UK Eye Care Services Project

Phase One: Systematic Review of the Organisation of UK Eye Care Services

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Glossary of abbreviations

A&E  Accident and Emergency
ABDO  Association of British Dispensing Opticians
AGO  Accredited Glaucoma Optometrist
AO  Accredited Optometrist
AOP  Association of Optometrists
ARMD  Age-related Macular Degeneration
CCI  Centre for Change and Innovation (Scotland)
CET  Continuing Education and Training
COAG  Chronic Open Angle Glaucoma
CoO  College of Optometrists
COSI  Community Optometrist with Special Interest
CVista  Children’s Visual Impairment Scheme- Tayside Agencies
DES  Data extraction sheet
DoH  Department of Health
DR  Diabetic Retinopathy
FODO  Federation of Dispensing Opticians
GOC  General Optical Council
GOS  General Ophthalmic Services
GP  General Practitioner
HES  Hospital Eye Service
IAPB  International Agency for the Prevention of Blindness
ISIP  Integrated Services Improvement Partnership
IOP  Intra-ocular pressure
LOC  Local Optometry Committee
LV  Low Vision
NHS  National Health Service
NICE  National Institute for Clinical Excellence
NSC  National Screening Committee
OA  Optometric Advisor
OH  Ocular Hypertension
OHT  Ocular Hypertension
OPSI  Optometrist with Special Interest
PEARS  Primary Eyecare Acute Referral Scheme
PCO  Posterior Capsular Opacification
PCT  Primary Care Trust
POAG  Primary Open Angle Glaucoma
QUORUM Quality of Reporting of Meta-analyses
RCT  Randomised Controlled Trial
RNIB  Royal National Institute for the Blind
SHA  Strategic Health Authority
STDR  Sight Threatening Diabetic Retinopathy
STED  Sight Threatening Eye Disease
SVFA  Suprathreshold Visual Field Analysis
UHW  University Hospital Wales
UKECSSP  UK Eye Care Services Survey Project
VA  Visual Acuity
VF  Visual Field
WECI  Welsh Eye Care Initiative
WEHE  Welsh Eye Health Examination
WHO  World Health Organisation
WMSHA  West Midlands Strategic Health Authority
Executive Summary

Aim of the report and the overall project
The joint paper ‘Primary Care and Community Services: Improving eye health services’, produced by the UK Vision Strategy, Department of Health and World Class Commissioning, dedicates an entire section to mapping baseline services, and therefore suggests the importance of mapping ‘baselines’ in order to make improvements to eye health services (DoH, 2009: 26-34). Mapping exercises can be supported by academic research, audits of optometric practices and mapping patient journeys. This report is directly tied to this, with the overall project aim being to map UK eye care services. The aim of this report is to present the current literature relating to optometrists within UK Eye Care Services in a variety of capacities. By mapping services, any organisations outside of the College, including PCTs, can be supported in identifying service gaps, as well as understand the ways in which current services operate to facilitate the development of new schemes. The schemes described in this report will also provide exemplars for other regions not currently involved in enhanced eye care services.

Methods
A systematic review was carried out of all UK-based research papers regarding UK Eye Care Services published since 1997 which incorporate the role of optometrists in a variety of ways. All relevant databases were searched, including Medline, Embase, Cochrane, Science Citation Index, Applied Social Science Index of Abstracts (ASSIA), Health Management Information Consortium (HMIC), Cumulative Index to Nursing and Allied Health Literature (CINAHL) and PsychINFO.

This report makes recommendations for future research based upon the findings. Where relevant, grey literature material was also identified during the literature search, this is included to provide background to the research evidence. Grey literature was identified from a variety of sources, including the National Institute for Clinical Excellence (NICE), the Association of Optometrists (AOP), the Federation of Dispensing Opticians (FODO), the Association of British Dispensing Opticians (ABDO), and the College of Optometrists. All AOP-listed optometric schemes are also included, as well as those schemes identified from the grey literature.

Results
5287 abstracts were screened, of these 5062 were excluded as not relevant to the organisation of eye care services. Two hundred and twenty-five full text papers were read and their bibliographies scrutinised to identify further potentially relevant articles. This revealed a further fourteen papers. Eighty-eight papers were included in a meta analysis which was carried out using detailed data extraction forms (Appendix 2).

Summary of findings
- The findings suggest that many optometrists are working within structured, co-managed schemes in order to provide enhanced services to patients. These schemes commonly occur in pockets within primary care trust (PCT) or local health board areas. The schemes are listed within the final section of the report.

- As the population ages, such schemes will be increasingly necessary in order to stem the flow of referrals to a heavily loaded hospital eye service (HES), (Royal College of Ophthalmologists, May 2004).
Communication between all those involved is a crucial element in making such schemes function effectively. Communication between all parties involved in eye care services will require some enhancement in order to provide the best practice services to patients in need. Some evidence suggests communication between optometrists and ophthalmologists, in terms of feedback, could be improved (Whittaker et al., 1999).

Where optometric eye care schemes are identified in this report, the research evidence suggests optometrists provide a safe and high quality service, which is already incorporated within the core skills of their initial degree training.

Referral guidance is a major aspect to consider within referral refinement and co-management schemes. This is particularly the case for glaucoma referral refinement and/or co-management schemes. NICE guidance (2009) defines the approach to the referral and management of OHT and Glaucoma. The section of the guidance relating to inter-ocular pressure (IOP) created a difficulty in primary care settings as the repeated IOP measurements for patients with pressures over 21mmHg indicated by the NICE guidance, did not fit within the current funding structure. Schemes which encompass new ways of working in terms of referrals must consider the impact of such guidance upon referral patterns. AOP guidance in 2007 also strongly encouraged optometrists to follow the NICE guidance carefully for reasons of personal legal protection. Joint College of Optometrists and Royal College of Ophthalmologists clarification on this point was aimed at addressing some of the reported confusion relating to when community optometrists working within ‘standard’ primary care settings should refer. The NICE guidance helped to clarify the need for community eye care services and secondary (Hospital Eye Services – HES) to be organised in a manner that took account of key clinical and professional guidance in ensuring schemes provided safe and effective care that does not conflict with the standards and expectations of the bodies that govern and guide clinical and professional practice.

The financial restraints placed on local PCTs and their successors, GP-led Consortia, must be considered. Where referral refinements and/or co-management schemes exist, the very nature of these means referrals are made only when the optometrist is satisfied that the patient requires additional care from the HES. This presents a competing challenge between streamlining glaucoma services via referral refinement and co-management, and adhering to professional guidance from key bodies including NICE.

Conclusion
In summary, this report suggests that the co-management schemes identified are particularly effective, however there will be continued debate regarding the generalisability of such schemes across wider areas.

Scotland and Wales have devolved powers for healthcare, here eye care services operate on higher fees to optometrists for each patient seen (Scotland) or are directly funded by the Government (Wales Eye Care Initiative (WECI) scheme).
The UK is divided in terms of its eye care provision to patients. Where schemes initially implemented in Wales have been taken up within England, these have been arranged between the PCT and optometrists within the particular area. There is evidence of success, in terms of improved access to diagnostic eye care services, improving the quality of referrals and reducing demands in Primary care (Sheen et al 2009). These include referral refinement and primary eye care acute referral schemes (PEARS). It remains to be seen how these pockets of best practice could be transferred across larger areas, where patient need may differ, and PCT budgets may have correspondingly different priorities. Furthermore, the recent announcements regarding the abolition of PCTs and strategic health authorities (SHAs) by 2012 made during the write-up of this report, and the emphasis this places on GP-based commissioning and community health services, could present a particular opportunity for community-based optometric care.

Finally, the report also advises on future research priorities, and identifies methods of data collection and presentation for this future research within eye care services.
1. Background to current organisation of UK eye care services

The quality and management of UK Eye Services has been the subject of much scrutiny over a number of years. Changes in English governmental jurisdictions over Wales and Scotland, has meant the evolution of new practice as a result of governmental devolution. Many sectors of the Scottish and Welsh public, including those in at-risk groups, can now receive free eye examinations under new guidelines and eye care schemes in both countries (e.g. PEARs and the new GOS contract in Scotland). In contrast, England continues to have a significant proportion of eye examinations requiring private funding from patients. Only certain groups, including full-time students aged 19 or under, under 16 year-olds, over 60 year-olds, those receiving state-benefits, people with diabetes, and those with a family history of certain conditions, can receive free eye examinations by a qualified eye-care professional, typically a community optometrist. Optometrists provide the largest eye care service in the UK, and are responsible for the largest number of referrals across the eye care services sector. For example, 90% or more of primary open angle glaucoma referrals in the UK originate from optometric practice (Gilchrist, 2000). Follow-up on such cases accounts for one quarter of the Hospital Eye Service (HES) workload (Gilchrist, 2000).

The leading causes of certifications for blindness and partial sight are macular degeneration and posterior pole degeneration, closely followed by glaucoma and diabetic retinopathy (Bunce and Wormald (2006). Since their study, an ageing population may have led to an increased incidence of these conditions as a result of a greater number of people in the age groups at most risk. Projections from commissioning sources suggest that the demand for NHS sight tests will rise by some 20% over the next twenty years as a result of the increase in the over 60 population. Furthermore, the cases of eye conditions such as glaucoma are set to increase by a third by 2021, and will continue to rise at a similar pace until 2031 (Commissioning toolkit for community based eye care services, January 2007). Therefore the future impact of the aging population upon referrals to HES will be particularly significant. In order to minimise excessive hospital workload, in which appointment slots are increasingly in short supply, referrals from the community require high levels of accuracy in order to ensure that only those conditions which truly require HES examination are passed on.

The General Optical Council (GOC), is currently considering the implementation of revalidation, in which all optometrists would be required to re-validate their license to practice by demonstrating quality of service and the scope of services provided by optometrists (GOC bulletin, Winter 2009). This is likely to involve development of the existing system for continuing education and training (CET) points, gained on training courses, conferences and similar professional activities.

In parallel to this, various other guidelines involving optometrists and health care professionals have been introduced, for example the NICE guidelines for the ‘diagnosis and management of chronic open angle glaucoma and ocular hypertension’, 2009, and the Department of Health’s ‘Action on Cataracts’, 2000. The latter suggested the need for increases in surgical throughput for cataracts, recommending changes to cataract care pathways. Correspondingly, direct cataract referral schemes and one-stop cataract surgery pathways have evolved considerably, and are included in this report. However, the impact of new governmental plans for restricting common operations including cataract surgery remains to be seen. Optometrists feature in key places within these schemes as the direct referrers from their community practice to the HES. Other
schemes involving optometrists include diabetic retinopathy screening, glaucoma monitoring, prescribing and schemes for acute eye conditions.

Within the diverse context of new guidance and a rapidly evolving environment for eye care provision, the long-standing debate continues regarding the role of eye-care professionals, particularly optometrists. As the population continues to age, the role of optometrists will become even more important in meeting the increasing demand for eye care services whilst taking account of the challenging budgetary decisions facing the NHS. The new GP-led Consortia, along with the rest of the NHS will be working within a tight regime of restricted funding and demands for cost saving measures across the board. The full impact of the 2010 spending review on the NHS has yet to become clear, but its impact is already influencing commissioning decisions. 80% of the NHS budget will be handed to GP-led Consortia, making them a key function in the system. Expanding roles for community optometrists has the potential to reduce the burden on the HES, particularly ophthalmologists, who are expensive in time and money to train and increasingly short on physical space within their working environments.

Guidance produced by the Integrated Services Improvement Partnership (ISIP), outlines the steps in a ‘benefits realisation’ approach to eye care services (Step-by-Step Guide to Commissioning Community Eye Care Services, 2007). This approach allows further engagement from stakeholder groups, and part of the process means stakeholders agree on the priority areas for change, based on the gap between current provision and where future provision should be. Therefore, by identifying this gap, the key factors for change can be identified. Many of the activities outlined by the ISIP pertain to community-based and co-managed eye care. In terms of service re-design for example, desired outcomes include patients being treated closer to home and being seen more quickly, increasing the range of services available to patients, community training programmes, and the increased use of community workforces.

The ISIP Guide (2007) also outlines recommended eye care pathways for cataract, glaucoma and low vision (Appendix 8). Many established and new eye care schemes described in the research papers included in this report largely mirror these model eye care pathways. Under the NHS Modernisation Agency, a chronic eye care services programme was established in order to pilot new patient pathways for low vision, age-related macular degeneration and glaucoma. The schemes detailed within the programme’s literature review are also included in the final section of this report (McLeod et al., 2006).

Some authors have called for the entire restructuring of eye care services, including one paper suggesting the implementation of a community ophthalmologist system in order to reduce ophthalmic referrals from general practice (Chopdar, 1999). However, the vast majority of new shared-care schemes in the UK include the training of community optometrists to detect, initially diagnose and later to manage specific eye conditions within a community setting.
Devolution of Scotland, Wales and Northern Ireland

Scottish Community Eye Care Services

In October 2005, Sense Scotland delivered a response to the Scottish Executive interim report on the review of eye care services in Scotland. The recommendations and comments mirror the full review article by providing an initial commentary regarding a ‘patient-centred approach to the design of eye care services.’ Similarly, the interim report also suggests the use of ‘the optometry network’ to deliver ‘an extended eye examination’, as well as the possible consideration of supermarket based ophthalmic services. Additionally, the recommendations suggested the need for further work to address the specific eye care needs of children (Sense Scotland, 2005: 3).

The follow-up report from the Scottish Executive, the ‘Review of Community Eye Care Services in Scotland’ in 2006 marked a significant development of eye care services for optometrists. As a result of this review, optometrists became able to use their clinical judgement to determine the content of a sight test, rather than to follow a rigidly prescribed format which could include carrying out procedures which did not benefit the patient. This increased flexibility has advantages for both optometrists and for patients. The fee structure was also reviewed, and the sight test fee paid to optometrists was increased from £18.50 to £36 (2007-2008 fees). Consequently, optometrists in Scotland are reimbursed for carrying out extended examinations, which is still a source of debate in England in terms of reimbursement methods and remuneration figures (Scottish Executive, 2006).

The final report of the review of community eye care services in Scotland set out a number of key recommendations including some of the following pertaining to service design and integration:

- Taking an integrated, patient-centred approach to designing eye care services for adults and children.
- The extended role of the optometrist should be used in order to strengthen clinical management of patients as well as strengthen links to support in the community.
- The CVISTA scheme (Children’s Visual Impairment Scheme - Tayside Agencies) should be undertaken across Scotland. CVISTA is an integrated team of health and social care agencies in Tayside who provide services for children and their families with visual impairment. The agencies include NHS Tayside, Angus Council, Forfarshire Society for the Blind, RNIB Scotland, Parent to Parent, Sense Scotland, Guide Dogs and Pamis. The agencies can recommend tests for low vision aids or an orientation and mobility assessment, as well as equipment and strategies for school, the home and in the community. This information is available from the CVISTA information sheet.

The other recommendations also directly relate to the optometrist role, and how this should be utilised in order to strengthen eye care services to patients. Similarly, where the guideline recommends a patient-centred approach, co-managed schemes will help to achieve this, placing the patient in charge of appointment times, deciding whether they wish to have surgery for conditions which are treated with surgery, and which particular optometrist to access within the community.

The current Scottish system is summarised by Optometry Scotland as follows (http://www.optometrscopytland.org.uk):
1. Universal access to free NHS routine eye examination by community optometrists
2. Universal access to free NHS eye care by community optometrists between scheduled recall periods if a visual or eye problem develops
3. Funding for retinal cameras in all Scottish community practices in 2008/2009
4. Funding for automated visual field analysers with threshold capability in 2006/2007
5. Recurrent annual education funding of £1 million delivered by NHS Education Scotland (NES).

The Centre for Change and Innovation in Scotland also produced patient pathways for an entire range of eye conditions, including strabismus, glaucoma, flashes and floaters, external eye disease, diplopia, cataract and ARMD. These pathways provided the recommended outlines for creating new pathways in individual areas of Scotland. Many of the resulting pathways share similarities with the co-management schemes in England and Wales, utilising optometrists’ skills. Some of the resulting local schemes in Glasgow, Lothian and Grampian (Aberdeen), are listed in the scheme section later. All CCI pathways are documented in Appendix 7.

**Welsh Community Eye Care Services**

The governmental independence of the Welsh Assembly has permitted the development of eye care services within Wales. As a result, the Welsh system has developed quite differently to other UK countries, although it is similar to Scotland in terms of growth in eye-care services. The Welsh Eye Care Initiative (WECI), incorporates both the Welsh Eye Health Examination scheme (WEHE), which is an extended sight test, and the Primary Eye Care Acute Referral Scheme (PEARS), as well as Low Vision, Diabetic Retinopathy Screening, Glaucoma Co-management, a Primary Care Cataract Post-Operative Service and Children’s Screening (information available from Welsh Assembly Government website).

There are 532 optometric practices in Wales, with at least one in every conurbation, and many rural practices. This permits widespread access to eye-care services for patients throughout Wales. A catalogue of local optometric care pathways has recently been published by Optometry Wales (2010). This provides a reference guide to local optometric schemes across Wales. Consequently, Wales has a suite of eye care services, and detailed protocols for some of these eye-care initiatives are available from the Eye Care Wales website (www.wales.nhs.uk). Schemes have been piloted prior to general implementation, and reports are available which evaluate the schemes and any cost-savings (Optometry Wales, 2010).

The Welsh Assembly funds the WECI. All optometrists are trained on Cardiff University approved courses in order to provide the services under the WECI, and practitioners display signage within their practices in order to show their involvement in the schemes. The WEHE is applicable to particular patients, including those in at-risk groups for particular eye conditions including glaucoma. The PEARs scheme allows community optometrists to refer patients directly to the HES when patients present with acute eye conditions requiring urgent HES appointments. If the patient first presents to a GP, the GP can refer the patient to the nearest accredited PEARs optometrist for subsequent HES referral.
The Low Vision Scheme involves over one hundred optometrists and dispensing opticians who can provide low vision assessments. Any necessary low vision aid is prescribed free of charge (RNIB, 2007). The optometrists and dispensing opticians who provide the low vision service take an Association of British Dispensing Opticians (ABDO) Low Vision qualification and referrals can be sent from ophthalmologists, GPs, optometrists, social workers, rehabilitation workers, relatives and the patient (self-referral) (Welsh Low Vision Scheme Service Manual, October 2005).

Condition-specific schemes include diabetic retinopathy screening, glaucoma co-management and cataract care. The diabetic retinopathy scheme exists across all Local Health Groups in Gwent, as well as Anglesey (Welsh Assembly Government, 2002). This was followed by a proposal made in 2005 for improving glaucoma services, by implementing service re-design to allow optometrists to co-manage care (Optometry Wales, 2005). A primary care cataract post-operative service is operating in Gwent, whereby trained and accredited optometrists carry out sight tests on patients after their cataract surgery which frees capacity in secondary care thus reducing HES waiting times (Optometry Wales, 2010). As with the WECI and PEARs examinations, a fee is paid to optometrists over and above the GOS sight test fee.

Schemes for children include the Cycloplegic Refraction Scheme which is operating in Camarthenshire (Optometry Wales, 2010). Optometrists receive referrals from HES orthoptists or ophthalmologists. As with the cataract scheme, trained and accredited optometrists carry out the full GOS sight test plus cycloplegic refraction. Again a fee is paid to optometrists over and above the GOS sight test fee.

Global Thinking Surrounding Preventable Blindness and the UK Response

The Vision 2020 Initiative and the UK Vision Strategy

Vision 2020 is a global initiative co-ordinated by the World Health Organisation (WHO) and the International Agency for the Prevention of Blindness (IAPB). The aim is to eliminate preventable blindness on a global level by 2020. This represents a massive undertaking and therefore a substantial commitment to improvements in eye care delivery and management.

The UK Vision Strategy, which is outlined in the document ‘Evidence Base for the UK Vision Strategy’, ‘aims to promote the elimination of avoidable sight loss, and improve the care, quality of life and opportunities of individuals and families affected by sight problems’ (Bosanquet and Mehta, 2008). The report estimates some two million people have significant sight loss in the UK. Most are older people aged 65 or over, though 80,000 are working age, and 25,000 are children living with sight problems. In addition to this, the most common causes of certification for blindness and partial sight are glaucoma, age-related macular degeneration (ARMD) and cataract. Figures are increasing with an ageing population. Diabetic retinopathy (DR) has seen a doubling of figures in the over 65s according to the report findings. Other reports from Northern Ireland suggest diabetic retinopathy increased by 120% between 1996 and 2003 and by 113% for ARMD in the same period (Kelliher, Kenny and O’Brien, 2006).
Other Ophthalmic Roles

Orthoptist Roles and Paediatric Eye Care in the Community
In 2003, Hall and Elliman produced policy recommendations on child eye care in the ‘Health for All Children’ document, which suggested the alteration of the screening age for children. Screening had previously been recommended to take place when the child was aged six weeks, 3 and a half, 5, 7 and 11 years. Hall and Elliman suggested results from eye screening examinations prior to the age of 5 were not reliable, and recommended an end to screening below this age. Screening at age 3 and a half had been carried out by a health visitor. Hall and Elliman further argued that if an effective orthoptist-led service was in place for age 4-5 year olds, then subsequent screening could also be discontinued. These recommendations were approved by the National Screening Committee and introduced by the Government, thereby introducing the orthoptist into school vision screening.

The Children’s Eye Health report in 2007 however suggested that the current orthoptist service does not have a sufficiently large workforce to screen all children (de Zoete, 2007). In addition, take up of free eye tests by optometrists for under 16s is particularly low. Between April 2006 and March 2007, only 22% of under-16 year olds in England and Wales took advantage of a free eye test. Other figures from this paper suggest some 663,000 four-year-olds in the UK are being screened by just 1,283 orthoptists. The final report of the Review of Community Eye Care Services in Scotland outlined the shortage of orthoptists in Scotland (Scottish Executive, 2006: 6). This is stated in the context of delivering integrated health and social care services for adults and children, and therefore suggests an immediate need to either increase the workforce or utilise current skills in a new way.

To add to the workload issues, orthoptist work not only involves school-vision screening but also includes the provision of services within hospital ophthalmology clinics. In light of this, the overall provision of child eye care services is being questioned, and ‘a nationwide review of the availability and effectiveness of vision screening for children’ has been recommended (de Zoete, 2007). deZoete also recommends that ‘children should visit an optometrist for a free NHS sight test before entering school’, which would represent a U-turn in thinking with regard to the age that children should be initially screened.

The Extension of the Role of the Nurse Practitioner - the HES Context
Within the hospital context, the role of the nurse has extended substantially to include ophthalmic care within the remit of some nurse practitioners. Research suggests that a high percentage of patients can be seen exclusively by the nurse practitioner within emergency eye care (Buchan et al., 2009). In their study, 311 out of 1831 patients were seen exclusively by the specialist nurse in 2006 (comparisons between 2001 and 2006 were made throughout the study). Eighty-one of the 311 did however return to the department. When 51 records were examined, 18 were scheduled returns, leaving a remainder of patients who returned for reasons which were not clear. Other work by Ezra et al. (2005) suggests emergency nurse practitioners are more accurate than A&E senior house officers in relation to history taking, recording visual acuity (VA), making a provisional diagnosis and describing ocular anatomy. Findings in the non-A&E context also suggest that agreement between nurse practitioners and other ophthalmic health professionals, in this case consultants, is particularly high (Banerjee et al., 1998). This research suggested all diagnoses made by nurse practitioners were agreed by the consultant, and where management was proposed by the nurse, 96% of cases were
also agreed by the consultant.

Other schemes have also utilised nurse and ophthalmologist workforce skill mix for tele-consultations in post-operative cataract patients with glaucoma (Rendell, Burns and Murdoch, 2000). Some 90% of the patient cohort were satisfied with the tele-consultation, and 76% felt the tele-consultation was either as personal (62%) or more personal (14%) than the traditional face-to-face consultation. Some patients felt less embarrassed about seeing the ophthalmologist via the tele-consultation method. Tele-consultation involved the nurse setting up examination equipment and examining using slit lamp (anterior segment) and taking IOP measurements. The nurse then presented the patients for tele-consultation. The ophthalmologist could then be involved in the examination from the HES via live feed (Moorfield’s Eye Hospital in Central London). The actual examination took place one and a half hours away in Ealing.

Rose et al. (1999) conducted action research involving nurses working within a peripheral hospital clinic and a specialist eye hospital. The peripheral clinic included one staff nurse and another enrolled for the study, both from the general hospital. Other personnel included a surgeon contracted from the specialist eye hospital, a clinical assistant (a GP from a local practice), and two optometrists. Patients were either randomised into the control group, where the established day-care surgery model was used, or the experimental group where care was organised to reduce the number of visits to the HES and with greater input from the optometrists and ophthalmic nurse. Once the study was implemented, the peripheral clinic team added an ophthalmic nurse into the team. Preoperative assessment contained the same elements at both sites. The control group however were seen on four separate assessment periods: by a doctor, auxiliary nurse, and two trained nurses.

The experimental group however were seen just once by the trained ophthalmic nurse, representing a ‘less fragmented model of care’ (Rose et al, 1999). As the study progressed however, the optometrists’ workload meant they could not successfully rotate preoperative assessment care with the nurses, and instead the care pathway evolved. With the support of the consultant ophthalmologist, the nurse continued to learn slit-lamp and applanation tonometry skills, which optometrists’ are already well-versed in, whilst the optometrist role developed to advising patients on eye drop instillation. The post-operative care of patients was compromised when the ophthalmic nurse was away from the hospital. Although cover was provided, the stand-in nurses did not have sufficient expertise to operate without medical supervision.

Evidence of Contact with Optometric and Ophthalmic Services

Cox et al. (2005) reported on the contact that elderly people had with optometric and ophthalmic services. The study population included elderly patients with and without visual impairment who had fallen and sustained a fractured neck of femur (Cox et al., 2005). Those patients with severe dementia and/or could not answer or take part in the study were excluded.

The study included 537 patients who had undergone hip fracture surgery within Glasgow, Ayr, Dundee and Fife. The results suggested that 393 patients (79%) had optometric contact within the last 3 years preceding surgery. Of 21% who had not had recent optometric contact, 64 had visual impairment due to uncorrected refractive error and cataract. Overall, visual impairment was identified in 239 patients (46%). However, just 16% (39 patients) of those with visual impairment were under ophthalmic care at the time of taking part in the study. Those in the more socially deprived group were also
less likely than any other group to have seen an optometrist. Furthermore, this group had a higher number of falls during the 5 years prior to the study. Overall, this suggests that poor contact with both optometric and ophthalmic services is having an effect upon incidence of falls in the elderly. In terms of patient safety in the home and the community, this represents a large, un-met need within this vulnerable population, and methods for increasing involvement within elderly groups are required to enhance their safety, and also to reduce the potential for additional hospital stays as the result of falls, which might otherwise have been prevented. The authors recommended that domiciliary visits made by optometrists could improve outcomes.

**Generalisability of Care Pathways**

The action research by Rose et al. (1999) meant the eye-care pathway was adapted to suit the very particular need within the hospital. This would be a different approach to implementing a care pathway which has been originally designed outside a proposed implementation area. When considering current care pathway schemes as exemplars for future implementation in other areas, it is important to recognise that schemes may have evolved since implementation. Understanding the reasons for such changes will be important in establishing generalisable results and information about the likely key factors in the application of a scheme developed in one area as opposed to another area. This is particularly pertinent when comparing Scottish and Welsh schemes and workforce structures to English systems, due to the fact the devolved countries have set-up eye care services differently in terms of fee structures and budgets for paying fees to optometrists. Furthermore, PCTs have different financial demands, requiring careful planning when considering transplanting a scheme into other Trusts.

**Report Aim**

The aim of this report is to present the current literature involving optometrists within UK Eye Care Services, in a variety of capacities. The report also aims to advise on future research priorities, and to identify methods of data collection and presentation for this future research within eye care services. To achieve these aims, this report necessarily focuses upon research conducted since 1997, when a change of UK government took place. The findings will provide a guide for future research avenues and associated methods of data collection and presentation.
2. Methods

2.1 Data Searches
All literature relating to UK eye-care schemes was included in the review. Searches were restricted to literature published from 1997 onwards. 1997 was chosen as this was when the New Labour Government came to power and embarked on considerable re-organisation of the UK National Health Service. This decision was taken for two reasons, firstly to include the most recent and current eye-care management schemes; and secondly reduce the number of 'hits' to a manageable size.

2.1.1. ‘Black’ Literature
Search terms were identified with input from the project steering group, and are reproduced in Appendix 1. The searches were carried out by the principal investigator and information scientist.

The following databases were searched for relevant literature:
- Medline
- Health Management Information Consortium (HMIC)
- Cochrane Collection
- EmBase
- Applied Social Science Index of Abstracts (ASSIA)
- Cumulative Index to Nursing and Allied Health Literature (CINAHL)
- ESRC Evidence Based Policy and Practice Network
- DHSS-DATA (forms part of HMIC)
- British Nursing Index
- Science Citation Index
- PsychINFO.

The abstracts of all papers were screened by a team of three researchers. Each abstract was screened by two independent researchers. The inclusion criteria used were:

A) Definitely relevant if:
1. Study carried out in UK
   AND
2. Study describes eye care services and management of these in some way.
   OR
3. Study describes eye care screening or co-ordination of services.
   OR
4. Study describes pathways of care and/or referral patterns.
   OR
5. Study describes an evaluation of eye care services, a pilot or experiment in new ways of service delivery
   OR
6. Study describes communication and/or referral pathways between different health professional groups with regard to eye care services (e.g. optometrists and nurses, ophthalmologists, GPs, etc.)

B) Possibly relevant if:
1. Study carried out in UK,
   AND
2. Study describes eye care services, perhaps as a secondary focus of the article.
C) Relevant review papers were also included which described:
1. Eye care services and management of these in some way.
   OR
2. Eye care screening or co-ordination of services.
   OR
3. Pathways of care and/or referral patterns.
   OR
4. Evaluation of eye care services, a pilot or experiment in new ways of service delivery
   OR
5. Communication and/or referral pathways between different health professional
groups with regard to eye care services (e.g. optometrists and nurses,
ophthalmologists, GPs, etc.).

2.1.2. Grey Literature
The same search criteria were applied to grey literature sources. Information was
collected using existing databases and through contacting relevant bodies and
organizations, and also by personal communication with experts in the field. The grey
literature sources were as follows:
- NHS PRODIGY – practical, reliable evidence-based guidance
- Aggressive Research Information Facility (ARIF – Birmingham University –
  provides critical appraisals on specific topics)
- Health Technology Assessment Programme
- Current Controlled Trials
- BMJ clinical evidence
- BMJ best treatments
- NHS Evidence (Website – www.evidence.nhs.uk)
- Primary Care Contracting website (www.primarycarecontracting.nhs.uk)
- Eyes and Vision Research Collaboration
- Local Optometry Committees and networks
- LOCCSU (Local Optometry Committees Central Support Unit)
- UK University Departments of Optometry
- Queen’s University
- University of Liverpool – research and teaching centre for control / treatment
  of ocular disorders
- Bristol Eye Hospital
- Hospital Optometry Committees
- British Contact Lens Association (BCLA)
- Association of Optometrists (AOP)
- RNIB (Royal National Institute for the Blind)
- Fight for Sight
- Thomas Pocklington Trust
- General Optical Council (GOC)
- Royal College of Ophthalmology
- Institute of Ophthalmology
- The Eye Care Trust
- National Eye Research Centre.
2.2 Data Extraction
A comprehensive data extraction sheet was developed, piloted and refined with input from the project steering group. A copy of the data extraction sheet (DES) is presented in Appendix 2. The DES gathered information on study design, methods, participants, results, data quality and reviewer comments. Data were extracted from all relevant papers by two researchers.

The search results from each major database are shown in table 1 below.

### Table 1: Summary of papers by database

<table>
<thead>
<tr>
<th>Database</th>
<th>Abstracts screened</th>
<th>Full text paper read and data extracted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embase</td>
<td>5167</td>
<td>67</td>
</tr>
<tr>
<td>Medline</td>
<td>2380</td>
<td>51</td>
</tr>
<tr>
<td>British Nursing Index (BNI)</td>
<td>157</td>
<td>41</td>
</tr>
<tr>
<td>Social Citation Index (SCI)</td>
<td>130</td>
<td>29</td>
</tr>
<tr>
<td>Applied Social Science Index of Abstracts (ASSIA)</td>
<td>105</td>
<td>11</td>
</tr>
<tr>
<td>PsychInfo</td>
<td>46</td>
<td>5</td>
</tr>
<tr>
<td>Health Management Information Consortium (HMIC)</td>
<td>26</td>
<td>21</td>
</tr>
</tbody>
</table>

The QUORUM chart (figure 1 below) shows the total number of papers found initially, and the reasons for exclusions which resulted in the final 88 papers.

**Figure 1: QUORUM Chart: initial search to final papers**

- Potentially relevant studies identified and screened for retrieval: 8069
- Studies excluded: 2782 Duplicates
- Studies retrieved for more detailed evaluation: 5287 abstracts screened
- Studies excluded
  - Reasons for exclusion: Not relevant to the organisation of eye care services, many pertaining to medical ocular care: 5062
- Potentially appropriate studies to be included in the meta-analysis: 225 full text papers read. A further 14 papers added from references found in full text papers. (239 papers read) 151 papers discarded as not meeting study criteria 88 papers meeting study criteria entered into the review database and data extracted
3. Results

3.1 Report organisation

The report contains 88 of the most relevant research articles incorporating optometrist practice within the wider context of UK eye care services (See Appendix 6 for table). The report is segmented according to type of eye disorder and corresponding schemes, many of which include refinements of optometric referral processes and other new initiatives for increasing eye health of the local population utilising the skills of accredited optometrists within the community. Each sub-section is headed by the number of research papers within the particular area, therefore suggesting the coverage of research overall and within specific eye condition care pathways. The final statement within each sub-section contains ideas for future research identified by the study authors and the report authors. Figure 2 shows the focus of the 88 papers included in the report. Figure 3 shows the type of study design used by authors of the 88 papers.

This report also contains findings from 57 grey literature sources. These include telephone conversation transcripts and follow-up documents from optometric advisors (personal communication), AOP-listed enhanced service schemes, all of which are contained in the final section of this report. Other background documents include NICE guidelines, AOP guidance, Welsh and Scottish eye care and Government documents, as well as Primary Care Commissioning documents, some literature review documents, local Government sources and also evidence from charitable organisations, particularly the RNIB. All of these documents are referenced throughout, and are therefore identifiable as grey literature. Appendix 9 contains the comprehensive list of grey literature included throughout this report. The references section also includes the grey literature (in grey font). AOP listed schemes do not appear in the references section.
Figure 2: Representation of paper distribution according to eye condition or initiative

<table>
<thead>
<tr>
<th>Condition/Initiative</th>
<th>Number of papers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glaucoma</td>
<td>18</td>
</tr>
<tr>
<td>Diabetic Retinopathy</td>
<td>12</td>
</tr>
<tr>
<td>Cataract</td>
<td>10</td>
</tr>
<tr>
<td>HES Optom</td>
<td>8</td>
</tr>
<tr>
<td>Referral quality, frequency, all conditions</td>
<td>6</td>
</tr>
<tr>
<td>Flashes and floaters</td>
<td>4</td>
</tr>
<tr>
<td>Prescribing</td>
<td>4</td>
</tr>
<tr>
<td>Low Vision</td>
<td>3</td>
</tr>
<tr>
<td>Referral initiative for all eye conditions</td>
<td>2</td>
</tr>
<tr>
<td>Paediatric</td>
<td>2</td>
</tr>
<tr>
<td>General commentary</td>
<td>2</td>
</tr>
<tr>
<td>Optometric technological comparison...</td>
<td>2</td>
</tr>
<tr>
<td>COSI critique</td>
<td>1</td>
</tr>
<tr>
<td>Posterior Capsular Opacification</td>
<td>1</td>
</tr>
<tr>
<td>Melanoma</td>
<td>1</td>
</tr>
<tr>
<td>Blood Glucose screening</td>
<td>1</td>
</tr>
<tr>
<td>Ocular Hypertension</td>
<td>1</td>
</tr>
<tr>
<td>Combined referral and eye exam initiative</td>
<td>1</td>
</tr>
</tbody>
</table>

NB: Glaucoma papers incorporated screening and referral quality (9), new initiatives (4), economic evaluation (2) and referral refinement (1). Cataract papers incorporated referral schemes (6) and quality of referrals from community optometrists to the HES (4). DR papers incorporated a mixture of referral initiatives and competency within these to manage DR.

Figure 3: Study Type

- Cohort
- Other
- Questionnaire
- Randomised Controlled...
- Unmatched control
- Observational
- Before and after

Number of papers
3.2 Summary of ‘black’ literature

This report includes 88 UK-based research papers regarding UK Eye Care Services since 1997 which incorporate the role of the optometrists in a variety of ways, and makes recommendation for future research based upon the findings. 21 papers are specific evaluations of eye care schemes involving optometrists (table 2 below), and many of these schemes re-appear in the final schemes section of this report.

Table 2: Evaluations of specific eye care schemes

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Scheme the paper evaluates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheen et al.</td>
<td>2008</td>
<td>Welsh PEARS and WEHE</td>
</tr>
<tr>
<td>Austen</td>
<td>2003</td>
<td>Loughborough GP referral scheme</td>
</tr>
<tr>
<td>Dahirman-Noor et al.</td>
<td>2008</td>
<td>West Suffolk referral scheme</td>
</tr>
<tr>
<td>Gray et al., Spry et al. (1999), Gray et al. (2000), Coast et al. (1997)</td>
<td>1997</td>
<td>Bristol</td>
</tr>
<tr>
<td>Azuaro-Blanco</td>
<td>2007</td>
<td>Glaucoma schemes in Scotland</td>
</tr>
<tr>
<td>Henson</td>
<td>2003</td>
<td>Manchester Glaucoma co-management scheme</td>
</tr>
<tr>
<td>Fielding and Watt</td>
<td>1998</td>
<td>Edinburgh Ocular Hypertension referral scheme</td>
</tr>
<tr>
<td>Gaskell</td>
<td>2001</td>
<td>Ayrshire Cataract scheme</td>
</tr>
<tr>
<td>Sharp et al.</td>
<td>2003</td>
<td>Stockport Cataract scheme</td>
</tr>
<tr>
<td>Muthcumarana and Rimmer</td>
<td>2000</td>
<td>Peterborough cataract scheme</td>
</tr>
<tr>
<td>Newsom</td>
<td>2005</td>
<td>Huntingdon cataract referral scheme</td>
</tr>
<tr>
<td>Pointer et al.</td>
<td>1998</td>
<td>Kettering Diabetic Retinopathy scheme</td>
</tr>
<tr>
<td>Ryder et al.</td>
<td>1998</td>
<td>Birmingham diabetic retinopathy scheme</td>
</tr>
<tr>
<td>Burnett et al.</td>
<td>1998</td>
<td>London diabetic retinopathy schemes</td>
</tr>
<tr>
<td>Prasad</td>
<td>2001</td>
<td>Wirral diabetic retinopathy scheme</td>
</tr>
<tr>
<td>Tu et al.</td>
<td>2004</td>
<td>Warrington Diabetic Retinopathy scheme</td>
</tr>
<tr>
<td>Hulme</td>
<td>2002</td>
<td>Preston diabetic retinopathy scheme</td>
</tr>
<tr>
<td>Warburton</td>
<td>2004</td>
<td>Stockport diabetic retinopathy scheme</td>
</tr>
<tr>
<td>James et al.</td>
<td>2000</td>
<td>Liverpool diabetic retinopathy scheme</td>
</tr>
</tbody>
</table>

Total: 21

NB: Table 2 does not include those papers which review optometrist referral quality within a particular area. This table lists those papers specifically related to the evaluation of a particular scheme.
Optometrists in primary care (Red)

In 1997, Ewbank discussed the concept of optometrists within the primary care context. Various areas of practice, including suitability for assessing certain eye diseases, have been the subject of controversy. According to this, 49% of ophthalmologists were against the concept of optometrists or opticians assessing anterior segment disease when surveyed. GPs on the other hand welcomed the idea of optometrists treating external eye conditions, including conjunctivitis. Ewbank also observed that professions now overlap due to the plethora of roles, including optical assistants, dispensing opticians, optometrists, pharmacists, orthoptists, school nurses, and HES nurse practitioners.

Table 3: Optometrists in primary care

<table>
<thead>
<tr>
<th>Authors</th>
<th>Date</th>
<th>Location</th>
<th>Description</th>
<th>Design</th>
<th>New initiative</th>
<th>Participants/number of case notes</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ewbank</td>
<td>1997</td>
<td>Not applicable</td>
<td>Discussed the concept of optometrists within the primary care context. Various areas of practice, including suitability for assessing certain eye diseases.</td>
<td>Not applicable</td>
<td>No.</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>
Optometrists within the Hospital Eye Service (HES) (Orange)

Five papers specifically reported studies on HES optometrists.

Oster, Culham and Daniel (1999) evaluated the referral appraisal skills of the hospital optometrist in Moorfields Eye Hospital, London. Referrals sent into the hospital would be seen by the hospital optometrist, thus representing an extension of their role. It is unclear whether one of the authors of the paper is the optometrist evaluated. The study took place over a 6 month period spanning December 1996 - May 1997, and therefore presents relatively old data in a limited time period. Referrals received were generally involving individuals over the age of 60 (56% of patients, n=86). 25% were aged 61-70, and thus involving an older study population. A provisional diagnosis was made in 152 cases out of the 157 patients included in the study. Some 79.6% and 17.1% were deemed correct or partially correct appraisals. Correct appraisal meant an accurate recording of both a primary and secondary diagnosis, whereas a partially correct diagnosis meant either the primary or secondary diagnosis was omitted or inaccurate. The results therefore suggest that hospital optometrists can accurately appraise a high number of referrals into the HES, and therefore sheds light on evidence for the validity of hospital-based optometrist care which could significantly save ophthalmologist resource. Similar results were produced by Banes et al. (2000 and 2006) within the same eye hospital, in terms of agreement with the consultant ophthalmologist on glaucoma management decisions. This suggests the short-term study in 1999 represented long-term efficiency of the hospital optometrist.

Hau et al. (2007) reviewed the ability of two senior optometrists based within the A&E department of Moorfield’s Eye Hospital to identify and manage eye disease. The two optometrists had a minimum of three years extended role experience, and as hospital-based optometrists represent a relatively small sector of the optometrist labour force. 150 patients were seen during the 6 month study period between January - June 2005. Those being seen by a nurse practitioner, or had pre-existing diagnoses from a previous visit/visits, were excluded. A wide variety of conditions were seen by the optometrists including the most prevalent conditions of glaucoma and cataracts, and other conditions related to contact-lens usage, blepharitis, dry eye and strabismus. Some 22 specific eye conditions are listed within the study article (see Appendix 3). Agreement was reached in 134, or 89.3% of cases of primary diagnosis, and there were 136 cases of management outcome agreement. As a result, this suggests hospital-based optometrists with experience of the role are well-placed to identify and manage the full range of eye conditions. The authors suggest that further research should assess whether trained optometrists are suitable to prescribe safely and competently in an A&E department.

This may be useful for those community optometrists who do spend some proportion of their work time within the HES, and also for extending the role of hospital optometrists on a larger scale.

In terms of other research based within the HES, Hau et al. (2008) suggested that a high number of ophthalmic A&E cases could in fact be managed in the community as a result of patients attending with conditions which may not represent genuine emergencies. Furthermore, the authors suggest that educating patients, specialist ophthalmic training for GPs and optometrists, and expanding outpatient services are required in order to ensure emergency services remain genuine emergency service
providers (Hau et al.: 740). In the context of the work by Oster, Culham and Daniel (1999), the work conducted by the hospital optometrist may therefore be directed, perhaps at least in part towards emergency cases, or at least cases with a long-term need for optometric or ophthalmic management.

Suggestions for future research:

1. Research regarding the utility and safety of optometric therapeutic practice within HES contexts.
2. Research regarding the scope of optometrists to treat emergency cases, bearing in mind the role of other practitioners, namely nurses.
3. Research on community optometrists as independent prescribers.

Types of work recommended for data collection and presentation:

1. Cohort studies utilising pilots for community optometrists and optometrists in the HES to use therapeutic agents.
2. Questionnaire studies of eye care providers, including ophthalmologists, optometrists and others to ascertain views on initial treatment of emergency cases by optometrists with later referral to the ophthalmologist.
### Table 4: Optometrists within the HES

<table>
<thead>
<tr>
<th>Authors</th>
<th>Date</th>
<th>Location</th>
<th>Description</th>
<th>Design</th>
<th>Participants/ number of case notes</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banes et al.</td>
<td>2000</td>
<td>Moorfield’s Eye</td>
<td>Comparison of HES optometrist and ophthalmologist management</td>
<td>Retrospective case note analysis</td>
<td>54 (108 eyes)</td>
<td>Glaucoma management decisions were of high quality/ similar to ophthalmologist management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hospital, London</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Banes et al.</td>
<td>2006</td>
<td>Moorfield’s Eye</td>
<td>Analysis of agreement between optometrists and ophthalmologists on glaucoma</td>
<td>Case note analysis</td>
<td>350 patients. 4 optometrists (HES</td>
<td>Overall agreement was 55% for VF status, 79% for management (medical aspects), other aspects</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hospital, London</td>
<td>management decisions</td>
<td>specially designed forms for the purpose of recording clinical management decisions</td>
<td>based) and 3 medical clinicians,</td>
<td>of managements- 72-98% and 78% for scheduling the next appointment.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>with 50 patients each</td>
<td></td>
</tr>
<tr>
<td>Hau et al.</td>
<td>2007</td>
<td>London</td>
<td>Evaluation of the ability of two senior optometrists based within the A&amp;E</td>
<td>Case note analysis</td>
<td>No.</td>
<td>Agreement was reached in 134, or 89.3% of cases of primary diagnosis, and there were 136</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>department of Moorfield’s Eye Hospital to identify and manage eye disease</td>
<td></td>
<td></td>
<td>cases of management outcome agreement.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hau et al.</td>
<td>2008</td>
<td>London</td>
<td>Review of A&amp;E cases to an A&amp;E department in an eye hospital</td>
<td>Questionnaire prospective study</td>
<td>560 questionnaires</td>
<td>High numbers of patients</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>were evaluated</td>
<td></td>
</tr>
<tr>
<td>Oster et al.</td>
<td>1999</td>
<td>Moorfield’s Eye</td>
<td>Evaluated the referral appraisal skills of the hospital optometrist</td>
<td>Case note analysis of discussion, measurement and recording history, measures of vision, slit-lamp examination, Goldmann tonometry</td>
<td>157 examined by the optometrist, provisional diagnosis in 152. 56% were over the age of 60 (86 patients) and 25% were aged 61-70.</td>
<td>79.1% and 17.1% were deemed correct or partially correct according to the study criteria, based on optometrist re-examination and history-taking in HES.</td>
</tr>
</tbody>
</table>
Combined eye examination and referral initiatives for all eye conditions (yellow)

One paper emerged referring to eye examination initiatives for all eye conditions. The largest initiative which covers a number of eye conditions is the Welsh Eye Care Initiative covering vast areas of Wales since 2003. The scheme is an umbrella for the Primary Eye Care Acute Referral Scheme (PEARS) and WEHE (Welsh Eye Health Examination). The former allows primary care interventions for acute ocular conditions by optometrists, whereas the WEHE scheme is a ‘case-finding service for ocular disease in patients considered at risk’ (Sheen et al., 2008). The authors concluded that the management of eye conditions within the two schemes was ‘acceptable’ and the cost per patient was relatively low. The conclusions also suggested that protocols for referral into the HES (hospital eye service) ‘would enhance the systems’ (Sheen: 435). According to personal communication with an OA within WMSHA, a similar PEARs scheme is being trialled locally, within the PCT. As the WMSHA scheme is particularly new, initial findings have yet to be published.

Table 5: Optometrists in combined examination and referral initiatives for all conditions (Wales)

<table>
<thead>
<tr>
<th>Authors</th>
<th>Date</th>
<th>Location</th>
<th>Description</th>
<th>Design</th>
<th>New initiative</th>
<th>Participants/ number of case notes</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheen et al.</td>
<td>2009</td>
<td>Wales</td>
<td>Evaluation of the WECI</td>
<td>Donabedian model using structure, process and outcome applied to participants</td>
<td>Yes. Community optometrists accredited to diagnose and managed eye conditions including glaucoma</td>
<td>6432 participants going through scheme, of which 4243 (66%) were managed by optometrists.</td>
<td>The management of eye conditions within the two schemes was ‘acceptable’ and the cost per patient was relatively low.</td>
</tr>
</tbody>
</table>

**Future working:**
1. Enhancing protocols within the WECI/ similar schemes for HES referrals.

**Types of work recommended for data collection and presentation:**
1. Design and dissemination of protocols between SHAs, PCTs, LOCs and the College and Association.
Referral initiatives for all eye conditions (Blue)

Two papers specifically refer to referral initiatives for all eye conditions.

Austen (2003) set up a GP referral scheme within the North Charnwood PCG (Loughborough) prior to the PCG becoming part of the local PCT, whereby GPs referred patients to their local accredited optometrist. 113 patients were seen via this service within the first year, and recent personal communication with the author suggests a very high patient satisfaction rate in terms of service quality and convenience. Similarly, the author also suggested patients are happier to attend the optometric practice due to the fact the nearest eye hospital is some distance away in Leicester, and not always available at convenient times (personal communication, Austen, March 2010). Furthermore, when the Leicester HES service is closed, the patient would be referred to a hospital even further away in Nottingham.

More recently, Dahlmann-Noor et al. (2008) reported the findings of an evaluation of the West Suffolk referral scheme, which the authors claim to be the first of its kind to include referral options to ophthalmic sub-specialties i.e. the optometrist can chose to refer to a particular branch of ophthalmology within the HES. Diagnostic competence was deemed very high (87%), and referrals were appropriate in 99% of cases. The optometrists’ choice of sub-specialty referral was less accurate, as was referral urgency (74% and 75% respectively), though overall it was concluded that the West Suffolk Direct Referral Scheme provided ‘an efficient service of high quality’ (Dahlmann-Noor et al., 2008: 185).

Both schemes represent overall referral schemes which refer the range of conditions. Other schemes involve either national schemes (WECI), a focus upon referrals for specific conditions, include optometrists in novel contexts, for example the HES, or measure referral quality in community optometrists referring to the HES. As these schemes are relatively new, it may be premature to suggest further working until the current schemes are refined. Table 6 below summarises these studies.
Table 6: Optometrist involved in referral initiatives (all eye conditions)

<table>
<thead>
<tr>
<th>Authors</th>
<th>Date</th>
<th>Location</th>
<th>Description</th>
<th>Design</th>
<th>New initiative</th>
<th>Participants/number of case notes</th>
<th>Outcome</th>
<th>Comments/notes where applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austen et al.</td>
<td>2003</td>
<td>Loughborough</td>
<td>Commentary paper on a new GP referral scheme (GPs referring to the local accredited optometrist)</td>
<td>Not applicable</td>
<td>Yes. GP referral scheme to accredited optometrists in the community</td>
<td>113 patients were seen in the first year</td>
<td>High levels of patient satisfaction</td>
<td>Personal communication with the author also suggests patients perceive greater convenience in the optometrist practice-based optometric services</td>
</tr>
<tr>
<td>Dahlmann-Noor et al.</td>
<td>2007</td>
<td>Suffolk</td>
<td>Evaluation of the West Suffolk direct referral scheme (all eye conditions)</td>
<td>Audit of existing practice, including three interventions during 2003: direct referral clinics for urgent cases.</td>
<td>Yes. Direct referral scheme between HES and community accredited optometrists</td>
<td>185 seen during the observation period (referred by accredited optometrists)</td>
<td>Diagnostic competence was deemed very high (87%), and referrals were appropriate in 99% of cases. The optometrists’ choice of sub-specialty referral was less accurate, as was referral urgency (74% and 75% respectively)</td>
<td></td>
</tr>
</tbody>
</table>
Referral quality and frequencies for all eye conditions (Purple)

Four papers reviewed referral quality and frequencies for all eye conditions.

Pooley et al. (1999) reviewed the feasibility of optometrist and ophthalmic medical practitioner direct referrals to the HES within Merton, Sutton and Wandsworth Health Authority (also contained in the grey literature section). 433 patients were referred during the dates when the data was collected: 28/7/97-22/8/97 in one hospital (St George’s Hospital and 11/8/97-22/8/97 in Sutton Eye Unit). Sutton represented the most affluent area. 172 patients were referred by the optometrist, 28 by the ophthalmic medical practitioner. 51% of optometrist referrals contained a diagnosis, and were significantly more likely to contain a diagnosis than a GP initiated referral. 90% of glaucoma referrals originated from the optometrist, and showed varying levels of screening utilisation as found in other studies in this report (100%, 80% and 45% for intra-ocular pressure (IOP), optic disc measurement and visual field (VF) measurements respectively). Cataract was however the most frequently stated diagnosis by the optometrists (in 27% of referral cases). The results suggested a number of aspects, including the wide variation in the tests utilised to screen for glaucoma and a low level of accuracy of glaucoma referral. It is also possible that the significantly higher proportion of specific initial diagnoses deriving from optometrist examination is due to their concentration upon eye care specifically, and the amount of experience, and an associated level of confidence in examining eye conditions in comparison to GPs.

In terms of GP referral quality, Sheth et al. (2008) recently audited letters brought by patients into Moorfields Eye Hospital between November 2006- February 2007. Most patients had first presented to their GP, with fewer presenting to their optometrist initially (22.6%). Most letters were typed (GP referrals), and most that were handwritten were deemed legible. However, a number contained medical history and medication omissions. It is unclear whether the GPs believed that these details were not necessary due to the severity level of the particular eye condition. This is not discussed by the authors. This is particularly relevant considering 12 cases were finally recorded by the ophthalmologist as ‘no abnormality detected’ and the next most common eye condition was conjunctivitis, a relatively common condition (n=9 cases). On the other hand, 8 cases were finally recorded as posterior vitreous detachment, being the next most common condition, and this condition can often require urgent follow-up. In addition, it could be argued that including medical history and medication lists represents good practice in all cases.

Pierscionek, Moore and Pierscionek (2009) later compared optometric and GP referrals to ophthalmology, also based upon the traditional referral pathway. This Belfast-based study compared the two groups of professionals in terms of the conditions referred, and the reasons for referral (if the two professional groups concurred). Data were analysed from 566 patient referrals produced during the study period of 3 months between January 2007 and March 2007. Most were made by optometrists (323, where the optometrist initiated the referral, and 243 were initiated by the GP. Other reports have also suggested that optometrists initiate referrals the most for other eye conditions (Weed and McGhee, 1998, keratoconus). Table 7 below summarises these studies.
<table>
<thead>
<tr>
<th>Authors</th>
<th>Date</th>
<th>Location</th>
<th>Description</th>
<th>Design</th>
<th>New initiative</th>
<th>Participants/ number of case notes</th>
<th>Outcome</th>
<th>Comments/ notes where applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pierscionek et al.</td>
<td>2009</td>
<td>Belfast</td>
<td>Compared optometric and GP referrals to ophthalmology, also based upon the traditional referral pathway</td>
<td>Data were analysed from 566 patient referrals produced during the study period of 3 months between January 2007 and March 2007</td>
<td>No.</td>
<td>Traditional referral pathway (via GP)</td>
<td>566 patient referrals</td>
<td>Most referrals were made by optometrists (323, where the optometrist initiated the referral, and 243 were initiated by the GP.</td>
</tr>
<tr>
<td>Pooley et al.</td>
<td>1999</td>
<td>Merton, Sutton and Wandsworth Health Authority.</td>
<td>Feasibility of optometrist and ophthalmic medical practitioner direct referrals to the HES</td>
<td>433 patients were referred during the dates when the data was collected: 28/7/97-22/8/97 in one hospital (St George’s Hospital and 11/8/97-22/8/97 in Sutton Eye Unit).</td>
<td></td>
<td></td>
<td>90% of glaucoma referrals originated from the optometrist, and showed varying levels of screening utilisation as found in other studies in this report (100%, 80% and 45% for IOP, optic disc measurement and VF measurements respectively). Cataract was however the most frequently stated diagnosis by the optometrists (in 27% of referral cases).</td>
<td>The results suggested a number of aspects, including the wide variation in the tests utilised to screen for glaucoma and a low level of accuracy of glaucoma referral.</td>
</tr>
<tr>
<td>Sheth et al.</td>
<td>2008</td>
<td>Moorfield’s Eye Hospital, London</td>
<td>Letters brought by patients into Moorfields Eye Hospital between November 2006-February 2007.</td>
<td>No.</td>
<td></td>
<td></td>
<td>Most letters were typed (GP referrals), and most that were handwritten were deemed legible. However, a number contained medical history and medication omissions.</td>
<td>It is unclear whether the GPs believed that these details were not necessary due to the severity level of the particular eye condition. This is not discussed by the authors.</td>
</tr>
</tbody>
</table>
Suggested future research:
1. A study could explore the utility of medical history and medication lists on optometric referrals sent via GPs, and ascertain the additional value of these to the overall referral. An up-to-date study would be useful in the context of shared-care and the associated proliferation of optometric and ophthalmic job roles within eye care services.
2. Study of ophthalmologists to determine their perceptions regarding GP referrals containing medication lists and medical history.

Types of work recommended for data collection and presentation:
1. Case note, cohort studies of notes sent by GPs comparing those sent with and those without medical history and medication lists, then compared with ophthalmologist follow-up, length of time for follow-up to happen at HES and the reasons for this i.e. whether this relates to the referral details.
2. Question ophthalmologists utilising a questionnaire to ascertain how relevant they find GP medication lists and medical history on referrals, in context of certain types of conditions.
Glaucoma (Green)

Glaucoma in the older population
Sinclair, Hinds and Sanders (2004), conducted a case note analysis study in order to identify the characteristics of patients in Fife who were registered as blind with the main diagnosis of glaucoma. Patients were registered between 1990 and 1999, and 87 sets of notes were studied (for 87 patients). The average age for registration was 78 years. The results suggested that compliance with treatment was poor in over a quarter of the study population (26%), and by the time the patient had been referred to hospital initially, more than half of these patients were aware of visual loss. This suggests that older patients' glaucoma is not being identified effectively, leading to potential sight loss later. This is particularly relevant in light of the fact that 23% of the patients could be registered blind at their first hospital low vision clinic assessment.

It should be noted, however, that because the cohort was registered between 1990 and 1999, they may not have been screened extensively for glaucoma given they attended optometrists in the 1970s and 1980s when optometrists did fewer visual field checks. The characteristics of the patients may also indicate the need for enhancing services to older people who have particular mental health needs and hearing impairment. A third of the patients had hearing impairment, and dementia was identified in 24%. The findings may be confined to this study due to the relatively small sample size and the location of the study within one area in Scotland, although further research across a larger UK area may indicate similar results, or provide evidence for patient management in those older patients with a diagnosis of glaucoma.

Glaucoma in children
Whilst glaucoma in children (primary congenital glaucoma, or PCG) represents a small proportion of visual impairment overall (1/18,500 in the UK), Papadopoulos et al. (2007) published research to identify the ‘incidence, detection patterns…management and IOP control’ in children. The report concluded that the incidence of PCG was ‘comparable’ to other populations reporting PCG incidence. The incidence of PCG was nine times higher in children of Pakistani origin than Caucasians. There were also comparable levels of IOP control post surgery, with 94% achieving 21mmHg and below with medication, and 86% in cases of secondary glaucoma with medications. This drops to 28% in cases of secondary glaucoma with medications.

The optometry landscape for glaucoma
In 2009, NICE produced glaucoma guidance in relation to the ‘diagnosis and management of chronic open angle glaucoma and ocular hypertension, and this is applicable to England and Wales (NICE guidelines, 2009). With regard to the tenth chapter on ‘Service Provision’ some authors have produced summaries for healthcare professionals (HCPs), in order to present the most relevant details (Spry, 2009). This document was produced as an annual evidence update on glaucoma, and is available from NHS Evidence- eyes and vision (http://www.library.nhs.uk/eyes).

The NICE guidelines refer to ‘healthcare professionals’ throughout, whereby HCPs must be trained in case detection and referral refinement if they are involved in the diagnosis of ocular hypertension and chronic open angle glaucoma (suspect cases) and those involved in ‘preliminary identification of COAG.’ As a result, where schemes exist involving HCPs, including optometrists, then training must be provided. Perhaps the key aspects of the guideline are that OHT must be formally diagnosed using gonioscopy...
before continued monitoring, and also that ocular hypertension (OHT) must be referred to the HES where IOP, or intraocular pressure is over 21mmHG. This guideline means those with a high IOP measure in isolation should be referred, whether other risk factors or signs of glaucoma are or are not present.

Similarly, the Association of British Dispensing Opticians, the Association of Optometrists and the Federation of Ophthalmic and Dispensing Opticians also provided joint guidance regarding the NICE glaucoma guidelines (‘Advice on NICE glaucoma guidelines’, 2009). The paper warns that ‘optometrists and optical businesses put themselves at risk unless they recognise the implications of the guideline and follow the [this] advice.’ The paper represents the response of these professional bodies to the NICE guidelines, and may be indicative of some of the challenges facing the eye-care system as a whole.

Hatt, Wormald and Burr (2009) also recently reviewed randomised controlled trials involving screening for chronic open angle glaucoma (COAG), which typically involve older people. The results suggested that screening for COAG lacks an evidence base, and therefore opportunistic case finding should be retained. Evidence from Smeeth and Iliffe (1998) also suggests that population screening for impaired vision among older people ‘is not justified’, where the authors suggest that visual impairment can be treated, and therefore reduced. The screening tools and outcome measures were based upon self-reported measures of visual impairment. Smeeth and Iliffe conclude that the accuracy and referral quality of opportunistic case-finding remains a high priority for eye care service personnel.

**Research Literature**
16 research papers were found which involve optometrists in glaucoma care and referral schemes, referral quality or detection of glaucoma. A number of studies involve audits of referral reliability, as well as referral refinement and co-management schemes. Table 8 below summarises the papers on glaucoma care.

**Glaucoma Shared-Care Schemes: A suite of papers**
One of the largest glaucoma shared-care schemes is the Bristol Glaucoma Shared-Care scheme (Gray et al., 1997, Spry et al., 1999, Gray et al., 2000) (also in grey literature section 1). The initiative involved community optometrists monitoring primary open-angle glaucoma (POAG) and glaucoma suspect patients, and utilising direct referrals between the community and the HES. Initially the study group researched the validity of visual parameter measurements taken by community optometrists (Gray et al., 1997). The results suggested that community optometrists could make measurements ‘of comparable accuracy to those made in the Hospital Eye Service’ (Gray: 431). In addition, patients were particularly satisfied with the community scheme in terms of waiting time.

Spry et al. (1999) utilised an RCT study to assess the optometrists’ monitoring compared to the ‘research gold standard’ ophthalmologist assessment. The findings again suggested that community optometrists could provide equivalent services to that of the HES, in terms of using the key glaucoma case-finding methods of visual-field taking, cup to disc ratio and IOP. Follow-up two years into the scheme suggested no significant differences overall in outcome between patients in HES follow-up and community optometrist follow-up (Gray et al., 2000). The economic outcomes were also
similar between community optometrists and the HES if the follow-up interval by community optometrists is similar to the HES (£46.31 and £14.50-£59.95 respectively).

In a similar, more recent study, Azuara-Blanco et al. (2007) reviewed the performance of accredited glaucoma optometrists in Scotland, where healthcare service management in Scotland has been devolved, and is now largely provided free of charge with the exception of AOs (accredited optometrists), including AGOs (accredited glaucoma optometrists). The study compared ‘the diagnostic performance’ of AGOs with a consultant ophthalmologist. Whilst the authors acknowledged that some cases were missed, the study concluded that with glaucoma training, the optometrists could provide as reliable a service as junior ophthalmologists. As the members of the latter group are likely perform much ophthalmic work within the HES, it is a particularly encouraging finding for the optometric world that community based practitioners can operate at similar competency levels to trainee medical personnel at least in terms of diagnosis assessment.

Glaucoma screening and referral reliability within traditional frameworks

In terms of glaucoma detection, Shah et al. (2009) recently published a study based upon the findings of a community based study. The London- based study utilised an actor presenting as a 44 year old of African racial origin who was having recent near-sight difficulties, and was requesting new spectacles. The ‘patient’ had no family history of glaucoma and was thus examined in private practice. The findings suggested that 95% of optometrists visited by the actor carried out at least the minimum standard two tests for glaucoma, including optic disc assessment and tonometry. 35% utilised all three standard tests, including optic disc assessment, tonometry and visual field testing. This suggests both a relatively high standard of eye testing, but also variability in the number of tests and types of tests utilised in glaucoma optometric screening services. The authors suggested ‘a need for CPD in glaucoma screening’ particularly in light of the additional finding that 6% of the sample advised the ‘patient’ of the increased risk of POAG in individuals of African racial descent.

Various studies of optometrists’ referral reliability within traditional frameworks emerged (Bell and O’Brien, 1997, Newman et al. 1998, Theodossiades and Murdoch, 1999, Vernon, 1998). Vernon (1998) researched referral patterns in order to identify any changes over a five year period for suspect glaucoma. The retrospective analysis of referrals in 1988 and in 1993 revealed a reduction in the rate of true positive referrals from 48% to 34% at the two time points. However, measures were not taken between the time points and also represent relatively old data. Furthermore, the conclusions suggest that increases in the use of visual field measures were partly the reason for the decrease in true positive referrals. As false positives result in longer waiting times within the HES, this research suggests the possible need to ensure referral accuracy.

Newman et al. (1998) also concluded that all methods of screening have poor validity when used in isolation, including ophthalmoscopy, tonometry, and visual field testing. According to this study, optimal validity is achieved using all three, and therefore the number of screening tests used per examination may need to be increased by some practitioners.

Leong et al. (2003, Moorfield’s) suggested that two forms of glaucoma case-finding strategies (POAG), including intraocular pressure measurement and suprathreshold visual field analysis (SVFA) evoked similar sensitivity and specificity levels (71% and
69% sensitivity respectively and identical 94% specificity in both forms of screening). This suggests that certain forms of examination equipment do not necessarily lead to differing levels of sensitivity and specificity, and that all types of equipment in isolation are likely to lead to false positives. However, leong et al. (2003) also revealed some evidence which suggested optometrists can miss earlier changes in the optic disc including haemorrhage, nerve fibre layer defects and subtle forms of neuroretinal thinning.

To add to the evidence regarding optometric glaucoma referral, Theodossiades and Murdoch (1999) utilised positive predictive values to measure referrals for suspected glaucoma at Moorfield’s Eye Hospital. In support of Newman et al. (1998), and leong et al. (2003) in later years, this study also suggested that referrals which reported the use of all three types of glaucoma testing showed the highest positive predictive value (place in figure here). In addition, it was found that referral accuracy improved as the number of suspicious findings increases, suggesting the effect of previous experience and practice in revealing suspect glaucoma. A study of newly qualified optometrists and optometrists with more practice experience could strengthen this concept.

Bell and O’Brien (1997) researched the referral accuracy of optometrists in the traditional Scottish referral system, prior to devolution and the emergence of more recent eye care pathways. Akin to the current English system in most areas, the optometrist would send the referral to the GP prior to the GP’s referral to the HES, which generally includes the optometrists report. This study retrospectively reviewed 271 referral case notes from both the community optometrist and the GP over a 6 month period. Cases of previous history of ocular hypertension or glaucoma were excluded. The study revealed a high false positive rate (36%). Furthermore, it was suggested that combined approaches to screening for glaucoma gained the highest detection rate, and optometrists should combine methods in order to improve referral efficiency.

Willis et al. (2000) conducted a questionnaire study of 171 optometrists across Northern Ireland, many of whom were senior, sole practitioners. The results suggested that glaucoma detection within optometric practice is highly variable in terms of the equipment employed, and therefore the tests conducted with patients could be equally variable. The authors concluded that most optometrists are well-equipped for glaucoma screening as many utilised direct ophthalmoscopy (114 who responded to the question all used this), tonometry (116 had tonometers) and all but one optometrist had VF screening equipment. 89% said they would refer at any level of IOP ‘if visual field defect or disc cupping were present.’ However, 12 of the optometrists suggested guidelines regarding referral would be useful to them, suggesting that referral guidelines at the time of the study in 2000 were unclear. 9% said they would be interested in taking part in a shared-care scheme. These are interesting findings in the context of the current UK Eye Care Services Survey Project, and will likely form questionnaire items in phase 2 regarding interest in future shared-care schemes and refinement of referral protocols.

In a more recent, longitudinal study Bowling et al. (2005) reviewed the outcomes of glaucoma referrals made by community optometrists to the Oxford Eye Hospital between July 1994 and June 2004. The optometrists made 2505 referrals during this period. 510 patients had glaucoma, with 160 of these having normal intraocular
pressure (IOP). 1123 ‘were judged to have no evidence of glaucoma or OHT’, representing some 44.8% of the total sample (99% CI 42.2% to 47.4%). This study suggests referral inaccuracy is high. This could be viewed with concern, but may also suggest that optometrists are referring cases to be on the safe side, particularly in light of their duty to refer when any abnormality is revealed. As a result, many studies of referral accuracy should be treated with some caution due to the optometrists’ duty of care. Moreover, following GOC rules (1999) on referral, optometrists are not required to refer any abnormality and may choose not to refer in some circumstances.

Scully et al. (2009) have also recently reviewed the content of optometrists’ letters to Moorfield’s Eye Hospital. Criteria included ‘Ideal’, ‘Acceptable’ and ‘Fail’ (Scully et al.: 26) (see Appendix 4). The majority of the referral letters were considered ‘acceptable’ according to the study criteria of ‘acceptable’ with 7% only being ‘ideal’ and the rest ‘failing.’ Reasons for failure included the lack of information for non-clinical elements including patient details and practice details. In terms of clinical details, 26% lacked information regarding optic disc evaluation and 6% lacked IOP information. In light of the research which suggests a combination of 2/3 glaucoma tests is the most conducive for referral quality, this suggests that optometrists could be in a position improve the efficiency of eye care by providing thorough information on referral letters or GOS 18 forms.

**Critique of glaucoma referral effectiveness measures**

Gilchrist (2000) presented a critique of the conventional use of specificity and sensitivity as measurements for the effectiveness of screening. As Gilchrist explains, sensitivity and specificity measure ‘the association between screening test results and final diagnosis of all the patients screened (Gilchrist, 2000: 452). Gilchrist argues that diagnoses are gained only on those patients who are referred, and therefore the disease status of those not referred remains unknown. Instead, measures of detection rate should be utilised instead i.e. the proportion of those who are screened who are correctly referred/detected as having glaucoma, and ‘referral accuracy’ i.e. the proportion of those who are correctly referred. As this report includes a number of papers involving specificity and sensitivity, such arguments could provide a healthy consideration of alternative methods for measuring referral effectiveness, particularly where sensitivity and specificity may not be the best method for such important evaluations of optometric practice.

**Glaucoma referral refinement schemes**

As a result of high false positive rates over the past decade, some research has involved the implementation of refinement schemes in the Manchester community (Henson et al., 2003). According to this study the number of suspect glaucoma cases was reduced by 40% as a result of the scheme. The refinement involved the removal of the traditional GP to optometrist pathway prior to HES involvement. Instead referrals were made directly to the HES by the accredited optometrists. It is of course possible that the training of the optometrist to become an accredited optometrist also reduced the number of false positives, though this is not reported. This may be an additional area of future research i.e. the effect of accredited optometrist training itself upon levels of false positives within shared-care schemes. Measuring this in isolation however may be problematic.
A further glaucoma referral refinement scheme is also soon to be piloted within WMSHA (personal communication with optometric advisor) which could act as an update to previous referral refinement schemes, and provide the UK Eye Care Services Survey Project with a tangible, local study based upon local needs and financial provision.

**Economic evaluation of glaucoma services**
In terms of economic evaluations, Hernandez et al. (2008) conducted a study of screening for open angle glaucoma in Aberdeen. Various findings suggested that technician screening was more effective than a traditional case-finding, opportunistic approach, though more costly, and screening by an accredited optometrist was more costly than technician screening. Furthermore, general population screening was deemed to be less cost-effective than screening at-risk groups, as many in the general population are too young to see the benefits of long-term screening. At-risk groups were those aged 40-50 with a risk factor, for example family history, and that screening should occur at 10 year intervals.

Previous evaluations by Coast et al. (1997) in Bristol also suggested that management of glaucoma in the community is not necessarily more cost-effective than HES management (Bristol Shared-care study). A more current UK evaluation comparing shared-care referral and patient management schemes for glaucoma, and traditional HES schemes could be useful. As the optometrists in the earlier shared-care schemes are now likely to have additional experience, it may be possible that this learning has impacted upon their practice quality, and therefore would mean fewer false positives to the HES and associated lower costs to the HES. Other research might also look at the impact of false positives and how much each false positive costs the HES.
### Table 8: Optometrists involved in glaucoma schemes

<table>
<thead>
<tr>
<th>Authors</th>
<th>Date</th>
<th>Location</th>
<th>Description</th>
<th>Design</th>
<th>New Initiative</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Azuaro-Blanco et al.</td>
<td>2007</td>
<td>Scotland</td>
<td>Comparison of the diagnostic performance of AGOs versus consultant ophthalmologists</td>
<td>Case note cohort study</td>
<td>No. The paper is however based upon the AGO Glaucoma service</td>
<td>100</td>
<td>Optometrists provided as reliable a service as junior ophthalmologists in the HES.</td>
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<tr>
<td>Bell et al.</td>
<td>1997</td>
<td>Edinburgh</td>
<td>Glaucoma referral accuracy by optometrists</td>
<td>Retrospective case-note analysis</td>
<td>No. The case notes were based on traditional joint GP/optometrist referral to the HES</td>
<td>295 (case notes)</td>
<td>High false positive rate (36%). Recommendation that optometrists combine tonometry and ophthalmoscopy in order to improve referral quality.</td>
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</tr>
<tr>
<td>Bowling et al.</td>
<td>2005</td>
<td>Oxford Eye Hospital (Radcliffe)</td>
<td>Community optometrist referral outcomes</td>
<td>Case note analysis</td>
<td>No</td>
<td>2505 referrals from optometry</td>
<td>510 (20.4%) were diagnosed subsequently with glaucoma, of which 160 were normal tension glaucoma. 44.8% were deemed to show no evidence of glaucoma or OHT.</td>
<td></td>
</tr>
<tr>
<td>Coast et al.</td>
<td>1997</td>
<td>Bristol</td>
<td>Economic evaluation of glaucoma community initiatives and HES care</td>
<td>Cost analysis alongside an RCT.</td>
<td>No, however the analysis was based upon the new Bristol Share-Care Glaucoma scheme.</td>
<td>Not applicable.</td>
<td>Management of glaucoma in the community was deemed not necessarily more cost-effective than HES management (Bristol Shared-care study)</td>
<td>A more current UK evaluation comparing shared-care referral and patient management schemes for glaucoma, and traditional HES schemes could be useful. As the optometrists in the earlier shared-care schemes are now likely to have additional experience, it may be possible that this learning has impacted upon their practice quality, and therefore would mean fewer false positives to the HES and associated lower costs to the HES.</td>
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<tr>
<td>Gilchrist</td>
<td>2000</td>
<td>Not applicable</td>
<td>Critique of the conventional use of specificity and sensitivity as measurements for the effectiveness of screening</td>
<td>Critique article</td>
<td>No</td>
<td>Not applicable</td>
<td>Gilchrist argues that diagnoses are gained only on those patients who are referred, and therefore the disease status of those not referred remains unknown. Instead, measures of detection rate should be utilised instead i.e. the proportion of those who are screened who are correctly referred/detected as having glaucoma, and ‘referral accuracy’ i.e. the proportion of those who are correctly referred.</td>
<td></td>
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<tr>
<td>Gray et al.</td>
<td>1997</td>
<td>Bristol</td>
<td>Researched the validity of visual parameter measurements taken by community optometrists</td>
<td>Randomised study (Gray et al.:431)</td>
<td>Yes. (Gray et al.:431)</td>
<td>12 optometrists included, 403 patients (203 to community, 200 to HES)</td>
<td>The results suggested that community optometrists could make measurements ‘of comparable accuracy to those made in the Hospital Eye Service’</td>
<td></td>
</tr>
<tr>
<td>Gray et al.</td>
<td>2000</td>
<td>Bristol</td>
<td>Follow-up study two years after the commencement of the Bristol Shared-Care Glaucoma study</td>
<td>Randomised study with patient allocation to either HES or community optometrist care</td>
<td>Follow-up of an initiative established in 1998.</td>
<td>2780 (752 identified with established or suspected glaucoma. The rest were excluded)</td>
<td>The scheme suggested no significant differences overall in outcome between patients in HES follow-up and community optometrist follow-up. Economic outcomes were also similar between community optometrists and the HES if the follow-up interval by community optometrists is similar to the HES (£46.31 and £14.50-£59.95 respectively).</td>
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<tr>
<td>Hatt et al.</td>
<td>2009</td>
<td>Not applicable</td>
<td>RCT studies involving screening for chronic open angle glaucoma (COAG)</td>
<td>Review article</td>
<td>No</td>
<td>Not applicable</td>
<td>The results suggested that screening for COAG lacks an evidence base, and therefore opportunistic case finding should be retained.</td>
<td></td>
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<tr>
<td>Henson et al.</td>
<td>2003</td>
<td>Manchester</td>
<td>Glaucoma referral refinement scheme</td>
<td>Case note analysis</td>
<td>Yes</td>
<td>18 optometrists, 194 patients, with 112 referred to the HES, 93 with suspected glaucoma</td>
<td>According to this study some 40% of the number of suspect glaucoma cases were reduced by 40% as a result of the scheme</td>
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<tr>
<td>Authors</td>
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<td>Location</td>
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<tr>
<td>Hernandez et al.</td>
<td>2008</td>
<td>Aberdeen</td>
<td>Study of screening for open angle glaucoma</td>
<td>Markov model was utilised 'to estimate lifetime costs and benefits of a cohort of patients facing, alternatively, screening or opportunistic case finding strategies', the latter being current practice (Hernandez et al., 2008: 203)</td>
<td>No.</td>
<td>None as such</td>
<td>Suggested that technician screening was more effective than a traditional case-finding, opportunistic approach, though more costly, and screening by an accredited optometrist was more costly than technician screening. Furthermore, general population screening was deemed to be less cost-effective than screening at-risk groups, as many in the general population are too young to see the benefits of long-term screening.</td>
<td>At-risk groups were those aged 40-50 with a risk factor, for example family history, and that screening should occur at 10 year intervals.</td>
</tr>
<tr>
<td>Leong et al.</td>
<td>2003</td>
<td>Moorfield’s</td>
<td>To compare the use of usual best practice (history taking, IOP measurement, disc examination and SVFA) with a technique which replaces SVFA with computerised quantitative disc assessment</td>
<td>8 optometrists were asked to classify each of the 66 participants. Subjects with POAG were recruited through glaucoma clinics within the HES. Doctors at glaucoma clinic approached those with simple POAG, spouses and partners were also recruited into normal group if no history of glaucoma. Other ‘normals’ came from a practice in Ealing.</td>
<td>Yes.</td>
<td>8 optometrists with a minimum of 4 years experience in private practice. 66 patients (37 normals, 29 with POAG-15 of which were normal tension glaucoma)</td>
<td>Results suggested that two forms of glaucoma case-finding strategies (POAG), including intraocular pressure measurement and suprathreshold visual field analysis (SVFA) evoked similar sensitivity and specificity levels (71% and 69% sensitivity respectively and identical 94% specificity in both forms of screening)</td>
<td></td>
</tr>
<tr>
<td>Newman et al.</td>
<td>1998</td>
<td>Suffolk</td>
<td>Assessing the PPV of VF testing by optometrists' Retrospective case note study</td>
<td>Retrospective case note study</td>
<td>No.</td>
<td>86 out of initial 586 were for suspected glaucoma (original cohort was 595, though 9 records could not be found.)</td>
<td>Results suggested all methods of screening have poor validity when used in isolation, including ophthalmoscopy, tonometry, and visual field testing</td>
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<tr>
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<tr>
<td>Papadopoulos et al.</td>
<td>2007</td>
<td>Not applicable (nationwide survey)</td>
<td>This research aimed to identify the ‘incidence, detection patterns...manage ment and IOP control’ in children</td>
<td>Survey study sent to the reporting ophthalmologist to report demographic and socioeconomic data and information on clinical presentation and management.</td>
<td>No.</td>
<td>99 children were eligible for inclusion in the study. 47 had primary open angle glaucoma and 52 secondary glaucoma.</td>
<td>The report concluded that the incidence of PCG was ‘comparable’ to other populations reporting PCG incidence. The incidence of PCG was nine times higher in children of Pakistani origin than Caucasians.</td>
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<tr>
<td>Scully et al.</td>
<td>2009</td>
<td>Moorfield’s Eye Hospital, London</td>
<td>Reviewed the content of optometrists’ letters</td>
<td>Retrospective case note/ letter analysis</td>
<td>No.</td>
<td>466 referrals initially. 326 satisfied inclusion criteria for GP referrals, with 121 containing optometric letter.</td>
<td>The majority of the referral letters were considered ‘acceptable’ according to the study criteria of ‘acceptable’ with 7% only being ‘ideal’ and the rest ‘failing.’ In terms of clinical details, 26% lacked information regarding optic disc evaluation and 6% lacked IOP information.</td>
<td>In light of the research which suggests a combination of 2/3 glaucoma tests is the most conducive for referral quality, this suggests that optometrists could be in a position improve the efficiency of eye care by providing thorough information on referral letters or GOS 18 forms.</td>
</tr>
<tr>
<td>Shah et al.</td>
<td>2009</td>
<td>London</td>
<td>To evaluate the content of optometric examinations. Utilised an actor presenting as a 44 year old of African racial origin who was having recent near-sight difficulties, and was requesting new spectacles</td>
<td>Study actor</td>
<td>No.</td>
<td>100 optometrists</td>
<td>The findings suggested that 95% of optometrists visited by the actor carried out at least the minimum standard two tests for glaucoma, including optic disc assessment and tonometry. 35% utilised all three standard tests, including optic disc assessment, tonometry and visual field testing.</td>
<td></td>
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<tr>
<td>Sinclair, Hinds and Sanders</td>
<td>2004</td>
<td></td>
<td>Case note analysis study in order to identify the characteristics of patients in Fife who were registered as blind with the main diagnosis of glaucoma.</td>
<td>Retrospective case note analysis</td>
<td>No.</td>
<td>78 sets of case notes</td>
<td>Results suggested that compliance with treatment was poor in over ¼ of the study population (26%), and by the time the patient had been referred to hospital initially, more than half of these patients were aware of visual loss. This suggests that older patients’ glaucoma is not being identified effectively, leading to potential sight loss later.</td>
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<tr>
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<tr>
<td>Smeeth and Iliffe</td>
<td>1998</td>
<td>Authors address is Royal Free Hospital, London (though this is a review article)</td>
<td>A review of the effectiveness of screening older people for impaired vision in a community setting.</td>
<td>Systematic literature review</td>
<td>No.</td>
<td>3494 individuals who were involved in five trials of 'multiphasic assessment.'</td>
<td>The results and conclusions suggested that screening of asymptomatic older people was 'not justified.'</td>
<td>This could have important ramifications for planning eye care services for older people.</td>
</tr>
<tr>
<td>Spry et al.</td>
<td>1999</td>
<td>Bristol</td>
<td>Assessed optometrists’ glaucoma monitoring compared to the ‘research gold standard’ ophthalmologist assessment</td>
<td>RCT study</td>
<td>Yes.</td>
<td>405 (2,780 though 674 were eligible, then 405/674 were willing to partake.)</td>
<td>The findings again suggested that community optometrists could provide equivalent services to that of the HES, in terms of using the key glaucoma case-finding methods of visual-field taking, cup to disc ratio and IOP.</td>
<td></td>
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<tr>
<td>Theodossiades et al.</td>
<td>1999</td>
<td>Moorfield’s Eye Hospital</td>
<td>A study to measure referrals for suspected glaucoma</td>
<td>Referral notes reviewed from optometrists from September 1996-February 1997.</td>
<td>No.</td>
<td>87, most aged 50s-60s (22/87 and 24/87 respectively). 54% female. Median age at glaucoma diagnosis/glaucoma suspects-63.</td>
<td>Referrals which reported the use of all three types of glaucoma testing showed the highest positive predictive value</td>
<td>It was found that referral accuracy improved as the number of suspicious findings increases, suggesting the effect of previous experience and practice in revealing suspect glaucoma</td>
</tr>
<tr>
<td>Vernon et al.</td>
<td>1998</td>
<td>Nottingham</td>
<td>A study to review referral patterns in order to identify any changes over a 5 year period for suspect glaucoma</td>
<td>Retrospective analysis of referrals in 1988 and in 1993</td>
<td>No.</td>
<td>75 in 1988, 71 in 1993. 146 in total. Mean age in 1988-61.2. Mean age in 1993-59.4.</td>
<td>The results revealed a reduction in the rate of true positive referrals from 48% to 34% at the two time points</td>
<td>Vernon suggested that increases in the use of visual field measures were partly the reason for the increase, and concluded that increased false positives result in waiting time increases for the HES. The measures were not taken between the time points and also represent relatively old data.</td>
</tr>
<tr>
<td>Willis et al.</td>
<td>2000</td>
<td>Northern Ireland</td>
<td>Questionnaire study of optometric practice</td>
<td>Questionnaire study</td>
<td>No.</td>
<td>171 optometrists, many of whom were senior practitioners within their practice.</td>
<td>results suggested that glaucoma detection within optometric practice is highly variable in terms of the equipment employed, and therefore the tests conducted with patients could be equally variable</td>
<td></td>
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</table>
Future working:
1. Encouraging optometrist use of various screening methods for enhanced referral efficiency.
2. Research to compare entire shared care glaucoma schemes with HES services for economic purposes.
3. Research into the economic impact of false positives/ cost of each false positive on HES.
4. More current research regarding levels of false positives by COs/AOs
5. Research study to ascertain the effect of experience/ practice on identifying glaucoma suspects for referral to the HES.
6. Adding referral protocol refinement and interest in shared-care schemes to the questionnaire in phase 2.

Types of work recommended for data collection and presentation:
1. College campaign to raise awareness and CPD/CET events
2. Hospital financial records of shared-care schemes and HES services and compare the two across our SHA.
3. Identify cases of false positives, the number of steps within each, cost each step, and compare with a usual case where a true positive is identified and followed-up accordingly (potential ethical issues noted).
4. Case note analysis utilising the gold standard ophthalmologist comparison, or perhaps peer review by other optometrists, which would be a particularly novel approach to data collection and finding results.
5. Identify newly qualified optometrists and experienced optometrists from CoO lists and compare quality of referrals over a longitudinal study to see the effect of time/ experience over a long period.
Ocular Hypertension (OHT) (lilac)

One paper emerged regarding ocular hypertension specifically.

Fielding and Watt (1998) described the initial process of the OH shared-care scheme in Edinburgh, based at the Princess Alexandra Eye Pavilion. During two periods between June 1996 and September 1997, 200 patients were seen within the service.

The scheme was borne out of the need for change due to an over-stretched eye care clinic, where numbers of new patients with OH continued to increase. This scheme meant 40 participating optometrists and GPs could see patients within the community if the patient was willing to enter the scheme. Patients were those who had initially been seen within the HES. It was estimated that approximately 40% of patients could be re-referred to the community scheme, and there would be some 1000 patients seen within the scheme within 4 years. As this paper described the early stages of a new scheme, it remains to be seen how the scheme progressed.

Table 9: OHT co-management scheme in Edinburgh

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<tr>
<th>Authors</th>
<th>Date</th>
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<tbody>
<tr>
<td>Fielding et al.</td>
<td>1998</td>
<td>Princess Alexandra Eye Pavilion, Edinburgh</td>
<td>Describes the initial process of the OHT shared-care scheme in Edinburgh</td>
<td>Not applicable</td>
<td>Yes.</td>
<td>200 patients were seen within the service during two time periods between June 1996 and September 1997. 40 participating optometrists and GPs.</td>
<td>As this paper described the early stages of a new scheme, therefore overall results of the scheme were not produced.</td>
<td>It was estimated that approximately 40% of patients could be re-referred to the community scheme, and there would be some 1000 patients seen within the scheme within 4 years.</td>
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</table>
Cataract (Pink)

Background to the current research
As the result of the Department of Health’s ‘Action on Cataracts’ in 2000, the UK has seen an increase in cataract direct referral schemes for surgery. One of the key objectives of this paper was to highlight the need for an increase in surgical throughput and decrease waiting times for patients, resulting in such schemes. Action on Cataracts has provided one of the key drivers for change in cataract care. Ten papers on cataract management are included in this review. These are summarised in table 10 below.

Cataract Referral Schemes
Six papers specifically refer to new cataract referral schemes involving optometrists, or cataract referral quality. Table 10 summarises these papers.

The earliest paper in 2001 reported the feasibility of direct referral from optometrists to a one-stop cataract surgery pilot scheme in Ayrshire (Gaskell et al., 2001). The study involved 40 community optometrists and 160 patients who were referred to the one-stop clinic via telephone call to the HES from the referring optometrist. The one-stop concept included pre-operative assessment (blood pressure, IOP and biometry testing by a cataract nurse). The ophthalmologist then assessed the patient and if deemed appropriate, the ophthalmologist gained the consent of the patient if they wished to proceed with surgery on the same day. Surgery was then performed. A post-operative assessment was then conducted one hour later by the cataract nurse. A review appointment was also booked for 3-4 weeks after the cataract surgery either within the hospital clinic or with the referring optometrist.

This model and other very similar ones (Sharp et al., 2003, described below) form the basis of one-stop cataract referral schemes. The authors concluded that all patients achieved a good level of VA post-operatively, and just 3.7% of patient referrals were deemed inappropriate. The authors attribute this to development of direct optometric referral guidelines, training and screening of referral letters. GPs only supplemented 1.8% of referrals with further information also suggesting the content of the optometric direct referral was adequate in the vast majority of cases. Similar work by Muthcumarana and Rimmer (2000) in Peterborough supports the post-operative discharge of patients to their optometrist, as discussed by Gaskell et al. (2001).

Evans, Saunders and Haslett (2004) however refer to the findings of Gaskell et al. within a critique article regarding one-stop cataract clinics. The authors point to the fact that the ‘impressive listing rate’ was due to additional ‘optometric training and telephone pre-assessment both requiring additional resources (Evans et al., 2004: 227)’. Therefore, any time or resource saved within the one-stop cataract clinic would be required to train and pay staff during the times they conduct telephone pre-assessment. Similarly, Evans et al. (2004) suggest one-stop clinics do not necessarily lead to a more effective use of resources as the same staff time is necessary just for different purposes.

Another scheme in Stockport was described by Sharp et al. (2003), whereby a similar scheme to Ayrshire was piloted. Patients in the Stockport scheme completed a self-assessment questionnaire to aid the optometrist decision i.e. the questionnaire included the patients decision whether they felt surgery was appropriate for them. (The author of this report has not found any other schemes which include the patient questionnaire.)
The optometrist in the Stockport scheme also provided counselling. The results suggested waiting times were short, with an average of just ten days between their initial assessment and cataract assessment. 86% of the patients assessed during the pilot were also deemed to be appropriate candidates for direct referral as opposed to a two-stage plan, and 98% of these were listed for surgery. GPs and optometrists were ‘very supportive of the scheme.’

Newsom et al. (2005) also described a direct referral scheme in Huntingdon, Cambridgeshire, whereby AOs referred patients directly to the HES. Waiting times dropped from 15 months to 3 for the entire cataract pathway, being the national target derived from the Department of Health (Action on Cataracts, 2000, DoH). The small audit of referrals (100 direct referrals compared with 100 non-direct referrals) showed similar levels of post-operative visual acuity and post-operative refraction levels in both routes. The authors’ closing statements suggested other neighbouring PCTs to theirs (Hitchingbrooke Health Care NHS Trust, Huntingdon) were developing similar schemes, though this is outside phase 2 parameters of the WMSHA, or the West Midlands Strategic Health Authority, which is the target location for initial pilots of the questionnaire within the UKECSSP (UK Eye Care Services Survey Project).

Research by Tey et al. (2007) also suggests that in line with the Government ‘Action on Cataracts’ paper in 2000, one-stop cataract clinics were having a massive impact upon surgical throughput with a 71% increase in cataract operations (863 in 1997, 1473 in 2004). This presented findings from a district hospital within South-East Scotland, and surgery audit data from 1997 in Fife was used to provide the national comparison. The increase in surgery is marked, though the critique by Evans et al. (2004) may suggest a need to review the use of optometric time within new cataract care pathways.

Quality of optometric referrals to cataract services
Lash et al. (2006, Bournemouth) presented research regarding optometric referrals within the context of the ‘Action for Cataracts’ guidelines in order to determine whether optometrists were following them and ‘whether they are effective.’ (Lash: 464). 412 referrals were analysed, 50% being conventional via GP, 11% via optometrists letter, 35% via direct referral and 15% were GP referrals with no optometric information. Listing rates were 83% and 74% for direct and conventional routes respectively, meaning more listing in direct routes. Full information however was provided in just 17% of letter referrals and 10% of GOS 18 referrals.

Previous research by Lash et al. (2003, Southampton) reviewed 444 referral forms sent to a hospital ophthalmology department over a ten week period (cataract, n=163, glaucoma, n=82). The authors concluded that information on cataract referral forms could be more in-depth. Furthermore, 47% of referrals for cataract later resulted in these patients being listed for cataract surgery, representing a somewhat lower proportion than the later study in 2006. As a result, the studies represent somewhat differing findings, and further research could seek to address this.

Park et al. (2009) suggested that optometric direct referral for cataract surgery provided better information regarding measured vision and ‘better delivery of pre-operative counselling.’ GP referrals however contained better medical history, drug information, and details of personal circumstances.
This suggests that the two parties, being optometrists and GPs, provide better information within the cataract referral pathway just merely on different aspects, and the types of aspects one would expect according to the practitioners scope of practice, and the different records available to them for each patient. This suggests that direct cataract referral schemes must allow sufficient opportunity for the GP to respond to information sent from the optometrist regarding a particular patient’s referral to cataract surgery, as this will allow for sufficient care delivery in the HES and crucially patient safety, for example in cases where patients take other medications which can interfere with cataract surgery.

Goyal, Shankar and Sullivan (2004: 773) presented research regarding the ‘variations in cataract presentation within three eye units across a SHA,’ – the units being: Cardiff Eye Unit, University Hospital Wales (UHW), Royal Glamorgan Hospital and Princes Charles Hospital in Merthyr Tydfil. The three areas represent diverse levels of social deprivation. The authors also aimed to ascertain associations between the cataract at presentation and indices of social deprivation. 112 patients were involved, and results suggested that VA (visual acuity) was poorer than the national average across all three sites, though the lowest levels were in Merthyr Tydfil in both the listed eye and other eye. Patient waiting times, both for surgery and outpatient appointments were also longer. Social deprivation indices also correlated with the variation in cataract presentation and the use of optometric services, whereby higher levels of social deprivation correlated with poorer use of optometric services. These social factors need to be addressed and considered in any future research regarding the extension of optometric services to ensure the patients requiring the most help are those who are seen.
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<tr>
<th>Authors</th>
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<tbody>
<tr>
<td>Evans et al.</td>
<td>2004</td>
<td>Not applicable</td>
<td>Commentary paper regarding one-stop cataract surgery</td>
<td>Not applicable, though comments on the new advent of one-stop cataract surgery schemes</td>
<td>Not applicable</td>
<td>The authors point to the fact that the ‘impressive listing rate’ was due to additional ‘optometric training and telephone pre-assessment both requiring additional resources (Evans et al., 2004: 227)’</td>
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<tr>
<td>Gaskell et al.</td>
<td>2001</td>
<td>Ayrshire</td>
<td>Reported the feasibility of direct referral from optometrists to a one-stop cataract surgery pilot scheme</td>
<td>Case note referral analysis</td>
<td>Yes</td>
<td>The study involved 40 community optometrists and 160 patients who were referred to the one-stop clinic via telephone call to the HES from the referring optometrist.</td>
<td>The authors concluded that all patients achieved a good level of VA post-operatively (151 achieved VA of 6/12 or better at an average of 31 days post-operatively), and just 3.7% of patients’ referral were deemed inappropriate. GPs only supplemented 1.8% of referrals with further information also suggesting the content of the optometric direct referral was sufficiently adequate in the vast majority of cases.</td>
<td>The authors attribute this to development of direct optometric referral guidelines, training and screening of referral letters.</td>
</tr>
<tr>
<td>Goyal et al.</td>
<td>2004</td>
<td>Cardiff Eye Unit, University Hospital Wales (UHW), Royal Glamorgan Hospital and Princes Charles Hospital in Merthyr Tydfil</td>
<td>Social deprivation indices for cataract care/ surgery and identifying variations in cataract presentation.</td>
<td>Prospective questionnaire study. Participants filled in the Berth-Peterson VF Index</td>
<td>No</td>
<td>112</td>
<td>Results suggested that VA (visual acuity) was poorer than the national average across all three sites, though the lowest levels were in Merthyr Tydfil in both the listed eye and other eye. Patient waiting times, both for surgery and outpatient appointments were also longer.</td>
<td>Social deprivation indices did also correlate with the variation in cataract presentation and the use of optometric services, whereby higher levels of social deprivation correlate with poorer use of optometric services.</td>
</tr>
<tr>
<td>Lash et al.</td>
<td>2003</td>
<td>Southampton</td>
<td>Referral quality analysis for cataract</td>
<td>Yes, whereby referral forms for new cataract schemes were analysed.</td>
<td>444 referral forms</td>
<td>444 referral forms</td>
<td>The authors concluded that information on cataract referral forms could be more in-depth. Furthermore, 47% of referrals for cataract later resulted in these patients being listed for cataract surgery, representing a somewhat lower proportion than the later study in 2006.</td>
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<tr>
<td>Newsom et al.</td>
<td>2005</td>
<td>Huntingdon, Cambridgeshire</td>
<td>Direct cataract referral scheme</td>
<td>Small audit of 100 referrals (direct referrals) compared with another 100 non-direct referrals</td>
<td>Yes</td>
<td>200 referrals.</td>
<td>Waiting times dropped from 15 to 3 months for the entire cataract pathway, being the national target derived from the Department of Health (Action on Cataracts, 2000, DoH). The small audit of referrals (100 direct referrals compared with 100 non-direct referrals) showed similar levels of post-operative visual acuity and post-operative refraction levels in both routes.</td>
<td>This suggests that the two parties, being optometrists and GPs, provide better information within the cataract referral pathway just merely on different aspects, and the types of aspects one would expect according to the practitioners scope of practice.</td>
</tr>
<tr>
<td>Park et al.</td>
<td>2009</td>
<td>Bristol</td>
<td>Comparison of referrals and listing rates for direct referrals from optometry and traditional GP referrals for cataract surgery (Park et al: 309)</td>
<td>Quality of referral was checked against CoO referral framework.</td>
<td>Yes</td>
<td>124 patients referred for cataract surgery, 62 via optometrist direct referral, and 62 via traditional pathway.</td>
<td>Suggested that optometric direct referral for cataract surgery provided better information regarding measured vision and ‘better delivery of pre-operative counselling.’ GP referrals however contained better medical history, drug information, and details of personal circumstances.</td>
<td>This suggests that the two parties, being optometrists and GPs, provide better information within the cataract referral pathway just merely on different aspects, and the types of aspects one would expect according to the practitioners scope of practice.</td>
</tr>
<tr>
<td>Sharp et al.</td>
<td>2003</td>
<td>Stockport</td>
<td>Description of the new one-stop cataract referral scheme</td>
<td>Not applicable</td>
<td>Yes</td>
<td>Not applicable</td>
<td>The results suggested waiting times were short, with an average of just ten days between their initial assessment and cataract assessment. 86% of the patients assessed during the pilot were also deemed to be appropriate candidates for direct referral as opposed to a two-stage plan, and 98% of these were listed for surgery.</td>
<td>GPs and optometrists were ‘very supportive of the scheme.’</td>
</tr>
<tr>
<td>Tey et al.</td>
<td>2007</td>
<td>Findings from a district hospital within South-East Scotland</td>
<td>Audit of cataract one-stop clinics in SE Scotland</td>
<td>Findings from a district hospital within South-East Scotland. Surgery audit data from 1997 in Fife was used to provide the national comparison.</td>
<td>Yes</td>
<td>Not applicable.</td>
<td>Results suggest that in line with the Government ‘Action on Cataracts’ paper in 2000, one-stop cataract clinics were having a massive impact upon surgical throughput with a 71% increase in cataract operations.</td>
<td>The increase in surgery is marked, though the critique by Evans et al. (2004) may suggest a need to review the use of optometric time with new cataract care pathways.</td>
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</table>
Suggested future research:
1. Cataract referral accuracy.
2. Better understanding of social deprivation indices relevant to the use of optometric services and schemes to enhance this.

Types of work recommended for data collection and presentation:
1. Case note analysis of more recent cases to update findings and ascertain the reasons for the differing research findings.
2. Pilot projects to enhance optometric service use in lower socio-economic areas.
One paper specifically referred to posterior capsular opacification (a complication associated with cataract surgery) in terms of direct referral, with a second paper supporting findings with regard to seeking patient consent.

Menon, Faridi and Gray (2004) studied referrals for laser capsulotomy by optometrists and compared this referral method with the traditional referral route (via the GP). A total of 222 referrals were reviewed, 156 being direct and 66 via the GP. The assessment of quality included nine sub-sections:

- referral form usage
- legibility
- whether the letter was dated
- diagnosis clearly stated or not
- patient details
- discussion of visual problems
- visual acuity
- refraction and
- patient consent for the ophthalmologist to write back to the optometrist making the referral.

Each carried a potential mark, therefore each referral could be graded between 0-9 (8-9- Good, 6-7- Average and 5 marks or less- Poor). The majority of letters were graded average (63.5%, n=141), 45 were good and 36 were poor. The diagnosis agreement between the ophthalmologist standard and the referral letters was 99%. Laser capsulotomy rate was 98.2% or 215/219 referrals which were initially deemed by the optometrist to require such surgery. Overall, direct referral was effective, and reduced the workload of GPs. As the number of practitioners gaining patient consent was low, it was concluded that this should be sought by optometrists referring on to the HES. Whittaker et al. (1997) similarly noted previously that some 21 out of 79 optometrists surveyed did not gain consent from their patients, with a further 23 gaining consent ‘sometimes.’ In addition, ophthalmologists replied to the optometrists in 2 out of 17 cases where patient consent had been recorded on a revised GOS 18 form. This lack of communication would be worthy of future research.

Table 11: Optometrists involved in PCO referrals

<table>
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<tr>
<th>Authors</th>
<th>Date</th>
<th>Location</th>
<th>Description</th>
<th>Design</th>
<th>New initiative</th>
<th>Participants/ number of case notes</th>
<th>Outcome</th>
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</thead>
<tbody>
<tr>
<td>Menon et al.</td>
<td>2004</td>
<td>Taunton and Somerset NHS Trust</td>
<td>Studied referrals for laser capsulotomy by optometrists and compared this referral method with the traditional referral route (via the GP)</td>
<td>All referral letters sent to the HES from July 2002-January 2003 were utilised to compare the pathways.</td>
<td>Not as such.</td>
<td>222 referrals were reviewed, 156 being direct and 66 via the GP.</td>
<td>The majority of letters were graded average (63.5%, n=141), 45 were good and 36 were poor. The diagnosis agreement between the ophthalmologist standard and the referral letters was 99%. Laser capsulotomy rate was 98.2% or 215/219 referrals which were initially deemed by the optometrist to require such surgery.</td>
</tr>
</tbody>
</table>
Suggested future research:

1. A study to ascertain the reasons underlying the lack of patient consent sought by eye care providers, including GPs and optometrists.

Types of work recommended for data collection and presentation:

1. The author of this report recognises the potential bias involved in asking practitioners why they do not gain consent in all cases from patients.
Diabetic Retinopathy (DR) (White)

The National Screening Committee (NSC) in England produces guidance for all screening programmes within the UK including diabetic retinopathy screening. The corresponding National Screening Programme for Diabetic Retinopathy produced commissioning guidelines in 2007 to support those commissioning such programmes within SHAs and PCTs. Key recommendations include programme size and the corresponding ratio of optometrists who should be employed under individual programmes, being 12,000 patients to 4 optometrists respectively. The report also suggested that referral and treatment, with good feedback processes to the programme were essential for ‘closing the gap’ in the referral, treatment and feedback process. Furthermore, the report also states that costing documents produced for optometrist-led programmes do not include the cost of installation of software or maintenance costs. It is also assumed that the optometrist will provide their own camera.

Amongst a plethora of guidelines, NICE, in partnership with the Royal College of Physicians also produced the ‘clinical management of type 2 diabetes in primary and secondary care’ report. This document contains guidance for the array of issues associated with diabetes including diabetic retinopathy. One of the first key recommendations within the section covering ‘eye damage’ is the screening of all newly diagnosed diabetes patients (recommendation R104). Repeat screening is recommended annually, which is in line with the recommendation from the National Diabetic Retinopathy Screening programme from the NSC. As a result, eye care services need to be in a position to ensure this level of service to prevent avoidable eye disease as a consequence of diabetes.

One of the key providers of guidance to optometrists is the AOP. In 2007, the AOP produced guidance for optometrists regarding Diabetic Retinopathy schemes. The paper suggests that a number of PCT areas have utilised a non-optometric screening service in order to screen patients, and these schemes have subsequently been found to be under-resourced and therefore unable to screen patients regularly i.e. once per year as guidelines from the National Screening Committee suggest. Instead, screening periods can be two or more years, and as a result mean more potential cases of more severe diabetic retinopathy at subsequent screening presentation.

Other schemes involving the optometrist can take various forms, including:
- screening that takes place ‘in parallel with a sight test, with or without grading’ at the time of the testing
- screening which is a stand-alone service provision i.e. with no sight test at the time, and grading is performed at the same time
- screening again as a stand-alone service i.e. with no sight test at this time as in scenario 2, but grading is not performed at the same time and photography is carried out by the optometrist or carried out by a clinical assistant
- grading which is carried out by the optometrist independent of photography i.e. performed elsewhere.

As a result, the optometrist involvement differs across the four scenarios, and therefore professional liability changes according to the level of involvement. The following research presents evidence for safe optometric work within such schemes.
Research papers

Fourteen papers relating to diabetic retinopathy co-management schemes were found. These are summarised in table 12 below.

Wilson et al. (2004) surveyed twenty five health authorities across England and Wales in order to ascertain diabetic retinopathy screening provision. 9,200 records were reviewed during the process, and 63.2% or 5,812 had a record of one or more retinal examinations in the year before the survey. These examinations were from any source i.e. either from an ‘expert’ (ophthalmologist, optometrist or diabetologist) or a camera screening service. The overall results suggested that all types of schemes were associated with a doubling of the odds of individual patients with diabetes having had a retinal examination. There was also more doubling of testing within optometry schemes, though such schemes also recommend early referral for uncertain cases. Furthermore, double testing is a built-in mechanism for fail-safe, and is useful for quality assurance or intra-practitioner reliability. There was also a small difference in coverage according to the type of schemes, whereby camera schemes were favoured over optometry schemes. These results suggest that a variety of schemes, including optometry schemes will increase the odds of patients with diabetes having retinopathy screening. It also suggests that fail-safe mechanisms are in place within optometry schemes which mean doubling of testing procedures, and therefore testing duplication. This would have an effect upon time for optometrists to screen patients if they are re-screening certain proportions of patients.

Evidence from Philip, Cowie and Olson (2005) reviewed the effect of the newly implemented grading model for referrals to ophthalmology services in Scotland. Three new levels of referral are now utilised in Scotland, and triage occurs within primary care, whereby graders took images at levels 1 and 2, and these were passed to the level 3 grader for inspection. The level 2 graders had experience in retinal screening. The level 3 grader was a consultant in medical ophthalmology. Levels of retinopathy ranged from R0 (None)- R4 (proliferative retinopathy), R5 (enucleated eye) and R6 (not visualised adequately due to technical failure). R1 was mild, R2 was moderate retinopathy and R3 is classified as severe. These are the classifications derived from the Health Technology Board for Scotland grading model. The results suggested that only 302, or 5.4% of patient images required referral to the level 3 grader, and of those just 3.4% or 190 were referred into the HES. The authors also point to the fact that the difference between England and Scotland in this approach is that the Scottish approach allows those patients with ungradeable images requiring slit-lamp examination to remain in the screening programme. In England, ungradeable images result in ophthalmic referral. In this study, 11.9% or 661 patients required examination by slit-lamp. The authors also pointed to figures from other studies which suggest technical failure rates of 3.7%-19.7%, which would mean a significant workload in the English HES due to technical failures, not accounting for other work. This paper therefore represents evidence for diabetic retinopathy services in England which involve triage within the primary care screening service i.e. across different levels of screeners and retinopathy.

This paper now presents research which involves an optometrist within various screening scenarios depending, and ten papers emerged regarding such schemes.

The earliest papers to emerge from the literature search in terms of diabetic retinopathy schemes included work conducted in Kettering (Pointer et al., 1998), Birmingham (Ryder et al., 1998) and London (Burnett et al., 1998).
Ryder et al. (1998) concluded that the hospital-based scheme in Birmingham was ‘fail-safe’, utilising retinal photography examined by a specialist optometrist within the HES Diabetes unit, ophthalmoscopy with selective dilation, and diabetologist back-up in cases of ‘uncertainty’. The first audit review included patients seen using ophthalmoscopy, and all patients’ in this initial cycle experienced pupillary dilation. Cases were however being missed, and this inspired the change.

Pointer et al. (1998) report on a collaborative shared-care scheme evaluated after the first 12 months, between April 1995 and March 1996. Patients in this study instead visited accredited optometric practices (44 optometrists participated from 26 practices with 1781 patients screened), ‘with 92% of the optometrists in the locality recording 34% of the projected diabetic population of the Kettering Health area’ therefore providing significant coverage within the first year of the scheme. The authors suggest that publicising the scheme and introducing training regarding false positives in order to lead to a reduction, would be necessary in later stages. Furthermore, it was concluded that a review of a cohort of patients to check optometric sensitivity and specificity by ophthalmologists was necessary for future working.

Prasad et al. (2001) researched the effectiveness of optometric examination using slit-lamp biomicroscopy through dilated pupils for DR screening. 4904 patients were screened in 18 months within the Wirral-based study. Disagreement in grading was found in 13 cases, 5 of which were sight threatening cases. 371 were considered borderline or ‘threshold’ cases, in which 30.18% or 112 were false positives. The most common cause of these false positives was ‘drusen in patients with background DR.’ Overall, test sensitivity for STDR (sight threatening diabetic retinopathy) was 76% and specificity 95% utilising this one method of screening for DR. The authors concluded that the optometrists performed well, and that this performance was ‘facilitated by the use of simple grading and referral criteria.’ This may be an important consideration for further research, in terms of ensuring grading and referral systems are communicated to optometric staff, and are readily comprehended. Similarly, a review of guidelines and referral criteria across referral schemes and strategic health authorities could guide this.

Olsen et al. (2003, Aberdeen) reported similar levels of sensitivity and specificity when optometrists used slit-lamp examination in referable cases (73% and 90% sensitivity and specificity respectively). Olsen et al. (2003) compared digital retinal imaging, fundus photography (both utilising retinal photographers), and slit-lamp biomicroscopy (specially trained optometrists). The highest sensitivities and specificities were achieved within the retinal photography cohorts.

Okoli and Mackay (2002, Barnet Health Authority) evaluated three models of DR screening ahead of setting up a screening programme. The models included a GP-led scheme (single-lens reflex retinal camera and indirect ophthalmoscopy or slit lamp), and two optometrist led models (one using the same scheme as the GP-led scheme, the other utilising indirect ophthalmoscopy only). Both of the optometrist-led schemes had been operational for 18 months prior to the study, and were organised differently. The GP-led scheme had started a year before the optometrist models, therefore around 30 months before the study. The authors suggested that comparisons were therefore difficult across the schemes. All three schemes were deemed to provide an effective service however. The authors also suggested that the eventual screening programme should set-up a system of call and recall in order to facilitate uptake, and to place diabetes registers in GP practices.
Hasting and Shephard (1998) suggested the use of a dedicated diabetic eye care cooperation card improved the number of patients receiving an examination in the preceding two years. All eye examinations made by GP practice staff, community optometrists and hospital clinics were recorded on the patient’s card. The project took place in South Leicestershire across five GP practices. This suggests the importance of recording diabetic eye care information, and adds to the literature regarding recording information in order to recall patients efficiently.

Tu et al. (2004) also compared forms of DR screening including optometric screening and digital photography screening in the Warrington NHS Health Trust (Warrington and Halton areas). Optometric screening included slit-lamp biomicroscopy and the digital photography initiative was located within the HES and conducted by a medical photographer. A call-recall service was utilised under the Cheshire Health Agency and based upon the diabetes register. Those already attending the hospital eye clinic were excluded from this recall facility. Uptake for both systems was poor from a total of 1643 patients screened in the two schemes. As a result, cost effectiveness was also deemed to be poor. This also highlights the potential for poor uptake despite a call-recall service.

Hulme et al. (2002) evaluated a district wide DR screening service which utilised optometrists using slit-lamp and Volk lenses. The Preston-based audit was set against the national targets of 80% and 95% for sensitivity and specificity respectively, and was based upon screenings between April 1997 and November 1999. 439 patients (872 eyes) were examined, of which 64% were normal. Sensitivity for any retinopathy was 72%, specificity 77%. For the detection of sight threatening eye disease, sensitivity and specificity were 87% and 91% respectively. 26% of people with diabetes were screened over a 4-year period thus suggesting a reasonable level of service provision within a geographical location.

Warburton, Hale and Dewhurst (2004) researched the sensitivity and specificity rates for sight-threatening eye disease in the diabetic retinopathy screening service in Stockport, between April 2000 and March 2001. The data are therefore a decade old. Screening was performed using slit-lamp binocular indirect ophthalmoscopy and a hand-held fundus-imaging lens through dilated pupils. A number of patients were selected at random from the screen-negatives group to determine specificity. 3510 patients were screened during the study period. The results suggested that sensitivity fell somewhat short of the UK National Screening Committee target of 80%, recording instead 75.8%. Specificity was surpassed by 4% (target- 95%, actual- 99%). Geographical coverage was 1.2% with a target of 1.8% for new screening schemes. The authors did however suggest a 57% increase in overall numbers of individual screens and therefore in the context of this geographical area the scheme could be viewed as a vast improvement and a success. The authors also concluded that a computerised register was required in order to facilitate call-recall of patients and therefore avoid missed appointments.

Burnett et al. (1998) conducted research with the aim of recalling patients via a computerised system for DR screening by 63 accredited optometrists. The number of optometrists trained and subsequently recruited suggests a large-scale scheme. 666 patients were also recruited into the new scheme, of which 645 were scheduled for screening. 536 of these patients attended, representing an 83% uptake.
Scanlon et al. (2005) conducted an audit of ophthalmology department workload changes after the introduction of a diabetic retinopathy programme in Gloucestershire Health Authority. The study included 3877 patients over the first four years, between 1997 and 2001, including those already registered at the eye clinic who attended as emergencies booked between appointments. The results suggested that workload in fact increased on the first round of screening, and in further rounds the workload did not decrease below pre-screening levels, with the exception of laser surgery which did show a decrease. As a result, screening programmes could represent ‘a significant workload’ to the NHS. The authors suggested the failure to find a drop in workload was possibly due to the increasing numbers of individuals with diabetes.

Overall, sensitivity rates for any retinopathy were similar across the studies, though somewhat lower in terms of specificity. Screening methods were similar across the studies, though sample sizes were significantly different and represented different geographical locations. The reason for the difference in specificity is unclear. Further research could compare sensitivity and specificity rates across different diabetic retinopathy schemes and ascertain reasons for these. Other work could update the study by Burnett et al. and suggest the current utility of a computerised call-recall system for DR screening, and therefore be more reflective of the recent context integration plans for ICT within the NHS. In addition, further analysis of the workload issues surrounding new diabetic retinopathy screening programmes may prove useful for PCTs considering community based care.
Cost effectiveness of screening
James et al. (2000) utilised previous studies from Liverpool to ascertain the cost-effectiveness of screening for sight-threatening diabetic eye disease. Two papers were used from the Liverpool Diabetic eye study (early-mid 1990s), and another study outside of Liverpool. The results suggested that systematic screening is more cost-effective than opportunistic. The number of true cases found on an opportunistic basis totalled 346, and 502 in the systematic screening programmes. The cost-effectiveness measure was based upon the total cost divided by these true case figures. The report was however based on a relatively limited number of diabetic eye disease screening schemes. Similarly, sensitivity analysis was not conducted on cost data.

Davies et al. (2004) also compared two alternative policies for screening for diabetic retinopathy. Policy one involved screening the patient using a chosen screening method until background or more advanced retinopathy was discovered. The patient would then be assessed by an ophthalmologist in an outpatient clinic using mydriatic seven-field photography. If retinopathy was then confirmed, the screening would stop. If it was not confirmed then it would be resumed. Those patient who were found to have background DR were seen at more regular intervals in the clinic until they needed photocoagulation.

Three different types of screening were considered under policy 1:

- GP Ophthalmoscopy every 12 months, with reduced intervals of 6 months between visits once DR had been detected
- Ophthalmoscopy conducted by a diabetologist every 12 months, again with a reduced interval of 6 months between visits once DR had been detected.
- Fundoscopy conducted by an optometrist with the same screening intervals as the two schemes above.

Under policy 2, patients were screened using a mobile camera, which generated a single photo which was reviewed by the diabetologist. The patients were screened every 12 months, with the same 6 monthly visits once background DR was detected. Those patients under policy 1 who had been treated for either type of treatable DR continued to be seen in the ophthalmology outpatient clinic. Under policy 2, patients would continue to be screened until they had severe or central vision loss, required treatment for another type of DR (other than treatable), or died.

The final results of the study suggested policy 1 was more cost-effective, on the condition that the screening ‘sensitivity and compliance were relatively high (Davies, 2004).

Both of these papers were conducted some time prior to this literature review, and as many more schemes have been established across other areas of the UK, it may be worth considering a fresh look at the cost-effectiveness of DR screening, by comparing available schemes.
<table>
<thead>
<tr>
<th>Authors</th>
<th>Date</th>
<th>Location</th>
<th>Description</th>
<th>Design</th>
<th>New initiative</th>
<th>Participants/ no. of case notes</th>
<th>Outcome</th>
<th>Comments/ notes where applicable</th>
</tr>
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<tbody>
<tr>
<td>Burnett et al.</td>
<td>1998</td>
<td>Catchment area surrounding Whittington Hospital, London</td>
<td>Retinal screening programme</td>
<td>Service audit</td>
<td>Yes.</td>
<td>666 invited overall, 191 seen by accredited optometrists. 536 of these patients attended, representing an 83% uptake.</td>
<td>83% uptake.</td>
<td>For data of this kind only systematic screening should be implemented for case finding purposes.</td>
</tr>
<tr>
<td>Davies et al.</td>
<td>2004</td>
<td>Not applicable</td>
<td>Compared two alternative policies for screening for diabetic retinopathy</td>
<td>Not applicable (review article)</td>
<td>No.</td>
<td>Not applicable</td>
<td>Policy one was the preferred system for screening for DR.</td>
<td></td>
</tr>
<tr>
<td>Hasting and Shephard</td>
<td>1998</td>
<td>Leicestershire</td>
<td>Researched use of a dedicated diabetic eye care co-operation card</td>
<td>Audit</td>
<td>Yes.</td>
<td>450 patients in the first review and 370 in the second. An additional 133 were found for the second review from case notes, totalling 503 for the second review of records.</td>
<td>The use of the card improved the number of patients receiving an examination in the preceding two years.</td>
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<tr>
<td>Hulme et al.</td>
<td>2002</td>
<td>Preston</td>
<td>Evaluated a district wide DR screening service which utilised optometrists using slit-lamp and Volk lenses</td>
<td>Audit of optometrist screening by ophthalmologist.</td>
<td>Yes.</td>
<td>439 patients (872 eyes). 64% were normal.</td>
<td>Sensitivity for any retinopathy was 72%, specificity 77%. For STED sensitivity and specificity were 87% and 91% respectively, 26% of people with diabetes were screened over a 4-year period thus suggesting a reasonable level of service provision within a geographical location.</td>
<td></td>
</tr>
<tr>
<td>James et al.</td>
<td>2000</td>
<td>Not applicable</td>
<td>Utilised previous studies from Liverpool to ascertain the cost-effectiveness of screening for sight-threatening diabetic eye disease</td>
<td>To assess the cost-effectiveness of systematic photographic screening versus opportunistic screening for STDR within primary care services</td>
<td>No.</td>
<td>The effectiveness data was derived from two Liverpool studies, the first with 320 patients and the second with 1,363, totalling 1,683 patients with diabetes.</td>
<td>The results suggested that systematic screening is more cost-effective than opportunistic.</td>
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</table>

**Table 12: Optometrists involved in DR co-management schemes**
<table>
<thead>
<tr>
<th>Authors</th>
<th>Date</th>
<th>Location</th>
<th>Description</th>
<th>Design</th>
<th>New initiative</th>
<th>Participants/ no. of case notes</th>
<th>Outcome</th>
<th>Comments/ notes where applicable</th>
</tr>
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<tbody>
<tr>
<td>Okoli et al.</td>
<td>2002</td>
<td>Barnet Health Authority</td>
<td>Evaluated three models of DR screening ahead of setting up a screening programme</td>
<td>Case-note review and database analysis for uptake and coverage of service, follow-up for abnormal findings, postal questionnaire for service users, interviews with service providers, PPV evaluations</td>
<td>Not as such, though the study compared three different methods of DR screening prior to setting up a new DR screening scheme.</td>
<td>2230 patients with diabetes were March 1998- August 2000.</td>
<td>All three schemes were deemed to provide an effective service. GP-led model (single-lens reflex retinal camera and indirect ophthalmoscopy, results interpreted by orthoptist), optometrist scheme- same as GP led but with camera rotating between optometrists, second optometrist scheme- indirect ophthalmoscopy only operated from own practice and they interpreted the results.</td>
<td>The authors also suggested that the eventual screening programme should set-up a system of call and recall in order to facilitate uptake, and to place diabetes registers in GP practice.</td>
</tr>
<tr>
<td>Olson et al.</td>
<td>2002</td>
<td>Aberdeen</td>
<td>Compared digital retinal imaging, fundus photography (both utilising retinal photographers), and slit-lamp biomicroscopy (specially trained optometrists)</td>
<td>No. A number of DR screening methods were compared to ascertain the best for a new screening scheme.</td>
<td>6 optometrists (high-street based)</td>
<td>73% and 90% sensitivity and specificity respectively</td>
<td></td>
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<tr>
<td>Pointer et al.</td>
<td>1998</td>
<td>Kettering</td>
<td>Collaborative shared-care scheme evaluated after the first 12 months, between April 1995 and March 1996</td>
<td>Audit of first 12 months of collaborative scheme.</td>
<td>Yes.</td>
<td>44 optometrists participated from 26 practices with 1781 patients screened.</td>
<td>92% of the optometrists in the locality recording 34% of the projected diabetic population of the Kettering Health area.</td>
<td>The authors suggest that publicising the scheme and training regarding false positives in order to lead to a reduction, would be necessary in later stages. Furthermore, it was concluded that a review of a cohort of patients to check optometric sensitivity and specificity by ophthalmologists was necessary for future working.</td>
</tr>
<tr>
<td>Authors</td>
<td>Date</td>
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<tr>
<td>Prasad et al.</td>
<td>2001</td>
<td>Wirral</td>
<td>Researched the effectiveness of optometric examination using slit-lamp biomicroscopy through dilated pupils for DR screening.</td>
<td>Prospective study. Diabetes register utilised to collect patient demographic data, including 64 GP practices, hospital sites with diabetic clinics, laboratory reports. Positive referrals and 10% of negatives were re-examined by an ophthalmologist.</td>
<td>No.</td>
<td>Those not under HES-invited for eye test by AO. 27 AOs.* 4904 patients screened in first 18 months. 90.5% were negative screens, 429 (9.67%) were re-screened.</td>
<td>4904 patients were screened in 18 months. 371 were considered borderline or 'threshold' cases, in which 30.18% or 112 were false positives. The most common cause of these false positives was 'drusen in patients with background DR.' Overall, test sensitivity for STDR (sight threatening diabetic retinopathy) was 76% and specificity 95% utilising this one method of screening for DR.</td>
<td>The authors concluded that the optometrists performed well, and was 'facilitated by the use of simple grading and referral criteria.' This may be an important consideration for further research, in terms of ensuring grading and referral systems are communicated to optometric staff, and are comprehensible.</td>
</tr>
<tr>
<td>Ryder et al.</td>
<td>1998</td>
<td>Birmingham</td>
<td>Utilised retinal photography examined by a specialist optometrist within the HES Diabetes unit, ophthalmoscopy with selected dilation, and diabetologist back-up in cases of 'uncertainty'.</td>
<td>Implemented as part of an on-going audit of DR screening service.</td>
<td>Yes.</td>
<td>289 hospital clinic patients not attending an ophthalmologist already. 144 for first audit, 145 for second.</td>
<td>Concluded that the hospital-based scheme was 'fail-safe'</td>
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<tr>
<td>Scanlon et al.</td>
<td>2005</td>
<td>Gloucestershire Health Authority</td>
<td>Audit of ophthalmology department workload changes after the introduction of a diabetic retinopathy programme</td>
<td>Medical records of patients attending eye clinics over the four years. First year was prior to screening, two years was first round, final year was the second round.</td>
<td>Yes.</td>
<td>3877 patients with diabetes over the first four years between 1997-2001 including those already registered at the eye clinic who attended as emergencies booked between appointments.</td>
<td>The results suggested that workload in fact increased on the first round of screening, and in further rounds the workload did not decrease below pre-screening levels, with the exception of laser surgery which did show a decrease.</td>
<td>As a result, screening programmes could represent 'a significant workload' to the NHS. The authors suggested the failure to find a drop in workload was possibly due to the increasing numbers of individuals with diabetes.</td>
</tr>
<tr>
<td>Tu et al.</td>
<td>2004</td>
<td>Warrington NHS Health Trust (Warrington and Halton areas)</td>
<td>Compared forms of DR screening including optometric screening and digital photography screening</td>
<td>Comparative study</td>
<td>Yes.</td>
<td>1643 patients screened in the two schemes</td>
<td>Uptake for both systems was poor.</td>
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</tr>
<tr>
<td>Authors</td>
<td>Date</td>
<td>Location</td>
<td>Description</td>
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<tr>
<td>Warburton et al.</td>
<td>2003</td>
<td>Stockport</td>
<td>Researched the sensitivity and specificity rates for sight-threatening eye disease in the diabetic retinopathy screening service</td>
<td>Screening was performed using slit-lamp binocular indirect ophthalmoscopy and a hand-held fundus-imaging lens through dilated pupils.</td>
<td>Yes.</td>
<td>A number of patients were selected at random from the screen-negatives group to determine specificity. 3510 patients were screened during the study period.</td>
<td>Specificity was surpassed by 4% (target- 95%, actual- 99%). Geographical coverage was 1.2% with a target of 1.8% for new screening schemes. Sensitivity fell somewhat short of the UK National Screening Committee target of 80%, recording instead 75.8%. The authors did however suggest a 57% increase in overall numbers of individual screens and therefore in the context of this geographical area the scheme could be viewed as a vast improvement.</td>
<td></td>
</tr>
<tr>
<td>Wilson et al.</td>
<td>2004</td>
<td>Nationwide</td>
<td>Surveyed twenty five health authorities across England and Wales in order to ascertain diabetic retinopathy screening provision.</td>
<td>Case notes analysis.</td>
<td>No.</td>
<td>9,200 records were reviewed during the process</td>
<td>The overall results suggested that all types of schemes were associated with a doubling of the odds of individual patients with diabetes having had a retinal examination. There was also more doubling of testing within optometry schemes, though such schemes also recommend early referral for uncertain cases.</td>
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</table>
Future working:
1. Compare sensitivity and specificity rates across different diabetic retinopathy schemes and ascertain reasons for these.
2. Training optometrists in order to reduce false positives within DR schemes.
3. Ensuring good schemes for referral and grading for DR.
6. An up-to-date cost effectiveness analysis of the various kinds of DR screening.

Types of work recommended for data collection and presentation:
1. Create a collaborative study of neighbouring PCTs to compare sensitivity and specificity rates. A WMSHA optometric advisor has already mentioned some 100 DR schemes.
2. CET events to reduce DR false positives within DR schemes.
3. Research listed in 1 above.
4. Pilot studies across the WMSHA to trial call-recall registers based upon the previous research.
5. Compare records pre and post- community based DR schemes.
**Blood Glucose screening (Brown)**

One paper investigated blood glucose screening by optometrists, it is relevant within the context of the diabetic retinopathy schemes. Table 13 summarises the paper.

Lask (1997) produced a report on the commencement of a collaborative study funded by Brixton Professionals in Partnership (BPIP) in order to test blood glucose levels. The author highlights the fact the pilot was a screening project only, and that diagnoses remained the responsibility of the patient’s GP, and those under the treatment of the GP or hospital were not measured. Instead, this pilot aimed ‘to find previously undiagnosed cases of high blood glucose levels’ (Lask: 29). 23 optometrists out of 120 invited agreed to take part, and attended an evening course discussing the background of diabetes, prevalence among the targeted ethnic groups and the issues surrounding blood glucose measurement. The report does not present any results however, and it is unclear whether this initiative continued.

The author of this report considers such a scheme, if successful, a useful link for diabetic case finding, which may prevent associated eye conditions later along the line.

**Table 13: Optometrists involved in blood glucose screening**

<table>
<thead>
<tr>
<th>Authors</th>
<th>Date</th>
<th>Location</th>
<th>Description</th>
<th>Design</th>
<th>New initiative</th>
<th>Participants/ number of case notes</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lask</td>
<td>1997</td>
<td>London</td>
<td>Report on the commencement of a collaborative study funded by Brixton Professionals in Partnership (BPIP) in order to test blood glucose levels</td>
<td>Optometrists were recruited according to the Health Authority list. 23/120 applied for a place on the study, including evening course attendance.</td>
<td>Yes.</td>
<td>Those under the treatment of the GP or hospital were not measured. 23 optometrists out of 120 invited agreed to take part.</td>
<td>The report does not present any results however, and it is unclear whether this initiative continued.</td>
</tr>
</tbody>
</table>
3 papers studied optometric prescribing, and are summarised in table 14 below.

Mason and Mason (2002) conducted research to ascertain the use of therapeutic agents by optometrists and whether optometrists would like to train to become accredited optometrists for this purpose, both to prescribe dependently and independently. Other questionnaire items included whether the respondent felt optometrists should be allowed to prescribe both dependently and independently. A 10% random sample of optometrists was taken from a list of 7,500 GOC registered practitioners. The first survey was sent out in September 2000. The results suggested 67% of optometrists would like to prescribe either independently or dependently (69%). The vast majority felt optometrists should be able to do this for infection and inflammation (87%, independently). 90% were also willing to undergo further training for this, which may be an interesting question for phase 2 questionnaire purposes.

Bateman et al. (2002) reviewed the effect of new treatments for the management of glaucoma in Scotland. That data represented operation and prescribing rates between 1994 and 1999 across four geographical locations within Scotland. Overall prescribing rates per 1000 increased by nearly 25% (24.9%), though the increase across the regions varied between 14.3% and 31.9%. There was an increase in newer agents and a drop in miotic use. Furthermore, increases were reported, in: cataract operations, eye tests, numbers of optometrists and ophthalmic surgeons. The latter two are particularly encouraging in light of the ageing population and the associated increase in glaucoma over the forthcoming years and the corresponding need for more eye-care professionals.

An update of the study by Mason and Mason was conducted by Needle et al. (2008) in order to ascertain the current practice of optometrists, and to discover their views regarding the extension of their role in terms of prescribing. Between the Mason and Mason study and Needle et al., medicinal legislation change since 2005 now means optometrists can use and supply additional types of therapeutic drugs. Prior to this, in 2000 the GOC had allowed optometrists to manage a patient’s condition by virtue of the removal of the requirement to refer patients on. Some 1288 optometrists were therefore surveyed from the College of Optometrists list of registered practitioners. Participants were recruited via email. The optometrists managed an array of conditions, some including dry eye, blepharitis/ lid problems, simple corneal abrasions, allergic conjunctivitis, with management rates of 87-96% across these conditions. Optometrists in hospital were also more likely to manage acute sight-threatening diseases. Nearly 80% felt they could manage PAOG with further training, and also felt that most main classes of drugs should be available to them. This somewhat contradicts the initial commentary presented by Ewbank (1997) regarding ophthalmologists views on optometric prescribing.
Table 14: Optometrists involved in prescribing

<table>
<thead>
<tr>
<th>Authors</th>
<th>Date</th>
<th>Location</th>
<th>Description</th>
<th>Design</th>
<th>New initiative</th>
<th>Participants/ number of case notes</th>
<th>Outcome</th>
<th>Comments/ notes where applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bateman et al.</td>
<td>2002</td>
<td>Scotland (four geographical areas-)</td>
<td>Examination of the impact of new drug treatments on glaucoma management</td>
<td>Retrospective analysis of national health statistics</td>
<td>No</td>
<td>Not listed</td>
<td>Increases in topical prostaglandins, carbonic anhydrase inhibitors. Increases in cataract surgery, eye tests, numbers of optometrists. Fall in myotic usage</td>
<td></td>
</tr>
<tr>
<td>Mason and Mason</td>
<td>2002</td>
<td>UK-wide</td>
<td>Research to ascertain the use of therapeutic agents by optometrists and whether optometrists would like to train to become accredited optometrists for this purpose, both to prescribe dependently and independently</td>
<td>Questionnaire study</td>
<td>Not as such, though measures interest in the newer optometric area of prescribing.</td>
<td>A 10% random sample of optometrists was taken from a list of 7,500 GOC registered practitioners.</td>
<td>The results suggested 67% of optometrists would like to prescribe either independently or dependently (69%). The vast majority felt optometrists should be able to do this for infection and inflammation (87%, independently). 90% were also willing to undergo further training for this.</td>
<td>Useful for Phase 2 questionnaire</td>
</tr>
<tr>
<td>Needle et al.</td>
<td>2008</td>
<td>UK-wide</td>
<td>To ascertain the current practice of optometrists, and to discover their views regarding the extension of their role in terms of prescribing.</td>
<td>Questionnaire study</td>
<td>Not as such</td>
<td>1288 optometrists were therefore surveyed from the College of Optometrists list of registered practitioners</td>
<td>The optometrists managed an array of conditions, some including dry eye, blepharitis/ lid problems, simple corneal abrasions, allergic conjunctivitis, with management rates of 87-96% across these conditions. Optometrists in hospital were also more likely to manage acute sight-threatening diseases. Nearly 80% felt they could manage PAOG with further training, and also felt that most main classes of drugs should be available to them.</td>
<td>This somewhat contradicts the initial commentary presented by Ewbank (1997) regarding ophthalmologists views on optometric prescribing.</td>
</tr>
</tbody>
</table>
Future research:
1. Add questions regarding therapeutic prescribing to the questionnaire for phase 2. This has been completed.
2. Further research regarding the use of therapeutic agents in general to ascertain view points.

Types of work recommended for data collection and presentation:
1. This has been completed.
2. Questionnaire and/or interviews with various eye care providers regarding therapeutic agent usage by optometrists.
Low Vision Services (lime green)

Background
A systematic review of low vision service outcomes was produced in a collaborative project for the RNIB (Binns et al., 2009). This project team evaluated low vision service outcomes. The outcome measures included quality of life and vision related quality of life. One paper suggested that ‘enhanced’ low vision services were not significantly better than ‘good hospital services’ in terms of improving vision related quality of life. The report does not define ‘good hospital services.’ In addition to this, the report evidence suggests that multidisciplinary services are no better than optometric services for vision related quality of life. This is a particularly important finding for optometry. The report also concluded that the evidence remained contradictory in terms of rehabilitation programmes improving ‘vision related quality of life.’

Another paper produced by the research team provided the partner paper which profiles UK low vision services, though is primarily based upon English services. The report includes the range of low vision services, from ‘one stop shops’ to more traditional HES and corresponding referral pathways. The report suggested that there was not one service which ‘ticked all boxes.’ Furthermore, where all services showed some weakness, the authors also emphasised the fact that weakness was a ‘matter of opinion’ due to the paucity of ‘objective assessments of effectiveness.’ (Dickinson et al., 2009: 32). The second chapter of the report also outlines the economic study involving finance directors in Low vision services within the NHS, local authorities and voluntary sector. All directors received email or telephone calls and requests were made by the research team for cost data based on 2007-08 tax year. The key drivers were staffing and the provision of aids and equipment for service users. Overall, the respondents were concerned about financial sustainability of certain aspects of the service, including rehabilitation and eye clinic liaison officers, who are often based in the HES.

Both papers suggest that low version services operate across large areas, and are particularly varied in terms of service personnel and funding. Correspondingly, service pathways are also varied, which could lead to different patient outcomes, in this case in terms of quality of life. Furthermore, as there paucity of research regarding measurements of effectiveness, it is important to eye care services as a whole to gain a handle on low vision service evaluation in order to reach clearer decisions regarding the best form of low vision service provision.

Research papers
Two research papers specifically referred to Low Vision services (summarised in table 15 below).

In 2002, Culham et al. reported the ‘type and location of LV services within the UK’ (Culham et al., 2002: 743) due to a lack of knowledge regarding delivery of LV services. The postal questionnaire was distributed to all LV service providers and telephone interviews were utilised in cases where service providers failed to return the initial questionnaire. The service providers included ‘hospital eye departments (HED), Social services/ social work departments (SSD), opticians/ optometry practices (OP), local societies/ voluntary organisations for people with visual impairment (VO), specialist teachers (ST) and universities and colleges with optometry/ optical dispensing courses (UC) (Culham et al., 2002: 743).’
The study period was October 1997 to June 1998, prior to devolution and over a decade before the current research. The findings suggested the majority of low vision services were provided by the HES. As the HES is already stretched and the number of older people will continue to rise over the coming years, this finding is concerning for providing adequate eye care services. The authors also suggested that there were 'inadequacies' in terms of distribution, magnitude and coordination overall when compared to the 'probable number of people with a visual impairment.'

Russell et al. (2001) utilised a RCT to compare a traditional hospital based eye care service with an integrated service and a non-integrated service, each including a community-based rehabilitation officer and a 'generic community' service which was not 'vision specific.' Outcome measures were used at time of recruitment and at 12 months post-intervention, including vision and quality of life measures, 'patterns of low vision use and task performance' (Russell et al., 2001: 36). Whilst this paper described the design and methodology, it does not present data regarding the efficacy of each study arm in terms of eye care services and input of eye care professionals. Therefore, further research is required regarding the outcomes of LV shared-care services.
Table 15: Optometrists involved in Low Vision schemes

<table>
<thead>
<tr>
<th>Authors</th>
<th>Date</th>
<th>Location</th>
<th>Description</th>
<th>Design</th>
<th>New initiative</th>
<th>Participants/ no. of case notes</th>
<th>Outcome</th>
<th>Comments/ notes where applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binns et. al.</td>
<td>2009</td>
<td>Nationwide</td>
<td>Systematic review of low vision service outcomes</td>
<td>Not applicable</td>
<td>Yes.</td>
<td>Not stated.</td>
<td>The findings suggested the majority of low vision services were provided by the HES. The authors also suggested that there were ‘inadequacies’ in terms of distribution, magnitude and coordination overall when compared to the ‘probable number of people with a visual impairment.’</td>
<td></td>
</tr>
<tr>
<td>Culham et al.</td>
<td>2002</td>
<td>UK - wide</td>
<td>Reported the ‘type and location of LV services within the UK’</td>
<td>Questionnaire survey of UK LV service providers</td>
<td>No.</td>
<td>2539 service providers</td>
<td>Suggested the majority of low vision services were provided by the HES.</td>
<td></td>
</tr>
<tr>
<td>Dickinson et al.</td>
<td>2009</td>
<td>Authors based in Cardiff. Nationwide review</td>
<td>Profile of UK low vision services, though is primarily based upon English services</td>
<td>Systematic literature review</td>
<td>No.</td>
<td>Not applicable.</td>
<td>The report suggested that there was not one service which ‘ticked all boxes.’ The financial manager questionnaire respondents were concerned about financial sustainability of certain aspects of the service, including rehabilitation and eye clinic liaison officers, who are often based in the HES.</td>
<td></td>
</tr>
<tr>
<td>Russell et al.</td>
<td>2001</td>
<td>Manchester</td>
<td>Comparing a traditional hospital based eye care service with an integrated service and a non-integrated service, each including a community-based rehabilitation officer and a ‘generic community’ service which was not vision specific.</td>
<td>RCT study</td>
<td>Yes.</td>
<td>226 patients. Randomised to study arm- conventional, hospital based care with integrated home-based intervention by LV rehabilitation officer (still receiving same optometric care as study arm 1 participants), arm 3- HES and generic intervention at home (not vision based) by community care worker</td>
<td>This paper described the design and methodology, and does not present data regarding the efficacy of each study arm in terms of eye care services and input of eye care professionals</td>
<td>Further research is required regarding the outcome of LV shared-care services.</td>
</tr>
</tbody>
</table>
Paediatric eye care services (pale pink)

Five papers covered child eye care services, they are summarised in table 16 below.

Wickham et al. (2002) conducted a national audit of paediatric services with regard to the assessment and management of strabismus (squint) and amblyopia. The research team received responses from 75% of orthoptic departments where paediatric work is largely conducted (288 orthoptic departments were asked in total). The results suggested that a variety of systems are in place, and this is dependent upon the referral route. 66% involved ‘orthoptic assessment without refraction’ (Wickham et al., 2002: 522), ‘66% combined orthoptist and ophthalmologist assessment’ and ‘22% had an entirely orthoptist or optometric system.’ As a result, services appear to be particularly varied, and therefore children are receiving different services across different parts of the UK.

On a more local level, Karas et al. (1999) conducted a study to ascertain whether a community based hospital optometrist and community orthoptist model could provide a vision screening service for children. Between April 1994- March 1996, a total of 483 new patients were seen by the service representing an uptake of 65% (748 were offered the service). Children aged over 8 were not initially included in the scheme, though this criterion was waived in a small number of cases due to individual circumstances. Agreement regarding referrals to the HES strabismus centre was then sought from the hospital ophthalmologist. The authors commented that the low referral rate could reduce the use of the HES and subsequent cost by retaining the children within the community scheme. The scheme was deemed successful overall, with a referral rate of 14% and the ophthalmologist agreeing with 78% of these.

A follow-up study by Donaldson et al. (2002) re-visited the scheme above, utilising referrals made between 1994- 1998 being the first 4 years. 43% of the children (1300/1755 invited) were subsequently found to have ‘normal’ vision, and in 41% of these, the children required only spectacles. 17% had an orthoptic abnormality, generally refractive error and 98% were seen by the orthoptist, suggesting the high utility of orthoptist care instead of HES referral. The authors also suggested that only 16% of the children failing the primary vision screening in school needed HES referral due to the skill-mix of the combined orthoptist- optometrist practice within the clinic. Therefore, at initial stages and at follow-up the scheme appeared to reduce referrals and represent a scheme which could manage child-eye needs sufficiently within the community. This has particular benefits to the patient and parent in terms of convenience. Interesting further work could focus on the reasons for non-attendance in those who did not attend when invited.

Within the Huntingdonshire PCT, Alexander, Rahi and Hingorani (2009) described and costed paediatric eye care services. The total cost within the PCT was over £360,000. The study population involved over 33,000 children during the year of study, and 1970 (5.9%) had required outpatient appointments. 1870 (5.6%) underwent screening by an orthoptist. It is unclear from the paper the number of children who were referred from community to hospital care services. 1.3% of the children had been prescribed spectacles, which would happen in the community, however the figure requiring hospital appointments suggests a number of children are suspected of having conditions which cannot be treated simply with spectacle prescriptions.
The authors concluded that the resources required for comprehensive child eye care services is considerable to in order to screen and manage conditions, as well as supporting those with ‘serious eye conditions or visual impairment. The latter accounted for 69, or 0.2% of the study sample. This financial output is an important consideration for any similar paediatric eye care services, particularly in the current economic climate and the knock-on effect on healthcare services in general.

Thomson and Evans (1999) also reviewed the use of a new type of screening in schools. The system utilised a computer program. Prior to using the program, parents completed a questionnaire regarding the child’s symptoms, history and family history. 48 children later failed the test, with 32 unaware of there being any problem with their eyes. The program also gave a specificity of 93.8% and a specificity of 96.1%. Both aspects suggest efficiency of the program for detecting eye sight problems in children.
Table 16: Optometrists involved in paediatric eye care schemes

<table>
<thead>
<tr>
<th>Authors</th>
<th>Date</th>
<th>Location</th>
<th>Description</th>
<th>Design</th>
<th>New initiative</th>
<th>Participants/ number of case notes</th>
<th>Outcome</th>
<th>Comments/ notes where applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alexander et al.</td>
<td>2009</td>
<td>Huntingdonshire</td>
<td>Describes and costs paediatric eye care services</td>
<td>Cost-effectiveness paper utilising care records.</td>
<td>No.</td>
<td>The study population involved over 33,000 children during the year of study</td>
<td>The authors concluded that the resources required for comprehensive chid eye care services is considerable to in order to screen and manage conditions, as well as supporting those with ‘serious eye conditions or visual impairment. The latter accounted for 69, or 0.2% of the study sample.</td>
<td></td>
</tr>
<tr>
<td>Donaldson et al.</td>
<td>2002</td>
<td>John Scott Health Centre, Hackney, London</td>
<td>Follow-up to Karas et al. (1999). Referrals made between 1994-1998 being the first 4 years.</td>
<td>Case note analysis</td>
<td>No.</td>
<td>1300/1755 (74%) attended the clinic</td>
<td>43% of the children (1300/1755 invited) were subsequently found to have 'normal' vision, and in 41% of these, the children required only spectacles. 17% had an orthoptic abnormality, generally refractive error and 98% were seen by the orthoptist, suggesting the high utility of orthoptist care instead of HES referral.</td>
<td></td>
</tr>
<tr>
<td>Karas et al.</td>
<td>1999</td>
<td>London</td>
<td>To ascertain whether a community based hospital optometrist and community orthoptist model could provide a service of vision screening for children</td>
<td>Case note analysis (agreement between consultant’s diagnosis and the clinic team referees)</td>
<td>Yes.</td>
<td>Between the study period of April 1994-March 1996 a total of 483 new patients were seen by the service representing an uptake of 65% (748 were offered the service).</td>
<td>The authors commented that the low referral rate could reduce the use of the HES and subsequent cost by retaining the children within the community scheme. The scheme was deemed successful overall, with a referral rate of 14% and the ophthalmologist agreeing with 78% of these.</td>
<td></td>
</tr>
<tr>
<td>Thomson and Evans</td>
<td>1999</td>
<td>London</td>
<td>This study researched the use of a new type of screening in schools</td>
<td>The system utilised a computer program. Parents completed a questionnaire regarding the child’s symptoms, history and family history</td>
<td>Yes.</td>
<td>48 children later failed the test, with 32 unaware of there being any problem with their eyes. The program also gave a specificity of 93.8% and a specificity of 96.1%.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wickham et al.</td>
<td>2002</td>
<td>National audit</td>
<td>Conducted a national audit of paediatric services with regard to the assessment and management of strabismus (squint) and amblyopia.</td>
<td>Survey- based</td>
<td>No.</td>
<td>288 orthoptic departments were asked in total. The research team received responses from 75% of orthoptic departments where much of the paediatric work is undertaken.</td>
<td>The results suggested that a variety of systems are in place, and this is dependent upon the referral route. 66% involved ‘orthoptic assessment without refraction’ (Wickham et al., 2002: 522), ‘66% combined orthoptist and ophthalmologist assessment’ and ‘22% had an entirely orthoptist or optometric system.’</td>
<td></td>
</tr>
</tbody>
</table>
Future research:
1. A research study focus on the reasons for non-attendance in those who did not attend when invited.

Data collection and presentation:
1. Questionnaire or interview study of non-attenders identified from previous research.
Melanoma (Pale blue)

One paper described the detection of uveal melanoma by UK optometrists.

Damato (2001) conducted a study regarding the detection of uveal melanoma by community optometrists. The research was based upon retrospective data analysis of 223 patients with a mean age of 59.7. Larger melanomas were associated with male gender (p=0.003). According to the findings, ‘79% of symptomatic patients reported that their tumour was detected at their first visit’ (Damato, 2001: 268) and 45% of those with patients with melanomas were asymptomatic. Where there was a failure to detect the tumour, this was associated with an absence of ‘tumour extension posterior to equator’ and this finding was significant (p<0.0001). This suggested the importance of a full examination of the fundus area and ‘the importance of pupil dilation’ when a patient presents with symptoms.

Table 17: Optometrists involved in melanoma detection

<table>
<thead>
<tr>
<th>Authors</th>
<th>Date</th>
<th>Location</th>
<th>Description</th>
<th>Design</th>
<th>New initiative</th>
<th>Participant s/ number of case notes</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damato</td>
<td>2001</td>
<td>Liverpool University Hospital</td>
<td>The detection of uveal melanoma by community optometrists</td>
<td>Retrospective data analysis</td>
<td>No. 223 patients with a mean age of 59.7</td>
<td>‘79% of symptomatic patients reported that their tumour was detected at their first visit’ (Damato, 2001: 268) and 45% of those with patients with melanomas were asymptomatic. Where there was a failure to detect the tumour, this was associated with an absence of ‘tumour extension posterior to equator’ and this finding was significant (p&lt;0.0001).</td>
<td></td>
</tr>
</tbody>
</table>
Flashes and floaters (Peach)

Three papers specifically related to either: flashes and floaters at patient presentation; or a ‘presbyopic’ actor with recent photopsia. These papers are summarised in table 18.

Alwitry, Chen and Wigfall (2002) conducted a postal survey study to ascertain the management practices undertaken by optometrists in patients presenting with flashes and floaters. Flashes and floaters can be indicative of retinal tear and/or retinal detachment. The optometrists estimated that they saw an average of 14 patients with flashes and floaters, though relied on recall accuracy. This figure represented 8% of patients within a given month. The results suggested a wide variation in management and referral patterns. 30% of optometrists utilised slit-lamp biomicroscopy to examine the patient, with dilation performed in just some of these cases. The authors concluded that there is a need for further undergraduate and postgraduate level education in vitreous pigment.

Later research by Shah et al. (2008) presented a study with a 20-year old ‘patient’ (an actor) presenting to community optometrists complaining of headaches. 98% of optometrists identified the case of headache, with 82% ascertaining from questioning the reason for the visit. 48% found the patient’s symptoms of flashing lights.

Shah et al.’s 2009 study also involved an actor presenting to 102 community optometrists with recent onset flashing lights. Photopsia, or flashing lights, was detected in 87% without provocation from the actor. None of the optometrists asked all 7 questions regarding the flashing lights (see Appendix 5). 35% asked 4 out of 7 questions, and 85% asked if the patient had noticed any floaters in his vision, and therefore showing linkage between flashes and floaters as symptoms which together can indicate a condition of the retina, including tear or detachment. 66% also recommended fundoscopy screening with dilation, to be carried out themselves or by another eye care professional, and those who referred 70% suggested the patient be seen either on the same day or within a week. The results therefore suggested large variations in optometric care for photopsia.
<table>
<thead>
<tr>
<th>Authors</th>
<th>Date</th>
<th>Location</th>
<th>Description</th>
<th>Design</th>
<th>New initiative</th>
<th>Participants/ number of case notes</th>
<th>Outcome</th>
<th>Comments/ notes where applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alwitry et al.</td>
<td>2002</td>
<td>Derbyshire Royal Infirmary, Derby</td>
<td>To ascertain the management practices undertaken by optometrists in patients presenting with flashes and floaters.</td>
<td>Postal survey</td>
<td>No.</td>
<td>74/130 optometrists responded (56.9%)</td>
<td>The results suggested a wide variation in management and referral patterns. 30% of optometrists utilised slit-lamp biomicroscopy to examine the patient, with dilation performed in just some of these cases.</td>
<td>The authors concluded that there is a need for further undergraduate and postgraduate level education in vitreous pigment.</td>
</tr>
<tr>
<td>Shah et al.</td>
<td>2009</td>
<td>London</td>
<td>Involved an actor presenting to 102 community optometrists with recent onset flashing lights</td>
<td>Standardised patient (study actor) presenting to community optometrists then recording the details of the examination afterwards. This design is used throughout all Shah et al. studies.</td>
<td>No.</td>
<td>102 community optometrists</td>
<td>None of the optometrists asked all 7 questions regarding the flashing lights (see Appendix 5). 35% asked 4 out of 7 questions. 85% asked if the patient had noticed any floaters in his vision, 66% also recommended fundoscopy screening with dilation, to be carried out themselves or by another eye care professional, and of those who referred the patient, 70% suggested the patient be seen either on the same day or within a week.</td>
<td>The results suggested large variations in optometric care for photopsia.</td>
</tr>
<tr>
<td>Shah et al.</td>
<td>2008</td>
<td>London</td>
<td>20-year old ‘patient’ (an actor) presenting to community optometrists complaining of headaches to ascertain the content of optometric examinations for headaches.</td>
<td>Standardised patient/ study actor</td>
<td></td>
<td></td>
<td>98% of optometrists identified the case of headache, with 82% ascertaining from questioning the reason for the visit. 48% found the patients symptoms of flashing lights</td>
<td></td>
</tr>
</tbody>
</table>
Critique of the COSI concept (Community Optometrists with a Special Interest) (pale purple)

One paper contained a critique of the concept of COSIs.

Ellis et al. (2006) comment on the concept of COSIs with some criticism using the example of macular degeneration. They note that the role of the COSI is to triage patients suspected of having exudative age related macular degeneration (AMD). They argue that by adding another tier onto a macular disease pathway will not detect more patients with disease. It could save money but this is by no means guaranteed, for example if the patient still needs referral on to a medical retina specialist. In fact, all patients referred to the HES by the community expert will incur the cost of the retinal specialist as well as the additional cost of the community expert (COSI). Ellis et al go on to suggest that once training costs of COSIs are taken into account, any cost savings may be negated.

Table 19: Critique of the COSI role

<table>
<thead>
<tr>
<th>Authors</th>
<th>Date</th>
<th>Location</th>
<th>Description</th>
<th>Design</th>
<th>New initiative</th>
<th>Participants/ number of case notes</th>
<th>Outcome</th>
<th>Comments/ notes where applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ellis et al.</td>
<td>2006</td>
<td>Not applicable</td>
<td>Comment on the concept of COSIs</td>
<td>Not applicable</td>
<td>No</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>Suggests that the costs incurred by the patient referred to the HES by the COSI would incur both the COSI consultation cost and costs associated with the HES visit. Furthermore, the COSI cost would be incurred by the patient whether they were referred to the HES or not, whereas current systems do not lead to this additional cost.</td>
</tr>
</tbody>
</table>

Suggested future research:
1. Research patient views regarding the utility of COSIs and the cost associated with visiting a COSI.
2. Comparison of the benefits of special interest optometrists with entry level optometrists.

Data Collection and Presentation:
1. Questionnaire based studies akin to recent GP patient surveys, sent via postal services or provided within GP and optometric practice.
Optometric technological comparison studies (Terracotta red)

One paper referred to comparisons between electronic referrals.

Cameron et al. (2009) studied the ‘feasibility, safety and clinical effectiveness' (Cameron et al: 1134) of utilising electronic referral of patients between community practice and the HES. Study arms included referrals with images sent via email and without images sent via email. Over the 18 month study period, 346 electronic referrals were received into the HES with 218 (63%) requiring a HES appointment, in comparison to 85% referred through the traditional GP referral route. This suggests that referrals, with or without images sent electronically, reduce the number of subsequent HES appointments, perhaps due to the level of detail contained within the referrals. This could have a particularly significant impact upon HES resources. Future research could explore the use of digital imaging referrals on ophthalmic services.

Table 20: Optometrists involved in schemes with electronic referral

<table>
<thead>
<tr>
<th>Authors</th>
<th>Date</th>
<th>Location</th>
<th>Description</th>
<th>Design</th>
<th>New initiative</th>
<th>Participants/number of case notes</th>
<th>Outcome</th>
<th>Comments/notes where applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cameron et al.</td>
<td>2009</td>
<td>Queen Margaret Hospital, Dunfermline, Fife</td>
<td>Study reviewing the ‘feasibility, safety and clinical effectiveness’ (Cameron et al: 1134) of utilising electronic referral of patients between community practice and the HES</td>
<td>Comparative analysis of e-referrals from 3 optometric practices, paper referrals from the same 3 optometry practices prior to study period (Control A), and paper referrals from optometrists in the remainder of Fife.</td>
<td>Yes.</td>
<td>346 e-referrals in the study group. All referrals from the 3 optometric practices and the remainder of Fife (control groups A and B)</td>
<td>346 electronic referrals were received into the HES with 218 (63%) requiring a HES appointment, in comparison to 85% referred through the traditional GP referral route.</td>
<td>E-referrals appeared to save an additional 22% of hospital referral appointments.</td>
</tr>
</tbody>
</table>

Suggested future research:
1. The utility of digital imaging referrals on ophthalmic services.

Data Collection and Presentation:
1. A RCT of traditional systems versus electronic referral with or without images, therefore three study arms would be.
4. Conclusions from the literature

In line with the overall rationale for the UK Eye Care Services Survey Project, this report aimed to synthesise the literature involving optometrists and other healthcare professionals involved in the primary and secondary sectors of the optometric and ophthalmic care pathway. As a result, a number of research avenues have been presented, which could lead to a wealth of future research projects within a field which is already establishing extended roles for optometrists within geographical pockets. Where schemes exist, these often include glaucoma co-management, diabetic retinopathy co-management schemes, and cataract one-stop schemes. In addition, a small number of papers pertained to the therapeutic aspect of optometrists’ roles, and this has been extending to involve new types of therapeutic agents. Claydon, Efron and Woods (1998) suggested that the issue of non-compliance in optometric practice would ‘become more poignant’ in this context, and is an important consideration for prescribing optometrists, in terms of patient outcomes and resource usage.

England, Scotland and Wales have differing approaches to eye care services. It is not clear from the literature whether the Scottish system of universal free access to eye care is beneficial versus a more targeted approach such as the Welsh system. This is an important topic for future research.

In light of the evidence presented, the next logical step may be to develop a joined-up approach across PCTs nationwide, in order to offer schemes on a national scale but taking into account local needs and budgets. This may prove to be one of the biggest overall challenges for eye care services i.e. gaining the efficient balance between the needs of particular locations and providing eye care schemes which can be accessed across the country, and offering the same level of service. What is quite clearly necessary is the acknowledgement that optometrists overall provide high quality, sometimes extended services within the GOS (General Optical Services) contract which already allows much of the extended practice to happen due to the initial degree training undertaken by optometrists working under the contract. The larger scale schemes, including the WECI in Wales, as well as the various research studies based upon smaller scale projects, highlight the evidence for this. In addition, with current optometric CET point systems to ensure continual development of optometric practice, the future could be particularly bright for optometrists where gaps in service provision can be filled by their existing skills. This is particularly pertinent at a time when the population continues to age, and ophthalmologist time becomes correspondingly tight when dealing with conditions associated with older age, including cataract, glaucoma, and diabetic retinopathy. Careful negotiation over time is required to ascertain how extension of the optometrist’s role could fit in with other ophthalmic roles, and therefore allow all healthcare professionals to work together without fear of marginalisation.

A number of roles, including nurse practitioner, orthoptist, ophthalmologist, ophthalmic medical practitioner and dispensing optician, exist within the community and HES settings. Therefore the integration of all parties is a particularly important aspect to consider should co-management schemes become more prevalent. A number of papers were identified regarding nurse-led clinics for diabetic retinopathy and glaucoma, which did not include the role of optometrists. Whilst these do not inform the UK Eye Care Services Survey Project regarding optometrists’ roles, and were therefore excluded from this report, this perhaps reiterates the point regarding the delicate nature of extending one health-care professional’s role within the context of the similar patterns.
in the role of others.

This report has also informed the second phase of the project in terms of questionnaire items, and focus group questions, which will also provide insight into local priorities for eye care, and also current research projects. Items will include referral refinement and the extent to which optometrists are involved in a local referral refinement or co-management scheme. This questionnaire will also ask about future training needs, and the extent to which optometrists are currently involved in training for new schemes or therapeutic practice.

Uncertainty also lies with the recent change of UK government and how exactly Government funding will be utilised for healthcare. Widespread spending cuts are predicted. A coalition government of Conservative and Liberal Democrats means that compromises will need to be made in terms of pre-election party manifesto pledges. The Conservatives showed some support for shared-care within other healthcare professions (regarding patients being permitted to utilise local pharmacists for screening and the treatment ‘of minor ailments’, Draft Health Manifesto, 2010, Conservatives: 7). Whether this could mark the beginning of a similar push for co-managed optometric services is uncertain. The recent announcement of the future abolition of SHAs and PCTs will also affect the way in which community based healthcare is delivered in England. Radical changes for the commissioning and funding of UK healthcare are proposed. In future, budgets are to be managed by GP consortia, it remains to be seen how this will affect the delivery of optometric care.
5. References (black type: black literature, grey type: grey literature)


http://www.wales.nhs.uk/sites3/Documents/562/Basic%20WEHE.pdf (for WEHE protocol)


APPENDICES
Appendix 1: Search Terms

Example: Ovid Medline

Ovid MEDLINE(R) 1950 to October Week 3 2009
# Searches Results
1 low vision.ab,ti. 1346
2 exp Vision Disorders/ or Vision disorder*.mp. 49508
3 exp Eye Diseases/ or Eye disease*.mp. 368446
4 eyecare.mp. 67
5 exp Glaucoma/ or Glaucoma.mp. 41555
6 Diabetic retinopathy.mp. [mp=title, original title, abstract, name of substance word, subject heading word, unique identifier] 17693
7 diabetic retinopathy.ab,ti. 10161
8 exp Cataract/ or cataract*.mp. 44516
9 macular degeneration.mp. or exp Macular Degeneration/ 12892
10 or/1-9 384947
11 exp "Delivery of Health Care"/ 614154
12 Health Care Costs/ 18940
13 exp Health Services Accessibility/ 64876
14 Health Services Research/mt [Methods] 3852
15 Optometry.mp. or exp Optometry/ 4789
16 Primary health care.mp. or exp Primary Health Care/ 62760
17 (referral and consultation).mp. [mp=title, original title, abstract, name of substance word, subject heading word, unique identifier] 43237
18 Ambulatory Care/og [Organization & Administration] 1923
19 exp Community Health Services/ 405913
20 Physician's Practice Patterns/sn [Statistics & Numerical Data] 6967
21 community.ab,ti. 191225
22 exp Physicians, Family/ 13425
23 multi-agency.ab,ti. 220
24 shared care.ab,ti. 583
25 patient care management.mp. or exp Patient Care Management/ 399596
26 patient care pathway*.ab,ti. 20
27 exp Patient Care Team/ or multi-disciplinary.mp. 45789
28 Primary care physician*.ab,ti. 10484
29 professional role*.ab,ti. 917
30 exp Vision Screening/ or vision screen*.mp. 1714
31 (diab* and screen* and retinopathy).ab,ti. 1092
32 Diabetic Retinopathy/pc [Prevention & Control] 1121
33 Optometry.mp. or exp Optometry/ 4789
34 exp Optometry/ or Optometrist*.mp. 4969
35 Ophthalmology.mp. or exp Ophthalmology/ 23106
36 Ophthalmologist*.ab,ti. 6752
37 (general practitioner* or GP*).ab,ti. 81288
38 orthoptist*.ab,ti. 164
39 hospital*.ab,ti. 599275
40 or/11-39 1758571
41 Evaluat*.mp. 1736132
42 audit*.mp. or exp Clinical Audit/ 112655
43 exp Models, Organizational/ 11424
44 (model* and care).ab,ti. 49901
45 (organisation and (care or services*)).ab,ti. 3055
46 (task* and redesign*).ab,ti. 203
47 or/41-46 1876986
48 40 and 10 and 47 7484
49 limit 48 to yr="1997 -Current" 5637
50 limit 49 to (english language and humans) 4710
# Appendix 2  Data Extraction Sheet

## DATA EXTRACTION SHEET – OPTOMETRY EYE CARE SERVICES
8 FEBRUARY 2010

### A. General Information

<table>
<thead>
<tr>
<th>Study number</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>First 6 words of title</td>
<td></td>
</tr>
<tr>
<td>Authors</td>
<td></td>
</tr>
</tbody>
</table>

**Occupation/role of main authors**
- Optometrist □
- Researcher/Academic □
- Ophthalmologist □
- Other .................................................................

**Publication date**

**Journal**

**Institution of authors**
- If in a hospital, which dept/ clinic (if listed)?

**City/County study took place**

**Geographical coverage of study**
- (e.g. how many practices, hospitals, PCTs?)

**Multi-site?**
- YES □
- NO □

**Country**

**Screening colour**
- PINK □
- YELLOW □
- ORANGE □
- GREEN □

**Reviewer name**

<table>
<thead>
<tr>
<th>Reviewer comments</th>
<th>Is this a key paper?</th>
<th>YES □ NO □</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make contact with authors?</td>
<td>YES □ NO □</td>
<td></td>
</tr>
<tr>
<td>Date contact made:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Add this paper to the written report?**
- YES □
- NO □
- NOT SURE □

**Type of paper**
- (tick all that apply)
  - Review □
  - Editorial □
  - Original research □
  - Audit □
  - Descriptive □
  - Evaluative □
  - Observational □
  - Other .................................................................

### B. Professional groups studied and numbers if given

**Eye specialists (list)**
- Optometrists □ Number surveyed .......
- Ophthalmologists (consultant) □ Number surveyed .......
- Orthoptists □ Number surveyed .......
- Other ................................................................. □ Number surveyed .......

**Nurses (list)**
- Specialist nurses □ Number surveyed .......
- Nurse practitioners □ Number surveyed .......
- Other ................................................................. □ Number surveyed .......

**Medical (list)**
- GP □ Number surveyed .......
<table>
<thead>
<tr>
<th>Number of professionals studied (if applicable)</th>
<th>Number of professionals studied (if applicable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital doctor</td>
<td>□ Number surveyed …….</td>
</tr>
<tr>
<td>Therapists (list)</td>
<td>□ Number surveyed …….</td>
</tr>
<tr>
<td>Psychologists</td>
<td>□ Number surveyed …….</td>
</tr>
<tr>
<td>Occupational therapists</td>
<td>□ Number surveyed …….</td>
</tr>
<tr>
<td>Social workers</td>
<td>□ Number surveyed …….</td>
</tr>
<tr>
<td>Physiotherapists</td>
<td>□ Number surveyed …….</td>
</tr>
<tr>
<td>Other ……………………………………………….</td>
<td>□ Number surveyed …….</td>
</tr>
<tr>
<td>Other professional groups</td>
<td>□ Number surveyed …….</td>
</tr>
<tr>
<td>Pharmacists</td>
<td>□ Number surveyed …….</td>
</tr>
<tr>
<td>Other ……………………………………………….</td>
<td>□ Number surveyed …….</td>
</tr>
</tbody>
</table>

C. Methodological Details: study details

<table>
<thead>
<tr>
<th>Focus of study</th>
<th>Organisation of services</th>
<th>Shared care</th>
<th>Other (describe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aim of study</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Location of study | Community | Hospital | Independent Practice | Multi-
| (tick all that apply) | | | ple/franchise Practice | ple fringe |
|                 | GP surgery | | | Practice |
|                 | Other | | | Other |
| Eye condition studied | Glaucoma | Cataracts | |
|                 | Low Vision | Diabetic retinopathy | |
|                 | Vision pathway | Childhood eye problems | |
|                 | Range of eye conditions | | |
|                 | Other | | | Other |

D. Methodological Details: study quality

<table>
<thead>
<tr>
<th>Study type</th>
<th>Matched control</th>
<th>Unmatched control</th>
<th>Historic control</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCT</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Unmatched control</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Qualitative □</td>
<td>Observational □</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>---------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cohort □</td>
<td>Before and After □</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (specify)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Type of Evaluation**

<table>
<thead>
<tr>
<th>Economic □</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process □</td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>

**E. Novel Interventions**

**Intervention site**
(e.g. primary care / outpatients)

**Novel interventions**
(tick all that apply)

- Shared Care
- Optometrist prescribing
- Nurse prescribing
- Nurse triage
- Care pathway
- Referral pathway
- Screening
- Other (describe) …………………………………………………………….

**Summarise the intervention/initiative**

**What was the trigger for this initiative?**
e.g. policy change

**Did it work?**
Yes □  Partly □  Unsure □  No □
Not applicable □

**Authors’ positives:**
What worked well?

**Authors’ negatives:**
What did not work or could be improved?

**Evidence that the novel intervention/practice continued after end of project?**
YES □  NO □
Not applicable

**Possible to implement the initiative in another area (from the data presented)?**
Yes □  Partly □  Unsure □  No □

**Study limitations**

**F. Outcomes**

**Principal and secondary outcome measures**
Principal:………………………………………………………………
Secondary:………………………………………………………………

**Referral implications?**
YES □  NO □
If yes what? …………………………………………………………….
<table>
<thead>
<tr>
<th>Question</th>
<th>YES □</th>
<th>NO □</th>
<th>If yes what?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any implications for training?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evidence of cost-effectiveness?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of intervention given?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential for national roll-out by the College</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>G. Statistical analysis</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methods used</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>H. Reviewer Notes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summarise main results:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key recommendations for future working:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>References to check?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contacts for more information?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Please complete Reviewer Comments section on page 1.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix 3: Hau (2997): Eye conditions seen by optometrists

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

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

*Nine keratitis, one deposits problem, one CLARE, one abrasion, one keratopathy.
†One allergic eye disease, one conjunctival trauma, two inflamed pinguecula, one inflamed pterygium, one conjunctival phlycten, four SCH, one stitch granuloma. ‡One macular hole, five retinal detachment, three retinal tear, one retinoschisis.
§Four corneal foreign body, one corneal abrasion, one non-contact lens-related corneal ulcer, one endothelitis, one filamentary keratitis, one RCE.
¶One central retinal vein occlusion, three central serous retinopathy, one commotio, one valsava retinopathy, one dry AMD, two wet AMD.
**One inferior quadrantanopia, four migraine, one sixth nerve palsy, one Amaurosis fugax with no embolus detected.
††Three episcleritis, three scleritis.
‡‡One Fuchs heterochromic cyclitis, one hypertensive uveitis, two postoperative uveitis. §One orbital fracture, one preseptal cellulitis, one lagophthalmos secondary to Bells.
¶¶One Herpes simplex keratitis (HSV), one primary HSV blepharoconjunctivitis. ***One decompensating esophoria.
### Appendix 4: Scully et al. (2009)- list of ‘ideal’, ‘acceptable’ and ‘fail’ criteria for study referral forms

<table>
<thead>
<tr>
<th>Standard</th>
<th>Criteria required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptable</td>
<td>Date of referral</td>
</tr>
<tr>
<td></td>
<td>Referring practice details</td>
</tr>
<tr>
<td></td>
<td>Patient details (name, address, DOB)</td>
</tr>
<tr>
<td></td>
<td>VA and refraction</td>
</tr>
<tr>
<td></td>
<td>Optic disc assessment</td>
</tr>
<tr>
<td></td>
<td>Intra-ocular pressure measurement</td>
</tr>
<tr>
<td>Ideal</td>
<td>All criteria in 'acceptable' standard, plus:</td>
</tr>
<tr>
<td></td>
<td>Mention of risk factors for development of disease, e.g. presence of family history, ethnicity (for POAG), or presence of ocular co-morbidity (for secondary disease)</td>
</tr>
<tr>
<td></td>
<td>VF assessment with accompanying plot</td>
</tr>
<tr>
<td></td>
<td>Optometrist impression or tentative diagnosis</td>
</tr>
<tr>
<td></td>
<td>Referral urgency ('routine'/ 'soon'/ 'urgent')</td>
</tr>
<tr>
<td>Fail</td>
<td>Letters not satisfying all criteria in ‘acceptable’ standard</td>
</tr>
</tbody>
</table>
Appendix 5: Items asked of the study ‘patient’ (Shah et al. (2009: 112))

<table>
<thead>
<tr>
<th>Questions appropriate to identifying the nature of the flashing lights</th>
<th>% of optometrists asking the question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Where is your vision do you see the flashing lights?</td>
<td>53</td>
</tr>
<tr>
<td>Are the flashing lights in one eye or both eyes?</td>
<td>72</td>
</tr>
<tr>
<td>Describe the flashes</td>
<td>26</td>
</tr>
<tr>
<td>Is there a pattern to the occurrence of the flashes?</td>
<td>83</td>
</tr>
<tr>
<td>Is there a change in pattern of occurrence?</td>
<td>39</td>
</tr>
<tr>
<td>How long ago did you first notice them?</td>
<td>94</td>
</tr>
<tr>
<td>How long do they last?</td>
<td>34</td>
</tr>
</tbody>
</table>

(n=102)
### Appendix 6: All black literature

<table>
<thead>
<tr>
<th>Authors</th>
<th>Date</th>
<th>Location</th>
<th>Description</th>
<th>Design</th>
<th>New initiative</th>
<th>Participants/ number of case notes</th>
<th>Outcome</th>
<th>Comments/ notes where applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alexander et al.</td>
<td>2009</td>
<td>Huntingdonshire</td>
<td>Describes and costs paediatric eye care services</td>
<td>Cost-effectiveness paper utilising care records.</td>
<td>No.</td>
<td>The study population involved over 33,000 children during the year of study</td>
<td>The authors concluded that the resources required for comprehensive child eye care services is considerable to in order to screen and manage conditions, as well as supporting those with serious eye conditions or visual impairment. The latter accounted for 69, or 0.2% of the study sample.</td>
<td></td>
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<tr>
<td>Alwitry et al.</td>
<td>2002</td>
<td>Derbyshire Royal Infirmary, Derby</td>
<td>To ascertain the management practices undertaken by optometrists in patients presenting with flashes and floaters.</td>
<td>Postal survey</td>
<td>No.</td>
<td>74/130 optometrists responded (56.9%)</td>
<td>The results suggested a wide variation in management and referral patterns. 30% of optometrists utilised slit-lamp biomicroscopy to examine the patient, with dilation performed in just some of these cases.</td>
<td>The authors concluded that there is a need for further undergraduate and postgraduate level education in vitreous pigment.</td>
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<tr>
<td>Austen et al.</td>
<td>2003</td>
<td>Loughborough</td>
<td>Commentary paper on a new GP referral scheme (GPs referring to the local accredited optometrist)</td>
<td>Not applicable</td>
<td>Yes.</td>
<td>GP referral scheme to accredited optometrists in the community</td>
<td>113 patients were seen in the first year</td>
<td>High levels of patient satisfaction</td>
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<tr>
<td>Azuaro-Blanco et al.</td>
<td>2007</td>
<td>Scotland</td>
<td>Comparison of the diagnostic performance of AGOs versus consultant ophthalmologists</td>
<td>Case note cohort study</td>
<td>No.</td>
<td>The paper is however based upon the AGO Glaucoma service</td>
<td>100</td>
<td>Optometrists provided as reliable a service as junior ophthalmologists in the HES.</td>
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<tr>
<td>Authors</td>
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<tr>
<td>Banes et al.</td>
<td>2000</td>
<td>Moorfield’s Eye Hospital, London</td>
<td>Comparison of HES optometrist and ophthalmologist management</td>
<td>Retrospective case note analysis</td>
<td>No. Established system of HES-based optometrist care</td>
<td>54 (108 eyes)</td>
<td>Glaucma management decisions were of high quality/ similar to ophthalmologist management</td>
<td></td>
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<tr>
<td>Banes et al.</td>
<td>2006</td>
<td>Moorfield’s Eye Hospital, London</td>
<td>Analysis of agreement between optometrists and ophthalmologists on glaucoma management decisions</td>
<td>Case note analysis (specially designed forms for the purpose of recording clinical management decisions)</td>
<td>No.</td>
<td>350 patients. 4 optometrists (HES based) and 3 medical clinicians, with 50 patients each</td>
<td>Overall agreement was 56% for VF status, 79% for management (medical aspects), other aspects of management- 72-98% and 78% for scheduling the next appointment.</td>
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<tr>
<td>Bateman et al.</td>
<td>2002</td>
<td>Scotland (four geographical areas-)</td>
<td>Examination of the impact of new drug treatments on glaucoma management</td>
<td>Retrospective analysis of national health statistics</td>
<td>No</td>
<td>Not listed</td>
<td>Increases in topical prostaglandins, carbonic anhydrase inhibitors. Increases in cataract surgery, eye tests, numbers of optometrists. Fall in myotic usage.</td>
<td></td>
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<tr>
<td>Bell et al.</td>
<td>1997</td>
<td>Edinburgh</td>
<td>Glaucma referral accuracy by optometrists</td>
<td>Retrospective case note analysis</td>
<td>No. The case notes were based on traditional joint GP/optometrist referral to the HES</td>
<td>295 (case notes)</td>
<td>High false positive rate (36%). Recommendation that optometrists combine tonometry and ophthalmoscopy in order to improve referral quality.</td>
<td></td>
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<tr>
<td>Bowling et al.</td>
<td>2005</td>
<td>Oxford Eye Hospital (Radcliffe)</td>
<td>Community optometrist referral outcomes</td>
<td>Case note analysis</td>
<td>No</td>
<td>2505 referrals from optometry</td>
<td>510 (20.4%) were diagnosed subsequently with glaucoma, of which 160 were normal tension glaucoma. 44.8% were deemed to show no evidence of glaucoma or OHT.</td>
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<tr>
<td>Burnett et al.</td>
<td>1998</td>
<td>Catchment area surrounding Whittington Hospital, London</td>
<td>Retinal screening programme</td>
<td>Service audit</td>
<td>Yes.</td>
<td>666 invited overall, 191 seen by accredited optometrists. 536 of these patients attended, representing an 83% uptake.</td>
<td>83% uptake.</td>
<td></td>
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<tr>
<td>Coast et al.</td>
<td>1997</td>
<td>Bristol</td>
<td>Economic evaluation of glaucoma community initiatives and HES care</td>
<td>Cost analysis alongside an RCT.</td>
<td>No, however the analysis was based upon the new Bristol Share-Care Glaucoma scheme.</td>
<td>Management of glaucoma in the community was deemed not necessarily more cost-effective than HES management (Bristol Shared-care study)</td>
<td>A more current UK evaluation comparing shared-care referral and patient management schemes for glaucoma, and traditional HES schemes could be useful. As the optometrists in the earlier shared-care schemes are now likely to have additional experience, it may be possible that this learning has impacted upon their practice quality, and therefore would mean fewer false positives to the HES and associated lower costs to the HES.</td>
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<tr>
<td>Cameron et al.</td>
<td>2009</td>
<td>Queen Margaret Hospital, Dunfermline, Fife</td>
<td>Study reviewing the 'feasibility, safety and clinical effectiveness' (Cameron et. al: 1134) of utilising electronic referral of patients between community practice and the HES</td>
<td>Comparative analysis of e-referrals from 3 optometric practices, paper referrals from the same 3 optometry practices prior to study period (Control A), and paper referrals from optometrists in the remainder of Fife.</td>
<td>Yes.</td>
<td>346 e-referrals in the study group. All referrals from the 3 optometric practices and the remainder of Fife (control groups A and B)</td>
<td>346 electronic referrals were received into the HES with 218 (63%) requiring a HES appointment, in comparison to 85% referred through the traditional GP referral route.</td>
<td>E-referrals appeared to save an additional 22% of hospital referral appointments.</td>
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<tr>
<td>Culham et al.</td>
<td>2002</td>
<td>UK - wide</td>
<td>Reported the 'type and location of LV services within the UK'</td>
<td>Questionnaire survey of UK LV service providers</td>
<td>No.</td>
<td>2539 service providers</td>
<td>Suggested the majority of low vision services were provided by the HES.</td>
<td></td>
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<tr>
<td>Dahlmann-Noor et al.</td>
<td>2007</td>
<td>Suffolk</td>
<td>Evaluation of the West Suffolk direct referral scheme (all eye conditions)</td>
<td>Audit of existing practice, including three interventions during 2003: direct referral clinics for urgent cases.</td>
<td>Yes. Direct referral scheme between HES and community accredited optometrists</td>
<td>185 seen during the observation period (referred by accredited optometrists)</td>
<td>Diagnostic competence was deemed very high (87%), and referrals were appropriate in 99% of cases. The optometrists' choice of sub-speciality referral was less accurate, as was referral urgency (74% and 75% respectively)</td>
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<tr>
<td>Damato</td>
<td>2001</td>
<td>Liverpool University Hospital</td>
<td>The detection of uveal melanoma by community optometrists</td>
<td>Retrospective data analysis</td>
<td>No.</td>
<td>223 patients with a mean age of 59.7</td>
<td>'79% of symptomatic patients reported that their tumour was detected at their first visit' (Damato, 2001: 268) and 45% of those with patients with melanomas were asymptomatic. Where there was a failure to detect the tumour, this was associated with an absence of 'tumour extension posterior to equator' and this finding was significant (p&lt;0.0001).</td>
<td></td>
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<tr>
<td>Donaldson et al.</td>
<td>2002</td>
<td>John Scott Health Centre, Hackney, London</td>
<td>Follow-up to Karas et al. (1999). Referrals made between 1994-1998 being the first 4 years.</td>
<td>Case note analysis</td>
<td>No. The initiative was implemented 4 years prior to the study, and this paper represents a 64-month review.</td>
<td>1300/1755 (74%) attended the clinic</td>
<td>43% of the children (1300/1755 invited) were subsequently found to have 'normal' vision, and in 41% of these, the children required only spectacles. 17% had an orthoptic abnormality, generally refractive error and 98% were seen by the orthoptist, suggesting the high utility of orthoptist care instead of HES referral.</td>
<td></td>
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<tr>
<td>Davies et al.</td>
<td>2004</td>
<td>Not applicable</td>
<td>Compared two alternative policies for screening for diabetic retinopathy</td>
<td>Not applicable (review article)</td>
<td>No.</td>
<td>Not applicable</td>
<td>Policy one was the preferred system for screening for DR.</td>
<td></td>
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<tr>
<td>Ellis et al.</td>
<td>2006</td>
<td>Not applicable</td>
<td>Comment on the concept of COSIs</td>
<td>Not applicable</td>
<td>No</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>Suggests that the costs incurred by the patient referred to the HES by the COSI would incur both the COSI consultation cost and costs associated with the HES visit. Furthermore, the COSI cost would be incurred by the patient whether they were referred to the HES or not, whereas current systems do not lead to this additional cost.</td>
</tr>
<tr>
<td>Evans et al.</td>
<td>2004</td>
<td>Not applicable</td>
<td>Commentary paper regarding one-stop cataract surgery</td>
<td>Not applicable</td>
<td>Not applicable, though comments on the new advent of one-stop cataract surgery schemes</td>
<td>Not applicable</td>
<td>The authors point to the fact that the 'impressive listing rate' was due to additional 'optometric training and telephone pre-assessment both requiring additional resources (Evans et al., 2004: 227)'</td>
<td></td>
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<tr>
<td>Ewbank</td>
<td>1997</td>
<td>Not applicable</td>
<td>Discussed the concept of optometrists within the primary care context. Various areas of practice, including suitability for assessing certain eye diseases.</td>
<td>Not applicable</td>
<td>No.</td>
<td>Not applicable</td>
<td>Not applicable</td>
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<tr>
<td>Fielding et al.</td>
<td>1998</td>
<td>Princess Alexandra Eye Pavilion, Edinburgh</td>
<td>Describes the initial process of the OHT shared-care scheme in Edinburgh</td>
<td>Not applicable</td>
<td>Yes.</td>
<td>200 patients were seen within the service during two time periods between June 1996 and September 1997. 40 participating optometrists and GPs.</td>
<td>As this paper described the early stages of a new scheme, therefore overall results of the scheme were not produced.</td>
<td>It was estimated that approximately 40% of patients could be re-referred to the community scheme, and there would be some 1000 patients seen within the scheme within 4 years.</td>
</tr>
<tr>
<td>Gilchrist</td>
<td>2000</td>
<td>Not applicable</td>
<td>Critique of the conventional use of specificity and sensitivity as measurements for the effectiveness of screening</td>
<td>Critique article</td>
<td>No.</td>
<td>Not applicable</td>
<td>Gilchrist argues that diagnoses are gained only on those patients who are referred, and therefore the disease status of those not referred remains unknown. Instead, measures of detection rate should be utilised instead i.e. the proportion of those who are screened who are correctly referred/ detected as having glaucoma, and ‘referral accuracy’ i.e. the proportion of those who are correctly referred.</td>
<td></td>
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<tr>
<td>Goyal et al.</td>
<td>2004</td>
<td>Cardiff Eye Unit, University Hospital Wales (UHW), Royal Glamorgan Hospital and Prince Charles Hospital in Merthyr Tydfil</td>
<td>Social deprivation indices for cataract care/ surgery and identifying variations in cataract presentation.</td>
<td>Prospective questionnaire study. Participants filled in the Berth-Peterson VF Index</td>
<td>No.</td>
<td>112</td>
<td>Results suggested that VA (visual acuity) was poorer than the national average across all three sites, though the lowest levels were in Merthyr Tydfil in both the listed eye and other eye. Patient waiting times, both for surgery and outpatient appointments were also longer.</td>
<td>Social deprivation indices did also correlate with the variation in cataract presentation and the use of optometric services, whereby higher levels of social deprivation correlate with poorer use of optometric services.</td>
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<tr>
<td>Gray et al.</td>
<td>1997</td>
<td>Bristol</td>
<td>Researched the validity of visual parameter measurements taken by community optometrists</td>
<td>'Randomised study' (Gray et al.:431)</td>
<td>Yes.</td>
<td>The Bristol Shared-Care Glaucoma scheme, whereby community optometrists manage glaucoma conditions</td>
<td>12 optometrists included, 403 patients (203 to community, 200 to HES)</td>
<td>The results suggested that community optometrists could make measurements 'of comparable accuracy to those made in the Hospital Eye Service'</td>
</tr>
<tr>
<td>Gray et al.</td>
<td>2000</td>
<td>Bristol</td>
<td>Follow-up study two years after the commencement of the Bristol Shared-Care Glaucoma study</td>
<td>Randomised study with patient allocation to either HES or community optometrist care</td>
<td>Follow-up of an initiative established in 1998.</td>
<td>2780 (752 identified with established or suspected glaucoma. The rest were excluded)</td>
<td>The scheme suggested no significant differences overall in outcome between patients in HES follow-up and community optometrist follow-up</td>
<td>Economic outcomes were also similar between community optometrists and the HES if the follow-up interval by community optometrists is similar to the HES (£46.31 and £14.50-£59.95 respectively).</td>
</tr>
<tr>
<td>Hasting and Shephard</td>
<td>1998</td>
<td>Leicestershire</td>
<td>Researched use of a dedicated diabetic eye care co-operation card</td>
<td>Audit</td>
<td>Yes.</td>
<td>450 patients in the first review and 370 in the second. An additional 133 were found for the second review from case notes, totalling 503 for the second review of records.</td>
<td>The use of the card improved the number of patients receiving an examination in the preceding two years.</td>
<td></td>
</tr>
<tr>
<td>Hatt et al.</td>
<td>2009</td>
<td>Not applicable</td>
<td>RCT studies involving screening for chronic open angle glaucoma (COAG)</td>
<td>Review article</td>
<td>No.</td>
<td>Not applicable</td>
<td>The results suggested that screening for COAG lacks an evidence base, and therefore opportunistic case finding should be retained.</td>
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<tr>
<td>Hau et al.</td>
<td>2007</td>
<td>London</td>
<td>Evaluation of the ability of two senior optometrists based within the A&amp;E department of Moorfield’s Eye Hospital to identify and manage eye disease</td>
<td>Case note analysis</td>
<td>No.</td>
<td>150 within the 6 months</td>
<td>Agreement was reached in 134, or 89.3% of cases of primary diagnosis, and there were 136 cases of management outcome agreement.</td>
<td></td>
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<tr>
<td>Hau et al.</td>
<td>2008</td>
<td>London</td>
<td>Review of A&amp;E cases to an A&amp;E department in an eye hospital</td>
<td>Questionnaire prospective study</td>
<td>No</td>
<td>560 questionnaires were evaluated</td>
<td>High numbers of patients</td>
<td></td>
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<tr>
<td>Henson et al.</td>
<td>2003</td>
<td>Manchester</td>
<td>Glaucoma referral refinement scheme</td>
<td>Case note analysis</td>
<td>Yes</td>
<td>18 optometrists, 194 patients, with 112 referred to the HES, 93 with suspected glaucoma</td>
<td>According to this study some 40% of the number of suspect glaucoma cases were reduced by 40% as a result of the scheme.</td>
<td></td>
</tr>
<tr>
<td>Hernandez et al.</td>
<td>2008</td>
<td>Aberdeen</td>
<td>Study of screening for open angle glaucoma</td>
<td>Markov model was utilised 'to estimate lifetime costs and benefits of a cohort of patients facing, alternatively, screening or opportunistic case finding strategies', the latter being current practice (Hernandez et al., 2008: 203)</td>
<td>No.</td>
<td>None as such</td>
<td>Suggested that technician screening was more effective than a traditional case-finding, opportunistic approach, though more costly, and screening by an accredited optometrist was more costly than technician screening. Furthermore, general population screening was deemed to be less cost-effective than screening at-risk groups, as many in the general population are too young to see the benefits of long-term screening.</td>
<td>At-risk groups were those aged 40-50 with a risk factor, for example family history, and that screening should occur at 10 year intervals.</td>
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<tr>
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<td>Hulme et al.</td>
<td>2002</td>
<td>Preston</td>
<td>Evaluated a district wide DR screening service which utilised optometrists using slit-lamp and Volk lenses</td>
<td>Audit of optometrist screening by ophthalmologist.</td>
<td>Yes.</td>
<td>439 patients (872 eyes). 64% were normal.</td>
<td>Sensitivity for any retinopathy was 72%, specificity 77%. For STED sensitivity and specificity were 87% and 91% respectively. 26% of people with diabetes were screened over a 4-year period thus suggesting a reasonable level of service provision within a geographical location.</td>
<td></td>
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<tr>
<td>Ieong et al.</td>
<td>2003</td>
<td>Moorfield’s</td>
<td>To compare the use of usual best practice (history taking, IOP measurement, disc examination and SVFA) with a technique which replaces SVFA with computerised quantitative disc assessment</td>
<td>8 optometrists were asked to classify each of the 66 participants. Subjects with POAG were recruited through glaucoma clinics within the HES. Doctors at glaucoma clinic approached those with simple POAG, spouses and partners were also recruited into normal group if no history of glaucoma. Other ‘normals’ came from a practice in Ealing.</td>
<td>Yes.</td>
<td>8 optometrists with a minimum of 4 years experience in private practice. 66 patients (37 normals, 29 with POAG- 15 of which were normal tension glaucoma)</td>
<td>Results suggested that two forms of glaucoma case-finding strategies (POAG), including intraocular pressure measurement and suprathreshold visual field analysis (SVFA) evoked similar sensitivity and specificity levels (71% and 69% sensitivity respectively and identical 94% specificity in both forms of screening)</td>
<td></td>
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<tr>
<td>James et al.</td>
<td>2000</td>
<td>Not applicable</td>
<td>Utilised previous studies from Liverpool to ascertain the cost-effectiveness of screening for sight-threatening diabetic eye disease</td>
<td>To assess the cost-effectiveness of systematic photographic screening versus opportunistic screening for STDR within primary care services</td>
<td>No.</td>
<td>The effectiveness data was derived from two Liverpool studies, the first with 320 patients and the second with 1,363, totalling 1,683 patients with diabetes.</td>
<td>The results suggested that systematic screening is more cost-effective than opportunistic.</td>
<td>Data of this kind suggests only systematic screening should be implemented for case finding purposes.</td>
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<td>Karas et al.</td>
<td>1999</td>
<td>London</td>
<td>To ascertain whether a community based hospital optometrist and community orthoptist model could provide a service of vision screening for children</td>
<td>Case note analysis (agreement between consultant’s diagnosis and the clinic team referees)</td>
<td>Yes.</td>
<td>Between the study period of April 1994- March 1996 a total of 483 new patients were seen by the service representing an uptake of 65% (748 were offered the service).</td>
<td>The authors commented that the low referral rate could reduce the use of the HES and subsequent cost by retaining the children within the community scheme. The scheme was deemed successful overall, with a referral rate of 14% and the ophthalmologist agreeing with 78% of these.</td>
<td></td>
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<tr>
<td>Lash et al.</td>
<td>2003</td>
<td>Southampton</td>
<td>Referral quality analysis for cataract</td>
<td>444 referral forms sent to a hospital ophthalmology department over a ten week period</td>
<td>Yes, whereby referral forms for new cataract schemes were analysed.</td>
<td>444 referral forms</td>
<td>The authors concluded that information on cataract referral forms could be more in-depth. Furthermore, 47% of referrals for cataract later resulted in these patients being listed for cataract surgery, representing a somewhat lower proportion than the later study in 2006.</td>
<td></td>
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<tr>
<td>Lash et al.</td>
<td>2006</td>
<td>Bournemouth</td>
<td>Research regarding optometric referrals within the context of the ‘Action for Cataracts’ guidelines in order to determine whether optometrists were following them and ‘whether they are effective’.</td>
<td>412 referrals were analysed, 50% being conventional via GP, 11% via optometrists letter, 35% via direct referral and 15% were GP referrals with no optometric information.</td>
<td>Yes.</td>
<td>412 referrals</td>
<td>Listing rates were 83% and 74% for direct and conventional routes respectively, meaning more listing in direct routes. Full information however was provided in just 17% of letter referrals and 10% of GOS 18 referrals.</td>
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<td>Lask</td>
<td>1997</td>
<td>London</td>
<td>Report on the commencement of a collaborative study funded by Brixton Professionals in Partnership (BPIP) in order to test blood glucose levels.</td>
<td>Optometrists were recruited according to the Health Authority list. 23/120 applied for a place on the study, including evening course attendance.</td>
<td>Yes.</td>
<td>Those under the treatment of the GP or hospital were not measured.23 optometrists out of 120 invited agreed to take part.</td>
<td>The report does not present any results however, and it is unclear whether this initiative continued.</td>
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<td>Mason and Mason</td>
<td>2002</td>
<td>UK-wide</td>
<td>Research to ascertain the use of therapeutic agents by optometrists and whether optometrists would like to train to become accredited optometrists for this purpose, both to prescribe dependently and independently.</td>
<td>Questionnaire study</td>
<td>Not as such, though measures interest in the newer optometric area of prescribing.</td>
<td>A 10% random sample of optometrists was taken from a list of 7,500 GOC registered practitioners.</td>
<td>The results suggested 67% of optometrists would like to prescribe either independently or dependently (69%). The vast majority felt optometrists should be able to do this for infection and inflammation (87%, independently). 90% were also willing to undergo further training for this</td>
<td>Useful for Phase 2 questionnaire</td>
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<tr>
<td>Menon et al.</td>
<td>2004</td>
<td>Taunton and Somerset NHS Trust</td>
<td>Studied referrals for laser capsulotomy by optometrists and compared this referral method with the traditional referral route (via the GP).</td>
<td>All referral letters sent to the HES from July 2002- January 2003 were utilised to compare the pathways.</td>
<td>Not as such.</td>
<td>222 referrals were reviewed, 156 being direct and 66 via the GP.</td>
<td>The majority of letters were graded average (63.5%, n=141), 45 were good and 36 were poor. The diagnosis agreement between the ophthalmologist standard and the referral letters was 99%. Laser capsulotomy rate was 98.2% or 215/219 referrals which were initially deemed by the optometrist to require such surgery.</td>
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<td>Muthucumaran a et al.</td>
<td>2000</td>
<td>Peterborough</td>
<td>'To ascertain the outcome of discharge on the first day post-surgery for cataract and feedback from the patients' optometrists.'</td>
<td>Case note analysis for referrals dated between 1 April 1997-30 June 1998.</td>
<td>No.</td>
<td>288 patients (318 eyes underwent surgery)</td>
<td>Results support the post-operative discharge of patients to their optometrist</td>
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<td>Needle et al.</td>
<td>2008</td>
<td>UK-wide</td>
<td>To ascertain the current practice of optometrists, and to discover their views regarding the extension of their role in terms of prescribing.</td>
<td>Questionnaire study</td>
<td>Not as such</td>
<td>1288 optometrists were therefore surveyed from the College of Optometrists list of registered practitioners</td>
<td>The optometrists managed an array of conditions, some including dry eye, blepharitis/ lid problems, simple corneal abrasions, allergic conjunctivitis, with management rates of 87-96% across these conditions. Optometrists in hospital were also more likely to manage acute sight-threatening diseases. Nearly 80% felt they could manage PAOG with further training, and also felt that most main classes of drugs should be available to them.</td>
<td>This somewhat contradicts the initial commentary presented by Ewbank (1997) regarding ophthalmologists views on optometric prescribing.</td>
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<tr>
<td>Newman et al.</td>
<td>1998</td>
<td>Suffolk</td>
<td>Assessing the PPV of VF testing by optometrists</td>
<td>Retrospective case note study</td>
<td>No</td>
<td>86 out of initial 586 were for suspected glaucoma (original cohort was 595, though 9 records could not be found.)</td>
<td>Results suggested all methods of screening have poor validity when used in isolation, including ophthalmoscopy, tonometry, and visual field testing</td>
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<td>Newsom et al.</td>
<td>2005</td>
<td>Huntingdon, Cambridgeshire</td>
<td>Direct cataract referral scheme</td>
<td>Small audit of 100 referrals (direct referrals) compared with another 100, non-direct referrals</td>
<td>Yes</td>
<td>200 referrals</td>
<td>Waiting times dropped from 15 to 3 months for the entire cataract pathway, being the national target derived from the Department of Health (Action on Cataracts, 2000, DoH). The small audit of referrals (100 direct referrals compared with 100 non-direct referrals) showed similar levels of post-operative visual acuity and post-operative refraction levels in both routes.</td>
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<td>Okoli et al.</td>
<td>2002</td>
<td>Barnet Health Authority</td>
<td>Evaluated three models of DR screening ahead of setting up a screening programme</td>
<td>Case-note review and database analysis for uptake and coverage of service, follow-up for abnormal findings, postal questionnaire for service users, interviews with service providers, PPV evaluations</td>
<td>Not as such, though the study compared three different methods of DR screening prior to setting up a new DR screening scheme.</td>
<td>2230 patients with diabetes were March 1998- August 2000.</td>
<td>All three schemes were deemed to provide an effective service. GP-led model (single-lens reflex retinal camera and indirect ophthalmoscopy, results interpreted by orthoptist), optometrist scheme- same as GP led but with camera rotating between optometrists, second optometrist scheme- indirect ophthalmoscopy only operated from own practice and they interpreted the results.</td>
<td>The authors also suggested that the eventual screening programme should set-up a system of call and recall in order to facilitate uptake, and to place diabetes registers in GP practice.</td>
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<tr>
<td>Olson et al.</td>
<td>2002</td>
<td>Aberdeen</td>
<td>Compared digital retinal imaging, fundus photography (both utilising retinal photographers), and slit-lamp biomicroscopy (specially trained optometrists)</td>
<td>No. A number of DR screening methods were compared to ascertain the best for a new screening scheme.</td>
<td>6 optometrists (high-street based)</td>
<td>73% and 90% sensitivity and specificity respectively</td>
<td></td>
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<tr>
<td>Oster et al.</td>
<td>1999</td>
<td>Moorfield’s Eye Hospital, London</td>
<td>Evaluated the referral appraisal skills of the hospital optometrist</td>
<td>Case note analysis of discussion, measurement and recording history, measures of vision, slit-lamp examination, Goldmann tonometry</td>
<td>No.</td>
<td>157 examined by the optometrist, provisional diagnosis in 152. 56% were over the age of 60 (86 patients) and 25% were aged 61-70.</td>
<td>79.1% and 17.1% were deemed correct or partially correct according to the study criteria, based on optometrist re-examination and history-taking in HES.</td>
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<td>Park et al.</td>
<td>2009</td>
<td>Bristol</td>
<td>Comparison of referrals and listing rates for direct referrals from optometry and traditional GP referrals for cataract surgery (Park et. al: 309)</td>
<td>Quality of referral was checked against CoO referral framework.</td>
<td>Yes.</td>
<td>124 patients referred for cataract surgery, 62 via optometrist direct referral, and 62 via traditional pathway.</td>
<td>Suggested that optometric direct referral for cataract surgery provided better information regarding measured vision and ‘better delivery of pre-operative counselling.’ GP referrals however contained better medical history, drug information, and details of personal circumstances.</td>
<td>This suggests that the two parties, being optometrists and GPs, provide better information within the cataract referral pathway just merely on different aspects, and the types of aspects one would expect according to the practitioners scope of practice.</td>
</tr>
<tr>
<td>Papadopoulos et al.</td>
<td>2007</td>
<td>Not applicable (nationwide survey)</td>
<td>This research aimed to identify the ‘incidence, detection patterns...management and IOP control’ in children</td>
<td>Survey study</td>
<td>No.</td>
<td>99 children were eligible for inclusion in the study. 47 had primary open angle glaucoma and 52 secondary glaucoma.</td>
<td>The report concluded that the incidence of PCG was ‘comparable’ to other populations reporting PCG incidence. The incidence of PCG was nine times higher in children of Pakistani origin than Caucasians.</td>
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<tr>
<td>Pierscinek et al.</td>
<td>2009</td>
<td>Belfast</td>
<td>Compared optometric and GP referrals to ophthalmology, also based upon the traditional referral pathway</td>
<td>Data were analysed from 566 patient referrals produced during the study period of 3 months between January 2007 and March 2007</td>
<td>No. Traditional referral pathway (via GP)</td>
<td>566 patient referrals</td>
<td>Most referrals were made by optometrists (323, where the optometrist initiated the referral, and 243 were initiated by the GP.</td>
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<tr>
<td>Pointer et al.</td>
<td>1998</td>
<td>Kettering</td>
<td>Collaborative shared-care scheme evaluated after the first 12 months, between April 1995 and March 1996</td>
<td>Audit of first 12 months of collaborative scheme.</td>
<td>Yes.</td>
<td>44 optometrists participated from 26 practices with 1781 patients screened.</td>
<td>92% of the optometrists in the locality recording 34% of the projected diabetic population of the Kettering Health area.</td>
<td>The authors suggest that publicising the scheme and training regarding false positives in order to lead to a reduction, would be necessary in later stages. Furthermore, it was concluded that a review of a cohort of patients to check optometric sensitivity and specificity by ophthalmologists was necessary for future working.</td>
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<tr>
<td>Pooley et al.</td>
<td>1999</td>
<td>Merton, Sutton and Wandsworth Health Authority.</td>
<td>Feasibility of optometrist and ophthalmic medical practitioner direct referrals to the HES</td>
<td>All referrals made between stated dates to HES from optometrists and medical practitioners.</td>
<td>No.</td>
<td>433 patients were referred during the dates when the data was collected: 28/7/97-22/8/97 in one hospital (St George's Hospital and 11/8/97-22/8/97 in Sutton Eye Unit).</td>
<td>90% of glaucoma referrals originated from the optometrist, and showed varying levels of screening utilisation as found in other studies in this report (100%, 80% and 45% for IOP, optic disc measurement and VF measurements respectively). Cataract was however the most frequently stated diagnosis by the optometrists (in 27% of referral cases)</td>
<td>The results suggested a number of aspects, including the wide variation in the tests utilised to screen for glaucoma and a low level of accuracy of glaucoma referral.</td>
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<tr>
<td>Prasad et al.</td>
<td>2001</td>
<td>Wirral</td>
<td>Researched the effectiveness of optometric examination using slit-lamp biomicroscopy through dilated pupils for DR screening</td>
<td>Prospective study. Diabetes register utilised to collect patient demographic data, including 64 GP practices, hospital sites with diabetic clinics, laboratory reports. Positive referrals and 10% of negatives were re-examined by an ophthalmologist.</td>
<td>No.</td>
<td>Those not under HES- invited for eye test by AO. 27 AOs.* 4904 patients screened in first 18 months. 90.5% were negative screens, 429 (9.67%) were re-screened.</td>
<td>4904 patients were screened in 18 months. 371 were considered borderline or 'threshold' cases, in which 30.18% or 112 were false positives. The most common cause of these false positives was 'drusen in patients with background DR.' Overall, test sensitivity for STDR (sight threatening diabetic retinopathy) was 76% and specificity 95% utilising this one method of screening for DR.</td>
<td>The authors concluded that the optometrists performed well, and was ‘facilitated by the use of simple grading and referral criteria.’ This may be an important consideration for further research, in terms of ensuring grading and referral systems are communicated to optometric staff, and are comprehensible.</td>
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<tr>
<td>Russell et al.</td>
<td>2001</td>
<td>Manchester</td>
<td>Comparing a traditional hospital based eye care service with an integrated service and a non-integrated service, each including a community-based rehabilitation officer and a ‘generic community’ service which was not ‘vision specific.’</td>
<td>RCT study</td>
<td>Yes.</td>
<td>226 patients. Randomised to study arm-conventional, hospital based care with integrated home-based intervention by LV rehabilitation officer (still receiving same optometric care as study arm 1 participants), arm 3-HES and generic intervention at home (not vision based) by community care worker.</td>
<td>This paper described the design and methodology, and does not present data regarding the efficacy of each study arm in terms of eye care services and input of eye care professionals.</td>
<td>Further research is required regarding the outcome of LV shared-care services.</td>
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<td>Ryder et al.</td>
<td>1998</td>
<td>Birmingham</td>
<td>Utilised retinal photography examined by a specialist optometrist within the HES Diabetes unit, ophthalmoscopy with selected dilation, and diabetologist back-up in cases of ‘uncertainty’.</td>
<td>Implemented as part of an on-going audit of DR screening service.</td>
<td>Yes.</td>
<td>289 hospital clinic patients not attending an ophthalmologist already. 144 for first audit, 145 for second.</td>
<td>Concluded that the hospital- based scheme was ‘fail-safe’</td>
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<td>Scanlon et al.</td>
<td>2005</td>
<td>Gloucestershire Health Authority</td>
<td>Audit of ophthalmology department workload changes after the introduction of a diabetic retinopathy programme</td>
<td>Medical records of patients attending eye clinics over the four years. First year was prior to screening, two years was first round, final year was the second round.</td>
<td>Yes.</td>
<td>3877 patients with diabetes over the first four years between 1997-2001 including those already registered at the eye clinic who attended as emergencies booked between appointments.</td>
<td>The results suggested that workload in fact increased on the first round of screening, and in further rounds the workload did not decrease below pre-screening levels, with the exception of laser surgery which did show a decrease.</td>
<td>As a result, screening programmes could represent ‘a significant workload’ to the NHS. The authors suggested the failure to find a drop in workload was possibly due to the increasing numbers of individuals with diabetes.</td>
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<tr>
<td>Scully et al.</td>
<td>2009</td>
<td>Moorfield’s Eye Hospital, London</td>
<td>Reviewed the content of optometrists’ letters</td>
<td>Retrospective case note/ letter analysis</td>
<td>No.</td>
<td>466 referrals initially. 326 satisfied inclusion criteria for GP referrals, with 121 containing optometric letter.</td>
<td>The majority of the referral letters were considered ‘acceptable’ according to the study criteria of ‘acceptable’ with 7% only being ‘ideal’ and the rest ‘failing.’ In terms of clinical details, 26% lacked information regarding optic disc evaluation and 6% lacked IOP information.</td>
<td>In light of the research which suggests a combination of 2/3 glaucoma tests is the most conducive for referral quality, this suggests that optometrists could be in a position improve the efficiency of eye care by providing thorough information on referral letters or GOS 18 forms.</td>
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<td>Shah et al.</td>
<td>2009</td>
<td>London</td>
<td>Involved an actor presenting to 102 community optometrists with recent onset flashing lights</td>
<td>Standardised patient (study actor) presenting to community optometrists then recording the details of the examination afterwards. This design is used throughout all Shah et al. studies.</td>
<td>No.</td>
<td>102 community optometrists</td>
<td>None of the optometrists asked all 7 questions regarding the flashing lights (see Appendix 5). 35% asked 4 out of 7 questions. 85% asked if the patient had noticed any floaters in his vision, 66% also recommended fundoscopy screening with dilation, to be carried out themselves or by another eye care professional, and of those who referred the patient, 70% suggested the patient be seen either on the same day or within a week.</td>
<td>The results suggested large variations in optometric care for photopsia.</td>
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<tr>
<td>Shah et al.</td>
<td>2008</td>
<td>London</td>
<td>20-year old ‘patient’ (an actor) presenting to community optometrists complaining of headaches to ascertain the content of optometric examinations for headaches.</td>
<td>Standardised patient/ study actor</td>
<td>No.</td>
<td>100 optometrists</td>
<td>98% of optometrists identified the case of headache, with 82% ascertaining from questioning the reason for the visit. 48% found the patients symptoms of flashing lights</td>
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<tr>
<td>Shah et al.</td>
<td>2009</td>
<td>London</td>
<td>To evaluate the content of optometric examinations. Utilised an actor presenting as a 44 year old of African racial origin who was having recent near-sight difficulties, and was requesting new spectacles</td>
<td>Study actor</td>
<td>No.</td>
<td>100 optometrists</td>
<td>The findings suggested that 95% of optometrists visited by the actor carried out at least the minimum standard two tests for glaucoma, including optic disc assessment and tonometry. 35% utilised all three standard tests, including optic disc assessment, tonometry and visual field testing.</td>
<td>The authors suggested ‘a need for CPD in glaucoma screening’ particularly in light of the additional finding that 6% of the sample advised the ‘patient’ of the increased risk of POAG in individuals of African racial descent.</td>
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<td>Authors</td>
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<td>Sharp et al.</td>
<td>2003</td>
<td>Stockport</td>
<td>Description of the new one-stop cataract referral scheme</td>
<td>Not applicable</td>
<td>Yes.</td>
<td>Not applicable</td>
<td>The results suggested waiting times were short, with an average of just ten days between their initial assessment and cataract assessment. 86% of the patients assessed during the pilot were also deemed to be appropriate candidates for direct referral as opposed to a two-stage plan, and 98% of these were listed for surgery.</td>
<td>GPs and optometrists were ‘very supportive of the scheme.’</td>
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<tr>
<td>Sheen et al.</td>
<td>2009</td>
<td>Wales</td>
<td>Evaluation of the WECI</td>
<td>Donabedian model using structure, process and outcome applied to participants</td>
<td>Yes. Community optometrists accredited to diagnose and managed eye conditions including glaucoma</td>
<td>6432 participants going through scheme, of which 4243 (66%) were managed by optometrists.</td>
<td>The management of eye conditions within the two schemes was ‘acceptable’ and the cost per patient was relatively low.</td>
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<td>Sheth et al.</td>
<td>2008</td>
<td>Moorfield’s Eye Hospital, London</td>
<td>Audit of the quality of referral letters and diagnostic concordance between GPs and eye casualty ophthalmologists.</td>
<td>Letters brought by patients into Moorfields Eye Hospital between November 2006-February 2007.</td>
<td>No.</td>
<td>88 referrals between November 2006-February 2007.</td>
<td>Most letters were typed (GP referrals), and most that were handwritten were deemed legible. However, a number contained medical history and medication omissions.</td>
<td>It is unclear whether the GPs believed that these details were not necessary due to the severity level of the particular eye condition. This is not discussed by the authors.</td>
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<td>Sinclair, Hinds and Sanders</td>
<td>2004</td>
<td></td>
<td>Case note analysis study in order to identify the characteristics of patients in Fife who were registered as blind with the main diagnosis of glaucoma.</td>
<td>Retrospective case note analysis</td>
<td>No</td>
<td>78 sets of case notes</td>
<td>Results suggested that compliance with treatment was poor in over ¼ of the study population (26%), and by the time the patient had been referred to hospital initially, more than half of these patients were aware of visual loss. This suggests that older patients’ glaucoma is not being identified effectively, leading to potential sight loss later.</td>
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<tr>
<td>Smeeth and Iliffe</td>
<td>1998</td>
<td></td>
<td>A review of the effectiveness of screening older people for impaired vision in a community setting.</td>
<td>Systematic literature review</td>
<td>No</td>
<td>3494 individuals who were involved in five trials of multiphasic assessment</td>
<td>The results and conclusions suggested that screening of asymptomatic older people was ‘not justified.’ This could have important ramifications for planning eye care services for older people.</td>
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<tr>
<td>Spry et al.</td>
<td>1999</td>
<td>Bristol</td>
<td>Assessed optometrists’ glaucoma monitoring compared to the ‘research gold standard’ ophthalmologist assessment</td>
<td>RCT study</td>
<td>Yes</td>
<td>405 (2,780 though 674 were eligible, then 405/674 were willing to partake.)</td>
<td>The findings again suggested that community optometrists could provide equivalent services to that of the HES, in terms of using the key glaucoma case-finding methods of visual-field taking, cup to disc ratio and IOP.</td>
<td></td>
</tr>
<tr>
<td>Tey et al.</td>
<td>2007</td>
<td></td>
<td>Audit of cataract one-stop clinics in SE Scotland</td>
<td>Findings from a district hospital within South-East Scotland. Surgery audit data from 1997 in Fife was used to provide the national comparison.</td>
<td>Yes</td>
<td>Not applicable</td>
<td>Results suggest that in line with the Government ‘Action on Cataracts’ paper in 2000, one-stop cataract clinics were having a massive impact upon surgical throughput with a 71% increase in cataract operations. The increase in surgery is marked, though the critique by Evans et al. (2004) may suggest a need to review the use of optometric time with new cataract care pathways.</td>
<td></td>
</tr>
<tr>
<td>Authors</td>
<td>Date</td>
<td>Location</td>
<td>Description</td>
<td>Design</td>
<td>New initiative</td>
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<td>Outcome</td>
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<tr>
<td>Theodossiades et al.</td>
<td>1999</td>
<td>Moorfield’s Eye Hospital</td>
<td>A study to measure referrals for suspected glaucoma</td>
<td>Referral notes reviewed from optometrists from September 1996-February 1997.</td>
<td>No.</td>
<td>87, most aged 50s-60s (22/87 and 24/87 respectively). 54% female. Median age at glaucoma diagnosis/ glaucoma suspects- 63.</td>
<td>Referrals which reported the use of all three types of glaucoma testing showed the highest positive predictive value</td>
<td>It was found that referral accuracy improved as the number of suspicious findings increases, suggesting the effect of previous experience and practice in revealing suspect glaucoma</td>
</tr>
<tr>
<td>Thomson and Evans</td>
<td>1999</td>
<td>London</td>
<td>This study researched the use of a new type of screening in schools</td>
<td>The system utilised a computer program. Parents completed a questionnaire regarding the child’s symptoms, history and family history</td>
<td>Yes.</td>
<td>48 children later failed the test, with 32 unaware of there being any problem with their eyes. The program also gave a specificity of 93.8% and a specificity of 96.1%.</td>
<td></td>
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</tr>
<tr>
<td>Tu et al.</td>
<td>2004</td>
<td>Warrington NHS Health Trust (Warrington and Halton areas)</td>
<td>Compared forms of DR screening including optometric screening and digital photography screening</td>
<td>Comparative study</td>
<td>Yes.</td>
<td>1643 patients screened in the two schemes</td>
<td>Uptake for both systems was poor.</td>
<td></td>
</tr>
<tr>
<td>Vernon et al.</td>
<td>1998</td>
<td>Nottingham</td>
<td>A study to review referral patterns in order to identify any changes over a 5 year period for suspect glaucoma</td>
<td>Retrospective analysis of referrals in 1988 and in 1993</td>
<td>No.</td>
<td>75 in 1988, 71 in 1993. 146 in total. Mean age in 1988-61.2. Mean age in 1993-59.4.</td>
<td>The results revealed a reduction in the rate of true positive referrals from 48% to 34% at the two time points</td>
<td>Vernon suggested that increases in the use of visual field measures were partly the reason for the increase, and concluded that increased false positives result in waiting time increases for the HES. The measures were not taken between the time points and also represent relatively old data.</td>
</tr>
<tr>
<td>Authors</td>
<td>Date</td>
<td>Location</td>
<td>Description</td>
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<tr>
<td>Warburton et al.</td>
<td>2003</td>
<td>Stockport</td>
<td>Researched the sensitivity and specificity rates for sight-threatening eye disease in the diabetic retinopathy screening service</td>
<td>Screening was performed using slit-lamp binocular indirect ophthalmoscopy and a hand-held fundus-imaging lens through dilated pupils.</td>
<td>Yes</td>
<td>A number of patients were selected at random from the screen- negatives group to determine specificity. 3510 patients were screened during the study period.</td>
<td>Specificity was surpassed by 4% (target-95%, actual- 99%). Geographical coverage was 1.2% with a target of 1.8% for new screening schemes. Sensitivity fell somewhat short of the UK National Screening Committee target of 80%, recording instead 75.8%.</td>
<td>The authors did however suggest a 57% increase in overall numbers of individual screens and therefore in the context of this geographical area the scheme could be viewed as a vast improvement.</td>
</tr>
<tr>
<td>Weed et al.</td>
<td>1998</td>
<td>Ninewells Hospital, Dundee</td>
<td>Determining the patterns of referral, hospital-based management and degree of visual success achieved by patients with keratoconus.</td>
<td>Anonymous postal questionnaire</td>
<td>No</td>
<td>160 patients with keratoconus</td>
<td>Most referrals came from optometrists.</td>
<td></td>
</tr>
<tr>
<td>Whittaker et al.</td>
<td>1999</td>
<td>Southampton</td>
<td>Descriptive paper regarding ophthalmologist and optometrist communication</td>
<td>Questionnaires sent to optometrists. Medical records of all new patients in outpatient department and identified the patients for whom the new style GOS 18 had been utilised.</td>
<td>No</td>
<td>79 optometrists (54.5% response rate)</td>
<td>21 out of 79 optometrists surveyed did not gain consent from their patients, with a further 23 gaining consent ‘sometimes.’</td>
<td></td>
</tr>
<tr>
<td>Wickham et al.</td>
<td>2002</td>
<td>National audit</td>
<td>Conducted a national audit of paediatric services with regard to the assessment and management of strabismus (squint) and amblyopia.</td>
<td>Survey- based</td>
<td>No</td>
<td>288 orthoptic departments were asked in total. The research team received responses from 75% of orthoptic departments where much of the paediatric work is undertaken.</td>
<td>The results suggested that a variety of systems are in place, and this is dependent upon the referral route. 66% involved ‘orthoptic assessment without refraction’ (Wickham et al., 2002: 522), ‘66% combined orthoptist and ophthalmologist assessment’ and ‘22% had an entirely orthoptist or optometric system.’</td>
<td></td>
</tr>
<tr>
<td>Authors</td>
<td>Date</td>
<td>Location</td>
<td>Description</td>
<td>Design</td>
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<td>Willis et al.</td>
<td>2000</td>
<td>Northern Ireland</td>
<td>Questionnaire study of optometric practice</td>
<td>Questionnaire study</td>
<td>No.</td>
<td>171 optometrists, many of whom were senior practitioners within their practice.</td>
<td>results suggested that glaucoma detection within optometric practice is highly variable in terms of the equipment employed, and therefore the tests conducted with patients could be equally variable</td>
<td></td>
</tr>
<tr>
<td>Wilson et al.</td>
<td>2004</td>
<td>Nationwide</td>
<td>Surveyed twenty five health authorities across England and Wales in order to ascertain diabetic retinopathy screening provision.</td>
<td>Case notes analysis.</td>
<td>No.</td>
<td>9,200 records were reviewed during the process</td>
<td>The overall results suggested that all types of schemes were associated with a doubling of the odds of individual patients with diabetes having had a retinal examination. There was also more doubling of testing within optometry schemes, though such schemes also recommend early referral for uncertain cases.</td>
<td></td>
</tr>
</tbody>
</table>
Appendix 7: CCI listed Eye Care Pathways
‘Posterior capsule opacification (PCO) is the commonest complication of cataract surgery. It is caused by the proliferation of lens epithelial cells left behind following cataract surgery. The cells migrate behind the intraocular lens implant (IOL) to obscure the visual axis and reduce the patient's visual function similar to that experienced with the original cataract. If PCO occurs vision may be restored by a laser capsulotomy. As patients are discharged soon after cataract surgery it is essential that they are warned of the potential problem of PCO and advised to seek attention if they feel their vision deteriorates. Regular optometry review will ensure that PCO is detected and further referral to the HES may be organised as necessary.’
**Ophthalmology – Diplopia** Patient Pathway  June 2005

**Patient Presentation**  
Suspected Diplopia

**GP / Optometrist / Hospital A&E**  
Diagnosis – Monocular or Binocular Diplopia

- Monocular / Chronic / Longstanding
- Acute

**Optometrist**  
Assessment

If unable to determine diagnosis or if neurogenic, myogenic or mechanical aetiology is suspected

**Optometrist**  
Appropriate management

If no improvement within 3 months

**Hospital Eye Service**  
Refer to Hospital Eye Service for diagnosis and appropriate orthoptic management

**Useful Information for Patients**

- Patient
- Primary Care
- Secondary Care
**Ophthalmology – External Eye Disease**  Patient Pathway June 2005

**Patient Presentation**
Suspected external eye disease

**Optometrist / GP**
Suspected external eye disease

**Optometrist / GP**
Diagnosis

**Optometrist/GP**
Condition not normally sight threatening

**Optometrist/GP**
Diagnosis uncertain

**Optometrist/GP**
If no response or there is concern

**Optometrist/GP**
If sight threatening condition is identified

**Hospital Eye Service**
Refer to Hospital Eye Service for diagnosis and appropriate management

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**Common conditions that are not normally sight threatening** (can therefore be managed in the community) for example:
- Dry Eye
- Corneal Abrasion
- Foreign bodies
- Blepharitis
- Episcleritis
- Bacterial conjunctivitis
- Conjunctival haemorrhage
- Hordeola
- Allergic, Toxic or Viral external eye conditions

**Conditions that are normally sight threatening** (should therefore be managed in secondary care) for example:
- Anterior Uveitis
- Inclusion
- Scleritis
- Endophthalmitis
- Cellulitis
- Microbial Keratitis
- Angle Closure Glaucoma
- Chemical Burns
- Marginal Keratitis
- Neoplasia

**Standard optometric examination of an eye:**
- History & Symptoms: Protocol
- External – slit lamp - anterior eye examination
- Diagnostic agents: pinhole Visual Acuity, Intra-Ocular Pressure, Dilation

---

**Useful Information for Patients**
Ophthalmology – Flashes and/or Floaters  Patient Pathway updated Feb 2008

**Patient Presentation**
Presentation of flashes and/or floaters

**GP or other Clinician**
Presentation of flashes and/or floaters

**Optometrist**
Clinically significant SYMPTOMS
- Recent onset
- Increasing flashes and/or floaters
- Increasing dots
- Persistent symptoms
- Less than 6 weeks
- Progressive visual loss
- Visual field loss
- Veil/Cloak/Cloud

**Optometrist**
History & Symptoms
- Refraction
- Intraocular Pressure
- Visual Fields
- Best corrected visual acuity
- Dilated Fundus Biomicroscopy (Condensing Lens)
- Head Set: Indirect
- Contact Lens Technique

**Optometrist**
SYMPTOMS of loss concern
- Stable flashes and/or floaters
- Symptoms >2 months
- Good vision
- Normal subj. fields

**Optometrist**
NEGATIVE SIGNS
- Posterior Vitreous Detachment with no positive signs
- Normal vision
- Normal fields

**Optometrist**
POSITIVE SIGNS
- Posterior Vitreous Detachment with positive signs
- Tobacco Dust (proliferative vitreoretinopathy)
- Vitreo – retinal hole
- Pre-retinal blood
- Lattice degeneration
- Retinal hole/ tear
- Operculum
- Retinal detachment

**Optometrist**
URGENT REFERRAL

**Hospital Eye Service**
Refer to Vitreo Retinal Specialist

**Optometrist**
Ongoing Community Optometric Review as per protocol

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Useful Information for Patients
NHS24: 08454 24 24 24
www.doctoronlinenhs.uk
www.patient.co.uk

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Patient  Primary Care  Secondary Care
Appendix 8: Recommended eye care pathways (NHS Primary Care Contracting, 2007)

Cataract:  

Each stage explained  
1. The optometrist conducts a sight test, diagnoses the cataract and discusses this with the patient. The risks and benefits of surgery are discussed and if the patient wishes to proceed, information regarding the surgery is provided.  
2. The patient has an outpatient appointment with the ophthalmologist (the details of medication are received from the optometrist, GP or patients- this is according to the local protocol). A pre-assessment with a nurse also happens at this stage, and cataract surgery is agreed/ arranged.  
3. The patient visits the HES for day surgery  
4. Patient then finally attends the HES or optometrist for a final check, sight test, and are either discharged or second eye surgery is discussed and an appointment arranged.

Glaucoma:  
1. Patient attends community optometrist       2. Attends OPSI or OMP       3. OPSI/OMP relays data to HES       4. OPSI/ OMP manages patient in community  

Each stage explained  
1. The patient attends the community optometrist for a sight test, and where an IOP over 21Hmg and/or visual field defect and/or excavated discs is detected, the patient or optometrist makes an appointment with the optometrist with special interest in glaucoma (OSI) or the ophthalmic medical practitioner (OMP).  
2. The patient attends the OSI or OMP and a full history and assessment is carried out according to the local protocol. The decision is then taken whether the patient has OHT (which the OSI/OMP reviews) or can be discharged to return to the community optometrist or indeed has glaucoma (requiring either treatment or referral to the HES). The patient is advised and given information and further appointments made where necessary.  
3. The OSI or OMP relays the data to the HES and the HES advises the OSI/OMP regarding management of the patient’s condition and sets up a review at the HES if necessary.  
4. The OSI/OMP manages the patient is the community, ensuring regular reviews take place and the OSI or OMP continues to relay data to the HES if it is significant.

Low Vision:  
1. Patient referred to LV Service       2. Patient attends LVS       3. Patient has follow-up visits when necessary       4. Service enables re-access
Each stage explained

1. The patient is referred to the Low Vision Service (LVS) and a referral may be made from secondary care, the patient's GP, social, rehabilitation officer, community nurse, occupational therapist or it may be a self-referral. The patient may have a letter of visual impairment (LVI- explained below), Referral of Vision Impairment or a Certificate of Vision Impairment (CVI). All patients are contacted by LVS within ten working days.

2. The patient attends the LVS and the service is ‘seamless across health, social care and the voluntary sector.’ A full sight test is carried out as part of the assessment and the patient is provided with information on their eye condition, as well as entitlements and local services. They are also provided with counselling and advice on employment and education if required. Spectacles, Low Vision Aids and advice with regard to lighting, contrast and size and home adaptations are discussed and made available where appropriate. A referral to other areas of health and social care are also made where necessary, including certification of partial sight.

3. The patient has follow up visits when required, and the visits can take place in the patient's home or elsewhere, and the visit will be by an appropriate member of the low vision team.

4. The service enable re-access (and the patient continues in stages 3 and 4.)

Terminology

LVI: this is an information leaflet for patients who are newly diagnosed as blind or partially sighted. This has been replaced by the low Vision Leaflet (LVL). The LVL is more of a standardised information leaflet rather than a referral form. LVIs and LVLs are issued by high street optometrists. They contain a tear-off form that the patient can fill in and send to their local social services to request an assessment.

RVI: this is a form completed by the Hospital Eye Service to advise social services about a newly diagnosed blind or partially sighted patient, to request an assessment of support needs and to state how urgently the patient requires the support.

CVI: this is completed by the hospital ophthalmologist to notify social services that a patient is eligible to be registered as blind or partially sighted.
<table>
<thead>
<tr>
<th>Website/organisation name</th>
<th>Title of document</th>
<th>Document Type</th>
<th>Document Summary</th>
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</thead>
<tbody>
<tr>
<td>NICE (3)</td>
<td>‘Action on Cataracts,’</td>
<td>Health guidelines</td>
<td>This document outlines measures for improving surgical throughout, as well as recommending numbers of surgical procedures to be performed across the UK per annum. The emphasis is on increasing surgery figures.</td>
</tr>
<tr>
<td></td>
<td>‘Glaucoma: diagnosis and management of chronic open angle glaucoma and ocular hypertension,’</td>
<td>Health guidelines</td>
<td>This document outlines new policy for managing glaucoma. Optometrists must now refer to the HES on the basis on an IOP over 21 Hhmg.</td>
</tr>
<tr>
<td>NICE Evidence (2)</td>
<td>‘Childrens’ Eye Health: A report on vision screening for children’, De Zoete</td>
<td>Report</td>
<td>This document draws on the Hall and Elliman paper ‘Health for all Children’ and refers to this throughout. The report essentially critiques the current system for screening children, and points to a lack of orthoptic services.</td>
</tr>
<tr>
<td></td>
<td>Annual Evidence Update on Glaucoma- Service Provision (Prepared by Spry, P.)</td>
<td>Research evidence summary</td>
<td>This article summarises the evidence regarding glaucoma from an academic perspective. This document also summarises the tenth chapter of the NICE Glaucoma, in order to present the most relevant details</td>
</tr>
<tr>
<td>NHS Primary Care Commissioning (4)</td>
<td>Step-by-Step Guide to Commissioning Community Eye Care Services</td>
<td>New service guidelines</td>
<td>This guide provides an outline of current services, commissioning cycles and the next recommended steps for commissioning services in eye care.</td>
</tr>
<tr>
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<td>Kent- Glaucoma referral refinement scheme</td>
<td>Primary care resource pack</td>
<td>This primary care resource pack is the document submitted in order to develop the Kent glaucoma scheme involving optometrist co-management of the condition.</td>
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<td></td>
<td>Shipley SOAPS (Shipley Optometric Acute Scheme) scheme</td>
<td>Primary care resource pack</td>
<td>As above, a primary care resource pack submitted to the PCT.</td>
</tr>
<tr>
<td></td>
<td>‘Community Eye care Services: Review of local schemes for Low Vision, Glaucoma and Acute Care’</td>
<td>Review</td>
<td>This document reviews all of the aforementioned schemes and provides useful scheme information for the schemes listed at the end of this report. Many schemes run successfully throughout the UK.</td>
</tr>
<tr>
<td>GOC (General Optical Council) (1)</td>
<td>GOC Bulletin</td>
<td>Newsletter</td>
<td>This newsletter is for all who read the GOC updates. This Winter 2009 edition outlines the changes in CET accreditation i.e. that optometrists must prove their ability via CET points.</td>
</tr>
<tr>
<td>DoH website (2)</td>
<td>‘Primary Care and Community Services: Improving eye health services’</td>
<td>New service guidelines</td>
<td>Dedicates a section regarding the mapping baseline services, and therefore suggests the importance of mapping ‘baselines’ in order to make improvements to eye health services (DoH, 2009: 26-34). Directly links with this project.</td>
</tr>
<tr>
<td></td>
<td>‘Commissioning toolkit for community based eye care services’</td>
<td>New service guidelines</td>
<td>This document provides support for those who wish to produce new enhanced ways of working in terms of enhanced optometric services.</td>
</tr>
<tr>
<td>AOP Website (22)</td>
<td>All primary care resource packs (20)</td>
<td>Primary Care resource packs (final section of this report includes all listed schemes and are labelled ‘AOP’ listed)</td>
<td>All PCT application and paperwork for the schemes listed at the end of this report. Includes glaucoma, cataract, DR screening, ARMd, PEARS and GP schemes, and paediatric schemes.</td>
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<tr>
<td>Source</td>
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<tr>
<td>Advice on NICE glaucoma guidelines, revised 22nd December 2009</td>
<td>Guideline advice letter to optometrists</td>
<td>Created by the optometric advisor for the College of Optometrists and College colleagues. This paper advises optometrists to follow NICE glaucoma referral guidance.</td>
<td></td>
</tr>
<tr>
<td>Guidance for Optometrists in relation to Diabetic Retinopathy Screening Schemes</td>
<td>Professional guidance for optometrists</td>
<td>The paper suggests that a number of PCT areas have utilised a non-optometric screening service in order to screen patients, and these schemes have subsequently been found to be under-resourced and therefore unable to screen patients regularly i.e. once per year as guidelines from the National Screening Committee suggest. Instead, screening periods can be two or more years, and as a result mean more potential cases of more severe diabetic retinopathy at subsequent screening presentation.</td>
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</tr>
<tr>
<td>Centre for Change and Innovation, Scotland (4)</td>
<td>All CCI pathways listed in Appendix 7</td>
<td>These documents are diagrammatical representations of pathways utilised in Scotland. The CCI pathways are a model for creating more localised pathways across the Scottish nation.</td>
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</tr>
<tr>
<td>Eye Care Wales (under the auspices of the Welsh Assembly Government) (1)</td>
<td>Service Manual: Welsh Low Vision Scheme</td>
<td>This manual outlines the Welsh LV scheme.</td>
<td></td>
</tr>
<tr>
<td>RNIB (3) Dickinson et al. (prepared for RNIB)</td>
<td>Profile of UK Low Vision Services Literature review document</td>
<td>This review concluded that all low vision services had both positive and negative points, meaning that there was no service which provided completely comprehensive care. All services could therefore be improved.</td>
<td></td>
</tr>
<tr>
<td>Binns et al. (prepared for RNIB)</td>
<td>Low Vision Outcomes: a systematic review Literature review document</td>
<td>Some of the re view evidence suggests enhanced services are not better at improving vision-related quality-of-life beyond good hospital services.</td>
<td></td>
</tr>
<tr>
<td>Centre for Reviews and Dissemination (1)</td>
<td>The evaluation of screening policies for diabetic retinopathy using simulation (Davies et al.) Economic audit of DR screening methods</td>
<td>This paper analyses 2 different policies for DR and determines the most effective in economic terms</td>
<td></td>
</tr>
<tr>
<td>Angus Local Government Website (1)</td>
<td>CVista leaflet Information leaflet aimed at parents</td>
<td>This is a leaflet aimed at parents and guardians. CVISTA is the Children’s Visual Impairment Scheme- Tayside Agencies, representing an integrated approach to child eye care, involving health and social care services.</td>
<td></td>
</tr>
<tr>
<td>Conservative Party website (1)</td>
<td>Draft Manifesto Political party manifesto</td>
<td>The 2010 Draft Health Manifesto from the Conservative Part which suggests more community care services, with specific mention of services in pharmacy outlets.</td>
<td></td>
</tr>
<tr>
<td>Vision 2020 website (1)</td>
<td>Evidence base to support the UK Vision Strategy (Bosanquet and Mehta) RNIB report</td>
<td>The report estimates some two million people have significant sight loss in the UK. Most are older people aged 65 or over, though 80,000 are working age, and 25,000 are children living with sight problems.</td>
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<tr>
<td>National Screening Programme for Diabetic Retinopathy website (1)</td>
<td>‘Essential Elements in Developing a Diabetic Retinopathy Screening Programme’</td>
<td>Guidelines</td>
<td>Guidelines in to support those commissioning such programmes within SHAs and PCTs. Key recommendations include programme size and the corresponding ratio of optometrists who should be employed under individual programmes, being 12,000 patients to 4 optometrists respectively. The report also suggested that referral and treatment, with good feedback processes to the programme were essential for ‘closing the gap’ in the referral, treatment and feedback process.</td>
</tr>
<tr>
<td>Review of Eye care Services in Scotland: INTERIM REPORT</td>
<td>Governmental Report</td>
<td>Review of eye care services in Scotland. The recommendations and comments mirror the full review article by providing initial commentary regarding a ‘patient-centred approach to the design of eye care services.’</td>
<td></td>
</tr>
<tr>
<td>NHS Wales site (3)</td>
<td>A Welsh Eye Care Initiative Guideline: The Assessment and Management of Cataract</td>
<td>Informational booklet</td>
<td>Outline of the assessment and management of Cataract under the scheme.</td>
</tr>
<tr>
<td>A Welsh Eye Care Initiative Guideline: The Assessment and Management of suspect Retinal Tear, Hole or Detachment</td>
<td>Informational booklet</td>
<td>Guidance on the assessment and management of suspect retinal tear, hole or detachment</td>
<td></td>
</tr>
<tr>
<td>A Welsh Eye care Initiative- Protocol: The Assessment and Management of Age-related Macular Degeneration</td>
<td>Informational booklet</td>
<td>Guidance for the assessment and management of ARMD, as per the Welsh ARMD Scheme</td>
<td></td>
</tr>
<tr>
<td>Transcripts created by the researcher (2)</td>
<td>Two telephone interviews- one optometrist, one optometric advisor</td>
<td>Personal communication, followed up with information on new care pathways</td>
<td>These interviews provided initial information regarding eye care schemes within the West Midlands Strategic Health Authority, and the associated findings are detailed in the final section of this report.</td>
</tr>
<tr>
<td>NHS EyeCare Pathways (1)</td>
<td>Evaluation of the chronic eye care services programme: final report (McLeod et al., 2006)</td>
<td>Literature review of all enhanced eye care services under the auspices of the chronic eye care services programme</td>
<td>The chronic eye care services programme was established in order to pilot new patient pathways for low vision, age-related macular degeneration and glaucoma. The schemes detailed within the programme’s literature review are also included within the end section of this report.</td>
</tr>
<tr>
<td>Optometry Wales (1)</td>
<td>‘Improving Glaucoma Services in Wales’</td>
<td>Contains recommendations for improving glaucoma services, by implementing service re-design to allow optometrists to co-manage care.</td>
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<tr>
<td>Welsh Assembly Government (1)</td>
<td>The Future of Optometric Services in Primary Care In Wales: a consultation document, 2002</td>
<td>This report details various schemes within Wales. These include DR services, including Anglesey and the Gwent areas.</td>
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<td>Total: 57</td>
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Appendix 10: Published and unpublished care pathway schemes

*Applications produced for new eye care schemes*

50 published and unpublished co-management schemes involving optometrists have been identified as part of the extensive grey literature search. Some of these schemes are covered within the research literature presented above. These schemes include a number of GP referral refinement schemes (for all conditions or PEARS schemes), paediatric schemes, low vision, cataract and referral refinement schemes specifically for glaucoma care. Some of these are available from the AOP website as Primary Care Resource Packs. Other schemes currently being established are also included where personal communication with optometric advisors and optometrists has taken place. Two further schemes, including the Grampian Glaucoma Scheme, and the Lothian Cataracts Scheme, are contained in the final report of the Community Review of Eyecare Services in Scotland (Scottish Executive, 2006). The Community Eye Care Services: Review of Local Schemes for Low Vision, Glaucoma and Acute Care, also provides a list of schemes across the UK, and these schemes are also included if they have not already been sourced from the AOP site, or if the AOP site does not list these.

The source of all schemes appears in brackets beside each scheme title. Essentially, schemes exist in pockets, and differ in terms of the eye conditions treated. As a result, different patient groups are targeted and eye care service provision is correspondingly varied across PCTs and SHAs, Health Boards in Scotland and Wales.

Where costs to the patient or particular Health Authority are included in the Primary Care Resource Pack, these are listed. The costs relate to 2010.

Some sub-sections also include the flow-charts from the AOP documents to provide a visual representation of the scheme. Where subsequent schemes for the same eye condition are very similar, the diagram is not provided. Some of the information sources do not contain such diagrams.

Personal communication was made with optometric advisors within the WMSHA, and where unpublished schemes were discussed an outline has been produced in the following section alongside the AOP-listed schemes.

*GP and PEARS referral schemes for all conditions*

1. **North Charnwood GP referral scheme (AOP site)**

This scheme allows GPs to refer patients with eye conditions to the accredited optometrist in the area. Criteria for referral include the following, as listed in the Primary Care Resource Pack:

- Loss of vision including transient loss
- Ocular pain
- Systematic disease affecting the eye
- Differential diagnosis of the red eye
- Foreign body and emergency contact lens removal
- Dry eye
- Epiphora (watery eye)
- Trichitic (ingrowing) eyelashes
- Differential diagnosis of lumps and bumps in the vicinity of the eye
- Ulcers
Diplopia  
Flashes/ floaters  
Serious conditions which are still directly referred to the hospital by the optometrist include:  
Retinal detachments  
Perforating eye injuries  
Acute glaucoma  
The referral procedure involves:  
1. A phone call to the optometrist practice from the GP to request the patient be seen. The level of urgency is agreed at this point.  
2. If the patient presents within opening time of the optometrist practice, they are seen the same day.  
3. Once the practice has agreed to see the patient, a referral form is completed - one copy to the patient in an envelope marked confidential, the other retained by the GP.  
Cost: £30 per consultation  

2. Colchester PCT GP Ophthalmic Referral Scheme (AOP site)  
This scheme allows GPs to refer patients with eye conditions to the accredited optometrist in the area (very similar to the North Charnwood and all-Suffolk scheme). Criteria for referral include the following, as listed in the Primary Care Resource Pack:  
- Loss of vision including transient loss  
- Ocular pain  
- Systematic disease affecting the eye  
- Differential diagnosis of the red eye  
- Foreign body and emergency contact lens removal  
- Dry eye  
- Epiphora (watery eye)  
- Trichitic (ingrowing) eyelashes  
- Differential diagnosis of lumps and bumps in the vicinity of the eye  
- Ulcers  
- Diplopia  
- Flashes/ floaters  
- Refinement of non-specific or inadequate referral/ GOS18 from local optometrists  
- Serious conditions which are still directly referred to the hospital by the optometrist include:  
  - Retinal detachments  
  - Perforating eye injuries  
  - Acute glaucoma.  

The referral procedure involves:  
1. A phone call to the PCT for authorisation number i.e. phone number. Call then made to the optometrist practice to request the patient be seen. The level of urgency is agreed at this point.  
2. Once the practice has agreed to see the patient, a referral form is completed - one copy to the patient in an envelope marked confidential, the other retained by the GP. The GP receives a report form within 5 working days, detailing the results of the ophthalmic examination.
Cost: £40 per consultation

3. Macclesfield Referral Refinement scheme (AOP site) (pilot scheme, commenced in 2000)
This scheme is essentially very similar as the previous two, whereby the optometrist receives a form from the GP when the patient presents to the optometrist practice. Alternatively, the optometrist receives the form directly from the GP, with the GP completing the patient and GP practice details. The GP also provides any relevant medical details, presenting signs and symptoms, and a possible diagnosis. The optometrist will then complete another section of the same form with clinical findings and will indicate clinical management advice- either to refer on, no further action, or possibly to prescribe a therapeutic agent with the dosage and use advice. The optometrist will also indicate when the patient will be reviewed.
Cost: £25 for first visit, £15 for follow-up
A diagram of this scheme is shown below.
4. **Primary Eye care Referral Scheme- Bro Taf (AOP site) (this is also a nationwide scheme)**

In a similar fashion to the two previous schemes, Cardiff LHG has a PEARs scheme allowing GPs to refer acute eye conditions/ suspected eye disease to accredited optometrists. The patient is only examined according to the referred problem, or any other obvious eye abnormality.

The referral procedure involves:

1. The GP refers to one of the locally accredited optometrists (accreditation takes place at Cardiff University) using a particular referral form for the PEARs scheme.
2. The optometrist examines the patient and provides a written feedback form to the referring GP in an agreed format within a specified time-span (patients can select any optometrist according to a list available from GPs).

5. **North Staffordshire Acute Eye Management Scheme (AOP site)**

This scheme also allows GP referral to an optometrist, and also referral by pharmacists should a patient present to a pharmacist initially. Akin to other schemes, all parties receive feedback reports, though in this case, the pharmacist will also receive an optometrist examination report if the patient initially presented to the pharmacist (the pharmacist can allow the patient to decide whether they attend the GP or optometrist).

Cost: £25

6. **Surrey PEARs scheme (AOP site)**

The following information is based upon the SLA for this scheme between Surrey PCT and AOs.

The pilot period lasted from November 2006- March 2007. This would be extended for a period of three years if the PCT accepted the scheme.

Again, the scheme involved GP- AO referral, whereby the patient would bring a copy of the written referral to the AO. Patients referred from GPs would be encouraged to phone the Optometry practice prior to arrival to ensure an AO was available.

Cost/ remuneration to the PEARs AO: £40 for first appointments and £25 for follow-up appointments.

7. **Essex Integrated Eye care Scheme (AOP site)**

This scheme represented a pilot in the BBW (Billericay, Brentwood and Wickford) PCT area, whereby two optometrists in the area received referrals from GPs, or GP practices nurses or receptionists.

8. **Bradford Consultant and Optometrist Triage and Treatment Scheme** (originally sourced in the ‘Community Eye Care Services Review: Review of Local Schemes for Low Vision, Glaucoma and Acute Care, January 2007’ document)

The paper does not state further details.


The paper does not state further details.
10. **Nottinghamshire County Triage scheme** (originally sourced in the ‘Community Eye Care Services Review: Review of Local Schemes for Low Vision, Glaucoma and Acute Care, January 2007’ document)

The paper does not state further details.


The paper does not state further details. The Commissioning toolkit for community based eye care services (2007) however mentions that this is provided through a GP and also outlines the findings from the audit. The key findings are as follows:

3. Waiting time is two weeks, and around 75% of the patients in the current scheme do not require HES referral
4. The scheme makes ‘modest’ cost savings, though these are not detailed in the toolkit document
5. An audit of the first 100 patients revealed 60 patients who were not referred to the hospital did not have any further complications later on, where follow-up amounted to 2 years.
6. There is a high satisfaction rating amongst patients and GPs.

12. **Suffolk GPSI and COSI scheme** (originally sourced in the ‘Community Eye Care Services Review: Review of Local Schemes for Low Vision, Glaucoma and Acute Care, January 2007’ document)

The paper does not state further details.


The paper does not state further details.

14. **Worcestershire PEARS Scheme**

According to personal communication with the area OA, this scheme has been established in a similar fashion to the Welsh PEARS scheme, the latter providing the example for many PEARS schemes across England. This scheme allows GPs, pharmacists, optometrists and allied health professionals to refer to the accredited optometrist. The entire NHS Worcestershire area is involved in the scheme, with the exception of Redditch and Bromsgrove clusters (at the time of writing).

15. **Glasgow Integrated Eye care Scheme** (AOP site)

The GIES, or Glasgow Integrated Eye care Scheme, means those patients who initially approach their GP with an eye condition, often a red eye condition, can be referred to an accredited GIES optometrist for care and management. The optometrist will then either continue to care for the patient as per the scheme protocol, or refer to the HES, as per the protocol. The GP and optometrist may however retain the patient’s care within the community jointly. This is somewhat different to the scheme in Shipley, which is provided through a GP clinic. An independent audit of the scheme suggested good results, and it was intended to roll the schemes across all of the south-side of Glasgow later that year, being 2003.
According to the commissioning toolkit for community based eye care services, the scheme audit found the following:
- All referrals were seen within 2 weeks, and some 90% of these within 4 days
- 77% of patients are retained and safely managed in the primary care setting
- All of the referrals into the HES were considered appropriate by the consultant ophthalmologist receiving the referrals
- There was an 80% reduction in topical antibiotic prescribing
- There has been a high patient and professional satisfaction rating*
  *This section was sourced from the Commissioning toolkit for community based eye care services paper, 2007: 27

**Paediatric Schemes**

16. **Stockport Children’s Refraction Scheme** (AOP site)
This scheme provides referral of children from community clinics to local optometrists for cycloplegic refraction following screening by orthoptists at 3 ¼ years of age. The orthoptist provides parents with a list of participating optometrists and the parent can select which optometrist they attend. A prescription for spectacles may then be issued by the optometrist following refraction and assessment by the optometrist. Cost: £25 plus GOS sight test fee.

17. **South Birmingham paediatric scheme** (personal communication)
According to personal communication with the area optometric advisor, an enhanced service for children means those failing the age 4 school test can visit a community based clinic with a specialist protocol (in comparison to traditional pathways). This is reducing the load of the HES where referrals would otherwise be made.

**Low Vision Schemes**

18. **Merton, Sutton and Wandsworth Scheme (pilot)** (AOP site)
Five optometrists provided a LV service across Merton and Sutton. Merton and Sutton Social Services, and the Merton Association for the Blind were also involved. Referral to the service was due to be made initially by Merton or Sutton Social Services. Patients were issued with a leaflet explaining the scheme and a voucher inviting them to participate in the scheme. The target population was those experiencing difficulties due to reduced vision which cannot be adequately corrected by conventional spectacles.

19. **Hereford (pilot)** (AOP site)
This scheme allows trained community optometrists to provide low vision aid assessments and low vision aids. This is a new, integrated service with social services and GP practices. It has meant patients can be referred either from the GP or social services to the optometrist.
Cost: the service attracts a £40 fee in addition to the regular GOS STF.

20. **Dorset** (AOP site)
This scheme involves patient referrals from the hospital service, social services, optometrists, dispensing opticians and local societies for the blind or visually handicapped. The scheme was initially introduced in 1993 on a pilot basis as the first community-based low vision aid service. In 1993, fewer optometrists were involved, though exact figures are not contained within the resource pack.
The scheme allows optometrists to provide LVAs (low vision aids) to patients with LV following a full eye examination. A report is then sent back to the GP. Patients are then followed up two weeks later, and are issued with a different LVA is necessary, or provided further training.

21. Derbyshire (AOP site)
This scheme involves a community-based LVAs service. Optometrists would be trained to undertake assessments in the community. This service would run alongside the established one-day per week clinic service provided in the hospital by the hospital optometrist.
According to the primary care resource pack, patients would be referred to the eye clinic by GPs. Where it was deemed appropriate, the consultant ophthalmologist could then refer the patient to the LVAs clinic. The hospital optometrist would decide whether patients could be assessed in the community for LVAs.
Eligibility includes:
patients registered blind or partially sighted and registered with the local PCT (South Derbyshire)
patients who had been referred to the Derbyshire Royal Infirmary and had a visual acuity of less than 6/18.
patients who came into direct contact with optometrists at their practice only if they were registered blind or partially sighted
Supplier: The LVAs would be supplied by the Derbyshire Association for the Blind (DAB) on behalf of the PCT.
Cost: £60 (paid by the patient unless they are exempt from charges)

The paper does not state further details.

23. Camden and Islington (as above)
The paper does not state further details.

24. Nottinghamshire County (as above)
The paper does not state further details.

According to the aforementioned report, 478 low vision assessments had taken place by the time of publication. 355 domiciliary follow-up visits had also taken place. All of the Low Vision Projects described in the report operated on a one-stop combined LV assessment by an optometrist and a rehabilitation worker within community settings (see Appendix 8). The Gateshead project is deemed the ‘gold standard’ in terms of capacity for domiciliary visits, and also the duration of assessments.

This scheme was initially intended to be placed into 3 local clinics, though the project continued within 2 clinics. The report includes the fact that some administration issues were experienced between the two clinics. The clinics operated weekly.
The report also suggests that the administrative issues were also part of a larger problem regarding 'sub-optimal communication between participating managers and clinicians about roles and responsibilities, and limited empathy.' At the time of publication, it was unclear whether this scheme would continue, in part due to PCT re-organisation.

As stated under the Gateshead scheme, this scheme provided one-stop services to patients, which links into Appendix 8. The Evaluation report aforementioned explains a high staff turnover. Furthermore, the project experienced tensions between health and social care agencies across the two PCTs and boroughs. Other areas of the UK, including Northern Ireland, integrate health and social care services within local health and social care boards. It would therefore be interesting to establish how well such LV schemes operate in areas where historically health and social care are intrinsically linked together.

Glaucoma referral refinement schemes

28. Wales (WECI Glaucoma Service Scheme) (AOP site)
Wales already has the Welsh Eye Care Initiative (WECI), incorporating the welsh eye health examination (WEHE) and the primary eyecare acute referral scheme (PEARS), the latter of which has been copied in a number of locations, including those referral schemes listed above.
The scheme proposal involves the set-up of a new WECI Glaucoma Service, a half-way house between the patients’ initial Welsh Eye Health Examination (WEHE) sight test, and the Hospital eye service. Borderline suspect cases would be retained within the WECI Glaucoma service (community-based/ ‘primary care optometry’), and those with stable glaucoma would also be routinely monitored in this service. Those cases where glaucoma is suspected, or there is a change in stable glaucoma, then the patient would be necessarily referred from this new WECI Glaucoma service to the HES. Likewise, selected stable glaucoma cases in the HES could be referred to the WECI Glaucoma service, representing a complete cycle whereby patients with less severe and/or stable glaucoma could be seen in the community, and those with changing glaucoma, or glaucoma suspected for the first time, would be referred to the HES. The examination carried out under the new Glaucoma Scheme would be the same those incorporated in the WEHE.
Cost: Same as WEHE due to similarity of test (£36)

29. Hull Glaucoma and Ocular Hypertension Scheme (AOP site)
According to the scheme protocol, this represents a partnership between the Royal Hull Hospitals NHS Trust, East Riding Health, the Local Optical Committee for Humberside and the Humberside Family Health Services Authority.
The diagram for this scheme is presented below.
30. Bristol Glaucoma and ocular hypertension scheme (AOP site)
Initially designed in 1995, this represents a relatively old scheme, whereby community optometrists were trained to monitor stable glaucoma patients and glaucoma suspects. A number of papers included in the literature papers section pertain to this well-established and nationally recognised scheme. The primary care resource pack does not contain details of costs.

31. Manchester Glaucoma referral refinement scheme (AOP site)
This scheme involved 18 optometrists attending an accreditation course to undertake glaucoma monitoring in the community to fulfil this scheme. All possible glaucoma referrals received by the accredited optometrists came from GPs or non-accredited optometrists. It was expected the 18 optometrists would see approximately 1200 new referrals for glaucoma each year, thus reducing pressure on the HES. Following referral to the accredited optometrist, the patient would then have a glaucoma refinement examination, and where they fulfilled criteria for further referral (to the HES), the HES, patient’s GP, the referrer (the accredited optometrist) and the audit team for the scheme received a copy of the referral form. In instances where the patient did not fulfil criteria, the GP, audit and referrer only would receive copies, and not the HES.
Cost: £35
The diagram of the scheme can be viewed below.
32. Bradford Glaucoma and ocular hypertension scheme (monitoring) (AOP site) 
This scheme represents a slightly different approach to the other glaucoma monitoring schemes. Stage 1 involves the HES contact, whereby a consultant, senior registrar, registrar or clinical assistant decides whether the patient’s condition is stable and therefore whether the patient is a suitable candidate for the monitoring scheme. The practitioner then describes the scheme to the patient, and if they agree to take part, they are asked to nominate a glaucoma monitoring scheme (GMS) registered optometrist, normally being their usual optometrists, unless the optometrist is not registered. The practitioner records the optometrist’s details and the time intervals the patient will visit. The patient is then given their next out-patient appointment at the hospital and told when they are to make appointments with their optometrist. The patient is also asked to obtain treatment from the GP as and when necessary. The practitioner notifies the GP of this. The Head Optometrist then registers the patient onto the schemes electronic database system. When the patient sees the optometrist the optometrist will fill in the GMS2 form. Copies are sent to the HES, GP and the third is retained for the optometrists own records.

If the optometrist is dissatisfied with a patient’s progress this is recorded under ‘Clinical Decision’ section on the GMS2 form and the patient will be recalled to the hospital. Also, where a patient appears unlikely to attend further GMS appointments, the optometrist must inform the hospital which will trigger a recall to the HES. The Head Optometrist will check with the optometrist if they do not receive a report within one month of the scheduled GMS appointment, therefore leaving ultimate responsibility for patient follow-up with the HES. If the patient has attended all appointments (at the intervals requested by the hospital practitioner), or if the patient has been re-referred to the HES, this is treated as a complete cycle and therefore it is unnecessary to arrange a further appointment with the optometrist. Following the next HES appointment, the patient may be re-registered onto the GMS for a further cycle if the practitioner feels it is necessary.
33. Peterborough Glaucoma Pilot Study (AOP site. Also discussed in the Evaluation of the chronic eye care services programme: final report)

This scheme involves SOGs (specialist optometrists in glaucoma) trained to provide an examination service in the community. The scheme incorporates three phases, whereby the clinical data and investigation information is sent to the HES for evaluation. A consultant sees the referral, completes an audit form and the outcome letters are sent to the patient, GP, the SOG and the original referral source. GPs initiate the treatment. At the time of writing (January 2008), all SOGs were in this phase. Phase two would allow SOGs more independence. The SOGs would only send information to the HES for those patients who they believed would require treatment for their glaucoma, or patients with exclusion criteria and any other case which the SOG wanted to discuss with the HES. Those patients who were found to be ‘normal’ could be discharged back to the community optometrist. SOGs would retain those patients who were either at risk of glaucoma or those with suspected early glaucoma.

As the evaluation report notes, this scheme is somewhat different to others, namely the Waltham Forest scheme, whereby the latter allows more optometrist autonomy from the consultant. As stated under the Waltham Forest description, the Peterborough scheme remained more ‘cautious’, with consultants still seeing and checking the referrals. In Waltham Forest however, this was not the case, and allowed optometrists also to prescribe. As a result, comparing schemes in terms of efficacy of optometrist work, may prove problematic, and the audits conducted locally for each may provide the best information for determining whether pilot schemes should continue.

34. Heart of Birmingham Scheme (personal communication)

According to personal communication with a local Optometric advisor, a glaucoma referral refinement scheme is being established currently within the Heart of Birmingham Teaching Primary Care Trust via primary care commissioning. It is planned that this will eventually involve a co-management scheme with optometrists included. Optometrists have already completed stage one training. This year the hospital will move to the outskirts of Sandwell, therefore moving the initial stages of the scheme.

35. Grampian Glaucoma Scheme (Scottish Executive, 2006 report)

The paper does not state further details.


The paper does not state further details.

37. Bexley (as above)

The paper does not state further details.

38. Gateshead and South Tyneside (as above)

The paper does not state further details.

39. Huntingdonshire (as above)

The paper does not state further details.

40. Nottingham (as above)

The paper does not state further details.
41. **SW Kent and Maidstone** (as above)
The paper does not state further details.

42. **Worcestershire Level 2 Glaucoma Monitoring Scheme**
Following personal communication with the OA involved, a business case was submitted in September 2009 for a level two stable glaucoma monitoring scheme. In a similar vein to other glaucoma schemes, all optometrists involved in the scheme are trained to monitor glaucoma in their community practice. This scheme is being utilised with patients who have a diagnosis of ocular hypertension (OHT) or suspected chronic open angle glaucoma as confirmed by a consultant, and do not require treatment. Patients are referred into the pathway from secondary care i.e. from the consultant ophthalmologist who has confirmed the diagnosis.

43. **Waltham Forest (Evaluation of the chronic eye care services programme: final report)**
This scheme involves the screening of new referrals, as detailed in the report (McLeod et al., 2006). The scheme involves ‘shared-care follow-up’, with community optometrists with a special interest in glaucoma working in community centres in order to undertake the follow-up work. The COSIs, via a GP letter, can initiate medication without notes being reviewed by a consultant. According to the report, a clinical audit indicated strong evidence for the COSIs skills. The report does not provide any further details about this scheme.

**Cataract referral schemes**

44. **South Gloucestershire Scheme** (AOP site)
According to the scheme protocol, Gloucestershire was chosen in 1999 as an exemplar site for the Action on Cataracts project. Concurrently, a merger between the two ophthalmology units in the area led to the one based in Cheltenham General. The cataract scheme followed, and was launched in late January 2000. The scheme allows the optometrist to refer directly to the HES, with the usual form copies being sent both to the HES and the patient’s GP. The patient also receives an information sheet. The scheme did not eradicate the traditional route. Instead, both routes ran in parallel, and direct referral was utilised when appropriate to refer directly to the HES.

The scheme seems to particularly benefit from good communication between all parties, being GPs, ophthalmologists and optometrists.

Costs: £37.50 per referral was eventually negotiated with Gloucestershire Health. In addition to this, the usual GOS sight test fee (STF) was also added. The fee is only payable for those patients who were referred directly and not when patients failed to meet the referral criteria. Also referring via the traditional route meant no additional fee to the GOS STF.
45. Peterborough (AOP site)
The Peterborough Cataract scheme means that the optometrist can telephone the cataract co-ordinator within the HES and book an operation the same day as the initial examination. The optometrist will also send a form to the patients GP as well as the HES. Once this has been checked by the co-ordinator, and the referral has been assessed by the consultant, the patient attends the HES, see the nurse for biometry and consents to surgery. If any problems exist, the operation will happen at a later date. Otherwise, the operation will happen on the same day as the first assessment with the nurse. Where patients do not meet protocol criteria on initial visit to the optometrist but wishes to have surgery, a form is sent to the GP and HES and an outpatient appointment is arranged. If the subsequent result means an operation is required, then the patient will be added to a waiting list for this. If an operation is not required, a management/ treatment plan is drawn up, and the patients discharged to the care of the optometrist (community). Those who have surgery are seen by the consultant one week later. Where no problems exist, the patient is discharged to the care of the optometrist. The scheme flow-chart is reproduced below. Cost: £35 (unclear who pays)
46. Ayrshire (AOP site)
This scheme is very similar to the South Gloucestershire scheme, with the addition of the nurse telephone call check to the patient 24 hours post-operatively, and also 2 weeks prior to appointment. The scheme is shown below in the diagram.
Cost: £30 per visit (the pack does not detail who pays the fee, however it is assumed that the fee is paid by patient per visit to the optometrist).
47. Kings Lynn (AOP site)
This scheme includes two providers of cataract surgery- Queen Elizabeth Hospital in
King’s Lynn, with the satellite being the South Cambridgeshire Hospital, and the Gayton
Road Health and Surgical Centre. The latter has an operating suite within a GP
practice. According to their website, this is the first GP practice in the country to offer
such a service, and private operations are also available at an ‘all-inclusive fee of £950’.

The two schemes are therefore included the diagram below. As with other schemes, the
initial examination with the optometrist may lead to a referral to the HES co-ordinator
should surgery be deemed necessary. A copy of the surgery form will be sent to the GP
to allow the GP to send medical information. The co-ordinator will however call the
patient to conduct a prioritisation questionnaire, and if the patient has sufficient points
from the scoring system, then they will be allocated either to the Gayton Road GP
practice or Queen Elizabeth Hospital. At Gayton Road the patient is seen by the GP/
Ophthalmic Medical Practitioner (OMP) and will have surgery at Gayton Road. For
Queen Elizabeth hospital referrals, the patient is seen by an ophthalmic nurse, and if no
problems are found, surgery will be carried out on the same day. At 24 hours, the
patient will be examined by the nurse, and again at 7 days. They are then discharged to
the care of the optometrist with instructions for care. Where problems are found during
the nurse assessment, the patient is seen by the ophthalmologist prior to a final
decision regarding surgery. Where surgery is not recommended at this stage, a letter is
sent both to the optometrist and the GP.
Cost: None