Impact of Cataract Screening Outreach in Rural China

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Purpose. To examine differences between patients with cataract detected during screening and presenting to clinic in rural China.

Methods. Subjects were recruited from 27 screenings and an eye clinic in the same town. All had pinhole-corrected vision ≤6/18 in ≥1 eye due to ophthalmologist-diagnosed cataract. Subjects were administered a previously validated questionnaire on barriers to surgery in four areas: knowledge (K), perceptions of quality (Q), transportation (T), and cost (C).

Results. Screening group (SG; n = 120) and clinic group (CG; n = 120) participants did not differ from eligible, examined screening and clinic patients respectively in age, gender, or vision. SG participants were significantly more likely to be female (P = 0.002) and had a smaller housing area and less education (P < 0.001 for both) than those in the CG. Those in the CG were more likely to be blind (habitual VA ≤ 6/60) in the better-seeing eye (P = 0.05) and more willing to undergo and pay for cataract surgery (P < 0.001 for both) than SG. In logistic regression models, SG subjects had significantly lower quality scores (P < 0.001) and better habitual vision (P = 0.02) than did CG participants, and SG subjects who agreed to cataract surgery (78.3%) had significantly higher knowledge scores (P < 0.001) than those who refused.

Discussion. Screening outreach has the potential to ameliorate disparities in access to cataract surgery in rural China, as it appears more likely to detect patients with cataract with gender-related, economic, educational, and attitudinal barriers to surgery. However, education may be needed to convince screening subjects to undergo surgery.

Screening outreach efforts have been used for various medical conditions in an attempt to improve access, increase demand, and redress health disparities. Results have been mixed. For example, significant racial16,17 and socioeconomic16,18,19 disparities have persisted or even increased16 despite vigorous national efforts at screening for breast,17–19 cervical,18 and colon16 cancer, even in countries where there is universal, free access to screening.18

Evidence of the impact of screening programs in redressing disparities in access to cataract surgery is comparatively modest. Baruwa et al20 report greater access to surgery among women and the illiterate 5 years after a program of free screening and low-cost cataract operations was instituted in rural southern China. However, Fletcher et al13 indicate that <7% of persons with vision problems on a population basis presented to free screening camps in India, with women and those living >5 km away being significantly less likely to attend.

Having recently added screening outreach activities to a low-cost surgical program in rural Guangdong province, we sought to assess the impact of screening by comparing two cohorts of patients with visually significant cataract: those identified during screening and those presenting spontaneously to the program clinic in the same town. Our purpose was to compare screening and clinic-based cohorts with regard to clinical and demographic characteristics and responses on a previously reported instrument9 designed to assess potential barriers to cataract surgery.

Methods

The Caring is Hip project has provided cataract surgery since 2003 in six towns in the rural Chaoshan area of eastern Guangdong province, for a one-time, all-inclusive fee of 100 renminbi (US$150). In March 2008, a pilot outreach cataract screening program was initiated in the fishing town of Jiazi, with an area of 18 square km, a population of 108,000, and a per capita total production of US$1090 in 2000.21 The current project was initiated prospectively at the same time. The protocol was approved by the Institutional Review Board at the Joint Shantou International Eye Center, written informed consent was obtained from all subjects, and the tenets of the Declaration of Helsinki were observed throughout.

A total of 27 screenings were conducted by a team of one to three ophthalmologists and an ophthalmic nurse in 25 locations in all 14 villages of Jiazi Township between March 2008 and March 2009. The team also reviewed patients presenting to the local eye clinic during the same period. Eligible for the study were all consenting persons aged 40 years and above presenting to the eye clinic or screenings with pinhole-corrected vision of ≤6/18 in ≥1 eye that was thought by the examining ophthalmologist to be due to cataract. Excluded were persons having undergone previous eye surgery, with vision loss from other causes, not residing in Jiazi Township or presenting to the clinic on referral from the screening program.

Because of time constraints at the screening sites, a convenience sample of approximately 50% of subjects was interviewed, whereas in the clinic, eligible subjects were approached consecutively to participate. Data on age, gender, and vision were recorded on all eligible subjects. Data on age, gender, and vision were recorded on all eligible subjects.
subjects at the screening sites, and for all subjects solicited to participate at the clinic site.

Habitual vision (wearing distance spectacles if available) and pinhole-corrected vision were measured for each eye separately at a distance of 6 m in a well-lighted area by an ophthalmic nurse using a Snellen tumbler E chart. A single optotype of each size was presented first, starting at 6/30. If a letter was not identified, testing began two lines above, with the subject asked to read all optotypes on the line sequentially. A subject had to identify more than half of the letters on a given line to pass successfully to the next line.

A slit lamp examination with dilation of the pupil (facilitated by 2 drops of tropicamide 0.5% administered 5 minutes apart) was performed by the senior ophthalmologist (DCX) on all subjects, except those thought to have narrow angles on the slit beam assessment of the peripheral anterior chamber depth at the slit lamp. The following clinical data were recorded: cataract present or not in each eye, comorbid conditions present in each eye if any, any decrement in vision thought to be due primarily to cataract or not.

A previously validated questionnaire was administered in the local dialect by a single investigator (JW). The use and scoring of this questionnaire have been described elsewhere in detail. Briefly, the instrument was designed to assess potential barriers to uptake of cataract surgery in each of the following four areas: knowledge (K) of cataract and its treatment; perception of the quality (Q) of local services; the subject’s access to transportation (T); willingness to pay, for all 266 eligible persons presenting for screening (Table 1).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Screen Group</th>
<th>Clinic Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1) Study Participant (n = 120)</td>
<td>(2) All Persons with Cataract (n = 266)</td>
</tr>
<tr>
<td>Age (y, mean ± SE)</td>
<td>74.9 (9.7)</td>
<td>75.2 (9.9)</td>
</tr>
<tr>
<td>Gender (% female)</td>
<td>74.2</td>
<td>75.0</td>
</tr>
<tr>
<td>VA ≤ 6/60 in the better-seeing eye (%)</td>
<td>29.2</td>
<td>26.9</td>
</tr>
</tbody>
</table>

* Defined as pinhole-corrected visual acuity ≤ 6/18 in at least one eye, diagnosed as due to cataract by an ophthalmologist on the basis of a slit lamp examination with dilated pupil.

RECOMMENDATION

Among 1280 persons completing examinations in the screening program, 920 presented when the study team was available, and 266 (28.9%) of those had pinhole-corrected vision ≤ 6/18 in at least one eye attributed by the examining ophthalmologist to cataract. Among these patients, a convenience sample of 120 (45.1%) subjects completed the interviews. The mean age, proportion of women, and proportion with habitual visual acuity ≤ 6/60 in the better-seeing eye among participants in the screening group did not differ significantly from those for all 266 eligible persons presenting for screening (Table 1).

At the clinic, 127 persons were approached to participate and 120 (94.5%) agreed. Persons agreeing and refusing to participate in the clinic group did not differ from one another with respect to mean age, gender, or proportion with habitual acuity ≤ 6/60 (Table 1). Clinic patients not approached to join the study were not examined under study protocols, and thus data are not available for them.

Participants in the screening group were significantly more likely to be female than those from the clinic group (74.2 vs. 55.7, P = 0.002), and also reported significantly smaller mean housing area (10.1 ± 12.9 vs. 17.8 ± 13.8 m², P < 0.001) and less education (96.7% vs. 77.5% with no formal education, P < 0.0001; Table 2). The proportion of patients blind in the better-seeing eye was higher in the clinic group (46.2% vs. 30.0%, P = 0.05), as was the proportion willing to undergo cataract surgery and the mean amount willing to pay (P < 0.0001 for both; Table 2).

In multiple logistic regression models, only the lower quality score (P < 0.001) and better habitual vision (P = 0.03) among the screening group differed significantly from the clinic group (Table 4). When only those subjects agreeing to undergo cataract surgery were included, the difference in quality score remained significant (P < 0.001), whereas the difference in vision was borderline (P = 0.05; data not shown).

Statistical Methods

Demographic and clinical differences between persons with visually significant cataract participating in a screening outreach program or presenting spontaneously at an eye clinic were analyzed by t test (continuous data) and χ² test or by Fisher’s exact test (discrete data), as appropriate. In addition, nonparametric tests (χ² test) were performed for knowledge, transportation, quality, and cost scores across a one-way classification (clinic versus screening group, age ≥ 74 years, and gender). Finally, we applied separate multivariate logistic regression models with clinic versus screening group and willingness versus unwillingness to have surgery as the outcomes and age, gender, the scores on the four subsection of the questionnaire, and habitual VA (≤ or > 6/60) as potential predictors (SPSS; ver. 16, SPSS Inc., Chicago, IL).
The decision to undergo surgery among patients in the screening group was modeled by logistic regression. The only significant predictors of refusal were low knowledge score (P = 0.003) and older age (P = 0.01; Table 5). Among 24 screening group subjects refusing surgery, the most common reasons were concern about costs (60.4%), and unwillingness to undergo surgery due to age (22.9%).

**DISCUSSION**

Our results provide evidence that screening outreach identifies subjects with cataract who are poorer, less educated, and more likely to be women than persons presenting spontaneously to a clinic in the same rural town. These data suggest that screening outreach may be helpful in overcoming gender and economic disparities that have regularly been identified in studies of access to cataract surgery.

Yorston has suggested that barriers to cataract surgery in developing countries may be divided into four areas, each of which has been validated independently in a variety of settings: lack of knowledge, perception of poor surgical quality, transportation, and cost. Using a form previously validated in Chinese subjects, we demonstrated that persons detected with cataract during screening outreach had significantly lower scores in each of these four areas than patients with cataract presenting to a local clinic. This further suggests that screening outreach may assist in ameliorating disparities in access to cataract surgery, by bringing patients into contact with the health care system who are quite different from those actively seeking care at medical centers. We collected data, however, only on the stated will-

### Table 2. Demographic and Clinical Differences between Persons Participating in the Screening versus Clinic Group in a Study of Cataract Barriers

<table>
<thead>
<tr>
<th>Variable</th>
<th>Screening Group (n = 120)</th>
<th>Clinic Group (n = 120)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y, mean ± SE)</td>
<td>74.9 ± 9.7</td>
<td>72.9 ± 9.1</td>
<td>0.0947</td>
</tr>
<tr>
<td>Gender (% female)</td>
<td>74.2</td>
<td>55</td>
<td>0.002</td>
</tr>
<tr>
<td>Housing area per resident, (m², mean ± SE)</td>
<td>10.1 ± 12.9</td>
<td>17.8 ± 13.8</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Education (%)</td>
<td>81.7</td>
<td>103.2</td>
<td>.0001</td>
</tr>
<tr>
<td>No formal education</td>
<td>96.7</td>
<td>77.5</td>
<td></td>
</tr>
<tr>
<td>Primary level education</td>
<td>18.3</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Secondary education or higher</td>
<td>4.2</td>
<td>30.0</td>
<td>0.05</td>
</tr>
<tr>
<td>Willing to undergo cataract surgery (%)</td>
<td>78.3</td>
<td>92.5</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Mean amount willing to pay for surgery among those willing to have surgery (renminbi, ±SE)</td>
<td>788 ± 1220</td>
<td>1220 ± 2780</td>
<td></td>
</tr>
</tbody>
</table>

### Table 3. Subsection and Total Scores on the Barriers Questionnaire by Age, Gender, and Screening versus Clinic Group

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y)</td>
<td>4.25</td>
</tr>
<tr>
<td>Gender (M (n = 85) &amp; F (n = 154))</td>
<td>4.74</td>
</tr>
<tr>
<td>Group (Screening (n = 120) &amp; Clinic (n = 120))</td>
<td>5.89</td>
</tr>
</tbody>
</table>

### Table 4. Multivariate Logistic Regression Model of Factors Potentially Associated with Belonging to the Screening versus the Clinic Group

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR (Clinic Group is Reference Value)</th>
<th>95% CI</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (per year)</td>
<td>0.985</td>
<td>0.951–1.02</td>
<td>0.390</td>
</tr>
<tr>
<td>Gender (% female)</td>
<td>1.31</td>
<td>1.662–2.58</td>
<td>0.440</td>
</tr>
<tr>
<td>Knowledge score (per unit)</td>
<td>0.782</td>
<td>0.432–1.42</td>
<td>0.418</td>
</tr>
<tr>
<td>Quality score</td>
<td>0.162</td>
<td>0.091–0.287</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Transportation score</td>
<td>1.19</td>
<td>0.799–1.77</td>
<td>0.394</td>
</tr>
<tr>
<td>Cost/financial score</td>
<td>1.06</td>
<td>0.618–1.80</td>
<td>0.843</td>
</tr>
<tr>
<td>Habitual visual acuity in better-seeing eye ≤/6/60</td>
<td>2.48</td>
<td>1.26–4.87</td>
<td>0.008</td>
</tr>
</tbody>
</table>

Model includes all participants. Screening and clinic groups, both n = 120. Bold data indicate statistical significance.
ingness of this cohort of patients to undergo surgery, not on the proportion of subjects who actually underwent operations.

In our logistic models, uncertainty over the quality of local surgery appeared to be the most important factor distinguishing patients with cataract in screening outreach from those who present spontaneously. These concerns are reflective of the frequently poor surgical outcomes documented in rural areas of China.\textsuperscript{24,25} This finding has clear implications for outreach programs: not only must quality of surgery be improved, but potential patients must be shown that it has improved. Evidence suggests that word-of-mouth advertising plays an important role in the decision to undergo cataract surgery in rural China.\textsuperscript{26} The use of pseudophakic motivators and related approaches may be useful in disseminating positive perceptions of surgical outcomes more rapidly.

Our finding in the present study that a lower knowledge score was associated with refusal to undergo cataract surgery among the screening group is consistent with our findings in two separate locations in rural China\textsuperscript{9} and also in rural Indonesia (Bani A, Tijong R, Palmer J, et al., unpublished manuscript, 2009).\textsuperscript{27} Efforts to inform rural populations about the fact that cataract can be treated surgically should play a part of screening outreach programs, again with word-of-mouth dissemination of knowledge perhaps being enhanced by previously motivators who have undergone surgery.

Another finding with potential implications for cataract surgical programs in rural China is the observation that patients identified with cataract during screening outreach may not be as visually disabled, or as willing to undergo or pay for surgery, as those presenting to nearby clinics. Programs dependent on cost-recovery from surgical income may have to calibrate their expenditures on outreach, or use techniques as suggested above to increase the yield of patients willing to undergo surgery. It is nonetheless encouraging that some three-quarters of patients identified with cataract by screening outreach agreed to surgery, and that those persons were willing to pay nearly 800 RMB (over US$100), on average, for surgery.

Results and implications of this study must be understood within the context of its limitations. Unlike other studies of barriers to cataract surgery in rural China,\textsuperscript{9} the present investigation was not population-based. Although our results demonstrate that the screening group was demographically similar to persons with cataract taking part in a large screening outreach program, it is possible that our method of convenience sampling, necessitated by time constraints at the screening site, selected persons not representative in other important ways. Moreover, data are not available to indicate whether clinic group participants were similar to the general clinic population, although refusal rates were low. Results can thus only be applied with caution to the general population of this and other regions of rural China.

### References


