SCIENTIFIC REPORT

An evaluation of optometrists' ability to correctly identify and manage patients with ocular disease in the accident and emergency department of an eye hospital

Scott Hau, Daniel Ehrlich, Katy Binstead, Seema Verma

Br J Ophthalmol 2007;91:437–440. doi: 10.1136/bjo.2006.105593

See end of article for authors' affiliations

Correspondence to:
S C H Hau, Department of
Optometry, Moorfields Eye
Hospital, 162 City Road,
London EC1V 2PD, UK;
scott.hau@moorfields.nhs.uk

Accepted 27 October 2006
Published Online First
31 October 2006

Aim: To assess optometrists' ability to correctly identify and manage patients with different ocular conditions seen in the accident and emergency (A&E) department of an eye hospital.

Methods: Randomly selected patients presenting to the A&E department were initially examined by one of two senior optometrists and a consultant ophthalmologist. A diagnosis and a management plan were made for each patient by the optometrist and by the consultant, who was blinded to the optometrists' plan. Agreement was assessed between optometrist and consultant ophthalmologist for primary and secondary diagnoses, management plan and whether patients could be seen by an optometrist only. Weighted kappa (κ) statistics was used to assess the level of agreement in management between the two groups.

Results: A total of 150 patients were assessed. The agreement in primary diagnosis and management outcome between the two groups were 89.3% (95% CI 83.2% to 93.8%) and 79.3% (95% CI 84.8% to 94.8%), respectively. A high level of agreement in management outcome was found ($\kappa=0.82$). No sight-threatening conditions were misdiagnosed by the optometrist.

Conclusions: There was good agreement in both the diagnosis and management plan between optometrists and the ophthalmologist. This study has shown that optometrists can potentially work safely in an A&E department of a busy eye hospital.

With the ageing population, the development of shared care between different ophthalmic professions can have a large-scale effect on healthcare delivery in the National Health Service in the UK. Over the past few years, hospital-based shared care involving optometrists working alongside ophthalmologists to co-manage patients with ocular disease have become well established, and there are a number of shared-care projects which have been developed involving both community and hospital optometrists.^{1–5}

To the authors' knowledge, there are no published data on hospital optometrists' ability to clinically appraise new referrals from general practitioners or community optometrists to an accident and emergency (A&E) department of an eye hospital. The aim of this study was to evaluate optometrists' ability to correctly identify and manage patients with different ocular conditions seen in the A&E department of an eye hospital.

PATIENTS AND METHODS

This was a prospective observational study carried out in the A&E department at Moorfields Eye Hospital, London, UK in January 2005 over a 6-months period. Local research ethics committee approvals were obtained before starting the study. Two senior optometrists with a minimum of 3 years of extended-role experience and one consultant ophthalmologist who acted as a gold standard for comparison took part in the study.

The inclusion criteria included all patients who attended the A&E department, and the exclusion criteria were those patients in whom an ophthalmic diagnosis had already been made from a previous visit, or those being managed by the nurse practitioner.

Before being seen by the optometrist, each patient was initially seen by a nurse who triaged them into urgent and non-urgent cases, and then allocated their record into separate trays. To reduce the effect of bias, the optometrist obtained a hospital

record alternately from the two trays and informed consent was obtained before the optometrist examined each patient. The optometrist formulated a provisional diagnosis and a referral management plan: to see the ophthalmologist on the same day, refer to another ophthalmological subspecialty within 1 month (<1 month), refer to another subspecialty after 1 month (>1 month) and to discharge. The ophthalmologist, blinded to the optometrist's findings, made an independent assessment of the patient's diagnosis and management plan. The clinicians also recorded whether they felt it would have been appropriate for the patient to see an optometrist only in the A&E setting.

The primary outcomes were the percentage agreement in primary diagnosis and referral management between optometrists and the ophthalmologist. Other outcomes include secondary diagnosis and whether the patients could have been seen by the optometrist only.

Statistical analysis and sample size

A sample size of 150 was determined for an estimation of a 90% agreement between the two groups with 95% CI at the 5% significance level.

Descriptive statistics including mean, standard deviation (SD) and range were calculated; weighted kappa (κ) statistics were used for estimating the level of agreement in management outcome: poor if $\kappa \leq 0.20$, fair if $\kappa = 0.21–0.40$, moderate if $\kappa = 0.41–0.60$, substantial if $\kappa = 0.61–0.80$ and good if $\kappa > 0.80$.⁶

RESULTS

Patient demographics

There were 150 patients, 78 (52%) were female and 72 (48%) male. The mean (SD, range) age was 46.5 (16.6,

Abbreviations: A&E, accident and emergency; NAD, nothing abnormal detected

10.1–90.6) years. In all, 96 (64%) patients were self-referred, 30(20%) from community optometrists, 22 (14.7%) from general practitioners and 2 (1.3%) were referred from other hospitals.

Primary and secondary diagnoses agreement

There was an agreement in 134 (89.3%; 95% CI 83.2% to 93.8%) primary diagnoses between the optometrists and ophthalmologist. The severity of each condition was subdivided into acute and non-acute diagnosis; there were 104 (77.7%) acute cases deemed to be potentially sight threatening (table 1).

There were four cases where the optometrists detected abnormality, but the ophthalmologist recorded nothing abnormal detected (NAD). Of the 31 (20.7%) patients with secondary diagnoses, there were 26 (83.9%) cases of agreement and 5 (16.1%) cases of disagreement (table 2).

Referral management agreement

There were 136 (90.7%; 95% CI 84.8% to 94.8%) cases of agreement in management outcome between optometrists and ophthalmologist; the weighted κ statistics indicated good agreement between the two groups (table 3).

There were 12 cases where there was an agreement in primary diagnoses but disagreement in management outcome and this is shown in table 4. There were only 2 (1.3%) cases of disagreement in both primary diagnosis and management outcome (patients 128 and 129 in table 2).

Agreement of ocular conditions that could be seen by the optometrists only

The ophthalmologist considered that 61 (45.5%) of the 134 agreed primary diagnoses cases were suitable to be seen by the optometrist only, whereas the optometrists considered 80 (59.7%) patients to be suitable (table 1).

DISCUSSION

To our knowledge, this is the first study to evaluate the diagnostic accuracy and referral management of hospital optometrists in an ophthalmic A&E department in the UK. The results of this study showed good agreement in terms of primary diagnoses (89.3%) and referral management (90.7%) between the optometrists and consultant ophthalmologist.

There were 22.3% of cases categorised as non-acute conditions, and this included 9 (6.7%) patients with NAD. This indicates that not all patients who present to an ophthalmic A&E department have any detectable abnormalities, and this is in agreement with other published studies.^{7–9}

Disagreement in primary diagnoses

The ophthalmologist recorded NAD in four cases, but the optometrists made a diagnosis for each of these patients (table 2). The reason might be because the findings from the ophthalmologist were deemed insignificant or the optometrists were not confident in diagnosing NAD in an A&E setting.

Some ocular conditions that the optometrists failed to diagnose were intermediate uveitis, marginal keratitis, multiple sclerosis-related eye problem, Herpes simplex virus keratitis

Table 1 Primary diagnoses agreement, diagnoses classification and agreement in those conditions suitable to be seen by the optometrists only (n = 134)

Primary diagnoses agreement	Frequency (%)	Diagnosis classification	Conditions suitable to be seen by optometrists only
Posterior vitreous detachment	15 (11.2)	Acute	Yes (exclude high myope)
Contact lens-related problems*	13 (9.7)	Acute	CLARE, deposits problem, keratopathy, abrasion
Other conjunctival disorders†	11 (8.2)	Acute	Allergic eye disease, trauma, SCH, inflamed pinguecula and pterygium
Vitreoretinal‡	10 (7.5)	Acute	No
Blepharitis	9 (6.7)	Non-acute	Yes
Cornea problems§	9 (6.7)	Acute	FB, abrasion, RCE
Medical retina¶	9 (6.7)	Acute	Dry AMD
Nothing abnormal detected	9 (6.7)	Non-acute	Yes
Conjunctivitis	7 (5.2)	Acute	Yes
Neuro-ophthalmic**	7 (5.2)	Acute	Migraine
Episcleritis/scleritis††	6 (4.5)	Acute	Episcleritis
Anterior uveitis	5 (3.7)	Acute	No
Chalazion	4 (3)	Non-acute	Yes
Dry eye	4 (3)	Non-acute	Yes
Other uveitis‡‡	4 (3)	Acute	No
Eczema	3 (2.2)	Non-acute	Yes
Orbital§§	3 (2.2)	Acute	Lagophthalmos secondary to Bells
HSV infections¶¶	2 (1.5)	Acute	No
Cataracts	1 (0.7)	Non-acute	Yes
Glaucoma	1 (0.7)	Acute	No
Herpes zoster ophthalmicus	1 (0.7)	Acute	No
Strabismus***	1 (0.7)	Acute	Yes

AMD, age-related macular degeneration; CLARE, contact lens-associated red eye; FB, foreign body; HSV, Herpes Simplex virus; RCE, recurrent corneal erosion; SCH, subconjunctival haemorrhage.

*Nine keratitis, one deposits problem, one CLARE, one abrasion, one keratopathy.

†One allergic eye disease, one conjunctival trauma, two inflamed pinguecula, one inflamed pterygium, one conjunctival phlycten, four SCH, one stitch granuloma.

‡One macular hole, five retinal detachment, three retinal tear, one retinoschisis.

§Four corneal foreign body, one corneal abrasion, one non-contact lens-related corneal ulcer, one endothelitis, one filamentary keratitis, one RCE.

¶One central retinal vein occlusion, three central serous retinopathy, one commotio, one vasa retina, one dry AMD, two wet AMD.

**One inferior quadrantanopia, four migraine, one sixth nerve palsy, one Amaurosis fugax with no embolus detected.

††Three episcleritis, three scleritis.

‡‡One Fuchs heterochromic cyclitis, one hypertensive uveitis, two postoperative uveitis.

§§One orbital fracture, one preseptal cellulitis, one lagophthalmos secondary to Bells.

¶¶One Herpes simplex keratitis (HSV), one primary HSV blepharoconjunctivitis.

***One decompensating esophoria.

Table 2 Disagreement between optometrists and ophthalmologist in primary and secondary diagnoses

Patient number	Diagnosis type	Optometrist's diagnosis	Ophthalmologist's diagnosis
9	Primary	Unsure	NAD
22	Primary	Hypertension	Postural hypotension
27	Primary	Dry eyes	Lagophthalmos
32	Primary	Preseptal cellulitis	Chalazion
46	Secondary	Macular hypoplasia	Tilted disc
50	Primary and secondary	FHC and retinal changes	Intermediate uveitis and cataracts
66	Primary	Blepharitis	HSV blepharoconjunctivitis
77	Secondary	Pseudoexfoliation	Nothing recorded
82	Primary	Haemorrhages and exudates	Branch retinal vein occlusion
87	Primary	PVD	NAD
88	Secondary	Dry eyes	Nothing recorded
107	Primary	Conjunctivitis	Marginal keratitis
126	Primary	Floater	NAD
128	Primary	Transient ischaemic attack	NAD
129	Primary	Inferior rectus underaction	Multiple sclerosis-related eye problem
135	Primary	Blepharitis	Eczema
136	Primary	Contact lens-related keratopathy	HSV Keratitis
139	Primary	Unsure	Idiopathic chronic orbital inflammation
150	Primary and secondary	Swollen eyelid and no secondary diagnosis recorded	Chalazion and preseptal cellulitis

FHC, Fuchs heterochromic cyclitis; HSV, herpes simplex virus; NAD, nothing abnormal detected; PVD, posterior vitreous detachment.

and a case of idiopathic chronic orbital inflammation (table 2). There were two cases where both groups disagreed in primary and secondary diagnoses (patient 50 and 150), but the conditions misdiagnosed by the optometrists were not sight threatening. The prevalence of these conditions is much lower, which may reflect the lack of exposure the optometrists have with these rarer conditions and indicates that further training or support from ophthalmologists was required.

Management agreement

Weighted κ value for the referral management outcome indicated good agreement (table 3). This shows that the optometrists were competent in making referral management decisions. None of the 12 conditions where there was an agreement in primary diagnoses but a difference in referral management were sight threatening (table 4). The four cases where the optometrist indicated a same day referral was because of their limited therapeutic prescribing power, as a topical steroid was indicated for three cases. With the two cases (patient 128 and 129) of disagreement in both diagnosis and management, the optometrist was cautious in referring patients when he or she could not identify a cause for the patient's

symptoms. This highlights the need of establishing an A&E protocol for conditions that can be managed by optometrists.

The agreement in conditions that was suitable to be seen by the optometrists only

There were more cases that the optometrists considered they could manage by themselves if they were able to prescribe certain topical medications such as steroids and antiviral drugs. However, the conditions that both groups agreed on are mainly non-sight-threatening disorders—for example, dry eyes and posterior vitreous detachment, and this is in tandem with the recent introduction of legislations by the Department of Health in the UK to grant suitably trained optometrists the rights to extend their therapeutic prescribing power.^{10 11} Future studies in assessing whether therapeutically trained optometrists are able to prescribe safely and competently in an A&E department are warranted.

In conclusion, this study has shown that appropriately trained optometrists show strong agreement with a consultant ophthalmologist when assessing patients in an ophthalmic A&E department.

Table 3 Level of agreement in referral management between optometrists and ophthalmologist

Optometrist's management	Ophthalmologist's management				
	Discharged	Same day	<1 month	>1 month	Total
Discharged	50	0	1*	2†	53
Same day	0	78	5‡	0	83
<1 month	1§	2¶	3	2**	8
>1 month	0	0	1††	5	6
Weighted κ 0.82	51	80	10	9	150

*One valsalva retinopathy.

†One chronic episcleritis, one nothing abnormal detected with family history of glaucoma.

‡One conjunctival trauma, two allergic eye disease, one vitreous syneresis, one viral keratoconjunctivitis.

§One transient ischaemic attack.

¶One stitch granuloma, one filamentary keratitis.

**One chalazion, one multiple sclerosis-related eye problems.

††One macular oedema.

Table 4 Agreement in primary diagnosis but disagreement in referral management (n = 12)

Primary diagnosis	Frequency (%)	Optometrist's management	Ophthalmologist's management
Allergic eye disease	2 (16.7)	Same day	<1 month
Conjunctival trauma	1 (8.3)	Same day	<1 month
Viral keratoconjunctivitis	1 (8.3)	Same day	<1 month
Syneretic vitreous (high myope)	1 (8.3)	Same day	<1 month
NAD (cataracts)	1 (8.3)	Discharged	>1 month
Episcleritis	1 (8.3)	Discharged	>1 month
Valsalva retinopathy	1 (8.3)	Discharged	<1 month
Filamentary keratitis	1 (8.3)	<1 month	Same day
Stitch granuloma	1 (8.3)	<1 month	Same day
Chalazion	1 (8.3)	<1 month	>1 month
CRVO	1 (8.3)	>1 month	<1 month

CRVO, central retinal vein occlusion; NAD, nothing abnormal detected.

ACKNOWLEDGEMENTS

We thank Dr C Bunce and Dr M Crossland for their advice and comments on this study.

Authors' affiliations

Scott Hau, Daniel Ehrlich, Katy Binstead, Seema Verma, Moorfields Eye Hospital, London, UK

Competing interests: None.

REFERENCES

- 1 Banes MJ, Culham LE, Crowston JG, et al. An optometrist's role of co-management in a hospital glaucoma clinic. *Ophthalmic Physiol Opt* 2000;**20**:351–9.
- 2 Oster J, Culham LE, Daniel R. An extended role for the hospital optometrist. *Ophthalmic Physiol Opt* 1999;**19**:351–6.
- 3 Hodgson K. Moving towards a wider role. *Optician* 1994;**208**:18–21.
- 4 Hitchings R. Shared care for glaucoma. *Br J Ophthalmol* 1995;**79**:626.
- 5 Gray SF, Spry PG, Brookes ST, et al. The Bristol shared care glaucoma study: outcome at follow up at 2 years. *Br J Ophthalmol* 2000;**84**:456–63.
- 6 Petrie A, Sabin C. Assessing agreement. In: Petrie A, Sabin C, eds. *Medical statistics at a glance*. Oxford: Blackwell Science Publishing, 2005:105–7.
- 7 Fenton S, Jackson E, Fenton M. An audit of the ophthalmic division of the accident and emergency department of the Royal Victoria Eye and Ear Hospital, Dublin. *Irish Med J* 2001;**94**:265–6.
- 8 Jones NP, Hayward JM, Khaw PT, et al. Function of an ophthalmic accident and emergency department: results of a six month survey. *BMJ (Clin Res Ed)*, 1986;**292**:188–90.
- 9 Kheterpal S, Perry ME, McDonnell PJ. General practice referral letters to a regional ophthalmic accident and emergency department. *Eye* 1995;**9**:67–9.
- 10 Buckley R, Lawrenson J, Hennelly M. Therapeutics in clinical practice—recent developments in drug legislation for optometrists. *Optom Today* 2005;**45**:40–7.
- 11 Lawrenson J. Recent changes in the use and supply of medicines by optometrists. *Optom Today* 2005;**45**:28–32.