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Improved Visual Function and Attenuation of Declines in Health-Related Quality of Life After Cataract Extraction

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Objective: To measure the effect of cataract extraction and lens implantation on elderly persons' health-related quality of life and on their ability to perform visual activities.

Design: Evaluations of health status were conducted preoperatively and at 3 and 12 months after surgery on patients scheduled for cataract extraction.

Setting: Patients were enrolled from the General Eye Service of the Massachusetts Eye and Ear Infirmary and 33 Boston practices.

Patients: The cohort consisted of 464 patients aged 65 years or older who were identified from the surgical schedule of the Massachusetts Eye and Ear Infirmary. At 3 to 12 months after surgery, 458 (99%) of the participants were successfully contacted. Health-related quality of life data were available for 419 (90%) to assess changes after surgery.

Main Outcome Measures: Ophthalmologic exami-

nations were performed preoperatively and during the follow-up period. The Activities of Daily Vision Scale (ADVS) and the Medical Outcomes Study 36-item short form (SF-36) were administered before surgery and at 3 and 12 months postoperatively to assess changes in health status.

Results: At 12 months after surgery, 95% of patients had improved Snellen visual acuity, 80% had improved ADVS scores, but only 36% had improved SF-36 physical functioning. Average scores on seven of eight SF-36 subscales worsened at 12 months. Patients with improved ADVS scores had significantly smaller declines across all SF-36 dimensions except for role limitations due to emotional problems.

Conclusion: Improved visual function after cataract surgery was associated with better health-related quality of life, suggesting that age-related declines in health may be attenuated by improvements in visual function.

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IT IS ESTIMATED that 18% of persons 65 to 74 years of age and 46% of those 75 to 84 years of age have cataracts,¹ and that cataracts are the leading cause of reversible blindness in the United States.¹ Cataract extraction is the most frequent surgical intervention performed on Medicare beneficiaries, accounting for 12% of the entire Medicare budget in 1989.² The frequency of cataract extraction varies across different geographic areas.³ Although some of these variations could represent overutilization, there is clear evidence to support the underutilization of cataract extraction in low-use areas. For example, unoperated-on senile cataract has been identified as the leading cause of blindness in East Baltimore, where it accounts for 27% of all blindness among blacks.⁴

The goal of cataract extraction and in-

traocular lens implantation is functional improvement.⁵ Previous investigations have demonstrated improvement in vision-specific functioning after cataract extraction.⁶⁻¹⁰ Recently, investigators have demonstrated a positive correlation of questions that assess visual function with improvements in mental health, satisfaction, and selected aspects of social functioning that the investigators believed might be mediated by sight.⁹

This investigation measured visual function and non-vision-specific health-related quality of life preoperatively and at 1 year after surgery using standard measures that are documented to be reliable

See Subjects and Methods
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SUBJECTS AND METHODS

We prospectively enrolled patients age 65 years or older who were scheduled for cataract extraction on the General Eye Service of the Massachusetts Eye and Ear Infirmary, Boston, and in 33 Boston ophthalmology practices in which the surgeon had operating room privileges at the Massachusetts Eye and Ear Infirmary. Consecutive patients were enrolled as permitted by the available research staff. Three percent of the participants were recruited from practices in which the operating surgeon also operated on a regular basis at other facilities in 1990. The operating surgeon gave blanket consent to have patients enrolled and played no role in the selection of individual participants. Exclusion criteria included inability to speak English and decreased hearing or cognitive function such that the patient would be unable to understand a telephone interview. Judgments regarding exclusions were made by the research staff. Of 690 patients screened for eligibility, 107 patients met at least one of these criteria and were ineligible. Of the remaining 583 persons eligible for enrollment, 489 (84%) gave informed consent to participate. The major reasons for refusal were lack of interest in 50 patients (53%) and personal or family illnesses in 23 patients (24%). After enrollment, 25 patients (5%) canceled their surgery and were excluded from further follow-up. Therefore, the final study sample consisted of 464 patients.

DATA COLLECTION

Health Status Measures

Prior to surgery and at 3 and 12 months after surgery, patients were asked to participate in a telephone interview consisting of the Activities of Daily Vision Scale (ADVS), a newly developed, brief measure of vision-specific functional status,¹¹ and the 36-item Medical Outcomes Study short-form health survey (SF-36), a generic global measure of multidimensional health-related quality of life.¹² In addition, patients reported their chronic medical conditions and medications that they were currently taking.

The ADVS, a reliable and valid measure of visual function,¹¹ consists of 20 common visual activities categorized into five subscales: night driving, daytime driving, distance-vision activities that do not require driving, near-vision activities, and activities subject to glare. The subscales are combined to give an overall visual function score that ranges from 0 to 100, in which 100 represents no difficulty with any of the visual activities and 0 means that the activities are so difficult because of visual impairment that they are no longer performed. If a participant were having moderate difficulty with all 20 visual activities, the overall score would be 50 points. To increase the vision-specific nature of the ADVS, the items are structured such that if the sub-

ject indicates that a visual activity is difficult for nonvisual problems, it does not contribute to the overall ADVS score. Additionally, if a subject does not perform an activity, such as driving at night, he or she does not rate the degree of difficulty for the specific item. Previous research indicates that the reliability and validity of the ADVS are similar when the driving items are not answered.¹¹

Insight into the clinical meaning of change for the ADVS is provided by examples of improvements in responses to specific items on the overall scale. For example, a patient could have a nine-point improvement on the ADVS if he or she reported that three of the night-driving activities have changed from being moderately difficult before surgery to not difficult at all after surgery. A 16-point change in ADVS score would occur if a patient reported improvement in three night-driving activities and additionally reported that four of the near-vision tasks had changed from being moderately difficult to a little difficult after surgery.

The SF-36, a reliable and valid measure of health-related quality of life, was designed for the longitudinal assessment of the process and outcome of ambulatory medical care for chronically ill patients.¹⁵ It includes questions that evaluate eight health status dimensions: health perception, physical function, role limitations due to physical or mental disability, mental health, social function, vitality, and pain.¹² Each of the health dimensions is scored on a 0- to 100-point scale, in which 100 represents the best possible functioning on the subscale and 0 means the worst function. These analyses used a published scoring algorithm for the SF-36.¹⁶

Clinical Data

Visual acuity, as assessed by the Snellen eye chart, and ocular comorbidities were obtained preoperatively and at 3 months and 1 year after surgery by chart reviewers who were masked to the functional outcome data. Evidence of a posterior subcapsular cataract alone or in combination with nuclear and/or cortical changes was recorded. Reviewers also noted whether patients had a concomitant filtration procedure for the treatment of glaucoma at the time of cataract extraction. To classify patients as having age-related macular degeneration, the examining ophthalmologist had to note pigment change or drusen in combination with the diagnosis of macular degeneration in the preoperative evaluation. Subjects were classified as having glaucoma if they used medication for glaucoma and had this diagnosis in the medical record. Data on other chronic eye conditions, including corneal abnormalities, pseudoexfoliation, cystoid macular edema, previous retinal detachment, and diabetic retinopathy, were collected. Since the functional implications of binocular visual acuity are influenced by the severity of visual loss in each eye, preoperative visual acuity in the operated-on and non-

and valid, and therefore have less potential for instrument-related bias.¹¹⁻¹⁴ Our findings on the association of changes in visual function after cataract extraction with general health and well-being confirm and extend previous findings by demonstrating significant attenuation of declines in most dimensions of health for those who had improvements in visual function after surgery.

RESULTS

PREOPERATIVE CHARACTERISTICS

The 441 patients with serial visual functional status data had a mean age of 76 ± 6 years, and 301 (68%) were fe-

operated-on eyes was considered separately in analyses of changes in visual function.

During the preoperative interview, subjects were asked to report chronic medical conditions and medications that they were currently taking. Patients were coded as having diabetes mellitus only if they reported using insulin or were currently taking oral hypoglycemics. Past or current malignant neoplasms were recorded if the patient reported a history of any malignant neoplasm other than nonmelanoma skin cancer.

Longitudinal Follow-up

At 1 year after surgery, 417 subjects or their families (90%) were successfully contacted. Of these 417 patients, 10 had died and five were too ill to be interviewed; 402 patients (87%) completed the ADVS, including 371 patients (80%) who also completed the SF-36. Three-month data were available for 39 of the 47 subjects who were missing ADVS data at 12 months after surgery and for 48 of the 78 subjects who were missing SF-36 data at 12 months after surgery. Thus, after excluding the 15 patients (3%) who were too ill to be interviewed or had died during the follow-up interval, some follow-up visual functional status data were available for 441 subjects (95%) and health-related quality of life data were available for 419 subjects (90%) to assess changes in health status after surgery. Best-corrected Snellen visual acuity was recorded at 3 or more months after surgery for 425 (96%) of the subjects.

STATISTICAL ANALYSIS

Changes over time in Snellen eye chart visual acuity and visual function as measured by the ADVS were tested for significance by the Wilcoxon Sign Rank Test. After adjusting for differences in preoperative ADVS subscale scores with linear regression analyses, changes in ADVS over time were compared among three groups: those who were enrolled for their first and only cataract extraction during the 12-month period; those who were enrolled for their second cataract extraction; and those who were enrolled for their first cataract extraction but had cataract extraction in both eyes before the end of the 12-month follow-up period. Changes observed for those with bilateral surgery during the follow-up interval were compared with those observed for the two groups who had cataract extraction in one eye only. Linear regression analysis was also used to evaluate the relationship between log-transformed preoperative Snellen visual acuity in the operated-on eye and change in ADVS scores while controlling for measured visual acuity in the non-operated-on eye and the presence of other eye diseases. Student's *t* tests were used to test the significance of the unadjusted change in health-related quality of life, as measured by the SF-36, at 1 year after cata-

ract extraction for patients with improved ADVS scores compared with those whose ADVS scores remained the same or worsened. To assess whether the association between improved visual function and change in SF-36 scores was influenced by the presence of other eye diseases, these analyses were then stratified by the presence or absence of at least one other chronic eye disease.

Multiple linear regression analyses were used to test the association between changes in visual function (baseline compared with 1-year follow-up for the ADVS and for log-transformed visual acuity) and changes in health-related quality of life (baseline compared with 1-year follow-up for the SF-36). These models were adjusted for the following: age; gender; educational status; preoperative health-related quality of life; ocular and other medical conditions; first, second, or bilateral cataract extraction; and intervening hospitalizations. The adjustments were made by creating bivariate variables for all dichotomous factors. Factors such as age and preoperative health status were entered as continuous variables. To determine whether ocular comorbidity was an effect modifier, the models also had an interaction term for change in ADVS multiplied by the presence of other eye diseases in the operated-on eye. These linear regression models were used to estimate the amount of change that could be expected over 1 year for each SF-36 health dimension, depending on the amount of improvement achieved on the ADVS. To illustrate these relationships, we graphed predicted change in each dimension of health-related quality of life against the change in visual function while setting all other covariates to average values for the cohort. For this illustration, we selected four points that represented a range of observed changes in ADVS after surgery: 16 points, which was the average improvement in ADVS observed after surgery; zero points, which represented no improvement; and minus six points and 43 points, which represented the 10th and 90th percentiles, respectively, of the observed changes in the cohort.

For a small group of patients, 12-month data were missing but 3-month values were available. Since most of the changes in visual function occurred by 3 months after surgery, linear regression analysis was used to impute 12-month data, based on the available 3-month data and on preoperative characteristics in these 39 patients. This option was considered to be preferable to omitting patients from the analysis, since patients who were missing information at 12 months were not randomly selected. Imputed values were used to estimate final ADVS scores for 39 subjects with ADVS data at 3 but not at 12 months and for 48 subjects with SF-36 data at 3 but not at 12 months. To test the stability of analyses that included the imputed data, all multivariate analyses were repeated with these subjects excluded. The 15 patients who had died or were too ill to be interviewed were not included in the models of change in health-related quality of life. Data are reported as means $\pm$ SDs, and *P* values are two sided.

male (**Table 1**). Median preoperative visual acuity was 20/70 in the eye scheduled for surgery and 20/40 in the non-operated-on eye. A substantial number of subjects (168 [38%]) had previous cataract surgery on the contralateral eye, and 187 (42%) had evidence of posterior subcapsular cataract alone or in combination with nuclear cortical changes. Thirty-one (7%) had a filtration pro-

cedure for the treatment of glaucoma simultaneously with cataract extraction.

Other chronic eye diseases were very common in this elderly cohort. Prior to surgery, 96 (22%) had age-related macular degeneration, and 74 (17%) had glaucoma; 97 other less frequent underlying eye conditions are shown in Table 1. Sixty-eight patients (15%) had two

Table 1. Study Population (n=441)

Characteristics	No. (%)
Preoperative characteristics	
Female	301 (68)
Medicare	430 (98)
Prior cataract surgery	168 (38)
Posterior subcapsular changes	187 (42)
Nuclear cortical changes	398 (90)
Simultaneous filtration	31 (7)
Chronic eye diseases in the operated-on eye	
Macular degeneration	96 (22)
Glaucoma	74 (17)
Corneal abnormality	37 (8)
Pseudoexfoliation	30 (7)
Previous retinal detachment	15 (3)
Macular edema	8 (2)
Diabetic retinopathy	7 (2)
Chronic medical conditions	
Hypertension	218 (50)
Chronic obstructive lung disease	55 (13)
Diabetes mellitus	50 (11)
Past myocardial infarction	54 (12)
Past or current malignant neoplasm	51 (12)
Congestive heart failure	37 (8)
Past cerebrovascular accident	29 (7)
Past hip fracture	18 (4)

or more other eye conditions in addition to cataracts, and 220 patients (50%) had evidence of at least one additional eye disease in the eye scheduled for surgery. The distribution of all bivariate characteristics in Table 1 was within 1% of the values that would be reported if the 23 subjects without longitudinal visual functional status were included.

PERIOPERATIVE COURSE

Intraoperatively, 22 patients (5%) had posterior capsular rupture with or without an unplanned anterior vitrectomy. During the 1-year postoperative period, 20 patients (5%) had cystoid macular edema confirmed by fluorescein angiography, 15 (4%) had development of corneal edema, six (1%) had retinal detachment, and 108 (25%) underwent Nd-YAG laser capsulotomy for the treatment of postoperative capsular opacification in the operated-on eye. During the 1-year follow-up period, 49 (18%) of 273 patients who were eligible for second eye surgery had cataract extraction and lens implantation in the other eye.

FOLLOW-UP

Visual Acuity

For the 425 subjects (96%) with postoperative Snellen data, median visual acuity in the operated-on eye improved from 20/70 prior to surgery to 20/30 by 3 months after surgery ($P < .001$), and it remained at 20/30 at 1 year after surgery. Ninety-five percent of patients had some degree of improvement in Snellen visual acuity at 1 year. Best corrected visual acuity at 12 months in the operated-on eye ranged from a best of 20/15 to the ability to

perceive hand motion. The best corrected postoperative visual acuity in the operated-on eye at 3 or 12 months after surgery was 20/40 or better for 342 patients (81%), worse than 20/40 and up to 20/60 for 42 patients (10%), and 20/70 or poorer for 41 patients (10%). On average, median visual acuity in the non-operated-on eye did not change significantly during the follow-up period. However, among the 49 patients who had cataract extraction in their second eye, visual acuity improved at 12 months from 20/50 to 20/30 ($P < .05$).

Activities of Daily Vision

By 12 months after cataract extraction, all five ADVS subscales improved on average between 10 and 37 points (all $P < .05$) (Table 2). After adjusting for differences in preoperative scores, patients who had undergone bilateral cataract extraction during the 1-year follow-up interval had significantly greater improvement in their overall ADVS scores and in the near vision and glare subscales than subjects who had undergone first or second eye cataract extraction only (Table 2). Log-transformed preoperative visual acuity in the operated-on eye was not significantly associated with change in ADVS scores after surgery after adjusting for the presence of other chronic eye diseases and visual acuity in the non-operated-on eye.

Overall Health-Related Quality of Life

At 3 months after surgery, physical functioning transiently improved by 4 ± 17 points ($P < .05$), while, paradoxically, health perception, social function, and pain scores worsened ($P < .05$) (Figure 1); the remainder of the SF-36 subscales did not change from preoperative levels. Despite improvement in visual function by 1 year after surgery, all SF-36 dimensions except for role disability due to mental health problems were worse by an average of 3 to 16 points (all $P < .05$) (Figure 1). Those patients who did not have improvement in visual function at 12 months after surgery had significantly greater declines in role function due to physical limitations, mental health, and pain SF-36 subscales ($P < .05$) and a trend toward greater declines in social function, vitality, and role limitations due to emotional problems ($P < .15$), when compared with patients with improved ADVS scores (Table 3). When stratified by the presence of at least one additional chronic eye disease in the operated-on eye, these results were qualitatively the same except that the association between improvement in visual function and change in pain score was not significant in patients without other eye diseases.

Association of Visual Improvement on Declines in Health-Related Quality of Life

Regression analyses that adjusted for age; gender; educational status; preoperative dimension-specific quality of life scores; ocular and other medical conditions; first, second, or bilateral cataract extraction; and intervening nonophthalmologic hospitalizations suggested that had visual functioning not improved, patients' deteriorations in overall health status would have been much worse

Table 2. Serial Changes in Visual Function After Cataract Extraction*

	First Eye Only (n=224)		Second Eye Only (n=168)		Bilateral (n=49)	
	Preoperative	Change†	Preoperative	Change	Preoperative	Change
Overall ADVS	67.2±1.3	15.9±1.2	72.1±1.7	14.7±1.4	62.9±3.4	22.4±2.5††
Distance vision	67.6±1.6	20.1±1.3	73.9±1.9	20.5±1.5	65.0±3.7	25.3±2.6
Near vision	72.3±1.4	11.0±1.3	75.8±1.9	9.8±1.5	67.4±3.9	17.4±2.6††
Glare problems	67.4±2.0	16.2±1.5	75.1±2.2	14.2±1.8	60.0±4.7	23.0±3.2††
Day driving	65.1±2.4‡	19.2±2.0	74.3±3.0	16.3±2.3	60.9±5.5#	25.0±3.8
Night driving	43.0±3.3§	24.0±3.7	51.5±3.4¶	21.1±4.1	34.7±6.6**	37.0±7.4

*Values are mean±SEM. ADVS indicates Activities of Daily Vision Scale.

†Change indicates 12-month scores—preoperative scores.

‡n=144.

§n=89.

||n=103.

¶n=61.

#n=33.

**n=21.

††Adjusted mean change was significantly greater for those with surgery on both eyes relative to each of the other groups. All reported change scores are adjusted for between-group differences in preoperative values. All within-group changes over time were significant at $P<.05$.

at 1 year (**Figure 2**). Compared with patients in whom ADVS scores were unchanged at 1 year, patients with an average (16.1 points) improvement in ADVS scores had 10% to 59% less of a decline across all SF-36 dimensions except for role function limitations due to emotional problems, where the association between the subscale and the ADVS was not significant. Neither second eye surgery nor log-transformed change in visual acuity during the follow-up interval was associated with smaller declines in SF-36 scores at 1 year after surgery. Participants who had the greatest improvements in ADVS scores reported improvements on the social and role functioning due to physical limitations subscales. The interaction term between other eye diseases and change in ADVS was significant only for the SF-36 social functioning scale. Ocular comorbidity did not influence the correlation between change in the ADVS and the remaining SF-36 scales. When the subjects with imputed data were excluded, the predicted declines in health-related quality of life were essentially identical.

COMMENT

Our results demonstrate that for most patients, cataract extraction and intraocular lens implantation significantly improved visual functional status as measured by the Snellen eye chart and the ADVS. Most importantly, these findings demonstrate the positive influence of improved visual function on the many dimensions of health status assessed by the SF-36. These findings confirm and extend previous research by Brenner and coworkers¹⁰ demonstrating that better visual function translates into better health-related quality of life. Although the median preoperative visual acuity in the non-operated-on eye was 20/40 in our cohort, the average preoperative ADVS score of 67 points indicates a moderate degree of difficulty across many of the visual activities included in the questionnaire. The 49 participants who had bilateral cataract extraction during the follow-up interval reported greater improvement in ADVS scores when compared with those who had just a first or second eye cataract

Figure 1. Serial changes in health-related quality of life after cataract extraction. Open bars indicate mean preoperative 36-item short form scores; shaded bars, scores at 3 months; and solid bars, mean scores at 12 months after surgery (asterisk indicates $P \leq .05$ vs baseline). The SDs for baseline measures ranged from 18 to 25, and the SDs for the 12-month differences ranged from 17 to 29.

extraction. This finding confirms those of Javitt and coworkers⁹ but should be interpreted with caution since, as in previous studies, patients who had undergone surgery on both eyes were not randomly selected from the cohort.

Our cohort was quite elderly and had high prevalence of chronic ocular and medical diseases. Nevertheless, 80% of the patients reported an improvement in visual function at 12 months after surgery. We expected that subjects with the poorest preoperative visual acuity would have the most to gain from cataract extraction. However, after adjusting for the influence of other eye diseases, the severity of visual loss as measured by preoperative Snellen visual acuity in the eye scheduled for surgery was not associated with improvement in visual functional status after surgery. If reproduced in future studies, this lack of association between preoperative Snellen visual acuity and postoperative visual func-

tional improvement could have important implications for the selection of patients for cataract extraction. Further investigation is needed to estimate the magnitude of the effect of other disabling eye diseases, such as macular degeneration and glaucoma, on decreasing improvement in visual function after cataract extraction.

This study was limited by the absence of a comparable group of patients with equally severe senile cataracts and visual disability who were not scheduled for surgery. Hence, our findings can only describe correla-

tions between changes in visual functional status and changes in other dimensions of health, rather than establish a causative relationship between these characteristics. Improved visual functioning as measured by the ADVS was associated with less decline in mental health and pain. Whether this finding reflects an indirect benefit of improved vision and its potential influence on patients' outlook and perception of pain vs a bias toward positive responses in general is not known and will require further investigation. Our cohort was principally white, 98% were Medicare recipients, and many received care in private practices. Therefore, the generalizability of our findings to underserved groups of elderly patients is unknown. Additionally, although our participants were recruited from 33 practices, they all had undergone surgery at the same hospital. Since the hospital did not impose appropriateness guidelines for cataract extraction, we do not believe that operating privileges at this specific institution influenced each surgeon's decision about whether to offer cataract extraction to each patient. Because clinical characteristics, such as measured visual acuity and chronic eye conditions, were abstracted from the medical record, our ability to grade the severity of underlying eye diseases was limited.

Health status measures that emphasize the patient's perception of health are now increasingly recognized as important long-term end points in clinical studies,¹⁷⁻²⁶ but they have only rarely been used to evaluate the effectiveness of high-volume, high-cost procedures such as cataract extraction.⁸⁻¹⁰ As physicians attempt to set priorities for the use of elective operations that are designed to preserve the capacity for independent functioning among elderly patients, end points such as physical, social, or role functioning may prove to be at least as relevant as traditionally accepted clinical measures of success, such as improvement in Snellen visual acuity af-

Table 3. Relationship of Changes in Health-Related Quality of Life (as Measured by the SF-36 Scales) to Changes in Visual Function*

SF-36 Subscales†	Mean (±SEM) Change at 12 mo‡		P§
	Those With Improved ADVS (n=341)	Those With Unchanged or Worse ADVS (n=79)	
Health perception	-16±1.0	-16±2.4	.99
Physical function	-5±1.0	-8±2.3	.16
Social function	-2±1.2	-8±3.4	.11
Role-physical	0±2.3	-21±5.7	.001
Role-mental	7±1.5	0±3.7	.08
Pain	-6±1.3	-14±3.1	.01
Mental health	-6±1.0	-14±2.3	<.001
Vitality	-3±1.1	-8±2.9	.13

*For the 420 (95%) of the 441 patients with full longitudinal data on health-related quality of life. SF-36 indicates Medical Outcomes Study 36-item short form; ADVS, Activities of Daily Vision Scale.

†Scored between 0 and 100 points; best function=100.

‡Positive changes indicate improvement in SF-36 after 12 months; negative values indicate decline.

§Student's *t* test comparing changes in SF-36 subscale scores for patients with improvement in ADVS vs those with unchanged or worse ADVS scores at 12 months after surgery.

Figure 2. Association of change in visual function with change in health-related quality of life at 1 year after surgery. The figure displays the predicted change in the Medical Outcomes Study 36-item short form score from linear regression models adjusted for age, gender, educational status, preoperative dimension-specific scores, ocular and medical comorbidities, number of eyes operated on, and intervening medical hospitalizations. The range on the x-axis (-6 points to 43 points) includes the 10th to the 90th percentile of the observed distribution of change in the Activities of Daily Vision Scale (ADVS). The β -coefficient and P value refer to the main effect from the adjusted model: the association between changes in ADVS and change on the 36-item short form subscale. The error bars represent the 95% confidence interval for the four point estimates per subscale.

ter cataract extraction or degrees of range of motion after joint arthroplasty. The value of the SF-36 may not be in its ability to measure condition-specific changes in patients undergoing procedures such as cataract extraction, but rather in its provision of a common metric to compare benefits across a wide array of medical and surgical interventions. Conversely, the magnitude of positive change on the vision-specific questionnaire suggests that some dimensions of health-related quality of life that are not represented in the SF-36 improve after cataract extraction.

Previous research suggests an association between decreased life expectancy and the presence of cataracts.^{27,28} In the Framingham Study, diabetic patients with cataracts had twice the mortality rate of diabetic patients without cataracts.²⁹ Therefore, cataracts and the need for cataract surgery may be markers for other underlying diseases that are contributing to the dramatic declines in health-related quality of life that we observed in this cohort. The average improvement in visual function observed in this cohort was associated with a significant attenuation in the declines in health status that were observed when visual function remained at preoperative levels. If the natural history of elderly persons with chronic diseases is progressive deterioration in health-related quality of life, procedures designed to improve functioning may blunt the decline in health-related quality of life even when they cannot yield absolute improvement.

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REFERENCES

- Kahn HA, Liebowitz HM, Ganley JP, et al. The Framingham Eye Study: outline and major prevalence findings. *Am J Epidemiol*. 1977;106:17-32.
- Stark WJ, Sommer A, Smith RE. Changing trends in intraocular lens implantation. *Arch Ophthalmol*. 1989;107:1441-1444.
- Bernth-Petersen P. Cataract surgery: outcomes assessments and epidemiologic aspects. *Acta Ophthalmol (Copenh)*. 1985;63(suppl):27-37.
- Sommer A, Tielsch JM, Katz J, et al. Racial differences in the cause-specific prevalence of blindness in East Baltimore. *N Engl J Med*. 1991;325:1412-1417.
- Cataract Management Guideline Panel. *Management of Cataract in Adults: Clinical Practice Guideline: Quick Reference Guide for Clinicians: No. 4*. Rockville, Md: US Dept of Health and Human Services, Agency for Health Care Policy and Research; February 1993. Agency for Health Care Policy and Research publication 93-0543.
- Bernth-Petersen P. The effectiveness of cataract surgery, a retrospective study. *Acta Ophthalmol (Copenh)*. 1981;59:50-56.
- Bernth-Petersen P. Cataract surgery: outcomes assessments and epidemiologic aspects. *Acta Ophthalmol (Copenh)*. 1985;63S:9-47.
- Applegate WB, Miller ST, Elam JT, Freeman JM, Wood TO, Gettlefinger TC. Impact of cataract surgery with lens implantation on vision and physical function in elderly patients. *JAMA*. 1987;257:1064-1066.
- Javitt JC, Brenner MH, Curbow B, Legro MW, Sweet DA. Outcomes of cataract surgery: improvement in visual acuity and subjective visual function after surgery in the first, second, and both eyes. *Arch Ophthalmol*. 1993;111:686-691.
- Brenner MH, Curbow B, Javitt JC, Legro MW, Sommer A. Vision change and quality of life in the elderly: response to cataract surgery and treatment of other chronic ocular conditions. *Arch Ophthalmol*. 1993;111:680-685.
- Mangione CM, Phillips RS, Seddon JM, et al. Development of the 'Activities of Daily Vision Scale': a measure of visual functional status. *Med Care*. 1992;30:1111-1126.
- Ware JE, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I: conceptual framework and item selection. *Med Care*. 1992;30:473-483.
- McHorney CA, Ware JE, Raczek AE. The MOS 36-item short-form health survey (SF-36). II: psychometric and clinical tests of validity in measuring physical and mental health constructs. *Med Care*. 1993;31:247-263.
- McHorney CA, Ware JE, Lu JFR, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). III: tests of data quality, scaling assumptions, and reliability across diverse patient groups. *Med Care*. 1994;32:40-66.
- Stewart AL, Greenfield S, Hays RD, et al. Functional status and well-being of patients with chronic conditions: results from the Medical Outcomes Study. *JAMA*. 1989;262:907-913.
- Ware JE, Snow KK, Kosinski M, Gandek B. *SF-36 Health Survey Manual and Interpretation Guide*. Boston, Mass: Nimrod Press; 1993.
- Wenger NK, Mattson ME, Furberg CD, Elinson J. Assessment of quality of life in clinical trials of cardiovascular therapies. *Am J Cardiol*. 1984;54:908-913.
- Ott CR, Sivarajan ES, Newton KM, et al. A controlled randomized study of early cardiac rehabilitation: the Sickness Impact Profile as an assessment tool. *Am Heart J*. 1983;12:162-170.
- Liang MH, Larson MG, Cullen KE, Schwartz J. Comparative measurement efficiency and sensitivity of five health status instrument in arthritis research. *Arthritis Rheum*. 1985;28:542-547.
- Bergner M. Quality of care, health status, and clinical research. *Med Care*. 1989;27:S148-S156.
- Bombardier C, Ware J, Russell IL, Larson M, Chalmers A, Read JL. Auranofin therapy and quality of life in patients with rheumatoid arthritis: results of a multicenter trial. *Am J Med*. 1986;81:565-578.
- Ware JE. Measuring patient function and well-being: some lessons from the Medical Outcomes Study. In: Heitoff KA, Lohr KN, eds. *Proceedings Effectiveness and Outcomes in Health Care*. Washington, DC: National Academy Press; 1990:107-119.
- McHorney CA, Ware JE, Rogers W, Raczek AE, Lu JFR. The validity and relative precision of MOS short- and long-form health status scales and Dartmouth COOP charts. *Med Care*. 1992;30:MS253-MS265.
- Kaplan SH. Patient reports of health status as predictors of physiologic health measures in chronic disease. *J Chronic Dis*. 1987;40:27S-35S.
- Nerenz DR, Repansky DP, Whitehouse MD, Kahkonen DM. Ongoing assessment of health status in patients with diabetes mellitus using the SF-36 and diabetes TYPE Scale. *Med Care*. 1992;30:MS112-MS124.
- Kurtin PS, Davies AR, Meyer KB, DeGiacomao ME, Kantz ME. Patient-based health status measurements in outpatient dialysis: early experiences in developing an outcomes assessment program. *Med Care*. 1992;30:MS136-MS149.
- Benson W. Increased mortality rates after cataract surgery. *Ophthalmology*. 1988;95:1288-1292.
- Hirsch R, Schwartz B. Increased mortality among elderly patients undergoing cataract extraction. *Arch Ophthalmol*. 1983;101:1034-1037.
- Podger MJ, Cassel GH, Kannel WB. Lens changes and survival in a population-based study. *N Engl J Med*. 1985;313:1438-1444.