaction with cataract extraction

	Satisfied	Not satisfied	P-value
Gender			
Male	1623 (42.23)	147 (40.38)	0.49
Female	2220 (57.77)	217 (59.62)	
Age			
<65	524 (13.80)	49 (13.69)	0.55
65–75	1376 (36.23)	120 (33.52)	
>75	1898 (49.97)	189 (49.97)	
Education			
No studies	2043 (55.96)	187 (53.13)	0.04
Primary	1010 (27.66)	118 (33.52)	
Secondary	598 (16.38)	47 (13.35)	
Marital status			
Married	2341 (63.74)	212 (60.23)	0.40
Divorced	289 (7.87)	32 (9.09)	
Widow	1043 (28.40)	108 (30.68)	
Employment status			
Employed	277 (7.37)	27 (7.37)	0.95
Housewife	1044 (27.76)	96 (27.12)	
Retired	2440 (64.88)	231 (65.25)	
Living condition			
Alone	673 (17.92)	62 (17.82)	0.04
With partner	3048 (81.17)	278 (79.89)	
Residence	34 (0.91)	8 (2.30)	
Social dependence			
Yes	1692 (50.92)	170 (54.31)	0.25
No	143 (45.69)	143 (45.69)	

VF-14 scores than those who were not satisfied with the intervention. We observed statistically significant differences in the mean change in VA and VF-14 scores across the three satisfaction groups ($P < 0.001$). Patients with lower mean changes in VA and the VF-14 score were less satisfied with the results of the intervention (Table 2).

When we explored the satisfaction level according to the pre-intervention VA and VF-14 scores and their respective gains after the intervention, we observed that satisfaction with the intervention was more likely to be high among those with the greatest post-intervention gains (Fig. 1). Nevertheless, 85.62% of patients who reported being quite satisfied with their cataract extraction presented with mean pre-intervention VA < 0.1 and gained ≥ 0.4 after cataract extraction. In this group, 97.66% presented with pre-intervention VF-14 scores < 45 but gained 15 points or more after the intervention. Among patients who were not satisfied with cataract extraction, 27.17% had no change in VA and 52.29% had no change in VF-14 scores following the intervention. In this group, 72.83% of patients presented with pre-intervention VA < 0.1 and

gained less than 0.4 after the procedure; 90.40% presented with pre-intervention VF-14 scores > 70 but gained fewer than 15 points. (Tables 3 and 4).

In the multivariate analysis (Table 5), we found that the combined variables 'status after intervention in VA' and 'status after intervention in VF-14 score' influenced global satisfaction as well as satisfaction with the three specific activities. Level of education was also associated with satisfaction, primarily with the ability to read (primary education vs. no education, $OR_{95\%} = 1.48_{(1.08, 2.01)}$, $P = 0.01$). The presence of unresolved ocular complications after cataract extraction was related to global satisfaction ($OR_{95\%} = 0.37_{(0.25, 0.55)}$, $P < 0.001$). Patient expectations before the intervention were related to satisfaction with specific activities. Both the mental and physical component scales of the SF-36 were related to global satisfaction and satisfaction with the ability to perform housework: people with better health status were more likely to be satisfied after the intervention. The SF-36 mental component scale was related to satisfaction with the ability to read ($OR_{95\%} = 1.23_{(1.09, 1.38)}$, $P = 0.0005$) and also with ability to do housework

Table 2 Visual acuity (VA) and visual function (VF) before and after cataract extraction across categories of patient satisfaction with the procedure

	Overall satisfaction				P-value ^{**}
	Total (n = 4335)	Very satisfied ^a (n = 3295)	Satisfied ^b (n = 548)	Not satisfied ^c (n = 364)	
Pre-intervention VA, entire sample	0.28 (0.17)	0.28 (0.17)	0.28 (0.16)	0.26 (0.17)	0.06
Pre-intervention VA ^{§§}					
≤ 0.1	977 (23.40)	762 (77.99)	109 (11.16)	106 (10.85)	0.002
0.2–0.4	2524 (60.46)	1952 (77.34)	357 (14.14)	215 (8.52)	
≥ 0.5	674 (16.14)	552 (81.90)	80 (11.87)	42 (6.23)	
Pre-intervention VF-14, entire sample	61.02 (22.47)	61.70 (22.40) ^c	60.07 (20.66)	57.65 (24.45) ^a	0.002
Pre-intervention VF-14 ^{§§}					
< 45	1001 (24.10)	770 (76.92)	121 (12.09)	110 (10.99)	0.001
45–70	1564 (37.66)	1204 (76.98)	235 (15.03)	125 (7.99)	
> 70	1588 (38.24)	1282 (80.73)	181 (11.40)	125 (7.87)	
Mean change VA, entire sample	0.47 (0.26)	0.50 (0.24) ^{all}	0.41 (0.25) ^{all}	0.30 (0.29) ^{all}	< 0.001
Mean change VF-14, entire sample	24.04 (24.34)	28.12 (22.39) ^{all}	14.69 (21.64) ^{all}	2.12 (24.87) ^{all}	< 0.001

^{**}P-value obtained from ANOVA. Superscripts indicate differences among groups.

^{§§}Data shown as frequencies and percentages in the case of categorical variables and as means and standard deviations in the case of continuous variables.

Figure 1 Level of satisfaction with cataract extraction according to pre-intervention visual acuity (a) and visual function (b) and their respective gains after intervention.

Table 3 Visual acuity pre-intervention and gain in visual acuity adjusting by satisfaction level

AV pre-intervention	Very satisfied ¹ (%)			Satisfied ² (%)			Not satisfied ³ (%)		
	Gain <0.4	Gain ≥ 0.4	Total (n)	Gain <0.4	Gain ≥ 0.4	Total (n)	Gain <0.4	Gain ≥ 0.4	Total (n)
<0.1	14.38	85.62	723	36.67	63.33	90	72.83	27.17	92
0.2–0.4	25.79	74.21	1846	40.06	59.94	342	48.02	51.98	202
≥ 0.5	46.82	53.18	534	52.63	47.37	76	66.67	33.33	39

¹Chi-square $P < 0.0001$.

²Chi-square $P = 0.08$.

³Chi-square $P = 0.0002$.

($OR_{95\%} = 1.21_{(1.05, 1.39)}$, $P = 0.009$). The ability to do housework was also influenced by the physical component scale of SF-36 ($OR_{95\%} =$

$1.21_{(1.02, 1.45)}$, $P = 0.009$) (Table 3). The C statistic of our models was 0.79 for global satisfaction and satisfaction with the ability to do

Table 4 Visual function (VF) pre-intervention and gain in visual function adjusting by satisfaction level

VF-14 pre-intervention	Very satisfied ¹ (%)		Total (n)	Satisfied ² (%)		Total (n)	Not satisfied ³ (%)		Total (n)
	Gain <15	Gain ≥ 15		Gain <15	Gain ≥ 15		Gain <15	Gain ≥ 15	
<45	2.34	97.66	769	19.01	80.99	121	47.71	52.29	109
45–70	11.80	88.20	1203	36.17	63.83	235	63.71	36.29	124
>70	63.67	36.33	1280	84.53	15.47	181	90.40	9.60	125

¹Chi-square $P < 0.0001$.²Chi-square $P < 0.0001$.³Chi-square $P < 0.0001$.

housework and >0.80 for satisfaction with the ability to read a newspaper and to go out and recognize people.

Discussion

In this large prospective study of patients undergoing cataract extraction by phacoemulsification, satisfaction with the intervention was related to both clinical outcomes and patients' pre-intervention expectations.

Our results corroborate the findings of other authors about the importance of patient-reported outcomes in the assessment of cataract surgery. Valderas *et al.*²⁰ and Wright *et al.*²¹ found that patients were more likely to be satisfied with cataract extraction if they experienced a significant gain in visual function. Conner-Spady *et al.*²² showed that the gain in VA was similarly related to post-intervention satisfaction. Monestam *et al.*²³ found that unresolved complications made patients less satisfied with cataract extraction.

In this study, a significant percentage of patients reported that they were not satisfied with their cataract extraction, even though their gains in VA and VF-14 scores were similar to gains among patients who were quite satisfied with the intervention. Up to 27% of patients who presented with low pre-intervention VA and who gained more than 0.4 in VA were not satisfied after the intervention. In addition, the 52% of patients who gained more than 15 points in VF with a VF pre-intervention <45 were not satisfied after intervention. The only differences we observed between these groups were that the not satisfied group included a higher percentage

of patients with less education and living in residence than the satisfied group. However, these differences were small. General health status before surgery had little influence in overall satisfaction. This finding supports results of other studies that have demonstrated that specific measures of quality of life are more sensitive than measures of general health-related quality of life to detect changes after cataract removal.^{1,24–26}

We analysed variables that could have influenced post-intervention patient satisfaction with the ability to perform specific activities. Unresolved complications were related only to global satisfaction and did not influence satisfaction with specific activities. Individuals with better physical and mental health status before the intervention, as measured by the SF-36, were globally more satisfied after it. However, satisfaction with the ability to perform specific activities was not systematically influenced by either scale. This should be taken into account in pre-intervention counselling, as other authors have suggested,¹ when patient expectations are explored.

Post-intervention satisfaction with the ability to read a newspaper was associated with level of education – patients with higher levels of education were more satisfied with their cataract extraction than those with less education. One possible explanation for this is that people with high levels of education are undergoing cataract extraction at higher pre-intervention VA and VF-14 scores than those with less education. Another possible explanation is that reading a newspaper is not an important daily activity for people with little education. We observed

Table 5 Adjusted analysis of associations between measures of satisfaction and post-intervention satisfaction overall and with specific activities

	Overall satisfaction		Read newspapers		Go out, recognize people		Do housework	
	OR (95% CI)	P-value	OR (95% CI)	P-value	OR (95% CI)	P-value	OR (95% CI)	P-value
Education level								
Primary	–	–	1.48 (1.08, 2.01)	0.01	–	–	–	–
Secondary	–	–	1.55 (0.98, 2.44)	0.05	–	–	–	–
VA status								
AV pre < 0.1, gain $\geq$ 0.4	8.59 (4.72, 15.62)	<0.0001	3.22 (1.82, 5.70)	<0.0001	4.41 (2.10, 9.28)	<0.0001	2.71 (1.32, 5.58)	0.0065
AV pre 0.2–0.4, gain $\geq$ 0.4	5.38 (3.41, 8.50)	<0.0001	3.34 (2.04, 5.47)	<0.0001	3.68 (2.08, 6.49)	<0.0001	2.58 (1.41, 4.71)	0.0021
AV pre 0.2–0.4, gain < 0.4	3.00 (1.87, 4.82)	<0.0001	2.85 (1.68, 4.83)	0.0007	2.22 (1.24, 3.97)	0.0072	1.84 (0.98, 3.48)	0.06
AV pre $\geq$ 0.5, gain $\geq$ 0.4	10.88 (5.16, 22.92)	<0.0001	9.06 (3.82, 21.52)	<0.0001	10.12 (2.88, 35.60)	0.0003	3.57 (1.43, 8.94)	0.0065
AV pre $\geq$ 0.5, gain < 0.4	4.59 (2.52, 8.37)	<0.0001	3.45 (1.78, 6.70)	0.0002	2.10 (1.00, 4.37)	0.048	2.33 (1.05, 5.18)	0.04
VF-14 status								
VF-14 pre < 45, gain $\geq$ 15	12.78 (7.11, 22.96)	<0.0001	6.42 (3.27, 12.64)	<0.0001	6.08 (2.95, 12.58)	<0.0001	3.36 (1.55, 7.28)	0.0021
VF-14 pre 45–70, gain $\geq$ 15	15.92 (8.81, 28.76)	<0.0001	6.32 (3.22, 12.41)	<0.0001	5.26 (2.56, 10.85)	<0.0001	2.58 (1.20, 5.52)	0.01
VF-14 pre 45–70, gain < 15	2.21 (1.22, 3.99)	0.0022	1.69 (0.85, 3.38)	0.13	2.43 (1.16, 5.07)	0.02	1.30 (0.60, 2.85)	0.50
VF-14 pre > 70, gain $\geq$ 15	21.28 (9.42, 48.07)	<0.0001	7.59 (3.35, 17.18)	<0.0001	10.69 (3.57, 32.00)	<0.0001	5.96 (1.92, 18.50)	0.0020
VF-14 pre > 70, gain < 15	4.64 (2.64, 8.17)	<0.0001	3.82 (1.96, 7.46)	<0.0001	4.01 (1.96, 8.19)	0.0001	1.59 (0.75, 3.36)	0.22
Post-intervention complications								
Resolved	0.85 (0.61, 1.18)	0.42	–	–	–	–	–	–
Unresolved	0.37 (0.25, 0.55)	<0.001	–	–	–	–	–	–
PCS*	1.16 (1.01, 1.33)	0.0290	1.09 (0.94, 1.26)	0.23	0.97 (0.80, 1.16)	0.73	1.21 (1.02, 1.45)	0.03
MCS**	1.28 (1.15, 1.44)	<0.0001	1.22 (1.09, 1.38)	0.0005	1.12 (0.97, 1.30)	0.13	1.21 (1.05, 1.39)	0.009
Expectations								
High expectations	–	–	7.98 (5.77, 11.03)	<0.0001	8.90 (5.97, 13.27)	<0.0001	8.18 (5.50, 12.15)	<0.0001
No expectation for reading a newspaper	–	–	0.32 (0.18, 0.55)	<0.0001	–	–	–	–
No expectation for going out and recognizing people	–	–	–	–	0.64 (0.32, 1.26)	0.19	–	–
No expectation for doing housework	–	–	–	–	–	–	0.59 (0.31, 1.10)	0.09

References groups considered in the model were as follows: Low education; 2) AV pre < 0.1, gain < 0; 3) VF-14 pre < 45, gain < 15; 4) No complications; 5) Poor overall expectation for cataract extraction; 6) High expectation for reading, going out and recognizing people, and doing housework.

*PCS: Physical Component Scale. SF-36, **MCS: Mental Component Scale. SF-36.

statistically significant differences in both pre-intervention VA and VF-14 scores across levels of education, although none attained the level of clinical importance. Post-intervention satisfaction with the ability to go out and recognize people or the ability to do housework was related to pre-intervention patient expectations for their ability to perform these functions.

Interestingly, patients' pre-intervention expectations were related to their satisfaction with the ability to perform specific activities after cataract extraction, but not with overall satisfaction, as other authors have found.^{5,22} Among patients with high pre-intervention expectations of satisfaction with the ability to perform a specific activity after cataract extraction, differences in gains in VA were statistically significant but not clinically significant. With regard to visual function, we observed statistically and clinically significant (greater than 15 points) differences in gains in VF-14 scores between patients who expected to be able to perform the activities measured and those who did not. This suggests a discrepancy between pre-intervention expectations and post-intervention outcomes, at least in achieved VA, because patients who expected more from cataract extraction did not have greater clinical gains than those who had lower expectations.⁴

Status after intervention for VA and status after intervention for VF – combined variables based on pre-intervention VA and VF-14 scores and their respective clinically important gains after cataract extraction – substantially influenced the explanation of satisfaction. Gains in both variables after cataract extraction were strongly associated with global satisfaction with the intervention. Independent of the pre-intervention VA and the VF-14 score, the magnitude of the clinically important difference determined the final probability of satisfaction with cataract extraction.

Our study has several strengths. The large sample size (4335 patients) and the high response rate, near 80%, are two strengths of our study. To the best of our knowledge, this represents the largest study of satisfaction with cataract surgery to date. Another strength is the

consideration of clinically important differences in VA and VF-14 scores when we defined outcomes. In our study, we considered VA and VF to have improved only when patients' gains in these parameters were higher than the MCID, and were not just statistically different. Because MCID takes into account opinions and values of patients, we considered this measure closer to true patient satisfaction than differences that were only statistically significant.²⁷ Our goodness-of-fit of models (AUC = 0.79 for global satisfaction and satisfaction with the ability to do housework and >0.80 for satisfaction with the ability to read a newspaper and to go out and recognize people) suggests that we were able to explain a large amount of variability in patient satisfaction. In studies similar to ours, AUCs are not provided for models,^{4,22} and none of the models explored predictors for satisfaction with the ability to perform specific activities after cataract extraction. Another strength is that patients in our study completed quality-of-life and satisfaction questionnaires 3 months after surgery, while most similar studies measured patient satisfaction just 1 month after surgery.^{9,23,28} The extended follow-up could better reflect a patient's ultimate visual situation as it occurs well past the visit 6 weeks after the intervention when VA is assessed and the patient's glasses are re-accommodated to the new VA.

Limitations of our study must also be noted. Although it is possible that the information physicians provided to patients before cataract extraction about the procedure's risks and benefits could have influenced patient satisfaction with the results,^{4,9,23} we did not collect such information. The generalizability of our results is limited to the participating hospitals, and does not necessarily extend to other areas of our country, the country as a whole, or other health-care systems. However, the large sample size allows us to ensure that the results are valid for the study population. Another possible limitation is that we chose the first intervention performed in our patients during the recruitment period. In cases in which the first intervention was done in the non-dominant eye, it is possible that the

patient would have experienced greater improvement in VA following the second intervention for cataract in the dominant eye. This could influence patient satisfaction among those undergoing bilateral cataract extraction.

In conclusion, we found that clinical outcomes and patient-reported outcomes are both related to patient satisfaction with cataract extraction. Further studies are needed to explore other possible factors influencing satisfaction in order to better define patient-reported outcomes following cataract surgery and make efforts to achieve it.

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Conflict of interest

No potential conflicts of interest (e.g. funding sources for consultancies or studies of products) exist in this study.

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