Clinical Trials

A Randomized, Controlled Trial of an Intervention Promoting Cataract Surgery Acceptance in Rural China: The Guangzhou Uptake of Surgery Trial (GUSTO)

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Purpose. To evaluate an educational intervention promoting acceptance of cataract surgery in rural China using a randomized controlled design.

Methods. Patients aged 50 years or older with presenting visual acuity (PVA) less than 6/18 in one or both eyes due to cataract were recruited from 26 screening sessions (13 intervention, 13 control) conducted by five rural hospitals in Guangdong, China. At intervention sessions, subjects were shown a 5-minute informational video, and counseled about cataract, surgery, and surgical cost. During screening, all subjects answered questionnaires on knowledge and attitudes about cataract, their finances, and transportation, and were referred for definitive examination if eligible. Study outcomes were acceptance of surgery (principal outcome) and hospital follow-up.

Results. Subjects in the intervention group were younger than controls ($P = 0.01$), but the groups did not otherwise differ. Among 212 intervention patients and 222 controls, no differences in knowledge and attitude regarding cataract were found. Surgery was accepted by 31.1% of intervention patients and 34.2% of controls ($P > 0.50$). Predictors of acceptance included younger age, worse logMAR PVA, knowing that cataract can be treated surgically only, greater anticipated loss in income from hospitalization, and greater house floor space per person. Membership in the intervention group was not associated with accepting surgery (odds ratio [OR] = 1.11, 95% confidence interval [CI] 0.67–1.84) or hospital follow-up (OR = 1.03, 95% CI = 0.63–1.67).

Conclusions. Educational interventions that successfully impart the knowledge that cataract can be only treated surgically may be more effective in increasing uptake in this setting. (ClinicalTrials.gov number, NCT01123928.) (*Invest Ophthalmol Vis Sci.* 2012;53:5271–5278) DOI:10.1167/iovs.12-9798

Cataract remains the leading cause of blindness in China today, with 4.5 million people blind from this condition.[1–7] China's cataract surgical rate (CSR) was approximately 680 per million per year in 2008, a third of the rate needed to eliminate the backlog of unoperated cataract.[8] With 400,000 new cases of cataract every year,[9] there is an urgent need for strategies to increase cataract surgical coverage and acceptance.

Cataract surgery coverage rates are especially low in rural areas of China. A recent multiprovince study found that only 36% of rural patients bilaterally blind from cataract had undergone surgery.[10] A number of barriers to surgery acceptance have been identified: lack of knowledge about cataract and concerns about the quality of local services appear to be important predictors of poor uptake.[11] Cost appears to play a role as well.[12] Lack of education is also associated with higher levels of blindness[3,5,13] and lower rates of cataract surgical coverage.[10] A 2008 study of cataract patients in rural eastern China showed that although 90% had been aware of their condition for more than a year, only half knew that cataract could be treated.[14] Furthermore, patients identified through screening who elect to have surgery are reported to have better knowledge of cataract than patients who refuse.[15] All of these findings suggest that patient education and counseling may play important roles in increasing surgery acceptance rates.

Although little research has been done on educational interventions to increase cataract surgery acceptance rates, a study in the United Kingdom showed that, compared with cataract referrals from general practitioners, referrals from optometrists, who were more likely to provide information and counseling, resulted in higher rates of surgery acceptance.[16] Furthermore, studies have shown that multimedia presentations can increase patient understanding of cataract,[17] satisfaction after surgery,[18] and recall of information, when compared with simple verbal information sessions.[19]

We report here the results of a randomized, controlled trial assessing the impact of a preoperative informational video and counseling session on the rates of surgery acceptance (principal outcome) and follow-up presentation to the hospital among patients with potentially operable cataract identified through outreach screening in rural China. The aims of the current study were to

1. Determine whether an educational intervention with a design based on focus groups[12] and other studies[11,15,20] in the area is effective in increasing acceptance of

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surgery, when adjusting for a number of other potential determinants of service uptake.
2. Assess the short-term impact of the educational intervention on knowledge about cataract and cataract surgery, and attitudes toward locally available surgical services.

Methods

This randomized clinical trial was conducted during outreach screenings carried out by six county hospitals in Guangdong Province between June and November 2010. The protocol was approved in advance by the institutional review boards of the Zhongshan Ophthalmic Center (ZOC; Guangzhou, China) and Swarthmore College (Swarthmore, PA). The tenets of the Declaration of Helsinki were followed throughout. Oral informed consent was obtained from all subjects before enrollment. Subjects were informed that they would receive information regarding cataract and treatment, but were not told about the randomized design of the study.

Screenings

Beginning in June 2010, a capacity-building program involving frequent community-based outreach screenings was carried out in collaboration between ZOC and Helen Keller International (New York, NY) at 10 county hospitals in rural Guangdong Province, China. Six of these sites were selected for the current study. Criteria for selection of facilities, all of which were government-run, county-level hospitals, included a strong working relationship with ZOC and a requirement that fewer than 50% of cataract surgeries be provided free of charge. Offering free cataract surgery in rural China tends to inflate rates of surgery acceptance artificially, and this practice is not sustainable in most areas.

The mean per capita gross domestic product (GDP) of the six selected counties ranged from US$4841 to 6031, as compared with the mean for Guangdong Province of US$6907 in 2009. The county populations ranged from 56,921 to 2,260,000.[21] In all of the selected counties, the facilities participating in the current research were the only local providers of cataract surgery. Screening for visually significant cataract was carried out by a team from each hospital consisting of at least one ophthalmologist, one nurse, and one administrative assistant, who traveled on a rotating basis to various townships and villages located in the county.

To calculate sample size, a rate of surgery acceptance of 30% was assumed, based on hospital screening and surgical records. A sample size of 134 in each treatment arm was required to detect an increase in surgery acceptance to 50%, with an α-value of 0.05 and a two-sided power of 0.90. Because randomization occurred by screening session rather than by individual subject for reasons of feasibility, the required sample size was adjusted upward by a factor of 1.5 to account for clustering effects. After adjustment, a total of 402 subjects (201 in each treatment group) was required.

Each hospital was requested to carry out a sufficient number of screening sessions to fulfill an enrollment target of 80 to 100 subjects per facility (the actual number of enrollees at each hospital ranged from 36–134). At each participating facility, half of the screening sessions were randomly designated as "intervention" sessions. Randomization was carried out by a random number generator (www.random.org) and ensured that each pair of consecutive screenings consisted of one intervention and one nonintervention session, to minimize any potential confounding effect of season.

Each screening session was announced before the day of screening by local village officials or by local community partners with posters and door-to-door notification. On the day of screening, all participants were registered using a standardized screening registration form. An ophthalmic nurse measured the presenting visual acuity (PVA) of each subject separately in each eye using a Snellen chart at a distance of 5 meters in a well-lighted area of a public building in the village. An ophthalmologist then examined the anterior segment without dilation of the pupil using a handheld slit lamp (66 Vision-Tech Company, LTD., Suzhou, China) and the posterior segment where visible with a direct ophthalmoscope (66 Vision-Tech Company, LTD.). Participants in screenings who were 50 years or older, with PVA less than 6/18 in at least one eye, suspected by the examining ophthalmologist to be due to cataract, were eligible for the current study, and were referred to the county hospital for definitive examination. Potential subjects with traumatic or congenital cataract and those unable to give informed consent were excluded.

Educational Intervention

All consenting eligible subjects identified at intervention sessions were asked to view a 5-minute informational video about cataract and cataract surgery, played using a projector (Model JX-A300B; Guangzhou Weijie Electronic Limited Company, Guangzhou, China) and speakers in a darkened room separated from the examination area. The video, created by one of the authors (TL) specifically for the study, consisted first of segments of an interview in the local dialect with a cataract patient and family members describing the impact of the patient's reduced vision on family life before surgery. Clips were then shown of the patient's surgical process from arrival at the hospital to discharge, including the preoperative slit lamp examination and discussion with the ophthalmologist, entrance to the operating room supported by a nurse, disinfection of the periocular area, and postoperative examination by the surgeon in the recovery room. The video concluded with segments of an interview with a postoperative patient and his or her family members describing the surgical experience and the impact of the patient's improved vision on family life. Material for the video was filmed using a patient and hospital personnel from a rural hospital in an area not participating in the study. Three different dubbed versions were made, in Cantonese, Hakka, and Chaoshan dialects of Chinese, for use in different locales. Training in use of the projector was provided to all hospital doctors at a training session in July, and a study author (TL) was present at initial screenings for all hospitals to ensure correct implementation of the protocol. Following the movie, a trained nurse provided groups of 2 to 3 patients and their family members with a 5-minute counseling session based on a script. The content consisted of the following:

1. Description, etiology, and visual impact of cataract.
2. A statement that cataract is treatable only through surgery, with a high rate of success.
3. Description of the cataract surgical procedure.
4. Statement of the out-of-pocket cost of surgery, based on the prevailing price and reimbursement rate under the New Cooperative Medical Scheme (NCMS: China's national rural insurance scheme) at each county hospital. The out-of-pocket costs ranged from 0 to 3500 RMB (USD 515 at the time of the study) with a median of 430 RMB (USD 63).
5. Timetable and location for a definitive examination at the county hospital to determine suitability for cataract surgery.

Following counseling, patients and their family members were offered the opportunity to ask questions.

Subjects in screenings randomized to the control group received standard care in this area: they were told that they had decreased vision due to cataract and that this could be treated, without being shown the video or given the counseling session by the nurse.

Questionnaire

Subjects from all screening sessions (intervention and nonintervention) were administered a modified version of the questionnaire described by Yin et al,[11] administered in the local dialect of Chinese. This questionnaire consisted of the following five sections:

1. A brief demographic section including age, sex, educational

level, and floor space per household resident (as a culturally acceptable proxy for socioeconomic status).
2. A "knowledge" section assessing patients' awareness of whether and how cataracts can be treated.
3. An "attitudes" section assessing the patient's views on likely postoperative vision improvement, the skill of local surgeons, and the attitude of medical personnel at the county hospital.
4. A "cost" section recording the expected out-of-pocket cost of surgery to the patient, who would pay for surgery, and the patient's and family's estimated expenditures for transportation, food, lodging, and lost income as a result of accepting surgery.
5. A "transportation" section assessing the patient's mode of transportation and distance from home to the hospital, and the availability of a person to accompany the patient.

At the end of screening, all enrolled subjects were given a referral slip indicating their study identification number, which they were asked to bring to the county hospital at the time of their definitive examination. Subjects were provided a date for their follow-up examination at the time of screening. The scheduled time between screening and follow-up was recorded for each patient and included in subsequent analyses.

Subjects who presented to the hospital underwent a definitive ocular examination with dilation of the pupil by an ophthalmologist to confirm eligibility for cataract surgery. Recommendations regarding suitability for surgery based on this examination were recorded on a standardized preoperative examination form. Before undergoing surgery, all patients (intervention and control groups) were required to give written informed consent after listening to a description of the steps of the operation and the risks and benefits of surgery. The list of enrolled study subjects at each hospital was checked against surgical records at the facility more than 6 months after the initial outreach examination, and all enrolled subjects were recorded as having undergone cataract surgery or not. Hospitals in China are required by law to maintain records of all patients undergoing surgery, as surgical fees are reimbursed by government insurance. The principal outcome of the trial was having undergone surgery in at least one eye 6 months or less after the initial screening ("accepting surgery"), whereas the secondary outcome was having presented at the county hospital for the definitive examination. Although 6 months was chosen as the cutoff point, no patients accepted surgery between 6 and 11 months after screening (the final time at which hospital records were reviewed). Due to difficulty in recontacting patients who had not presented for surgery, it was not possible to verify that they had not been operated elsewhere, although the lack of other local facilities providing cataract surgical services in any of the participating counties made this less likely.

Statistical Methods

Differences in baseline demographic, attitude, knowledge, transportation, and clinical variables by intervention group were tested. Normally distributed variables, ordinal variables, and binary variables were tested with a generalized linear mixed model (GLMM), as implemented in the SAS procedure PROC GLIMMIX, with two random statements to adjust for the correlation among subjects participating in the same screening session and hospital-to-hospital differences. A stratified version of the nonparametric Wilcoxon rank-sum test,[22] as implemented by the SAS program (stratify.cluswilcox.sas), was used for nonnormally distributed continuous variables.

Visual acuity values are presented in Snellen 6-meter units, but were converted into logarithm of the minimum angle of resolution (LogMAR) values for analysis. The following variables were initially recorded as continuous values and then treated as ordinal values for analysis: time from screening until definitive examination ($>$ versus $\leq$100 days), distance of patient's residence from hospital ($\leq$ versus $>$ 1 hour's travel) and quoted out-of-pocket cost of surgery ($0, $1–87, $>$$88). The following variables were recorded and analyzed as ordinal values: spending on transportation ($0, $1.00–3.20, $3.30–6.35, $6.40–9.50, $>$ $9.50), spending on food and lodging ($0, $1.00–4.80, $4.90–9.50, $9.60–14.30, $>$$14.30), and expected loss of income due to surgery ($0, $1.00–6.35, $6.40–12.70, $12.80–19.00, $>$$19.00). All monetary data were originally collected in RMB and converted to US$ for presentation and analysis.

Univariate regression models included the above potential predictors of the two main study outcomes: undergoing surgery (main outcome) and presenting to hospital for follow-up examination (secondary outcome). Variables with a P value less than or equal to 0.10 in the univariate analysis, as well as age and sex, were included as potential predictors in multivariate logistic regression models. Both univariate and multivariate analyses were performed using GLMM models.

Except as noted above, all statistical analyses were performed using the statistical software SAS (version 9.1.3; SAS Institute Inc., Cary, NC).

Results

Because one hospital failed to follow the intervention protocol and did not randomize subjects as required, patients enrolled at that center were excluded from analysis. Each of the remaining five hospitals carried out 3 to 8 screening sessions, and a total of 212 intervention and 222 control subjects from 26 screening sessions (13 intervention, 13 control) were recruited. Intervention subjects (median age 75 years) were significantly younger than control subjects (median 76 years, $P = 0.01$), but the groups did not differ significantly with respect to any other baseline characteristics (Table 1). The median better-eye PVA was 6/30 for both groups, whereas the median worse-eye PVA was counting fingers. A total of 35.1% of the control group and 40.1% of the intervention group received free cataract surgery ($P = 0.88$) (Table 1).

Immediately after the intervention, subjects in the intervention and control groups did not differ significantly with respect to their knowledge about cataract (i.e., that cataract can be treated, and can be treated only surgically) or their attitudes toward surgery (i.e., belief that surgery would hurt, that vision would improve "a lot" after surgery, that surgeons at the hospital were "highly skilled," or that doctors and nurses at the hospital had "very good" attitudes) (Table 2).

Neither the rate of hospital follow-up (intervention group: 40.1%; control group: 41.4%; $P = 0.85$) nor surgical acceptance (intervention group: 31.1%; control group: 34.2%; $P = 0.55$) differed significantly by group assignment. Based on a surgery acceptance rate of 34.2% in the control group, the power of this study to detect a 50% higher rate of acceptance in the intervention group (i.e., 51%) was calculated to be 0.80, after adjusting for clustering effects in the randomization scheme.

In multivariate regression models, greater likelihood of accepting surgery (the main trial outcome) was associated with worse logMAR PVA in the worse-seeing eye (odds ratio [OR] = 1.61, 95% confidence interval [CI] 1.22–2.12, $P \leq 0.001$), knowing that cataract could be treated only with surgery (OR = 1.83, 95% CI 1.07–3.13, $P \leq 0.05$), greater anticipated loss of income from hospitalization (OR = 1.36, 95% CI 1.01–1.83, $P \leq 0.05$), and greater floor space per person in the home (as an index of socioeconomic status, OR = 1.27, 95% CI 1.09–1.47, $P \leq 0.01$) (Table 3). Being a member of the intervention group was not a significant predictor of accepting surgery (OR = 1.11, 95% CI 0.67–1.84). Other factors not associated with uptake of surgery included age, sex, education, screening season, having been accompanied by a family member to screening, history of previous surgery, quoted out-of-pocket payment for surgery, self-pay for surgery, anticipated spending on food/lodging/transport, distance to hospital, having a family member able to

Table 1. Comparison of the Control and Intervention Groups at Baseline in a Randomized Trial of an Intervention to Increase Uptake of Cataract Surgery in Rural China

Characteristic	Intervention Group	Control Group	*P* Value: Control vs. Intervention
Age, y, median (25%, 75%)	75 (69, 79.5)	76 (72, 81)	0.01
Female, *n* (%)	128 (60.4)	121 (54.5)	0.12
Received some formal education, *n* (%)	87 (41.4)	109 (50.7)	0.08
Screening in the summer, *n* (%)	167 (78.8)	196 (88.3)	0.91
Presenting vision in the better eye, median [25%, 75%]	6/30 [CF, 6/18]	6/30 [6/60, 6/18]	0.93
Presenting vision in the worse eye, median [25%, 75%]	CF [HM, 6/60]	CF [HM, 6/60]	0.72
Previous cataract surgery, *n* (%)	41 (19.3)	37 (16.7)	0.24
Patient knows a person well who has been previously operated for cataract, *n* (%)	93 (43.9)	98 (44.1)	0.49
Family member accompanied patient to screening, *n* (%)	80 (37.7)	108 (48.6)	0.21
Quoted out-of-pocket payment for surgery after insurance reimbursement, $, *n* (%)			0.38
0	83 (40.5)	68 (34.5)	
1–87	58 (28.3)	49 (24.9)	
≥88	64 (31.2)	80 (40.6)	
Patient will self-pay for surgery, *n* (%)	41 (19.3)	37 (16.7)	0.85
Anticipated spending on transportation to hospital, $, *n* (%)			0.83
0	19 (9.2)	12 (5.6)	
1–3.20	37 (17.9)	64 (30.1)	
3.30–6.35	64 (30.9)	39 (18.3)	
6.40–9.50	52 (25.1)	69 (32.4)	
> 9.50	35 (16.9)	29 (13.6)	
Anticipated spending on food/lodging for surgery, $, *n* (%)			0.10
0	9 (4.3)	7 (3.3)	
1–4.80	34 (16.4)	28 (13.2)	
4.90–9.50	54 (26.0)	39 (18.4)	
9.60–14.30	71 (34.1)	49 (23.1)	
> 14.30	40 (19.2)	89 (42.0)	
Anticipated loss in family income from going to hospital, $, *n* (%)			0.13
0	20 (9.8)	12 (5.8)	
1–6.35	22 (10.7)	19 (9.1)	
6.40–12.70	47 (22.9)	47 (22.6)	
12.80–19.00	91 (44.4)	77 (37.0)	
> 19.00	25 (12.2)	53 (25.5)	
Floor space of house/resident, median [25%, 75%], in m^2/person	19.4 [10, 30]	14 [7, 20]	0.08
Less than 1 min from hospital, *n* (%)	122 (62.6)	103 (51.8)	0.76
Family member available to accompany patient to hospital, *n* (%)	177 (83.5)	192 (86.5)	0.70
More than 100 days between screening and scheduled hospital examination, *n* (%)	61 (28.8)	54 (24.3)	0.98

CF, count fingers; HM, hand movement.

escort the patient to the hospital, and time between screening and scheduled hospital appointment (Table 3).

In multivariate regression models, greater likelihood of presenting to the hospital after screening (the secondary study outcome) was associated with younger age, worse logMAR PVA in the worse-seeing eye, knowing that cataract can be treated only with surgery, greater anticipated loss in income from going to the hospital, and greater average housing space/resident ($P < 0.05$ for all) (Table 4). Being a member of the intervention group was not a significant predictor of presenting to the hospital (OR = 1.03, 95% CI 0.63–1.67).

Discussion

The present study found that only a third of patients identified through outreach screening ultimately accepted surgery, and this decision was not significantly influenced by our intervention. Although surgery acceptance varied with PVA of the worse-seeing eye, the proportion accepting surgery remained low: 20.9% acceptance for patients with PVA greater than or equal to 6/60 in both eyes and 32.5% for patients bilaterally blind (PVA < 6/120). This poor uptake of offered surgery among people with poor vision from cataract suggests that there is potential to greatly increase current surgical output if interventions can be devised to encourage and enable those identified by screening to accept surgery. Although the study protocol only required PVA less than 6/18 in the worse-seeing eye, participants generally had very poor acuity. The better-seeing eye median PVA was 6/30 and the worse-seeing eye median was counting fingers in both study groups. Only 2.5% of subjects had PVA greater than or equal to 6/18 in the worse-seeing eye.

Our video-based educational intervention did not have a discernible short-term impact on improving measured indicators of knowledge and attitudes about cataract and cataract surgery. Most of the indicators of knowledge and attitudes we measured (e.g., expected improvement in vision, trust in surgeons' skill or attitudes) were not significant predictors of accepting surgery or presenting to the hospital. However, knowing that cataract can be treated only surgically was a

Table 2. Comparison of Knowledge and Attitudes among Control and Intervention Groups in a Randomized Trial of an Intervention to Increase Uptake of Cataract Surgery, Assessed Immediately after the Educational Intervention

Item	Intervention Group	Control Group	*P* Value: Control vs. Intervention
Knowledge about cataracts			
Knows that cataracts can be treated, *n* (%)	186 (87.7)	177 (79.7)	0.18
Knows that cataracts only can be treated surgically, *n* (%)	113 (53.3)	121 (54.5)	0.64
Attitudes toward surgery			
Believes surgery will hurt, *n* (%)	100 (48.1)	124 (57.7)	0.48
Believes vision will improve "a lot" after surgery, *n* (%)	127 (62.0)	114 (54.0)	0.73
Thinks surgeons at the hospital are "highly skilled," *n* (%)	149 (74.1)	166 (79.4)	0.15
Thinks doctors and nurses at the hospital have "very good" attitudes, *n* (%)	167 (81.9)	175 (82.9)	0.46

significant predictor of both accepting surgery and presenting to the hospital. Therefore, modified educational interventions that successfully impart this knowledge should be more effective in increasing surgery acceptance rates.

Our intervention had no effect on cataract surgery acceptance rate or rates of presenting to the hospital. We had designed our sample size to detect an increase in surgery acceptance from 30% to 50%, based on the magnitude of the association between having undergone cataract surgery and "knowledge of cataract" and "trust in surgical quality" in a previous population-based study in the area.[11] Although a larger sample size may have detected a smaller increase in surgery acceptance rates, it is not clear that the program expenditures necessary to carry out this intervention would have been warranted in the face of a lesser effect.

Although there are a few reports of other interventions to increase uptake of eye care services in rural Asia, these too have generally failed to alter patient behavior. An educational intervention carried out in south India was shown to have a negligible effect on awareness of cataract surgery and surgery acceptance.[23] An intervention consisting of a lecture, video, and classroom demonstration failed to increase purchase or use of spectacles by rural Chinese schoolchildren.[24] These findings highlight the difficulty of effecting even short-term behavioral changes, especially in rural settings. A systematic review[25] of interventions to improve medication adherence reports that the most effective interventions are often complex

Table 3. Model of Possible Predictors of Accepting Surgery in a Randomized Trial of Interventions to Increase Acceptance of Surgery in Rural China

Potential Predictor	OR (95% CI)	
	Univariate Analysis	Multivariate Analysis
Younger age	1.00 (0.98–1.03)	1.02 (0.99–1.04)
Female sex	1.05 (0.69–1.59)	1.26 (0.76–2.08)
Received some formal education	1.29 (0.85–1.97)	
Presenting logMAR vision in better eye (worse)	1.06 (0.87–1.31)	
Presenting logMAR vision in worse eye (worse)	1.44 (1.15–1.80)†	1.61 (1.22–2.12)‡
Screening during summer	0.96 (0.35–2.64)	
Family member accompanied to screening	2.21 (1.46–3.34)‡	1.44 (0.87–2.39)
Previous cataract surgery	1.18 (0.70–2.00)	
Knows someone who had cataract surgery	0.90 (0.59–1.37)	
Thinks cataract can be treated	0.98 (0.56–1.73)	
Knows cataract can be treated only with surgery	2.04 (1.31–3.19)†	1.83 (1.07–3.13)§
Believes vision will improve "a lot" after surgery	1.70 (1.09–2.65)§	1.40 (0.82–2.40)
Believes surgery will hurt	1.24 (0.81–1.92)	
Thinks surgeons at hospital are "highly skilled"	1.40 (0.81–2.42)	
Thinks doctors and nurses at the hospital have "very good" attitudes	1.77 (0.96–3.29)	1.99 (0.97–4.08)
Higher quoted out-of-pocket payment for surgery*	1.41 (1.04–1.92)§	0.93 (0.59–1.45)
Self-pay	0.83 (0.48–1.45)	
Greater anticipated spending on transportation*	1.20 (0.98–1.47)	
Greater anticipated spending on food/lodging*	1.42 (1.17–1.72)‡	1.01 (0.74–1.37)
Greater anticipated loss in income from going to hospital*	1.54 (1.25–1.90)†	1.36 (1.01–1.83)§
Greater floor space/person in house (log m^2/person)	1.19 (1.05–1.33)†	1.27 (1.09–1.47)†
Less than 1 hour's travel from hospital	1.40 (0.78–2.49)	
Family member available to accompany to hospital	1.28 (0.71–2.32)	
> 100 days between screening and scheduled hospital examination	0.64 (0.29–1.44)	
Member of intervention group	0.86 (0.54–1.40)	1.11 (0.67–1.84)

* These variables were analyzed as ordinal values; for categories and cutoffs used, see Statistical Methods section.
† Indicates statistical significance at $P \leq 0.01$.
‡ Indicates statistical significance at $P \leq 0.001$.
§ Indicates statistical significance at $P \leq 0.05$.

Table 4. Model Showing Possible Predictors of Hospital Follow-up in a Randomized Trial of Interventions to Increase Acceptance of Surgery in Rural China

Potential Predictor	OR (95% CI)	
	Univariate Analysis	Multivariate Analysis
Younger age	1.02 (1.00–1.04)	1.03 (1.01–1.06)†
Female sex	0.95 (0.64–1.41)	1.11 (0.69–1.80)
Received some formal education	1.44 (0.96–2.17)	
Presenting logMAR vision in better eye (worse)	0.98 (0.80–1.19)	
Presenting logMAR vision in worse eye (worse)	1.43 (1.15–1.77)‡	1.66 (1.30–2.13)‡
Screening during summer	1.22 (0.33–4.54)	
Family member accompanied to screening	1.74 (1.17–2.59)§	1.19 (0.73–1.95)
Previous cataract surgery	1.06 (0.63–1.76)	
Knows someone who had cataract surgery	0.76 (0.51–1.15)	
Thinks cataract can be treated	1.06 (0.62–1.81)	
Knows cataract can only be treated with surgery	2.19 (1.44–3.32)‡	2.14 (1.32–3.49)§
Believes vision will improve "a lot" after surgery	1.30 (0.86–1.98)	
Believes surgery will hurt	1.17 (0.77–1.77)	
Thinks surgeons at hospital are "highly skilled"	1.27 (0.76–2.14)	
Thinks doctors and nurses at the hospital have "very good" attitudes	1.28 (0.72–2.27)	
Higher quoted out-of-pocket payment for surgery*	1.64 (1.25–2.13)‡	0.98 (0.67–1.43)
Self-pay	0.88 (0.52–1.49)	
Greater anticipated spending on transportation*	1.27 (1.06–1.52)§	1.10 (0.83–1.46)
Greater anticipated spending on food/lodging*	1.34 (1.12–1.61)§	0.95 (0.68–1.34)
Greater anticipated loss in income from going to hospital*	1.52 (1.25–1.84)‡	1.40 (1.05–1.86)†
Greater floor space/person in house (log m^2/person)	1.18 (1.05–1.32)§	1.28 (1.11–1.47)‡
Less than 1 hour's travel from hospital	1.25 (0.73–2.15)	
Family member available to accompany to hospital	1.18 (0.67–2.07)	
> 100 days between screening and scheduled hospital examination	0.86 (0.24–3.17)	
Member of intervention group	0.96 (0.63–1.46)	1.03 (0.63–1.67)

* These variables were analyzed as ordinal values; for categories and cutoffs used, see Statistical Methods section
† Indicates statistical significance at $P \leq 0.05$.
‡ Indicates statistical significance at $P \leq 0.001$.
§ Indicates statistical significance at $P \leq 0.01$.

and include reminders, reinforcement, family therapy, psychological therapy, and/or supportive care in addition to information and counseling. Although interventions of this intensity may not be practical or sustainable in this setting, allocating some of the resources used for provision of services and screening to ensuring that those in need obtain care seems to be warranted based on the very low existing uptake rates.

Because of time and space constraints at each screening session, it was not feasible to include interventions beyond the video and counseling session utilized here. However, other interventions that could practically be implemented outside of the screening session might enhance the impact of the video and counseling. For example, family members of rural patients likely play a strong role in a patient's decision to undergo cataract surgery. In rural Kenya, lack of social support from family members was the primary reason given for refusing surgery.[26] Similarly, rural Chinese patients have indicated in focus group discussions that "speaking with friends and relatives" is their most important source of information about cataract and cataract surgery,[27] and there is evidence that the patient's children pay for surgery in more than 70% of cases.[20] Therefore, targeting family members in educational interventions where possible may have a positive impact on the patient's decision to accept surgery. That said, even though all hospitals in the present study issued instructions for family members to accompany patients to screening, fewer than half (43.3%) of patients had family members with them. Targeting educational interventions toward family members in ways that are more convenient for them, such as telephone counseling by a nurse or home counseling by a village health worker, may improve families' acceptance of surgery. Telephone reminders to patients and families have been shown to improve self-management of diabetes, increase medical compliance, aid in smoking cessation, increase breast cancer screening attendance, and reduce missed appointments in primary care clinics.[28–30] Such reminders might also be a useful adjunct in this context, although to our knowledge these have yet to be evaluated as a means of improving rural cataract surgery acceptance rates.

In the present study, we used a video of a patient because recruiting an actual cataract patient who had undergone surgery was not realistic in a temporary outreach setting. However, one-on-one contact with such an actual patient might have been more effective than a video in motivating uptake of surgery. In a study of a series of educational interventions in India, house-to-house visits by a subject with aphakia increased cataract surgery acceptance more than other interventions.[23] Word-of-mouth advertising has been shown to be an important source of patient knowledge about cataract services, with 85% of surgery patients in rural China knowing a person who had undergone cataract surgery.[20] On the other hand, first-hand accounts of poor surgical outcomes could have negative results; a study in Kenya showed that knowledge of or even rumors of someone whose vision worsened after surgery can deter local acceptance of surgery, even when offered for free.[26] In rural China, nearly a quarter of patients have PVA less than 20/200 after cataract surgery according to Zhao et al.'s nine-province survey.[10] Given these nonoptimal outcomes, negative social marketing could be occurring in our study locales.

One study has suggested that cataract patients may not wish to receive preoperative information, or may find such information anxiety-provoking.[31] In a UK study, fewer than 50% of patients wished to discuss possible complications preoperatively, and 32% did not wish to know "anything at all" about risks.[32] In the present study, although patients receiving the intervention were not significantly more likely to believe that surgery would hurt, there may be other anxiety-provoking considerations, such as risk and comfort, that were not assessed. A randomized controlled trial of a preoperative informational videotape for cataract patients conducted in Britain showed that viewing the video was associated with more uncomfortable, painful, and risky expectations of surgery, but ultimately resulted in greater patient satisfaction.[18] This relationship between preoperative information and patient satisfaction has also been documented in Egypt.[33] We did not evaluate patient satisfaction after surgery in the present study, and were thus unable to ascertain whether the intervention led to increased patient satisfaction postoperatively.

A study of counseling for cataract surgery in Australia showed that recall was significantly better immediately after counseling than 2 weeks after surgery, at which point many patients could not recall information regarding success rates or complications.[34] In the present study, although most patients were asked to come to the hospital less than a week following screening, nearly half (44.5%) were scheduled to come to the hospital more than a month following screening, which may have reduced the impact of the counseling intervention on hospital presentation and surgery acceptance rates. However, the effect of the intervention remained insignificant ($P > 0.05$) even when including in the multivariate regression analysis only those subjects who were scheduled to come to the hospital within 1 week. A shorter waiting period between screening and follow-up examination was not associated with greater acceptance of surgery in our models.

The role of cost in willingness to accept surgery is still unclear; whereas some previous studies have shown that cost is not a significant barrier to accessing surgery,[11] others have shown that patients often list cost as their number one reason for refusing surgery.[12] In the present study, lower quoted out-of-pocket payment was not a significant predictor of accepting surgery; however, both greater mean floor space per household member (as an index of socioeconomic status) and greater anticipated income loss from hospitalization were associated with a higher likelihood of both presenting to the hospital and of accepting surgery. Both of these factors suggest that individuals with higher incomes were more likely to undergo surgery. We found no evidence of colinearity between expected loss of income and floor space in the home. Given the potential role of income and cost in surgery acceptance decisions, interventions that use monetary incentives in addition to counseling may be more effective in encouraging surgery uptake. An intervention in the area that provided reimbursement for travel costs (valued at US$7) was effective in increasing attendance for post-surgical follow-up.[35] In the United States, direct financial incentives to patients ("Payments for Performance for Patients") have been shown to be effective in promoting desired behaviors, such as weight loss[36] and reduction in tobacco use,[37] and may also be effective in encouraging cataract surgery uptake, although such interventions would need to take into account potential cultural obstacles.[38]

A final limitation is the fact that enrollment and baseline data were dependent on record keeping by trained personnel from participating hospitals, and so imperfect record keeping during unsupervised outreach screening sessions may have contributed to incomplete data. However, because most hospitals had similar numbers of intervention and control subjects, incomplete recording of data could be expected to equally affect both experiment arms.

The very low rate of surgical acceptance in this rural Chinese population with significant vision loss from cataract highlights the need for more effective and yet still economically feasible interventions to increase cataract surgical uptake in this setting.

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