

The Bristol shared care glaucoma study – validity of measurements and patient satisfaction

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Abstract

Background The aims of the study were to determine (1) whether community optometrists are able to make valid measurements of visual parameters in patients with established or suspect primary open angle glaucoma and (2) patient satisfaction with follow-up by community optometrists.

Methods A randomized study was carried out in the former county of Avon in South West England with patients allocated to follow-up by the hospital eye service or by community optometrists. The subjects were 403 patients with established or suspected primary open angle glaucoma attending Bristol Eye Hospital and meeting defined inclusion and exclusion criteria. The main outcome measures were (1) measurements of key visual parameters (intraocular pressure, visual fields and cup/disc ratio) made by hospital eye service and community optometrists, compared with a research clinic reference standard at baseline, and (2) patient satisfaction at baseline and at six months.

Results Community optometrists were able to make measurements of comparable accuracy to those made in the hospital eye service. Patients were significantly more satisfied with a number of aspects of care provided by community optometrists, particularly those relating to waiting times, compared with those from the hospital eye service.

Conclusions Community optometrists are able to make measurements of key visual parameters in patients with established or suspect primary open angle glaucoma which are of comparable quality to the hospital eye service. Follow-up by community optometrists is acceptable to patients. The costs of each option are reported elsewhere.

Keywords: glaucoma, shared care, patient satisfaction, optometrists.

Introduction

Primary open angle glaucoma (POAG) is a slowly progressive chronic eye condition which, once diagnosed, requires lifelong observation and management. Even with careful monitoring and

good control of intraocular pressure up to 25 per cent of patients continue to lose visual field.¹ The prevalence of glaucoma is 0.4–3.3 per cent in those over 40 years but rises with age to 5 per cent in people aged 80 and over,^{2,3} resulting in a considerable workload for ophthalmic departments. Almost a quarter of out-patient attendances at Bristol Eye Hospital are for follow-up of patients with glaucoma (Professor J. Colley, personal communication). A survey of ophthalmologists in the South West of England found that almost two-thirds of consultants estimated that glaucoma patients constituted between 10 and 25 per cent of outpatient attendances.⁴

The Bristol Shared Care Glaucoma Study was set up to examine if community-based optometrists might have a role in the management of patients with POAG. A randomized controlled design was used to determine whether community optometrists could make valid measurements on patients with POAG and ocular hypertension (OHT), and to examine patient satisfaction and costs of the two approaches to surveillance. This paper reports on the validity and satisfaction aspects for first six months of the study; data collection is still in progress and patient outcomes at two years will be reported at a later date. The cost analysis is the subject of a separate paper.⁵

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Methods

Selection and training of optometrists

All optometrists in Avon (approximately 100) were sent a questionnaire to determine whether they would be interested in participating in the study and also if they had appropriate instrumentation. Forty-five expressed an interest, of whom 13 had an appropriate visual field analyser (Henson's) for the study. Twelve were recruited so as to achieve a geographical spread of participating practices. Permission was sought from non-participating optometrists for their patients to be seen by study optometrists if allocated to that arm of the study. Study optometrists received training consisting of 15 hours of lectures and 10 hours of practical 'hands on' examination experience on volunteer glaucoma patients at Bristol Eye Hospital. At the completion of training all participants were assessed to ensure they were able to undertake the relevant visual measurements.

The local Family Health Services Authority in Avon agreed to contribute a fee of £18 per visit to the optometrists, who were paid this fee to participate in the study. Payment was available for a maximum of four visits. Community optometrists confirmed that they were insured professionally to cover the measurements and referrals required by the study. United Bristol Healthcare Trust Local Research Ethics Committee gave approval for the study.

Patient eligibility and randomization

Potentially eligible patients were identified by reviewing case notes of attenders at specialist glaucoma clinics at the Bristol Eye Hospital. Inclusion and exclusion criteria are listed in the Appendix (Table A1). Those who appeared eligible following case note review were invited for a detailed assessment by the research team (described hereafter as the research clinic reference standard). The research team consisted of an ophthalmological registrar (I.S.), a registered optometrist (P.S.) and an ophthalmologically trained nurse with special skills in field testing. Details of the examination are given in the Appendix (Table A2). Once eligibility was confirmed, informed consent was sought and patients were randomized using sealed opaque envelopes containing the allocation to either the hospital eye service (HES) or to community based optometrists. Allocation codes were generated using random numbers (Fig. 1).

Follow-up

Patients randomized to the HES were followed up according to usual practice; those randomized to care by community-based optometrists were seen at six-monthly intervals. Community-based optometrists were provided with the patient's personal details, diagnosis, medical and surgical treatments, and the threshold for Henson CFA3000 field analysis.

At each visit to the community optometrist, information was recorded on a four-page, self-carboning proforma. Two copies

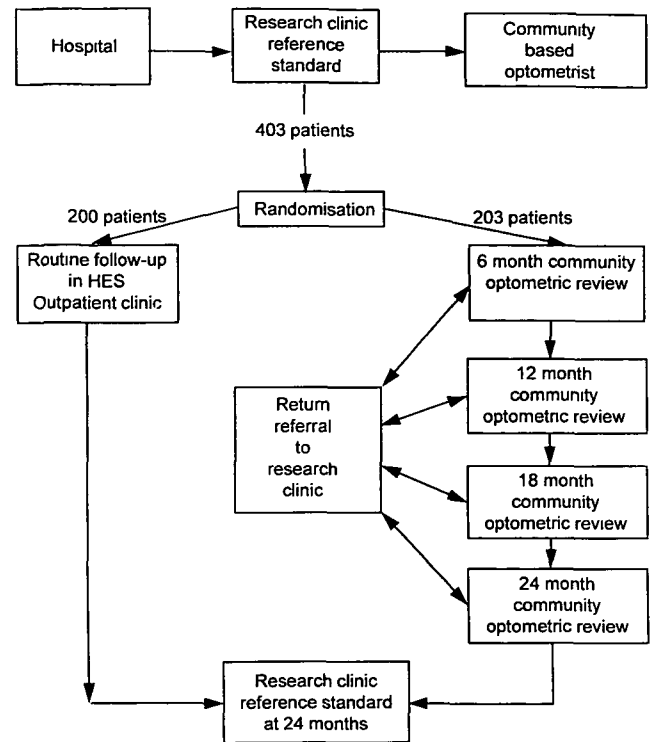


Figure 1 Flow diagram of study design.

were sent to the research team (one for archiving and one for data entry) and a copy to the general practitioner (GP). One copy was retained by the optometrist. Data were entered and stored on a database by the research team. Data collection was on a similar form for patients in the HES arm but data were obtained by the research team from the medical notes.

A standardized examination schedule was used by community optometrists (Table A2), and a clear protocol developed by the research team indicated the degree of change in visual parameters which would necessitate referral back to the HES. Patients meeting any of these criteria were referred back to the research team for confirmation of findings. (Further details of the methods have been provided previously.⁶) If confirmed, the results of the test were presented to the patient's consultant or senior registrar for a clinical decision regarding a possible treatment change. Any change in treatment was recorded and information passed on to the patient's community optometrist. If changes were not confirmed by the research team, the patient was referred back to the community optometrist.

Assessment of validity of measurements of visual parameters

Measurements of the visual field (VF), intraocular pressure (IOP) and cup/disc ratio (CDR) were made by three different sets of observers: patients were seen and measured by the HES routinely at out-patient clinics, all those who were eligible for

the study then had measurements carried out by the research team (the research clinic reference standard), and within two months all patients in both arms of the study were seen and measured by one of the community optometrists.

Patient satisfaction

Patient satisfaction was assessed by a questionnaire developed with patients which collected information about the time spent at appointments, travel costs and perceptions of quality of services. Patients received the self-completion questionnaire after recruitment to the study and were asked to record their satisfaction with their most recent hospital attendance. The questionnaire was sent to patients in both arms of the study again after their next appointment. Non-responders were sent a further questionnaire after three weeks. Baseline data suggested that satisfaction among hospital patients was of the order of 90 per cent satisfied and 50 per cent very satisfied. Two hundred patients in each arm of the study was considered adequate on follow-up to detect a difference of the order of 10–15 per cent in the proportion of patients who expressed satisfaction in the two groups. Specifically, with a 5 per cent two-sided significance level, this study had 80 per cent power to detect a difference of 90 per cent satisfied vs 80 per cent satisfied, and 85 per cent power to detect a difference of 50 per cent vs 35 per cent very satisfied.

Statistical analysis

For validity, the community optometrist and hospital measurements were compared with the research clinic reference standard using standard method comparison techniques to determine the relevant measures of variability such as standard deviation of differences.⁷ For patient satisfaction, the two groups were compared using χ^2 tests and associated confidence intervals. For the items which function as ordinal scales, Mann–Whitney tests were used.

Results

Recruitment

Of the 2780 patient notes examined, 2106 (76 per cent) patients were excluded as entry criteria were not met. Where eligibility was confirmed, 269 (40 per cent) patients were unwilling to participate in the study, because of problems with health, transport, employment or other time commitments. By October 1994, 403 patients had been recruited to the study, of whom 203 were allocated randomly to follow-up by community optometrists and 200 to the HES. The characteristics of patients in both groups are shown in Table 1. Both were broadly comparable at baseline, although the community optometrist’s group contained a slightly higher proportion of glaucoma suspects. As expected, the range and standard deviation of visual field measurements was much greater in patients with

POAG. By November 1995, 14 patients had been lost from the study, predominantly for non-specific reasons such as poor health.

Validity

For each eye separately, the validity of measurements made by community optometrists and hospital staff was determined by comparison with those made by the research clinic reference standard (Table 2). Standard deviations of all measurements were large in relation to the mean differences and similar across the three comparisons for each parameter.

Patient satisfaction

In the community group, 194 of 203 (95.6 per cent) patients completed baseline and 191 (94.1 per cent) follow-up patient satisfaction questionnaires. In the hospital group, 190 of 200 (95 per cent) completed baseline and 141 (70.1 per cent) follow-up information. It is not clear why the response rate was poorer in the hospital arm.

Baseline data for patient satisfaction with the last hospital appointment were broadly comparable in each arm. At six months, patients in the community group were significantly more likely to be satisfied than the HES with respect to a number of parameters, and not likely to be less satisfied in any area (Table 3). However, satisfaction also remained generally high in the hospital group.

Table 1 Baseline characteristics of the patients allocated to the two arms of the study (with percentages given in parentheses)

Visual function	Hospital (n = 200)	Community (n = 203)	
		Right	Left
Sex (male)	115 (57.5)	103 (50.7)	
Age (years)			
Mean	71.2	69.8	
SD	8.8	8.3	
Glaucoma type			
Suspect	78 (39)	95 (47)	
POAG	122 (61)	108 (53)	
		Right	Left
IOP			
Mean	21.06	21.08	21.80
Median	20.33	21	21.33
SD	4.37	4.18	4.42
CDR			
Mean	0.62	0.62	0.62
Median	0.7	0.7	0.7
SD	0.14	0.15	0.16
VF			
Mean	10.43	10.37	8.77
Median	4	5	4.5
SD	12.51	12.47	10.74

IOP, Intraocular pressure in mmHg; VF, visual field score in points missed out of 132 tested; CDR, cup/disc ratio from 0 to 1 (0.05 intervals).

Table 2 Comparison of measurements of paired differences of key visual field parameters made by research clinic reference standard, community optometrists and hospital eye service at baseline

		<i>n</i>	Mean	SD
IOP	H – RCRS (right eye)	398	-2.39	4.42
	H – RCRS (left eye)	397	-2.8	4.47
CDR	H – RCRS (right eye)	371	-0.08	0.16
	H – RCRS (left eye)	371	-0.09	0.18
VF	H – RCRS (right eye)	308	-0.61	10.7
	H – RCRS (left eye)	309	-0.17	11.85
IOP	C – RCRS (right eye)	393	-1.91	4.3
	C – RCRS (left eye)	394	-2.15	4.41
CDR	C – RCRS (right eye)	388	-0.04	0.17
	C – RCRS (left eye)	385	-0.04	0.18
VF	C – RCRS (right eye)	366	0.51	10.23
	C – RCRS (left eye)	366	0.36	9.15
IOP	C – H (right eye)	390	0.41	4.48
	C – H (left eye)	388	0.56	4.68
CDR	C – H (right eye)	362	0.05	0.18
	C – H (left eye)	360	0.05	0.18
VF	C – H (right eye)	288	1.08	12.78
	C – H (left eye)	289	0.73	12.91

IOP, Intraocular pressure in mmHg; VF, visual field score in points missed out of 132 tested; CDR, cup/disc ratio from 0 to 1 (0.05 intervals); RCRS, research clinic reference standard; H, hospital out-patient clinic measurement; C, community optometric measurement, RE, right eye, LE, left eye; SD, standard deviation of paired differences.

Discussion

The increasing numbers of elderly patients with chronic eye disease (of which POAG is an important one) have led to problems of overburdened ophthalmic out-patients departments in the United Kingdom. A survey of GPs in Avon demonstrated that although virtually all perceived the *quality* of services from Bristol Eye Hospital to be adequate or good, 85 per cent perceived the *quantity* of service to be inadequate or grossly

inadequate;⁸ similar problems have been described elsewhere.⁹ A report to the General Optical Council from the Optical Services Audit Committee¹⁰ in 1990 recommended ways of increasing the contribution of optometrists to the management of chronic eye diseases, and specifically that the clinical expertise of optometrists could be used to relieve the burden of overloaded outpatient departments. Against this background a number of shared care schemes for patients with glaucoma have been or are in the process of being set up, based upon an (as yet unproved) assumption that this will result in more cost-effective patient care. Not all have included specific training, standardized measurements, or agreed referral protocols which the Royal College of Ophthalmologists has strongly recommended for all those considering setting up such schemes,¹¹ all of which were a feature of this study.

The Bristol Shared Care Glaucoma Study was set up as a rigorous evaluation of a shared care scheme whereby community optometrists undertook surveillance of selected patients with glaucoma. A relatively high level of input of training was provided. Strict inclusion criteria, standardization of measurements and clear protocols for referral and return back to the HES were agreed at the outset. Within this context, the study has demonstrated that community optometrists are able to make measurements of the key visual parameters in patients with established or suspected glaucoma of comparable quality to those currently made within the HES. These measurements themselves are subject to considerable variation, and raise questions about the validity of treatment re-referral criteria. This scheme used optometrists who were volunteers and who had also undertaken additional training, both factors which may improve their performance. It is recognized that this may limit the generalizability of the findings of this study.

Patients were significantly more satisfied with certain aspects of care in the community compared with their experience in the HES. The response rate in the HES arm was acceptable, but less than in the community arm. We speculate that this group felt less

Table 3 Patient satisfaction (per cent 'very satisfied') at baseline and at six months

Satisfaction variable	Baseline	Hospital (<i>n</i> = 190)	6 months	Hospital (<i>n</i> = 141)	<i>p</i> value*
	Community (<i>n</i> = 194)		Community (<i>n</i> = 191)		
Convenience of travel	53	42	65	43	0.031
Obtaining appointment	64	57	79	57	0.055
Wait to see doctor	55	46	94	46	<0.0001
Reception facilities	62	68	88	58	<0.0001
Waiting area	53	55	86	50	<0.0001
Privacy arrangements	74	80	90	79	0.0023
Thoroughness of examination	88	85	95	86	0.069
Amount of information	65	59	81	67	0.071
Amount of time with doctor/specialist	68	65	87	67	0.0035
Doctor/specialist's general attitude	82	83	98	89	0.0065

*For presentational purposes, the percentages above a certain cut-off point are given in the table. However, *p* values have been calculated using Mann-Whitney U-tests on the original data comparing community with hospital in terms of differences in assessments between baseline and six months and do not involve any dichotomization.

involved in the study than those in the community arm, receiving as they did, routine care, and that this had an adverse impact on response rate. The inclusion and exclusion criteria used in this study were relatively strict, and only 25 per cent of the total patients with glaucoma attending the HES were eligible to participate. Of those eligible, only 60 per cent were willing to participate. It is important to recognize that the findings of this study apply to a small and highly selected group of patients with glaucoma. However, relatively modest changes in the inclusion criteria would allow a much higher proportion of patients to be included in such a scheme.

Glaucoma is a slowly progressive chronic disease. It is difficult to compare the outcomes of care between the different options over a short time period, especially in patients selected for their stability in a chronic condition. Patient safety is clearly of immense importance in the setting up of shared care schemes. Information about patient outcomes in both groups two years after randomization is currently being collected, and will be reported at a later date.

The development of shared schemes with the substitution of primary for secondary care is not unique to ophthalmology but is happening in many areas, notably with diabetes, asthma and minor surgery. The evaluation of shared care schemes for patients with diabetes¹² has demonstrated that in general, patients in GP care have received a similar quality of care compared with patients in conventional care, whereas the costs were higher to the health service and lower to patients when in GP care. A recent review¹³ which examined and summarized the evidence on the cost-effectiveness of substituting primary for secondary care in a number of different areas concluded that although the evidence is relatively scanty and inconclusive, it is not always the case that patients are better off (nor resources saved) when primary care is substituted for secondary care. Shared care schemes are being implemented in a number of areas, but purchasers of health care must be aware of the paucity of evidence regarding the costs and long-term quality of care provided in this context.

A key issue for purchasers will be the costs of securing follow-up for patients with POAG through optometrists; data on costs have been collected and are reported elsewhere.⁵ The potential impact also needs to be considered carefully, given the relatively small proportion of patients with glaucoma who were able to benefit from this scheme as described. Other approaches to service development could include a rigorous examination of the organization of the provision of long-term follow-up care for patients with chronic eye conditions within the HES. This would include addressing the skill mix within ophthalmological out-patient departments, standardizing the frequency with which individuals are seen, and consideration of the need for an internal quality assurance programme for measurement of key visual parameters which determine treatment changes.

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Appendix

Table A1 Eligibility criteria

Inclusion criteria	Exclusion criteria
Glaucoma suspects* 'Stable':‡ Primary open angle glaucoma Pigment dispersion glaucoma Pseudoexfoliative glaucoma Informed consent Ability to co-operate with examination Snellen visual acuity of 6/18 or better in both eyes (phakic or pseudophakic eyes) Aged 50 years and over	Unstable glaucoma† Other glaucomas: Normal tension glaucoma Secondary glaucoma Narrow angle glaucoma Other coexisting ocular pathology§ Extensive visual field loss¶ Best corrected visual acuity in either eye <6/18 Age less than 50 years

*Glaucoma suspects were defined as having intraocular pressure of above 24 mmHg on at least two occasions, and/or suspicious optic disc appearances, but no demonstrable visual field defect in either eye on threshold-related suprathreshold visual field assessment on at least two occasions.

†Unstable POAG patients were defined according to clinical judgement of the supervising ophthalmologist, as was poor IOP control necessitating a change in treatment or poor compliance in taking medical treatment

‡Patients were considered 'stable' if their consultant felt that IOP control was satisfactory on treatment and that visual field deterioration had not been identified on at least two repeatable threshold-related suprathreshold field tests over the last year. A visual acuity of 6/18 or better ensured clear ocular media sufficient to allow reliable measurement of optic disc parameters.

§Coexistent ocular pathology requiring hospital service review.

¶Extensive visual field loss was defined as: (1) more than half the tested points missed at a suprathreshold level; (2) a defect which affected the central 5° and extended to the periphery. An isolated point missed in the central 5° was acceptable.

Table A2 Details of measurements

Research clinic reference standard

(measurements by the research team at baseline comprised two visits 1–2 weeks apart)

First visit

Humphrey 24-2 full threshold central visual field analysis
 Henson CFA3000 132 point threshold-related suprathreshold examination

Second visit

Snellen visual acuity (6 m) and LogMAR (4 m) with current refractive correction
 Intraocular pressure measurement by Goldmann applanation tonometry
 Repeat Humphrey full threshold test
 Repeat Henson CFA3000 132 point threshold-related suprathreshold examination
 Slit lamp anterior segment examination
 Zeiss four mirror gonioscopy
 Optic disc assessment after dilation with tropicamide 0.5 per cent (\pm phenylephrine 2.5 per cent)
 Optic disc stereo-photography

Community optometrists

Snellen visual acuity (6 m) with current refractive correction
 Intraocular pressure measurement by Goldmann applanation tonometry
 Optic disc assessment using slit lamp and 90 dioptre lens
 Visual field analysis with a Henson CFA3000/CFS2000

Hospital eye service

Snellen visual acuity (6 m) with current refractive correction
 Intraocular pressure measurement by Goldmann applanation tonometry
 Optic disc assessment using direct ophthalmoscopy or slit lamp and 90 dioptre lens
 Visual field analysis with a Henson CFS2000/CFA3000 or Friedmann Mk II