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Optometrist Prescribing of Therapeutic Agents: Economic Implications for the UK

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Executive Summary

Introduction

- Following the Crown Report, optometrist care of ocular disease could be expanded to include both the independent therapeutic management of certain acute external eye conditions and dependent management of certain chronic conditions, where treatment has been initiated by an ophthalmologist.

Literature review

- There is little adequate research to inform about an expanded therapeutic role for optometrists. Although optometrist therapeutic prescribing has been introduced in the United States, its impact has not been investigated rigorously. Surveys conducted in the US suggest that optometrists appear confident in a prescribing role.

- In the UK, studies indicate that optometrists can work well with GPs and ophthalmologists in managing a range of ocular conditions. Scope to prescribe might rationalise these relationships by making some referrals unnecessary.

- There is little adequate research to describe the quality of GP management of eye disease. Although discord may seldom be clinically important, in approximately half of cases ophthalmologists disagreed with general practitioners' diagnoses. Several studies have questioned the inappropriate GP use of corticosteroids for eye conditions.

- There is little adequate research to describe the appropriateness of GP referrals for eye disease. GP accuracy of diagnoses on referral is variable, and GPs may often refer for a definite diagnosis because of clinical uncertainty.

- About 5% of all optometrist consultations result in a referral, most commonly for suspected cataract or suspected glaucoma. Optometrist accuracy of diagnoses and appropriateness of referral is heavily influenced by legal requirements upon optometrist practice. Despite this, optometrists perform as well as or better than GPs on these counts.

- Currently, on average, an optometrist conducts about 150 sight tests and prescribes about 60 pairs of glasses to NHS and private patients per month.

- Each GP conducts an estimated 162 consultations for eye disease each year, referring 20-25% of patients. In 1999, GPs wrote nearly 12.9 million scripts for eye disorders at a cost of £72 million.

The AESOP survey

- The Anonymous Enquiry of the Scope for Optometrist Prescribing (AESOP), a national UK survey involving a random 10% sample of optometrists, was conducted to explore current referral practice and views about therapeutic prescribing.

- Participants in the AESOP survey were broadly representative of UK optometrists. The vast majority worked full or part-time in high street locations, providing full eye examinations as their main workplace activity. Self-reported activity data from the survey correlates well with data from the literature and published national sources.

- On average optometrists were consulted about 200 times a month and referred about 200 patients a year, most commonly for cataract.

- Almost 90% of optometrists were in favour of the introduction of therapeutic prescribing and agreed with the necessity of training: two-thirds of respondents wished to participate personally.

- Each optometrist might avoid about 60 referrals to or via a GP per year by being able to prescribe therapeutically; changes in other referrals would be negligible.

- Differing opinions about the need for a full eye examination when prescribing therapeutically will need to be addressed if prescribing rights are introduced.

- Optometrists are unhappy about the way they are currently reimbursed and demonstrate a strong preference for fee-for-service payments for therapeutic prescribing.

- Most respondents indicated a willingness to participate in supervised audit, re-accreditation and continuing education at reasonable intervals.

Economic impact

- Optometrist therapeutic prescribing will improve patient access to care for ocular conditions by 27% to 50% and thus reduce costs of access to patients and increase convenience for users.

- Limited evidence suggests that extended shared care between ophthalmologists and optometrists does not compromise clinical outcomes or substantially alter cost. The introduction of dependent optometrist prescribing would provide a logical extension of existing shared care arrangements.

- Optometrist therapeutic prescribing may be anticipated to reduce secondary care waiting list sizes and primary care waiting times. This could occur through a number of mechanisms, including improved patient access, more appropriate referral patterns and the appropriate devolution of patient acute and chronic management to optometrists. It is unclear if budgetary savings can be realised from changes in the current provision of care to offset the cost of optometrist involvement.

- It is plausible that the introduction of independent therapeutic prescribing by optometrists will be cost neutral, but further research and formal detailed costing is required to establish this with confidence.

Discussion

- In the absence of studies that directly assess the quality of care delivered by optometrists who can prescribe therapeutically, the economic impact of introducing prescribing in the UK remains speculative.

- Optometrists, who wish to prescribe therapeutically, are willing to participate in supervised audit, re-accreditation and continuing education, consistent with the requirements of the Crown report.

- The need to address the reimbursement of optometrists is vital to the profession as well as to provide definitive analysis of the cost of introducing optometrist therapeutic prescribing. Different reimbursement strategies present different incentives to optometrists and have different administrative costs, which the profession should explore.

- Any reimbursement strategy chosen may be expected to have a profound impact upon patient choices, if it involves cost shifting from the NHS to the patient.

- Research providing valid, comparative data on the resources used and quality of care delivered by optometrists and other health care providers is required.

Glossary

A&E:	accident and emergency department
AESOP:	Anonymous Enquiry of the Scope for Optometrist Prescribing
BMEH:	Birmingham and Midland Eye Hospital
CO:	casualty officer
DPA:	diagnostic pharmaceutical agent
FODO:	Federation of Ophthalmic and Dispensing Opticians
HES:	hospital eye service
MEH:	Moorfields Eye Hospital
NA:	not applicable
NS:	not stated
PCC:	primary care clinic
PCP:	primary care physician
SHO:	senior house officer
TPA:	therapeutic pharmaceutical agent

1. Introduction

- *Following the Crown Report, optometrist care of ocular disease could be expanded to include both the independent therapeutic management of certain acute external eye conditions and dependent management of certain chronic conditions, where treatment has been initiated by an ophthalmologist.*

The Crown Report recommends that "new groups of professionals would be able to apply for authority to prescribe in specific clinical areas, where this would improve patient care and patient safety could be assured" (Crown, 1999). Optometry is listed as one such professional group.

In response, the College of Optometry, the Association of Optometrists and the Federation of Ophthalmic and Dispensing Opticians jointly commissioned the Centre for Health Economics, University of York to undertake an analysis to explore the potential implications of UK optometrist prescribing.

In the UK, optometry is "the occupation of measuring eyesight, prescribing corrective lenses, detecting eye disease, etc." (Oxford University Press, 1995), and reflects the important primary care role of optometrists (ophthalmic opticians). Optometrists routinely detect and refer a range of ocular disease and in some areas this role is formalised in screening arrangements for certain patient groups (The Royal College of Ophthalmologists et al., 1995). In the United States, optometrists not only diagnose eye disease, but also to varying extents are authorised to prescribe certain therapeutics. The Crown report recommendations offer the possibility of increasing the responsibilities of optometric practice in the UK to include therapeutic prescribing, thus expanding its primary healthcare role.

Eye disease is treated in a number of different settings. Minor or acute eye conditions are routinely seen at primary care level by a GP. More urgent cases, particularly those involving trauma, are managed by the accident and emergency department (A&E) of the local hospital, which may or may not involve a specialist eye clinic. Chronic or more serious eye conditions are typically managed at secondary care level, although the patient's GP and/or optometrist may be involved in a shared care arrangement with the consultant. Optometrist prescribing of medicines would involve a change in the treatment setting: certain patients may attend their local optometric practice instead of the GP surgery, A&E or Hospital Eye Service (HES). Such a change may ease the burden on currently overstretched healthcare providers, and improve access to care for patients. However, this may be an adverse change for optometrists, who largely operate in a commercial environment, if reimbursement does not cover the necessary time and additional infrastructure costs to deliver an appropriate quality of care.

Optometrists may detect a wide range of ocular conditions needing a variety of primary and secondary care treatments. To analyse formally the health improvements and the economic impact due to the introduction of optometrist prescribing would require aggregating assessments of the costs and benefits of each treatment and proportions of patients in whom these costs and benefits might change. The task of establishing the cost-effectiveness of individual treatments is beyond the scope of this report and will be a task for those devising clinical guidelines for optometric care. However, therapeutic prescribing is anticipated to involve the optometrist initiating treatment for self-limiting or non-sight threatening disease, or continuing and monitoring secondary care initiated treatment for more serious conditions. The principle issues are the extent to which patient

management may become more appropriate (patients receiving the right treatment or a correct referral) and how the use of NHS and patient resources may change.

Shared care arrangements between optometrists and ophthalmologists exist in the US, the UK, Canada and Australia. In all 50 states in the US, optometrists are now licensed not only to use diagnostic pharmaceutical agents (DPAs) in the course of their professional practice, but also to prescribe certain therapeutic pharmaceutical agents (TPAs) for their patients (Reed, 1998) (Ridder, 1998). In three Canadian provinces, optometrists may use certain drugs (Optometrists Registration Board of Victoria, 1998). In the Australian province of Victoria, optometrists may "obtain, possess, use, sell, or supply (including prescribe) in the course of their professional practice, certain Schedule 4 poisons within the meaning of the Agents, Poisons and Controlled Substances Act 1981" (Optometrists Registration Board of Victoria, 1998). In Europe as a whole, the most recent evidence suggests that optometrists are not licensed to give their patients any medication (apart from treatment for dry eyes in Sweden and in the UK) (Elie, 1997). In the UK, optometrists may use DPAs, but may only prescribe TPAs in an emergency.

To explore the impact of introducing therapeutic prescribing by UK optometrists, a literature review of the epidemiology and appropriateness of care for a range of ocular conditions is presented, together with activity data from national sources. A national survey of optometrists is reported, providing data on perceptions about the introduction of prescribing and consequent changes in practice. Drawing together the available information, the impact on cost and appropriateness of care of introducing therapeutic prescribing is assessed. Implications of our findings are discussed and a tentative research agenda is outlined.

2. Literature Review

2.1 Search methods

We conducted a systematic review of the literature on optometrist prescribing and related issues. We searched major databases (CINAHL, EMBASE, MEDLINE EXPRESS, HMIC, AMED and Sociological Abstracts) from 1980 onwards. Individually tailored search histories were constructed to reflect the differences in key terms used by the different databases, using the thesaurus option provided in WinSPIRs (version 4). Search terms were chosen in five areas, covering eye-care practitioners, prescribing, medical audit, referral and eye disease. The search strategies are shown in Appendix 1. In addition, national activity data were analysed, in order to provide a benchmark for findings from the literature review and survey.

2.2 Search results

Searching identified 570 citations, of which 130 references, considered relevant on the basis of title and abstract, were retrieved. These included 53 references to 49 studies and one PhD thesis (Pooley, 1996). One paper gathered data from a postal survey and a review (Whittaker et al., 1999) and four papers reported on different aspects of one randomised controlled trial. Key details of these studies may be found in Appendix 2; the study designs are shown in Box 1. It is notable that most studies are descriptive, and by design subject to a range of potential biases. For example, any observational study may be subject to selection biases that make its findings atypical. The literature may broadly describe current practice, but will not provide good evidence about how practice may best be improved.

Box 1: Designs of retrieved studies

14	surveys
13	retrospective observational studies
13	prospective observational studies
6	prospective experimental studies
2	randomised controlled trials
1	review/meta-analysis
1	PhD thesis

Most studies (33/50, 66%) were set in the UK. Thirteen studies were set in the US and one each from Canada, Europe and Australia. One paper (a meta analysis) reviewed 15 studies taken from the UK, US and Australia (Brin & Griffin, 1995).

The care settings for these studies are presented in Table 1. The setting is determined by the location from which data was retrieved. For example, if referral data were collected from an A&E department, these are classified as 'secondary care' data; a study, in which GP referrals to A&E were found from GP notes, is classified as a 'primary care' study. There is some overlap between secondary care outpatient departments and the so-called 'Primary Care Clinics' (PCC), which "aim to provide a one stop diagnostic service within the hospital" (Oster et al., 1999). Equally, hospital-based accident and emergency departments have been classified here as 'secondary care', but could be seen as a primary care service, since patients tend to be self-referred. Studies covered a variety of topics, which are divided into three headings: changes in optometrist management of eye disease, GP management of eye disease and referrals for eye disease. Some studies address several of these topics and so appear in more than one column.

Table 1: Study settings

Care Setting	Location	Number of References by Topic			
		Optometrist management	GP management	Referrals	All
Primary	GP practice	0	8	6	8
Primary	Hospital clinic (PCC)	0	1	3	3
Primary	OMP office	0	0	1	1
Primary	Optometrist office	6	0	8	14
Primary	Optometrist and GP office	1	1	1	2
Secondary	A&E Dept	1	0	5	8
Secondary	Dermatologist	0	0	1	1
Secondary	Outpatient Dept	0	1	4	4
Secondary	Outpatient and A&E Dept	0	0	1	1
Secondary	Opthalmology Dept	0	0	0	1
Secondary	Optometrist clinic	1	0	0	1
Secondary & Primary	Various locations	4	1	5	8*
Other	Community (nursing home)	0	0	1	2
Total number references		13	12	36	54

*Three papers published on a single trial

2.3 Changes in optometrist management of eye disease

- *There is little adequate research to inform about an expanded therapeutic role for optometrists. Although optometrist therapeutic prescribing has been introduced in the United States, its impact has not been investigated rigorously. Surveys conducted in the US suggest that optometrists appear confident in a prescribing role.*

- *In the UK, studies indicate that optometrists can work well with GPs and ophthalmologists in managing a range of ocular conditions. Scope to prescribe might rationalise these relationships by making some referrals unnecessary.*

A total of thirteen studies were retrieved that examined the scope to develop optometric practice, including shared care arrangements; four were based in the UK. A summary of UK studies is presented in Box 2; key findings of all studies may be found in Appendix 3.

Eight studies addressing optometrist management of eye disease were set in the US. Four of these were postal surveys directly addressing the introduction of optometrist prescribing in Missouri, USA.

In June 1986, the state of Missouri began to grant optometrists the legal authority to prescribe therapeutic pharmaceutical agents (TPA) for management of ocular disease and trauma. To qualify, optometrists had to meet additional educational requirements and to practise within the state. (Bachman & McAlister, 1993). In 1991, new legislation was introduced to further expand the scope of practice to the treatment of glaucoma, again subject to appropriate educational attainment. The legislation allowed the use of all non-injected pharmaceutical agents for the treatment of ocular conditions, and, additionally, new eye care drugs as they became available.

Box 2: UK Studies of optometrist management of eye disease.

Study 1

Chambers and Fisher (1998) conducted an uncontrolled experimental prospective study in which patients with acute eye conditions were referred by GPs, GP staff or by pharmacists to designated optometrists, who were reimbursed for their services by the Health Authority.

All of the optometrists felt that they were already seeing many patients with acute eye problems out of good will, free of any charge to the patient or Health Authority. Before the study, they had had patients referred to them by a GP for diagnosis of eye conditions. It was felt that the scheme would formalize the optometric service already provided for GPs and patients with appropriate remuneration (Chambers & Fisher, 1998).

However, because optometrists were unable to prescribe therapeutic agents, 38% of the 109 patients seen then had to visit their GP for a prescription. A further 6% were referred back to GP for other reasons and 20% of patients were directed to pharmacist for OTC medication. Optometrists referred 7% of patients to hospital via GP and 5% were referred directly to hospital.

The authors concluded that, in general, the primary care team felt optometrists should be able to prescribe a limited number of drugs. Without this, the scheme offered less, rather than more, convenience for the patient.

Study 2

The issue of shared care was also addressed by the Bristol Glaucoma Study. 403 patients with established or suspected glaucoma were randomized to receive follow-up care from either the hospital-based ophthalmologist or a community optometrist.

After two years, no statistically significant difference in clinical outcomes was detected (Gray et al., 2000). The annual per patient cost for hospital ophthalmologists varied from £14 to £60; whereas the annual per patient cost for treatment by community optometrists ranged from £70 to just under £110 (1994 prices) (Coast et al., 1997). Reflecting the pragmatic design of the trial, there were substantial differences in the interval between follow up visits (averaging 10 months for ophthalmologists and 6 months for optometrists). This factor largely accounted for the difference in cost. The authors estimated that it cost £5210 to train the 12 study optometrists to participate in shared care.

Study 3

A 6-month prospective experimental study was conducted in a hospital-based primary care clinic (Oster et al., 1999). An extended role for an optometrist involved the clinical evaluation of new referrals.

Correct appraisal was achieved in almost 80% (N=152) of cases for which a provisional diagnosis was made. For a further 17% of patients, the diagnosis was partially correct.

Study 4

A prospective uncontrolled experimental study carried out in Camden and Islington offered local GPs the option of informally referring selected patients with anterior segment eye disease to a specially trained optometrist for examination and advice (Winkler & Meads, 1998). The scheme recruited four optometrists with a GP and a pharmacist as 'partners'. The Health Authority paid optometrists a fixed fee of £30 for each patient seen. Optometrists had five options: discharge the patient; advise non-pharmaceutical treatment; recommend routine referral to the HES; urgent referral to the HES; or advise that a prescription be issued.

Of the 111 patients seen during the first 21 months of the scheme, medication was advised for 35 (32%) patients. 35% of patients were given advice on non-pharmaceutical treatment and 23% were discharged without treatment. Optometrists advised routine referral for 10% of patients and none was referred urgently; 39% of patients presented with dry eyes or blepharitis; 5% had bacterial conjunctivitis (personal communication).

Surveys of TPA-registered optometrists were conducted in 1991 and 1995 (Bachman & McAlister, 1993, Bachman & Bachman, 1996). Over the four-year period, the median number of prescriptions written by optometrists each month rose from 12 in 1991, to 20 in 1995. The percentage of optometrists prescribing oral drugs in 1995 was lower than the 1991 level, whereas the percentage prescribing topical drugs changed very little.

In 1990, McAlister conducted a survey of TPA-registered optometrists (McAlister, 1990a) and another survey of non-TPA registered optometrists. Over 95% of TPA-registered optometrists who responded reported confidence in treating corneal abrasions, conjunctivitis, and blepharitis. More than 80% were confident in the removal of foreign bodies and treatment of keratitis. However, fewer than 60% felt confident treating iritis: this may have reflected the possible need for further systemic investigation. Interestingly, 43% of responders felt that the increased scope of practice had improved their relations with ophthalmologists, who showed greater willingness to co-manage post-surgical care or glaucoma patients. Of non-certified optometrists, 89% felt that legislative changes had had no impact on referrals from ophthalmologists and 82% felt there had been no impact on interpersonal relations with ophthalmologists. The most commonly cited obstacle to certification was time for educational requirements, followed by 'impending retirement'.

Another US study considered the scope of optometric practice from the point of view of emergency eye care (Cohn & Kurtz, 1992). Computerised medical records were reviewed of almost 500 patients with eye-related problems attending an emergency clinic over a 6-month period in 1989. Ocular emergencies comprised of 2.9% of all emergencies seen in the clinic. Of the ocular conditions, 92% were for superficial conditions. Conjunctivitis (in almost 30% of cases) together with abrasions and superficial foreign bodies accounted for almost three-quarters of all eye emergencies. The authors concluded that optometrists, whose scope of practice included therapeutic prescribing, might be able to treat some urgent eye conditions more cost-effectively than the hospital.

Two US postal surveys were directed at both primary and secondary care eye care providers (Bass et al., 1996), (Walls et al., 1993).

Postoperative cataract care was surveyed nationally on a random sample of optometrists and ophthalmologists (Bass et al., 1996). A high response rate (more than 80%) was achieved by follow up telephone interviews of non-responders. Questions about the frequency and content of postoperative examinations and about referrals by optometrists were posed. The reported median number of referrals for cataract surgery in 1991 made by optometrists was 30. For patients without post-operative complications, four follow up visits during the first four months after surgery were recommended by the American Academy of Ophthalmologists: 12% of ophthalmologists and 54% of optometrists reported that they would perform fewer examinations.

The Oklahoma study (Walls et al., 1993) surveyed general and family physicians (434/1356; 32%), optometrists (236/368; 64%) and ophthalmologists (67/127; 53%) about the general management of eye disease. A therapeutic drug license was held by 94% of responding optometrists. Similarly, 94% of optometrists would treat conjunctivitis and a similar proportion would treat dry eye and corneal abrasion, 66% would treat a corneal ulcer and 60% would treat glaucoma. For all the conditions listed, optometrists would treat a higher proportion of presenting patients than would family and general physicians.

A US review of optometric malpractice summarised 163 case reports involving optometrists on file at Florida Society of Ophthalmology which took place during the period 1977- 1983 (Kirkconnell et al., 1986). These were 'clinically serious medical conditions arising from the efforts of all health practitioners to diagnose and treat ocular conditions'. Only 11 of these 163 cases went to court with failure to prosecute being attributed to lack of evidence of optometric malpractice. No conclusions about the safety of optometrist practice can be drawn from this study design.

A postal survey conducted in 18 European countries (Elie, 1997), posed a range of questions to opticians, optometrists and ophthalmologists, covering the scope of the professions, inter-professional relationships, fees charged, the supply of ophthalmologists and the "hopes and fears" held by respondents. A small sample (N=90), and low response rate (41%) precludes drawing any firm conclusions from the study findings.

2.4 GP management of eye disease

- *There is little adequate research to describe the quality of GP management of eye disease.*

- *Although discord may seldom be clinically important, in approximately half of cases ophthalmologists disagreed with general practitioners' diagnoses.*

- *Several studies have questioned the inappropriate GP use of corticosteroids for eye conditions.*

Twelve studies addressed the management of eye disease by GPs or other primary care physicians: key findings are summarised in Appendix 4. With one exception, all studies were published before 1995; since then important changes within both the UK and US primary health care systems may have affected the relevance of findings. There was no study with a randomised-controlled design, and only two attempted a comparative analysis (Harrison et al., 1988, Walls et al., 1993). There were four reviews of case notes, four prospective observational studies and two postal surveys. Referral patterns are reported in the section 2.5.

There were two experimental studies, one of which gave GPs the option of sending patients with anterior eye conditions to an optometrist (Winkler & Meads, 1998). However, details of GP management were not reported.

Most of the studies were UK-based (10/12) and data was collected from GP practices (8/10). Of two US studies, one provided few data (Ettinger et al., 1993) and the other surveyed the proportion of eye conditions that eye care practitioners would treat (Walls et al., 1993). The response rate of family practitioners to this latter survey was low (32%). Of respondents, 93% indicated that they would treat conjunctivitis, 88% would treat corneal abrasion and 62% would treat dry eye. Only 25% would treat a corneal ulcer and just 4% would treat glaucoma. These proportions were similar to, or lower than, the treatment levels indicated by surveyed optometrists in the same study.

2.4.1 Diagnostic accuracy

Two studies examined the accuracy of GP diagnosis of ocular conditions within the practice setting. The diagnostic accord and disagreement between GPs and an ophthalmologist were investigated as part of a prospective observational study of 17 GPs (Sheldrick et al., 1992). In 58% of cases, the ophthalmologist confirmed the GPs' diagnoses. There was important disagreement in only 1.4% of cases. Allergic conjunctivitis and dry eyes were the most commonly misdiagnosed conditions and infective conjunctivitis was the most frequently over-diagnosed condition. The accuracy of GP diagnosis was presented in terms of sensitivity, specificity and positive predictive power (PPV)[1]. The PPV for GP diagnosis of suspected glaucoma was 55%, for infective conjunctivitis was 71%, for allergic conjunctivitis was 67%, and for cataract was 70%. Of patients prescribed a corticosteroid, 70% were seen by the ophthalmologist and diagnostic accord was found in only 28.6% of the cases (Sheldrick et al., 1993).

An observational study of eye disease was conducted at a community health centre (Dart, 1986). An ophthalmic service was provided by an ophthalmologist at an equipped examination room at the health centre. Thirty patients saw both a GP and the ophthalmologist. Diagnostic accord was achieved for 12 (40%) of these patients. Microbial conjunctivitis had been over-diagnosed at the expense of blepharitis and two GP diagnoses of cataract were also found to be incorrect. The small sample size of this study limits generalisation from these results.

2.4.2 Prescribing appropriateness

Three studies reported on the use of steroids for ocular conditions. An eight-week prospective observational study of 14 GPs found that 17% of patients with ophthalmic ailments received eye preparations containing steroids and that these were sometimes supplied on repeat prescription (Phillips et al., 1990). The authors highlighted the dangers of ocular steroid use, recommending that these medications should not be available as repeat prescriptions. Sheldrick and colleagues reported that corticosteroids constituted 3.4% GP ophthalmic medications prescribed, of which 35% were considered inappropriate by the study ophthalmologist, based on the GP's diagnosis (Sheldrick et al., 1993). Details of studies that provide data on the frequency of prescriptions for different topical eye preparations are summarised in Table 2.

2.4.3 Epidemiology of ocular diseases

Studies provided some data on the prevalence of various eye conditions (Table 3). Phillips defines 'patient contacts' in the loose sense, to include repeat prescriptions and telephone conversations, whereas Dart, Sheldrick and McDonnell include only face-to-face consultations between the patient and physician for new, or newly recurrent, disease. This may account for some variation in the prevalence of more chronic disorders such as cataract and glaucoma. Dart's study was conducted over a three-month period during the summer, which may explain the findings for allergic conjunctivitis. Based on these data, a GP with a list size of 2000 patients, would expect between 90 and 170 consultations for eye disorders a year.

[1] Sensitivity represents the proportion of diseased persons in a screened population who test positive for the disease. It is a measure of the probability of correctly diagnosing a condition. Specificity is the proportion of non-diseased persons who test negative for a disease. It is a measure of the probability of correctly identifying a non-diseased person. The Positive Predictive Value gives the proportion of persons testing positive who are actually diseased.

Table 2: Ocular medications: frequency of prescribing in general practice

	McDonnell, 1988	Phillips, 1990	Sheldrick, 1993
Number of prescriptions (*patient contacts)	193	292	1771*
Non drug treatment (% consultations)	2.1% (5/238)	NS	NS
Advice only/ no treatment (% consultations)	19.3% (46/238)	NS	1.6% (28/1771)
Anti infective eye preparations			
Oral antibiotics	4.7%		
Topical antibiotics (all)			47.8%
Chloramphenicol	68.9%	35.3%	40.1%
Framycetin		0.3%	
Gentamycin	2.6%	5.8%	
Sulfacetamide		1.4%	
Trimethoprim +polymyxin		0.3%	
Acyclovir		0.3%	
Corticosteroids and other antiinflammatory preparations			
Allergy drugs			22.7%
Oral antihistamines	5.7%		
Topical corticosteroids	3.6%		3.4%
Topical antihistamines	3.6%		
Betamethasone		8.9%	
Clobetasone		0.3%	
Hydrocortisone		0.7%	
Topical sodium cromoglycate	12.4%		8.8%
Antazoline + cyclometazoline		1.4%	
Mydriatics and cycloplegics			
Atropine		0.7%	
Cyclopentolate		0.7%	
Treatment of glaucoma			
Timoptol		12.0%	
Pilocarpine		4.1%	
Local anaesthetics			
Miscellaneous			
Hypromellose	1.0%	9.9%	
Chloramphenicol + hydrocortisone		1.0%	

Table 3: Prevalence of eye conditions in general practice

Trial	Dart, 1986	McDonnell, 1988	Phillips, 1990	Sheldrick, 1993
Nº cases diagnosed	169	240	244	1685
Consultation rate for ocular disorders /1000 population/year	69.6	66.0	84.0	45.3
Allergic conjunctivitis	24.2%	14.6%	10.7%	12.2%
Anterior uveitis				0.9%
Bacterial (infective) conjunctivitis	4.7%	43.3%	35.2%	39.8%
Blepharitis (all)	6.5%	5.4%	7.8%	5.5%
Cataract	5.9%	0.4%	2.0%	4.6%
Corneal abrasion and foreign body		3.3%		
Dry eye/ keratoconjunctivitis sicca	1.8%		9.4%	4.5%
Floaters	2.4%	2.5%		
Glaucoma	1.2%	0.4%	15.6%	2.2%
Iritis	0.6%	0.8%	1.6%	
Lacrimal disorder	3.0%	1.6%	1.2%	6.4%
Macular disease	1.2%			1.1%
Meibomian cyst /chalazion*	4.7%	8.3%	6.6%*	3.2%
Migraine (with eye symptoms)	1.2%			2.2%
Problems with contact lenses	1.8%	4.2%		
Stye		2.9%		2.0%
Trauma	2.4%			1.0%

*including hordeolum cyst

2.5 Referrals for eye disease

- *There is little adequate research to describe the appropriateness of GP referrals for eye disease.*
- *In studies, about 15% of GP ocular consultations result in a referral. GP accuracy of diagnoses on referral is variable, and GPs may often refer for a definite diagnosis because of clinical uncertainty.*
- *About 5% of all optometrist consultations result in a referral, most commonly for suspected cataract or suspected glaucoma.*
- *Optometrist accuracy of diagnoses and appropriateness of referral is heavily influenced by legal requirements upon optometrist practice. Despite this, optometrists perform as well as or better than GPs on these counts.*
- *Conjunctival disorders form about 30% of all ocular conditions seen at A&E departments.*

Thirty-five published studies addressed referral for ocular disease; in addition, a review of referrals at two UK eye hospitals was identified, published as a PhD thesis. Key findings of all 36 references are summarised in Appendix 5. The studies adopted a variety of designs and addressed a range of issues. The source of diagnoses reported in practice-based studies varied, for example based on GPs' observations or the patients' medical records.

Most of the studies (81%) were based in the UK, but five were set in the US, one in Canada and one paper included studies taken from the UK, US and Australia (Brin & Griffin, 1995). Of the 36 studies, eleven were reviews (one including a survey), eight were surveys and ten were observational studies. There were two prospective case series studies (Ilango et al., 2000, Claoué, 1988) and two RCTs (Gray et al., 2000) (Kljakovic et al., 1985). The remaining designs were a prospective experimental study (Chambers & Fisher, 1998), and a meta analysis (Brin & Griffin, 1995).

Optometrists were the sole initiators of referrals in just over one third (35%) of studies. A further third of studies compared referrals by a variety of initiators and 17% addressed solely GP (or Primary Care Physician) referrals. One study, based in a dermatology department, considered referrals by dermatologists to ophthalmologists for medication-related ocular disorders (Cox & Paterson, 1994). A postal survey of optometrists considered perceived changes in referrals received from ophthalmologists (McAlister, 1990b) and an A&E-based study reported only self-referrals (Edwards, 1987). In one study of referrals to the Bristol Eye Hospital, no initiator of referrals was specified (Laidlaw et al., 1994). A UK observational study assessed the role of an ophthalmologist in a community health centre and measured the number of referrals averted as well as actual referrals (Dart, 1986).

2.5.1 Reasons for GP-initiated referrals

An observational study of 17 GPs found that 14.2% of patients presenting to the GP with an ocular disorder were referred to an ophthalmologist; the referral rate to all providers (opticians and medical or neurology specialists) was 16.4% (Sheldrick et al., 1993). Of referrals to an ophthalmologist, 47% were 'routine' referrals and 12% were 'urgent' referrals. 25% of referrals were for emergency care; and a further 12% were re-referrals. Fewer than 5% were for private ophthalmic consultations.

Similarly, McDonnell found that 15.6% of ocular patients were referred to an ophthalmologist; referrals to other providers were not reported (McDonnell, 1988). Eight studies providing data on GP referrals are summarised in Table 4. Variation in study design limits the comparability of findings. Referral data could be collected at practice level or from a range of secondary care settings, and prevalence and incidence data are variously reported.

Despite different study approaches, some messages are apparent. Referrals for cataracts represent between 30% and 40% of GP referrals, although this rate is much lower when only new referrals are considered. Eyelid disorders form about 20% to 35% of referrals. In general, less than 5% of GP referrals were for glaucoma except, notably, in one study where all patients were previous referrals and aged 75 and over (Hillman, 1994).

Table 4: GP referrals for ocular disease: by condition

Study	Source of diagnosis	Referral destination	Reason for referral	% Referrals	Nº cases	N	Patient group
Ettinger et al, 1993	PCP	Ophthalmologist	Conjunctivitis	16.67%	1	6	All referrals for ocular conditions
	PCP	Ophthalmologist	Eye irritation	16.67%	1	6	All referrals for ocular conditions
	PCP	Ophthalmologist	Glaucoma	16.67%	1	6	All referrals for ocular conditions
	PCP	Ophthalmologist	Itchy eyes	50.0%	3	6	All referrals for ocular conditions
Harrison et al, 1988	GP	Ophthalmologist	Binocular vision anomaly	12.8%	70	546	New GP referrals for ocular conditions
	GP	Ophthalmologist	Cataract	7.1%	39	546	New GP referrals for ocular conditions
	GP	Ophthalmologist	Glaucoma (suspected)	4.6%	25	546	New GP referrals for ocular conditions
	GP	Ophthalmologist	Headache	1.1%	6	546	New GP referrals for ocular conditions
	GP	Ophthalmologist	Lid/ adnexa disorders	19.6%	107	546	New GP referrals for ocular conditions
	GP	Ophthalmologist	Red eye	12.1%	66	546	New GP referrals for ocular conditions
	GP	Ophthalmologist	Visual disturbance/loss	24.4%	133	546	New GP referrals for ocular conditions
Hillman, 1994	GP	Ophthalmologist	Cataract	36.2%	72	199	Patients aged 75 +, referred for ocular conditions
	GP	Ophthalmologist	Glaucoma	21.1%	42	199	Patients aged 75 +, referred for ocular conditions
	GP	Ophthalmologist	Macular degeneration	29.6%	59	199	Patients aged 75 +, referred by GP for ocular conditions
McDonnell, 1988	GP	Ophthalmologist	Cataract	2.9%	1	35	Referrals for ocular conditions
	GP	Ophthalmologist	Corneal abrasion/ foreign body	14.3%	5	35	Referrals for ocular conditions
	GP	Ophthalmologist	Dacryocystitis	2.9%	1	35	Referrals for ocular conditions
	GP	Ophthalmologist	Floaters	11.4%	4	35	Referrals for ocular conditions
	GP	Ophthalmologist	Glaucoma	2.9%	1	35	Referrals for ocular conditions
	GP	Ophthalmologist	Iritis	5.7%	2	35	Referrals for ocular conditions
	GP	Ophthalmologist	Meibomian cyst	11.4%	4	35	GP referrals for ocular conditions
	GP	Ophthalmologist	Squint	5.7%	2	35	GP referrals for ocular conditions
Olver et al, 1989	A&E staff	A&E	Injury	59.3%	83	140	All referrals for ocular conditions
Oster et al, 1999	Ophthalmologist	Ophthalmologist	Cataract	35.5%	54	152	Consenting referrals for ocular conditions
Pooley, 1996	GP	A&E	Conjunctival disorders	20.2%	68	336	Diagnoses in 309 referrals with GP diagnosis stated
	GP	A&E	Iritis	7.1%	24	336	Diagnoses in 309 referrals with GP diagnosis stated
	GP	A&E	Lid disorders	17.3%	58	336	Diagnoses in 309 referrals with GP diagnosis stated
	GP	A&E	Glaucoma	6.5%	22	336	Diagnoses in 309 referrals with GP diagnosis stated
	GP	Ophthalmologist	Binocular vision anomaly	6.8%	167	2443	Diagnoses by GPs for referrals of ocular conditions
	GP	Ophthalmologist	Binocular vision anomaly	4.0%	6	150	Diagnoses by GPs for referrals of ocular conditions
	GP	Ophthalmologist	Cataract	29.5%	720	2443	Diagnoses by GPs for referrals of ocular conditions
	GP	Ophthalmologist	Cataract	38.0%	57	150	Diagnoses by GPs for referrals of ocular conditions
	GP	Ophthalmologist	Conjunctival disorders	9.2%	225	2443	Diagnoses by GPs for referrals of ocular conditions
	GP	Ophthalmologist	Conjunctival disorders	8.7%	13	150	Diagnoses by GPs for referrals of ocular conditions
	GP	Ophthalmologist	Glaucoma	1.6%	40	2443	Diagnoses by GPs for referrals of ocular conditions
	GP	Ophthalmologist	Glaucoma	0.7%	1	150	Diagnoses by GPs for referrals of ocular conditions
	GP	Ophthalmologist	Lacrimal disorders	8.1%	199	2443	Diagnoses by GPs for referrals of ocular conditions
	GP	Ophthalmologist	Lacrimal disorders	4.0%	6	150	Diagnoses by GPs for referrals of ocular conditions
	GP	Ophthalmologist	Lid disorders	31.2%	763	2443	Diagnoses by GPs for referrals of ocular conditions
	GP	Ophthalmologist	Lid disorders	35.3%	53	150	Diagnoses by GPs for referrals of ocular conditions
Sheldrick et al, 1993	GP	A&E	Anterior uveitis	14.5%	9	62	GP referrals to A&E for ocular conditions
	GP	A&E	Conjunctivitis	16.1%	10	62	GP referrals to A&E for ocular conditions

2.5.2 GP's confidence in the management of ocular disorders

GP confidence in the management of eye disease is implicit in GP referral behaviour: if a GP does not feel confident, he may seek to refer the patient. Two postal surveys addressed GP confidence in management of eye disorders (Walls et al., 1993, Featherstone et al., 1992). The studies used different methodology: Featherstone assessed the proportion of GPs who said they would refer (to whom was not specified), while Walls assessed the proportion of patients a primary care physician (PCP) would refer (to an optometrist or ophthalmologist) for a given condition. Featherstone and colleagues found that GPs would initially manage non-sight threatening ocular conditions themselves, but refer later if necessary, particularly when managing less common ocular conditions. Walls and colleagues similarly reported that PCP responders would manage most cases of conjunctivitis, corneal abrasion and corneal foreign body themselves, but would refer three-quarters of patients with corneal ulcers. Only 3% of these referrals would be to optometrists.

2.5.3 Diagnostic accuracy of GP-initiated referrals

Not all GP referrals to ophthalmologists contain a diagnosis, although most report patients' symptoms (Pooley, 1996). Two studies measured the accuracy of GP diagnosis of referrals (Box 3).

2.5.4 Appropriateness of GP-initiated referrals

Referrals to A&E for external eye conditions such as abnormalities of conjunctiva, lid or lacrimal disorders, some types of glaucoma and all referrals for cataract might be considered inappropriate (Pooley, 1996). In addition, referrals for which no abnormality could be detected may be thought inappropriate. However, an appropriate referral is not necessarily the same as an accurate referral. As the potential for harm from a missed diagnosis for a certain disease increases, society will tolerate higher levels of false positives, or patients referred simply where there is diagnostic doubt. An 'appropriate' referral may usefully be defined as one for a suspected condition that needs the level of care and skill provided by the practitioner to whom the referral is directed.

Little adequate evidence on the appropriateness of GP-initiated referrals was found. Frequently, insufficient information on the final diagnosis was given, the initiator of the referral was not specified, or the direction of referral was unclear. Six studies were found that provided some evidence.

One study (using 1986/87 data) compared an ophthalmologist's diagnosis with information from initiators of referrals (Harrison et al., 1988). No abnormality was detected in 11.4% of all new GP referrals to an ophthalmic outpatient department; GPs made 18% of these referrals for suspected disorders of the lids or adnexa, 13% were for red eye and 34% were for squint.

In a practice-based study, 16% of GP referrals to A&E were for suspected infective conjunctivitis (Sheldrick et al., 1993), although in 70% of these, the main reason for referral was to ascertain a diagnosis. McDonnell found that 4 of 35 (11.4%) referrals in his study were for meibomian cysts (McDonnell, 1988). The direction of referral was not specified.

Box 3: The accuracy of GP diagnosis of referrals

Study 1

Harrison and colleagues conducted a review of consecutive referrals to an outpatient department. The accuracy of diagnosis was assessed by comparing the primary and secondary reason for referral with the final diagnosis. The accuracy of diagnosis by general practitioners (compared with diagnosis by optometrists) was found to be 37% (80%) for suspected glaucoma; 20% (33%) for red eye; 52% (61%) for abnormalities of binocular vision and 98% (88%) for cataract.

Ophthalmic opticians were more likely than general practitioners to refer patients with suspected glaucoma or red eye correctly. More patients with disease of the posterior segment of the eye were referred by ophthalmic opticians than by general practitioners, and in nearly half of the referrals by ophthalmic opticians the presenting condition was asymptomatic (Harrison et al., 1988).

Study 2

Pooley conducted a review of referrals for ocular conditions to Birmingham and Midland Eye Hospital (BMEH) and to the outpatient and A&E departments of Moorfields Eye Hospital (MEH) (Pooley, 1996). The accuracy of GP-initiated referrals was assessed for:

(a) Referrals to the A&E department, with the GP's diagnosis, compared with that of the casualty officer (CO).

Of 702 GP referrals to Moorfields A&E department, 44% stated a diagnosis. Of these, 46% were correct and a further 9% partially correct. Retinal detachment was the most common misdiagnosis and fewer than 10% of cases of suspected glaucoma were confirmed. Over 90% of referrals for eyelid inflammations were confirmed.

(b) Referrals to the Bow Community Care Clinic over a 53-day period. Accuracy was measured by comparison of the GP's diagnosis with that of the ophthalmologist.

Approximately half (49%) of all GP-initiated referrals to the Bow Community Care Clinic contained no diagnosis. Of 174 GP referrals given a diagnosis by the GP, 57.5% were found to be correctly diagnosed, and only 13% were classified as incorrect diagnoses. Almost one quarter of all diagnoses was found to be partially correct. Almost 80% of eyelid disorders and half of all cases of suspected cataract and conjunctival disorders were confirmed by the ophthalmologist, but only 25% of lacrimal disorders were confirmed. Only 5% of cases of suspected cataract were found to be inaccurate, but 33% of lacrimal disorders and 29% of conjunctival disorders were inaccurate.

Pooley reported on referrals to an A&E department (Pooley, 1996). Of 336 diagnoses given by GPs, 181 (54%) were for conditions that could be considered as not requiring emergency treatment. One third of these referrals were for inflammation of the conjunctiva and a further 31% were for inflammation of the lids. 12% of the referrals were for corneal opacity and defect and a further 3% for cataract. Although the diagnoses given by the GPs suggest the referrals were inappropriate, this was not confirmed by an ophthalmologist. Similarly, reviews of two ophthalmic outpatient departments indicated that almost half of referrals were for external eye conditions, but the absence of any final and sufficiently detailed diagnoses preclude strong conclusions regarding appropriateness. There may have been 'reasonable doubt', necessitating a referral.

Two postal surveys of GPs suggest that some practitioners may refer conditions that should be treated in primary care. One study found that a significant proportion of responders would refer for some common conditions: up to 12% of GPs would refer bacterial conjunctivitis; up to 21% would refer allergic conjunctivitis and up to 32% would refer blepharitis, although the direction of referral was not specified (Featherstone et al., 1992). Family and general practitioners surveyed in the US (Oklahoma) indicated that they would refer 7% of cases of conjunctivitis and 38% of cases of dry eye (Walls et al., 1993).

2.5.5 Optometrist referrals

Of the twenty studies that assessed the reasons for optometrist referrals, fourteen were found that provided data on ocular conditions. Of these, two were surveys of optometrists and provided self-reported referral rates, rather than activity data (Bass et al., 1996, Walls et al., 1993).

Referrals for all conditions to any providers made up between 3% (Hobley et al., 1992) and 5.5% (Brin & Griffin, 1995) of all optometrist consultations. Referrals for all conditions to GPs ranged from 2.6% (Hobley et al., 1992) to 6% (Port, 1989) of all optometrist consultations. Direct referrals to an ophthalmologist resulted from only 0.2% of consultations (Hobley et al., 1992). Data on referrals by optometrists to 'traditional' A&E departments were only reported in A&E based studies. Emergency referrals by optometrists formed between 0.7% (Jones et al., 1986) and 3.5% (Marsden, 2000) of all referrals. Conversely, between 25% (Pooley, 1996) and 40% (Pooley & Frost, 1999) of referrals seen by the ophthalmic outpatients were initiated by optometrists. The conditions referred by optometrists are summarised in Table 5. The studies used different denominators in their analysis. For instance, some studies provided the number of optometrist referrals for suspected glaucoma as percentage of all referrals by optometrists; others provided the number of optometrist referrals for suspected glaucoma as percentage of all referrals by optometrists *for which a diagnosis was given*. In addition, some studies measured referrals at the optometrist's practice (giving the intended direction of referral), while others measure referrals received at the hospital level. The median and range of findings are reported in Table 5 below.

‘Reason for referral' means the optometrist's diagnosis of the probable condition, rather than the diagnosis given by an ophthalmologist.

2.5.6 Diagnostic accuracy of referrals by optometrists

Five studies were retrieved that compared the diagnosis of optometrists' referrals with those of the ophthalmologist: all were UK based (Box 4). One further study considered the accuracy of an optometrist's clinical appraisal of new referrals to hospital-based Primary Care clinic (Oster et al., 1999), but did not report the initiator of referrals.

2.5.7 Appropriateness of referrals by optometrists

The appropriateness of optometrist-initiated referrals may be assessed from secondary care referrals (to A&E or to outpatients), referrals to a GP recommending referral to a consultant ophthalmologist, or referrals to a GP for treatment. However, interpretation of previously published studies addressing the appropriateness of optometrists' referrals is confounded by legal considerations, which restrict their scope for professional judgement. Under the Opticians Act (1989), UK optometrists were required to refer all patients with eye diseases to a medical practitioner. The National Health Service (Primary Care) Act 1997 amended the Opticians Act (1989) to allow optometrists to use professional judgement when making referrals and not to be legally obliged to refer all abnormalities (Pooley & Frost, 1999). In February 2000, new guidelines were issued by the NHSE for cataract referrals, recommending that 'referrals should not be based simply on the presence of a cataract' (Department of Health, 2000a). Prior to this, it could be expected there would be high levels of both 'inaccurate' (i.e., not clinically significant) and inappropriate referrals.

Table 5: Optometrist referrals for ocular disease by condition

Reason for referral	Direction of optometrist referrals (%): median (range)				
	A&E	GP	Ophthalmologist via GP	Ophthalmologist directly	All providers
Binocular vision anomaly	-	-	5.8% (5.0%-10.0%)	-	5.8% (5.0%-10.0%)
Cataract/lens opacity	1.4% (1.0%-1.8%)	16.2% (14.6%-44.3%)	34.2% (12.5%-55.6%)	32.0%	18.2% (1.0% - 55.6%)
Conjunctivitis and related disorders (incl. red eye)	3.8% (3.6%-3.9%)	4.1% (4.0%-4.2%)	1.3% (1.2%-3.9%)	2.0%	3.8% (1.2%-6.1%)
Corneal disorders	10.9% (7.3%-14.6%)	4.4% (4.1%-4.8%)	5.0% (4.6%-5.3%)	12.0%	5.1% (4.1%-14.6%)
Diabetic retinopathy	-	2.0%	3.1%	-	2.5% (2.0%-3.1%)
Dry eyes	-	1.5% (1.4%-1.7%)	-	-	1.5% (1.4%-1.7%)
Floaters	-	1.6%	-	-	1.6%
Glaucoma	19.4% (9.7%-29.2%)	14.8% (12.1%-15.9%)	19.4% (4.4%-26.9%)	26.0%	16.4% (4.4%-29.2%)
Headache/migraine	-	5.8% (4.9%-6.7%)	3.1% (0.9%-5.3%)	-	4.9% (0.9%-6.7%)
Keratitis	26.2%	-	-	-	-
Lacrimal disorders (not including dry eye)	0.0%	-	1.7% (1.6%-1.8%)	0.0%	0.0% (0.0%-1.8%)
Lid disorders (including blepharitis)	0.0% (0.0%-0.0%)	4.3% (4.0%-4.6%)	1.7% (1.3%-2.1%)	6.0%	3.0% (0.0%-6.0%)
Macular degeneration	-	4.0% (3.0%-4.9%)	10.0% (4.4%-15.5%)	-	4.9% (3.0%-15.5%)
Maculopathy	14.8% (11.7%-18.2%)	-	10.6% (3.5%-12.9%)	8.0%	11.1% (3.5%-18.2%)
Retinal defect	10.9%	-	7.6% (6.3%-8.8%)	-	8.8% (6.3%-10.9%)

Where no range is reported, only one value was found from the literature review.

Harrison and colleagues found that in 9.6% of all new optometrist referrals to ophthalmic outpatients, no abnormality was detected (Harrison et al., 1988). None of these referrals was for disorders of the lids or adnexa and 4.8% were for red eye. 17% were for unspecified visual loss, but it is unclear whether this included any cases of suspected cataract. One third of optometrist-initiated referrals for which no abnormality was detected was for suspected glaucoma.

In a small study, Perkins' review of GOS18 forms found that 29% of patients, referred on by a GP and who were seen by an ophthalmologist (13/45), were found to have normal eyes. Although only the accuracy of optometrist diagnosis was assessed, the GP had implicitly supported this diagnosis. The optometrist's diagnosis was not reported in just under half (6/13) of the patients found to have normal eyes and it is unclear if the GP's decision to refer these patients was based on advice from the optometrist (Perkins, 1990).

Optometrist referrals to an A&E department were classified by the optometrists' diagnosis (Pooley, 1996). Approximately one quarter of optometrist-initiated referrals could be classed as 'inappropriate', since they were 'non-emergency' conditions; this was true both of direct referrals and of referrals via the GP. The main ocular condition for which optometrist referral was found to be inappropriate was corneal opacity and defect, which accounted for almost 60% of inappropriate direct referrals and just under 30% of referrals via the GP. No case of an inappropriate lid or lacrimal disorder was reported, but around 13% of inappropriate referrals were classed as inflammatory conjunctival disorders.

Box 4: The accuracy of optometrist diagnosis of referrals

Study 1

An ophthalmologist's diagnosis was compared with fifty-two optometrists' diagnoses made of 45 patients (Perkins, 1990). Patients were referred by optometrists to a GP practice and referred on to an ophthalmologist.

GPs in the study referred on 82% of referrals from optometrists. Diagnostic accord was achieved for 57% of optometrist diagnoses specified. Glaucoma was over-diagnosed by optometrists (7 of 9 diagnoses were false positives), but cataract was correctly diagnosed in 76% of cases.

Study 2

The International Glaucoma Association (IGA) Survey of optometrist referrals for suspected glaucoma reported on the accuracy of optometrists' assessments (Tuck, 1991). The survey graded optometrists' assessments in terms of the probability that the patient had the disease.

Of 1048 cases where a diagnosis was known, 74% of 'almost definite' cases of glaucoma were confirmed, compared with only 21% of those assessed as 'possible'. Overall, 42% of all suspected cases, for which the outcome was known, were confirmed.

Study 3

The accuracy of the diagnosis of eighty-nine optometrists' referrals was assessed, selected from new patients seen in an ophthalmologist's clinic over a 10-week period (Pooley & Frost, 1999).

The overall rate of optometrist diagnoses confirmed was 57%, but this varied by condition from 83% for diagnosis of cataract, 77% of maculopathy diagnoses, 71% of lacrimal disorders to 27% of glaucoma diagnoses. All diagnoses of lid disorders were confirmed, but there was no confirmation of diagnosis for 7 patients, four of which were diagnosed by the optometrist as having 'visual disturbances'.

Study 4

Harrison assessed the accuracy of referral by optometrists and by GPs. See Box 3: The accuracy of GP diagnosis of referrals.

Study 5

The accuracy of optometrist-initiated referrals was assessed for:

(a) Direct referrals to MEH (A&E) (Pooley, 1996).

Approximately 31% of direct referrals by optometrists contained no diagnosis. Comparison with the casualty officer's diagnosis found that 59% of diagnoses were correct, and a further 6.7% were partially correct.

(b) Referrals to an ophthalmologist at an outpatients clinic over a 53-day period (Pooley, 1996).

Approximately 20% of all optometrist-initiated referrals contained no diagnosis. Of 141 optometrist referrals containing a diagnosis by the optometrist, 42.6% were found to be correctly diagnosed, 27.0% were classified as incorrect and 24.8% partially correct. Almost 55% of cataract diagnoses were confirmed and a further 39% were classified as partially correct diagnoses; none was found to be incorrect. Almost half of glaucoma referrals were found to be inaccurate, with 40% correctly diagnosed by the optometrist and a further 8% partially correct. Maculopathy was correctly diagnosed in 35% of cases; lower rates of correct diagnosis were reported only for diagnostic classifications containing three instances or fewer. Only two cases of conjunctival disorders were diagnosed, one correctly and one incorrectly.

2.5.8 Notifications

Three of the studies addressed notifications by optometrists to GPs (Hobley et al., 1992, Port & Pope, 1988, Port, 1989). Since changes in the level of notifications are unlikely to result in any significant movement of resources, they have not been analysed here.

2.5.9 Emergency referrals

Ten studies assessed referrals for emergency eye care. One US study, set in a general A&E department with no ophthalmic speciality (Cohn & Kurtz, 1992), did not specify the source of referral, but provided data on the frequency of ocular emergencies. Studies varied by initiator of referral, organisation of emergency service, and patients groups referred. With such diversity, comparisons between the studies need to be made with caution. Table 6 shows the prevalence of ocular conditions found in the studies classified by the location of the emergency service.

Approximately one half of the ocular conditions seen in A&E were made up of trauma cases, with the majority of these being non-penetrating. A further one third of cases were for inflammation, of which the largest contributor was conjunctival disorders.

Between 60% and 90% (Marsden, 2000, Jones et al., 1986) of patients attending 'traditional' A&E departments were self-referred. GP referrals accounted for between 7% and 30% of patients (Jones et al., 1986, Olver & Hague, 1989), while optometrists accounted for few referrals, the highest proportion reported being less than 4% (Marsden, 2000). Scant data on the reason for referral of emergency conditions suggest that GPs tend to refer patients with injury and inflammatory conditions (Olver & Hague, 1989, Pooley, 1996, Sheldrick et al., 1993). Optometrists, on the other hand, seem to refer to A&E chiefly for keratitis and corneal opacity, and refer via the GP chiefly for glaucoma and maculopathy (Pooley, 1996).

2.6 National activity data

- *In the year 1999-2000, optometrists and Ophthalmic Medical Practitioners conducted 9.4 million NHS sight tests and prescribed 3.7 million pairs of NHS-reimbursed glasses at a cost of approximately £281 million.*

- *Currently, on average, an optometrist conducts about 150 sight tests and prescribes about 60 pairs of glasses to NHS and private patients per month.*

- *Each GP conducts an estimated 162 consultations for eye disease each year, referring 20-25% of patients.*

- *In 1999, GPs wrote nearly 12.9 million scripts for eye disorders at a cost of £72 million.*

We assessed national activity data to describe aggregate patterns of care for patients presenting with ocular conditions.

2.6.1 Optometrist activity data

In 1999-2000, NHS funded sight tests rose to 9.40 million in England, a 34% increase upon the previous year (Department of Health, 1999a), due to an extension of the eligibility of NHS sight tests to all persons over 60, although prescribing of glasses through the NHS voucher scheme remained static at 3.66 million (Department of Health, 2000c).

Table 6: All referrals to emergency care for ocular disease: by condition

Condition	% of all ocular conditions seen			
	A&E (HES) median (range)		A&E (general) (Cohn & Kurtz, 1992)	Primary care clinic+ (Ilango et al., 2000)
Allergy (*children)	1.9%	(0.4%* - 3.4%)	-	-
Blepharitis (*children)	3.4%*		4.5%	2.4%
Cataract	0.5%	(0.4% - 1.6%)	-	9.8%
Conjunctival disorders (all)	27.6%	(15.0% - 34.5%)	-	-
Conjunctival foreign body (*children)	7.7%	(2.9%* - 10.2%)	-	-
Conjunctivitis (*children)	18.6%	(9.4% - 24.8%*)	29.1%	24.4%
Corneal abrasion (*all abrasions)	12.5%	(9.9% - 17.2%)	26.6%*	9.8%
Corneal foreign body (*children)	13.2	(1.7%* - 21.7%)	-	21.1%
Corneal opacity and defect	8.1%		-	-
Dry eyes	2.4%	(2.0% - 2.8%)	-	6.5%
Foreign body (all) (*children)	6.1%	(4.6%* - 7.5%)	18.9%	-
Glaucoma	0.6%	(0.3% - 9.7%)	-	-
Inflammation	35.3%	(21.7% - 45.5%)	-	-
Injury/trauma (all)	54.7%	(43.7% - 65.7%)	-	-
Injury/trauma (penetrating)	0.2%	(0.1% - 0.6%)	7.9%	-
Injury/trauma (non-penetrating)	45.1%	(43.6%- 65.1%)	-	0.8%
Iritis (*children)	2.4%	(0.8%* - 5.7%)	-	-
Lacrimal disorders (*children)		(1.6% - 6.1%*)	-	-
Lid disorders	11.6%	(9.3% - 12.6%)	-	-
Meibomian cyst (*children)	10.1%*		-	4.9%
Uveitis	3.1%	(3.0% - 3.2%)	-	-

+Data relate to referrals managed solely by a nurse practitioner

10.5% of tests were for diabetes or glaucoma sufferers, or the close relatives of glaucoma sufferers over 40 (Department of Health, 2000b). Optometrists and OMPs also performed 267,810 domiciliary visits in England (Department of Health, 1999b). The cost to the NHS in England in 1999-2000 was £281 million. The cost of an NHS-funded sight test is currently £15.52 (Department of Health, 2001).

In 1999, there were 7,517 optometrists and Ophthalmic Medical Practitioners (OMPs), working in 6566 practices in England. Practitioners were contracted to perform sight tests, thus on average each optometrist conducted 1,250 NHS sight tests, and prescribed 487 pairs of glasses per year at a cost to the NHS of £36,100. However, 32.7% of tests were privately funded (Department of Health, 2000c), giving a total of 1,862 tests per optometrist per year or 155 per month. Assuming the same rate of spectacle prescribing for private and NHS funded consultations, an optometrist prescribes on average 60 pairs of glasses per month.

There are no national data available on the referrals made specifically by optometrists to primary or secondary care practitioners.

2.6.2 GP activity data

GPs may manage eye disease in primary care or refer patients when specialist care is indicated or in cases of diagnostic uncertainty. National data on referrals by GPs are only available at a fairly aggregated level. In 1998/9 there were 1.08 million ophthalmology outpatient referrals in England (DoH form QM08), of which 72% were written referral requests by GPs (personal communication: Department of Health). The remainder are a mix of 'unwritten' GP referrals, optometrist and self referrals, and referrals from other hospital departments. The proportion of referrals by GPs to A&E Departments for eye conditions is not reported nationally.

GP consultations rates for eye disease are shown in Table 7 (OPCS, 1994), although these were estimated in 1991. In 1999, there were 27 591 unrestricted principals and equivalents in England working in 8944 practices (Birmingham, 2000): on average, GPs had 162 consultations for eye disorders each year, or 13 per month. This is consistent with values found in individual studies (see 2.4.3). A GP would expect to make about 28 to 39 referrals per year or 2 to 3 per month.

National data for scripts prescribed on the NHS have been assessed and are shown in Table 8 (personal communication: Prescription Pricing Authority). GPs wrote nearly 12.9 million scripts for eye disorders in 1999 at a cost of £72 million. One quarter of all scripts was for antibacterials, primarily chloramphenicol. 5.6% of scripts were for corticosteroids, similar to 3.4% found in one study (Sheldrick et al., 1993). Two thirds of expenditure was accounted for by treatment for glaucoma. On average, each GP wrote 468 scripts in 1999, reimbursed at a total cost of £2,600. The average cost per patient for therapeutics for ocular conditions is estimated to be £16 per year.

Table 7: GP consultations for ocular disease: by condition per annum

Condition (ICD:9 Code)	Number per 10,000 population
Disorders of the globe (360)	0
Retinal detachments and defects (361)	3
Other retinal disorders (362)	16
Chorioretinal inflammations and scars and other disorders of choroid (363)	1
Disorders of iris and ciliary body (364)	7
Glaucoma (365)	31
Cataract (366)	46
Disorders of refraction and accommodation (367)	7
Visual disturbances (368)	31
Blindness and low vision (369)	9
Keratitis (370)	8
Corneal opacity and other disorders of cornea (371)	3
Disorders of conjunctiva (372)	521
Inflammation of eyelids (373)	100
Other disorders of eyelids (374)	16
Disorders of lacrimal system (375)	36
Disorders of the orbit (376)	3
Disorders of optic nerve and visual pathways (377)	1
Strabismus and other disorders of binocular eye movements (378)	10
Other disorders of eye (379)	24

Table 8: Therapeutics prescribed in primary care in England, 1999, with most common agents listed.

		Items	Cost (£)	Cost/Item
11	***Eye***	***12,867,691***	***72,081,416***	***5.60***
11.3.1	**Antibacterials**	**3,239,048**	**4,645,962**	**1.43**
	Chloramphenicol	2,216,022	2,280,876	1.03
	Fusidic Acid	895,116	2,015,599	2.25
	Gentamicin Sulphate	63,454	126,924	2.00
	Framycetin Sulphate	18,848	74,745	3.97
	Polymyxin B Sulphate	13,027	47,750	3.67
	Chlortetracycline Hydrochloride	11,651	12,432	1.07
	Ofloxacin	7,056	19,371	2.75
	Ciprofloxacin	4,257	24,556	5.77
	Neomycin Sulphate	3,942	16,864	4.28
	Propamidine Isethionate	2,732	6,804	2.49
	Dibromopropamidine Isethionate	2,635	7,339	2.79
	Others	308	12,702	41.24
11.3.2	**Antifungals**	**28**	**6,184**	**220.85**
11.3.3	**Antivirals**	**31,128**	**364,172**	**11.70**
	Aciclovir	30,980	357,485	11.54
	Others	148	6,687	45.18
11.4.1	**Corticosteroids**	**726,587**	**1,776,212**	**2.44**
	Betamesthasone Sodium Phosphate	276,080	395,858	1.43
	Dexamethasone	235,551	654,132	2.78
	Prednisolone Sodium Phosphate	102,784	415,141	4.04
	Prednisolone Acetate	71,085	189,870	2.67
	Fluorometholone	33,720	97,486	2.89
	Hydrocortisone Acetate	4,582	13,239	2.89
	Clobetasone Butyrate	2,721	9,900	3.64
	Others	64	586	9.15
11.4.2	**Other Anti-Inflammatory Preparations**	**1,306,189**	**8,507,989**	**6.51**
	Sodium Cromoglycate	949,406	5,473,592	5.77
	Nedocromil Sodium	214,474	2,334,363	10.88
	Anatazoline	62,896	154,690	2.46
	Lodoxomide Trometamol	57,336	349,152	6.09
	Azelastine Hydrochloride	11,037	86,655	7.85
	Levocabastine	7,074	66,847	9.45
	Emedastine	2,415	22,086	9.15
	Others	1,551	20,604	13.28
11.5.0	**Mydriatics and Cyclopegics**	**95,427**	**145,821**	**1.53**
	Atropine Sulphate	57,121	71,895	1.26
	Cyclopentolate Hydrochloride	28,013	43,000	1.53
	Tropicamide	6,493	11,860	1.83
	Homatropine Hydrobromide	3,127	13,395	4.28
	Others	673	5,672	8.43
11.6.0	**Treatment of Glaucoma**	**4,546,788**	**48,103,669**	**10.58**
	Timolol Maleate	1,262,477	8,686,386	6.88
	Dorzolamide	607,224	8,727,142	14.37
	Latanoprost	561,979	12,521,142	22.28
	Levobunolol Hydrochloride	477,648	4,016,239	8.41
	Pilocarpine Hydrochloride	379,315	976,905	2.58
	Betaxolol	366,434	2,848,154	7.77
	Carteolol Hydrochloride	337,997	2,761,183	8.17
	Brimonidine Tartrate	279,320	4,519,112	16.18
	Dipivefrine Hydrochloride	111,382	735,053	6.60
	Acetazolamide	69,479	863,121	12.42
	Dorzolamide & Timolol	54,680	1,063,916	19.46
	Adrenaline	23,038	139,061	6.04
	Guanethidine Monosulphate	6,015	48,388	8.04
	Pilocarpine Nitrate	5,798	100,781	17.38
	Metipranolol	3,411	89,082	26.12
	Others	591	8,004	13.54
11.7.0	**Local Anaesthetics**	**4,231**	**7,044**	**1.66**
11.8.1	**Miscellaneous Opthalmic**	**2,918,059**	**8,522,990**	**2.92**
	Hypromellose	1,532,340	2,867,301	1.87
	Carbomer 940/980	523,734	2,019,870	3.86
	Polyvinyl Alcohol	395,805	1,021,832	2.58
	Liquid Paraffin	297,890	971,546	3.26
	Paraffin Yellow Soft	58,767	224,109	3.81
	Acetylcysteine	30,890	280,207	9.07
	Sodium Chloride	25,669	349,986	13.63
	Hydroxyethylcellulose	23,728	425,969	17.95
	Ketorolac Trometamol	9,504	117,218	12.33
	Zinc Suphate	7,851	26,031	3.32
	Fluorescein Sodium	2,709	3,405	1.26
	Others	9,172	215,517	23.50
11.9.0	**Contact Lenses**	**206**	**1,375**	**6.67**

3. The AESOP Survey

- *The Anonymous Enquiry of the Scope for Optometrist Prescribing (AESOP), a national UK survey involving a random 10% sample of optometrists, was conducted to explore current referral practice and views about therapeutic prescribing.*

- *Participants in the AESOP survey were broadly representative of UK optometrists. The vast majority worked full or part-time in high street locations, providing full eye examinations as their main workplace activity. Self-reported activity data from the survey correlates well with data from the literature and published national sources.*

- *On average optometrists were consulted about 200 times a month and referred about 200 patients a year, most commonly for cataract.*

- *Almost 90% of optometrists were in favour of the introduction of therapeutic prescribing and agreed with the necessity of training: two-thirds of respondents wished to participate personally.*

- *Each optometrist might avoid about 60 referrals to or via a GP per year by being able to prescribe therapeutically; changes in other referrals would be negligible.*

- *Differing opinions about the need for a full eye examination when prescribing therapeutically will need to be addressed if prescribing rights are introduced.*

- *Optometrists are unhappy about the way they are currently reimbursed and demonstrate a strong preference for fee-for-service payments for therapeutic prescribing.*

- *Most respondents indicated a willingness to participate in supervised audit, re-accreditation and continuing education at reasonable intervals.*

3.1 Introduction

We conducted a survey in pursuit of representative data to describe optometric practice in the United Kingdom and how practice might change with the introduction of therapeutic prescribing. Survey data has strengths and weaknesses. Advantages may include speed and cost compared with other research designs, and suitability to measure simple factual constructs or to gauge opinion. Disadvantages include susceptibility to a range of biases, particularly for quantitative questions, such as responder, motivational and recall biases. What people say and what they do may not be the same thing. This is illustrated by a large study where printed educational materials were targeted at obstetricians in Ontario, aiming to reduce the number of unnecessary repeat caesarean sections (Lomas et al., 1989). Two years after the distribution of the guideline, one third of obstetricians indicated they had consequently changed their practice. However, only a 0.13% reduction in the overall section rate actually occurred. Caveats accepted, we elected to conduct a survey given the (anticipated) inadequacies of the findings of the literature review and the need for relevant descriptive data.

3.2 Methods

A postal survey was designed, named AESOP: Anonymous Enquiry of the Scope for Optometrist Prescribing. The content of AESOP was developed in conjunction with a project advisory group (see Acknowledgements) and piloted among Council members of the College of Optometrists in August 2000. The feedback from the piloting process were use to clarify and refine the survey content. The AESOP survey consists of 22 questions in 5 sections, covering basic demographic details, the nature of optometrists' work, and their views on prescribing, reimbursement and audit. Survey questions have either simple tick box answers or require numeric estimates.

The General Optical Council (GOC) supplied names, addresses, gender, region of practice (GOC coding) and date of registration from their database of UK registered optometrists. Individuals with incomplete details, or with a date of birth on or before 31/12/29, were excluded. Subsequently, a random 10% sample was derived to receive the survey using SPSS for Windows, release 10.0.5. The survey, reproduced in Appendix 6, was mailed on 14th September 2000, along with a letter and FREEPOST addressed return envelope. Reminder letters, with a further copy of the survey and envelope, were sent on 4th October 2000.

3.3 Results

A summary of the survey findings and their interpretation is provided. The survey questions together with data and graphical representations of responses are provided verbatim at the end of the chapter.

3.3.1 Representativeness of respondents (Questions 1-3, Figures 1-3)

The GOC provided details for 7,913 UK registered optometrists. After exclusions, 7,438 optometrists with complete details provided a random sample of 758 optometrists who were mailed the survey. The first mailing produced a response rate of 38.7%, rising to 57.0% after the second mailing, a total of 432. Nine respondents had retired, emigrated or died. Complete or partial data were available for 426 respondents (56.2%).

The demographic characteristics of the sample and of responders were similar to the population of optometrists from which they were drawn with respect to year of registration, gender and locality of employment with no statistically significant differences apparent (Table 9). With respect to these broad parameters responders are representative of their profession although it was not possible to test this on potentially more discerning parameters such as place of work or rural vs. urban practice. It remains possible that optometrists responding to AESOP were more interested in, or more inclined to consider, the subject of prescribing than non-responders. Just over half of optometrists surveyed were male, and the mean age of those surveyed was about 40.

3.3.2 Place and nature of work (Questions 4-9, Figures 4-9)

Of those optometrists reporting full time employment, 60% were employed in single practices, partnerships, franchises or multiple practices ('high street' locations). A further 10% were in other types of employment or retired and 30% did not report holding a full time post. Just over half of respondents reported part-time employment (some respondents reported full and part-time work). Of those in part-time work, 46% were in regular employment to some extent in high street locations. Of those in part-time work, 67% had more than one part-time job. One percent of respondents worked full-time, and a further 6% worked part-time, in a hospital. This compares with 4% of all optometrists surveyed in the College of Optometrists' Clinical Practice Survey in 1998 (The College of Optometrists, 1999). In total, 84% of respondents worked full or part-time in high street locations.

Table 9: Characteristics of the study population, random sample and responders

		Population, UK [1]		Random sample [2]		Respondents [3]	
		No.	**%**	**No.**	**%**	**No.**	**%**
Total		7438	100	758	10%	432	57%
GOC Area	Inner London	516	7%	54	7%	19	5%
	Outer London	557	7%	58	8%	30	8%
	England (not London)	5011	67%	510	67%	255	72%
	Scotland	717	10%	73	10%	25	7%
	Wales	386	5%	39	5%	16	5%
	Northern Ireland	251	3%	24	3%	8	2%
	Chi-square goodness of fit: [1] vs. [2], p = 0.99; [2] vs. [3], p = 0.26; [1] vs. [3], p = 0.23.						
Gender	Female	3400	46%	340	45%	180	43%
	Male	4038	54%	418	55%	240	57%
	Test for difference in proportions, exact test: [1] vs. [2], p = 0.64; [2] vs. [3], p = 0 .50; [1] vs. [3], p = 0.25.						
Date of Registration							
	-1960	267	4%	35	5%	24	6%
	1961-65	375	5%	37	5%	11	3%
	1966-70	397	5%	46	6%	23	6%
	1971-75	550	7%	54	7%	30	7%
	1976-80	882	12%	92	12%	64	15%
	1981-85	921	12%	96	13%	63	15%
	1986-90	1035	14%	115	15%	67	16%
	1991-95	1274	17%	105	14%	59	14%
	1996-2000	1737	23%	178	23%	75	18%
		Mean	**95%CI**	**Mean**	**95%CI**	**Mean**	**95%CI**
	Date of Registration	1985	(84 to 85)	1985	(84 to 85)	1984	(83-85)

Most respondents (95%) indicated that their main employment involved them in providing full eye examinations; this compares with 96% of respondents of the Clinical Practice Survey. Just under half of respondents (45%) reported involvement in local shared care schemes. The mean number of consultations made by an optometrist per month (reflecting the mix of full time and part-time work) is conservatively estimated to be approximately 200, matching the rate based on national statistics (section 2.6.1). However, 35% of respondents reported conducting 250 or more consultations per month.

On average, optometrists referred 249 patients each year: 97 patients to GPs, a further 129 patients to an ophthalmologist via a GP, 14 patients directly as an emergency and 9 patients privately to an ophthalmologist. These estimates were obtained by scaling monthly data.

Referral frequencies, by condition, were asked annually, since piloting suggested some conditions would be too rare to provide data for a monthly referral period. Optometrists make an average of 171 referrals a year and 56 of these are for cataract. Estimates of referral by condition (171) and by referral route (249) are of similar order of magnitude, bearing in mind differences in recall period, and the approximate nature of recall.

3.3.3 Views about the introduction of therapeutic prescribing (Questions 10-16, Figure 10)

Almost 90% of respondents thought optometrists should be able to train as therapeutic prescribers, whether this was independently for infection and inflammation, or dependently participating in clinician-initiated prescribing. Nearly two-thirds of respondents would wish to be able to prescribe either independently or dependently. Most respondents (90%) would be willing to undergo further training to be able to prescribe therapeutically, but only half of respondents thought it should be a basic entitlement following from registration.

3.3.4 Views about the conduct of therapeutic prescribing (Questions 16-17, Figures 11-12)

With scope to prescribe therapeutically and a patient presented with a suspected eye infection, optometrists held widely differing views about the need to conduct a full eye examination. Fifty-five percent of respondents reported that they would always or usually conduct a full examination in this circumstance.

Respondents reported that the ability to prescribe therapeutically would avoid the need for nearly 40% of referrals to a GP, and nearly 20% of referrals to an ophthalmologist via a GP. Respondents felt, on average 9% of emergency referrals could be prevented. It is interesting to speculate what these cases could be; possibly minor emergencies, such as corneal abrasion, ocular bodies, or contact lens complications. However, response data are highly skewed (i.e. influenced by relatively few respondents). Another possibility may be inadequate collaboration with local GPs leading to some optometrists deciding to 'fast track' patients through Accident and Emergency departments to an ophthalmologist.

By combining responses in Questions 8 and 17, an optometrist could avoid about 60 referrals to or via a GP per year by being able to prescribe therapeutically, but changes in other referrals would be negligible.

3.3.5 Views about reimbursement (Questions 18-19, Figures 13-14)

Just 12% of respondents were satisfied or very satisfied with current methods of reimbursement; conversely 41% were unsatisfied and 44% very unsatisfied. It is then unsurprising, when asked about the acceptability of alternative methods of funding, that only 4% of respondents would accept prescribing without any additional reimbursement. Three-quarters of respondents rejected the idea of taking on therapeutic prescribing under current funding arrangements. Only 24% of respondents supported the idea of an annual payment to provide a therapeutic prescribing service. Respondents were more equally divided about the idea of an enhanced sight test fee for all routine examinations, with 42% for and 47% against.

The two favoured forms of funding were a simple fee per therapeutic consultation or a fee schedule reflecting complexity, with 69% and 65% of respondents indicating that these would be acceptable respectively.

3.3.6 Views about training and audit (Questions 20-22, Figures 15-17)

Simple professional audit was considered acceptable by 77% of respondents. This might involve each optometrist receiving a PACT listing, similar to GPs, comparing their own prescribing activities against local, regional and national behaviour, with guidance provided by local authorities for unusual prescribing habits.

About three-quarters of respondents felt re-accreditation of therapeutic prescribing should occur every 3 or 5 years (40% and 37% respectively), and most respondents felt continuing education should be on an annual basis (68%).

3.4 Survey findings

The survey is reproduced with detailed findings of each question in Appendix 6. Most results are expressed as numbers of responses and as two percentages. The first percentage (% S) gives the number of responses, as a proportion of the total number of survey respondents. The second percentage (% Q) gives the number of responses, as a proportion of the total number of valid responses to that particular question.

4. Economic Impact

Economic analysis attempts to value alternative states of the world. In the context of the introduction of optometrist therapeutic prescribing this means estimating how patterns and appropriateness of healthcare will change and the resource implication of these changes. Ideally, analyses should take a societal perspective: in terms of healthcare provision, this means assessing patients' costs and benefits as well as those costs and consequences incurred by the NHS and by other institutions. In this section, the available evidence is drawn together and implications of findings are discussed.

4.1 Patient values, evidence and access to care

- *Optometrist therapeutic prescribing will improve patient access to care for ocular conditions by 27% to 50% and thus reduce costs of access to patients and increase convenience for users.*

There is inadequate evidence to assess how care might vary in terms of patient costs or health outcomes, when either a GP or optometrist provides initial care. The standpoint that optometrists are at least as accurate in diagnosis and referral is justified from the limited evidence, but it is not possible to proceed quantitatively beyond this broad equivalence. In terms of process of care, there are no adequate data to assess how patients may feel about receiving more care from optometrists rather than from other healthcare providers or how this may change the costs of obtaining care in terms of time and travel. However, one small experimental study suggests that, having once received care from optometrists, 55% (45/82) of patients preferred to consult an optometrist for eye care in the future. This compared with 15% (12/82) of patients who preferred to consult a GP (Chambers & Fisher, 1998). Since access to traditional routes to eye care would not be curtailed (patients can still present at their GP, A&E or HES), the introduction of optometrist therapeutic prescribing may be argued to increase patient choice and reduce the cost of access to services.

The Crown report indicates that benefits to patients should include improvement in patient access to treatment and in convenience for the user (Crown, 1999). Uptake of prescribing by optometrists is optimistically set at 68% (mid-point of responses to Questions 12 and 13 from the AESOP survey). If survey non-responders were assumed to have no interest in prescribing, then conservative uptake would be 37% (the number of those wishing to participate in prescribing divided by the survey sample size). Consequently, access to primary care at 8944 GP practices across England (Birmingham, 2000) would be extended by access to between 2,429 and 4,465 optometric practices (Department of Health, 2000c), which for commercial reasons are located for their users' convenience. Access would thus be increased by 27% to 50%.

4.2 Changes in the pattern of care

- *Limited evidence suggests that extended shared care between ophthalmologists and optometrists does not compromise clinical outcomes or substantially alter cost. The introduction of dependent optometrist prescribing would provide a logical extension of existing shared care arrangements.*
- *Optometrist therapeutic prescribing may be anticipated to reduce secondary care waiting list sizes and primary care waiting times. This could occur through a number of mechanisms, including improved patient access, more appropriate referral patterns and the appropriate devolution of patient acute and chronic management to optometrists. It is unclear if budgetary savings can be realised from changes in the current provision of care to offset the cost of optometrist involvement.*

- *It is plausible that the introduction of independent therapeutic prescribing by optometrists will be cost neutral, but further research and formal detailed costing is required to establish this with confidence.*

There are two kinds of therapeutic prescribing activity that optometrists may become involved in. Firstly, optometrists could prescribe independently for infection and inflammation. Secondly, dependent (clinician-initiated) prescribing may extend shared care between ophthalmologists and optometrists for stable chronic ocular conditions, such as glaucoma, cataract, and retinopathy.

4.2.1 Dependent prescribing

Dependent prescribing might be expected to involve the same scripts being prescribed by an optometrist rather than another healthcare provider, with the optometrist monitoring the medical condition and providing re-referral if necessary. If secondary care attendance is reduced, this may reduce monitoring costs and provide greater convenience to patients.

The Bristol Glaucoma study randomised patients with established or suspected glaucoma to traditional ophthalmologist care or shared care with optometrists, where the optometrists provided a monitoring role but had no scope to modify medication. There are a number of methodological limitations to the study, including details of randomisation and statistical analysis of resource data. After two years of follow-up, the study showed comparable clinical endpoints in patients followed-up by trained optometrists and ophthalmologists (Gray et al., 2000). The estimated higher average cost of optometrist management compared to ophthalmologist care (£77.48 vs. £59.95 per patient per year) appears largely to be an artefact of the study protocol, which required more frequent consultations with optometrists (Coast et al., 1997). The detailed costing illustrates the substantial administrative workload that shared care may generate for optometrists. The study also raises the issue of training: it included 12 optometrists who cost £5,210 to train on a 1-week course, or £434 per optometrist. There are no data on the number of patients who might be affected by changed shared care arrangements due to the introduction of optometrist therapeutic prescribing, and thus the overall economic consequences remain uncertain.

The Camden and Islington study, in which optometrists managed patients with anterior eye conditions, also involved an initial training programme (Winkler & Meads, 1998). The estimated cost per optometrist was approximately £1000 and involved a course in ocular therapeutics at City University, clinical training at Moorfields Eye Hospital and participation in outpatient clinics (personal communication).

4.2.2 Independent prescribing

There are two levels at which one could consider changes due to the introduction of independent therapeutic prescribing by optometrists. In the first scenario, the existing patterns of presentation of eye conditions continue (patients present as before to GPs, optometrists, HES and A&E), except that when an optometrist diagnoses inflammation or infection then they may prescribe. Prescribing would rise or fall depending upon optometrists' and GPs' relative use of therapeutics. Since there are no adequate comparative data to show how GPs and optometrists may prescribe differently, it has not been possible to model prescribing changes. As optometrists are at least as accurate at diagnosing these conditions, this is unlikely to lead to overall increases in prescribing or inappropriate care.

The main expected increase in cost would be the cost of optometrist training and the administrative costs associated with prescribing. The main expected decrease in NHS cost would be in the number of GP consultations and in secondary care referrals. The additional time spent by the optometrist for each patient would be small, since an eye examination and diagnosis are assumed to have already taken place. Changes in referral may be estimated from the AESOP survey (Table 10). There is good correlation between levels of referrals by optometrists estimated from the survey and from the literature (Perkins, 1990). Survey estimates of avoidable referrals are similarly supported (Chambers & Fisher, 1998).

Table 10: Changes in current referral patterns and cost per optometrist per annum, based on the findings of the AESOP survey

	Number (Question 8)	% Avoidable (Question 17)	Number avoided	Cost/referral (£)	Cost Saving (£)
GP referrals	100	39.4% (95%CI: 36.7% to 42.2%)	39.4 (95%CI: 36.7 to 42.2)	18[1]	709 (95%CI: 661 to 760)
Ophthalmologist referrals via a GP	130	18.1% (95%CI: 16.5% to 19.7%)	23.5 (95%CI: 21.5 to 25.6)	18+68[1]	2,021 (95%CI: 1849 to 2202)
			62.9 (95%CI: 58.2 to 67.8)		**2,730** (95%CI: 2510 to 2962)

[1] (Netten et al., 1999)

Assuming no change in treatment cost, these referral savings must be set against an optometrist's costs of participation (training, administration, time with patient, overheads) and the costs of providing audit and prescribing feedback. These costs would be divided between an average of 63 patients per optometrist per year. The estimated potential savings suggest that as long as this additional cost is no greater than about £43 per patient, then optometrist therapeutic prescribing will be no more expensive than existing care. Analysis of costs of providing extended shared care in the Bristol Glaucoma study suggests this may be plausible, although the cost components for independent prescribing may differ and further research is required. This first scenario may reasonably describe optometrist activity in the short run immediately after introduction of therapeutic prescribing.

The second scenario considers the long run, when optometrist therapeutic prescribing is established. In addition to optometrists prescribing for existing patients, a certain proportion of patients previously presenting to GPs, HES and A&E will instead present to the optometrist, aware that they are able to provide not just diagnosis but treatment. Again, there are no data to explore the extent of changes in patient healthcare-seeking behaviour. These changes may ease the burden on other over-stretched healthcare providers, but may substantially increase the gate-keeping role of optometrists (providing access to therapeutics and referral). It is possible that the work content of therapeutic optometrists could alter substantially if patients saw optometrists as their first port of call for eye conditions. Since optometrists operate in a commercial environment, it is clear that reimbursement will have to cover the necessary time and additional infrastructure costs to deliver a viable service. How optometrists will be reimbursed then becomes a central issue and, unsurprisingly, one about which optometrists have strong views. These issues are dealt with more fully in the following chapter.

5. Discussion

- *In the absence of studies that directly assess the quality of care delivered by optometrists who can prescribe therapeutically, the economic impact of introducing prescribing in the UK remains speculative.*
- *Optometrists, who wish to prescribe therapeutically, are willing to participate in supervised audit, re-accreditation and continuing education, consistent with the requirements of the Crown report.*
- *The need to address the reimbursement of optometrists is vital to the profession as well as to provide definitive analysis of the cost of introducing optometrist therapeutic prescribing. Different reimbursement strategies present different incentives to optometrists and have different administrative costs, which the profession should explore.*
- *Any reimbursement strategy chosen may be expected to have a profound impact upon patient choices, if it involves cost shifting from the NHS to the patient.*
- *Research providing valid, comparative data on the resources used and quality of care delivered by optometrists and other health care providers is required.*

Current legally authorised prescribers in the UK include doctors, dentists and certain nurses. The Crown Report recommends the extension of prescribing authority to new professional bodies, who may act independently or dependently. Optometrists are cited as potential candidates for independent prescribing, due to their expertise and use of specialist diagnostic instruments. The report cites emergency eye conditions and non-threatening sight conditions as potential areas for the application of prescribing authority (Crown, 1999). Quality assurance in primary care sits upon appropriate accreditation, continuing education and audit. Respondents indicated a willingness to participate in supervised audit, re-accreditation and continuing education at reasonable intervals: prerequisites of any new prescribing authority granted (Crown, 1999).

Emphasising that improvements in patient care and that safety must be assured, the Crown report identifies some potential benefits and costs that may arise as a result of an extension of prescribing authority. Benefits to patients include a more effective use of the experience and skills of certain professional groups, which may lead to more clinically appropriate and sympathetic prescribing as well as reducing the potential for wasteful use of resources. Patient access to treatment and advice is also expected to improve the care process and convenience. The Crown Report anticipates that expected improvements in professional relationships, with greater clarity regarding the roles and responsibilities of each profession, should also result in more integrated care, a central government objective for the NHS (Department of Health, 1997). The planned introduction of 500 new one-stop primary care centres by 2004, to accommodate GPs, pharmacists, dentists, opticians, health visitors and social workers under one roof, may further improve both patient access and inter-professional relationships (Department of Health, 2000d). Expected costs of extended prescribing authority include prescribing costs, training costs and administrative costs. Where there is uncertainty regarding the balance of costs and benefits, and in particular, where the net cost to the NHS is unclear, a thorough economic evaluation is encouraged (Crown, 1999). Our systematic review exposes the inadequacies of the literature to assess formally the cost-effectiveness of optometrist prescribing. There is no comparative evaluation of the quality-of-care provided for acute eye conditions by optometrists and GPs, or of patient views about access, convenience or satisfaction. Although optometrist therapeutic prescribing has been introduced in the United States, Canada and Australia, no adequate evaluation has been conducted from which to model changes in the UK. The dearth of good quality evidence makes the findings of any analysis necessarily tentative.

5.1 Reimbursement

The AESOP survey suggests that optometrists are unhappy about the way they are currently reimbursed, and this may explain their preference for fee-for-service style reimbursement. Such funding raises interesting issues for a publicly funded health delivery system. Fee-for-service payment may provide an incentive to optometrists to prescribe that is absent from an annual flat rate service payment. A recent systematic review provides evidence that the method of payment of primary care physicians affects their behaviour and the consequent health care provided (Gosden et al., 2000). Additionally, per-item reimbursement may be costly to administer compared to flat rate payment. An enhanced sight test fee for prescribing optometrists may be a middle ground, and respondents were fairly evenly split about the acceptability of this option. However, an enhanced sight test fee may be perceived as being divisive and may fail to address optometrists' dissatisfaction with the current system of reimbursement.

As identified in the chapter on economic impact, in the short run patients will be presenting to the optometrist with conventional expectations of either paying for eye care or receiving a NHS exemption. In the long run, patients who choose to consult an optometrist instead of a GP for an acute eye condition may expect this consultation to be covered by the NHS, as is the case in general practice. However, for legal or clinical reasons, it may be necessary for optometrists to conduct full sight tests on these patients, i.e. it may not be possible to separate sight testing from therapeutic prescribing. Under existing funding arrangements, this would involve cost shifting from the NHS onto those patients who are not NHS exempted. As a replacement for a GP consultation, and to ensure quality of care, it may be necessary for the NHS to fund a full sight test in these patients with some adjustment for therapeutic prescribing. However, it may not then be possible to differentiate between patients consulting for therapeutic and non-therapeutic reasons, making the current exemption system hard to sustain. Any transfer of costs onto patients may be expected to limit patient utilisation of optometrist therapeutic prescribing.

5.2 Research questions

The Crown report recommends the use of pilot studies to investigate the likely costs and benefits to the NHS in cases where the balance of these is unclear (Crown, 1999).
There is a fundamental need for valid comparative data on management of acute and chronic eye conditions in primary care, and no single study has adequately addressed this. Inferring differences between practitioners' by comparing the findings from different (uncontrolled) studies may be confounded by differences in design, and measurement and selection biases.

To address this issue, a number of study designs are possible. Each would seek to compare validly the care delivered by optometrists and other practitioners (in terms of appropriateness, clinical outcome and patient satisfaction) alongside their use of resources. Randomisation of patients to optometrist or GP care would provide definitive evidence, although the analysis plan would be required to reflect clustering at the level of the practitioner. Such a study would have an element of artificiality, since all patients would have to be enrolled from general practice. Alternatively, a calibration study would involve optometrists and GPs assessing and indicating the management of a panel of patients with representative conditions. This is a much simpler study to conduct, but findings may not reflect practitioners' actual practice. Although imperfect, these designs seek to eliminate known and unknown differences between patients and thus assess practitioner performance credibly. It would be possible, more simply, to introduce optometrist prescribing and conduct an observational study to provide data on quality of care, but a number of confounding influences may make such studies hard to interpret. The final study design chosen may depend upon whether the research objective is to provide precise estimates of their relative resource use and clinical outcomes, or, less ambitiously, to provide reassurance of the performance of optometrists.

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Appendix 1. Search strategies

AMED (1985 - 2000/08)
HMIC databases (King's Fund; HELMIS; Dhdata)
Sociological Abstracts (1963 - 2000/06)

```
1       62781  general
2       20342  practitioner*
3       62781  general
4       55547  practice
5       4537   GP
6       5126   GPs
7       94851  family
8       55547  practice
9       94851  family
10      20342  practitioner*
11      15703  (general practitioner* or general practice or GP or
               or family practitioner* ) in ti,ab
12             691    ophthalmolo*
13             209    optometr*
14             300    optician*
15             32     opthalmic
16      1015   ophthalmolo* or optometr* or optician* or opthalmic
17      16564  #16 or #11
18      2533   Medical-Audit
19      4526   referral*
20      9059   audit
21      2303   prescribing
22      3496   prescription*
23      13920  (referral* or audit or prescribing or prescription*) in ti,ab
24      2533   eye*
25      23763  disease*
26             321    eye* and disease*
* 27          11     #17 and (#18 or #23) and #26
```

CINAHL (1982 - 2000/07)

1	3673	explode "Eye-Diseases"/ all topical subheadings / all age subheadings
2	459	"Physicians-Family"/ all topical subheadings / all age subheadings
3	42	"Ophthalmology"/ all topical subheadings / all age subheadings
4	46	"Optometry"/ all topical subheadings / all age subheadings
5	540	#2 or #3 or #4
6	27705	general
7	18901	practitioner*
8	27705	general
9	73377	practice
10	4172	GP
11	575	GPs
12	34079	family
13	73377	practice
14	34079	family
15	18901	practitioner*
16	1891	(general practitioner* or general practice or GP or GPs or family practice or family practitioner*) in ti,ab
17	125	optometrist*
18	135	ophthalmologist*
19	94	(optometrist* or ophthalmologist*) in ti,ab
20	2144	explode "Referral-and-Consultation"/ all topical subheadings / all age subheadings
21	875	"Audit"/ all topical subheadings / all age subheadings
22	520	"Drugs-Prescription"/ all topical subheadings / all age subheadings
23	3511	#20 or #21 or #22
		The searches above are from: C:\WORK\OPTOME~1\SEARCHES\CINAHL.HIS.
24	1668	explode "Fees-and-Charges"/ all topical subheadings / all age subheadings
25	5110	#23 or #24
26	5424	referral*
27	3925	audit
28	1795	prescribing
29	4109	prescription*
30	1734	fees
31	5655	(referral* or audit or prescribing or prescription* or fees) in ti,ab
* 32	21	#1 and (#5 or #16 or #19) and (#25 or #31)

EMBASE (1980 - 2000/07)

```
1     227409   explode "Eye-Diseases"/ all subheadings
2      33014   "Family-Practice"/ all subheadings
3       6143   "Physicians-Family"/ all subheadings
4       2911   "Optometry"/ all subheadings
5       8613   "Ophthalmology"/ all subheadings
6      49153   #2 or #3 or #4 or #5
7     312507   general
8      42823   practitioner*
9     312507   general
10    186829   practice
11     42594   GP
12      2975   GPs
13    248706   family
14    186829   practice
15    248706   family
16     42823   practitioner*
17     35721   (general practitioner* or general practice or GP or GPs or family
               practice or family practitioner* ) in ti,ab
18             759   optometrist*
19      3306   ophthalmologist*
20      3928   (optometrist* or ophthalmologist*) in ti,ab
21     22699   "Referral-and-Consultation"/ all subheadings
22             13    "Gatekeeping"/ all subheadings
23      5437   explode "Medical-Audit"/ all subheadings
24     10625   explode "Fees-and-Charges"/ all subheadings
25      8464   "Prescriptions-Drug"/ all subheadings
26     46107   #21 or #22 or #23 or #24 or #25
27     35457   referral*
28     10181   audit
29      6806   prescribing
30     20032   prescription*
31     41614   (referral* or audit or prescribing or prescription*) in ti,ab
32             486   #1 and (#6 or #17 or #20) and (#26 or #31)
33   6861181   PY > "1980"
34             423   #32 and (PY > "1980")
35   7855651   LA = "ENGLISH"
36             381   #34 and (LA = "ENGLISH")
37    402186   exact{LETTER} in PT
38             367   #36 not #37
39    158997   explode "Asia"/ all subheadings
40     77193   explode "Africa"/ all subheadings
41     31190   explode "South-America"/ all subheadings
42     64095   explode "Scandinavia"/ all subheadings
43    322160   #39 or #40 or #41 or #42
44             355   #38 not #43
45    162194   explode "eye-disease"/ all subheadings
46     10097   "general-practice"/ all subheadings
47      2248   explode "ophthalmology"/ all subheadings
48             707   "optometry"/ all subheadings
49     12970   #46 or #47 or #48
50     26069   (general practitioner* or general practice or GP or GPs or family
               practice or family practitioner* ) in ti,ab
51      5794   "patient-referral"/ all subheadings
52      4734   "medical-audit"/ all subheadings
53     14190   "prescription"/ all subheadings
54      3561   explode "fee"/ all subheadings
55     27583   #51 or #52 or #53 or #54
56     36426   (referral* or audit or prescribing or prescription*) in ti,ab
57      2700   (optometrist* or ophthalmologist*) in ti,ab
* 58          289   #45 and (#49 or #50 or #57) and (#55 or #56)
```

MEDLINE EXPRESS (1980 – 2000/07)

No.	Records	Request
1	315402	eye*
2	85912	ocular
3	60481	optic
4	15114	conjunctiva
5	53486	cornea
6	97525	retina
7	4321	Sclerotic
8	24846	Choroid
9	57104	lens
10	498690	eye* or ocular or optic or conjunctiva or cornea or retina or Sclerotic or Choroid or lens
11	11742	optometr*
12	131522	optic*
13	118493	ophthalmolog*
14	700536	"general"
15	111347	practitioner*
16	439668	practice
17	504482	#15 or #16
18	109731	#14 and #17
19	82388	#14 near #17
20	327760	#19 or #11 or #12 or #13
21	Failed	drug*
22	4480797	drug*
23	1182481	therapeutic
24	58185	referral
25	30791	audit
26	52376	prescrib*
27	4943675	drug* or therapeutic or referral or audit or prescrib*
28	31015	#10 and #20 and #27
29	725251	infection
30	12972	conjunctivitis
31	1316	blepharitis
32	319476	viral
33	78265	fungal
34	32828	parasitic
35	1046092	infection or conjunctivitis or blepharitis or viral or fungal or parasitic
36	3479	#28 and #35
Searches and records above from: Selected Databases		
37	227409	explode "Eye-Diseases"/ all subheadings
38	33014	"Family-Practice"/ all subheadings
39	6143	"Physicians-Family"/ all subheadings
40	2911	"Optometry"/ all subheadings
41	8613	"Ophthalmology"/ all subheadings
42	49153	#38 or #39 or #40 or #41
43	312507	general
44	42823	practitioner*
45	312507	general
46	186829	practice
47	42594	GP
48	2975	GPs
49	248706	family
50	186829	practice
51	248706	family
52	42823	practitioner*
53	35721	(general practitioner* or general practice or GP or GPs or family practice or family practitioner*) in ti,ab
54	759	optometrist*
55	3306	ophthalmologist*
56	3928	(optometrist* or ophthalmologist*) in ti,ab
57	22699	"Referral-and-Consultation"/ all subheadings
58	13	"Gatekeeping"/ all subheadings
59	5437	explode "Medical-Audit"/ all subheadings
60	10625	explode "Fees-and-Charges"/ all subheadings
61	8464	"Prescriptions-Drug"/ all subheadings
62	46107	#57 or #58 or #59 or #60 or #61

```
63     35457   referral*
64     10181   audit
65      6806   prescribing
66     20032   prescription*
67     41614   (referral* or audit or prescribing or prescription*) in ti,ab
68       486   #37 and (#42 or #53 or #56) and (#62 or #67)
69   6861181   PY > "1980"
70       423   #68 and (PY > "1980")
71   7855651   LA = "ENGLISH"
72       381   #70 and (LA = "ENGLISH")
73    402186   exact{LETTER} in PT
74       367   #72 not #73
75    158997   explode "Asia"/ all subheadings
76     77193   explode "Africa"/ all subheadings
77     31190   explode "South-America"/ all subheadings
78     64095   explode "Scandinavia"/ all subheadings
79    322160   #75 or #76 or #77 or #78
* 80     355   #74 not #79
```

Appendix 2. Literature review, key details of studies

Study	Study question	Design and duration	Inclusion / exclusion criteria	Study period	Baseline comparability of patients/ practitioners	No. patients or practitioners	Reported outcome measures
Bachman and Bachman, 1996	Results from 1995 survey TPA registered optometrists reported and compared with results of 1991 survey	Survey, postal Primary care (optometrist) US (Missouri) NA	I: Optometrists listed by state board as TPA registered E: Optometrists practising outside the state	03/95 – 04/95	None explicit	353/552 valid responses	Office instruments used Categories of medication prescribed No. prescriptions written/month Sources of patients requiring therapeutic care Exposure to pharmaceutical representatives Characteristics of TPA practices
Bachman and McAlister, 1992	1991 survey of TPA registered optometrists	Survey, postal Primary care (optometrist) US (Missouri) NA	I: Optometrists listed by state board as TPA registered E: Optometrists practising outside the state	02/91 – 04/91	NA	253/381 valid responses	Mode of practice Categories of medication prescribed No. prescriptions written/month Sources of patients requiring therapeutic care Exposure to pharmaceutical representatives Characteristics of TPA practices
Bass et al, 1996	Ophthalmologist and optometrist postoperative management of cataract surgery patients assessed against national guidelines.	Survey, postal; random sample; Reminder; telephone interview Primary care (optometrist); Secondary care (ophthalmologist) US NA	I: Member of the AAO; performed at least 1 cataract operation in 1991; randomly chosen (1/6) Member of the AOA; had referred at least 1 cataract patient to an ophthalmologist in 1991; randomly chosen (1/12) E: None	06/01/92 – 03/02/92	Yes (of practitioners)	538/655 Ophthalmologists 130/154 Optometrists	Frequency and content of postoperative examinations Referrals by optometrists
Brick, 1995	Five case studies of ophthalmologist medication errors and subsequent litigation.	Case studies Secondary care (ophthalmologist) US NS	I: Part of data review by Physician Insurers Association of America (PIAA) E: Unclear	NS	NA	5 cases reviewed	Type medication involved Grounds for suing Settlement
Brin and Griffin 1995	Optometrist referral rates for ocular conditions	Literature review and meta-analysis Primary care (optometrist) US, UK, Australia 1961 - 1993	I: Referral rate can be computed or inferred E: Unclear	Variable	Type of practice reported	15 studies included	Type practice Mode research Referral rate: to ophthalmologists Referral rate: to all providers

Glossary to Appendix 2:

BMEH: Birmingham and Midlands Eye Hospital
HES: Hospital Eye Service
MEH: Moorfields Eye Hospital
HES: hospital eye service
NA: not applicable
NS: Not stated
VA: visual acuity
SHO: senior house officer

Study	Study question	Design and duration	Inclusion / exclusion criteria	Study period	Baseline comparability of patients/ practitioners	No. patients or practitioners	Reported outcome measures
Chambers and Fisher, 1998	Expansion in the scope of optometrist management of acute eye conditions in the community	Prospective experimental study Primary care (optometrist) UK (Staffordshire) 6 months	I: Patients referred to study optometrists E: NS	02/98 – 07/98	NA	7 optometrists (5 practices) 8 pharmacists 14 GPs (6 practices) 120 patients referred	Source referrals Waiting times Diagnoses Referrals Medications
Claoué, 1988	Prevalence of disease in patients attending ophthalmic medical practitioner (OMP) clinic	Prospective case series Primary care (OMP) UK (London) NS	I: Patients consulting OMP E: NS	NS	NA	500 consecutive patients	Reason for consultation Demographics and spectacle correction Abnormalities of the eye/visual system
Coast et al, 1997 (see also Gray et al, 2000; Spencer et al, 1995)	Community optometrists vs. hospital ophthalmologists: cost of care for patients with glaucoma	Pragmatic RCT; prospective cost analysis Primary care (optometrist); Secondary care (HES) UK (Bristol) 2 years	I: Stable glaucoma; ability to co-operate with examination; Snellen visual acuity of 6/18 or better in both eyes; aged at least 50 E: Co-existing pathology; extensive visual field loss	06/93	Reported elsewhere	405 patients enrolled 12 optometrists	Long term average costs Marginal opportunity costs Patient costs Sensitivity analysis
Cohn and Kurtz 1992	Prevalence of ocular conditions presenting to emergency room and cost of treatment	Review of computerised medical records Secondary care (A&E) US (Massachusetts) 6 months	I: All patients attending ER of sample hospital E: NS	01/01/89 – 30/06/89	NA	16,942 patients 492 patients with eye-related problems	Frequency of ocular emergencies Cost of ocular emergencies Source of payment Costs at other hospitals
Cox and Paterson, 1994	Dermatologist management of patients receiving antimalarials.	Survey, postal Secondary care (dermatologist) UK NA	I: Consultant and associate specialist members of the British Association of Dermatologists E: NS	NS	NA	224/325 dermatologists	Indications for antimalarials Types of antimalarials and dosage Efficacy and side effects Experience of ocular side effects Risk of ocular side effects Referrals to ophthalmologists Comparison with PUVA Basis for current management
Dart, 1986	Prevalence of ocular conditions in ophthalmologist community clinic and diagnostic accuracy in general practice	Prospective observational study Primary care (GP/ophthalmologist) UK (London) 3 months	I: All patients registered with study practice E: NS	20/05/84 – 20/08/84	NA	13,914 patients	Prevalence of eye disease Comparison of diagnoses Patients with referral avoided Patients referred to HES Cost of community ophthalmic specialist service
Edwards, 1987	Prevalence and management of ophthalmic emergencies	Prospective and retrospective observational study Secondary care (A&E, with specialist ophthalmic service) UK (Kent) 12 months	I: Patients attending study A&E department for eye conditions E: Eye emergencies referred directly by the GP to general ophthalmic clinics	05/83 – 04/84	NA	1870 new visits	No. and ages of patients attending Main diagnostic categories Analysis of trauma Seasonal variations for certain diagnoses Analysis of inflammation Diagnosis for patients admitted Disposal of new cases

Study	Study question	Design and duration	Inclusion / exclusion criteria	Study period	Baseline comparability of patients/ practitioners	No. patients or practitioners	Reported outcome measures
Elie, 1997	International comparison of scope of optometric practice in Europe	Survey, postal Primary care (optometrist, GP); Secondary care (ophthalmologist) 18 European countries NS	I: National representatives of the ECLSO E: NS	NS	NS	37/90 respondents	Profile of the professions Inter-professional relationships Fees Supply of ophthalmologists Hopes and fears
Ettinger et al, 1993	Management of ocular conditions by hospital-based primary care physicians.	Review of medical records Primary care (hospital clinic) US (New York) 1 year	I: Patients aged 40 and over, attending the hospital primary care department on the study day E: NS	NS	NA	48 patients 6 patients referred for eye care	For all, hypertensive and diabetic patients: % referred for eye care % seen within ophthalmology clinic
Featherstone et al, 1992	Prevalence and management of ocular disease in general practice	Survey, postal Primary care (GP) UK (S. Devon) NA	I: All GPs in the Torbay health district E: GPs who did not refer to Torbay DGH	04/89	NA	110/146 responders	Equipment Confidence in diagnostic skills Management policy Continuing medical education
Gray et al, 2000 (see also Coast et al, 1997, Spencer et al, 1995 a,b)	Cost-effectiveness of routine HES monitoring vs. community based optometric monitoring of patients with glaucoma	Pragmatic RCT Primary care (optometrist); Secondary care (HES) UK (Bristol) 2 years	I: Established or suspected POAG; attending study HES glaucoma clinic; aged 50 and over E: Extensive visual field loss; serious co-morbidity; unstable glaucoma	06/93 – 06/95	Yes	403 patients analyzed 200 (HES) 203 (community)	Baseline demographics Visual variables Number, reason and outcome of referrals by community optometrists
Gutteridge, 1987	Prevalence of ocular disease in optometric practice	Prospective case series Primary care (optometrist) Australia (Melbourne) 18 months	I: Consecutive new patients consulting study optometrist E: NS	02/02/81 – 20/07/82	NA	1500 patients	Demographic patient characteristics Prevalence of signs by site Number and prevalence of signs, symptoms and test results
Harrison et al, 1988	Rates and accuracy of referrals by GPs vs optometrists	Review of case notes Secondary care (OP) UK (Staffordshire) 14 months	I: Consecutive new patients referred to study ophthalmologist E: NS	01/11/86 – 31/12/87	NS	1113 patients	Referring agent and reason for referral Accuracy of referral Screening for ocular disease
Hillman, 1994	Non-attendance of elderly patients referred by GP to HES	Review of case notes (audit) Primary care (GP) UK (Humberside) 10 months	I: All patients aged 75 and over, registered with one GP practice E: NS	09/91 – 06/92	NA	838 patients	% attending HES Number of, disorders of and reasons for non attending
Hobley et al, 1992	Referrals and notifications by optometrists	Random, retrospective review Primary care (optometrist) UK 4 weeks	I: Optometrists, randomly selected from each electoral constituency of the GOC E: Optometrists not consenting to participate	04/90 – 04/91	NA	100/313 optometrists consented 74/100 complied 13 107 patients	For a 4 week period: Number of referrals and notifications by age of practitioner Direction of referral/ notification Reasons for referral/ notification Number asymptomatic patients referred

Study	Study question	Design and duration	Inclusion / exclusion criteria	Study period	Baseline comparability of patients/ practitioners	No. patients or practitioners	Reported outcome measures
Illango et al, 2000	Prevalence of ocular conditions managed by nurse practitioner at hospital eye clinic.	Prospective case series Primary care (hospital clinic) UK (Liverpool) 1 week	I: Consecutive patients attending primary care eye clinic without prior appointment E: Routine referrals	NS	NA	250 consecutive patients	Patient's age, sex, Liverpool residency Source of referral Diagnosis Number of re-appointments
Jones et al, 1986	Prevalence of ocular conditions in A&E	Retrospective review Secondary care (A&E, HES) UK (Southampton) 6 months	I: All patients attending during study period E: None	01/02/83 – 31/07/83	NA	8092 patients; 13544 visits	Method of referral Method of disposal (treatment outcome) Type of injury for trauma patients Causes of injury for trauma patients Duration of symptoms before attendance Age and sex distribution of new patients
Kaplan, 1982	Prevalence and management of ocular disease in primary vs. secondary settings	Prospective observational study Primary care (optometrist); Secondary care (residency clinic) US (Ohio) 2 years	I: All patients seen by author E: NS	24/01/79 - 07/02/81	Not done	377 patients (practice) 3279 patients (clinic)	Number of referrals Reasons for referrals Feedback from ophthalmologists % patients with contact lenses % with ocular disease
Kirkconnell et al, 1986	Misdiagnosis and mistreatment by optometrists and subsequent litigation	Review of case reports Primary care (optometrist) US (Florida) 6 years	I: Case reports involving optometrists on file at Florida Society of Ophthalmology E: NS	1977 - 1983	NA	163 cases	Type of error Age of optometrist (over 40) Visual result Malpractice cases
Kljakovic et al, 1985	Direct optometrist referral for raised IOP vs. referral via GP	Prospective RCT; CTA unclear Primary care (optometrist; GP) UK (Edinburgh) 5 months	I: Patients with raised IOP, fulfilling at least one of 4 criteria E: NS	NS	NA	49 direct referrals, 44 via GP	% GP referrals involving delay % GP referrals marked urgent % referrals with diagnosis confirmed
Laidlaw et al, 1994	Actual referrals vs. predicted referrals (extrapolated from earlier years) of patients with glaucoma	Review of referral records and clinical notes Secondary care (OP) UK (Bristol) 9 years (sample, 4 years)	I: Adult referrals to study hospital; sample of clinical notes for suspected glaucoma E: NS	1984 – 1992 01/07 – 31/12 for each year: 1987 - 1991	NA	9438 patients' case notes included	Numbers of referrals Rate of adult true positive glaucoma referrals
Marsden, 2000	Evaluation of telephone triage by nurse practitioners, advising GP and patients on referrals to A&E	Review of telephone triage Secondary care (A&E, HES) UK (Manchester) 1 month	I: Patients using TT, either directly by referrer, during study period. E: NS	1 month	NA	462 records, 303 from ARC, 158 from EEC	Accuracy of provisional diagnosis Accuracy and safety of assessment of urgency Difficulties of telephone triage decision making

Study	Study question	Design and duration	Inclusion / exclusion criteria	Study period	Baseline comparability of patients/ practitioners	No. patients or practitioners	Reported outcome measures
McAlister, 1990a	Survey of TPA registered optometrists	Survey, postal Primary care (optometrist) US (Missouri) NA	I: Optometrists licenses with Missouri State Board of Optometry, with address in Missouri or neighbouring sate within commuting distance E: Optometrists not TPA certified; those not practising within state	01/08/88	NA	205/305 optometrists responded	Confidence in treatment of conditions Confidence in prescribing TPAs Optometrists' perception of patients' confidence in optometrists' ability Change in patient volume % receiving referrals from PCPs Methods used to inform other health professionals / patients Shared care issues
McAlister, 1990b	Survey of optometrists, not TPA registered	Survey, postal Primary care (optometrist) US (Missouri) NA	I: Optometrists licenses with Missouri State Board of Optometry, with address in Missouri or neighbouring state within commuting distance E: Optometrists TPA certified	01/08/88	NA	113/471 optometrists responded	Practice setting % DPA certified Intentions regarding TPA certification Reasons for no TPA certification Changes in referrals from ophthalmologists Impact on interpersonal relations with ophthalmologists
McDonnell, 1988	Prevalence and management of ocular conditions in general practice	Prospective observational study Primary care (GP) UK (London) 3 months	I: Ophthalmic consultations E: NS	07/86 – 09/86	NA	2 GP practices; 238 consultations (224 patients) for ocular conditions	Proportion of consultations for ocular symptoms Age and sex of patients consulting with ocular symptoms Ocular diagnoses by GPs Treatments by GPs Diagnoses of patients referred to HES
Olver et al, 1989	Prevalence of ocular conditions in children presenting to A&E	Prospective observational study Secondary care (A&E, HES) UK (London - MEH) 5 months	I: All children (0-14) attending an ophthalmic A & E department during study period E: Patients aged 15 and over	11/86 – 03/87	NA	475 children (plus 26 children, excluded due to incomplete data)	% children attending % with non-traumatic disorders % with minor injuries Mode of referral Incidence of suspected NAI (non accidental injury)
Oster et al, 1999	Diagnosis of ocular disease by hospital-based optometrist of outpatients referrals	Prospective experimental study Primary care (hospital clinic) UK (London - MEH) 6 months	I: All new patients attending E: Existing patients	12/96 - 05/97	NA	157 patients examined, 152 provisionally diagnosed by optometrist	Number of complete examinations Accuracy of appraisal, all Accuracy of appraisal, cataract subgroup
Perkins, 1990	GP management of patients with suspected ocular disease referred by optometrists	Review of GOS 18 forms Primary care (GP) UK (Bournemouth) 18 months	I: All patients referred by optometrist to GPs using GOS18 forms. E: None	07/87 – 12/88	NA	61 forms	Patient's reason for contacting optometrist Optometrist's diagnosis Referrals to outpatients Ophthalmologist's diagnosis
Philips et al, 1990	Prevalence and management of ocular disease in general practice, including use of steroids.	Prospective observational study Primary care (GP) UK (Scotland) 8 weeks	I: All ophthalmic patient contacts (includes telephone contact, repeat prescription) E: None	NS	NA	14 GPs 297 ophthalmic patient contacts	No. ophthalmic preparations prescribed Diagnoses of patients prescribed steroid preparations Eye conditions diagnosed

Study	Study question	Design and duration	Inclusion / exclusion criteria	Study period	Baseline comparability of patients/ practitioners	No. patients or practitioners	Reported outcome measures
Pooley & Frost, 1999	Assessment of feasibility of direct referral by optometrists and OMPs	Review of referral correspondence Secondary care (OP) UK (London, Surrey) 4 weeks 2 weeks	I: All patients referred during study periods E: None	29/07/97 – 22/08/97 (London) 11/08/97 – 22/08/97 (Surrey)	NA	2 HES departments; 433 patients	No referrals by practitioner Correspondence format Median/mean times for referrals to reach hospital Patient demographics Content of referrals (diagnosis, exam results) Diagnoses of optometrist referrals Diagnostic accuracy of optometrist referrals
Pooley, 1996	Assessment of referrals for ocular conditions by optometrists, GPs and OMPs in different settings	Review of referral correspondence Secondary care (OP; A&E; HES) UK (London, Birmingham) 24 weeks 6 weeks 10 weeks	I: All patients referred during study periods E: None	London (MEH): 24 weeks randomly selected from period 27/02/92 – 26/10/93 Birmingham (BMEH): 16/07/94 – 27/08/94 London (MEH: A&E): 10 weeks randomly selected from 28/08/93 – 03/11/93	Yes	MEH (OP): 8435 patients; BMEH: 647 patients MEH (A&E): 7460 attendances	No. referrals by practitioners Reasons for referrals Referral delays Referral diagnosis score
Port & Pope, 1988	Survey of optometrist referrals and notifications over 6-day period in 1986	Survey, postal Primary care (optometrist) UK NA	I: Members or fellows of the BCO, resident in UK E: NS	10/02/86 – 15/02/86	NA	1031/5381 responses	Referrals by condition and sex Notifications by condition and age
Port, 1989	Survey of optometrist referrals and notifications over 5-day period in 1988. Reason for referral compared with that of 1986 survey.	Survey, postal Primary care (optometrist) UK NA	I: Members or fellows of the BCO, resident in UK E: Overseas, associated and retired members and fellows of BCO	04/01/88 – 08/01/88	NS	1561/5125 optometrists	Referrals by condition and age Notifications by condition and age
Shaw et al, 1986	Prevalence of disease and source of referral in ophthalmic outpatients	Prospective observational study Secondary care (OP) UK (Leicester) 1 year	I: All patients visiting eye clinic at LRI during study period. E: None	01/09/81 – 31/08/82	NA	10 002 patients 3004 new referrals	Age Sex Source of referral Clinical diagnoses Treatment
Sheldrick et al, 1992	Diagnostic accord of GP diagnosis with diagnosis by ophthalmologist	Prospective experimental study Primary care (GP) UK (Nottingham) 12 months	I: Patients attending general practice, presenting with ophthalmic conditions; invited and consented to see study ophthalmologist E: NS	01/03/89 – 28/02/90	NA	1474 patients invited 1121 saw ophthalmologist	Diagnosis of commoner eye conditions (GP/O) Diagnoses with important disagreement (GP/O) Sensitivities, specificities and PPVs for GP diagnoses
Sheldrick et al, 1993	Prevalence and management of ocular disease in general practice	Prospective observational study Primary care (GP) UK (Nottingham) 12 months	I: Patients attending general practice, presenting with ophthalmic conditions E: Estimated under reporting of consultations of 22.5%	01/03/89 – 28/02/90	NA	17 doctors in 7 practices 1577 patients 1771 consultations	Consultation rates Investigations Diagnoses Treatments Referrals

Study	Study question	Design and duration	Inclusion / exclusion criteria	Study period	Baseline comparability of patients/ practitioners	No. patients or practitioners	Reported outcome measures
Spencer et al, 1995a	Report on study design of routine HES monitoring vs. community based optometric monitoring of patients with glaucoma	Pragmatic RCT; CTA unclear Primary care (optometrist); Secondary care (HES) UK (Bristol) 2 years	I: Stable glaucoma: Primary open angle (POAG), pigment dispersion, pseudoexfoliative. Ability to co-operate with examination. Snellen visual acuity of 6/18 or better in both eyes. Aged 50 years and above E: Other glaucomas. Other co-existing ocular pathology. Extensive visual field loss. Best corrected visual acuity in either eye less than 6/18. Age less than 50 years	06/93	NS	204 (CC) 201 (HES) 12 optometrists	None reported
Spencer et al, 1995b	The cost of community based optometric monitoring of patients with glaucoma	Pragmatic RCT; CTA unclear Primary care (optometrist) UK (Bristol) 2 years	I: See Spencer et al 1995a E: See Spencer et al 1995a	06/93	NA	8 optometric practices	Cost of optometrist monitoring
Tabendeh et al, 1997	Identification of previously undiagnosed systemic disease in patients presenting to emergency eye clinic	Prospective observational study Secondary care (A&E; eye clinic) UK (London) 6 months	I: All new patients presenting with ocular problem E: Existing patients	NS	NA	1025 new patients	Previously undiagnosed systemic disease
Tan et al, 1997	Survey of senior house officers' confidence in management of ocular conditions presenting to A&E	Survey, telephone standardised structured questionnaire Secondary care (A&E) UK 2 months	I: Randomly chosen sample of A&E departments E: A&Es where patients redirected to nearby eye casualty department Paediatric A&Es	September and October 1993?	NA	226 A&E departments contacted; 192 Senior House officers (SHOs)	% SHOs receiving no training in eye emergencies Confidence of SHOs in dealing with eye emergencies Ways to improve confidence Access to slit lamp Ease of referral # eye cases/day
Tuck, 1991 Tuck and Crick, 1992	Survey of optometrist referrals for suspected glaucoma	Survey, delivered by hand Primary care (optometrist) UK 6 months	I: Optometrists within 7 areas of differing socio-economic class, invited by author to participate E: Unclear	11/88 – 08/89 (approx.)	Socio-demographic characteristics of sampled areas compared with average for GB	241 optometrists 275 600 sight tests	Referrals for suspected glaucoma Outcome of referrals Optometrists' assessments of likely diagnosis Accuracy of referrals
Vernon, 1983	Management and prevalence of ocular conditions presenting, or referred, to A&E	Prospective observational study Secondary care (A&E, HES) UK (Bristol) 24 weeks	I: All new cases E: None	01/02/81 – 31/07/81	NA	10 575 patient visits 7113 new cases	Diagnosis Aetiology Referral Disposal

Study	Study question	Design and duration	Inclusion / exclusion criteria	Study period	Baseline comparability of patients/ practitioners	No. patients or practitioners	Reported outcome measures
Walls et al, 1993	Management of ocular conditions by optometrists, ophthalmologists and family physicians	Survey, postal Primary care (family physician/ optometrist); Secondary care (ophthalmologist) US (Oklahoma) NS	I: Members of Oklahoma Optometric Association, practising in Oklahoma; Family/general practitioners and ophthalmologists, who are members of the Oklahoma State Medical Association Osteopathic family or general practitioners, provided by OOA E: Retired responders	NS	Profile of respondents given	Family physicians (434/1356) Optometrists (236/368) Ophthalmologists (67/127)	Referral patterns Distances between practitioners Treatment patterns Perceived adequacy of care Licensing of optometrists Laboratory testing optometrists Medicaid and Medicare Potential cost savings
Whittaker et al, 1999	Use of revised GOS 18 form in ophthalmic outpatient referrals	Survey, postal Review of medical records Primary care (optometrist); Secondary care (OP) UK (Southampton) 1 month (review)	I: All optometrists registered with the FHSA and within hospital catchment area Records of new outpatients at study hospital E: None	NS	NA	79/145 responders 555 case notes reviewed	Survey: routine use of revised GOS 18 form patient consent: sought, reasons Review: % with optometrist's referral letter % with letter on revised GOS 18 % with patient consent % with ophthalmologist response to optometrist
Wilcox and Bartlett, 1988	Systemic medication profiles of adult optometric outpatients and comparison of findings with results from national survey (1986)	Prospective case series Secondary care (OP) US (Alabama) NS	I: Aged 19 and over Scheduled for eye exam at study setting E: None	NS	NS	502 consecutive patients	Age and gender of patients 10 most common systemic drug groups 22 most common systemic drugs by sex 22 most common systemic drugs by race most frequent systemic drugs by age most frequent drug groups by age drug use by age 10 most frequently prescribed drugs in 1986
Wingert et al, 1992	Prevalence of ocular disease and access to care in nursing home residents	Prospective experimental study Community (Nursing home) US (Missouri) NS	I: All residents of study nursing home E: None	NS	NA	47 white, female patients	Ametopia Ocular disease Treatment received Visual acuity Tonometry
Winkler and Meads, 1998	GP referral of anterior segment eye conditions to optometrists	Prospective experimental study Primary care (optometrist; GP) UK (London) NS	I: Unclear E: Unclear	07/97	NA	4 optometrists 4 GPs	Not reported
Woodruff and Pack, 1980	Prevalence of ocular disease and role of screening in nursing home residents	Prospective experimental study Community (Residential and nursing homes) Canada (Ontario) NS	I: Residents of study homes consenting to screening E: NS	1970s	NA	1112/1331 patients screened	Demographic statistics Patients referred and cause of referral Time since last vision exam Visual acuity Intraocular pressure

Appendix 3. Optometrist management of eye disease

Study	Study question	Design and duration	Nº practitioners	Patient characteristics	Key results
Bachman and Bachman, 1996	Results from 1995 survey TPA registered optometrists reported and compared with results of 1991 survey	Survey, postal Primary care (optometrist) US (Missouri) NA	353/552 valid responses	NA	% Optometrists prescribing medication (N=353): Topical antimicrobial: 99% Topical antihistaminic: 92% Topical anti-inflammatory: 92% Oral analgesics (not controlled): 43% Oral analgesics (controlled): 30% Oral antimicrobial: 55% Oral antihistaminic: 40% No prescriptions written/month (N=353): Median: 20 (SIQR: 10; range: 2 - 400)
Bachman and McAlister, 1992	1991 survey of TPA registered optometrists	Survey, postal Primary care (optometrist) US (Missouri) NA	253/381 valid responses	NA	% Optometrists prescribing medication (N=253): Topical antimicrobial: 99% Topical antihistaminic: 96% Topical anti-inflammatory: 96% Oral antimicrobial: 61% Oral antihistaminic: 47% Oral analgesics (not controlled): 58% Oral analgesics (controlled): 53% No prescriptions written/month (N=253): Median: 12 (SIQR: 6; range: 1 - 100)
Bass et al, 1996	Ophthalmologist and optometrist postoperative management of cataract surgery patients assessed against national guidelines.	Survey, postal; random sample; reminder; telephone interview Primary care (optometrist); Secondary care (ophthalmologist) US NA	538/655 Ophthalmologists 130/154 Optometrists	NA	Number patients referred by optometrists (N=130) For cataract surgery: median and range for 1991: 30 (1 – 100) No. of patients referred by optometrists For postoperative complications (N=59): Acute pain/raised IOP: 52 (92%) Rebound inflammation: 46 (78%) Dislocation intraocular lens: 59 (100%) For postoperative complications (N=58): Unexplained decrease in VA: 58 (100%) Cystoid macular oedema: 53 (91%) Posterior capsule opacification: 58 (100%) New irregularity of pupil: 50 (86%)
Chambers and Fisher, 1998	Expansion in the scope of optometrist management of acute eye conditions in the community	Prospective experimental study Primary care (optometrist) UK (Staffordshire) 6 months	7 optometrists (5 practices) 8 pharmacists 14 GPs (6 practices) 120 patients referred	Male: 43.1% (N=109): 47 Mean age: 46 (22SD, N=109)	Optometrists' diagnoses (N=109): conjunctivitis: 16 (14.7%) Dry eyes: 8 (7.3%) Subconjunctival haemorrhage: 8 (7.3%) Corneal erosion: 7 (6.4%) (38%) Allergic conjunctivitis: 6 (5.5%) Reassurance only: 4 (3.7%) GP visits (N=109): No further consultation: 92 (84.4%) At least one consultation: 11 (10.1%) Unknown: 6 (5.5%) Patients requiring GP prescription (N=109): 41 Local hospital based ophthalmology service began a few months before the start of this study, offering almost immediate appointments with a triage nurse and SHO
Cohn and Kurtz 1992	Prevalence of ocular conditions presenting to emergency room and cost of treatment	Review of computerised medical records Secondary care (A&E) US (Massachusetts) 6 months	16,942 patients 492 patients with eye-related problems	NS	Frequency of ocular emergencies (N=16 942): 492 (2.9%) Superficial ocular emergencies (N=492): 453 (92.1%) Penetrating trauma (N=492): 39 (7.9%) Diagnosis (N=492): Conjunctivitis: 29.1% Abrasions: 26.6% Superficial foreign bodies: 18.9%

Study	Study question	Design and duration	Nº practitioners	Patient characteristics	Key results
Elie, 1997	International comparison of scope of optometric practice in Europe	Survey, postal Primary care (optometrist, GP); Secondary care (ophthalmologist) 18 European countries NS	Primary care (optometrist, GP); Secondary care (ophthalmologist)	37/90 respondents	Profile of the professions Inter-professional relationships Fees Supply of ophthalmologists Hopes and fears
Gray et al, 2000	Cost-effectiveness of routine HES monitoring vs. community-based optometric monitoring of patients with glaucoma	Pragmatic RCT Primary care (optometrist); Secondary care (HES) UK (Bristol) 2 years	12 optometrists 403 patients	HES: mean age = 69.4 (SD8.8) Male: 57.5% (N=200): 115 Community: mean age = 68.0 (SD8.3) Male: 50.7% (N=203): 103	HES (N=200): Mean number of missed points on visual field testing (better eye): 7.9 Mean number of missed points on visual field testing (worse eye): 20.2 IOP (better eye): 19.3 mm Hg IOP (worse eye): 19.1 mm Hg Community (N=203): Mean number of missed points on visual field testing (better eye): 6.8 Mean number of missed points on visual field testing (worse eye): 18.4 IOP (better eye): 19.3 mm Hg IOP (worse eye): 19.0 mm Hg No significant differences found
Kirkconnell et al, 1986	Misdiagnosis and mistreatment by optometrists and subsequent litigation	Review of case reports Primary care (optometrist) US (Florida) 6 years	163 case reports	NA	11 malpractice cases 4 settled in favour of plaintiff; 7 pending at time of publication
McAlister, 1990a	Survey of TPA registered optometrists	Survey, postal Primary care (optometrist) US (Missouri) NA	205/305 optometrists responded	NA	Confidence in treating (% optometrists; From histogram; N=205): Corneal abrasion: 99.2% Conjunctivitis: 97.5% Blepharitis: 95.9% Foreign body removal: 81.0% Iritis: 59.5% Keratitis: 82.6% Confidence in prescribing (From histogram; N=205): Topical antimicrobial: 100% Topical antihistaminic: 100% Topical anti-inflammatory: 89.3% Oral antimicrobial: 44.6% Oral antihistaminic: 47.9% Oral analgesics: 55.4% Relations with ophthalmologists (N=205): Improved: 43% No change: 40% Worsened: 7%
McAlister, 1990b	Survey of optometrists, not TPA registered	Survey, postal Primary care (optometrist) US (Missouri) NA	113/471 optometrists responded	NA	% DPA certified (N=104): 38 (36.5%) Impact on referrals from ophthalmologists (From histogram; N=103): Increase: 4.9% Decrease: 7.3% No change: 89.0% Impact on interpersonal relations with ophthalmologists (From histogram; N=103): Better: 7.1% Worse: 4.7% No change: 88.2%

Study	Study question	Design and duration	Nº practitioners	Patient characteristics	Key results
Oster et al, 1999	Diagnosis of ocular disease by hospital-based optometrist of outpatient referrals	Prospective experimental study Primary care (hospital clinic)UK (London - MEH) 6 months	One optometrist	New outpatient referrals (N=152) Age reported in histogram	Accuracy of appraisal for all study patients (N=152): Correct appraisal: 121 (79.6%) Partially correct appraisal: 26 (17.1%) Incorrect appraisal: 5 (3.3%) Accuracy of appraisal for cataract subgroup (N=54): Correct appraisal: 50 (92.6%) Partially correct appraisal: 4 (7.4%) Incorrect appraisal: 0 (0.0%)
Walls et al, 1993	Management of ocular conditions by optometrists, ophthalmologists and family physicians	Survey, postal Primary care (family physician/ optometrist); Secondary care (ophthalmologist) US (Oklahoma) NS	Family physicians (434/1356) Optometrists (236/368) Ophthalmologists (67/127)	NA	% patients that family physicians (optometrists) would treat, by condition: Conjunctivitis: 93% (94%) Corneal abrasion: 88% (95%) Corneal foreign body: 83% (90%) Dry eye: 62% (96%) Corneal ulcer: 25% (66%) Glaucoma: 4% (60%) Cataract: 0% (13%) Unclear what proportion of 'treat' means refill of prescriptions
Winkler and Meads, 1998	GP referral of anterior segment eye conditions to optometrists	Prospective experimental study Primary care (optometrist; GP) UK (London) NS	4 optometrists 4 GPs	Patients with anterior segment problems	Not reported here Full report ordered as ILL

Appendix 4. GP management of eye disease

Study	Study question	Design and duration	No. patients or practitioners	Patient characteristics	Key results
Dart, 1986	Prevalence of ocular conditions in ophthalmologist community clinic and diagnostic accuracy in general practice	Prospective observational study Primary care (GP/ophthalmologist) UK (London) 3 months	223 patients presented with ocular conditions 242 consultations	NS	Prevalence of eye disease seen by ophthalmologist (N=169): Seasonal allergic conjunctivitis: 36 (21.3%) No abnormality detected: 22 (13%) Blepharitis: 11 (6.5%) Cataract: 10 (5.9%) Meibomian cyst: 8 (4.7%) Microbial conjunctivitis: 8 (4.7%) Comparison of diagnoses by GP with ophthalmologist (N=30): Same as ophthalmologist: 12 (40%) Different from ophthalmologist: 18 (60%) Patients with referral avoided (N=223): 46 (20.6%) Patients referred (N=223): 18 (8.1%) Cost of community ophthalmic specialist service: Cost of 46 ophthalmic outpatient visits to MEH: £768 Cost of weekly community ophthalmic service: £423
Ettinger et al, 1993	Management of ocular conditions by hospital-based primary care physicians.	Review of medical records Primary care (hospital clinic) US (New York) 1 year	48 patients	NS	Number seen within hospital ophthalmology clinic (N=48): 16 (33.3%)
Featherstone et al, 1992	Prevalence and management of ocular disease in general practice	Survey, postal Primary care (GP) UK (S. Devon) NA	130/146 GPs used DGH 98/130 completed questionnaire	NA	Equipment (N=98): Snellen chart: 95% Fluoroscein drops: 94% Slit lamp: 11% Tonometer: 10% Confidence in diagnostic skills [confidence in managing] (N=98): Bacterial conjunctivitis: 94% [88%] Allergic conjunctivitis: 93% [79%] Meibomian cyst: 93% [12%] Blepharitis: 92% [68%] Corneal abrasion: 94% [45%] Continuing medical education: 53% wished to attend eye clinics as observers
Harrison et al, 1988	Rates and accuracy of referrals by GPs vs optometrists	Review of case notes Secondary care (OP) UK (Staffordshire) 14 months	546/1113 patients	NS	Primary reason for GP referral (N = 546): Visual disturbance/loss: 133 (24%) Suspected glaucoma: 25 (5%) Abnormality of binocular vision: 70 (13%) Disorders of eyelid/adnexa: 107 (20%) Red eye: 66 (12%) Accuracy of referrals (primary and secondary diagnosis): Suspected glaucoma: 10/27 (37%) Abnormality of binocular vision: 40/77 (52%) Red eye: 8/40 (24%) Cataract: 42/43 (98%) Screening for ocular disease (N = 546): Asymptomatic patients: 10 (1.8%)
Hillman, 1994	Non-attendance of elderly patients referred by GP to HES	Review of case notes (audit) Primary care (GP) UK (Humberside) 10 months	838 patients	Aged 75 and over	Patients attending HES (N=838): 199 (24%) Diagnosis (N=199): Cataracts: 72 (36%) Glaucoma: 42 (21%) Macular degeneration: 59 (30%)

Study	Study question	Design and duration	No. patients or practitioners	Patient characteristics	Key results
McDonnell, 1988	Prevalence and management of ocular conditions in general practice	Prospective observational study Primary care (GP) UK (London) 3 months	238 consultations (224 patients) for ocular conditions	Male: 42% (N=224): 94 26% patients aged 25-44 26% patients aged 0-4	Proportion of consultations for ocular symptoms: 2.3% Ocular diagnoses by GPs (N=240): Bacterial conjunctivitis 104 (44%) Allergic conjunctivitis 25 (15%) Meibomian cyst 20 (8.4%) Blepharitis 13 (5.4%) Problems with contact lenses 10 (4.2%) Treatments by GPs (n=224): Topical chloramphenicol 133 (55%) Topical sodium cromoglycate 19 (8%) Oral antihistamines 11 (4.6%) Oral antibiotics 11 (4.6%) Non drug treatment 5 (2%) Advice only 46 (19.3%) GP diagnoses of patients referred to HES (N=35): Corneal abrasion and foreign body 5 (14.3%) Floaters 4 (11.4%) Meibomian cyst 4 (11.4%) Squint 2 (5.7%)
Perkins, 1990	GP management of patients with suspected ocular disease referred by optometrists	Review of GOS 18 forms Primary care (GP) UK (Bournemouth) 18 months	61 forms	NA	GP referrals to ophthalmologist (N=61): 50 (82.0%); 2 to A&E. Diagnosis by ophthalmologist (N=45): Optometrists provisional diagnosis confirmed: Cataracts: 19/22; Glaucoma: 2/9; Macular degeneration: 2/8; Amblyopia: 1/1 13 found to be normal GP did not referred (N=11): 1 refused; 3 untreatable; 2 under review by hospital; 5 referral to ophthalmologist not needed (1 carcinoma of stomach; 2 headaches; 1 to ophthalmic practitioner; 1 IOP normal) No information on GP diagnoses of referred group.
Philips et al, 1990	Prevalence and management of ocular disease in general practice, including use of steroids.	Prospective observational study Primary care (GP) UK (Scotland) 8 weeks	14 GPs 297 ophthalmic patient contacts; 244 diagnoses for 227 patients Estimated 25% consultations missed by the study.	NS	Ophthalmic preparations prescribed (N=292): Chloramphenicol: 103 (35%) Timoptol: 35 (12%) Hypromellose: 29 (10%) Betamethasone: 26 (9%) Gentamycin: 17 (6%) Pilocarpine: 12 (4%) (2.5%) Diagnoses of patients prescribed steroids (N=40): Allergic conjunctivitis: 15 (38%) Postoperative: 7 (18%) Iritis: 6 (15%) Conjunctivitis: 4 (10%) Follicular conjunctivitis: 3 (8%) Episcleritis/trauma/blepharitis/meibomian cyst/other: 1 each Chloramphenicol + hydrocortisone: 3 (1%) Hydrocortisone: 2 (0.7%) Eye conditions diagnosed (N=244): Infectious conjunctivitis: 86 (35%) Glaucoma: 38 (16%) Allergic conjunctivitis: 26 (11%) Conjunctivitis sicca: 23 (9%) Blepharitis: 19 (8%) Hordoleum + meibomian cysts: 16 (7%) Cataract: 5 (2%)

Study	Study question	Design and duration	No. patients or practitioners	Patient characteristics	Key results
Sheldrick et al, 1992	Diagnostic accord of GP diagnosis with diagnosis by ophthalmologist	Prospective experimental study Primary care (GP) UK (Nottingham) 12 months	1474 patients invited 1121 saw ophthalmologist	Male: 38.0% (N=1103): 419 Age: NS	Diagnosis of commoner eye conditions (GP/O): N=1103 Infective conjunctivitis: 425 (39%; GP); 345 (31% ophth) Allergic conjunctivitis: 119 (11%; GP); 136 (12% ophth) Dry eyes: 52 (5%; GP); 87 (8%; ophth) Cataract: 48 (4%; GP); 40 (4%;ophth) Blepharitis: 43 (4%; GP); 46 (4%; ophth) Chalazion: 32 (3%; GP); 50 (5%; ophth) Diagnoses with important disagreement (GP/O) (N=15): Sensitivities, specificities and PPVs for GP diagnoses: Chalazion: 0.58; 0.995; 86% Dendritic ulcer: 0.75; 0.999; 75% Infective conjunctivitis: 0.86; 0.83; 71% Dry eyes: 0.40;0.98; 68% Allergic conjunctivitis: 0.59: 0.96: 67% Stye: 0.60; 0.99; 35% Blepharitis: 0.23; 0.96; 27%
Sheldrick et al, 1993	Prevalence and management of ocular disease in general practice	Prospective observational study Primary care (GP) UK (Nottingham) 12 months	17 doctors in 7 practices 1577 patients 1771 consultations	Male: 48.6% (N=36 010): 17490 Age: NS	Consultations for eye problems (N=36 018): 1577 patients (4.4%) made 1771 consultations (1630 new) Investigations in consultations (N=1771): VA (visual acuity): 164 (9.3%) Fluorescein stain: 19 (1.1%) BP (blood pressure): 19 (1.1%) Urine tested: 7 (0.4%) Eye swabs: 21 (1.2%) Blood samples: 11 (0.6%) Diagnoses (N=1630) Infective conjunctivitis: 41.1% Allergic conjunctivitis: 12.6% Cataract: 4.8% Blepharitis: 4.5% Chalazion: 3.3% Trauma: 17 (1.0%) Treatments (N=1771) All ophthalmic medications: 1245 (70.3%) Topical antibiotics: 846 (47.8%); chloramphenicol: 710 (40.1%) Allergy drugs: 402 (22.7%); sodium cromoglycate: 155 (8.8%) Corticosteroids: 60 (3.4%), of which 21 (35%) considered inappropriate by study ophthalmologist. Management (N=1771): Single visit: 1538 (94.4%) One follow up visit: 69 (4.0%) Two follow up visits: 17 (1.0%) *See also: Appendix 5*
Walls et al, 1993	Management of ocular conditions by optometrists, ophthalmologists and family physicians	Survey, postal Primary care (family physician/ optometrist); Secondary care (ophthalmologist) US (Oklahoma) NS	Family physicians (434/1356) Optometrists (236/368) Ophthalmologists (67/127)	Profile of respondents reported	Treatment patterns (family and general practitioners): Over 80% treat corneal abrasions, corneal foreign bodies and conjunctivitis Over 50% treat dry eye patients and 'lumps and bumps' on eyelids Unclear what proportion of these conditions are treated Unclear what proportion of 'treat' means refill of prescriptions
Winkler and Meads, 1998	GP referral of anterior segment eye conditions to optometrists	Prospective experimental study Primary care (optometrist; GP) UK (London) NS	4 optometrists 4 GPs	NS	No summary statistics reported

Appendix 5. Referrals for eye disease

Study	Study question	Design and duration	Disease area	No. patients or practitioners	Patient characteristics	Referral initiator(s)	Key results
Bass et al, 1996	Ophthalmologist and optometrist postoperative management of cataract surgery patients assessed against national guidelines.	Survey, postal; random sample; Reminder; telephone interview Primary care (optometrist); Secondary care (ophthalmologist) US NA	Cataract surgery	538/655 Ophthalmologists 130/154 Optometrists	NS	Optometrist	Number patients referred by optometrists (N=130) For cataract surgery: median and range for 1991: 30 (1 – 100) Number patients referred by optometrists for postoperative complications (N=59): Acute pain/raised IOP: 54 (92%) Rebound inflammation: 46 (78%) Dislocation intraocular lens: 59 (100%) Number patients referred by optometrists for postoperative complications (N=58): Unexplained decrease in VA: 58 (100%) Cystoid macular oedema: 53 (91%) Posterior capsule opacification: 58 (100%) New irregularity of pupil: 50 (86%)
Brin and Griffin 1995	Optometrist referral rates for ocular conditions	Literature review and meta-analysis Primary care (optometrist) US, UK, Australia 1961 - 1993	Ophthalmic	15 studies included	NS	Optometrist	Referral rate: to ophthalmologists: 3.83% Referral rate: to all providers: 5.50% % patients referred by condition (medians): 12.5% referrals for cataract or lens opacity 12.1% referrals for glaucoma 5.2% referrals for conjunctivitis and related conditions (8 studies) % patients referred by anatomic site (medians): 11.5% referrals for anterior eye 8.3% referrals for retina 4.3% referrals for cornea
Chambers and Fisher, 1998	Expansion in the scope of optometrist management of acute eye conditions in the community	Prospective experimental study Primary care (optometrist) UK (Staffordshire) 6 months	Acute eye conditions	7 optometrists (5 practices) 8 pharmacists 14 GPs (6 practices) 120 patients referred, 109 attended	Male: 43.1% (N=109): 47 Mean age: 46 (SD22, N=109)	Optometrist	Direction of referrals by study optometrists (N=109): GP for prescription: 38% Pharmacist for OTC medication:20% GP: 20% Hospital via GP: 7% Hospital directly: 5%
Claoué, 1988	Prevalence of disease in patients attending ophthalmic medical practitioner (OMP) clinic	Prospective case series Primary care (OMP) UK (London) NS	Ophthalmic	500 consecutive patients 64 not attending for routine sight test	Male: 44.8% (N=500): 224 Mean age (male): 42.3 (17.6SD, N=500) Mean age (female): 41.5 (20.4SD, N=500)	GP/PCP OMP	Referrals by GP to OMP (N=64): 4 (6.25%) OMP referrals to GP (N=500): 25 (5.0%)

Study	Study question	Design and duration	Disease area	No. patients or practitioners	Patient characteristics	Referral initiator(s)	Key results
Cox and Paterson, 1994	Dermatologist management of patients receiving antimalarials.	Survey, postal Secondary care (dermatologist) UK NA	Dermatological	224/325 dermatologists	NS	Dermatologist	Dermatologists referring all patients for baseline ophthalmology screening (N=244): All patients: 30% After initial trial of therapy: 26% Never: 17%
Dart, 1986	Prevalence of ocular conditions in ophthalmologist community clinic and diagnostic accuracy in general practice	Prospective observational study Primary care (GP/ophthalmologist) UK (London) 3 months	Ophthalmic	223 patients presented with ocular conditions 242 consultations 169 seen by ophthalmologist	NS	GP/ ophthalmologist	Patients with referral avoided (N=169): 46 (27.2%) Patients referred (N=169): 18 (10.7%) Referral rate if no ophthalmic service (N=169): 64 (37.9%)
Edwards, 1987	Prevalence and management of ophthalmic emergencies	Prospective and retrospective observational study Secondary care (A&E, with specialist ophthalmic service) UK (Kent) 12 months	Ophthalmic emergencies	1870 new visits for eye complaints	Male (new cases): 75% (N=1870): 1410 25.1% aged 20-29	Self	Number of self referrals (N=1870) 1667 (89.7%) [GPs in this area refer to general eye clinic (not to A&E)] Diagnostic categories (N=1870): Trauma (all): 1228 (65.67%) Inflammation (all): 405 (21.66%) Corneal foreign body: 405 (21.66%) Corneal abrasion/non-penetrating laceration: 229 (12.25%) Conjunctivitis: 175 (9.36%) Conjunctival or subtarsal foreign body: 162 (8.66%) Degenerative: 75 (4.01%) Allergy: 63 (3.37%) Lid inflammation: 51 (2.73%) Iritis: 44 (2.35%) Glaucoma (acute): 11 (0.59%)
Ettinger et al, 1993	Management of ocular conditions by hospital-based primary care physicians.	Review of medical records Primary care (hospital clinic) US (New York) 1 year	diabetic retinopathy; hypertensive retinopathy	48 patients 6 patients referred for eye care	Patients aged 40 and over	GP/PCP	Number referred for eye care (N=48): For all reasons: 6 (12.5%) For acute conditions: 5 (10.4%) For glaucoma medication review: 1 (2.5%) Number hypertensive patients referred for eye care (N=NS):13.0% Number diabetic patients referred for eye care (N=NS): 8.0%
Featherstone et al, 1992	Prevalence and management of ocular disease in general practice	Survey, postal Primary care (GP) UK (S. Devon) NA	Ophthalmic	130/146 used DGH 98/130 completed questionnaire	NA	GP/PCP	% GP that would refer immediately [later if necessary] (N=98): Bacterial conjunctivitis: 3% [9%] Allergic conjunctivitis: 3% [18%] Meibomian cyst: 12% [76%] Blepharitis: 4% [28%] Corneal abrasion: 7% [48%]

Study	Study question	Design and duration	Disease area	No. patients or practitioners	Patient characteristics	Referral initiator(s)	Key results
Gray et al, 2000	Cost-effectiveness of routine HES monitoring vs. community based optometric monitoring of patients with glaucoma	Pragmatic RCT Primary care (optometrist); Secondary care (HES) UK (Bristol) 2 years	Glaucoma	403 patients analysed 200 (HES) 203 (community)	HES: mean age = 69.4 (SD8.8) Male: 57.5% (N=200): 115 Community: mean age = 68.0 (SD8.3) Male: 50.7% (N=203): 103	Optometrist	Number patients referred at least once over 2 year period by optometrist (N=203): 111 (55%) Number referrals over 2 year period by optometrist (N=203): 167 Number referrals for which changes confirmed (N=167): 121 (72.5%) Number referrals for which treatment changed (N=167): 77 (46.1%)
Harrison et al, 1988	Rates and accuracy of referrals by GPs vs optometrists	Review of case notes Secondary care (OP) UK (Staffordshire) 14 months	Ophthalmic	1113 patients	Male: 42.0% (N=1113): 467 Age distribution reported (bimodal)	GP/PCP Optometrist hospital CMO OMP	Initiator of referrals (N=1113): GP: 546 (49%) optometrist: 439 (39%) other hospital doctor: 88 (8%) community medical officers: 23 (2%) OMP: 4 (0.4%) Primary reason for referral (N1[optom] = 439; N2[GP] = 546; N3[all] = 1113): Visual disturbance/loss: 168 (38%; N1); 133 (24%; N2); 490 (44.0%; N3) Suspected glaucoma: 118 (27%; N1); 25 (5%; N2);145 (13%; N3); Abnormality of binocular vision: 44 (10%; N1);70 (13%; N2); 140 (13%; N3); Disorders of eyelid/adnexa: 9 (2%; N1); 107 (20%;N2); 127 (11%; N3); Red eye: 17 (4%; N1); 66 (12%; N2); 86 (8%; N3) Accuracy of referrals (primary and secondary diagnosis): Suspected glaucoma: 96/120 (80%; optom); 10/27 (37%; GP) Abnormality of binocular vision: 28/46 (61%; optom); 40/77 (52%; GP) Red eye: 5/15 (33%; optom); 8/40 (24%; GP) Cataract: 52/59 (88%; optom); 42/43 (98%; GP) Screening for ocular disease (N1[optom] = 439; N2[GP] = 546; N3[all] = 1113): Asymptomatic patients: 149 (34%; N1); 10 (1.8%); 180 (16%; N3)
Hillman, 1994	Non-attendance of elderly patients referred by GP to HES	Review of case notes (audit) Primary care (GP) UK (Humberside) 10 months		838 patients	Patients aged 75 and over	GP/PCP	Patients attending HES (N=838): 199 (24%) Patients lost to follow up with HES (N=199): 24 (42%)

Study	Study question	Design and duration	Disease area	No. patients or practitioners	Patient characteristics	Referral initiator(s)	Key results
Hobley et al, 1992	Referrals and notifications by optometrists	Random, retrospective review Primary care (optometrist) UK 4 weeks	Ophthalmic	100/313 optometrists consented 74/100 complied 13 107 patients	Male (referrals and notifications) 38% (N=516): 197 311/516 (60%) aged 61 and over	Optometrist	For a 4 week period: Number patients (N=13 107): Referred: 375 (2.86%) Notification made: 141 (1.08%) Direction of referral (N=375): 250 (67%) ophthalmologist via GP 97 (26%) GP 28 (7%) ophthalmologist directly Reasons for referral (N=375): 76 (20%) for lens condition 45 (12%) for retina (not macular) 45 (12%) for suspected POAG 23 (6%) for red eye Number asymptomatic patients referred: 124 (33%)
Illango et al, 2000	Prevalence of ocular conditions managed by nurse practitioner at hospital eye clinic.	Prospective case series Primary care (hospital clinic) UK (Liverpool) 1 week	Ophthalmic: acute	250 consecutive patients 123 patients seen by NP only	NS	GP/PCP Optometrist Self Hospital	Source of referral (N=250): Self: 176 (70.0%) GP/optometrist: 68 (27.2%) Hospital internal: 6 (2.4%)
Jones et al, 1986	Prevalence of ocular conditions in A&E	Retrospective review Secondary care (A&E, HES) UK (Southampton) 6 months	Ophthalmic emergencies	8092 patients; 13544 visits	Age/gender shown graphically: new patients: unimodal, skewed right old patients: unimodal, skewed left	GP/PCP Optometrist Self	Source of referral (N=8092): Self: 7273 (89.9%) GPs 594 (7%) Optometrist: 53 (0.7%)
Kaplan, 1982	Prevalence and management of ocular disease in primary vs. secondary settings	Prospective observational study Primary care (optometrist); Secondary care (residency clinic) US (Ohio) 2 years	Ophthalmic	377 patients (practice) 3279 patients (clinic)	NS for whole sample	Optometrist	Number of referrals (N=377): 113 (30%) Reasons for referrals (N=113): 68 (60%) high myopia 19 (17%) suspected glaucoma 6 (5%) headache 4 (4%) diabetes 4 (4%) maculopathy
Kljakovic et al, 1985	Direct optometrist referral for raised IOP vs. referral via GP	Prospective RCT; CTA unclear Primary care (optometrist; GP) UK (Edinburgh) 5 months	Glaucoma	49 direct referrals 44 via GP	NS	GP/PCP Optometrist	GP referrals involving delay (N=44): 7 (16%) GP referrals marked urgent (N=44): 31% Referrals with diagnosis confirmed (N=93): 46% Urgent referrals with diagnosis confirmed (N=14): 18%

Study	Study question	Design and duration	Disease area	No. patients or practitioners	Patient characteristics	Referral initiator(s)	Key results
Laidlaw et al, 1994	Actual referrals vs. predicted referrals (extrapolated from earlier years) of patients with glaucoma	Review of referral records and clinical notes Secondary care (OP) UK (Bristol) 9 years (sample, 4 years)	Glaucoma	9438 patients' case notes included	adults	NS	Numbers of new ophthalmic referrals: All referrals between 1984 and 1992: 51 919 5042 (1984) – 6376 (1992) Rate of adult true positive glaucoma referrals (sampled notes from 6 months of each year from 1987 - 1991): Mean rate: 5.6% (p not significant)
Marsden, 2000	Evaluation of telephone triage by nurse practitioners, advising GP and patients on referrals to A&E	Review of telephone triage Secondary care (A&E, HES) UK (Manchester) 1 month	Ophthalmic	462 records, 303 from ARC, 158 from EEC	NS	GP/PCP Optometrist Self Hospital	Emergency Eye Centre (EEC) (N=118): GP: 24 (20%) Optometrist: 4 (3%) Hospital: 12 (10%) Self: 69 (58%) Acute Referral Centre (ARC) (N=268): GP: 159 (59%) Optometrist: 38 (14%) Hospital: 25 (9%) Self: 21 (8%) Accuracy of provisional diagnosis (by NP): EEC: GP: 75%; optom: 50%; hosp: 67%; self-referred: 90% ARC: GP: 66%; optom: 80%; hosp: 88%; self-referred: 95%
McAlister, 1990b	Survey of optometrists, not TPA registered	Survey, postal Primary care (optometrist) US (Missouri) NA	Ophthalmic	113/471 optometrists responded	NA	Ophthalmologist	Impact on referrals from ophthalmologists (from histogram; N=103): Increase: 4.9% Decrease: 7.3% No change: 89.0%
McDonnell, 1988	Prevalence and management of ocular conditions in general practice	Prospective observational study Primary care (GP) UK (London) 3 months	Ophthalmic	238 consultations (224 patients) for ocular conditions 2 GP practices	Male: 42% (N=224): 94 26% patients aged 25-44 26% patients aged 0-4	GP/PCP	Referral rate: 35/224 (16%) Initial referral from optometrist 2/35 GP diagnoses of patients referred to HES (N=35): Corneal abrasion and foreign body 5 (14.3%) Floaters 4 (11.4%) Meibomian cyst 4 (11.4%) Squint 2 (5.7%)
Olver et al, 1989	Prevalence of ocular conditions in children presenting to A&E	Prospective observational study Secondary care (A&E, HES) UK (London - MEH) 5 months	Ophthalmic: trauma and non trauma	475 children (plus 26 children, excluded due to incomplete data)	Children (0-14) Age reported as histogram	GP/PCP Optometrist Self Hospital	Referrals (N1[injury] = 342; N2[non injury] = 133; N3[all] = 475): self: 222 (64%; N1); 72 (54.1%; N2); 294 (61.9%; N3) GP: 83 (24.3%; N1); 57 (43.2%; N2); 140 (29.5%; N3) Other hospital: 23 (6.8%; N1); 0 (0%; N2); 23 (4.8%; N3) Optometrist: 9 (2.7%; N1); 4 (2%; N2); 13 (2.7%; N3) Diagnosis (N=475): Conjunctivitis: 118 (24.8%) Blepharitis: 16 (3.4%) Chalazion: 48 (10.1%) Foreign body: 22 (4.6%) Corneal abrasion: 61 (12.8%) Nothing wrong: (68+7) (15.8%)

Study	Study question	Design and duration	Disease area	No. patients or practitioners	Patient characteristics	Referral initiator(s)	Key results
Oster et al, 1999	Diagnosis of ocular disease by hospital-based optometrist of outpatients referrals	Prospective experimental study Primary care (hospital clinic)UK (London - MEH) 6 months	Ophthalmic Cataract	157 patients examined, 152 provisionally diagnosed by optometrist	Outpatients Age reported as histogram; 56% aged over 60	GP/PCP	Accuracy of appraisal of new consenting referrals (N=152): Correct appraisal: 121 (79.6%) Partially correct: 26 (17.1%) Incorrect appraisal: 5 (3.3%) Diagnosis (N=152): Cataract: 54 (35.5%)
Perkins, 1990	GP management of patients with suspected ocular disease referred by optometrists	Review of GOS 18 forms Primary care (GP) UK (Bournemouth) 18 months	Ophthalmic	7200 patients on list 61 GOS 18 forms received in study period	NS	GP/PCP Optometrist	GP referrals to ophthalmologist (N=61): 50 (82.0%) Diagnosis by ophthalmologist (N=45): Optometrists provisional diagnosis confirmed: Cataracts: 19/22; Glaucoma: 2/9; Macular degeneration: 2/8; Amblyopia: 1/1 13 found to be normal GP did not referred (N=11): 1 refused; 3 untreatable; 2 under review by hospital; 5 referral to ophthalmologist not needed (1 carcinoma of stomach; 2 headaches; 1 to ophthalmic practitioner; 1 IOP normal)
Pooley & Frost, 1999	Assessment of feasibility of direct referral by optometrists and OMPs	Review of referral correspondence Secondary care (OP) UK (London, Surrey) 4 weeks 2 weeks	Ophthalmic	433 patients	Mean age of patients referred by optometrists: 62	GP/PCP Optometrist OMP	No referrals by initiating practitioner (N=433): GP: 44%; Optometrist: 172 (40%); OMP: 2% Diagnoses of optometrist referrals (N=161): Cataract: 47 (29.2%) Glaucoma: 31 (19.3%) Macular degeneration: (15.5%) Fundus abnormality: 15 (9.3%) Diagnostic accuracy of optometrist referrals (N=84): % Correctly assessed Cataract: 15/18(83%) Maculopathy: 7/9 (77%) Lacrimal disorders: 5/7 (71%) Retinal defects: 5/9 (54%) Glaucoma: 5/19 (27%)
Pooley, 1996	Assessment of referrals for ocular conditions by optometrists, GPs and OMPs in different settings	Review of referral correspondence Secondary care (OP; A&E; HES) UK (London, Birmingham) 24 weeks 6 weeks 10 weeks	Ophthalmic	MEH (OP): 8435 patients; BMEH: 647 patients MEH (A&E): 7460 attendances	MEH (OP): Male: 42.0% (N=8435): 3541 Age reported by gender BMEH (OP): Male: 46.7% (N=625): 292 Age reported by gender MEH (A&E): Age and sex presented in bar chart	GP/PCP Optometrist OMP Optician Hospital	MEH (OP) (N=8435): GP: 5360 (63.9%) Optometrist: 25.2% 'Optician': 7.5% OMP: 1.4% Other hospital: 0.9% BMEH (OP) (N=647): GP: 294 (45.4%) Optometrist: 229 (35.4%) OMP: 5 (0.8%) Other hospital: 82 (12.7%) MEH (A&E) (N=7460): Self: 6340 (85.0%) GP: 851 (11.4%) OMP/optometrist/DO: 181 (2.4%) Other hospital: 48 (0.6%)

Study	Study question	Design and duration	Disease area	No. patients or practitioners	Patient characteristics	Referral initiator(s)	Key results
Port & Pope, 1988	Survey of optometrist referrals and notifications over 6-day period in 1986	Survey, postal Primary care (optometrist) UK NA	Ophthalmic	1031/5381 responses	No overall summary statistics reported	Optometrist	Mean patients/day: 8.4 Referrals by condition and sex: 2194/52123 (4.2%); N=2194 Lens opacity/cataract: 320 (14.59%) Glaucoma related: 266 (12.12%) Other fundus changes: 197 (8.98%) Headache: 147 (6.70%) Lid conditions: 101 (4.60%) Conjunctivitis: 93 (4.24%) Dry eyes 30 (1.37%) Notifications by condition and age: 1214/52123 (2.3%); N=1211 Report on child: 260 (21.47%) First examination: 203 (16.76%) GP requests report: 184 (15.19%) Lens opacity/cataract: 117 (9.66%) Glaucoma related: 40 (3.30) Other fundus changes: 32 (2.64%) Headache: 89 (7.35%) Lid conditions: 12 (0.99%) Conjunctivitis: 18 (1.49%) Dry eyes 4 (0.33%)
Port, 1989	Survey of optometrist referrals and notifications over 5-day period in 1988. Reason for referral compared with that of 1986 survey.	Survey, postal Primary care (optometrist) UK NA	Ophthalmic	1561/5125 optometrists	No overall summary statistics reported	Optometrist	Mean patients/day: 10.0 Origin of referrals/notifications: 13% GP request 16% first eye examination 71% reminders/periodic attendances Referrals by condition and sex: 4517/74710 (6.05%); N=4517 Lens opacity/cataract: 732 (16.2%) Glaucoma related: 718 (15.9%) Other fundus changes: 262 (5.8%) Headache: 221 (4.9%) Lid conditions: 158 (3.5%) Conjunctivitis: 185 (4.1%) Dry eyes: 104 (2.3%) Notifications by condition and age: 1748/74710 (2.33%); N=1748 Lens opacity/cataract: 355 (20.3%) Glaucoma related: 84 (4.8%) Other fundus changes: 59 (3.4%) Headache: 225 (12.9%) Lid conditions: 42 (2.4%) Conjunctivitis: 50 (2.9%) Dry eyes 67 (3.8%)
Shaw et al, 1986	Prevalence of disease and source of referral in ophthalmic outpatients	Prospective observational study Secondary care (OP) UK (Leicester) 1 year	Ophthalmic	10 002 patients 3004 new referrals	Median age of all patients: (N=10 002): 65 33% females aged 65 or over	GP/PCP Optician Self Specialty clinic Blind society	Source of new referrals (N=3004): Clinical diagnoses (N=3004): GP: 2402 (80%) No abnormality: 119 (4.0%) Specialty clinics: 324 (10.8%) Lens related disease: 939 (31.3%) Blind Society: 88 (2.9%) At least one major blinding eye disorder: Opticians: 69 (2.3%) 1345 (44.8%) Treatment (N=3004): Discharged after first visit: 838 (27.9%) Listed for surgery: 512 (17.0%)
Sheldrick et al, 1993	Prevalence and management of ocular disease in general practice	Prospective observational study Primary care (GP) UK (Nottingham) 12 months	Ophthalmic	17 doctors in 7 practices Study population: 36 018 For eye conditions: 1577 patients 1771 consultations	Male: 48.6% (N=36 010): 17490 Age: NS	GP/PCP	Consultations for eye problems (N=36018): 1577 patients (4.4%) made 1771 consultations (1630 new) Referrals (N=1771) All referrals: 291 (16.4%) To ophthalmologist: 252 (86.6%) A&E: 62 (3.5%) HES: 118 routine (6.7%); 31 urgent (1.8%); 30 re-referred (1.7%); 11 private (0.6%) Medical/neurology: 9 (0.5%) Optician: 30 (1.7%)

Study	Study question	Design and duration	Disease area	No. patients or practitioners	Patient characteristics	Referral initiator(s)	Key results
Tuck, 1991 Tuck and Crick, 1992	Survey of optometrist referrals for suspected glaucoma	Survey, delivered by hand Primary care (optometrist) UK 6 months	Glaucoma	241 optometrists 275 600 sight tests	Mean age referred patients (N=1402): 67 Male: 47.6% (N=1420): 676	Optometrist	Referrals for suspected glaucoma (N=275600):1505 (0.55%) Accuracy of referrals; diagnosis confirmed: (opt/ophth); (N=1048): Opt (almost definite): 194/262 (74.0%) Opt (likely): 153/360 (42.5%) Opt (possible): 89/426 (20.9%) Cases confirmed (N=1402): 456
Vernon, 1983	Management and prevalence of ocular conditions presenting, or referred, to A&E	Prospective observational study Secondary care (A&E, HES) UK (Bristol) 24 weeks	Emergency eye conditions	10 575 patient visits 7113 new cases	NS	GP/PCP Optometrist	Diagnosis (N=7113): Non-perforating trauma: 3210 (45.13%); foreign body/abrasion: 2475 (34.80%) Inflammatory conditions: 2507 (35.25%); conjunctivitis: 1070 (15.0%) Lid conditions: 660 (11.26%) Dry eyes: 141 (1.98%) Referral (N=7113): GP/optician: 518 (7.28%)
Walls et al, 1993	Management of ocular conditions by optometrists, ophthalmologists and family physicians	Survey, postal Primary care (family physician/ optometrist); Secondary care (ophthalmologist) US (Oklahoma) NS	Ophthalmic	Family physicians (434/1356) Optometrists (236/368) Ophthalmologists (67/127)	NS	GP/PCP Optometrist	Referral patterns (PCP): 7% PCP consultations are for 'vision care' 1/10 'vision care' PCP consultations referred to optometrist 4/10 'vision care' PCP consultations referred to ophthalmologist Optometrist (PCP) referrals to ophthalmologists, by condition: Cataract: 87% (99%) Corneal abrasion: 3% (12%) Corneal ulcer: 31% (73%) Glaucoma: 37% (95%) Strabismus: 26% (90%) Conjunctivitis: 4% (6%) Corneal foreign body: 8% (16%) Dry eye: 2% (36%) Lumps/bumps on eyelid: 28% (36%)
Whittaker et al, 1999	Use of revised GOS 18 form in ophthalmic outpatient referrals	Survey, postal Review of medical records Primary care (optometrist); Secondary care (OP) UK (Southampton) 1 month (review)	Referrals	79/145 optometrists responded 555 case notes reviewed	NS	Optometrist	Review: % with optometrist's referral letter (N=555): Optometrists referral letter 158 (28.47%) Revised GOS 18: 107 (19.28%) Patient consent recorded: 17/107 (15.89%)
Woodruff and Pack, 1980	Prevalence of ocular disease and role of screening in nursing home residents	Prospective experimental study Community (Residential and nursing homes) Canada (Ontario) NS	Ophthalmic	1112/1331 patients screened	Male: 28.62% (N=1331): 381 Age: reported as distribution. 58% aged 75 and over.	Optometrist	Referral pattern (N=1112): Optician: 111 (9.98%) Primary care clinic: 105 (9.44%) GP/ ophthalmologist: 130 (11.69%) Reason for referral (N=103): Symptoms of systemic disease: 55.38% Suspected glaucoma: 13.85% Cataract: 9.23% Adnexa disorder: 6.15% Cornea disorder: 4.62%

Appendix 6. The AESOP Findings

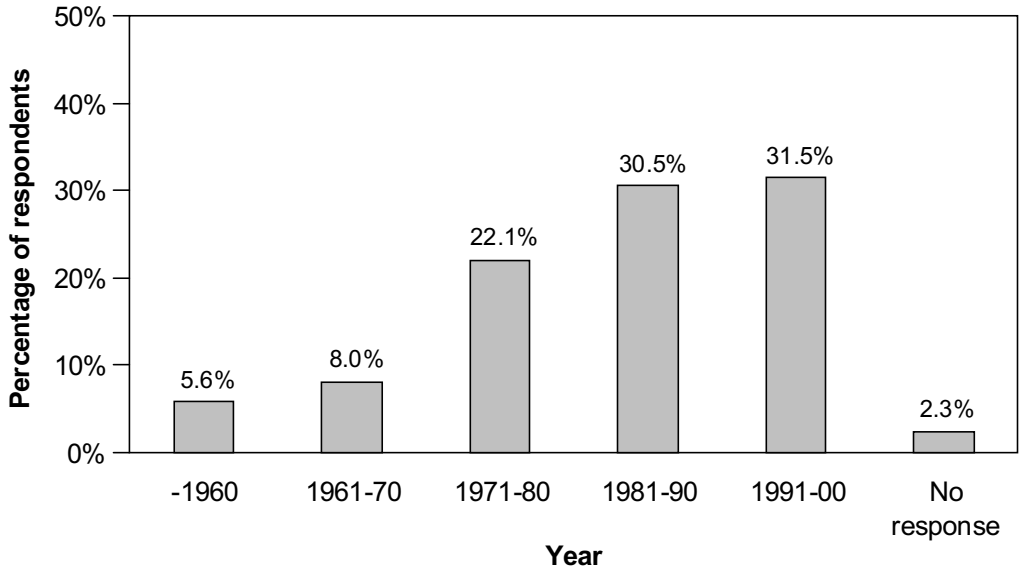
About you

1. In which year did you first register?

Data

Year	Number	% (S)	% (Q)
-1960	24	5.6%	5.8%
1961-70	34	8.0%	8.5%
1971-80	94	22.1%	22.6%
1981-90	130	30.5%	31.3%
1991-00	134	31.5%	32.2%
No response	10	2.3%	

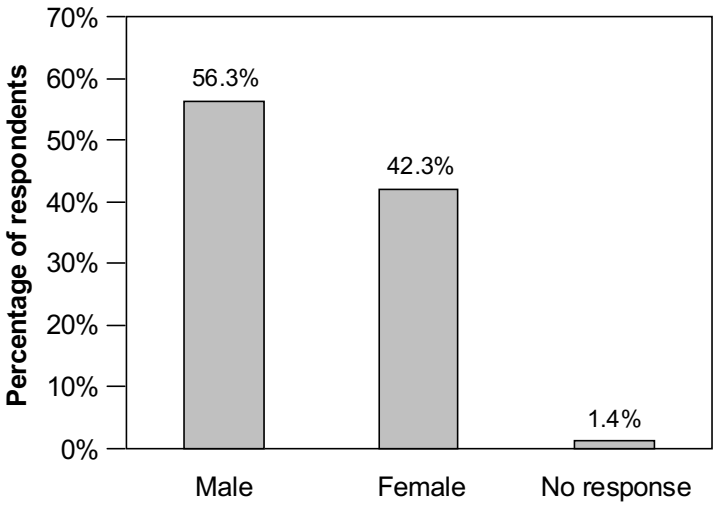
Figure 1. Year of registration of survey respondents



Data

Gender	Number	% (S)	% (Q)
Male	240	56.3%	57.1%
Female	180	42.3%	42.9%
No response	6	1.4%	

Figure 2. Gender of respondents



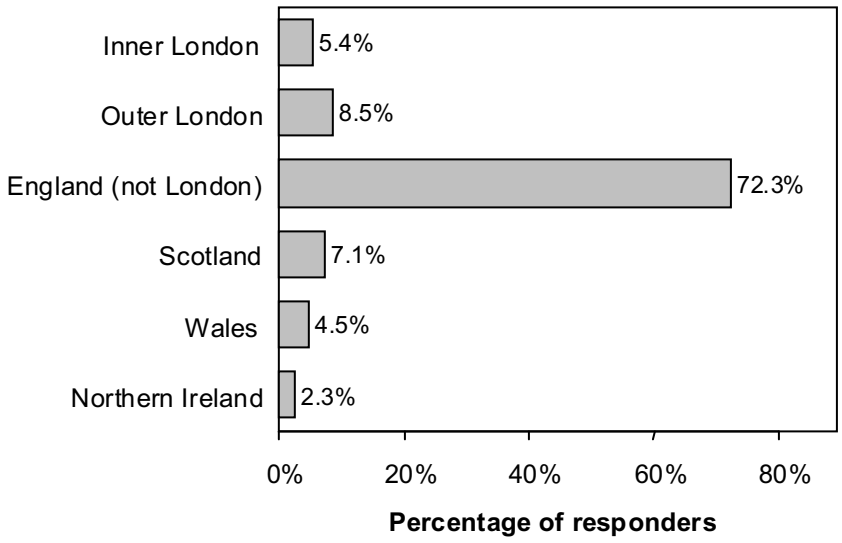
Please give the postcode where you most often work

Data*

	Number	% (S)	% (Q)
Inner London	19	5.4%	5.4%
Outer London	30	8.5%	8.5%
England (not London)	256	72.3%	72.3%
Scotland	25	7.1%	7.1%
Wales	16	4.5%	4.5%
Northern Ireland	8	2.3%	2.3%

* Postcode data were mapped onto College of Optometry regions.

Figure 3. Regional distribution of responders (GOC coding)



Please indicate if you work full time, or part-time, in any of the following types of practice:

Sole practitioner	Full	Part	Partnership	Full	Part	Hospital	Full	Part	Locum	Full	Part
Non-practising	Full	Part	Franchise	Full	Part	Multiple	Full	Part	Other	Full	Part
Small Group	Full	Part	Academic	Full	Part	Retired	Full	Part			

Data*

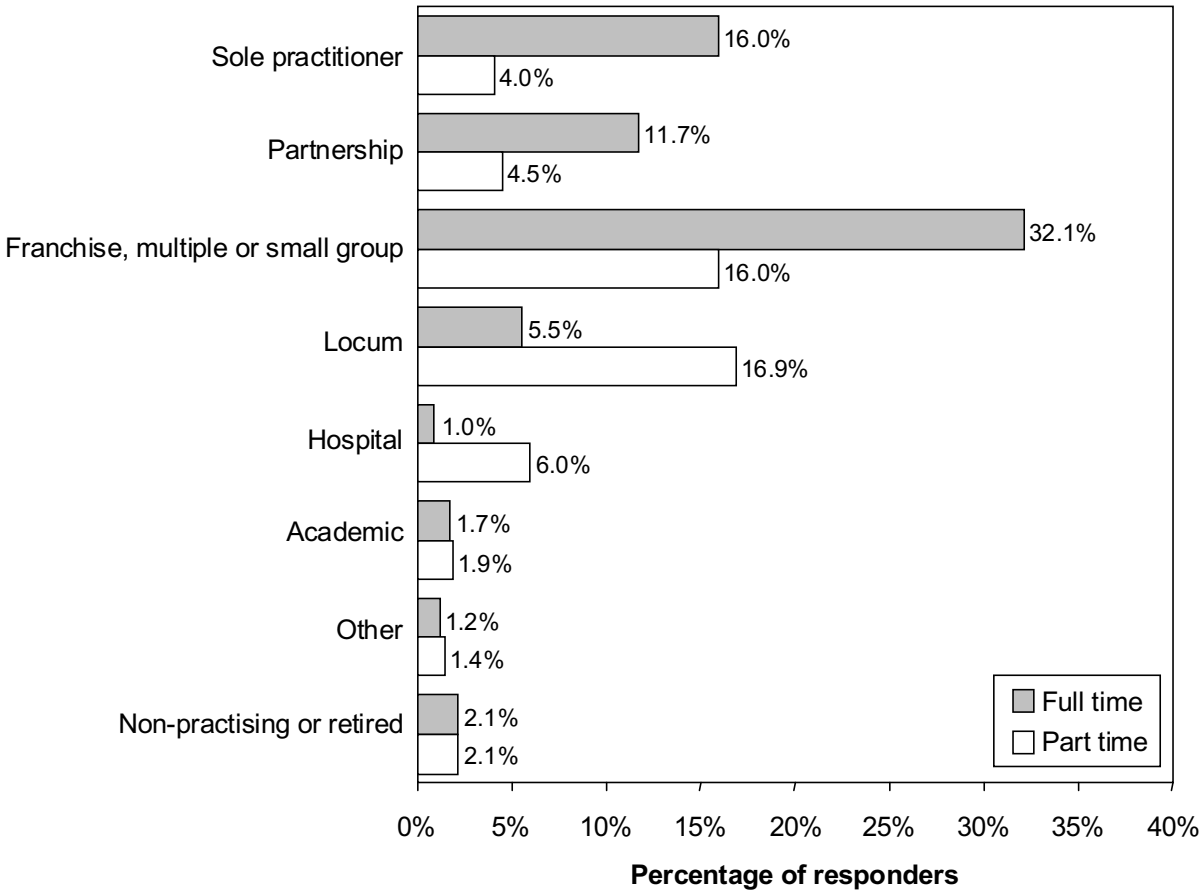
	Full time		Part-time	
	Number	Percent	Number	Percent
Sole practitioner	67	16.0%	17	4.0%
Partnership	49	11.7%	19	4.5%
Hospital	4	1.0%	25	6.0%
Locum	23	5.5%	71	16.9%
Non-practising	4	1.0%	1	0.2%
Franchise	31	7.4%	11	2.6%
Multiple	62	14.8%	27	6.4%
Other	5	1.2%	6	1.4%
Small group	42	10.0%	29	6.9%
Academic	7	1.7%	8	1.9%
Retired	5	1.2%	8	1.9%
Response total	299	71.2%	222	52.9%

Data regrouped

	Full time		Part-time	
	Number	Percent	Number	Percent
Sole practitioner	67	16.0%	17	4.0%
Partnership	49	11.7%	19	4.5%
Franchise, multiple or small group	135	32.1%	67	16.0%
Locum	23	5.5%	71	16.9%
Hospital	4	1.0%	25	6.0%
Academic	7	1.7%	8	1.9%
Other	5	1.2%	6	1.4%
Non-practising or retired	9	2.1%	9	2.1%
Response total	299	70.2%	222	52.1%

* Six respondents did not answer this question, percentages are based on 420 respondents

Figure 4. Optometrists' place of employment



About your work

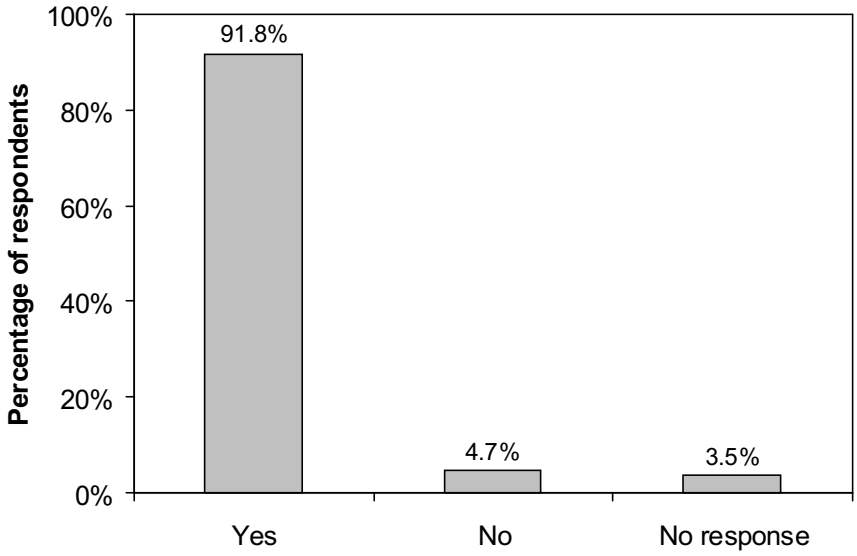
Does your main employment involve you in providing full eye examinations?

Yes	No

Data

	Number	% (S)	% (Q)
Yes	391	91.8%	95.1%
No	20	4.7%	4.9%
No response	15	3.5%	

Figure 5. The respondent's main employment involves providing full eye examinations



A variety of 'shared-care' schemes operate between optometrists and other health care professionals, for the long-term management of conditions such as glaucoma and diabetic retinopathy.

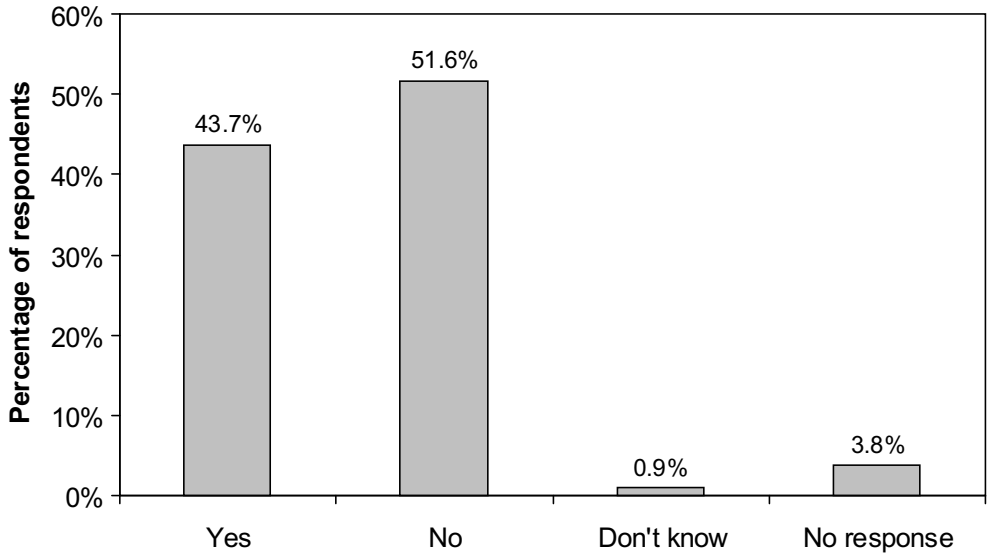
Are you involved in a local shared-care scheme?

Yes	No	Don't know

Data

	Number	% (S)	% (Q)
Yes	186	43.7%	45.4%
No	220	51.6%	53.7%
Don't know	4	0.9%	1.0%
No response	16	3.8%	

Figure 6. Optometrist involvement in a local shared-care schemes



Approximately how many patient consultations, for any reason, do you conduct in a typical month?

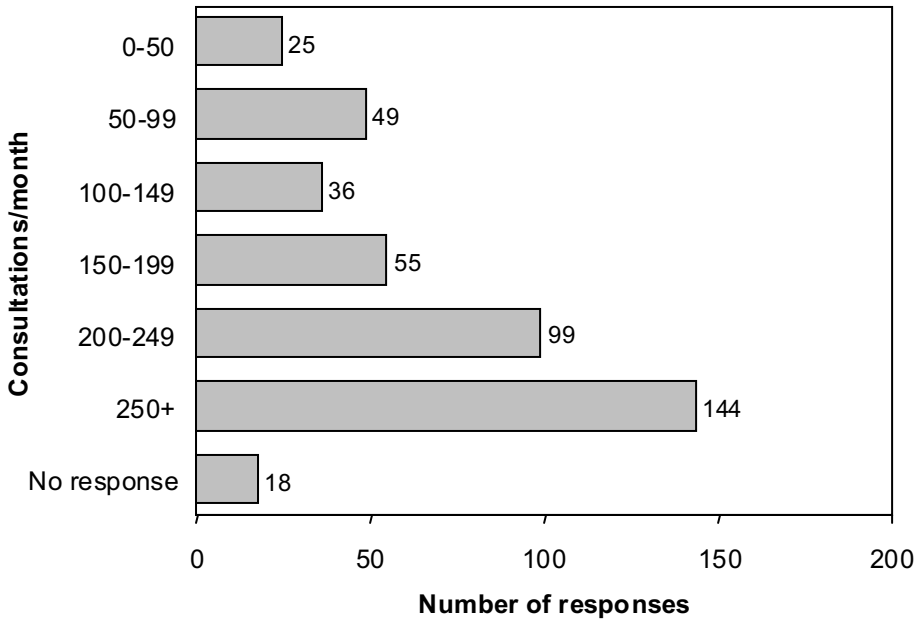
Less than 50	50-99	100-149	150-199	200-249	250 or more

Data

	Number	% (S)	% (Q)
0-50	25	5.9%	6.1%
50-99	49	11.5%	12.0%
100-149	36	8.5%	8.8%
150-199	55	12.9%	13.5%
200-249	99	23.2%	24.3%
250+	144	33.8%	35.3%
No response	18	4.2%	

The approximate mean number of consultations per month is 200, using weighted mid-point values.

Figure 7. Optometrist consultations per month



Approximately how many referrals, for any reason, would you make in a typical month to the following health professionals?

GP ☐ Ophthalmologist via GP ☐ Ophthalmologist via A&E ☐ Ophthalmologist privately ☐

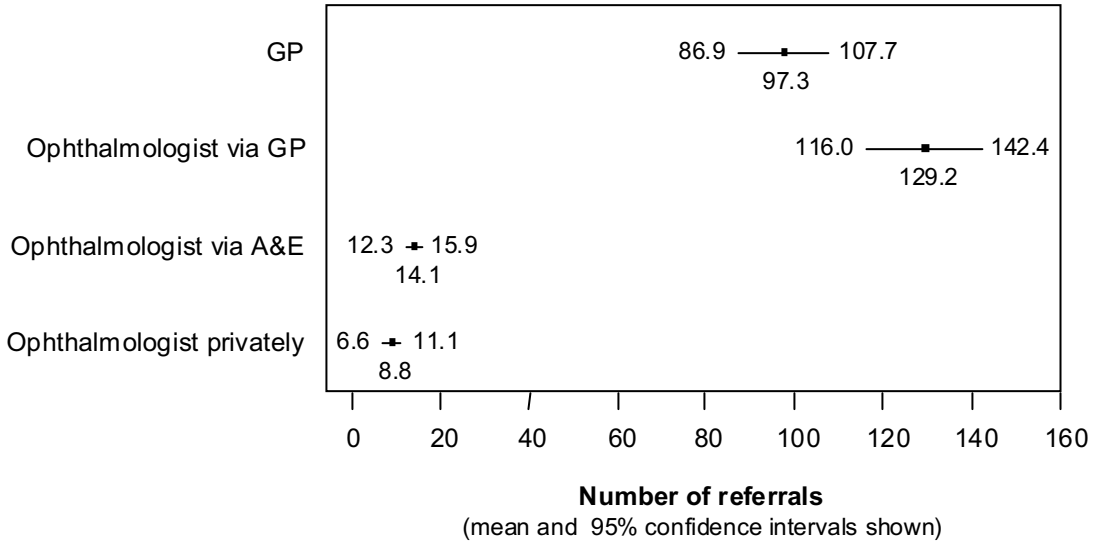
Data (per month)

				Distribution of responses				
	Mean	N*	Standard Error	Minimum	1st Quartile	2nd Quartile (median)	3rd Quartile	Maximum
GP	8.11	371	0.441	0	2.8	5.0	10.0	50
Ophthalmologist via GP	10.76	365	0.559	0	5.0	8.0	15.0	150
Ophthalmologist via A&E	1.18	280	0.076	0	0.5	1.0	1.1	15
Ophthalmologist privately	0.74	229	0.094	0	0.0	0.0	1.0	10

* Number of valid responses out of 426.

For annual mean rate and standard error multiply by 12;
95% Confidence interval =mean ± (t* x standard error), where t* is the inverse t distribution,
with parameters for the two tailed t distribution probability of 0.05, and degrees of freedom N-1.

Figure 8. Optometrist referrals per annum



Approximately how many patients would you refer each ***year*** with the following conditions?

Dry eyes		Infective conjunctivitis		Allergic conjunctivitis		Blepharitis	
Glaucoma		Diabetic retinopathy		Cataract		Other	

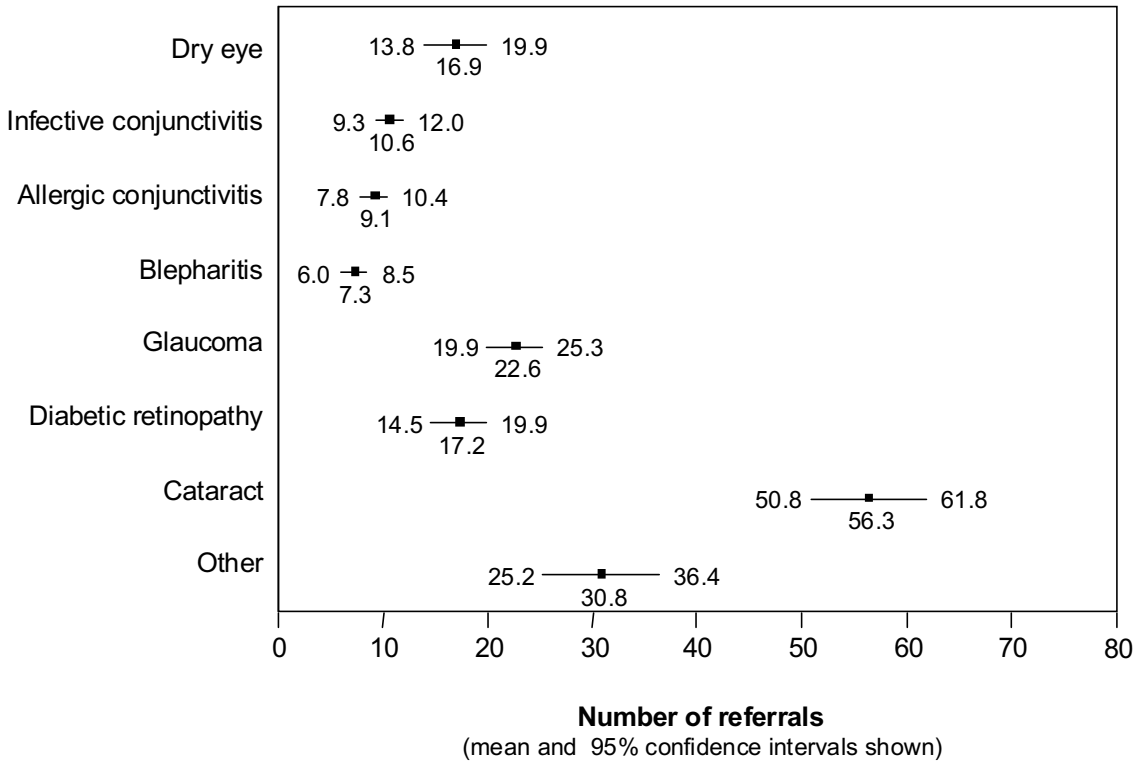
Data

				Distribution of responses				
	Mean	N*	Standard Error	Minimum	1st Quartile	2nd Quartile (median)	3rd Quartile	Maximum
Dry eye	16.85	333	1.554	0	3.0	10.0	20.0	300
Infective conjunctivitis	10.63	330	0.690	0	3.0	6.0	15.0	100
Allergic conjunctivitis	9.14	309	0.665	0	2.0	5.0	10.0	100
Blepharitis	7.25	308	0.625	0	1.0	4.5	10.0	100
Glaucoma	22.58	371	1.383	0	9.5	12.0	25.0	200
Diabetic retinopathy	17.22	358	1.370	0	5.0	10.0	20.0	250
Cataract	56.31	373	2.810	0	20.0	40.0	75.0	400
Other	30.78	266	2.835	0	10.0	15.0	40.0	500

* Number of valid responses out of 426.

95% Confidence interval =mean ± (t* x standard error), where t* is the inverse t distribution, with parameters for the two tailed t distribution probability of 0.05, and degrees of freedom N-1.

Figure 9. Number of referrals by condition per annum



Your views about prescribing

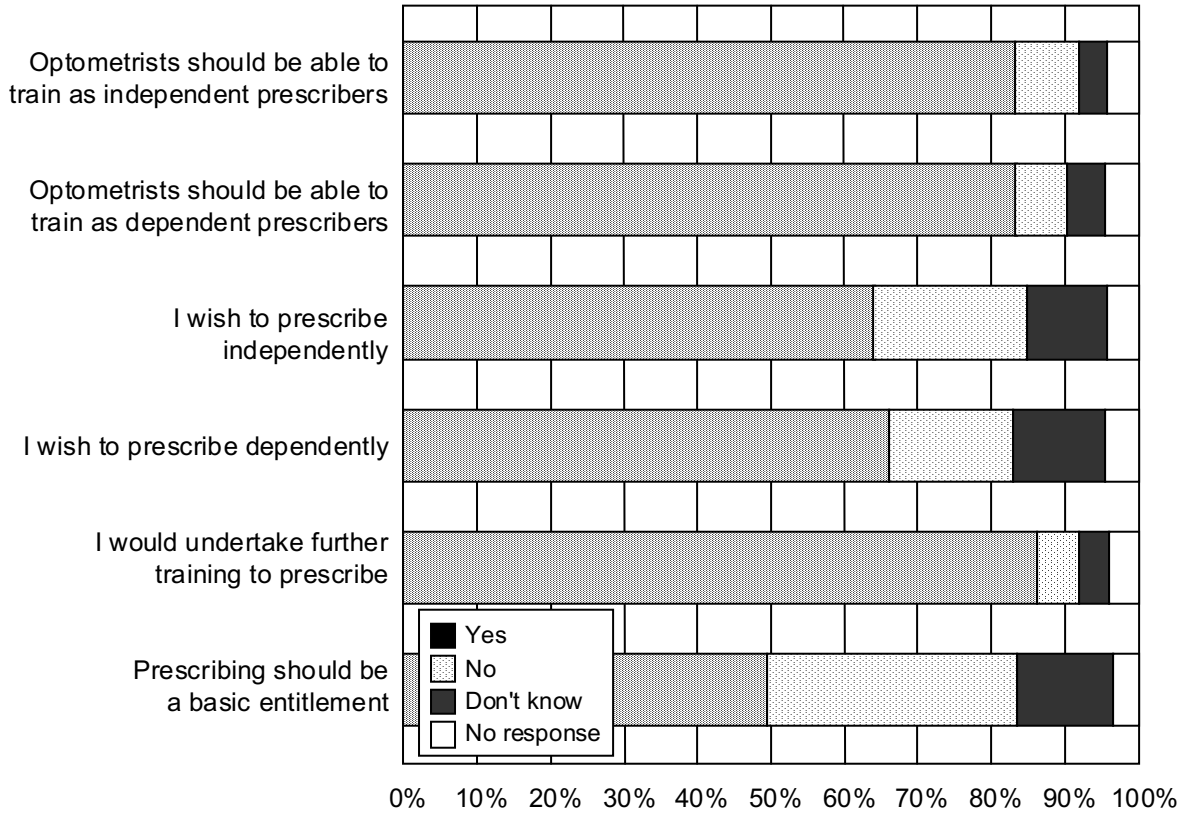
In future, UK optometrists may opt to receive additional accredited training, allowing them to prescribe from a designated formulary of therapeutic agents. Prescribing rights for optometrists may be introduced at two levels. Firstly, optometrists may be able to prescribe *independently* for infection and inflammation. Secondly, *dependent* (clinician-initiated) prescribing may facilitate shared care between ophthalmologists and optometrists for stable chronic ocular conditions.

In principle, do you agree that optometrists should be able to train to become *independent* prescribers?	Yes	No	Don't know
In principle, do you agree that optometrists should be able to train to become *dependent* prescribers?	Yes	No	Don't know
Would you personally wish to prescribe therapeutic agents *independently*?	Yes	No	Don't know
Would you personally wish to prescribe therapeutic agents *dependently*?	Yes	No	Don't know
Would you be prepared to undertake further training to allow you to prescribe?	Yes	No	Don't know
In future, do you think the right to prescribe therapeutic agents should be a basic entitlement of registration?	Yes	No	Don't know

Data

	Yes			No			Don't know			No response		
	No.	% (S)	% (Q)	No.	% (S)	% (Q)	No.	% (S)	% (Q)	No.	% (S)	% (Q)
Optometrists should be able to train as independent prescribers	354	83.1	86.6	38	8.9	9.3	17	4.0	4.2	17	4.0	NA
Optometrists should be able to train as dependent prescribers	355	83.3	87.2	30	7.0	7.4	22	5.2	5.4	19	4.5	NA
I wish to prescribe independently	273	64.1	66.9	89	20.9	21.8	46	10.8	11.3	18	4.2	NA
I wish to prescribe dependently	282	66.2	69.3	71	16.7	17.4	54	12.7	13.3	19	4.5	NA
I would undertake further training to prescribe	368	86.4	89.8	24	5.6	5.9	18	4.2	4.4	16	3.8	NA
Prescribing should be a basic entitlement	211	49.5	51.3	145	34.0	35.3	55	12.9	13.4	15	3.5	NA

Figure 10. Optometrists' views about therapeutic prescribing



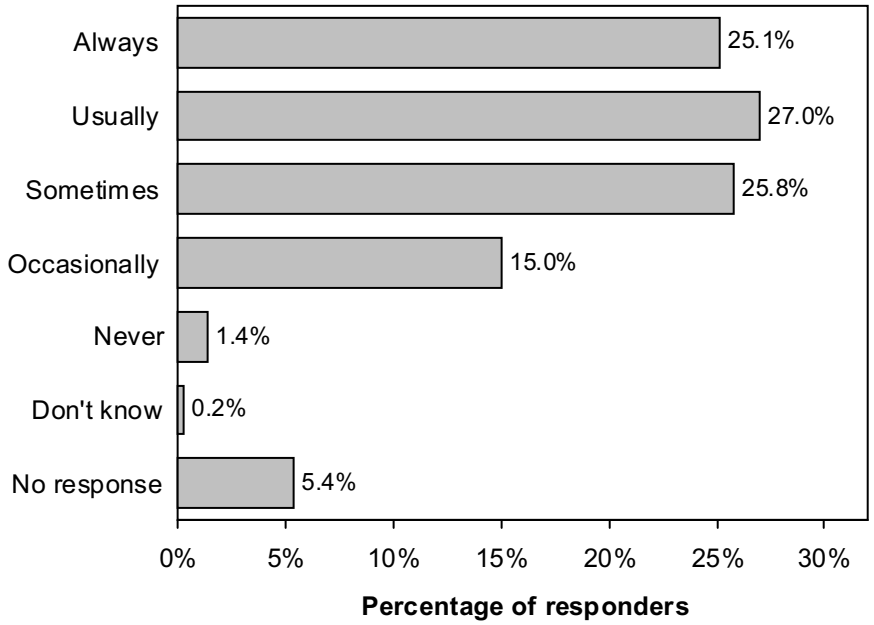
If you could prescribe therapeutically and a patient presented with a suspected inflammatory or infectious eye condition, how often would you feel it was necessary to conduct a full eye examination (including refraction) as part of such a consultation?

Always	Usually	Sometimes	Occasionally	Never	Don't Know

Data

	Number	% (S)	% (Q)
Always	107	25.1%	26.6%
Usually	115	27.0%	28.5%
Sometimes	110	25.8%	27.3%
Occasionally	64	15.0%	15.9%
Never	6	1.4%	1.5%
Don't know	1	0.2%	0.2%
No response	23	5.4%	

Figure 11. The need for a full eye examination for cases requiring therapeutic prescribing



What percentage of all your referrals might be avoided if you could prescribe therapeutic agents?
(Please mark each scale with one vertical line)

GP
0 10 20 30 40 50 60 70 80 90 100 % referrals avoided

Ophthalmologist via
0 10 20 30 40 50 60 70 80 90 100 % referrals avoided

Ophthalmologist via
0 10 20 30 40 50 60 70 80 90 100 % referrals avoided

Ophthalmologist
0 10 20 30 40 50 60 70 80 90 100 % referrals avoided

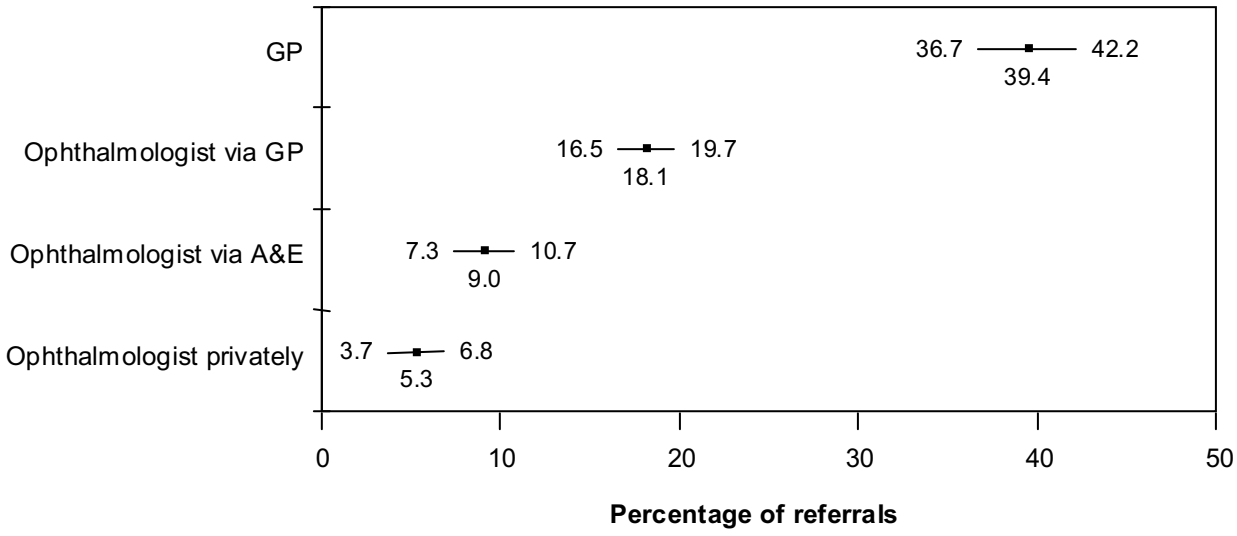
Data

				Distribution of responses				
	Mean	N*	Standard Error	Minimum	1st Quartile	2nd Quartile (median)	3rd Quartile	Maximum
GP	39.4	375	1.401	0	15	30	60	100
Ophthalmologist via GP	18.1	367	0.811	0	9	12	25	85
Ophthalmologist via A&E	9.0	335	0.862	0	0	2	10	80
Ophthalmologist privately	5.3	281	0.798	0	0	0	5	100

* Number of valid responses out of 426

95%confidence interval =mean ± (t* x standard error), where t* is the inverse t distribution, with parameters for the two tailed t distribution probability of 0.05, and degrees of freedom N-1.

Figure 12. Referrals avoidable by the ability to prescribe therapeutically



Your views about reimbursement

The standard General Ophthalmic Service fee is intended solely for routine eye examinations although in some Health Authorities it may be used to pay for participation in co-management schemes. Other Health Authorities have separate non-GOS payments for non-routine examinations.

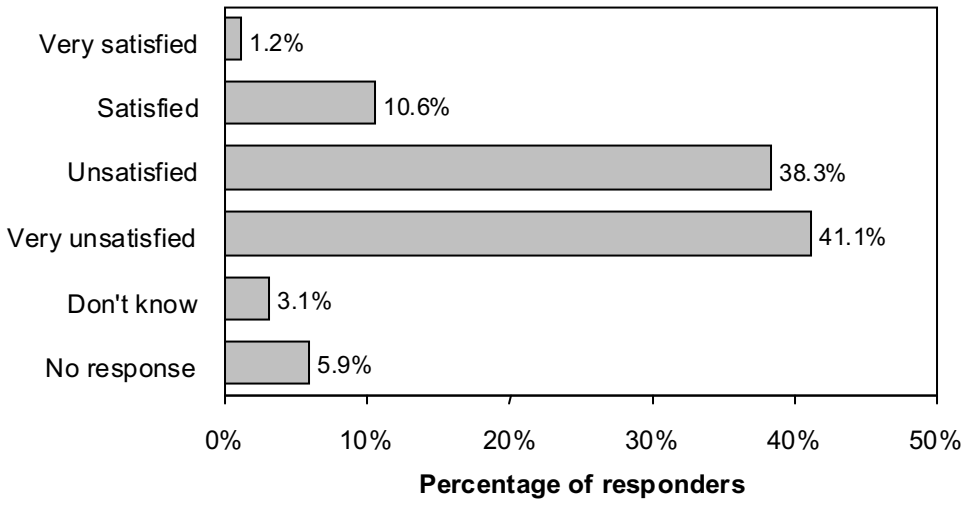
In general, do you think ***current*** methods of reimbursement for optometrists are:

Very satisfactory	Satisfactory	Unsatisfactory	Very unsatisfactory	Don't know

Data

	Number	% (S)	% (Q)
Very satisfied	5	1.2%	1.2%
Satisfied	45	10.6%	11.2%
Unsatisfied	163	38.3%	40.6%
Very unsatisfied	175	41.1%	43.6%
Don't know	13	3.1%	3.2%
No response	25	5.9%	

Figure 13. Optometrist satisfaction with current reimbursement arrangements



Reimbursement for optometrists with prescribing rights could be organised in a number of ways.

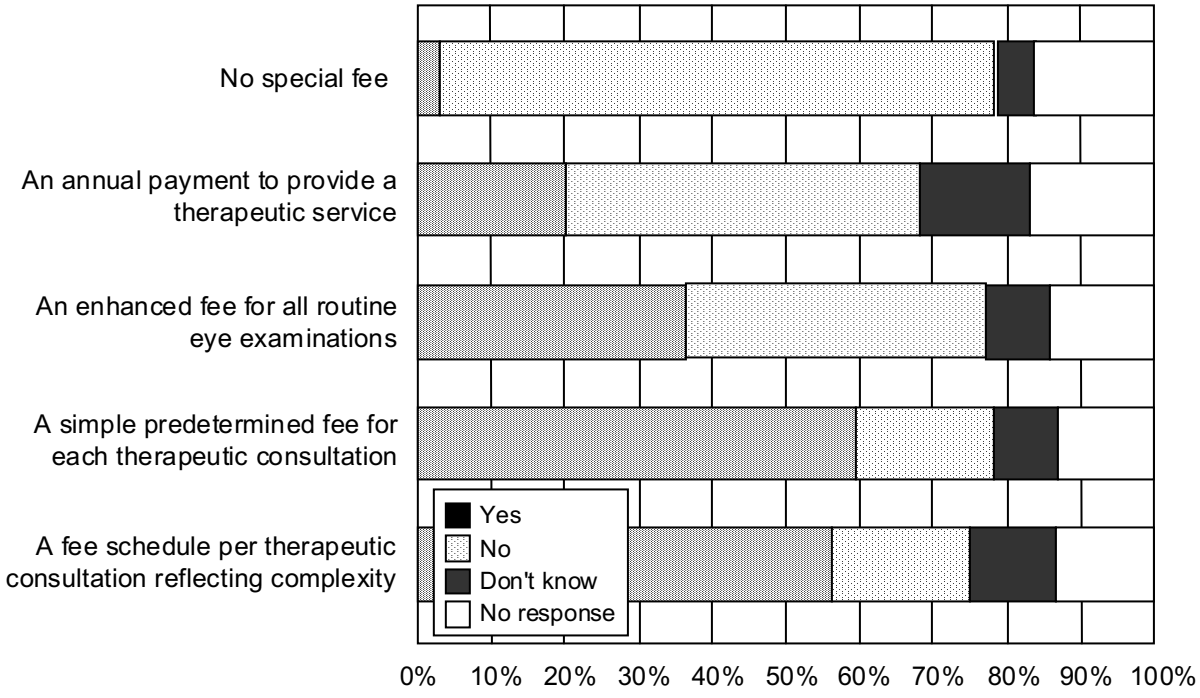
Please indicate which of the following would be acceptable forms of reimbursement:

a) No special fee	Yes	No	Don't know
b) An annual payment to provide a therapeutic service, negotiated with a local body such as a Primary Care Group or Trust	Yes	No	Don't know
c) An enhanced fee for all routine eye examinations, reflecting the time and resources spent on therapeutic consultations	Yes	No	Don't know
d) A simple predetermined fee for each therapeutic consultation	Yes	No	Don't know
e) A schedule determining the fee for each therapeutic consultation reflecting its complexity in diagnosis and management	Yes	No	Don't know

Data

	Yes			No			Don't know			No response		
	No.	% (S)	% (Q)	No.	% (S)	% (Q)	No.	% (S)	% (Q)	No.	% (S)	% (Q)
No special fee	13	3.1	3.7	321	75.4	90.2	22	5.2	6.2	70	16.4	NA
An annual payment to provide a therapeutic service	86	20.2	24.3	204	47.9	57.6	64	15.0	18.1	72	16.9	NA
An enhanced fee for all routine eye examinations	155	36.4	42.3	173	40.6	47.3	38	8.9	10.4	60	14.1	NA
A simple predetermined fee for each therapeutic consultation	254	59.6	68.6	79	18.5	21.4	37	8.7	10.0	56	13.1	NA
A fee schedule per therapeutic consultation reflecting complexity	240	56.3	65.0	79	18.5	21.4	50	11.7	13.6	57	13.4	NA

Figure 14. Optometrists' views about the acceptability of alternative forms of reimbursement



Your views about audit

GPs each receive PACT (Prescribing Analyses and Cost) or SPA (Scottish Prescribing Analysis) data, comparing their own prescribing activities against local, regional and national behaviour: this provides a level of self audit. Local health authorities may call to attention GPs prescribing habits when these are unusual: a type of simple professional audit. Visiting auditors, assessing a GP's prescribing for a sample of patients by note review, would provide detailed professional audit (with increasing computerisation and standardisation of patient records this may become common).

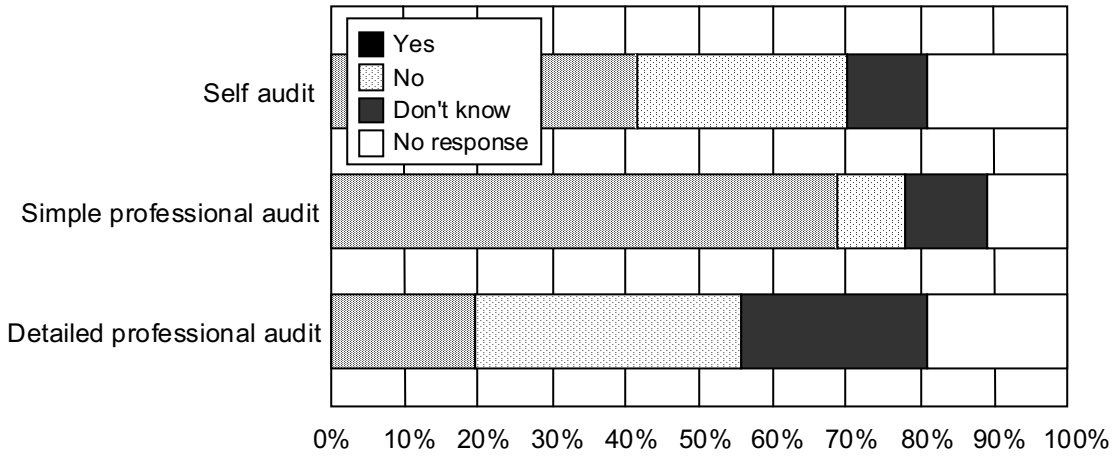
For an optometrist trained in therapeutic prescribing, at which level should audit occur?

a) Self audit	Yes	No	Don't know
b) Simple professional audit	Yes	No	Don't know
c) Detailed professional audit	Yes	No	Don't know

Data

	Yes			No			Don't know			No response		
	No.	% (S)	% (Q)	No.	% (S)	% (Q)	No.	% (S)	% (Q)	No.	% (S)	% (Q)
Self audit	177	41.5	51.5	122	28.6	35.5	45	10.6	13.1	82	19.2	NA
Simple professional audit	292	68.5	76.8	39	9.2	10.3	49	11.5	12.9	46	10.8	NA
Detailed professional audit	84	19.7	24.4	153	35.9	44.5	107	25.1	31.1	82	19.2	NA

Figure 15. Optometrists' views about the level of audit appropriate for therapeutic prescribing



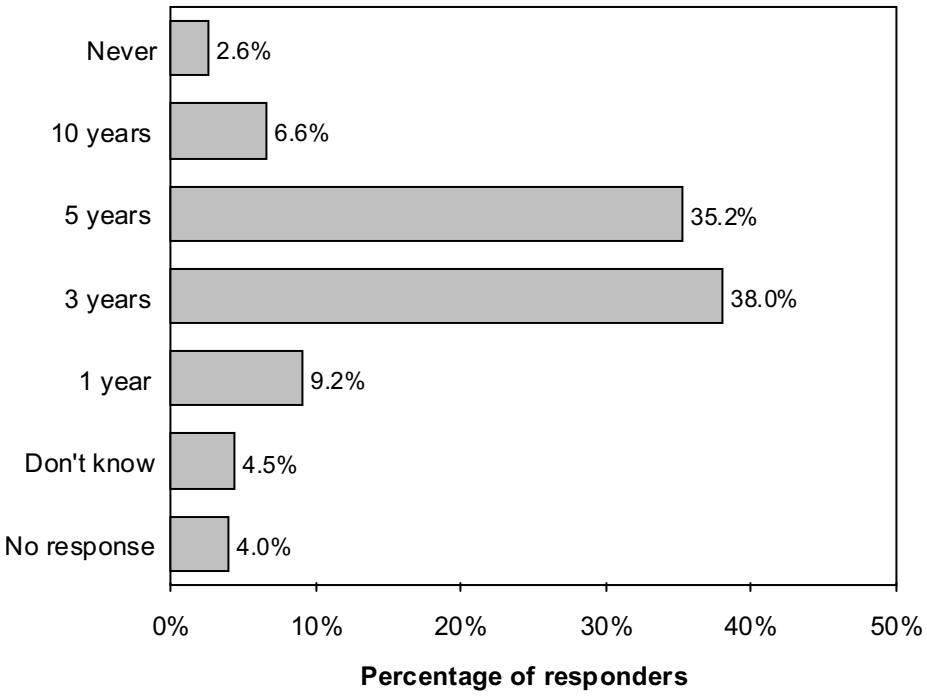
How often should re-accreditation of therapeutic prescribing occur?

Never	Every 10 years	Every 5 years	Every 3 years	Every year	Don't Know

Data

	Number	% (S)	% (Q)
Never	11	2.6%	2.7%
10 years	28	6.6%	6.8%
5 years	150	35.2%	36.7%
3 years	162	38.0%	39.6%
1 year	39	9.2%	9.5%
Don't know	19	4.5%	4.6%
No response	17	4.0%	

Figure 16. Optometrists' views about the frequency of re-accreditation appropriate for therapeutic prescribing



How often should optometrists receive continuing education to up date therapeutic prescribing?

Never	Every 10 years	Every 5 years	Every 3 years	Every year	Don't Know

Data

	Number	% (S)	% (Q)
Never	0	0.0%	0.0%
10 years	4	0.9%	1.0%
5 years	22	5.2%	5.4%
3 years	94	22.1%	23.0%
1 year	277	65.0%	67.7%
Don't know	12	2.8%	2.9%
No response	17	4.0%	

Figure 17: Optometrists' views about the frequency of continuing education appropriate for therapeutic prescribing