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An Evidence-Based Investigation of the Content of Optometric Eye Examinations in the UK

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Doctor of Philosophy

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In memory of my late father.....

Declaration

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City University, London

An Evidence-Based Investigation of the Content of Optometric Eye Examinations in the UK

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Doctor of Philosophy

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Thesis Abstract

A literature review revealed a lack of systematic research investigating standards of clinical practice within optometry. Three main approaches have been used to evaluate the content of clinical consultations: abstraction of clinical records, clinical vignettes and unannounced standardised patients. The aim of this thesis was to obtain an objective insight into the content of optometric eye examinations using these three approaches.

In the first scenario, the SP presented for a private eye examination as a 20 year-old myope, complaining of recent onset headaches. The presence of headache was detected in 98% of cases. 22% asked at least four of the eight questions appropriate for primary care headache investigation and 69% of practitioners asked the patient to seek a medical opinion regarding the headaches.

The second SP presented as a 44 year-old patient of African racial origin for a private eye examination having experienced recent difficulty with her near vision. 95% of optometrists visited carried out optic disc assessment and tonometry and 35% of optometrists carried out all of these tests. 6% advised the SP of the increased POAG risk in those of African racial descent.

The third SP presented for a private eye examination as a 59 year-old patient, with recent onset flashing lights in one eye in the dark. The presence of photopsia was proactively detected in 87% of cases. 35% asked four of the seven questions appropriate for identifying the nature of the flashing lights. 66% recommended dilated fundoscopy to be carried out by either themselves or by another eyecare practitioner. 29% of optometrists asked the patient to seek a second opinion regarding the photopsia.

SP encounters are an effective way of measuring clinical care within optometry. Substantial differences exist between different practitioners in the duration and depth of their clinical investigations. This is not surprising, since practitioners are individuals with different levels of experience and therefore variations in approach are inevitable. This highlights the fact that not all eye examinations are the same.

The findings of optometric consultations for record abstraction mirror the findings in other healthcare disciplines: clinical records are an imperfect representation of the content of a clinical consultation. Clinical records are subject to a recording bias leading to both under- and over-estimation of the care provided due to the presence of false negatives and false positives. It was proven that clinical vignettes can be easily administered and are a cost-effective way of assessing levels of clinical care and can therefore be used in a great variety of settings.

Different methods of measuring clinical care capture different elements of clinical practice and are prone to different biases. A three-way comparison of standardised patient, clinical record cards and computerised vignettes showed that clinical records are an imperfect representation of the content of an optometric clinical consultation as they tend to under-estimate actual care provided, while vignette scores tend to over-estimate clinical performance.

1 Literature Review and Introduction

1.1 Background

There are currently about 10,700 optometrists in the UK (Federation of Ophthalmic & Dispensing Opticians, 2008), which is more than all the other eyecare professions added together. Nearly all primary eyecare in the UK is practised by optometrists. The scope of optometry is wider now than ever before, with a growing number of specialities within optometry and with optometrists playing an important role in many secondary and tertiary care hospitals. However, the majority of optometrists are still engaged in routine primary eyecare examinations.

The fact that there is a fairly standard item of service that optometrists provide means that, compared with other healthcare professions, it should be relatively straightforward to determine the typical standard of care and range of standard of care within the optometric profession. For example, when presented with a patient aged 45 years who attends for their first eye examination, what are the contents of a typical eye examination? What proportion of optometrists would test visual fields? How many would undertake tonometry, test ocular motility, test pupil reactions, or even carry out ophthalmoscopy?

Optometric practice is legislated in the Opticians Act (1989) (Office of Public Sector Information, 2008) and professional guidelines are also provided within optometry by the General Optical Council (GOC) (General Optical Council, 2008a), and the College of Optometrists (CoO) (*Table 1.1*) (College of Optometrists, 2008a). The General Optical Council protect the public by promoting high standards of education, conduct and performance amongst opticians. The College of Optometrists is the professional, scientific and examining body for optometry in the UK, working for public benefit. The guidelines provided by the GOC and CoO are clearly valuable as they provide a plan for standards of professional practice. Organisations that fund eyecare also provide additional regulations or terms of service (Association of Optometrists, 2008a). The main organisation that funds eyecare in the UK is the NHS, through primary care organisations (primary care trusts in England) which fund basic NHS sight tests by community optometrists. The NHS has its own regulations concerning these sight tests (National Health Service (General Ophthalmic Services), 2008a). Additionally, there are a plethora of local relationships for additional NHS services, for example to provide

emergency eyecare (e.g., for patients with red eye). The College of Optometrists is just starting a research project to catalogue and map these services. Some employers fund eye examinations for their employees and it is possible that some of these organisations also have specific contractual relationships with optometrists, although we are not aware of any list of such relationships.

A recent government review of the regulation of non-medical healthcare professionals has been welcomed by the GOC and this review discusses effective regulation of healthcare staff (Department of Health, 2008). However, none of these documents tells us what actually happens inside the optometric consulting room. There have been attempts to gain an insight into the clinical activities of optometrists through questionnaires (O'Leary & Evans, 2003) most notably those administered by the College of Optometrists (Stevenson, 1998; College of Optometrists, 2008b). These are useful, but it is probable that there will be a sampling bias since conscientious practitioners are more likely to respond. Additionally, there is a further source of bias with human nature likely to result in replies which indicate higher standards of practise than may actually pertain.

Table 1.1: Optometric practice is legislated in the Opticians Act (1989), professional guidelines are provided by the General Optical Council (GOC) and the College of Optometrists, and regulations are issued by the National Health Service (General Ophthalmic Services). This table, while not a complete list of these documents, concentrates on those that influence the standards of professional practice relevant to the present research.

Opticians Act 1989
The statutory duties imposed by the Opticians Act 1989 (Office of Public Sector Information, 2008) include categories of persons who can carry out eye examinations and fit contact lenses. The Opticians Act also stipulates duties to be fulfilled when examining a patient's eyes (College of Optometrists, 2008a). The regulatory background to the eye examination [whether performed privately or under the General Ophthalmic Services (GOS)] contained in the Sight Testing (Examination & Prescription) (No.2) Regulations 1989 (General Optical Council, 2008b) state: When a doctor or optician tests the sight of another person, it shall be his duty a) to perform, for the purpose of detecting signs of injury, disease or abnormality in the eye or elsewhere I. an examination of the external surface of the eye and its immediate vicinity, II. an intra-ocular examination, either by means of an ophthalmoscope or by such other means as the doctor or optician considers appropriate; III. such additional examinations as appear to the doctor or optician to be clinically necessary, and b) immediately following the test to give the patient a written statement- I. that he has carried out the examinations required by sub-paragraph (a) of this section, and II. that he is or (as the case may be) is not referring him to a registered medical practitioner The Act also requires that the statement should say if the patient is being referred to a registered medical practitioner and if s/he is being referred, the reason for referral.

General Optical Council
The GOC Code of Conduct concentrates on general professional conduct and does not give details of clinical standards. It states, "The GOC recognises that other bodies have issued detailed guidance with regard to the matters covered in this Code. Practitioners are therefore expected to be familiar with the relevant guidance and advice issued by other organisations and, in particular, that of the professional and representative bodies. Reference may be made by the GOC to the guidance and advice of other bodies in the exercise of its functions." This is generally taken as referring to the College of Optometrists' Code of Ethics & Guidelines (see below).
College of Optometrists
The guidelines and advice start with the general statement: "The optometrist has a duty to place the welfare of his/her patient before all other considerations, to apply to each patient the full extent of his/her knowledge and skill, and to maintain and develop his/her professional competence throughout his/her life". The full Code of Ethics and Guidelines for Professional Conduct is very detailed (College of Optometrists, 2008a), specifying general ethics (e.g., patient practitioner relationships) and detailing the types of clinical tests that may be appropriate for specific categories of patients. However, it is stressed that the guidance document represents the College's view of good practice, this being defined by the College Council as being "what a competent optometrist is able to do in practical and achievable terms and within existing training and skills." It is stated that the optometrist has a duty to carry out whatever tests are necessary to determine the patient's need for vision care as to both sight and health. It is not a set of instructions and does not constitute a "checklist" of clinical or professional procedures that must be carried out. The content is to be determined by both the practitioner's professional judgement and the minimum legal requirements (College of Optometrists, 2008a).
NHS (General Ophthalmic Services; GOS) and other funding bodies
Optometrists carrying out NHS sight tests are bound by the NHS (GOS) regulations in addition to the above (Association of Optometrists, 2008a). These allow for a greater scope of practice within Scotland than the rest of the UK. In 2006-7, 13.1 million of the 18.5 million primary care eye examinations were paid for by the NHS (National Health Service (General Ophthalmic Services), 2007). Optometrists providing eyecare that is paid for by other funding bodies (e.g., to PCTs as part of a co-management (shared-care) scheme or vocational eyecare to corporate organisations) are likely to be bound by other service contracts or agreements.

One method of gaining an insight into standards within optometric practice is to study practitioners' clinical records. This approach is routinely used in clinicolegal cases (e.g., GOC disciplinary hearings, civil litigation), but is subject to a number of problems, for example, errors of over- and of under-reporting clinical tests. This is discussed in detail later in this chapter. Clinical records give very little information about how thoroughly and appropriately a test was carried out.

This issue of determining standards of clinical care is common to all the healthcare professions. Assessing quality of care by health outcome measures (e.g., number of cases diagnosed or referred) is very limited and processes that measure quality of care are increasingly being used (Peabody *et al.*, 2000).

1.1.1 Clinical competence in primary eyecare (optometry)

As clinicians, clinical competence could be described as "the degree to which a clinician can use their associated knowledge, aptitude, attitude and good judgement in the course of their professional practise and be able to work in an effective way in all situations that correspond to their field of practice" (Miller, 1990). The different levels of

clinical competence can be illustrated in a simple and elegant conceptual model, Miller's pyramid.

The base of the pyramid consists of factual knowledge, such as that learnt during lectures in undergraduate training or lectures on continuous education and training (CET) courses. The practitioner "knows" and has knowledge of the skills required in performing his/her professional responsibilities effectively. But knowledge of undergraduate and pre-registration training and CET courses tells us nothing about the practice of the profession.

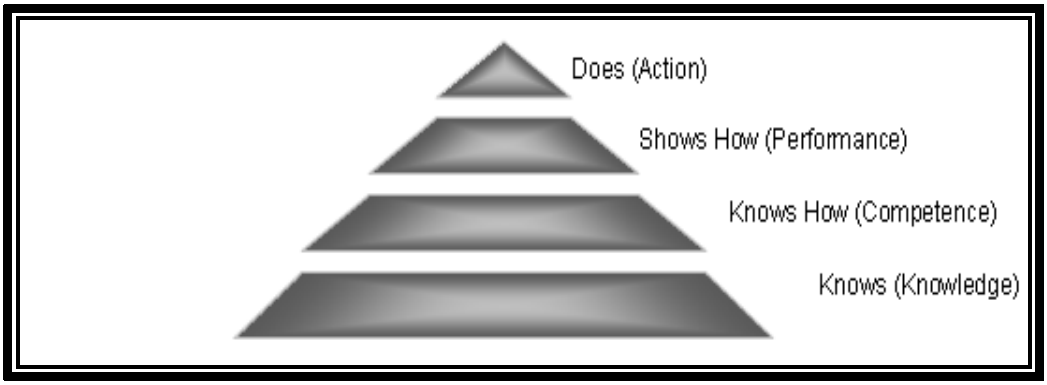


Figure 1.1: Miller's pyramid of clinical competence.

One level up, Miller describes the ability to use knowledge in a particular context as "knows how." This comes close to clinical reasoning and problem solving and might be assessed, for example, by the type of examination where the practitioner is given a clinical scenario and asked to write down which procedures they would carry out. At a higher level (*Figure 1.1*), "shows how" reflects the person's ability to act appropriately in a practical situation and describes hands-on behaviour in a simulated or practice situation. For optometrists, this is tested in the final assessment at the end of the pre-registration period (PRP) and usually never again in that practitioner's professional career.

The "does" level refers to actual performance in habitual practice. As can be seen, the higher the skills being tested in the pyramid, the more clinically authentic the assessment needs to be. The "action" component of professional behaviour is the most difficult to measure reliably and accurately (Miller, 1990). A literature review by the present author highlights a lack of systematic research that aims to investigate the upper level of the pyramid within optometry.

1.2 Why do we need to measure clinical practice?

Valid measures of the practice of clinicians are the basis of efforts to improve quality of care (Peabody *et al.*, 2000): “practice can be improved, but only if it is measured” (Peabody *et al.*, 2004a). There are several key reasons why the standard of optometric care in the UK needs to be determined and these are will now be discussed.

1.2.1 To evaluate the service provided to the public by the optometric profession

It is valuable for the profession of optometry to obtain objective data on the service that the profession provides to the public. The profession needs to guarantee that the procedure of an eye examination will identify any ocular abnormality; will use resources appropriately to identify ocular and systemic health problems (using tests which have adequate sensitivity and specificity); will result in the prescribing of functional corrections for defects of sight; will determine the need for remedial eye exercises where appropriate, and will provide advice to the patient on all aspects of visual efficiency. This guarantee is important because it allows patients to acknowledge the service they receive and to have confidence in the profession. Objective data on the eye examination will help to demonstrate the profession’s commitment to promote high standards and to ameliorate low standards. An eye examination is an important health check (RNIB, 2008), yet many members of the public may still not realise this, and research of this nature will help to demonstrate this point.

1.2.2 Determining priorities for continuing education and training (CET)

The General Optical Council (GOC) introduced compulsory CET for optometrists in 2005 to encourage high professional standards (General Optical Council, 2008c). The NHS makes a contribution towards the cost of this CET. Knowledge of the strengths and weaknesses of contemporary clinical practice will help to determine priorities for future CET.

1.2.3 Evaluating outcomes of continuing education and training

The GOC states that the purpose of optometric CET is to maintain high standards of professional knowledge and skills (General Optical Council, 2008a). A related question is whether CET can go further and bring about an improvement in standards of clinical practice? The research described in this thesis aims to measure contemporary standards of optometric practice. If this research is repeated in the future then it may allow changes in standards of practice to be detected.

1.2.4 Governmental and professional policy decisions

Governments sometimes have targeted campaigns on healthcare issues, for example cataract treatment, and glaucoma detection in people of African ethnic origin. These campaigns rely on the assumption that appropriate clinical services are available in primary eye care to detect and manage these conditions. Research into the content of an eye examination using the specific methods discussed in this thesis will contribute towards the provision of this information.

1.2.5 Implications for NHS General Ophthalmic Services

The NHS provides General Ophthalmic Services (GOS) and in 2006-7 13.1 million of the 18.5 million primary eyecare examinations were funded by the NHS (National Health Service (General Ophthalmic Services), 2007). Schedule 1 of the NHS (GOS) Regulations (1986) Terms of Service states “A contractor shall, having accepted pursuant to the regulations an application for the testing of sight, test the sight of a patient to determine whether the patient needs to wear or use an optical appliance, and on so doing shall fulfil any duty imposed on him by, or in Regulations made under, section 20B of the Opticians Act 1958” (Association of Optometrists, 2008a). The Opticians Act does not define the content of an eye examination in detail (see next section). The Association of Optometrists has produced a document defining the contents of the GOS sight test (Association of Optometrists, 2008b), and the College of Optometrists’ guidelines are also relevant in this context. However, a literature search revealed no research that investigates what actually occurs during a typical GOS sight test.

It is perhaps surprising that the GOS funds an item of service, the contents of which are poorly specified and poorly quantified. Information on the typical content and length of a GOS sight test might be useful for a number of reasons, including negotiations on fees and discussions on expanding the role of the optometrist. Research of this nature using standardised patients presenting for a GOS sight test, would provide the first solid data on the actual content of the GOS sight test.

1.2.6 Clinicolegal issues

Section 26 (1a) of The Opticians Act (1989) (Office of Public Sector Information, 2008) states that when a registered optometrist tests the sight of another person, it shall be their duty to perform such examinations of the eye for the purpose of detecting injury, disease or abnormality in the eye or elsewhere. There are also Statutory Instruments, most recently SI 1999/3267 relating to patient referral (General Optical Council, 2008d).

The Sight Testing (Examination and Prescription) (No. 2) Regulations 1989 give statutory force to the common law duty of care which optometrists must meet, namely that whenever a person's sight is tested within the meaning of Section 24 as defined by Section 36(2) of the Opticians Act 1989 (Office of Public Sector Information, 2008), a full eye examination must be carried out: this requirement holds whether the eye examination is carried out under the NHS or under private contract. The Regulations require the optometrist to perform an examination of the external eye and its immediate vicinity, an intra-ocular examination, either by means of an ophthalmoscope or other appropriate means, and any additional examinations as appear to the optometrist to be clinically necessary.

It is becoming increasingly common for healthcare practitioners to be accused of malpractice. For optometrists, malpractice accusations are defended in disciplinary hearings before the General Optical Council or in civil litigation. It is an acceptable defence if it can be demonstrated that there is a body of reasonably competent optometrists who would have acted in a similar way to the practitioner [the Bolam and Bolitho tests (Herring, 2006; Jones, 1996)]. The Bolam test is the measure of whether the practitioner has discharged his or her standard of care in the management of a patient (i.e. a practitioner is not guilty of negligence if s/he has acted in accordance with a practice accepted as proper and responsible by a responsible body of practitioners

skilled in that particular art). It applies to all professionals. In the case of Bolitho, the House of Lords decided, in effect, that if the management by a body of responsible practitioners was not demonstrably reasonable, it would not necessarily constitute a defence. If professional opinion called in support of a defence case was not capable of withstanding logical analysis, then the court would be entitled to hold that the body of opinion was not reasonable or responsible.

Unfortunately, there is a lack of information on the content of eye examinations carried out by reasonably competent optometrists, as discussed earlier in this section. This impacts on both the prosecuting and defending counsels, and means that they have to rely to a great extent on expert witnesses. But the lack of factual information on the contents of a typical eye examination means that the experts often have to base their advice on anecdotal experience, rather than factual data.

For example, in recent GOC disciplinary cases experts have commented that they felt that a certain test should have been in an eye examination because it was a test that would have been carried out by a pre-registration optometrist in their final examinations. This reflects confusion about the different levels of assessment of clinical knowledge, as illustrated in *Figure 1.1*.

1.2.7 Professional guidelines

The College of Optometrists has published a code of ethics and guidance for professional conduct in accordance with the College's objective: "the maintenance for the public benefit of the highest standards of professional competence and conduct" (College of Optometrists, 2008a). The College stresses that the guidelines are by no means a set of instructions or a checklist, allowing each practitioner to exercise his or her professional judgment (College of Optometrists, 2008a).

A detailed understanding of the nature of current optometric practice and of typical standards within optometric practice would be helpful for evolving professional guidelines. Evidence-based research on the content of typical optometric eye examinations would help to develop guidelines that differentiate between realistic minimum standards of competence (e.g., an important test that nearly all optometrists carry out) and aspirational goals (best practice that may not necessarily be achieved by a significant body of reasonably competent optometrists).

1.2.8 Consumer complaints

Consumer complaints about optical services in the UK are typically dealt with by the Optical Consumer Complaints Service (OCCS), an independent body set up to settle complaints from members of the public who are not satisfied with the optical services received in an optical practice (Optical Consumer Complaints Service, 2008). When these complaints relate to the eye examination, it would be useful for OCCS to know the contents of a typical eye examination.

1.2.9 Setting priorities for undergraduate training

The General Optical Council (GOC) approves institutions for the training of optometrists. This approval is based upon the institutions demonstrating that their training secures to the student adequate knowledge and skill for the practice of their profession. An investigation of the content of typical optometric examinations is likely to identify priorities not just for CET, but also for undergraduate training.

1.3 Methods of measuring clinical practice

The points listed in section 1.2 indicate the need for objective, evidence-based, data on the content of typical optometric eye examinations in the UK. This raises the question of "What is the most appropriate method for measuring clinical practice?" In other words, how can the peak of Miller's pyramid (*Figure 1.1*) be measured? This question is applicable to all healthcare professions, so a literature review was carried out to determine the answer to this question by analysing work in other healthcare professions. A literature review revealed that clinical practice is commonly assessed by three methods: (1) abstraction of medical records, (2) using clinical vignettes and (3) use of standardised patients who present unannounced to clinics. Each of these methods will now be discussed and are summarised in *Table 1.2*. Another method of measuring clinical practice, assessing billing claims for various procedures, is not well-suited to optometry in the UK because the NHS is the major funding source and in most regions presently funds only one item of service.

1.3.2 Record abstraction

Record abstraction has been described as the most widely used method of measuring quality of clinical care (Gilbert *et al.*, 1996; McDonald *et al.*, 1997; Rubin *et al.*, 1992). Record abstraction is sometimes performed simultaneously with other methods that are described below: standardised patients (Dresselhaus *et al.*, 2002) and/or clinical vignettes (Dresselhaus *et al.*, 2000; Luck *et al.*, 2000). Records generated during a clinical encounter are retrieved at the end of the visit for abstraction by a skilled expert. The requirement of skilled expertise means record abstraction is expensive to perform. Information generated during the abstraction is recorded on a pre-designed checklist. The individual scoring items in a checklist are categorised into four domains of clinical performance: history & symptoms, physical examination, diagnosis and treatment. The checklist is filled out using the information abstracted from each record and scores assigned for each of the four domains and to obtain an overall score.

There are widespread concerns regarding the use of this method due to the validity and reliability of results obtained (McLeod *et al.*, 1997; Norman *et al.*, 1985; Rethans *et al.*, 1994). One of the main limitations to consider is that record abstraction is subject to false negative results; i.e., tests carried out but not documented in the record (Dresselhaus *et al.*, 2000; Luck *et al.*, 2000). Busy practitioners may not record everything that was examined during the consultation. On the other hand, good record keepers may not necessarily be good physical examiners. The opposite form of bias can also occur; i.e., concern over medico-legal attention might lead some practitioners to record tests that they have not completed (Dresselhaus *et al.*, 2000; Luck *et al.*, 2000). These limitations could therefore skew the results leading to an overestimation or underestimation of the quality of care (Katz *et al.*, 1996; Lawthers *et al.*, 1995).

Other problems associated with record abstraction include illegibility, incomplete or unavailable record cards and differing skills between abstractors (Dresselhaus *et al.*, 2000; Dresselhaus *et al.*, 2002; Luck & Peabody, 2002; Peabody *et al.*, 2000). Record abstraction only provides a limited insight into the practitioner's clinical skills and practitioner-patient interactions. The usefulness of record abstraction is further limited by the fact that a skilled (and costly) expert must collect the data (Ashton *et al.*, 1995; Norman *et al.*, 1993).

1.3.3 Vignettes

Vignettes are written or computerised case simulations that have been widely used by educators and health service researchers to measure processes in a range of practice settings (Glassman *et al.*, 1997; O'Neill *et al.*, 1995; Sriram *et al.*, 1990). Vignettes are set up to simulate patient visits and have been used to measure a practitioner's ability to evaluate, diagnose and treat specific medical conditions (Peabody *et al.*, 2004a). A practitioner is exposed to the presenting problem and asked to provide open-ended responses identifying the most important element(s) of history for each case scenario. A similar stepwise process is repeated for the physical examination, diagnostic testing and treatment plan (Dresselhaus *et al.*, 2000). Practitioners are not allowed to return to and modify previously completed answers as new information is provided at each stage. Skilled experts score the completed vignettes in a similar way to that described earlier for record abstraction.

Clinical vignettes are not only designed to simulate a range of medical conditions but also to evaluate skills required in the care of the patient. Each practitioner could be asked to complete several vignettes to simulate diverse medical conditions (Peabody *et al.*, 2004a). Vignettes are a cost-effective way of assessing levels of clinical care and can be easily administered and are therefore used in a great variety of settings.

Peabody et al (2004) used computerised vignettes. The practitioner completing the vignette "sees the patient" on a computer. Vignettes are well suited to large scale (Epstein *et al.*, 2001; Morita *et al.*, 2002) quality assessments or for cross-system comparisons (Nordyke, 2002; O'Connor *et al.*, 1996) or if ethical issues preclude the use of patients or their records (Aitken *et al.*, 1998; Gould, 1996; Rosen *et al.*, 1995).

Despite widespread use of vignettes, there is uncertainty and controversy about whether vignettes reflect actual clinical practice or merely practitioners' competence at the vignette task (Peabody *et al.*, 2000). Some researchers feel vignettes only reflect what practitioners are competent or knowledgeable enough to do (Everitt *et al.*, 1990; Rethans *et al.*, 1991). For example, it seems likely that practitioners will give their "best answer" when responding to a vignette since they are in an assessment scenario. This best answer may not reflect the tests that they would actually have carried out if they had been presented with such a patient during everyday clinical practice when they would be unaware that their clinical performance was being observed or assessed.

1.3.4 Standardised patients

During a clinical consultation, only two people are usually present: the practitioner and the patient. So, the most appropriate way of determining what the practitioner does is to ask the patient, in particular to ask a patient who has been trained to be an expert observer. There are numerous descriptors of the roles played by individuals during simulated healthcare encounters. Examples of these descriptors include programmed patients, prepared patients, trained patients, standard patients, actors, patient instructors and pseudo-patients. Each term however has a specific meaning depending on the clinical setting and the encounter being simulated in that setting. Nevertheless, the term standardised patient is a well-accepted term in the literature, with only one author using the term differently (Barrows, 1993), and as can be seen from its definition below it describes an approach that is ideally suited to determining an optometrist's performance in a clinical setting.

A simulated patient encounter occurs when practitioners examine people who are simulating real patients. In optometry, this occurs during the final assessment at the end of the PRP. The most rigorous form of simulated patient is a **standardised patient (SP)** who is trained to give consistent verbal and behavioural responses to the examiner (Adamo, 2003) in order to accurately portray a specific patient (Ebbert & Connors, 2004). Typically, the SP is a highly trained actor.

The SP approach has been used in several healthcare professions for 40 years (Whelan *et al.*, 2005) and a search on PubMed (07-November-08) for the key phrase 'standardised patient' found 400 references. The literature on the use of standardised patients (SPs) will now be summarised.

1.4 Comparisons of the methods of measuring clinical care

Franco and colleagues compared three methods of assessing the performance of healthcare practitioners: direct observation of patient consultation, interviews with practitioners, and SPs (Franco *et al.*, 1997). They found that SP data are probably the best in reflecting normal practice and that during direct observation the practitioner is likely to give better than normal levels of quality of care. The authors cautioned that data from interviews with practitioners may reflect practitioner knowledge and not

necessarily performance (Franco *et al.*, 1997); the base of Miller's pyramid rather than the top (*Figure 1.1*). Concerning SP study design, their data suggested that practitioners' behaviour is not consistent across several patients and so SP testing should ideally be repeated with more than one patient if a more accurate reflection of a practitioner's typical practice is to be obtained (Franco *et al.*, 1997).

Dresselhaus and colleagues compared three methods of assessing practitioners' compliance with preventative care guidelines: abstracted medical records, SPs, and responses to written case scenarios (vignettes) (Dresselhaus *et al.*, 2000). Clinical record abstraction under-estimated performance by 16%, compared with SP checklists which were taken to be the gold standard. Depending on the aspect of clinical performance that was measured, vignettes were either superior to or no different from record abstraction. The authors concluded that relying on clinical records is misleading (Dresselhaus *et al.*, 2000). Dresselhaus and colleagues subsequently showed that practitioners' clinical records in some cases over-estimate the quality of care (Dresselhaus *et al.*, 2002).

Luck and colleagues showed that medical records were neither a sensitive nor a specific report of the clinical encounter (Luck *et al.*, 2000). Moreover, since the differences in scores between record abstraction and standardised patient checklists ranged from –10% to +23% for different aspects of the consultation, it is not possible to apply a "correction factor" to convert scores based on record abstraction to an equivalent for SP data. Peabody and colleagues compared clinical vignettes, record abstraction, and SPs for four common outpatient medical conditions (Peabody *et al.*, 2000).

A 3-way comparison of methods used to assess quality of care for all cases combined, revealed SP scores (76.2%) to be consistently higher than vignettes scores (71.0%) and record abstraction (65.6%). Vignettes were superior to record abstraction for most measures, but compared with SPs, vignettes over-estimated the quality of examinations and were inaccurate at reporting treatment plans (Peabody *et al.*, 2000). A later study used computerised clinical vignettes, which were significantly superior to record abstraction (Peabody *et al.*, 2004a). Indeed, it was suggested in this study that, if appropriately designed, vignettes can achieve greater accuracy than previous authors had suggested. However, Peabody and colleagues still used SPs as their gold standard measure.

1.5 Literature review of use of standardised patients (SPs)

The literature reviewed on the use of SPs will be discussed under several subheadings. The methodology for the literature review was to search, using PubMed, for the following key words: standardised patient; standardised patient AND gold standard; standardised patient AND training; standardised patient AND checklist; record abstraction; clinical vignette. The literature search was last updated on 7-November-2008.

1.5.2 SPs: the gold standard method for measuring clinical practice

Standardised patients are not the only method that has been used to investigate clinical practice and standards, but, as summarised earlier in this chapter, unannounced SPs (and completed standardised patient checklists) are regarded as the gold standard for quality measurement in clinical practice (Dresselhaus *et al.*, 2000; Dresselhaus *et al.*, 2002; Luck *et al.*, 2000; Luck & Peabody, 2002; Peabody *et al.*, 2000; Peabody *et al.*, 2004a). Luck and Peabody demonstrated the validity of SPs to measure the quality of physicians' practice, as the gold standard, by covertly tape recording the SP visit (Luck & Peabody, 2002). At the end of the visit, the SPs reported on the physician's performance by completing a checklist to "score" the consultation in the usual way, but the tape recordings were also independently "scored" by experts.

The level of agreement was very high (sensitivity 95%, specificity 85%) and the authors concluded that SP assessment is a valid measure of the quality of care (Luck & Peabody, 2002). This supports the assertion by many authors that SPs are the gold standard method of measuring the quality of practitioners' practice. In attempting to measure clinical practice, it seems likely that the major confounding variable will be the tendency for people to change their habits when they know that they are being observed or assessed. Of all the methods of measuring clinical practice, it is only unannounced SPs that can determine what practitioners do without alerting them to the fact that they are being assessed.

In order to measure everyday clinical practice, it is important for the SPs to be unannounced: the practitioner must not believe that the SP is there to assess their

clinical practice. Several authors have provided detailed summaries of the use of SPs (Adamo, 2003; Glassman *et al.*, 2000; Ramsey *et al.*, 1998). The various methods of investigating clinical practice are contrasted in *Table 1.2*.

Table 1.2: A hierarchy of methods used to assess clinical practice. Miller's pyramid of clinical competence is illustrated in Figure 1.1.The limitations of the standardised patient (SP) design, with solutions, are discussed in more detail in this chapter. A Hawthorne effect occurs when a practitioner behaves differently because they are being observed.

Method	Limitations	Level in Miller's pyramid
Unannounced standardised patient	• Selection bias, avoided by encouraging high participation rate • Hawthorne effect if SP is expected, avoided by fairly long duration of study • Normally only used with new patients (first visit) (Luck & Peabody, 2002) • Expensive	Does
Announced standardised patient (e.g., at training session)	• Selection bias if low participation rate • Hawthorne effect inevitable (practitioner will behave differently as being observed) • Expensive	Shows how
Direct observation of patient consultation by an expert	• Selection bias if low participation rate • Hawthorne effect (Luck *et al.*, 2000) inevitable (practitioners perform better when observed) (Franco *et al.*, 1997) • Very expensive because involves expert observer (Luck *et al.*, 2000)	Shows how
Clinical vignettes (response to written case scenarios)	• Selection bias if low participation rate • Hawthorne effect inevitable • Vignettes over-estimate the quality of an examination and are inaccurate for reporting treatment plans (Peabody *et al.*, 2000)	Knows how
Abstracted clinical records	• Selection bias if low participation rate • Hawthorne effect if abstraction expected • Practitioners "under-record" tests actually done (Dresselhaus *et al.*, 2000; Luck *et al.*, 2000; Peabody *et al.*, 2000) • Practitioners "over-record" tests not actually done (Dresselhaus *et al.*, 2000; Luck *et al.*, 2000) • May be illegible • Expensive because a skilled expert must abstract the data (Peabody *et al.*, 2000) • A less accurate method of measuring quality than vignettes (Peabody *et al.*, 2000; Peabody *et al.*, 2004a)	Knows how
Interviews with practitioners	• Selection bias if low participation rate • Hawthorne effect • Practitioners state that they do more than they actually do (Franco *et al.*, 1997) • Reveal knowledge, not performance (Franco *et al.*, 1997)	Knows
Questionnaire about current practice	• Selection bias if low participation rate • Hawthorne effect inevitable • Reveal knowledge, not performance	Knows

1.5.3 Use of standardised patients in training

A common use of SPs is in clinical skills training and assessment of medical students, where they are often used in an objective structured clinical examination (OSCE) (Adamo, 2003; Barrows, 1993; Major, 2005). The United States Medical Licensing Examination now uses SPs (Adamo, 2003). SPs have also been used in dentistry (Maupome & Sheiham, 2000) and nursing (Ebbert & Connors, 2004).

The structure of the College of Optometrists' pre-registration training year and professional qualifying examinations has recently been significantly modified. The new scheme for registration is based on continuous assessment in the workplace during the pre-registration period, followed by a final assessment. Although some components of the new optometric pre-registration final assessment are a form of OSCE, they do not use SPs. Rather, they use simulated patients with in-room examiners carrying out the assessment. The College of Optometrists' are in the process of piloting a two-part final assessment. The first part of the pilot final assessment is an OCSE to assess a wide range of clinical tasks using patient-centred scenarios. The second part of the examination will assess two common optometric procedures: routine examination and contact lens fitting and aftercare (College of Optometrists, 2008c).

A simulated patient is someone who pretends to be a patient but who, in contrast with a standardised patient, has not been trained to complete a checklist that allows an assessment of the examination. Also, SP encounters tend to be unannounced whereas the practitioners usually know when they are examining a simulated patient. Use of simulated patients for educational purposes avoids mistreatment of real patients and allows students to work without embarrassment about their novice status (Barrows, 1993). Working with SPs allows trainees to build their confidence and learn from actual patients without the trainee worrying about their ability or technique (Barrows, 1993).

Standardised patients used in training can be manipulated for educational purposes unlike a real patient and can therefore be used to directly assess behaviours that are required in a competent clinical performance. Standardised patients could be used to monitor the progress of pre-registration training optometrists as part of their continuous assessment and in the final assessment.

1.5.4 Use of standardised patients in assessing clinical care

In addition to their use in training and for examinations, SPs have also been widely used to assess the quality of clinical care in qualified practitioners (Bachmann *et al.*, 2004; Barragan *et al.*, 2000; Dresselhaus *et al.*, 2004; Glassman *et al.*, 2000; Ramsey *et al.*, 1998; Peabody *et al.*, 2000; Luck & Peabody, 2002). They can be used not just to assess clinical criteria, but also to investigate history taking (Ramsey *et al.*, 1998), compliance with preventative care guidelines (Dresselhaus *et al.*, 2000), and advice/counselling given to the patient (Ramsey *et al.*, 1998; Russell *et al.*, 1983).

When SPs are used for quality assessment with qualified practitioners, the practitioners and staff in most studies are unaware of when they are seeing an SP (unannounced SPs), although in one or two studies the SPs have been seen in a special clinic on a special day (announced SPs) (Ramsey *et al.*, 1998).

Rethans & Saebu (1997) used standardised patients to establish the consistency in performance of general practitioners when they examine the same patient twice. This study also assessed inter-examiner variability when the same standardised patient is examined by more than one clinician. Although there was no significant difference in the performance of general practitioners between the first and second consultation of the same patient, the results showed significant variation in performance between physicians (Rethans & Saebu, 1997).

1.5.5 Standardised patient recruitment, training and quality assurance

The selection and training of SPs is crucial in studies measuring clinical care (Adamo, 2003; Luck & Peabody, 2002; Peabody *et al.*, 2004a; Dresselhaus *et al.*, 2004; Ramsey *et al.*, 1998). Individual SPs are usually selected on the basis of age, gender, ethnicity, physique, current and previous medical history and level of education and/ or language. Certain other characteristics (*Table 1.3*) are important and are usually assessed during and after SP training. Throughout the course of SP research, each SP's performance should be monitored for quality assurance (Adamo, 2003; Peabody *et al.*, 2004a). This is usually achieved either by video-taping or by directly monitoring a clinical encounter (Luck *et al.*, 2000).

Table 1.3: Important characteristics of Standardised Patients (SPs).

Characteristics assessed during training
• Ability to adapt to varying practitioner and/or interviewer styles.
• Ability to effectively portray a case requirement.
• Demonstration of active listening and communication skills
• Demonstration of promptness and preparedness.
• Demonstration of ability to adapt behaviour as a result of coaching/feedback.
Characteristics assessed at the end of training
• Stable findings during clinical examination
• Ability to deliver constructive feedback from a patient perspective
• Recording accuracy

The standardised patient is usually matched to a case requirement (e.g., of an appropriate age, race, and possibly with symptoms or signs of relevant pathology) and trained to reliably portray a clinical scenario and accurately recall both the details of the conversation between the practitioner and the SP and the tests performed during the encounter. The SPs usually report their clinical encounter by providing an accurate, written and objective report in the form of a checklist.

A drawback of using the same standardised patient for several clinical encounters is the need for them to continue to portray themselves as a "non-expert" patient. Having undergone several examinations, SPs might begin to volunteer information during the course of the examination thereby prompting the practitioner (Adamo, 2003). It is therefore important to monitor SP consistency by video recording or directly observing a clinical encounter for quality assurance purposes (Adamo, 2003; Peabody *et al.*, 2004a).

1.5.6 Checklists for standardised patient based assessments

At the end of an SP encounter, it is usual practice for the SP actor to report a practitioner's performance by completing a checklist. These checklists can either be case specific or generic (Gorter *et al.*, 2000). Generic checklists are used in assessing general skills whereas case specific checklists provide detailed information about a practitioner's skills during history taking, physical examination, case management and/or communication (Gorter *et al.*, 2000). Case specific checklists are usually developed specifically for each case and therefore tailored to the content of the consultation.

The information recorded in the checklists should be accurate, reliable and valid. Therefore, it is important that the actors are carefully trained to complete the checklists in a consistent manner. Checklist development is crucial in order to obtain a valid and reliable record of a practitioner's performance. At the end of the checklist development stage it is essential to state who developed the checklist, whether or not the development of the checklist was based on reviewed literature or data resulting from consensus procedures, and the scoring system used (Gorter *et al.*, 2000).

1.5.7 Choice of standardised patient profiles

A literature review revealed the importance and need to carefully develop scenarios incorporating observable evidence-based criteria into realistic scripts and objective checklists, and to carry out extensive pre-testing of the scripts (Glassman *et al.*, 2000; Luck & Peabody, 2002; Ramsey *et al.*, 1998). In SPs used with physicians, actors have been shown to be able to cope with completing, immediately after the consultation, checklists of 35-45 items that might have been performed during the visit or discussed by the physician (Luck & Peabody, 2002).

A typical number of scenarios to select is three or four (Bachmann *et al.*, 2004; Dresselhaus *et al.*, 2002; Luck *et al.*, 2000). Typically, the case scenarios and scoring criteria for the standardised patients are selected based on evidence-based reviews and clinical guidelines, and are reviewed by a panel of experts during the development phase of the study (Luck *et al.*, 2000; Luck & Peabody, 2002; Peabody *et al.*, 2000). Scoring is usually broken down into domains of the consultation (Luck & Peabody, 2002; Whelan *et al.*, 2005) such as: history & symptoms, examination, further tests requested, diagnosis, management (prescription & discussion) (Peabody *et al.*, 2000).

1.5.8 Sample size in standardised patient research

Sample size in standardised patient research can be described by stating (a) the number of scenarios investigated (one scenario might be played by more than one actor), (b) the number of practitioners who received SP visits, and (c) the total number of SP encounters (visits). This latter variable is usually the product of (a) and (b). The fundamental nature of SP research is descriptive and therefore the sample size calculations that are appropriate for cohort or case control studies are not appropriate. As in any study of this type, a decision about sample size is a simple trade-off between

the desire to use the maximum possible sample size, which will increase the precision of the descriptive variables, against the inevitable practical and logistical constraints of how many participants can be included in the time available. It was felt that it would be useful to review previous SP research in order to obtain a multi-disciplinary perspective on sample sizes that are appropriate and achievable in this type of research, and this review now follows.

In a comparison of different methods of measuring quality of clinical care, Franco et al. carried out SP assessments of 20 practitioners (Franco *et al.*, 1997). In another evaluation of different methods of measuring quality in clinical encounters, Peabody and colleagues invited 101 physicians to participate in the study. Ninety-seven (97%) physicians consented to be randomised for the study. Twenty of these 97 practitioners were randomly selected for inclusion in the study (Peabody *et al.*, 2000).

Ramsey and colleagues used SPs to investigate the ability of primary care physicians to take a complete and accurate history from their patients using a sample size of 134 (Ramsey *et al.*, 1998). Of those who were originally asked to participate only 53% consented, but this low participation rate compared with other published SP studies may have been because practitioners were required to take their history from the (announced) SPs in a special clinic on Saturdays.

A study to assess clinical competence in primary care evaluated 22 doctors using three SP visits for each doctor (66 in total) (Barragan *et al.*, 2000). However, these authors noted that their conclusions were limited by the small sample size. In a study of primary care physicians, 79% of those approached gave consent to participate, giving a sample size of 232 (Bowman *et al.*, 1992). In another study of 101 primary care physicians, 97% agreed to participate, from which a sample of 20 practitioners were chosen, each of whom saw 8 SPs (played by 27 actors), resulting in a total of 160 SP encounters (Dresselhaus *et al.*, 2000; Dresselhaus *et al.*, 2002; Luck *et al.*, 2000; Glassman *et al.*, 2000).

In a study to validate SP use in clinical settings, Luck and Peabody found that 88% of 163 eligible physicians consented to participate (Luck & Peabody, 2002) and recorded data were obtained from 40 of these. This population also seems to have been used as the basis for a subsequent paper validating clinical vignettes, which states that 116 were assessed with SPs, vignettes or both and specifies that 60 physicians were

selected at random to see the SPs (Peabody *et al.*, 2004a). Bachmann and colleagues asked 42 clinics to participate in a SP study, and the staff in 37 (88%) of the clinics consented (Bachmann *et al.*, 2004). A total of 271 SP visits were made. Recently, Dresselhaus and colleagues investigated 71 physicians with a total of 480 SP encounters (Dresselhaus *et al.*, 2004).

On the basis of this review, it was decided that the target for the present research was to undertake a total of 300 SP encounters, comprising 100 practitioners each examining three unannounced patients.

1.5.9 Limitations of standardised patient research

1.5.9.1 Selection bias

In standardised patient research practitioners are the research participants and it is therefore appropriate to afford them the same rights as are given to any research participant. This means that practitioners should only be included as participants if they have given informed consent; in other words, if they volunteer. Practitioners who are more confident of their clinical skills may be more likely to volunteer (Ramsey *et al.*, 1998), which could result in a bias likely to discover a higher standard of practice than that which is typical. This is a problem common to all SP research; therefore it is surprising that the present author is not aware of this issue being raised in the literature. However, this is only likely to be a major problem if a high proportion of invited practitioners decline to participate. The studies reviewed indicate that between 53% and 98% of invited practitioners accept the invitation to participate.

1.5.9.2 Hawthorne effect

The Hawthorne effect is the positive impact on behaviour that sometimes occurs in a study as a result of the interest shown by the experimenter in humans who are being treated, studied, or observed (Lied & Kazandjian, 1998). From a scientific point of view, the ideal SP study would be of practitioners who were completely unaware that they were being visited by SPs. However, as noted earlier in this chapter, studies that use SPs to investigate standards of clinical practice amongst qualified practitioners first obtain consent from the practitioners (Bachmann *et al.*, 2004; Barragan *et al.*, 2000; Bowman *et al.*, 1992; Peabody *et al.*, 2000; Luck & Peabody, 2002; Dresselhaus *et al.*, 2000; Peabody *et al.*, 2004a; Ramsey *et al.*, 1998) and it is usual practice to guarantee

the anonymity of participating practitioners (Bachmann *et al.*, 2004; Barragan *et al.*, 2000). This makes practitioners aware that they might be visited by an SP and they may therefore practice differently.

If informed consent from practitioners is integral to the study there is no way to completely avoid the Hawthorne effect, but measures can be taken to minimise any Hawthorne effect. For example, it is crucial to carefully train and test SPs before and throughout the research, including training for and testing of their acting skills, so that they will act convincingly as a real patient. Additionally, the chances of a significant Hawthorne effect are reduced if participating practitioners selected are those who normally examine a fairly high number of new patients, if practitioners are informed that the SPs will visit the practice at any time over a reasonably long time period, and in particular, if there is a reasonably long (but unspecified) interval between the practitioner giving consent and receiving the first SP visit.

1.5.9.3 Limitations

Another limitation of SP research into optometric practice is that certain patient groups are not amenable to the SP approach. In particular, it is not possible to use SPs to investigate clinical practice for patients belonging to the extremes of the age range of patients seen in optometric practice.

1.6 Conclusions from literature review

A literature review suggests a lack of systematic research investigating standards of clinical practice within optometry. Evidence-based research to determine the content of typical optometric eye examinations would be valuable for several reasons identified in section 1.2. Evidence-based studies within other healthcare professions have evaluated the content of clinical consultations. The literature reviewed reveals three main approaches to assessing clinical care: (1) abstraction of medical records, (2) use of clinical vignettes and (3) use of standardised patients who present unannounced to clinics. The use of these different methods for assessing the content of clinical consultations has been compared and contrasted in this chapter. It is clear from the literature reviewed that the use of standardised patients is the “gold standard” methodology for assessing “real life” clinical practice.

As long as practitioners do not detect the SP, then clinicians' true behaviour will be observed and will not be modified by the awareness that they are being assessed. Although this is not true of assessment by clinical vignettes, recent research demonstrates that carefully constructed computerised clinical vignettes can also obtain valuable data and compare fairly well with the gold standard of SPs. Indeed, all methods of measuring clinical practice have advantages and disadvantages. This chapter formed the basis of a paper published in *Ophthalmic and Physiological Optics* in 2007 (Shah *et al.*, 2007a), which describes techniques for measuring clinical practice within healthcare professions and discusses their applications to primary care optometry.

In many respects, SP and clinical vignette methodology should be easier to apply to optometric practice than to medical practice. This is because, compared with, for example, a general medical practitioner, a community optometrist has a much narrower scope of practice and a more limited potential test battery. For all the reasons outlined in this review, it is surprising that there appear to have been no published scientific attempts to obtain an evidence-based assessment of clinical practice within primary care optometry.

The literature reviewed highlights that research is necessary to provide rigorous data on the content of eye examinations of randomly selected optometrists. This factual information will make it much easier for the Bolam and Bolitho tests to be applied in a fair and consistent way. Evidence-based research on the content of typical optometric eye examinations would help to develop guidelines that differentiate between realistic minimum standards of competence (e.g., an important test that nearly all optometrists are using) and aspirational goals (best practice, which is still not achieved by a significant body of reasonably competent optometrists). The research will clearly define the current scope of routine optometry, so that appropriate goals and plans for the future can be made.

1.7 Aims of the research study

The overarching aim of the research described in this thesis was to investigate clinical optometric performance using three approaches:

a) Standardised patients from a wide range of ages, races, presenting symptoms and clinical features
b) Record abstraction
c) Computerised clinical vignettes

Although thwarted in achieving this aim for the very young and the very elderly, using standardised patients and record abstraction, this research attempted to establish whether optometric practices are at least prepared to examine an infant with a possible squint and a 90 year old patient with dementia. This investigation, conducted by means of a telephone survey, is described in Chapter 2.

2 Telephone Survey: A survey of the Availability of State Funded Primary Eyecare in the UK for the Very Young and Very Old

2.1 Aims of study 1

The National Health Service (NHS) provides General Ophthalmic Services (GOS) to eligible patients in the UK. A PubMed search was carried out for keywords: (*primary eyecare* OR *sight test* OR *eye examination*) AND (*GOS* OR *General Ophthalmic Service* OR *NHS* OR *state funded*). In 2006, prior to performing this telephone survey, this search revealed no published studies that have investigated the availability of GOS sight tests in the UK. Primary eyecare practices were therefore randomly selected by telephone to enquire about the availability of a GOS sight test for two patient scenarios: a child aged one year whose mother is concerned due to the presence of a family history (parental) of strabismus and a patient aged 90 years who was described as having dementia.

2.2 General Introduction

Most optometrists in the UK work in primary care community optical practices and these are the major providers of primary eyecare services. Nearly all of these primary care optometrists have a contract with the National Health Service (NHS) via local primary care organisations (PCOs) to provide sight tests to eligible persons. In England, the PCOs are known as Primary Care Trusts (PCT). Through these PCOs, the NHS provides General Ophthalmic Services (GOS) to children; people aged over 60, and various other exempt groups (*Table 2.1*). In 2006-7, 13.1 million of the 18.5 million primary eyecare examinations were funded by the NHS (National Health Service (General Ophthalmic Services), 2007). A recent survey of 75 optical practices found that all provided NHS funded eye examinations (Jessa *et al.*, 2007) to eligible patients. The aim of this telephone survey was to determine the availability of GOS sight tests for two categories of eligible patients: an infant and an older person with special needs. The Association of Optometrists, who represent most optometrists in the UK, have advocated using the term *sight test* to refer to the GOS sight test, in order to differentiate this from a full optometric *eye examination* which may include additional

procedures (Association of Optometrists, 2008c); and this terminology will be followed in this chapter.

Table 2.1: Categories of people eligible for NHS sight tests in the UK.

- Persons aged 60 years and over
- Children aged 0-15 years
- Students 16-19 years (in full time education)
- Adults/Partners receiving:
    - Income Support, or
    - Income-based Jobseeker's Allowance, or
    - Pension Credit guarantee credit
    - People entitled to, or named on, a valid NHS tax credit exemption certificate
- Low-income certificate holders (HC2). People who are named on a valid HC3 certificate may receive some help towards the cost of a private sight test
- Registered blind/ partially sighted
- Diabetic/Glaucoma sufferers
- Close relatives of glaucoma sufferers aged 40 or over
- Patients considered to be at a risk of glaucoma by an ophthalmologist
- Patients who require complex lenses

In order to be able to provide GOS under the NHS, optometrists, ophthalmic medical practitioners (OMPs), and corporate opticians need to be on the appropriate PCO list and state the availability of GOS services (Hirji *et al.*, 2008). For inclusion in the list, practitioners agree to adhere to the GOS Terms of Service. These terms are contained in the National Health Service (General Ophthalmic Services) Regulations 1986 (as amended) Schedule 1 (National Health Service (General Ophthalmic Services), 2008a) and are summarised in *Table 2.2*.

Several authors have noted that the fee for GOS sight tests is uneconomic, so that GOS work is only viable if subsidised by income from spectacle dispensing (Atkinson, 1994; Anon, 2001; Evans, 1998). GOS contractors may limit the amount of time they devote to the GOS. For example, they may restrict the number of appointments or number of hours available per day or numbers of days or sessions during which GOS services are available (Hirji et al., 2008). The local PCO should be advised of the times (Hirji et al., 2008). Optometrists can refuse to see anyone for a GOS sight test on a case-by-case basis. However, it is not explicitly stated in the regulations whether optometrists can decline to provide GOS sight tests to certain categories of eligible patients (e.g., young children), although the Department of Health (DoH) has advised that they doubt whether GOS practitioners can exclude whole categories of patients (Hirji et al., 2008).

Table 2.2: Terms of Service for General Ophthalmic Services (GOS). This is not a complete list, but is an overview concentrating on the Terms of Service relevant to this study.

❖ Premises and Equipment

- Make all necessary arrangements for provision of services
- Have proper and sufficient consulting and waiting room accommodation and suitable equipment

❖ Notices

- Display notices in prominent positions about the GOS services and indicate which patients are eligible for financial assistance under the NHS (Optical Charges and Payments) Regulations 1989

❖ Deputies and Employees

- An optometrist can arrange for another optometrist to test sight on his behalf. The deputy must apply for inclusion on the list
- An optometrist can only employ for sight testing:
  1. another optometrist
  2. a person acting under continuous personal supervision (pre-registration optometrist)

❖ Testing of Sight

(1) A contractor shall, having accepted pursuant to the regulations an application for the testing of sight, make such examination of the patient's eyes as may be required and in doing so shall exercise proper care and attention.

(2) Where an optometrist is of the opinion that a patient whose sight he has tested pursuant to (1) :

(a) shows on examination signs of injury or disease in an eye or its immediate vicinity, or any other abnormality of the eye or the rest of the visual system which may require medical treatment; or

(b) is unable to attain a satisfactory standard of vision when using corrective lenses he shall, if appropriate, and with the consent of the patient, inform the patient's doctor of his opinion. Where the optometrist tests the sight of a patient diagnosed as suffering from diabetes or glaucoma he shall inform the patient's doctor of the results of the test.

(3) Where an optometrist is of the opinion the patient whose sight he has tested pursuant to (1) requires glasses (whether or not the patient already has the required glasses) he shall, immediately after completing the sight test: and after consulting the records, if any, relating to that patient:

(a) in every case, issue to that patient a prescription for glasses, indicating the power of lenses required;

(b) where the particulars of the prescription are the same as those relating to the patient's existing glasses, so inform the patient.

(4) When the optometrist issues to a patient the prescription for glasses, he shall, immediately thereafter, require the patient to acknowledge its receipt on a sight test form.

❖ Home Visits (Regulation 12)

REGULATION 12

1. A person who wishes to have his sight tested under the GOS but due to age or infirmity is substantially housebound may request a contractor to visit him at his home for the purpose of testing his sight. This information is recorded on the sight test application form GOS1.

2. A contractor to whom a request under paragraph (1) is made shall, before making the visit, take such steps as are reasonably practicable to ascertain that the conditions set out in paragraph (1) are fulfilled

The aim of the survey was not to carry out a detailed investigation of regional variations in the availability of GOS sight tests. However, as a preliminary indicator of whether this issue is worthy of further study, the results obtained from practices in the London area (practices whose telephone number had a 020 prefix) were compared with those in the rest of the country. This chapter formed the basis for a paper published in *Ophthalmic and Physiological Optics* in 2007 (Shah *et al.*, 2007b).

2.3 General Methods

2.3.1 Sample selection

To practise in the UK, optometrists must be registered with the General Optical Council. Registrants are listed in the Opticians Register (General Optical Council, 2005), along with the addresses at which they practise. To randomly sample practices, the 2005 edition of the Opticians Register was used, which contains details of about 60 practitioners per page. A "random number between" function was used in Microsoft Excel to generate random numbers between one and 60. The list of random numbers generated was used to select practitioners from each page; i.e., the numbers 7, 52 and 33 meant the 7th, 52nd and 33rd practitioners were selected from that page. Five practitioners were selected from each double page (three from one page and two from the next). This method of selection was followed throughout the register, which gave 500 randomly selected practitioners. This sampling method was designed to select more practitioners than were required for the study, to allow replacements for practitioners for whom telephone numbers were unavailable.

For these 500 randomly selected practitioners, the GOC registration number and practice details were recorded on a spreadsheet. For those practitioners who work in more than one practice, the entry in the Register should list all the practices at which that practitioner works. In these cases, the practice that appeared at the top of the list was selected.

In case some practices could not be contacted during the survey, a greater number of practices than were required were randomly selected during the early stages of the study. To obtain the 200 practices for the telephone survey from the 500, a second level of randomisation was applied. The 500 were divided into batches of five, and a final list of practices to contact was selected as the first and third in every batch of five.

Of the 200, only three practices could not be contacted (owing to incorrect or unavailable telephone numbers) and for these three the next practice in the list of 500 was contacted instead.

2.4 Scenario 1: A child aged one year

2.4.1 Introduction

The aim of this scenario was to establish the availability of a GOS sight test for a child aged one year whose mother is concerned due to a family history of strabismus. The accessibility of a GOS sight test for this particular group was of particular interest because the first few years of life are critical for visual development, and strabismus and uncorrected refractive error are common causes of amblyopia (Levi, 1994). It is widely acknowledged that a family history of strabismus greatly increases the risk of this being present in a child: if one parent has suffered from strabismus or amblyopia then the risk of a child being affected is 40% (Evans, 2007). This fact should be well known to optometrists who will also be aware of concerns over the adequacy of children's vision screening in the UK (Thomson, 2002). An investigation of the role of heredity as a risk factor in different subtypes of strabismus found that heredity had the highest risk in accommodative strabismus (Ziakas *et al.*, 2002), the type of strabismus which is most amenable to treatment in community optometric practice.

The inclusion of children as a group of patients for whom the NHS will fund primary eyecare (*Table 2.1*) indicates an expectation that optometrists will provide eyecare to this group. The case description for this scenario, a young child in an "at risk" group was chosen with the aim of determining the availability and willingness of primary eyecare practices to provide GOS sight tests for such a case.

2.4.2 Methods

One hundred practices, selected as described earlier in this chapter, were telephoned by the researcher acting as a member of the public who is concerned about her twelve month old son. The information in *Table 2.3* was obtained from any respondent who answered the phone. If during the enquiry further information was requested regarding the family history of strabismus, the respondent was advised that the mother had an "eye turn" as a child.

Table 2.3: Questions asked in Scenario 1.

Question	Data
1. My son is one year old. At what age do you start testing children?	Age
2. We have a family history of "eye turn". Should he have an eye test?	Yes/No
If answer to question 2 is YES, then proceed to 3. If No, then proceed to 4, 5, and 6.	
3. Can it be done at your "opticians"?	Yes/No
If answer to question 3 is NO, then proceed to 4, 5, and 6.	
4. At what age should he have an eye test?	Age
5. What should I do if I see his eye turning?	Text
6. Is there anybody you can recommend I may able to contact/visit?	Text
If answer to question 3 is *YES*, then proceed to question 7.	
7. Will I be paying for the consultation? How much?	Yes/No Amount

The responses to the questions in *Table 2.3* were recorded in a spreadsheet. The results were initially analysed for all respondents as a whole. Further analyses were performed by dividing the respondents into those with a London telephone number (0207 or 0208) or not. There were 14 practices with London telephone numbers, leaving 86 practices based outside London.

2.4.3 Results

The vast majority of the practices telephoned were in England (94%), with 4% in Scotland, 1% in Wales, and 1% in Northern Ireland. The mean age at which practices declared that they start examining children was 3.1 years (range = less than 1 year to 7 years, SD =1.70). This was not significantly (t-test, p=0.24) different in the London area (3.1 years, range = 1.50 years to 6 years, SD = 1.14) compared with the rest of the country (3.1 years, range = less than 1 years to 7 years, SD = 1.78).

In answer to Question 2, "Should he have an eye test?" there were three typical answers. Some practices simply said "no" and did not advise a sight test elsewhere, some said "yes, at our practice", and some said "yes, but at another establishment" (typically, the Hospital Eye Service via a GP or Health Visitor).

Table 2.4 shows 76 practices (76%) responded that the child "Should have an eye test". However, there was a difference in response that was location dependent, with 68 practices (79%) telephoned outside London suggesting the child "Should have an eye test", compared to 57% (8/14) practices within London.

Table 2.4: Responses to the questions: "We have a family history of "lazy eye"/ "squint". Should my son have an eye test?" and "Can it be done at your opticians?"

	Eye Test Recommended (n=76)		Eye test not recommended (n = 24)
	Eye test offered at contacted practice	Eye test suggested elsewhere	
Total sample (n = 100)	46%	30%	24%
Practices outside London (n = 86)	48%	31%	21%
London practices (n = 14)	36%	21%	43%

The difference between proportions in the London and non-London groups for practices that recommended an eye test, versus those that did not, approach statistical significance at the 5% level (chi-squared test, p=0.075). This result should be interpreted with caution because of the small London sample. Of the 76% practices across the country that recommended an eye test, 61% (46 practices) stated that they would examine the child themselves and 39% (30 practices) recommended that the examination should be elsewhere. This result was very similar (chi-squared test, p=0.90) for the areas assessed, with 48% (41 practices) outside London and 36% (5 practices) within London, offering to examine the child in their own practice.

In answer to the question "Will I be paying for the consultation?", 98% of the practices that offered to provide eyecare to a one year old child responded that there would be no charge, with most stating that NHS sight tests for children aged under 16 were available at that practice. In fact, there was only one practice where the respondent reported that they would charge a fee, as the practice only offered private examinations. This practice was within the London area.

When practices did not recommend routine eyecare for the one year old child or were unable to provide an eye test at their practice, they were asked three further questions (*Table 2.3*). From Question 4, the mean age at which the respondents from this subgroup of practices stated that they felt this child should have a sight test was 3.5 years (range 1.5 years to 7 years, SD = 1.30). This mean age was not significantly different for outside London telephone codes (3.4 years, range 1.5 years to 7 years, SD = 1.31) compared with London codes (3.6 years, range 2 years to 6 years, SD =1.31) (t-test, p=0.70).

Fifty-four of the practices contacted were asked questions 5 and 6 (*Table 2.3*), of which fifty responded to both questions. Of these fifty practices, 24% (12 practices) recommended that the child should be seen by the General Medical Practitioner and/or health visitor for further advice. There was no significant difference in the responses to this question between the London and outside-London practices (*Figure 2.1*)). Interestingly, only one practice (4% of those based outside London replying to this question) recommended going straight to the Hospital Eye Service if an 'eye turn' was noticed in the child, compared to three practices in the London region. Only one practice recommended that the child should have a sight test from a specific community optometrist: this practice recommended asking for an appointment with a specific optometrist who visited their practice on a certain day.

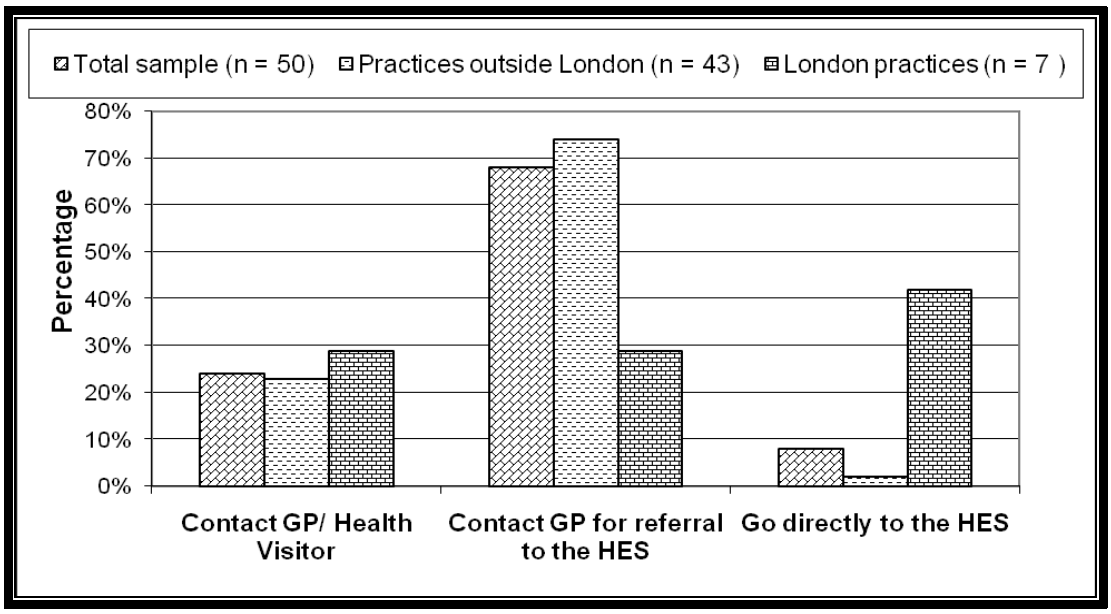


Figure 2.1: Responses to the question: "What should I do if I see his eye turning? Is there anybody you can recommend I may able to contact/visit?" 50 practices responded to this question and the proportions quoted are of this 50.

2.4.4 Discussion

The average age at which practices across the country will carry out a first sight test on a child is 3.1 years. Fifteen percent of practices telephoned would examine neonates aged from birth to six months, but it is worrying that 2% of practices would not carry out a sight test until the child is 7 years of age. In a recent survey by the College of Optometrists to gain an insight into the primary care activities of optometrists, one of the questions participating optometrists were asked was "What is the minimum age at which you would examine a child?" (College of Optometrists, 2008b). It is interesting to

note that, 41% of the 2751 optometrists who participated in the survey would examine a child less than one year of age; 76% of optometrists would examine a child less than 3 years of age; 15% of optometrists would examine a child aged 3 years; 5% of optometrists would examine a child at a minimum age of 4 years and 2% of optometrists would examine a child at a minimum age of 5 years. Although the question asked in the College survey was not relating to a specific patient scenario, it is noteworthy that 26% of optometrists who took part in the survey would examine a child aged less than 6 months compared to 15% of practices telephoned in this study.

Having explained the scenario above to the respondent, the majority (76%) of practices advised that the child should have an eye examination. These results show that most practices appreciate the need for early primary care for this category of children "at risk" due to the presence of family history of strabismus. Approximately half of the practices telephoned were willing to carry out the sight test themselves. *Table 2.1* shows "children under the age of 16" are a category of patient eligible for a GOS sight test and it was noted earlier in the discussion that the DoH takes the view that it is not permissible for optometrists to deny categories of patients the opportunity to receive a sight test in their practice. Yet the data obtained from this telephone survey indicate that 54% of practices do effectively exclude very young children.

Early primary eyecare in children is particularly important: vision plays a major role in a child's sensory and motor development, therefore, any undetected visual or ocular anomalies are liable to impede normal visual development (Donaldson, 2002). The importance of early optometric care in children has been recognised by the profession for many years. DOCET (Directorate of Optometric Continuing Education & Training) is a DoH special committee that oversees the management of government funds set aside for the provision of continuing education and training for all UK registered optometrists. DOCET has periodically focussed on paediatric optometry and a recent update (DOCET, 2006) publicised the launch of a new Paediatric Optometry Project. In this publication DOCET stressed that they consider training for optometrists in dealing with child patients and their visual problems to be a high priority. The objectives of the new project are to equip optometrists with the skills to examine a child patient; to increase the awareness of specific requirements for patients and to increase significantly the number of optometrists prepared to provide appropriate care to their child population.

The responses from London practitioners were generally similar to those of practitioners from other parts of the country. An exception is the proportion of practices who recommend that if a parent observes a turning eye in a one year old child then they should be advised to go directly to the Hospital Eye Service. Two of the seven London practices that responded to this question suggested that the child should go straight to Moorfields Eye Hospital. One practice in the London region recommended a different hospital. Of the 43 practices that responded to this question outside the London region, only one practice recommended going to an eye hospital. It is possible that this discrepancy is related to the presence of Moorfields Eye Hospital in the London area. However, in view of the small London sample this conclusion is tentative.

2.5 Scenario 2: A patient aged 90 years with dementia

2.5.1 Introduction

The aim of this scenario was to investigate the accessibility of a GOS sight test for an older person described as suffering from dementia. Dementia is a structurally caused permanent or progressive decline in several dimensions of intellectual function that interferes substantially with the person's normal social or economic activity (Berkow, 1992). Well known diseases that cause dementia include Alzheimer's disease and Creutzfeldt-Jakob disease. Dementia affects individuals in different ways depending on the type and severity of the condition. The disease usually begins after the age of 60, although it can occur earlier in some cases.

Vision loss in older people due to natural ageing is a major concern in the healthcare professions. A recent review of vision screening in older people concluded that between 20% and 50% of older people have undetected reduced vision (Jessa *et al.*, 2007). The majority of these people have correctable visual problems (refractive errors or cataract). Age-related changes also occur to structures such as the eyelids and cornea. All these changes can cause not only a reduction in the expected quality of vision but can also make examination of the eyes more difficult.

Patients with dementia not only suffer the general visual problems associated with aging but also experience visual disturbances as a result of the damage to, or degeneration of, the brain. These patients have difficulty in perceiving what they see

rather than how well or sharply they see it. Problems most commonly occur in perception of motion, depth, colour and contrast (Solomons, 2005).

In this scenario practices were asked if they could examine a patient aged ninety years who suffers from dementia. If on questioning further information was required, the practice was advised that the patient has moderate dementia and lives with her daughter. The practice was informed that the patient would be brought into the practice in a wheelchair, but was able to walk short distances if required.

The Disability Discrimination Act 1995 protects disabled people in the following areas; employment, access to goods, facilities and services and in the management, buying or renting of land or property. Following changes to the Act in 2004, discrimination under the Act by the community optometrist can occur in one of two ways. Firstly, by treating a disabled person less favourably, for a disability related reason, than a person who is not disabled. The following could be considered to constitute less favourable treatment: refusing treatment, providing a worse standard of service, or offering service on worse terms. The Disability Discrimination Act section 19(1a) also states that it is unlawful for a provider of services to refuse to provide "to the disabled person any service which he provides, or is prepared to provide, to members of the public" (Office of Public Sector Information, 2006). The second cause of discrimination is failing to comply with the duty to make reasonable arrangements for the disabled person. Service providers are required to provide extra help or make changes to the way they provide services. Specifically, as from October 2004 all service providers need to make reasonable adjustment to physical features of the premises in order to overcome physical barriers that may prevent someone from using their service. Hence, another aim of the survey was to investigate the extent to which optical practices meet their obligations under this Act.

An additional aim of this case scenario was to establish the accessibility and/or awareness of domiciliary visits. In order for a domiciliary visit to be deemed necessary, the criteria in the GOS *Terms of Service* state that it is the practitioner's responsibility to establish that a domiciliary visit is absolutely necessary (National Health Service (General Ophthalmic Services) 2006). However, the professionals will not be expected to exercise any clinical judgement in deciding whether the condition is as disabling as the patient alleges (Hirji *et al.*, 2008). The patient or carer will be required to certify that

they have requested a domiciliary visit because the patient is unable to leave home unaccompanied.

2.5.2 Methods

A different set of 100 practices (a different data set to that used in Scenario 1) were telephoned by the researcher, acting this time as a member of the public who would like to arrange an eye examination for her mother. The person who answered the phone (respondent) was advised that the patient had dementia and lived with her daughter. The questions in *Table 2.5* were asked and results recorded in a spreadsheet. The results were analysed for all respondents together and then by dividing the respondents into those with or without a London telephone number.

Table 2.5: Questions asked in Scenario 2.

Question	Data
1. I would like to book my mother in for an eye test. She is 90 years old and has dementia. Is it possible to arrange an appointment?	Yes/No
If answer to question 1 is YES, then proceed to question 2 **If answer to question 1 is NO, obtain reason for declining and then proceed to question 4**	
2. Will she have to cope with stairs?	Yes/No
For all those who are asked question 2, proceed to question 3.	
3. Do you have a room on the ground floor where she can be seen?	Yes/No
If answer to question 3 is YES, then proceed to question 5. **If answer to question 3 is NO, then proceed to question 4.**	
4. Do you know of a practice that can accommodate her?	Yes/No
If answer to question 4 is YES, then note down the practice details. **For all those who are asked question 4, proceed to question 5.**	
5. Do you know of an "optician" who may be able to visit her at home to examine her eyes?	Yes/No
If answer to question 5 is YES, then note down the details & finish. **If answer to question 5 is NO, then proceed to question 6.**	
6. Is there anyone I can speak to who may be able to give me this information?	Yes/No

2.5.3 Results

The vast majority of practices telephoned were in England (95), with 4 in Scotland, 1 in Wales, and none in Northern Ireland. Of the 100 practices, 93% responded that it was possible to arrange an eye examination for the patient with dementia. At this point, the issues of physical access (e.g., wheelchair, stairs) had not yet been raised. There is no difference (chi-squared test, p=0.25) in the responses for practices telephoned outside London (n=78) when compared to practices within London (n = 15).

The 93% of practices that responded “yes” to question 1 were asked question 2, “Will she have to cope with stairs?”, and 27 said there were stairs. Additionally, of the 7% of practices who had said “no” in response to question 1; that they would not see the patient, 3% had volunteered the information that this was because of steps. Therefore, a total of 31% (30 of 96) of practices have some form of stairs and/or steps, either to access the practice or within the practice to access some consulting rooms. This figure was not significantly different (chi-squared test, p=0.31) for outside London (27 of 81, 33%) when compared to practices within London (3 of 15, 20%). Most of the practices with stairs or steps to some areas of the practice also had at least one consulting room on the ground floor.

Altogether, 89% of practices responding “yes” to question 1 have a consulting room at ground level, with no significant variation between the areas assessed. Furthermore, some of the practices with steps to the consulting room had lift, ramp, or stair lift access. So, altogether 95% of practices responding “yes” to question 1 could provide access to a consulting room for a patient who cannot cope with steps. Only one practice, out of a total of 5 practices who responded “No” to question 3, responded positively to question 4, and recommended a nearby practice with a downstairs consulting room.

Fifty responses were obtained in answer to question 5, “Do you know of an ‘optician’ who may be able to make a home visit to examine the above patient?” Approximately a third of these were a suggestion that was made without prompting by the respondent as an alternative to bringing the patient into the practice for a sight test. Half of those who responded, could either arrange for a domiciliary visit themselves or recommended companies and/or optometrists who perform domiciliary visits. The difference between the proportions in the London and non-London groups was not statistically significant (chi-squared test, p=0.68).

Figure 2.2 illustrates the percentage of practices responding to question 5 that perform domiciliary visits as opposed to recommending another organisation. Only 6% of those practices that recommended a domiciliary visit specifically mentioned they would only perform a domiciliary visit if the patient was housebound.

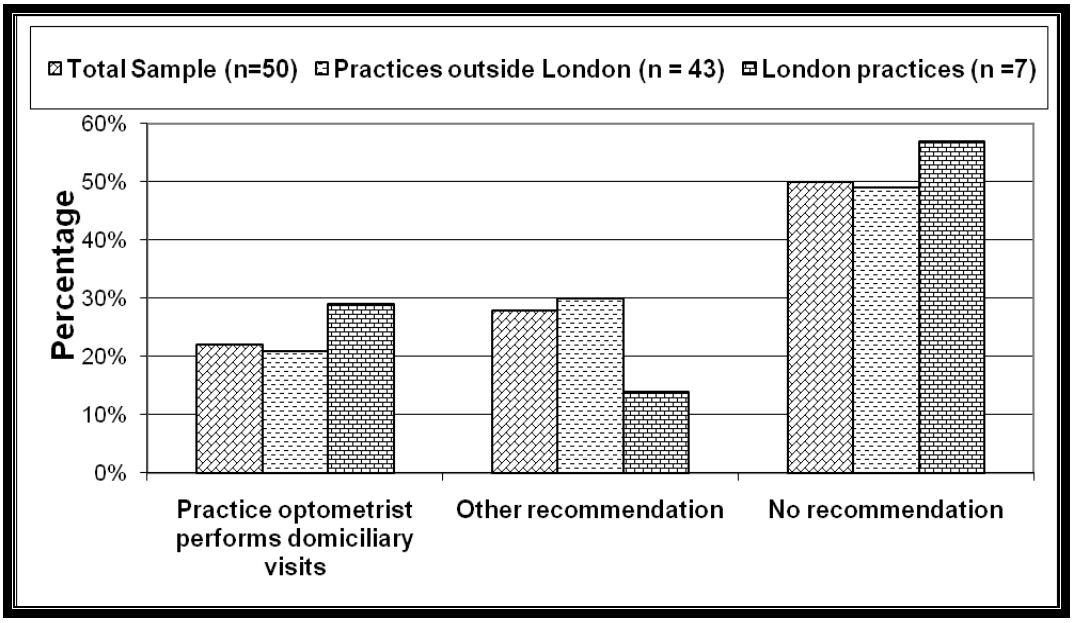


Figure 2.2: Responses to Question 5: "Do you know of an "optician" who may be able to visit her at home to examine her eyes?" The percentages quoted are calculated from the proportion responding to this particular question.

2.5.4 Discussion

Patients with dementia, particularly Alzheimer's disease, are prone to certain visual problems (Armstrong & Syed, 1996; Mort, 2000). Hence the willingness of practices to examine an older person with dementia was investigated. The majority (93%) of practices telephoned were willing to examine a patient with dementia, with no significant variation between the areas assessed. All of the practices that were willing to examine the patient informed the caller that it would be advisable if the patient were accompanied when she attended for the sight test, in case any assistance was required.

Seven percent of the practices declined to offer an appointment at a stage in the questioning when all they knew was that the patient was aged 90 and had dementia. Presumably, an appointment was declined in most cases either because of the age of the patient or because of the presence of dementia, and it seems more likely that the dementia was the reason. If so, this appears to be a contravention of the Disability Discrimination Act section 19(1a) stated above. The Disability Discrimination Act also discusses disability in relation to premises, which relates to the subsequent telephone questions regarding wheelchair and step-free access. The Disability Discrimination Act

1995 section 21(2) states that “Where a physical feature (for example, one arising from the design or construction of a building or the approach or access to premises) makes it impossible or unreasonably difficult for disabled persons to make use of such a service, it is the duty of the provider of that service to take such steps as are “reasonable” to remove, alter, provide a means of avoiding, or provide a reasonable alternative to make the service available” (Office of Public Sector Information, 2006).

Only five practices from the 100 telephoned had stairs with no step-free access into a consulting room. Of the five, two practices performed domiciliary visits and the other three recommended contacting the local health authority for a list of practitioners who provide domiciliary visits. Whether offering domiciliary services constitutes a “reasonable” alternative to making the service available is not known and Hirji et al (2001) noted that it remains for the courts to establish a definition of “reasonable” in particular cases.

Approximately half of the practices telephoned were asked question 5 (*Table 2.5*), of which half were able to organise a domiciliary visit or give contact details to obtain further information. Only 6% (3 practices) of respondents to question 5 specifically mentioned that domiciliary visits were only possible if “the patient is housebound”.

2.6 General Discussion

Primary eyecare for children at an early age is an important provision, especially when there is a family history of strabismus (Evans, 2007). The inclusion of the under sixteen age group as a category of patients eligible for GOS sight tests emphasizes the need for primary care optometrists to provide paediatric eyecare. In the UK, optometrists are the main providers of eyecare to children during the school years, a period during which refractive errors or binocular vision anomalies quite often occur (Logan & Gilmartin, 2004). It is hoped that the recent launch of DOCET’s Paediatric Eyecare Project will lead to an increase in the proportion of optometrists who provide eyecare to pre-school children.

With the ageing population in the UK, the category of an older patient with dementia used in this study is likely to be an increasingly common presentation to the primary care optometrist. It is therefore reassuring that 93% of practices felt able to cope with such a patient. The majority of practices meet the requirements of the Disability

Discrimination Act 1995. With reference to the NHS Terms of Service, practices need to be aware that domiciliary visits can only be made if the patient is substantially housebound and is unable to leave home unattended.

2.6.1 Exclusion of categories of patients

Fifty four per cent of practices telephoned declined to provide GOS services to young children. It was noted in the Introduction that the DoH has expressed the view that it is not permissible for practitioners to exclude categories of patients from GOS services (Hirji *et al.*, 2008). An explicit statement to this effect was not found in the GOS regulations. The Department of Health was therefore contacted to ascertain the source of this view and asked whether, for example, they consider it permissible for practitioners to decline to examine pre-school children. Their reply cited Section 13A (1) of the National Health Services (General Ophthalmic Services) Regulations 1986: "An eligible person who wishes to have his sight tested under General Ophthalmic Services may make an application to any contractor for his sight to be tested". The next section (2) of the regulations says that this application should be on the form provided by the PCO: this is the sight test form that will be familiar to UK optometrists.

The Department argues that "if a contractor were excluding a category of patient then that would mean eligible patients could not apply to any contractor". This would seem to be an equivocal interpretation. It could equally well be argued that it is implicit in the concept of an application that there is the facility for a rejection of the application, regardless of whether the reason is because the patient belongs to a certain category. Furthermore, if the practitioner were always to exclude members of a certain category, then it would be sensible for the practice to inform the patient of this at the initial telephone enquiry, rather than requiring them to attend the practice, complete a sight test form and then be refused.

Another difficulty is the definition of *a category*. It is possible that by "category" the DoH are referring to those groups of individuals who are entitled to GOS sight tests (e.g., those under 16 years of age), although the word category is not used in the GOS regulations. The researcher believes that the term category, when used in the DoH's response, has its more general everyday meaning. It is perhaps debatable whether a question about a specific 90 year old patient with dementia would identify a response by practitioners to a category of patient. However, it does seem unequivocal that the

question “at what age do you start testing children” will identify practitioners who might exclude a category of young patients.

As with any equivocal interpretation of legislation, the validity and significance of the DoH interpretation of the regulations can only be established by case law and therefore remains uncertain. Other factors will also need to be considered, such as ethical guidelines and most importantly the welfare of the patient. It can be argued that the Department’s assertion that practitioners cannot exclude categories of patients conflicts with the first point of the code of conduct of the GOC, “the practitioner should make the care of the patient their first and continuing concern” (General Optical Council, 2008a), and with the first principle stated in *Code of Ethics and Guidance for Professional Conduct* published by the College of Optometrists, “the optometrist has a duty to place the welfare of his/her patients before all other considerations” (College of Optometrists, 2008a). The key issue is whether the care and welfare of a patient are best served by a practitioner managing a patient who falls outside the limits of the practitioner’s clinical expertise.

This issue is recognised by the College of Optometrists who also inform the profession: “practitioners should recognise their limitations and where necessary seek further advice or refer the patient elsewhere” (College of Optometrists, 2008a). For example, if optometrists know that their clinical skills and experience are not adequate for examining young children then it is in the patient’s best interest for the practice receptionist to decline requests for an appointment from parents of children within this age group. This is confirmed by point 1.5 of a joint document issued by the Royal College of Ophthalmologists, College of Optometrists, and British Orthoptic Society (2002) which states: “All members of the ophthalmic team should be confident that they have the appropriate skills and expertise before managing any child. Any member of the ophthalmic team who does not spend a significant proportion of their time in the management of children is discouraged from participation in children’s eyecare”.

This is also an issue (Dr Margaret Woodhouse, personal communication) for people with special needs (physical and intellectual disabilities) where there are simply not enough patients for it to be practical for every optometrist to have adequate skills, let alone the necessary experience, to provide eyecare for these patients. Yet optometric anomalies are prevalent (Woodhouse *et al.*, 2003) in people with special needs (for

example, Down's Syndrome) and it is important that this group of the population receive regular eye examinations (Woodhouse, 1998).

It is important to note that this research was based on responses received during a telephone conversation during which full information about the patient scenario was provided. If however, an appointment was made for either of the two scenarios described in this chapter without any detailed information being provided, the practice would only be able to make a decision as to whether to test the sight of the person upon the patient's arrival.

Of the 200 practices that were contacted in the survey, 1% of respondents were from Wales and 4% from Scotland. It would be interesting to conduct further studies in the future to look at the impact of the various eye care schemes that have recently been set up in both Scotland and Wales. The proportion of UK practitioners practising in Wales (6%) and Scotland (9%) is higher (Federation of Ophthalmic & Dispensing Opticians, 2008) than the proportions of randomly selected respondents from these regions. It might also have been instructive to investigate whether there was a bias in responses depending on the type of practice (independent, small multiple, large multiple). Although these analyses were not carried out in this survey, it would be interesting to conduct a further study to look at these differences.

2.7 Chapter summary

In summary, this telephone survey highlighted an important issue for primary eyecare practitioners in the UK. Practitioners who lack the skills, experience, or aptitude to deal with a certain category of patient are faced with a dilemma. They could retrain to gain the necessary skills, and it is hoped that the recent DOCET project will result in increased interest in providing eyecare to pre-school children. But in view of the infrequent attendance of this very young age group (Guggenheim & Farbrother, 2005) and of other categories of patient (e.g., people with intellectual disabilities) in some optical practices, it may be impossible for all practitioners to maintain sufficient levels of experience to meet the professional guidelines. In these cases it will be in the patients' best interests for the practice reception staff to direct telephone enquiries to another practice which can provide the necessary care. The overriding ethic to place the welfare of the patient in Scenario 1 above other considerations may compel practitioners to make this decision, although it may be contrary to the current

interpretation of the GOS Terms of Service by the Department of Health. It is hoped that the present research, which was published in the journal of the College of Optometrists in 2007, will encourage a debate on this issue and will lead to departmental advice that is more commensurate with the maintenance of high ethical standards.

In chapters 3 to 7 the thesis returns to the overarching aim described in Section 1.7: to investigate optometric clinical performance. In these chapters the method employed is the gold standard Standardised Patient approach.

3 An Overview of Study 2: The Standardised Patient Study

3.1 Aims of study 2: The standardised patient study

As noted in Chapter 1, investigating the typical content of optometric eyecare in England is important in order to gather data on optometric services, to develop priorities for optometric continuing professional development, and to evaluate the outcome of training initiatives. Objective data on the current scope of optometric activities may influence governmental, NHS, and professional policy decisions. In clinicolegal cases (both for civil litigation and disciplinary cases instigated by the General Optical Council), an optometrist's actions can be successfully defended if it is shown that the eyecare that they provided is supported by the actions of a significant body of reasonably competent optometrists: the Bolam and Bolitho tests (Herring, 2006;Jones, 1996). Justice in these cases and in consumer complaints is facilitated by an evidence-based investigation of the content of optometric eyecare. Such research will also help to establish meaningful professional guidelines.

To investigate the content of typical optometric eyecare in England, the standardised patient methodology (described in detail in chapter 1) was used, although not previously used in optometry, was found from a literature review to be the gold standard methodology for the evaluation of clinical care. The research described in this chapter has four main aims:

1. Provide data on the content of typical optometric eye care in England for three different standardised patient scenarios.
2. Evaluate how appropriately the eye examinations were carried out for the patients as they presented.
3. Investigate the differences between different types of practice (independent, small multiple and large multiple).
4. Assess the appropriateness of the standardised patient approach to measure clinical care within optometry.

3.2 Choice of standardised patient profiles

As discussed in Chapter 1, standardised patient profiles are typically selected based on evidence-based reviews and clinical guidelines, and are reviewed by a panel of experts during the development phase of the study (Luck *et al.*, 2000; Peabody *et al.*, 2000; Luck & Peabody, 2002). A fairly characteristic number of scenarios to select based on previous similar studies seems to be 3 to 4 (Bachmann *et al.*, 2004; Luck *et al.*, 2000; Dresselhaus *et al.*, 2002). As part of this research, consenting optometrists were visited by three standardised patients to represent three different case scenarios.

Headaches are a common condition and a frequent reason for the public to consult healthcare practitioners, including optometrists (Gutteridge & Cole, 2000; Giovannoni, 2000). Patients typically present in optometric practice with headaches and/or symptoms suggestive of migraine by self referral. General medical practitioners often recommend an eye examination in cases where a patient is presenting with headaches with the suspicion that there may be an underlying ocular cause for their symptoms. In some cases, optometrists are required to establish or confirm diagnosis of migraine or differentiate it from other kinds of headache or visual phenomenon, some of which may have sinister causes (Gutteridge & Cole, 2000).

Similarly, optometrists often encounter patients presenting with symptoms of floaters and/or flashing lights, both of which are classical symptoms of acute posterior vitreous detachment (PVD) and retinal detachment, typically in a patient aged over about 40 years (Chignell *et al.*, 2000). PVD occurs as an ageing process of the vitreous and its prevalence increases proportionally with age and degree of myopia. Flashing lights, floaters, a visual field defect and loss of vision are the four most common presenting symptoms relating to a PVD, retinal break or retinal detachment (Tanner *et al.*, 2000).

The prevalence of primary open angle glaucoma (POAG) in the UK population aged over 40 is estimated to be 2.0%, with 542,000 estimated to have the disease and up to 65% of cases undetected (Azuara *et al.*, 2007). Prevalence is higher in people described as “Afro Caribbean” and “West African”, with onset at a younger age compared to people described as “Caucasian” (Rudnicka *et al.*, 2006). Late presentation with advanced disease is a risk factor for blindness from glaucoma (Fraser *et al.*, 1999). Late detection may result from patients not engaging with

community eyecare, from a failure of health professionals to identify the disease at an early stage, or from unusually rapid disease progression.

In view of the frequent attendance of patients presenting with headaches, photopsia and floaters and the risk associated with late detection of glaucoma, standardised patient profiles were chosen to investigate the symptoms, history, and clinical investigation and management by optometrists of these particular symptoms and conditions.

3.3 General Methods

3.3.1 Developing the case scenarios and checklists

As discussed in section 3.2, the standardised patient profiles were selected to represent common symptoms and conditions encountered in primary eyecare practice. Based on the standardised patient profiles selected, a case scenario was developed for each standardised patient. The case scenario outlined the standardised patient role description and the primary objectives for each standardised patient profile. The primary research objectives were different for each of the three standardised patients based on the patients' presenting symptoms or the condition being investigated. In order to answer the primary research question(s), a list of secondary research questions was derived based on clinical guidelines and the literature reviewed specific to each case scenario.

The list of secondary research objectives was designed to correspond fairly closely with the case-specific checklists discussed in the next section. The primary and secondary research objectives will be discussed separately in chapters relevant to each scenario. For example in the first patient scenario, the SP presented for an eye examination as a young myope with recent onset headaches. The primary research objectives in this case were two-fold: to establish whether the eye examination was appropriate for the identification of the recent onset headaches and for the appropriate management of these and whether the eye examination was appropriate for the prescribing of an accurate refractive correction. Questions that would need to be asked to elicit the headaches history, tests that would need to be performed and management options that may be offered to the patient all formed part of the list of secondary

research questions. These questions were also added to the basic checklist to form a case specific checklist for this scenario.

The standardised patient role descriptions were also based on the primary and secondary research objectives. The responses to the secondary research questions, particularly those relating to symptoms and history and management were used to develop the actor role description. To answer questions relating to the patient's general health, ocular history and family medical and ocular history during the SP visits, the patient's true history was used since in none of the cases was this inappropriate.

A panel of experts, shown to be a reliable approach for setting standards for clinical competence (Ross *et al.*, 1996), was recruited to provide a detailed peer review analysis of the case scenario and checklists. The panel of experts were asked to review and modify the case scenario and checklist prepared by the researcher for each SP. The panel of experts consisted of four members; each an expert in the field relevant to the case scenario. Upon receipt of feedback from all four members, the researcher reviewed, amalgamated and incorporated suggestions recommended in line with the literature reviewed. The feedback received for these two documents from members of the expert panels for each case scenario is included in the appendices (appendix 01, appendix 02, appendix 03).

To gain a qualification in optometry, trainees have to demonstrate that they are proficient in the associated core competencies relating to optometry. 'Core competency' is the term used to describe the knowledge and skills an optometrist must possess in order to register with the General Optical Council and practice in the UK. There are eight core subjects, each of which consists of a range of competencies to be achieved within the first quarter, second quarter or by the qualifying examination. The specific core competencies relating to each scenario are highlighted in *Table 3.1* below.

Table 3.1 : A table highlighting specific Stage 2 Core competencies relating to the three different scenarios.

	Core Competencies	Scenario
Core Subject 1: Communication Skills		
1.1	• The ability to take an accurate history from patients with a range of optometric conditions	1,2,3
1.2	• The ability to elicit significant symptoms	1,2,3
1.5	• The ability to impart to patients an explanation of their physiological or pathological eye condition	1,3
1.6	• An ability to understand a patient's fears, anxieties and concerns about their visual welfare, the eye examination and its outcome	1,3
Core Subject 2: Professional Conduct		
2.1	• The ability to manage patients in a safe, ethical and confidential fashion	1,2,3
2.2	• The ability to create and to keep clear, accurate and contemporaneous patient records	1,2,3
2.4	• The ability to make a judgement regarding referral and an understanding of referral pathways	1,2,3
Core Subject 3: Visual Function		
3.1	• The ability to refract a range of patients with common optometric problems by appropriate objective and subjective means	1,2,3
3.2	• The ability to make appropriate prescribing and management decisions based on the refractive and oculomotor status.	1,2,3
Core Subject 4: Optical Appliances		
4.1	• The ability to advise on and to dispense the most suitable form of optical correction taking into account durability, comfort, cosmetic appearance and lifestyle	1,2,3
Core Subject 5: Ocular Examination		
5.1	• The ability to use instruments in ocular examination and to understand the implications of the findings in terms of subsequent examination techniques	1,2,3
5.2	• The ability to assess the external eye and adnexa	1,2,3
5.4	• The ability to assess pupil reactions	1,2,3
5.5	• The ability to use a slit lamp	2,3
5.7	• The ability to examine fundii using direct and indirect techniques	1,2,3
5.9	• The ability to investigate visual fields and to analyse and interpret the results	1,2,3
Core Subject 6: Ocular Abnormalities		
6.1	• The ability to interpret and investigate the presenting symptoms of the patient	1,2,3
6.2	• The ability to develop a management plan for the investigation of the patient	1,2,3
6.4	• An understanding of risk factors for common ocular conditions	2,3
6.5	• The ability to recognise common ocular abnormalities and to refer when appropriate	3
6.10	• The ability to evaluate glaucoma risk factors, to detect glaucoma and refer accordingly	2
6.13	• The ability to evaluate and manage a patient presenting with symptoms suggestive of retinal detachment	3
Core Subject 8: Binocular Vision		
8.3	• The ability to investigate and manage adult patients presenting with heterophoria.	1

3.3.2 Developing the checklists

In designing the checklist, one possible approach is to produce a prescribed list of questions and tests that are felt to be essential and to criticise practitioners who fail to conform to this prescribed list. This approach was avoided as it was regarded as over-simplistic. For example, in preliminary discussions about symptomatology, one expert adopted a very 'open' questioning style ('so, what can I do for you today?') with very few specific closed questions. Another expert advocated the opposite approach, with a long list of detailed specific closed questions.

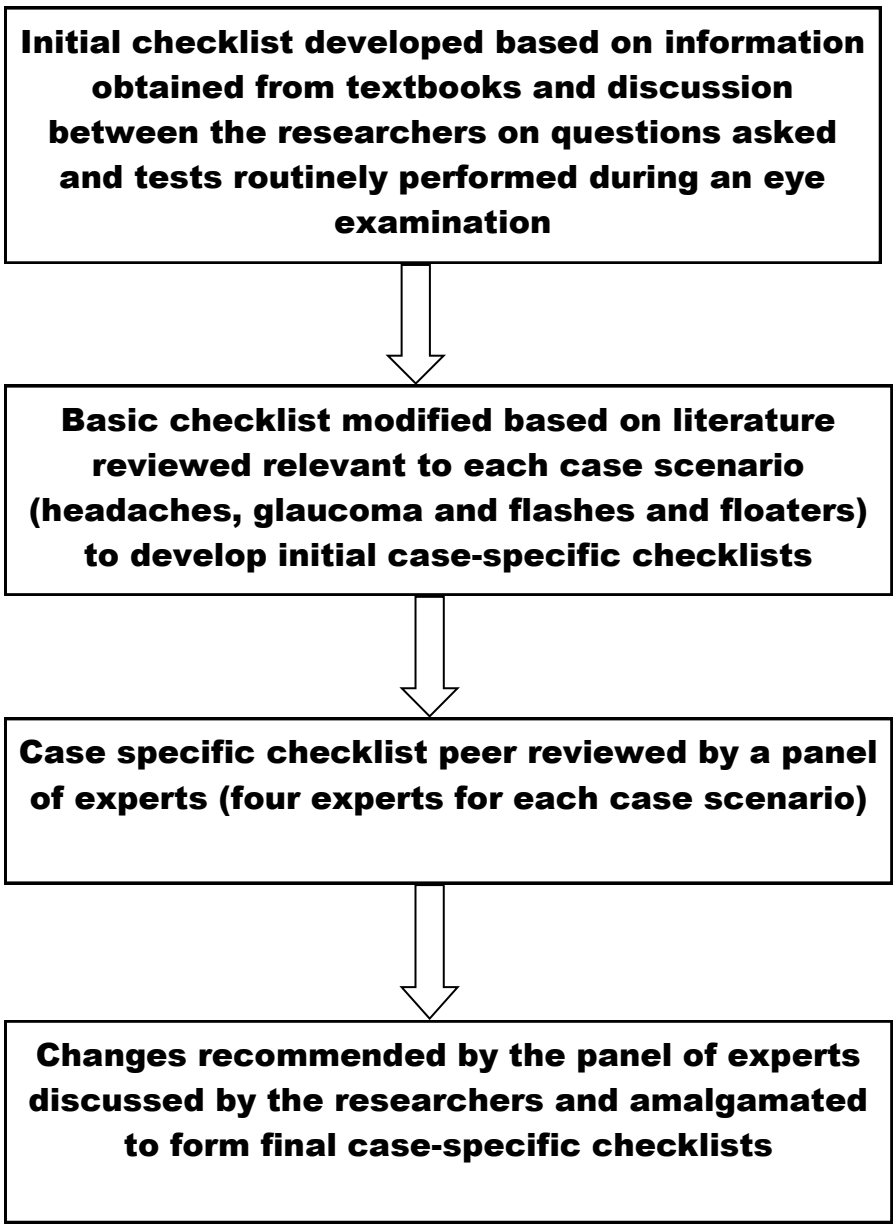
An initial checklist consisting of questions that would routinely be asked relating to the patient's symptoms and history, tests that would be performed during a regular eye examination and management advice (e.g., re-examination interval) was designed. Other general information such as the cost of the examination, duration of eye examination and whether an update in spectacles was recommended was also included in the checklist. The information relating to history and symptoms and tests performed during a "routine" eye examination included in the initial checklists was obtained from clinical guidelines (College of Optometrists, 2008a; General Optical Council, 2008b) and books used during optometrist training (Harvey & Franklin, 2005; Elliott, 2007). This checklist was then used to develop case specific checklists for each case scenario based on the literature reviewed relevant to each scenario. This will be discussed in chapters relevant to each scenario.

The checklists were designed to be completed by the SP immediately at the end of each consultation as a record of the consultation. The checklists for each case scenario consisted of a list of questions and tests that the practitioner may or may not have carried out on the patient. Some of the questions and tests were specifically appropriate to the presenting symptoms and were selected based on evidence-based reviews and clinical guidelines relevant to each case scenario, others were questions and tests which may not have been specifically appropriate to the presenting symptoms but which may nonetheless have been asked or carried out. The checklists were split into six main sections: symptoms and history; preliminary tests; objective and subjective refraction; slit lamp and ophthalmoscopy; supplementary tests, and advice and management. The vast majority of questions in the checklist required the SP to state whether a question was asked and whether a test was performed. At the end of every section a question was included to establish any additional questions (not

already listed) that may have been asked by the practitioners or any additional tests (not already listed) that may have been performed.

In addition to the quantitative description of the number and type of tests carried out, a subjective indication of the standardised patients' impression of (a) the thoroughness of the eye examination and (b) the extent to which their symptoms were addressed would be beneficial. Hence two vertical scales of ten centimetres in length were placed at the beginning of the checklists. The SPs were advised to complete this section before completing the remainder of the checklist to encourage a non-biased subjective assessment. The SPs were advised to make these subjective impressions in comparison to the training eye examinations carried out at the Institute of Optometry (discussed in detail in section 3.3.4).

Figure 3.1: A flowchart summarising the development of checklists completed by standardised patients at the end of the eye examinations.



3.3.2.1 Defining the checklists

The content of undergraduate training and of training in the PRP is of great importance as the foundation of a professional's knowledge base. During both of these periods optometrists are trained in all aspects of optometric clinical care. Great emphasis is placed on the "routine eye examination" as most optometrists spend the greatest part of their working day carrying out routine examinations in the consulting room. Guidance on what a routine eye examination may include is published in the College of Optometrists' *Code of Ethics and Guidance for professional conduct*. For the routine eye examination this states (College of Optometrists, 2008a):

"The optometrist has a duty to carry out whatever tests are necessary to determine the patient's needs for vision care as to both sight and health. The exact format and content will be determined by both the practitioner's professional judgement and the minimum legal requirements."

The legal requirements are defined in part 4 of the Opticians Act 1989-Restrictions on testing of sight, fitting of contact lenses, sale and supply of optical appliances and use of titles and descriptions (General Optical Council, 2008e). The section relevant to the eye examination states:

(1) When a doctor or optometrist tests the sight of another person it shall be his duty

(a) to perform for the purpose of detecting signs of injury, disease or abnormality in the eye or elsewhere

- ***(i) an examination of the external surface of the eye and its immediate vicinity***
- ***(ii) an intraocular examination, either by means of an ophthalmoscope or by such other means as the doctor or optician considers appropriate***
- ***(iii) such additional examinations as appear to the doctor or optician to be clinically necessary.***

(b) immediately following the test to give the patient a written statement-

- ***III. that he has carried out the examinations required by sub-paragraph (a) of this section, and***
- ***IV. that he is or (as the case may be) is not referring him to a registered medical practitioner***

The Act also requires that the statement should say if the patient is being referred to a registered medical practitioner and if s/he is being referred, the reason for referral.

Part (a) above requires optometrists to perform an examination of the anterior segment and ocular adnexa for the purpose of detecting abnormalities or anomalies. This includes anomalies of the eyelids, eyelashes, conjunctiva, tear layer, cornea, anterior chamber, iris, crystalline lens and anterior vitreous (Elliott, 2003a). This procedure has been performed during all primary care assessments; during problem-specific assessments involving the anterior segment; and before and after any procedure that touches the eye (e.g., tonometry) to assess any iatrogenic damage (Elliott, 2003a). An examination of all these structures is best achieved using a slit lamp hence this has been included on the checklist.

Optometrists performing NHS sight tests are bound by the General Ophthalmic Services Contracts Regulations in addition to the above. Part 5, Section 13 relating to Testing of Sight (National Health Service (General Ophthalmic Services), 2008b) states:

(2) A contractor shall, having accepted an application from or on behalf of a patient for the testing of sight

(a) secure the testing of the patient's sight to determine whether the patient needs to wear or use an optical appliance; and

(b) in so doing, shall secure the fulfillment of any duty imposed on a tester of sight by, or in regulations made under, section 26 of the Opticians Act 1989 (above).

(3) Where a contractor or an ophthalmic practitioner employed by it to perform the contract is of the opinion that a patient whose sight was tested pursuant to paragraph (2)

(a) shows on examination signs of injury, disease or abnormality in the eye or elsewhere which may required medical treatment; or

(b) is not likely to attain a satisfactory standard of vision notwithstanding the application of corrective lenses,

the contractor shall, if appropriate, and with the consent of the patient-

(i) refer the patient to an ophthalmic hospital, which includes an ophthalmic department of a hospital,

(ii) inform the patient's doctor or GP practice that it has done so, and

(iii) give the patient a written statement that it has done so, with details of the referral.

The above paragraph summarises the importance of assessing the health of the eyes as well as checking for any refractive error. During the training of optometrists, the importance of a thorough patient history is stressed to elicit information such as the patient's reason for visit, previous ocular history, the patient's general health and family medical and ocular history (Harvey & Franklin, 2005). If the reason for attendance is to

be investigated properly, then the optometrist must ask pertinent questions to place the patient's requirements in the appropriate context (Harvey & Franklin, 2005). Information relating to the patient's occupation and hobbies is useful when prescribing spectacles (Harvey & Franklin, 2005) hence questions to elicit all this information were included in the checklist. The information gathered in the early stages of the eye examination allows the optometrist to adapt the eye examination to the patient's needs, i.e., to eliminate irrelevant tests and carry out any further tests in response to the patient's symptoms. For example, in the case of a patient presenting with recent onset headaches, the optometrist may take a detailed history relating to the headaches and/or instigate further investigations such as visual fields.

The measurement of intraocular pressure (IOP) is an important part of a primary care eye examination. As well as providing baseline data for future eye examinations of a patient's eye, it has important implications in screening for eye disease. It is therefore useful to have baseline IOP measurements for interpretation of future readings taken (Doshi & Harvey, 2005). Perimetry enables the assessment of visual function throughout the visual field, the detection and analysis of damage along the visual pathway and the monitoring of disease progression (Elliott, 2003a). Central visual field screening can be considered part of routine eye examination for asymptomatic and risk-free patients; hence tonometry and visual field assessments were included on the checklist.

Questions included in the checklist designed during the initial stages of the research were based on the law as discussed above and questions asked and tests performed during "routine eye examination" as described in books used during optometric training (Elliott, 2007; Harvey & Franklin, 2005). Gathering basic information about optometric eye examinations as well as case-specific information was crucial in defining the true content of optometric eye examinations.

3.3.3 Selection of participating optometrists

To practise in the UK, optometrists must be registered with the General Optical Council. Registrants are listed in the Opticians Register, along with the addresses of practices at which they practise. In order to randomly select practices, the 2005 edition of the Opticians Register was used, which lists the optometrists working in various towns and cities. To verify that the practitioner was still working in the practice at which

they were registered, the entries that were selected from the printed register, as outlined in the next paragraph, were checked in the online register (www.optical.org). The online register was also used to check that only one practitioner was chosen from each practice.

A map of London and the surrounding counties was divided into four sections: North West, South West, North East and South East. Fifteen towns or cities within an hour and half travelling distance of central London (excluding those in the inner London area) were randomly selected from each quadrant. The outermost boundaries within which the visits took place included Cambridge, Basingstoke, Brighton and Pitsea. This was achieved by listing all the towns and cities in each quadrant in a spreadsheet and the "random number between" function was used in Microsoft Excel to generate random numbers. If for example there were 30 towns and cities in a quadrant, a list of random numbers was drawn up for numbers from 1-30. If for example the random numbers generated were 3, 10 and 26 then the towns listed 3rd, 10th and 26th were chosen. The first fifteen numbers were chosen from this list and matched to the corresponding town or city. The number of optometrists working in each town or city was established from the Opticians Register. A similar method of random selection was used to randomly select ten optometrists from each of the 60 towns and cities.

Names of the practitioners, practice details and GOC registration numbers were recorded on a spreadsheet. This sampling method was designed to select more practitioners than required for the study and to allow replacements for practitioners who may change their place of work during the course of the research. Each practitioner randomly selected using the method described earlier in this section was sent a letter of invitation explaining the aims, the need for research of this nature and a brief description of what would happen in the research (appendix 04). A total of 600 letters were sent out over a period of 3 months to recruit the 100 practitioners required to participate in the research.

All practitioners who did not respond to the initial letter of invitation were telephoned to address any queries or concerns they had about the research. For those practitioners who opted not to participate, an explanation was documented. Thirty three practitioners said they were unable to participate as they were only working one day a week, 175 practitioners informed the researcher they were not interested, 28 practitioners were planning on travelling for a long period of time and 17 practitioners said they were not

able to participate due to commercial pressure. Having telephoned all the practices, the researcher identified 109 practitioners who were no longer working at the practice where they were listed. In this case, the name of the practitioner working there at the time was noted and a letter of invitation sent to them. A total of 111 practitioners consented to participate. Consenting practitioners were offered a choice of two levels of anonymity:

1. **Full Anonymity-** For practitioners who chose this option, the SPs were given a list of consenting practitioners for them to visit. At the end of the visit, the actors did not record the practitioner's name or any other identifying features relating to the practitioner. For practitioners who chose this option, there was no way for the researcher to subsequently identify the practitioner who saw the patient.

2. **Feedback for professional development and anonymity in research-** This option was designed to give practitioners something in return for their participation in the form of feedback about the SPs' findings. For practitioners who chose this option, the SPs recorded the name of the practitioner to enable the research team to provide feedback. Upon completion of the SP visits, practitioners who requested this option were invited to send a photocopy of their clinical record card. The data obtained from record abstraction was compared to the SP findings. These findings will be discussed in detail in chapter 8. Once the practitioners' clinical records were received, optometrists who selected this option were sent a spreadsheet summarising suggested "best practice" based on published clinical guidelines and on the views of an expert panel, the findings from the SP checklist and the information abstracted from the clinical records for practitioners who sent copies of their clinical record cards. This served several purposes. First, the information provided as individualised feedback might be useful for the optometrist's professional development. Additional benefits from including this option were that it: gave the optometrists the right of reply; informed the researcher whether the SP had been detected; and provided feedback regarding the performance of the SPs.

A consent form was enclosed with the letter of invitation sent to the randomly selected practitioners (appendix 05). Consenting practitioners were requested to complete this form and select one of the two levels of anonymity discussed earlier in this chapter. The consent form informed all participating practitioners that information gathered during the research would be held and processed for the purpose of completing the

research study and to investigate the content of primary eye examinations in the UK only. Consenting practitioners were also made aware that their participation was voluntary; that they could choose not to participate in part or all of the project, and that they could withdraw from the research at any stage without being penalised or disadvantaged in any way.

Once the consent form had been received, a letter of confirmation of receipt of the consent form was sent to the practitioners (appendix 06). This letter also advised participating optometrists on the use of audio recording by the standardised patients to aid accurate completion of the checklists. For practitioners who had opted for full anonymity, the actors would only use the recording (through earphones to prevent a third party from listening to the recording) whilst completing the checklist after the each eye examination. After this, the actors deleted the recording. The researcher was given access to all the recordings obtained from visits to practitioners who opted to receive feedback. These recordings were also used to monitor quality control of the actors and to ensure the checklists were accurately completed (discussed in section 3.3.5).

3.3.4 Actor recruitment and training

During the course of the standardised patient research study each consenting practitioner was visited by three different SPs, representing different patient scenarios (i.e., different ages, races, presenting symptoms, and clinical features). Two of these three SPs (second and third scenario) were played by professional actors with no prior expert knowledge of eyecare. The standardised patient used in the first patient scenario was the researcher, who is an optometrist with previous acting experience. This SP received extensive training to ensure that all details of the clinical encounter were remembered and accurately recorded. The training also helped ensure that the SP's acting skills were adequate to avoid her being detected as an actor by participating practitioners. For example, care was taken to ensure that this SP avoided using any technical language that would raise the suspicion of the optometrist.

To recruit actors for the second and third case scenarios, the actor roles were advertised in a local acting school and theatre. To match the pre-designed case scenarios, the advert specified the actors would need to be either a male or female, over the age of 40 and of "Afro-Caribbean" race, or a male or female of any race but over the age of 50. Four actors responded to the advert for the second scenario and

five for the third scenario. The researchers interviewed all nine actors to determine their career history, advise them of the aims of the research and their involvement in the study.

As part of the interview, although no training had been offered at this stage, the researcher (RS) performed an eye examination on each actor to ensure they were able to act as a convincing patient. The researcher also asked the actor a few basic questions relating to the eye examination (e.g., were you asked about your general health during the eye examination?) to establish how well they performed at remembering certain basic aspects of the examination. Although this was not the deciding factor when selecting the actor best suited to each role, it was an important factor in the selection process because the checklists to be completed at the end of the eye examinations consisted of 40-50 different items.

These two SPs underwent intensive one-to-one training on the different aspects of an eye examination prior to visiting consenting optometrists. This involved use of a document entitled “The journey through an eye examination” which describes an eye examination in lay terms (appendix 07). During the early stages of the training, the actors were made aware of all the different equipment and instruments used within optometric practice. The actors then observed and received several eye examinations (some whilst being observed) from different optometrists at the Institute of Optometry, London. The actors were trained to remember and record details of each clinical encounter.

During the training some eye examinations were video recorded to allow for quality control later in the study when it was felt that it would be helpful to remind the SP of certain tests. The actors were asked for their consent to video-record some eye examinations during the training (appendix 08). The SPs were also given a copy of a video of one of their training eye examinations on a CD and were advised to watch the videos on a regular basis. At the end of the training the actor signed a confidentiality agreement stating that any information gathered during the eye examinations is confidential and will be used solely for the completion of the checklist provided (appendix 09).

In particular the actors were trained in recognising various techniques that are carried out with the slit-lamp biomicroscope and different methods used for fundus

examination. The actors were also advised to make a note of the method used for objective assessment of refractive error (autorefraction or retinoscopy), whether a subjective refraction was performed, the subjective technique used by the practitioner to determine any astigmatism (fan and block or cross cylinder) and whether an intermediate and reading addition (if applicable) were established. The different uses and attachments of the slit lamp biomicroscope were also discussed in detail with the actors. In particular, attention was drawn to the use of the cobalt blue filter during examination following fluorescein instillation and contact tonometry (the Goldmann tonometer as an attachment to the slit lamp), the use of the biomicroscope with a Volk lens for fundus examination and the use of the biomicroscope with a gonioscope to assess the anterior chamber. During the training, the actors were advised of the importance of giving accurate and consistent responses throughout their visits.

3.3.5 Quality control and actor validation

As discussed in the first chapter (section 1.5.4, p.29), it is usual practice to monitor the standardised patients' performance throughout the course of the research (Adamo, 2003; Peabody *et al.*, 2004a). This is usually achieved either by video-taping or by directly monitoring a clinical encounter (Luck *et al.*, 2000). The actors in this study were monitored for quality control after every 20-25 visits by attending the Institute of Optometry for an eye examination with a staff clinician. This eye examination was video recorded and the actor completed a checklist in the usual way. The checklist was compared with the video recording for inaccuracies, so that any further instruction could be given if required. If during quality control it was felt that the actor needed reminding of any particular aspects of the eye examination, the video-recording from the training was played back and that particular aspect concentrated on during the quality control eye examination.

The actors carried a digital audio recorder during the visits to allow accurate completion of the checklists. One practitioner had consented to participate in the research and selected the feedback option but did not consent to audio recording. This eye examination was not audio recorded. The researcher was only given access to audio recording for practitioners consenting to receive feedback (section 3.3.3) on their examination. The confidential nature of these recordings was emphasised during the course of the research. 219 audio recordings (for practitioners who opted for the

feedback option) were played back by the researcher to ensure that the checklists were accurately completed.

3.3.6 Logistics

Although participating optometrists were likely to be expecting visits from SPs, several steps were taken in an effort to ensure that the SPs remained undetected. Practitioners were only included if they reported examining at least three new patients a week, and no SP visits took place within a month of the optometrist recruitment. Also, no practitioners were recruited who were personally known to the standardised patients.

Prior to starting the visits, the SPs were given a list of all the consenting practitioners stating which anonymity option they had chosen and the practice address details. The actors used this information to design a timetable to allow visits in the same area to be carried out on the same day. On average, four visits were carried out per day depending on the availability of appointments and consenting optometrists.

The eye examinations were timed, starting from when the SPs were taken through to start the first clinical test or symptoms and history. The timing stopped when s/he left the consulting room. The timing therefore included any delegated testing for which the patient was present (e.g., visual fields, autorefractor, tonometry), but not delegated testing for which s/he was not present (e.g., focimetry). If the SP was kept waiting between the pre-screening and the eye examination, the SPs discretely paused the audio-recorder during this time and restarted the recording when they were called through for the rest of the examination.

3.3.6.1 Analyses

The information gathered about the content of eye examinations for each case scenario from the checklists completed by the SPs was recorded and summarised in spreadsheets for analysis. At the top of each checklist, the SPs were advised to record the option (feedback or anonymity) selected by the practitioner visited, the name of the practitioner visited (for practitioners who selected the feedback option), the type of practice visited and the location of the practice visited.

In order to categorise different practice types, the Keynote report on Opticians and Optical Goods (Key Note, 2006) was consulted. This report revealed that the largest five optical corporate bodies (Specsavers, Dollond and Aitchison, Boots Opticians, Vision Express, and Optical Express) account for approximately 25% of practices and each corporate body has more than 150 practices (or more than 2% of the total number of optical practices). Therefore, when analysing the findings obtained from different practice types, these five corporate bodies are classified as 'large multiples', other groups with more than one practice as 'small multiples', and the remaining practices, where there is only one practice address given against a practice name, are classified as 'independents'.

3.3.6.2 Refractive Error

As discussed in section 3.3.2.1, it is a requirement for a practitioner to issue a signed, written copy of the prescription at the end of every examination in England (General Optical Council, 2008b). One of the items on the checklist was recording whether a copy of the prescription was issued. If at the end of the eye examination the practitioner did not voluntarily issue a copy of the prescription, the SPs were advised to ask for a copy of their prescription before leaving the practice. This was recorded in the checklist as prescription issued before or after prompting. Although an assessment of the reproducibility in refractive findings between practitioners visited is listed as a research question for each case scenario, a detailed analysis of the refractive findings obtained for all three SPs will be presented in Chapter 7.

3.4 Introduction to results

Of the 600 letters sent, 109 practitioners no longer worked at the practice and 55 had not reached the addressee. A letter of invitation was resent to these 55 practitioners by email (obtained when the practice was telephoned) and/or to the practice address. In a further 75 cases it was not possible to speak to any optometrist at that practice despite telephoning the practice at least three times. Therefore, the participation rate expressed as the proportion of optometrists who could be contacted who agreed to participate was 27%. 111 optometrists consented to participate, 59 male optometrists and 52 female optometrists. Although 111 consented to participate, 100 optometrists were visited by the SPs in the first and second scenario and 102 optometrists were

visited by the SP in the third scenario. Of the 111 consenting practitioners, 84 optometrists were visited by all three SPs; 5 optometrists by the first and second SPs; 8 optometrists by the first and third SPs; 10 optometrists by the second and third SPs; 3 optometrists by the first SP only and 1 optometrist by the second SP only. One consenting optometrist was not visited by any of the three SPs.

During the early stages of the research participants were asked to choose which option they preferred, complete anonymity or the feedback option. Of the 111 optometrists who consented to participate: 10 chose the full anonymity option, 78 chose the feedback option and 23 optometrists did not state a preference. As mentioned in the methods section, the actors were given a list of all the consenting practitioners. The proportion of optometrists who chose the different options and were visited by the standardised patients was variable and will be discussed in chapters relevant to each case scenario.

Although every effort was made by the SPs to organise the eye examinations with the consenting practitioners, it was inevitable that some eye examinations would be performed by a different optometrist. In some cases this was because the consenting optometrist was ill or absent from the practice at short notice hence a locum optometrist was standing in for the consenting practitioner. To avoid incurring further travelling costs (as some practices were far away hence expensive to get to); creating a scene or in some cases making it obvious that the patient was part of the research project, the SPs were advised to have the eye examination with the 'non-consenting practitioner' but treat the recordings and findings of these optometrists in the same way as those who chose the full anonymity option.

3.5 Chapter summary

This chapter has described the aims of the standardised patient research, the choice of standardised patient profiles, the general methods used in developing the case scenarios and standardised patient checklists, and actor recruitment and training. The content of optometric eye examinations for three different standardised patient profiles will be discussed in the next three chapters. Chapter 4 highlights the content of optometric eye examinations for a young myope presenting with headaches of recent onset.

4 Scenario 1: The Content of Optometric Eye Examinations for a Young Myope Presenting with Headaches

4.1 Introduction

The need to measure clinical care within optometry was discussed in section 1.2 and the need for standardised patient research was discussed in section 3.1. The standardised patient approach was initially used to investigate the content of optometric eyecare for a young myope presenting with recent onset headaches. Headaches are a common condition and a frequent reason for the public to consult healthcare practitioners, including optometrists (Gutteridge & Cole, 2000). 93% of the population experience one or more headaches in their lifetime, 11% of men and 22% of women have a headache at any one time (Rasmussen et al., 1991) and 9% of the population present to their general medical practitioners with a headache every year (Latinovic et al., 2006).

When optometrists ask patients about headaches during history taking, they can expect, on average, to be spending a significant amount of time in routine practice discussing migraines (Gutteridge & Cole, 2000). The most frequently reported headaches are the benign primary headaches; episodic tension-type headaches; episodic migraines and chronic daily headaches (Glover et al., 2006). Most studies suggest that tension-type headache is the most common form of headache, although one study of an out-patient population found migraine to be more common (Leone et al., 1994). A headache of a suspicious nature is one that is of recent onset (less than 6 months), has a change in character from a previously known headache, is resistant to medication or portrays symptoms not characteristic of a typical primary headache (Przywara & May, 2001). Despite a common belief that headaches have an ocular cause, epidemiological studies show that most headache sufferers have an episodic tension-type headache (TTH), with migraine and chronic daily headache in turn being the next two most common subtypes (Castillo et al., 1999; Rasmussen et al., 1991; Steiner et al., 2003). Episodic TTH typically has low impact on patients' daily activities, while migraine and chronic daily headaches have a high impact (Dowson et al., 2005). The optometric correlates of migraine have also recently been reviewed (Harle &

Evans, 2004) and investigated (Harle & Evans, 2005; Harle & Evans, 2006a; Harle & Evans, 2006b; Harle & Evans, 2006c; Harle et al., 2006).

Some headaches are triggered by environmental stimuli (e.g., diet, stress, posture, and lighting) and occasionally the trigger is obvious. More commonly, headaches are multi-factorial and it can therefore be very difficult to identify all relevant triggers. A thorough history is crucial to enable accurate diagnosis and to identify all relevant triggers. The history should not only include details relating to the headache but also associated factors that may be ocular (e.g., fortification spectra, diplopia) or non-ocular (e.g., altered consciousness, numbness, weakness). The patient's medical history, previous ocular history and family history are also important.

The Migraine in Primary Care Advisors (MIPCA) and Migraine Action Association (MAA) developed an eight term Diagnostic Screening Questionnaire (DSQ) that differentiates between the headache subtypes and is designed for when the patient first consults a healthcare professional with a headache (Dowson et al., 2005). This is based on the authoritative classification of headache by the International Headache Society (Olesen & Steiner, 2004), and the DSQ which was described in detail for use by optometrists in a widely read optometric magazine (Glover et al., 2006). The DSQ is a useful clinical tool in the management of headaches in primary care and is recommended for screening new headache patients at or below primary care level (*Table 4.1 and 4.2*). The designers of the DSQ hoped that patients would be able to obtain a copy at their first point of care, whether a GP surgery, pharmacist, optometrist, dentist or other provider (Dowson et al., 2005). The primary care practitioner can then review this and advise appropriate management.

There are about 10,700 optometrists in the UK (Federation of Ophthalmic & Dispensing Opticians, 2008) and about 95% of optometrists work as primary care practitioners in community optical practices (College of Optometrists, 2008b), which are the major providers of UK primary eyecare services. Of patients consulting optometrists, about one in ten men and one in four females have migraine (Gutteridge & Cole, 2000). The literature reviewed highlights the need for optometrists to investigate the symptoms, history, clinical investigation and management of a patient with migraine symptoms.

Table 4.1: The MIPCA/MAA eight item headache Diagnostic Screening Questionnaire (DSQ) [Reproduced with permission from the Optician].

1. Has the pattern of your headaches been generally stable (i.e., no change or small changes) in frequency and severity over the past few months? **Yes/No**
2. Have you had the headaches for longer than six months? **Yes/No**
3. Are you aged between 5 and 50 years? **Yes/No**
4. Does the headache interfere to a noticeable extent with your normal daily life (work, education and/or social activities)? **Yes/No**
5. On average, how many days with headache do you have per month? **Less than 1; 1; 1-4; 5-15; 15-30; Everyday**
6. On average, how long do the headaches last, if left untreated? **Less than 15 minutes; 15 minutes-1 hr; 1-2 hrs; 2-4 hrs; over 4 hrs; my headaches are always there**
7. On average, on how many days per week do you take analgesic medication? **Less than 1; 1; Up to 2; 2 or more; Everyday**
8. Do changes in your senses (sight, taste, smell or touch) occur in the period immediately before the headache starts? **Yes/No**
NB ➢ If the patient answers NO to any of questions 1, 2 and 3, they may possibly have sinister headache. They should be advised to seek immediate medical advice from their GP. ➢ If the patient answers YES to questions 1, 2 and 3, they should complete the remainder of the questionnaire.

Table 4.2: Diagnostic algorithm used with the DSQ for patients who answer 'yes' to questions 1-3. [Reproduced with permission from the Optician].

▪ A **No** answer to questions 1, 2 and 3 indicates the possibility of a secondary (or sinister) headache. These patients should be investigated further and do not complete the remaining questions. ▪ For patients who answer 'yes' to Questions 1-3: **Question 4:** ▪ 'No'= episodic tension-type headache ▪ 'Yes'=migraine or chronic headache **Question 5:** ▪ <1; 1; 1-4; 5-15 days=migraine ▪ 15-30 days and everyday= chronic headache **Question 6:** ▪ <15 minutes=investigate further ▪ 15 minutes to one hour=possible cluster headache, investigate further ▪ 1-2 and 2-4 hours= investigate further ▪ Over four hours and my headaches are always there=chronic daily headache **Question 7: For patients with Chronic Daily Headache only:** ▪ <1; 1; up to 2=chronic daily headache without medication overuse ▪ or more and everyday= chronic daily headache with medication overuse **Question 8: For patients with migraine only:** ▪ Yes=migraine with aura ▪ No=migraine without aura

This chapter forms part of a paper that has been published in *Ophthalmic and Physiological Optics* in 2008 (Shah *et al.*, 2008). This part of the thesis has three main aims.

- Provide data on the content of typical optometric eye care in England for a patient presenting with headaches of recent onset.
- Evaluate how appropriately the eye examinations were carried out for the patient as she presented; for example, the patient had a commonly encountered degree of myopia.
- Investigate differences between different types of practice (independent, small multiple and large multiple).

4.2 Methods

The case scenario and checklist for the SP were developed based on evidence-based reviews, clinical guidelines and recommendations of a panel of experts as discussed in Chapter 3 (section 3.3, p.57-60). The selections of participating optometrists, actor recruitment, training and quality control have also been described in detail in the General Methods in Chapter 3 (section 3.3, p.63-69). In this section (section 4.2), methods used in this particular case scenario have been described.

4.2.1 Standardised patient description (Case Scenario)

A 20 year old student complaining of headaches (first ever headache 4 weeks ago, resembling a migraine). This standardised patient used in this scenario was the researcher who is a myope (-3.75DS R&L) and presented for a private eye examination "to see if my glasses are OK", reporting that her last check-up was about two years ago. The script for the actor (presenting symptoms and standardised answers to questions) is summarised in *Table 4.3*.

Table 4.3: An overview of the first standardised patient's symptoms, and answers to questions asked during the eye examination.

- Last eye examination: 2 years ago, spectacles updated at the time following recommendation by the optometrist.
- Reason for visit: recent onset headaches. Also mention these if the optometrist asks you about any headaches/migraines. If the optometrist does not ask you anything that would lead you to mention the headaches then mention these at the end of the eye examination, as a patient who is concerned about the headaches would do.
- Headache history: You have been experiencing headaches over the last month. The headaches usually start at the back of the head and work their way forward on the left hand side of the head. If asked about the pain, it is quite bad and feels like a throbbing sensation. It can get worse with exercise. There is no real pattern to the occurrence of the headaches and no known triggers. The headache lasts 1-3 days. If asked about any visual disturbances, then inform the optometrist the headache can sometimes be preceded by seeing lights (zig zags). You have experienced 3 such headaches over the last month and have not consulted your GP about the headaches. If asked, you have felt nauseous on two occasions but have not been actually sick. You have had to go to bed because of the headaches and need to avoid any sounds or light as you feel these make the pain worse.
- Your distance and near vision appears to be fine. You wear your spectacles all the time. If asked, you don't wear contact lenses. You have not experienced any other visual symptoms (e.g., floaters or double vision). You are in good health otherwise (no diabetes or high blood pressure). You don't take any prescribed medication and have never attended an eye hospital (for injury or surgery to your eyes). You don't suffer from glaucoma.
- If asked, about family history: your grandmother was diabetic (IDDM), your mother suffers from high blood pressure and your father had cataract operations in both eyes and a retinal detachment in one eye.
- If asked, you do drive but don't have a car at present. You are currently in the final year of your Maths Degree at Queen Mary's University. If asked, you took a gap year at the end of your A-levels and went travelling for a year to India to do some voluntary work. You taught Maths to children in a rural town in North India (Shimla). You use the VDU about 4-5 hours/day and your hobbies are travelling and reading.
- You are concerned about the headaches as you have exams coming up in a couple of month's time.

4.2.2 Defining the case specific checklist

An accurate diagnosis of headache (in this case migraine) would allow the optometrist to offer an explanation for the patient's presenting symptoms. For accurate diagnosis of the exact nature of the headache, the optometrist would need to establish a detailed history relating to the headaches to differentiate primary and secondary headaches. During optometrists' training and in CET articles it is stressed that the minimum history for any presenting symptoms should include questions regarding the Location/Laterality, Onset, Frequency, Type/Severity, Self treatment and its effectiveness, Effect on patient and Associated factors (mnemonic LOFTSEA) of their symptoms (Elliott, 2003b; Harvey & Franklin, 2005; Davies, 2007; Brown, 2008). The

DSQ (section 4.1) is also helpful in differentiating between headache subtypes and is designed for when a patient first consults a healthcare professional with a headache (Dowson et al., 2005). Diagnosis relies almost totally on history, because there are usually no confirmatory objective signs between attacks (Olesen & Steiner, 2004). It was assumed that the gold standard assessment of headache by optometrists would include the questions in the DSQ, and this was used in addition to the mnemonic LOFTSEA referred to above to derive questions appropriate for identifying the significant nature of the SP's headaches.

The basis of visual aura in migraine is fortification spectra, although this may be present in only 10% of migraine patients (Lance & Anthony, 1966). The SP used in this case scenario presented with visual disturbances experienced before the onset of the headache. Visual-aura-like symptoms can be linked to a variety of ophthalmic conditions, hence need to be differentially diagnosed (Harle & Evans, 2004). The mnemonic LOFTSEA was therefore used to list questions (appendix 10) that could be asked by optometrists to investigate the exact nature of flashing lights.

The ocular examination in a patient presenting with headaches should be thorough and examining the patient's fundus, measuring visual acuities, checking pupil reactions, visual fields and external eye movements should be high priority (Davies, 2007). The response of the iris to light levels is a result of a neural reflex pathway that involves the iris, retina, visual pathway and sympathetic and parasympathetic innervations of the eye (Harvey & Franklin, 2005). Checking pupil reactions is therefore an important neurological test. These particular tests were therefore included in the case specific checklist for this scenario.

A review of the association between refractive errors and migraine shows the literature to be equivocal (Harle & Evans, 2004). In a study looking at the correlation between migraine headache and refractive error, Harle and Evans (2006) concluded that people who experience migraine headaches should attend their optometrist regularly for an eye examination to ensure their refractive errors are appropriately corrected (Harle & Evans, 2006a). This highlights the importance of checking the SP's refractive error; therefore refractive error assessment was included in the case specific checklist.

Management in a patient presenting with symptoms of this nature may include diagnosis of the type of headache and/or referral to the patient's general medical

practitioner (GMP) or in some cases directly to the hospital if the optometrist suspects a sinister cause of the headache. In cases where the patient is vague about their symptoms or where a clear diagnosis cannot be made, it is important for the patient to keep a headache diary prior to seeing their GP. Different management options to cover all these possibilities were included in the case specific checklists.

4.2.3 Expert panel feedback

The panel of experts was asked to review in detail and modify the case scenario and checklist prepared by the researchers for this SP. The feedback received for these documents from members of the expert panel for this scenario is included in the appendix 1.

4.2.4 Research questions specific to scenario 1

As discussed in Chapter 3 (section 3.3.1, p.57), a panel of experts was chosen for each case scenario to help in the development of the case scenario and checklist design. The panel experts were also asked for their views on questions and tests that might be appropriate for an optometrist when examining a patient presenting with recent onset headaches who is also myopic. The panel of experts consisted of four members; each an expert in clinical optometry. They came from broad range backgrounds:

- A professor of clinical optometry, examiner for the College of Optometrists' higher diploma examinations, and former head of department at a UK optometry department;
- An experienced community optometrist and optometric adviser to the College of Optometrists and three primary care trusts;
- An experienced community optometrist, head of an optometric continuing education and training company, examiner for the College of Optometrists membership exams, and member of the General Optical Council's fitness to practice committee;
- An experienced community optometrist, examiner for the College of Optometrists' membership and higher diploma exams, and an author of a leading clinical optometric textbook.

Their views are summarised as primary and secondary research questions in *Table 4.4*. The possible tests and questions listed in *Table 4.4* were not intended to define good practice, but more to be a list of possibly relevant clinical investigations and of relevant research questions.

Table 4.4: Primary and secondary research objectives relating to scenario 1.

Primary Research Questions
1. Is the eye examination appropriate for the identification of headaches of a suspicious nature and for appropriate management for the investigation of these? 2. Is the eye examination appropriate for the prescribing of an accurate refractive correction?
Secondary Research Questions
Relating to Headaches
1. What proportion of optometrists asked about headaches?
2. What proportion of optometrists asked questions relating to the headache history?
3. What proportion of optometrists tested pupil reactions?
4. What proportion of optometrists carried out fundoscopy?
5. What proportion of optometrists gave management advice about a headache diagnosis? Of these, what proportion: ❖ Diagnosed migraine? ❖ Indicated headache may be migraine? ❖ Indicated headache may be tension type headache? ❖ Indicated headache may be of another type?
6. What proportion of optometrists gave referral advice specific to the headaches? Of these, what proportion: ❖ Made a written referral to the GP? ❖ Advised the patient to consult the GP, but without a written referral? ❖ Advised the patient to consult the GP, but only if more headaches occurred? ❖ Other:.....
7. What proportion of optometrists proactively identified the patient's symptoms (flashing lights) prior to the patient having to actively inform the optometrist of their concerns?
8. What proportion of optometrists advised the patient to keep a diary of when the headaches occur to see if a pattern can be discerned?
9. What proportion of optometrists tested visual fields?
Relating to Refractive Error
1. What proportion of optometrists carried out focimetry (personally or delegated) of the patient's existing spectacles?
2. What proportion of optometrists carried out an objective assessment of the refractive error: i. Using an auto-refractor? ii. Using retinoscopy?
3. What proportion of optometrists carried out subjective testing of the spherical element of the refractive error?
4. What proportion of optometrists carried out a subjective test of the cylindrical element of the refractive error?

5. What proportion of optometrists carried out a cover test for distance and/or near?
6. What proportion of optometrists measured the aligning prism (associated heterophoria) for distance and/or near?
7. What proportion of optometrists issued a prescription?
8. How variable were the refractive findings? ❖ The refractive findings will be transformed into their astigmatic components and these will be used to calculate the frequency distributions of the refractive findings. Specifically, the mean and central 95%th percentile range of the recommended refractive correction will be identified.
9. What proportion of optometrists recommended new spectacles?
10. What proportion of optometrists advised upon visual hygiene when reading/using a computer?
11. What re-examination interval was advised?

4.3 Results

As described in the general methods (section 3.3.3), consenting optometrists were asked to choose which option they preferred, complete anonymity or the feedback option. Twenty-nine optometrists visited by the SP in this scenario chose full anonymity (this figure included twenty practices where a locum practitioner was standing in for the consenting practitioner), 58 chose feedback, and 13 did not state a preference (these were given the option of receiving feedback when the results were available).

4.3.1 Addressing the research questions

Concerning the primary research question, the presence of headache was identified in 98% of cases: in 82% of cases simply by asking the patient the reason for their visit, and in a further 16% of cases where the reason for the visit was not established but the practitioner did ask specifically about headaches. According to the criteria specified in the Introduction, none of the optometrists asked all the potentially appropriate questions for identifying the significant nature of the headache (*Table 4.5*). 22% asked at least four questions. Only 14% asked about the severity of the headaches.

Table 4.5: Questions appropriate for identifying the significant nature of the patient's headaches[1], giving the percentage of practitioners who asked each question.

Questions appropriate to identifying the significant nature of the headaches	**%**
1. Has the pattern of your headaches been generally stable (i.e., no change or small changes) in frequency [and severity] over the past few months?	9%
2. Have you had the headaches for longer than six months?	50%
3. Are you aged between 5 and 50 years?	100%
4. Does the headache interfere to a noticeable extent with your normal daily life (work, education and/or social activities)?	14%
5. On average, how many days with headache do you have per month?	68%
6. On average, how long do the headaches last, if left untreated?	41%
7. On average, on how many days per week do you take analgesic medication? / Do you take medication for the headaches?	7%
8. Do changes in your senses (sight, taste, smell or touch) occur in the period immediately before the headache starts?	40%

[1] For some questions, the actual item on the checklist was worded slightly differently to the DSQ questionnaire and the most similar item has been taken as equivalent. In only one case was there a significant discrepancy between the questions listed here and those in the DSQ. In question 1, information regarding the severity of the headaches was not obtained because this was effectively addressed in question 4.

Forty-eight percent of practitioners proactively identified the patient's symptoms of flashing lights. 15% specifically asked whether the patient had encountered any flashing lights and 33% asked if the patient was experiencing visual disturbances either prior to or at the time of the headaches. *Table 4.6* below summarises the proportion of optometrists who asked further questions relating the nature of the flashing lights.

Table 4.6: A table showing the percentage of optometrists visited who asked questions relating to the exact nature of the patient's symptoms of flashing lights.

Further questions asked relating to the symptoms of flashing lights (n=16).*	
Do the flashing lights precede the headaches?	8%
Are the flashes in one or both eyes?	5%
Describe the flashes?	12%
Where in your vision do you see the flashing lights?	1%
How long do they last?	7%

*the percentages quoted are based on the entire sample (N=100). The totals do not add up to 16 (the number of optometrists who asked further questions) because several practitioners asked more than one question.

Some testing was carried out by assistants (e.g., tonometry, visual fields and autorefraction). These tests were included as components of the eye examination in the data described in this section. A full summary of the contents of the eye examinations is included in appendix 11. The tests most relevant to the presenting

symptom of recent onset headaches are detailed in this section. Nearly all participants carried out an examination of the ocular fundus: 68% by monocular direct ophthalmoscopy, 24% by binocular indirect ophthalmoscopy (5% by both methods), and 2% by fundus photography. One optometrist did not assess the ocular fundus by any means (see discussion). Five percent of optometrists took fundus photographs in addition to performing ophthalmoscopy.

Sixty-one percent carried out visual field testing, almost invariably using perimeters (only one participant carried out confrontation, and he also carried out an automated visual field test). Forty-two percent measured the intraocular pressure (mostly carried out by assistants). Three practitioners carried out additional tests: one carried out keratometry, one a red desaturation test, and one a colour vision test.

In answer to the question, "Did the practitioner ask you to seek a medical opinion regarding the headaches?" there were several possible responses detailed in *Table 4.7*. 69% of practitioners asked the patient to seek a medical opinion regarding the headaches. Three practitioners made a written referral to the GP, two practitioners asked the patient to see their GP within a week and the other asked the patient to see her GP whenever convenient.

Table 4.7: Outcomes* that emerged from the question: "Did the practitioner ask you to seek a medical opinion regarding the headaches?"

Responses from the optometrists who advised the patient to seek a medical opinion regarding the headaches (n=69)	
Attend the hospital now	0%
Consult your General Medical Practitioner now	0%
Consult your General Medical Practitioner within one week	2%
Consult your General Medical Practitioner whenever convenient	10%
Good idea to consult your General Medical Practitioner with no definite recommendation as to urgency	7%
Consult your General Medical Practitioner if symptoms no better with new spectacles	13%
Consult your General Medical Practitioner if symptoms no better or if they worsen	43%

*the percentages quoted are based on the entire sample (N=100). The total adds up to 75 because six recommended more than one option.

Fourteen percent of optometrists asked the patient to keep a diary of when the headaches occur in an effort to identify any pattern. The SP made a note of any further advice that was given by the practitioner regarding the headache diagnosis, change of

spectacles and the use of contact lenses as an alternative to spectacles. 49% of the optometrists gave further advice regarding the nature of the patient's headaches.

Table 4.8: Table showing further advice provided by the optometrists regarding the nature of the patient's headache diagnosis, giving the percentage of practitioners who provided each piece of advice.

Further advice provided regarding the headache diagnosis (n=49)*	
Diagnosed migraine	3%
Indicated the headache may be a migraine	17%
Indicated the headache may be a tension type headache	25%
Indicated the headache may be a migraine and /or tension type headache	6%
Indicated the headache may be of another type	4%

*the percentages quoted are based on the entire sample (N=100). The totals add up to 49 (the number of optometrists who provided advice regarding the nature of the headaches).

100% of practitioners carried out focimetry, either personally or delegated, of the patient's existing spectacles. 59% carried out an objective assessment of the refractive error. 23% used an autorefractor (personally or delegated), 30% carried out retinoscopy and 6% carried out both. All the optometrists carried out subjective testing of the spherical element of the refractive error and 94% checked subjectively for the cylindrical element. 14% of practitioners carried out a binocular refraction (Humphriss, 1988). Of the 86% who carried out a monocular refraction, 36% binocularly balanced the prescription. In total, 50% of practitioners binocularly balanced this young patient and 75% checked the patient's near visual acuity. 4% checked the intermediate visual acuity. Thirty-six percent of practitioners checked the patient's accommodation, and 35 of these checked both accommodation and near visual acuity.

Eighty-three percent of examinations included a cover test, carried out at one distance at least, either with or without spectacles. Thirty-six percent measured accommodation, 51% convergence, 31% ocular motility, 65% pupil reactions, and a test for fixation disparity was carried out by 29% at distance and 14% at near. One optometrist measured the SP's stereo-acuity. None of the practitioners measured fusional reserves.

Fifty-three percent of the sample recommended an update of the current spectacles and 99% issued a prescription. However, only just over half (57%) of practitioners issued a prescription without prompting, with a further 42% providing the prescription when the SP asked for it. The one practitioner who did not issue a prescription did not

refuse, but told the SP to return for the prescription later. Ultimately, for data analysis, this prescription was obtained over the telephone.

Five optometrists advised the SP on visual hygiene when using the computer or reading. The patient was advised to take regular breaks when reading or using the computer for long periods of time. Twelve optometrists did not offer any further advice with regards to the patient's presenting symptoms. *Table 4.8* gives the percentage of optometrists who offered further information regarding headache diagnosis. Eight optometrists informed the patient that headaches caused by a change in prescription are usually frontal, while two optometrists advised to the contrary by suggesting that headaches caused by a change in prescription are located at the back of the head or upper neck area.

Eighty percent of practitioners advised a re-examination interval. A minimum interval of 12 months was advised and a maximum of 24 months. Most (62%) advised two years, with 16% advising one year and the remainder (2%) advising 18 months (20% made no recommendation).

4.3.2 General descriptive data

The general descriptive data are included in appendix 11 and only the key features that have not already been described whilst addressing the research questions have been highlighted here. Ninety-four percent asked when the patient last had an eye examination. 69% asked if the SP had experienced any problems with their distance vision and 58% asked about any problems with near vision with the current spectacles. It is perhaps surprising in such a young patient that 22% asked the SP if she had experienced floaters and 25% asked about double vision. 9% did not ask the SP about her occupation/vocation. The SP, when asked, described herself as a driver, and 91% checked her corrected distance visual acuities with the current spectacles.

92% asked if the patient was in good health and 96% asked if the patient was taking any medication. Seventy-five optometrists asked about previous ocular history, 64% asked if the SP had attended an eye hospital, 44% asked about any previous injuries, surgery or infection, and 4% asked if the SP had a lazy eye. Forty practitioners asked if the patient was a contact lens wearer.

Thirty-five optometrists carried out a biomicroscope assessment; only one optometrist used fluorescein and informed the SP of a poor quality tear film. Five optometrists carried out both direct ophthalmoscopy and binocular indirect ophthalmoscopy. One practitioner carried out direct ophthalmoscopy and head mounted binocular indirect ophthalmoscopy and one carried out binocular indirect ophthalmoscopy and scanning laser ophthalmoscopy. 24 of the 35 (69%) optometrists who carried out a biomicroscope assessment examined the fundus using slit lamp binocular indirect ophthalmoscopy.

The average time taken for the examination (including any screening) was twenty-one minutes, ranging from five minutes to fifty minutes (95% CI 19 to 23). The average cost of a consultation was £22.55 (range £0 to £40; 95% CI £21 to £24).

Figure 4.1 shows for the sample of 100 examinations how the time taken for the examination is related to its cost. The r^2 for the correlation is 0.23, indicating that 23% of the variability in the data is explained by the association between the time taken and the fee charged.

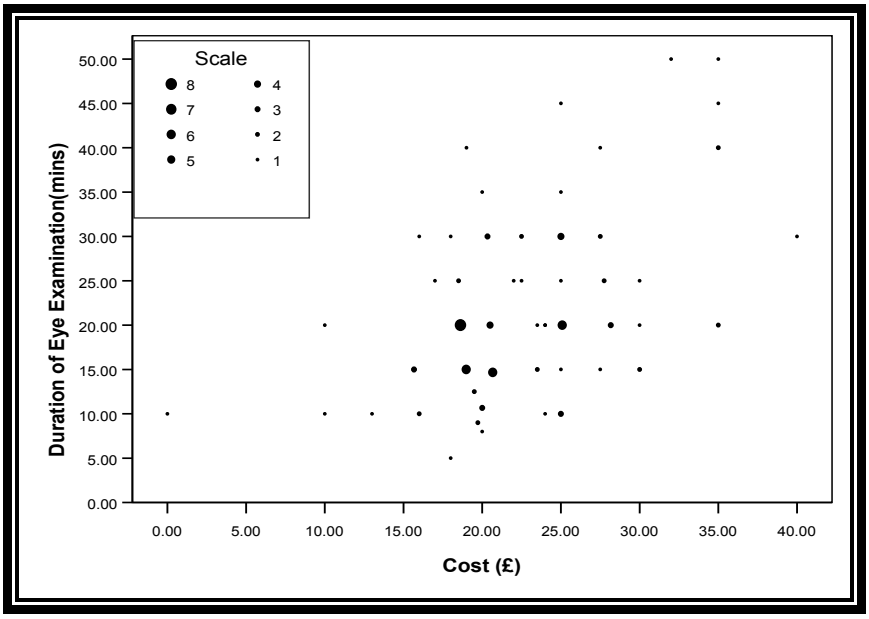


Figure 4.1: Scatter plot showing the duration of each eye examination plotted against the cost of the examination for the first patient scenario. Data were obtained from a sample of 100 optometrists. The size of each marker is directly proportional to the number of practitioners visited who performed an eye examination in that time for that fee. For example, the largest marker (8 on the scale) on the scatter plot reveals that eight practitioners performed an eye examination in 20 minutes and charged £18 for the examination.

4.3.3 Comparisons

The practices that this SP visited comprised 50 independent practices, 35 large multiples and 15 small multiple practices. The average time taken for an eye examination (including screening) by the independent practices was 23 minutes (95% CI 20 to 26), compared to 22 minutes (16 to 25) by small multiples, and 18 minutes (16 to 22) by large multiples. These differences were not statistically significant (ANOVA; F=2.36, p=0.996). The cost of an eye examination was highest for independent practices and lowest for large multiples but these differences were not statistically significant (ANOVA; F=2.79, p=0.661).

The times quoted in the previous paragraph include delegated screening tests (e.g., where visual field testing, autorefraction, or tonometry was delegated to a trained lay person). The proportion of practices where this type of delegated function occurred was highest for large multiples (63%), and lower for small multiples (20%) and independents (22%). These differences were statistically significant (chi-squared test, p=0.0002). The pair-wise comparison between small and large multiple practice types was also significant (chi-squared test with Yates' correction, p=0.005) as was the comparison between independent and large multiple practice types (chi-squared test with Yates' correction, p=0.0001). There was however no significant difference in the results between independent and small multiple practices (chi-squared test with Yates' correction, p=0.87).

The SP subjectively rated the thoroughness of the eye examination and the extent to which her presenting symptoms were addressed. The SP completed this section before the remainder of the checklist to encourage a non-biased subjective assessment. In answer to the question "How thorough do you feel the eye examination was?" the average score was 62%. Large multiple practices had an average score of 57%, small multiples 65% and independent practices 64%. These differences were not statistically significant (ANOVA; F=0.59, p=0.56). In answer to the second question, "To what extent do you feel your presenting symptoms were addressed?" the average score was 59%. Independent practices had an average score of 64%, small multiples 61% and large multiples 50%. These differences were statistically significant (ANOVA; F=3.25, p=0.04). The pair-wise comparison between independent and small multiple practice types showed no significant difference (Tukey's, p=0.644) as did the comparison between small and large multiple practice types (Tukey's, p=0.503). There was

however a significant difference in the results between independent and large multiple practices (Tukey's, p=0.033).

As described in chapter 3 (section 3.3.1), literature reviewed, clinical guidelines and suggestions from a panel of experts highlighted tests (in the form of secondary research questions, *Table 4.4*) that could be appropriate for a patient presenting with recent onset headaches. *Table 4.9* compares the percentages of optometrists working in independent, small and large multiple optical practices who performed these suggested tests. Overall, on average, optometrists performed six of the nine tests (minimum 3, maximum 8) recommended by the expert panel. It is stressed that this list of tests is not intended to define good practice, but rather to be a list of possibly relevant clinical investigations and of relevant research questions.

A greater proportion of examinations in large multiples included an objective assessment using an autorefractor (54%) than those examinations in independent practices (14%). This can be attributed to the findings of the present research; a greater proportion of large multiple practices (63%) delegate screening tests to a trained lay person compared to small multiple and independent practices. The opposite result was found for retinoscopy, with 42% of optometrists in independent practices performing retinoscopy but only 29% in large multiples. The percentage of optometrists carrying out a visual field assessment was also greatest for large multiples, followed by small multiples and lastly independents.

Table 4.9: The percentages of optometrists working in independent practices, small multiples and large multiple practices that carried out tests recommended by the expert panel in case scenario 1.

Tests recommended by the expert panel	Independent (n=50)	Small Multiple (n=15)	Large Multiple (n=35)	Total Sample (n=100)
Pupil Reactions	58%	67%	74%	65%
Focimetry of current spectacles (almost always delegated)	100%	100%	100%	100%
Objective assessment of refraction	54%	69%	53%	59%
Subjective refraction	100%	100%	100%	100%
Subjective assessment of cylindrical element	94%	93%	94%	94%
Cover Test (at distance or near or both)	82%	87%	83%	83%
Fundus Examination	98%	100%	100%	99%
Visual Fields	54%	67%	69%	61%

4.4 Discussion

Headache is a common symptom reported by patients who consult optometrists (Barnard & Edgar, 1996) and a standardised patient encounter provides an insight into evaluating a practitioner's ability to elicit essential information during the eye examination. Although other methods such as surveys and paper or computerised vignettes can be used to elicit this information, standardised patients are the recognised gold standard for assessing the quality of clinical care in qualified practitioners (Barragan *et al.*, 2000; Bachmann *et al.*, 2004; Dresselhaus *et al.*, 2004; Glassman *et al.*, 2000; Peabody *et al.*, 2000; Luck & Peabody, 2002; Ramsey *et al.*, 1998; Shah *et al.*, 2007a).

4.4.1 Addressing the research questions

In answer to the primary research question, it is encouraging that 98% of optometrists identified the symptom of headaches. In the case of the two optometrists who did not identify the headaches, the SP prompted them by mentioning her headaches towards the end of the eye examination. Only 14% of optometrists asked about the severity of headaches, yet significant headaches are sometimes identified by severity (Goadsby, 2004). Future CET on headaches and their optometric management should perhaps emphasise the usefulness of having patients' score their headaches on a scale of 1-10 for severity. As discussed in section 4.2.2, during optometrists' training and in CET articles it is stressed that the minimum history for any presenting symptoms should include questions regarding the Location/Laterality, Onset, Frequency, Type/Severity, Self treatment and its effectiveness, Effect on patient and Associated factors (mnemonic LOFTSEA) of their symptoms (Elliott, 2003b). If this mnemonic was followed, the majority of optometrists would have asked at least six questions from *Table 4.5* relating to the significant nature of the headaches.

A change in the pattern of the headaches could significantly affect a person's quality of life and can be a warning sign for a pathological cause for the headaches (Adamczyk, 1999). Yet only 9% of optometrists visited by the SP asked about this. Forty-eight percent of optometrists visited by this SP proactively identified the patient's symptoms of fortification spectra. For patients who may not relate these to the headaches, symptoms like these are disturbing and it would be helpful for the optometrist to identify the symptoms and put the patients' mind at rest. If a thorough history is established

regarding the patient's symptoms at the beginning of an eye examination, the optometrist can then carry out the most relevant tests and offer advice accordingly. Also, any change in symptoms at subsequent appointments will be easier to detect.

It is interesting that nearly one third of optometrists use binocular indirect ophthalmoscopy, which is likely to reflect CET and university teaching in this field in recent years. A variety of methods were used for fundus assessment, with 5% checking the fundus by both monocular direct and binocular indirect ophthalmoscopy, 7% taking fundus photos, but with 1% not checking the ocular fundus. In a clinical practice survey carried out in 2008, of the 2,751 optometrists who responded, 88% of optometrists would use direct ophthalmoscopy through undilated pupils; 50% stated they would carry out slit lamp binocular indirect ophthalmoscopy through undilated pupils and 3% would performed undilated head-mounted BIO to examine the optic disc when checking for glaucoma (College of Optometrists, 2008b). Although these statistics are for examining a patient for glaucoma, it is encouraging that in the present research study a third of optometrists used binocular indirect ophthalmoscopy on a young, healthy myope with a presenting symptom of headaches.

The one practitioner who did not check the ocular fundus by any method did identify the headache as the key symptom. This optometrist did not ask about general health or ocular history, did ask about family history, but did not check pupil reactions, motility, or the cover test. However, the practitioner did measure accommodation and carry out slit lamp biomicroscopy of the anterior segment, albeit without fluorescein (no Volk lens or similar was used). Intraocular pressures were measured, but there was no visual field assessment. The SP was advised to make a non-urgent appointment with her GP to investigate the headaches and the practitioner produced an appropriate refractive correction. The practitioner's eye examination was completed in less than 15 minutes, which is a shorter duration than average (21mins). 67% of the eye examinations were completed in less than 21 minutes. It is not clear whether the omission of the fundus examination was deliberate or simply forgetfulness on this occasion. This practitioner opted for the feedback option.

As discussed in section 4.2.2, the ocular examination in a patient presenting with headaches should be thorough and examining the patient's fundus, measuring visual acuities, checking pupil reactions, visual fields and external eye movements should be high priority (Davies, 2007). Although all the optometrists carried out a subjective

assessment of the patient's visual acuity, it is noteworthy that 35% of optometrists did not check pupil reactions and only 61% carried out a visual field assessment. Investigation of the visual field is a common component of an eye examination as it helps detect early ocular and neurological disease processes which can be missed with other investigations (Harvey & Franklin, 2005).

Of the 4,000 members who responded to the College of Optometrists clinical practice questionnaire in 1998, 69% of optometrists said they would routinely check patients' ocular motility. However, it is noteworthy that in the present research only 31% carried out ocular motility, 83% carried out the cover test, at least at one distance either with or without spectacles, but 36% did not perform a cover test at both distance and near. In view of the possible link between migraine and binocular vision anomalies (Harle & Evans, 2004; Harle & Evans, 2006c) it would be desirable to have a detailed binocular vision assessment for this SP. Since the present research was carried out, a CET DVD on binocular vision anomalies has been circulated to all optometrists in the UK by DOCET [The Directorate of Optometric Continuing Education and Training, (DOCET, 2007)].

The International Headache Society provides diagnostic criteria for headaches associated with refractive error (section 11.3.2 of the International classification of headaches disorders, second edition) as follows: (a) recurrent mild headaches in the frontal regions and in the eyes themselves, (b) uncorrected or miscorrected refractive errors; e.g., hypermetropia, astigmatism, presbyopia and wearing of incorrect glasses, (c) pain absent on awakening, and aggravated by prolonged visual tasks at distance or the angle[1] where vision is impaired (d) headache and eye pain resolve within 7 days and does not recur after full correction of refractive error. According to these criteria, it is unlikely that the headaches described by the SP (*Table 4.3*) are due to a change in refractive error. It is perhaps surprising that, including those who carried out a binocular refraction, only 50% of practitioners binocularly balanced this young patient. Bearing in mind that the patient is a final year university student, doing a great deal of close and computer work, it is interesting that 25% of the practitioners did not check the patient's near visual acuity and that only 4 optometrists checked the patient's intermediate visual acuity. Fifty-three percent of practitioners advised the patient to update her spectacles; this and the data on refractive error will be discussed further in Chapter 7.

[1] This is the terminology used in the IHS criteria and its meaning is not clear to the author.

The summary in *Table 4.3* states that, if the optometrist asked if the headaches had a pattern the SP would respond that there is no pattern to the occurrence of the headaches and no known triggers. 14% of optometrists asked the patient to keep a diary to note the pattern (if any) of the headaches. Although the presence of headaches was identified in 98% of cases, 49% of optometrists offered further advice regarding headache diagnosis. Diagnosis of a migraine relies almost totally on history, because there are no confirmatory objective signs between the attacks (Olesen & Steiner, 2004). From the summary of the standardised patient's symptoms in *Table 4.3* and the Diagnostic Screening Questionnaire (*Tables 4.1 and 4.2*), it is evident that the patient's headache symptoms strongly suggest a migraine diagnosis. Therefore, it is notable that only three optometrists positively diagnosed the headaches as migraines and that only a further 17% advised the patient that the headaches may be a migraine.

A survey of specified recall intervals for eye examinations found the average re-examination interval for a young adult to be two years (Warburton et al., 2000). 62% of the practitioners visited who advised a re-examination interval advised two years. These results are consistent with the findings from the survey.

4.4.2 General descriptive data

Although it is important to elicit the patient's reason for visit at the outset of the examination, it is also important to ask details about the patient's current visual status. The majority of patients will mention any reduction in distance or near vision when asked about their reason for the visit, although some will only mention this when asked specifically about their vision status (i.e., do you see well in the distance). It is perhaps surprising that thirty-one percent of optometrists did not ask the patient about her distance visual status.

Asking a patient about the nature of work they do or their occupation is useful, although it may not be necessary to ask this question directly of some patients, for the reason for their visit may be directly linked to their occupation or hobbies. In this research the presenting symptoms of headaches could conceivably have been linked to the fact the patient is a final year university student with a heavy schedule of study. Nine optometrists failed to ask the patient about her occupation; twenty-three did not ask the patient about the nature of the visual tasks her work or hobbies entail, and twenty-two did not ask the patient if she was a driver. These three factors and the patient's reason

for visit can greatly influence the optometrist's management advice at the end of the examination and their advice on vision correction. Previous ocular history is a key part of history taking, particularly for new patients (Harvey & Franklin, 2005). The standardised patient in this case presented as a new patient for the eye examination visits. Information gathered during the first eye examination for a patient forms the baseline data for their future records, hence it is of some concern that 25% of optometrists did not ask about previous ocular history.

Thirty-seven per cent of optometrists who completed the clinical practice survey in 2008 would routinely use a biomicroscope in their day-to-day practice to examine an adult patient's external eye or anterior segment (College of Optometrists, 2008b). 60% of optometrists would use a slit lamp 'sometimes' and 1% would never use a slit lamp to examine the external eye or anterior segment (College of Optometrists, 2008b). Thirty-five percent of optometrists carried out slit lamp biomicroscopy on the standardised patient, which is at the lower end of the percentage that might be expected based on the College of Optometrists' survey.

In many practices optometrists are allocated 20 minutes to carry out a "routine" eye examination (Harvey & Franklin, 2005). In smaller practices, 30 minutes is often allowed for each appointment, but this normally includes 10 minutes for dispensing (Harvey & Franklin, 2005). The average duration of an eye examination in this research was 21 minutes. It is however noteworthy that the range was from 5 minutes to 50 minutes. Sixty seven optometrists carried out an eye examination in less than 21 minutes.

4.4.3 Comparisons

Results relating to the SP's subjective assessment of the thoroughness of the eye examination revealed no significant differences between different types of practice. In the present research, thirty-five optometrists (or assistants) carried out both visual fields and tonometry. Of these, 15 were from large multiples (so 43% of practitioners working in large multiples delegate fields & tonometry), 4 from small multiples (so 27% of practitioners working in small multiples delegate fields & tonometry), and 16 from independent practices (so 32% of practitioners working in independents delegate fields & tonometry). These differences were not statistically significant (chi-squared test, $p=0.45$). In the vast majority of practices from large multiples, IOPs, visual fields and

autorefraction are carried out by assistants as pre-screening tests before the actual eye examination. Thirteen practitioners (or assistants) carried out IOPs, visual fields and autorefraction. Of these, 9 were from practices in large multiples. It is not possible to establish if these tests would have been performed either by the optometrist or by an assistant on request by the optometrists had they not been part of the pre-testing routine. There was no significant difference between the proportions of optometrists working for different practice types carrying out tests recommended by the expert panel.

An objective assessment of refractive error (retinoscopy and/or autorefraction) is important in patients who are unable to cooperate in a subjective refraction (young children) or if the subjective responses are limited (patients who do not speak the same language as the practitioner) or are unreliable. Retinoscopy however provides a more accurate result of refractive error in a greater array of patients than autorefraction, although autorefraction is a reliable alternative in “standard” adult patients (Elliott, 2003a). It is interesting that the results of this research found that a greater proportion of optometrists working in large multiples carried out an objective assessment using an autorefractor than those working in independent practices. Predictably, the opposite result was found for retinoscopy, with 42% of optometrists in independent practices performing retinoscopy but only 29% in large multiples.

4.5 Chapter summary

To conclude optometrists in primary care practice can expect approximately 10% of their male patients and one quarter of their female patients to be migraine sufferers or to have a history of migraines (Gutteridge & Cole, 2000). When optometrists ask patients about headaches during history taking, they can expect, on average, to be spending a significant amount of time in routine practice discussing migraines (Gutteridge & Cole, 2000). The presence of headache was detected in 98% of cases. Although none of the optometrists asked all of eight standard headache questions that were considered to be appropriate for primary care headache investigation, 22% asked at least four of the eight questions. 69% of practitioners asked the patient to seek a medical opinion regarding the headaches. The next chapter focuses on the content of optometric eye examinations for a presbyopic patient of African racial descent.

5 Scenario 2: The Content of Optometric Eye Examinations for a Presbyopic Patient of African Racial Descent

5.1 Introduction

The need to measure clinical care within optometry was discussed in section 1.2 and the need for standardised patient research discussed in section 3.1. The standardised patient approach was used to investigate the content of optometric eyecare for an early presbyopic SP of African racial descent, an 'at risk' patient group for Primary Open Angle Glaucoma (POAG). Glaucoma is a leading cause of vision loss and affects more than 66 million individuals worldwide with at least 6.8 million bilaterally blind (Quigley, 1996; Weinreb & Khaw, 2004). The glaucomas are a group of progressive optic neuropathies that have in common a progressive degeneration of retinal ganglion cells and their axons, resulting in a characteristic appearance of the optic disc and a concomitant pattern of visual field loss (Weinreb & Khaw, 2004). Glaucoma can be congenital or acquired; be associated with an open or closed drainage angle; be acute or chronic; or be primary or secondary depending on the presence or absence of associated factors.

Primary open angle glaucoma (POAG) is a chronic, generally bilateral although asymmetrical disease, characterised by progressive damage of the optic nerve shown by glaucomatous changes affecting the optic disc, the retinal nerve fibre layer and/or the visual field (Weinreb & Khaw, 2004). POAG has an adult onset, an open anterior chamber angle of normal appearance, and an absence of other known explanations for the changes in the optic nerve (Weinreb & Khaw, 2004). POAG, accounts for 75 to 95% of primary glaucomas in 'white' people (Quigley, 1996) and is the most common form of glaucoma in the UK. The prevalence of primary open angle glaucoma (POAG) in the UK population aged over 40 is estimated to be 2.0%, with 542,000 estimated to have the disease and up to 65% of cases undetected (Azuara et al., 2007). The prevalence rises steeply with age, from 0.3% at 40 years of age to 3.2% at 70 (Azuara et al., 2007). Late presentation with advanced disease is a risk for blindness from glaucoma (Fraser et al., 1999). Late detection may result from patients not engaging

with community eyecare, from a failure of health professionals to identify the disease at an early stage, or from unusually rapid disease progression.

The risk of developing POAG substantially increases as the level of intraocular pressure increases (Sommer *et al.*, 1991a; Tielsch *et al.*, 1991a; Weinreb & Khaw, 2004). Other risk factors for POAG include visual field abnormalities seen in otherwise routine baseline visual field examinations (Gordon et al., 2002; Kass et al., 2002); myopia (Weinreb & Khaw, 2004; Daubs & Crick, 1981; Tomlinson et al., 1975) and family history (Tielsch et al., 1994; Weinreb & Khaw, 2004; Wolfs et al., 1998). Rudnicka et al (2006) noted that POAG cases identified by cross-sectional survey (i.e., prevalent cases) are two to three times more likely to report a family history of glaucoma compared with controls and four times more likely to report sibling history of glaucoma. The link between race and POAG is also well documented and will now be described.

5.1.1 The link between POAG and race

The description of race in scientific publications is a sensitive issue (Anon, 1996; Kaplan & Bennett, 2003; McKenzie & Crowcroft, 1994) and concepts and categories of race are inherently imprecise (Kaplan & Bennett, 2003). Several studies have reported a higher prevalence of glaucoma in people variously described as 'African-American' (Tielsch et al., 1991b) and Caribbean (Kosoko-Lasaki et al., 2006). In the present review the terms used are those used by the authors whose work is being described and, where available, their method of categorising race [(e.g., self-report) (Kaplan & Bennett, 2003)] is described. It is not implied that individuals fit neatly into the categories that are described or that each category captures a homogeneous group. It must also be acknowledged that although the evidence reviewed indicates that race is a risk marker for glaucoma, this does not necessarily mean that membership of a certain racial group is itself a risk factor for glaucoma (Kaplan & Bennett, 2003). The likelihood of developing a condition may vary considerably amongst members of the group, and those who are actually at risk may share relevant characteristics with people in other racial/ethnic groups (Kaplan & Bennett, 2003).

A seminal paper established a higher risk of POAG by four to five times in people who were described in the paper as being of 'Black American race' than in those described as 'white' (Tielsch et al., 1991b). The observed difference is often attributed to "race"

(Leske et al., 1994; Mason et al., 1989; Tielsch et al., 1991b). The basis on which participants were classified into just these two racial groups is not explicitly stated in the paper, but the classification appears to have taken place at 'an enrolment interview'. Factors leading to this observable difference in the prevalence of POAG are unclear. Kosoko-Lasaki et al. (2006) examined the potential ethnic diversity in the prevalence of POAG among populations of the same race. The study concluded that there are statistically significant differences in the prevalence of POAG among populations of the same "race". This could be attributed to different methodologies and definitions of POAG in population-based studies; differences in social, behavioural and environmental factors; and/or genetic predisposition (Kosoko-Lasaki et al., 2006). For example, the prevalence of POAG in people described as being 'Caribbean living in London' is significantly lower than 'those living in St Lucia' and is marginally lower than 'those living in Barbados' (Kosoko-Lasaki et al., 2006).

Results of the Baltimore Eye Survey found that prevalence of POAG exceeded 1% among people described as younger 'blacks' (between 40 and 50 years of age) and rose to more than 10% among 'blacks' aged 80 years or older. A meta-analysis of six studies also confirmed a higher prevalence in 'black Americans' compared to 'white Americans' (Friedman et al., 2004). Not only is the prevalence of glaucoma greater, but the age of onset is on average earlier, there is more optic disc damage at the time of diagnosis, it is more difficult to treat and the risk of blindness is higher (Sommer *et al.*, 1991b; Tielsch *et al.*, 1991c; Mason *et al.*, 1989; Leske *et al.*, 1994; Racette *et al.*, 2003). Estimates of the prevalence in 'white' populations ranged from 1% to 1.5% in those aged 40-65 years, rising to from 2% to 7% in those older than 65; estimates in 'black Americans' ranged from 1.5% to 3.6%, and from 4.6% to 9.8%, respectively for similar age groups (Friedman et al., 2004). These results also show that POAG is more common in older individuals, especially after the age of 65 years. A systematic review of the published literature on glaucoma prevalence and a Bayesian meta-analysis by Rudnicka et al (2006) concluded that although 'black' populations had the highest prevalence of POAG at all ages, the steepest increase in POAG prevalence with age was found in white populations.

5.1.2 POAG detection

The majority of POAG cases are unfortunately not discovered until vision has been permanently lost because the early clinical signs of glaucoma are subtle (Weinreb &

Khaw, 2004). Loss of vision caused by POAG can be limited or prevented by identifying the condition during its early stages. Population screening for glaucoma is not performed in the UK using a structured or defined national protocol; hence POAG sufferers are typically detected through "case finding" (Harper & Reeves, 1999). Screening is a process of selection with the purpose of identifying those individuals who are at sufficiently high risk of a particular disorder to warrant further investigation (Anon, 1994). The measurement of intraocular pressure alone is not effective for glaucoma screening. Harper et al. (2000) concluded that although clinical examination of the optic disc using direct ophthalmoscopy can achieve comparable sensitivities and specificities to those reported for stereo photographic assessment or visual field screening, the diagnostic accuracy of disc assessment in isolation is inadequate for screening. Hence, a combined strategy of intraocular pressure measurement, optic disc and visual field assessment is necessary (Weinreb & Khaw, 2004; Harper & Reeves, 1999). Visual field screening should be used routinely, but the challenge is to design a screening protocol that can be implemented without imposing substantial further demands and costs on primary eye care practitioners (Harper & Reeves, 1999).

In the UK, most cases of suspect glaucoma are referred to the Hospital Eye Service by general practitioners (Azuara et al., 2007; Tuck & Crick, 1991), although over 90% of these referrals are initiated by optometrists (Bowling et al., 2005). Glaucoma suspects constitute the second most common cause of referrals to the Hospital Eye Service (Lash, 2003). In the largest study reported to date, Bowling et al. reported that nearly half (45.8%) of all patients referred to a glaucoma clinic were discharged at first visit (Bowling et al., 2005). False positive referrals cause unnecessary pressure on already overstretched hospital eye departments resulting in long waiting times for patients. Detection rates for POAG are likely to vary across the optometric profession because criteria for (1) using screening tests and (2) referral of suspects have been shown to vary widely between optometrists (Vernon & Ghosh, 2001). The optometric referral refinement scheme in Manchester resulted in a 40% reduction in the number of new glaucoma referrals to the Hospital Eye Service (Henson et al., 2003). This scheme benefited from an examination by accredited optometrists as a confirmatory check on the original optometrists' findings. Patients referred through this scheme were examined by the accredited optometrists within 2 weeks of being referred, compared to 2-3 months through the pre-existing pathway (Henson et al., 2003). Henson et al. concluded that the number of false positive referrals can be significantly reduced by the introduction of referral refinement schemes and by further education and training for

optometrists to ensure they use all three current main diagnostic tests on patients at risk of POAG.

A benefit resulting from the recent changes to the General Ophthalmic Services in Scotland was to encourage the use of dilation, contact applanation tonometry and full threshold fields on patients, with the aim of reducing inappropriate hospital referrals. Optometrists are able to repeat tests and procedures when necessary by performing a supplementary examination (Association of Optometrists, 2008d). Ang et al. 2007 investigated the influence of the new NHS contract on glaucoma referrals in Scotland. After the introduction of the new GOS contract, there was a statistically significant increase in true-positive referrals (from 18.0% to 31.7%; P=0.006), and a decrease in false-positive referrals (from 36.6% to 31.7%; P=0.006). In addition, there were increases in the number of referrals containing information from applanation tonometry (from 11.8% to 50.0%; P=0.000), from dilated fundal examination (from 2.2% to 24.2%; P=0.000), and from repeat visual fields (from 14.8% to 28.3%; P=0.004) when compared to the 6-month period prior to the introduction of the new contract (Ang et al., 2007).

There have also been changes in legislation in Wales to aid early detection of eye problems in susceptible individuals, to enable early assessment and to provide a low vision service that is accessible to all (Association of Optometrists, 2008e). Patients may either self-refer or be referred by their general practitioner under this scheme (Association of Optometrists, 2008e). Several categories of patients are eligible for an examination annually by an optometrist registered under this scheme. Optometrists are required to undergo further accreditation training in order to be registered on this scheme, and practices are required to have a minimum level of equipment. Also, patients whose family origins are described as ‘Black African’, ’Black Caribbean’, ‘Indian’, ‘Pakistani’ or ‘Bangladeshi’, and patients at risk of eye disease by reason of ‘race’ or family history are entitled to a free ‘eye health examination’ under this scheme (Association of Optometrists, 2008e). Optometrists are required to perform a minimum of visual acuity measurement, dilated fundus examination using a slit lamp biomicroscope and Volk lens, a slit lamp biomicroscope assessment of the anterior segment, assessment of the anterior chamber angle, contact tonometry using Goldman or Perkins, visual field examination for which a quantifiable visual field printout is available and any other procedures at their discretion (Association of Optometrists,

2008e). Patients who have an examination under this scheme may return on another day for a private or NHS sight test at the discretion of the examining optometrist.

There are about 10,700 optometrists in the UK (Federation of Ophthalmic & Dispensing Opticians, 2008) and about 95% of optometrists work as primary care optometrists in community optical practices (College of Optometrists, 2008b; Blakeney, 2002). These community optometrists are the major providers of primary eyecare services in the UK. Optometrists play an important role in glaucoma detection by performing eye examinations and as discussed above account for about 90% of all referrals to hospital clinics for suspected POAG (Bowling et al., 2005).

This chapter aims to provide data on the content of typical optometric eye care in England for a 44 year old patient of African racial origin presenting with difficulty with near vision. The College of Optometrists document entitled “What happens during an eye examination?” advises the general population: “If you are over 40, we recommend you should be checked to ensure you are not developing glaucoma. Checking for glaucoma involves a combination of two or three of the following three tests: looking inside your eye; measuring the pressure inside your eye (using an air puff instrument or drops to gently numb the eye) and checking your visual field for any abnormal blind spots” (College of Optometrists, 2008d). This states the importance of the use of at least two of the three tests commonly used by optometrists for the accurate referral of suspect POAG patients.

This chapter formed the basis for a much shorter paper that has been published in the *British Journal of Ophthalmology* (Shah et al., 2009b). This part of the thesis has three main aims:

- Provide data on the content of typical optometric eye care in England for a patient of African racial origin, presenting with a recent deterioration in her near vision.
- Evaluate how appropriately the eye examinations were carried out for this patient as she presented; for example, the patient had a commonly encountered degree of hypermetropia and was in an ‘at risk’ group for primary open angle glaucoma (POAG).
- Investigate differences between different types of practice (independent, small multiple and large multiple).

5.2 Methods

5.2.1 Standardised patient description (Case Scenario)

A 44 year old person of African racial origin presents for a private eye examination, requesting new reading spectacles. There is no personal or family history of glaucoma, and the patient did not mention (or indicate any knowledge of) the increased risk of glaucoma in people of African origin. The patient stated that she had not had an eye examination for about two years. The script (presenting symptoms and standardised answers to questions) is illustrated in *Table 5.1*.

Table 5.1: An overview of the second standardised patient's symptoms, and answers to questions asked during the eye examination.

- Your last eye examination was 2 years ago when you needed new reading glasses. If asked, you don't think that any other problems were detected.
- Your distance vision appears to be good but you have recently been experiencing difficulty whilst reading using your current spectacles. If asked, you have noticed the deterioration over the last couple of months and it is worse if you are reading in poor lighting and when you are tired. You have not experienced any other visual symptoms (e.g., floaters, flashes, double vision).
- You are in good health (no diabetes, no high BP) but you have an underactive thyroid for which you take thyroxine daily. You don't take any other prescribed medication. If asked, you attended an eye hospital as a child because you think you have a lazy eye (left eye). If asked, you remember having to wear a patch but have not had any surgery or injuries to your eyes. If asked, you don't suffer from glaucoma. Your father was diabetic (tablet and diet controlled) and has had cataract operations on both eyes. There is no other family history of any other ocular or medical condition.
- You do drive but did not drive in today. You are a project manager and spend most of your day using a VDU. Your hobbies are going to the gym and reading.
- If asked, your ethnic origin is West African. You are keen to know if you are at a greater risk of any eye conditions.

5.2.2 *Defining checklists*

As described in the introduction to this chapter, glaucoma can be sub-classified into several different types. In the broadest terms glaucoma involves a study of the following: Intraocular pressure; optic nerve head damage; visual field loss and drainage angle (Kanski, 1999). It is therefore imperative when characterising the type of glaucoma and/or examining a patient for glaucoma to measure the intraocular pressure, examine the optic disc and assess the drainage angle and visual fields. In

this particular case, the standardised patient presented as being in an 'at risk' patient group for Primary Open Angle Glaucoma (POAG). Consenting optometrists were unaware that this aspect of the examination was being assessed (the risk factors of POAG and the link between POAG and race have been discussed earlier in this chapter).

Examination of the optic disc is the most valuable method of diagnosing early glaucoma, because the optic nerve appearance often changes before visual field loss is detectable (Weinreb & Khaw, 2004). The optic disc should be examined with a magnified stereoscopic view. This examination is therefore best done using a slit lamp biomicroscope with indirect lens or contact lens (Weinreb & Khaw, 2004). The direct ophthalmoscope is less desirable for examining the optic disc as it provides a view that lacks the depth of a stereoscopic image (Weinreb & Khaw, 2004). The case specific checklists therefore included questions relating to the method used for fundus examination (i.e., direct ophthalmoscopy, binocular indirect ophthalmoscopy or fundus camera).

As discussed in chapter 3, tonometry is an important part of a primary care eye examination and although it is a poor screening test for glaucoma (Weinreb & Khaw, 2004) compared to optic nerve head and visual field assessment, it provides useful information when used in conjunction with other assessments (Harper & Reeves, 1999). Although Goldmann tonometry has long been the gold standard for intraocular pressure measurements, it is noteworthy that it under-estimates the true intraocular pressure of patients with thin corneas and over-estimates it in patients with thick corneas (Weinreb & Khaw, 2004). The case specific checklists were therefore designed to gather information on the method used to assess the intraocular pressure (appendix 12).

Glaucoma patients normally suffer considerable optic nerve head damage before they experience any symptoms. Central visual acuity is relatively resistant to glaucomatous damage and, therefore, is reduced late in glaucoma (Weinreb & Khaw, 2004). Approximately 50% of POAG patients are unaware of their disease at the time of diagnosis, becoming symptomatic after significant visual loss has occurred (Harasymowycz *et al.*, 2005) hence it is a priority for primary vision carers to develop ways of detecting a greater proportion of patients with the disease (Harper & Reeves, 1999). Visual field examination using automated static perimetry has become the

standard clinical tool for the diagnosis and monitoring of glaucoma in both optometric practice and ophthalmology (Cubbidge, 2005). It is often recommended that a visual field examination is carried out on all individuals over the age of 35. The rationale for this recommendation is the increased risk of glaucoma in those over this age, although visual field defects commonly manifest in other diseases, particularly neurological disease affecting the visual pathway (Cubbidge, 2005).

For the research reported in this thesis, the time taken per eye for the visual field examination was established from the SP checklists. Trials were performed at the Institute of Optometry using patients in the 50-year-old age group. These indicated that the minimum time taken for supra-threshold testing is approximately 1.5 minutes per eye and the minimum time taken for full-threshold testing is approximately 3 minutes per eye. These norms were therefore used as a guideline when analysing the visual fields results in order to establish whether a supra- or full-threshold visual field test was performed.

Gonioscopy is the standard procedure for examination of the anterior chamber angle (Elliott, 2003a). A contact lens is necessary for the examination of the anterior chamber angle structures as light from the angle is totally internally reflected within the anterior chamber (Elliott, 2003a). Although gonioscopy is one of the tests required for a complete baseline examination to characterise the glaucoma type (to confirm the 'primary' diagnosis in POAG), it is not a core competence which UK optometrists are expected to possess at registration and is not routinely carried out in optometric practice. Optometrists may learn the technique during postgraduate training and 6% of optometrists have access to a gonioscope lens (College of Optometrists, 2008b). Optometrists who are part of a glaucoma monitoring scheme carry out gonioscopy as part of their protocol. This was included in the case specific checklist both for completeness and to establish whether optometrists would perform this technique as part of a routine eye examination.

The anterior chamber angle can also be assessed using a slit lamp biomicroscope, typically using van Herick's method (Van Herick *et al.*, 1969). Although the van Herick angle assessment is unable to assess the superior angle (narrowest, hence most likely to close), the technique is sufficient to indicate if there is a danger of angle closure (Foster *et al.*, 2000). In most cases optometrists include the van Herick assessment as part of the anterior eye examination routine hence it would be difficult to establish

whether this was performed without asking the practitioner. During the training of the SP it was confirmed that this test could not be reliably detected. This was therefore not included in the case-specific checklist.

The College of Optometrists Code of Ethics and Guidelines for professional conduct for optometrists on Examining the patient at risk of Primary Open Angle Glaucoma states: "when examining a patient who falls within the at-risk groups for POAG, the optometrist has a duty to carry out the appropriate tests necessary to determine the likelihood of the condition being present." The majority of patients who can be considered to be at risk of POAG will be identifiable in the course of the initial overall eye examination. Patients in certain ethnic groups (e.g. African-Caribbean people) can always be considered as being at a more than average risk of glaucoma. The advice to optometrists when examining patients in an "at risk" group states (College of Optometrists, 2008a):

- ***It is for the practitioner to satisfy him/herself that procedures are included or excluded according to the patient's clinical need but in addition to the guideline on the eye examination, good practice for these patients should normally include:***
    - ***Assessment of the optic nerve head***
    - ***Tonometry. Where pressures are high or borderline, arrangements should be made for the test to be repeated, noting the time of the day of each test.***
    - ***Central visual field assessment using perimetry with threshold control. Where necessary practitioners should consider repeating visual fields assessments to obtain a meaningful result.***

The College of Optometrists document entitled "What happens during an eye examination?" advises the general population: "If you are over 40, we recommend you should be checked to ensure you are not developing glaucoma. Checking for glaucoma involves a combination of two or three of the following three tests: looking inside your eye; measuring the pressure inside your eye (using an air puff instrument or drops to gently numb the eye) and checking your visual field for any abnormal blind spots" (College of Optometrists, 2008e). Although the literature reviewed states that a combined strategy of intraocular pressure measurement, optic disc and visual field assessment is necessary (Harper & Reeves, 1999; Weinreb & Khaw, 2004), the College of Optometrists' guidance states at least two of the three tests commonly-used by optometrists are important for the accurate referral of suspect POAG patients. All

three tests were included in the case specific checklist to establish the proportion of optometrists who performed each test and the proportion that performed two or three tests.

At the age of about 40-45 years [earlier in some ethnic groups, people with shorter arms and/or working distances and hyperopes; later in people with longer arms and/or working distances and myopes (Millodot & Millodot, 1989; Pointer, 1995b; Pointer, 1995a; Pointer, 1995c)], most people become presbyopic [i.e., they do not have enough accommodation to read and do other near work comfortably (Elliott, 2003a)]. These patients require a positive lens addition or "reading addition" to their distance prescription. As this SP fits into this age group and the presenting symptoms (section 5.2.1) are suggestive of presbyopia, questions to establish whether or not a test for a reading addition was performed during the subjective assessment of refractive error have been included in the case-specific checklist.

5.2.3 Expert panel feedback

The panel of experts was asked to review in detail and modify the case scenario and checklist prepared by the researcher for this SP. The feedback received for these documents from members of the expert panel for this scenario is included in the appendix 2.

5.2.4 Research questions specific to scenario 2

As discussed in Chapter 3 (section 3.3.1, p.57), a panel of experts was chosen for each case scenario to help in the development of the case scenario and checklist design. The panel of experts was also asked for their views on questions and tests that might be appropriate for an optometrist when examining a presbyopic patient of African racial origin presenting with near vision problems. The panel of experts consisted of four members; each an expert in the field of glaucoma. They came from broad range backgrounds:

- A head optometrist in a shared care department of a hospital, head of visual electrophysiology in the hospital;

- A consultant optometrist at an eye hospital and senior lecturer at a UK optometry department, examiner for the College of Optometrists membership exams and Glaucoma higher diploma, former chairman and current member of the College of Optometrists glaucoma panel;
- A lecturer at a UK optometry department and a honorary research fellow at a Glaucoma research unit at Moorfields Eye Hospital;
- A specialist hospital optometrist with an interest in Glaucoma.

Their views are summarised as primary and secondary research questions in *Table 5.2*. The list of possible tests and questions in *Table 5.2* was not intended to define good practice, but more to be a list of possibly relevant clinical investigations and of relevant research questions.

Table 5.2: Primary and secondary research objectives relating to scenario 2.

Primary Research Questions
Is the eye examination appropriate for the investigation of POAG?
Secondary Research Questions
1. What proportion of optometrists asked about family history of glaucoma?
2. What proportion of optometrists inspected the anterior chamber angle using gonioscopy?
3. What proportion of optometrists carried out fundoscopy? ➢ Using a monocular instrument (ophthalmoscope/monocular indirect)? ➢ Using slit lamp BIO method? ➢ Using a fundus camera?
4. What proportion of optometrists carried out tonometry? ➢ Using contact tonometry? ➢ Using non-contact tonometry?
5. What proportion of optometrists tested visual fields? ➢ Using supra-threshold testing? ➢ Using full-threshold testing?
6. What advice was given regarding re-examination interval? ➢ What proportion of optometrists explained the increased risk of glaucoma in people of African racial origin and/or stressed the need for frequent re-examinations?
7. What proportion of optometrists recommended a new refractive correction?
8. What proportion of optometrists issued a prescription?
9. How variable were the refractive findings? ➢ The mean and central 95th percentile range of the recommended refractive correction will be identified.

5.3 Results

As described in the general methods (section 3.3), consenting optometrists were asked to choose which option they preferred, complete anonymity or the feedback option. Thirty-one optometrists visited by the SP in this scenario chose full anonymity (this figure included nineteen practices where a locum practitioner was standing in for the consenting practitioner), 53 chose feedback, and 10 did not state a preference (these were given the option of receiving feedback when the results were available).

5.3.1 Addressing the research questions

Concerning the primary research question, "Is the eye examination appropriate for the investigation of glaucoma", 35% of optometrists carried out all three of the main 'glaucoma tests' (ophthalmoscopic assessment of optic discs, tonometry, and visual field testing) and 95% carried out optic disc assessment and tonometry. Only one optometrist who carried out a visual field assessment and ophthalmoscopy did not carry out tonometry. This issue is discussed in further detail in the discussion.

Ninety four per cent asked the SP when she last had an eye examination and all the optometrists visited asked the reason for visit, hence had established that the patient was having difficulty with her near vision. 75% asked if the SP had experienced any pain or discomfort around the eyes. 30% of optometrists visited asked the SP if she had glaucoma and 95% enquired about a family history of glaucoma.

Thirty-seven percent of optometrists visited examined the anterior surfaces of the eye using a slit lamp biomicroscope. Some or all of these optometrists may have carried out van Herick assessment of the anterior chamber angle although this was not assessed by the SP. None of the optometrists visited inspected the anterior chamber angle using gonioscopy. Ninety-nine percent of participants carried out an examination of the ocular fundus: 77% by monocular direct ophthalmoscopy, 13% by binocular indirect ophthalmoscopy, and 9% by both monocular direct ophthalmoscopy and binocular indirect ophthalmoscopy. Two optometrists used head mounted binocular indirect in addition to direct ophthalmoscopy. One optometrist did not assess the ocular fundus by any means. Eight optometrists took fundus photographs in addition to performing ophthalmoscopy.

Some testing was carried out by assistants (e.g., tonometry, visual fields, and autorefraction). These tests were included as components of the eye examination in the data described in this section. 96% of optometrists visited carried out tonometry. 84% carried out non-contact tonometry and 12% used contact tonometry. None of the optometrists carried out both contact and non-contact tonometry.

Only 36% carried out visual field testing, almost invariably using perimeters (only one participant carried out confrontation, and also carried out an automated visual field test). The type of visual field testing performed was classified on the basis of time taken for the test using trials performed at the Institute of Optometry as a baseline. The SP recorded the approximate time taken for the visual field examination for each eye in the checklist she completed at the end of each consultation. This indicated that 32% of optometrists (or assistants) carried out supra-threshold visual field testing and 4% carried out a full threshold visual field examination. As described in chapter 3 (section 3.3.4 and 3.3.5), the actor used a digital audio recorder during the visits to allow accurate completion of the checklists. The audio recordings obtained for those practitioners (70%) who gave consent for this option were played back by the researcher to ensure that the checklists were accurately completed.

100% of optometrists carried out focimetry, either personally or delegated, of the patient's existing spectacles. 83% carried out an objective assessment of the refractive error. 35% used an autorefractor (personally or delegated), 60% carried out retinoscopy and 12% carried out both. All the optometrists carried out subjective testing of the spherical element of the refractive error and 76% checked subjectively for the cylindrical element. The patient presented as a project manager (87% asked about this), and 77% of the optometrists asked the patient about the kind of visual tasks she does (i.e., computer use). The SP presented for the eye examinations with a single vision hyperopic prescription. 74% of optometrists established a prescription for near vision and 45% of these also established a prescription for intermediate vision. None of the optometrists prescribed a separate addition for intermediate vision hence it was concluded that the same add was prescribed for intermediate and near vision. All of the optometrists checked the SP's near visual acuity and 62% her intermediate visual acuity. 50% of the optometrists visited checked the range of clear near vision.

Eighty-three percent of optometrists advised a re-examination interval. A minimum of 12 months was advised and a maximum of 24 months. Most (76%) advised two years,

with 22% advising one year and two optometrists advising 18 months. At the end of each eye examination the standardised patient asked the optometrist if she was at a greater risk of any conditions. Ninety optometrists responded to this question. Ten optometrists did not respond to the question when asked by the SP. The various responses to this question are listed in *Table 5.3*.

Table 5.3: Responses to the question "Am I at a greater risk of any particular conditions?"

Advice given to the SP regarding her risk of developing any medical conditions	Percentage of optometrists
Not at risk of any conditions	27%
Not at risk of any conditions and advised not to worry	12%
At a low risk of glaucoma as no immediate family history, and risk associated with family history explained by optometrist	16%
Would only be at a greater risk of developing glaucoma if there was a family history	44%
Ruled out risks of any conditions after the eye examination	14%
At an increased risk of glaucoma as patient of African racial descent	6%
Increased risk of glaucoma with age	5%
Regular eye examinations are important for early diagnosis of any conditions	2%
Important to have regular blood tests to keep a check on diabetes due to family history of diabetes	11%
Important to keep a regular check on the underactive thyroid	3%

*the proportions quoted are based on the entire sample (N=100). The totals do not add up to 90 (the number who addressed this question) because several optometrists recommended more than one option.

Sixty-nine percent recommended an update of the current spectacles. Seventy percent of optometrists issued a prescription without prompting, but a further 28% only gave the prescription when the SP asked for it. The two optometrists who did not issue a prescription did not refuse, but told the SP to return for the prescription later.

5.3.2 General descriptive data

The general descriptive data are included in appendix 13 and only the key features that have not already been described whilst addressing the research questions have been highlighted here. Fifty-four percent asked the SP if she had experienced flashing lights, 49% asked about floaters and 48% asked about double vision. 86% asked the patient about headaches. The SP, when asked by 95% of the optometrists, described herself as a driver. 97% asked if the patient was in good health and 99% asked if the patient was taking any medication. Ninety-seven optometrists asked about previous ocular

history, 96% asked if the SP had attended an eye hospital clinic, 89% asked about any previous injuries, surgeries or infection, and 41% asked if the SP had a lazy eye.

All the optometrists visited checked a cover test, at one distance at least, either with or without spectacles and 62% checked ocular motility. Twenty-one percent measured accommodation, 40% convergence, 94% pupil reactions, and fixation disparity testing was carried out by 30% at distance and 14% at near. Three optometrists measured the SP's stereo-acuity. Thirty-seven optometrists carried out a slit lamp biomicroscope assessment; with four optometrists using fluorescein. 24% of optometrists who carried out a slit lamp biomicroscope assessment examined the fundus using slit lamp biomicroscopy.

Seven optometrists advised the SP on visual hygiene when using the computer. The patient was advised to take regular breaks when using the computer for long periods of time. Only one optometrist explained the need for a reading correction due to the onset of presbyopia. The average time taken for the examination (including any screening) was 23 minutes, ranging from twenty to thirty minutes (95% CI: 23-24). The average cost of the consultation was £22.33 (range £0 to £40; 95% CI £21-£24). *Figure 5.1* shows for the sample of 100 examinations how the time taken for the examination is related to its cost. The r^2 for the correlation is 0.06, indicating that only 6% of the variability in the data is explained by the association between the time taken and the fee charged. It is noteworthy that r^2 is influenced by a "restriction in the range", hence it likely that this figure has been influenced by the small range of values for the two variables (duration and cost of examination).

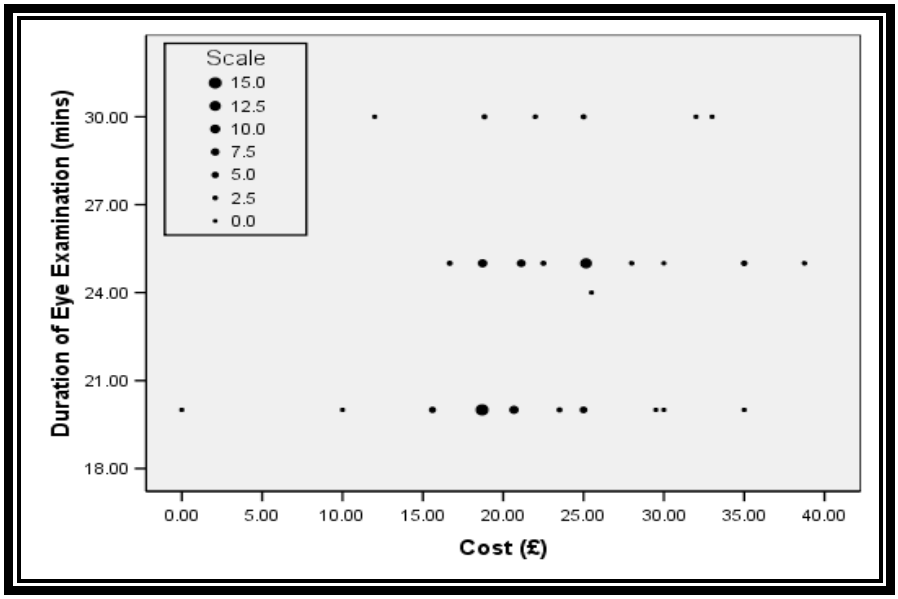


Figure 5.1: Scatter plot showing the duration of each eye examination plotted against the cost of the examination for the second patient scenario. Data were obtained from a sample of 100 optometrists.

5.3.3 Comparisons

The randomisation process for participant selection resulted in the SP visiting 50 independent practices, 34 large multiples and 16 small multiple practices. The average time taken for an eye examination by independent practices was 24 minutes (95% CI: 22.9-24.8) and similarly 24 minutes for small multiple practices (22.7-26.0) compared to 22 minutes (21.1-23.3) by large multiples (see Discussion). These differences were statistically significant (ANOVA: F=3.59, p=0.03). The average cost of an eye examination was highest for independent practices (£23.58) and lowest for large multiples (£20.00). These differences were statistically significant (F=4.25, p=0.01). It should be noted that all the times quoted in the previous paragraph include delegated vision screening tests (e.g., where visual field testing, autorefraction, or tonometry were delegated to a trained lay person).

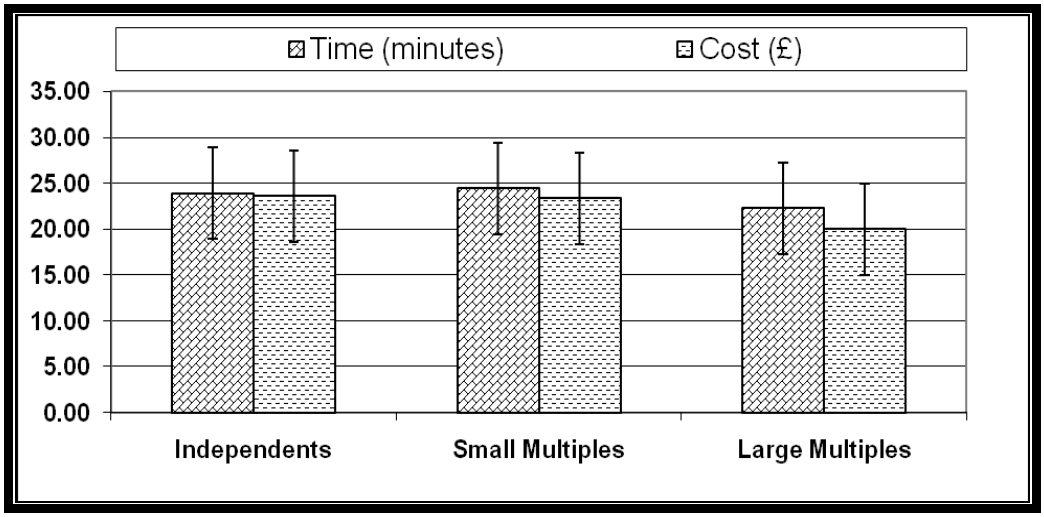


Figure 5.2: Mean duration and cost of the eye examination for independent practices, small and large multiples visited by the second standardised patient. The vertical axis represents both time (minutes) and cost (£).The error bars represent the upper and lower boundaries of the 95% confidence intervals for the means.

As described in chapter 3 (section 3.3.2) the SP was required to complete a checklist recording details of their encounter immediately after each eye examination. As the first item on each checklist, the SP subjectively rated the thoroughness of the eye examination and the extent to which her presenting symptoms were addressed. In answer to the question "How thorough do you feel the eye examination was?" the average score was 92%. Independents had an average score of 91%, large multiple and small multiple practices both had an average score of 94%. These differences were not statistically significant (ANOVA: F=1.90, p=0.15). In answer to the second question, "To what extent do you feel you presenting symptoms were addressed?" the average score was 92%. Independent practices had an average score of 91%, small multiples 93% and large multiples 92%. These differences were not statistically significant (ANOVA: F=1.02, p=0.36).

As described in chapter 3 (section 3.3.1) and in section 5.2.2, literature reviewed, clinical guidelines and suggestions from a panel of experts were used to highlight tests (in the form of secondary research questions) that could be appropriate for a patient who is of African racial origin in this age group (40-50 year olds). *Table 5.4* compares the percentages of optometrists working in independent, small and large multiple optical practices who performed these suggested tests. On average, optometrists performed six of the eight tests (minimum 4, maximum 7) that the expert panel felt were appropriate for this patient. The percentage of optometrists carrying out a visual

field assessment was greater for small and large multiple practices compared to independent practices. This issue is discussed in detail in section 5.4.3. It is stressed that this list of tests is not intended to define good practice, but rather to be a list of possibly relevant clinical investigations and of relevant research questions.

Table 5.4: The percentages of optometrists working in independent practices, small multiples and large multiple practices that carried out tests recommended by the expert panel in case scenario 2.

Expert panel recommended tests	Independent (n=50)	Small Multiple (n=16)	Large Multiple (n=34)	Total Sample (n=100)
Ask about a family history of glaucoma	90%	100%	100%	95%
Gonioscopy	0%	0%	0%	0%
Fundus Examination	98%	100%	100%	99%
a) using direct ophthalmoscopy	84%	88%	88%	86%
b) using slit lamp biomicroscopy	22%	38%	15%	22%
c) using a fundus camera	14%	6%	0%	8%
Tonometry	94%	100%	97%	96%
a) Using contact tonometry	18%	19%	0%	12%
b) Using non-contact tonometry	76%	81%	97%	84%
Visual Fields	24%	50%	47%	36%
a) Using full-threshold testing	8%	0%	0%	4%
b) Using supra-threshold testing	16%	50%	47%	32%
Objective assessment of refractive error	80%	75%	91%	83%
Subjective refraction	100%	100%	100%	100%
Subjective assessment of cylindrical element	72%	75%	82%	76%

*the proportions quoted are based on the entire sample (N=100). For fundus examination several optometrists used more than one method.

5.4 Discussion

5.4.1 Addressing the research questions

In answer to the primary research question, it is notable that only 35% of optometrists carried out all of the three tests important for the accurate diagnosis of POAG. In a clinical survey carried out by Willis et al. (2000) looking at glaucoma in optometric practice, optometrists were asked on which patients they would carry out tonometry, 9% said on all patients. Of the remainder, 61% would carry out tonometry on patients over the age of 40, 30% on patients with suspicious discs and 23% on patients with a family history of glaucoma (Willis et al., 2000). Although it is encouraging that 95 of the optometrists visited carried out at least two of the key tests (ophthalmoscopy and

tonometry), it is of some concern that one optometrist did not carry out any form of fundus examination and four optometrists did not carry out tonometry.

It is known that the current usage of glaucoma screening tests, and the criteria chosen for referral, varies widely across the optometric profession, with visual field screeners being used relatively rarely (Harper & Reeves, 1999; Strong, 1992). In 1994, optometrists who used a visual field screener on a routine basis for patients over 40 years of age comprised less than a tenth of the profession, although they have been shown to have the highest glaucoma detection rates (Tuck & Crick 1994). In a survey performed by Willis et al. 2000, optometrists were asked "in relation to glaucoma and its screening, on what percentage of your patients would visual fields testing be done?" 23% would have tested visual fields on over a third of their patients and 77% in up to one third of their patients (Willis et al. 2000). As discussed in the introduction above, race and age are risk factors for glaucoma. Although the SP did not have a family history of glaucoma, raised IOP or suspicious looking discs, it is still a concern that only 36% carried out a visual field assessment. In the CoO survey, a comparable 43% of respondents would always carry out perimetry on a similar patient, although 51% would perform perimetry 'sometimes' (College of Optometrists, 2008b).

Although most new generation perimeters contain supra-threshold screening programs, it is interesting to note that four optometrists carried out full-threshold testing, despite the increased test duration. In the clinical survey by Willis et al. 2000, 82% cited suspicious discs, increased IOP and family history of glaucoma as selection criteria for carrying out visual fields (Willis et al. 2000). Although full-threshold examinations can take about 10 minutes for both eyes, visual field screening can be carried out in 4 to 5 minutes for both eyes (Cubbidge 2005). Advanced visual field loss has been found in 20% of patients newly diagnosed with POAG. This could be due to late presentation of patients, failure of optometrists to carry out visual field tests, inappropriate interpretation of visual fields, or unusually rapid disease progression.

Optometrists play an important role in the early detection of glaucoma, particularly as patients are usually asymptomatic until the disease is in its late stages. Therefore by performing ophthalmoscopy in combination with tonometry and visual field assessment, optometrists can help in the early detection of glaucoma. However, there is no real incentive for optometrists to carry out further investigations in order to improve the accuracy of diagnosis and referrals at present. For example, a standard fee of £19.32

is paid for an NHS sight test in England irrespective of whether further tests are carried out. Although the SP in this research study was examined in a private consultation, most (71%; Sight tests volume and workforce survey: Great Britain 2006/7) sight tests in the UK are NHS funded and data gathered during this study indicates that optometrists typically carry out the same routine on private patients as on NHS patients. The NHS sight test is not clearly defined and it is uncertain (Association of Optometrists, 2008f) whether this would include visual field testing for a patient similar to the SP used in this research.

It could be argued that the 1989 Eye Examination regulations are an incentive for optometrists to perform such additional examinations as appears to be necessary. However, the Association of Optometrists advice is that 'additional examinations' are to be performed for the same purpose as other examinations, which is 'for the purpose of detecting signs of injury, disease and abnormality in the eye or elsewhere' (Association of Optometrists, 2008f). Thus the sight test ends with the detection of signs; referral refinement is not a requirement of the regulations. Following the detection of signs, which, after the exercise of the optometrist's clinical judgement, are seen to require medical intervention, the practitioner must refer the patient (Association of Optometrists, 2008f).

In a clinical survey of optometrists carried out by Willis et al. 2000, 61% of respondents have access to a non-contact tonometer only and 15% to a contact tonometer only. A quarter of the respondents had access to both types of instruments. The College of Optometrists survey (2008) established that at least 80% of optometrists have access to a non-contact tonometer and 54% to a Goldmann/Perkins tonometer (College of Optometrists, 2008b). Optometrists visited by this SP demonstrated a preference for non-contact tonometry (84%) over contact tonometry (12%). While 96% of practitioners undertook tonometry, it is of concern that four optometrists failed to measure IOP in a patient in this age group and of African racial origin, although all four examined the fundus and one carried out supra-threshold visual field screening. Although tonometry is a poor screening test for glaucoma compared to optic nerve head examination and visual field assessment, it still provides additional information when used in conjunction with other tests (Harper & Reeves, 1999).

Visual field screening should be used routinely, but the challenge is to design a protocol that can be implemented without imposing substantial further demands and

costs on primary eye care practitioners (Harper & Reeves, 1999). Vernon et al. (1998) found an increased use of visual field screeners by optometrists between 1988 and 1993 led to an increase in the proportion of false positive referrals (Vernon, 1998). This suggests that the use of visual field tests per se does not necessarily increase the accuracy of referrals for suspect POAG. However, if a defect is noted during visual field testing, repeating the visual field testing has been found to reduce false positive referrals (Vernon & Ghosh, 2001; Henson et al., 2003). Similarly, when raised intraocular pressures were recorded using non-contact tonometry, repeating tonometry using a contact tonometer rather than a non-contact tonometer resulted in an improvement in the accuracy of referrals (Salmon et al., 2007).

As highlighted in section 5.2.2, although gonioscopy is one of the tests required for a complete baseline examination to characterise the glaucoma type, it is not a core competence which UK optometrists are expected to possess at registration and is not routinely carried out in optometric practice. Hence it is not surprising that none of the optometrists visited carried out anterior chamber angle assessment using gonioscopy. As mentioned in the results section above, optometrists who examined the anterior surfaces of the eye with a slit lamp biomicroscope may have inspected the depth of the anterior chamber using the van Herick method. This was not assessed by the SP as it is usually incorporated into a slit lamp biomicroscope routine whilst examining other structures. The sight testing regulations above stipulate the need for an examination of the external surface of the eye and its immediate vicinity, although it is not specified whether a slit lamp biomicroscope is necessary for this. More than 90% of optometrists have access to a slit lamp biomicroscope (College of Optometrists, 2008b), but only a third of optometrists visited carried out anterior segment examination. Ninety-five per cent of optometrists who completed the clinical practice questionnaire in 1998 said they routinely use a slit lamp biomicroscope in their day-to-day practice (Stevenson, 1998) although it is not clear whether this relates to contact lens practice. Questionnaires such as these are useful, but are likely to be subject to a bias indicating a higher standard of practice than actual practice.

A variety of approaches to fundus examination was apparent, with 9% checking the fundus by both monocular direct and binocular indirect ophthalmoscopy. It is encouraging that 22% of optometrists used binocular indirect ophthalmoscopy, which is likely partly to reflect CPD in this area in recent years. In a clinical practice survey carried out in 2008, of the 2,751 optometrists who responded, 88% of optometrists

would use direct ophthalmoscopy through undilated pupils; 50% stated they would carry out slit lamp binocular indirect ophthalmoscopy through undilated pupils and 3% would performed undilated head-mounted BIO to examine the optic disc when checking for glaucoma (College of Optometrists, 2008b).

The results of the one optometrist who did not check the ocular fundus by any means were investigated in more detail. The optometrist asked about the reason for the visit, asked about the general health but did not ask if the patient was taking any medication, asked about previous ocular history and asked about family history of glaucoma. The optometrist carried out an objective and subjective assessment of the spherical element of the refractive error but did not check for the cylindrical element. This optometrist carried out cover test for distance and near, motility and checked pupil reactions. The optometrist checked the SP's accommodation and near visual acuity but did not prescribe or establish a separate reading addition. No slit lamp biomicroscope assessment of the anterior segment or fundus photography was carried out. Although the intraocular pressure was checked using contact tonometry, there was no visual field assessment. The optometrist issued a copy of the prescription without prompting, advised an update in the patient's spectacles but did not advise a re-examination interval. The optometrist's eye examination took about 20 minutes, which is quicker than the average time taken (23 mins) by the 100 optometrists visited by the SP. It is not clear whether the omission of a fundus examination was deliberate or simply forgetfulness.

It is interesting to note that 76% of the optometrists visited who advised a re-examination interval advised two years and 22% advised one year. As mentioned in the results section above, if not discussed by the optometrist in their post-examination advice, the SP asked at the end of the examination if she was at a greater risk of any particular eye conditions. It is of some concern that only 6% of the optometrists who responded to this question discussed the link between race and glaucoma. Age, race and family history are major risk factors of glaucoma hence it is interesting that only 5% discussed the increased risk of glaucoma with age; 16% advised the SP that she was at a low risk as there was no immediate family history and 44% informed the SP she would only be at a risk if there was a family history. This emphasizes the need for CET on the risk factors of glaucoma and the link between POAG and race. The ten optometrists who did not respond to this question did so by either ignoring the question when asked or by talking about a different aspect of the examination.

5.4.2 General descriptive data

Although it is important to elicit the patient's reason for visit at the outset of the examination, it is just as important to ask details about the patient's current visual status. The majority of patients may mention a reduction in their distance or near vision when asked about their reason for visit, but some will only mention this when asked specifically about their visual status (i.e., "do you see well in the distance?"). All the optometrists visited asked the SP's reason for visit and hence had ascertained that she was experiencing difficulty with her near vision.

Asking a patient about the nature of work they do or their occupation is vital (Harvey & Franklin, 2005) although some patients' reason for visit is directly linked to their occupation or hobbies. In the present research the presentation of difficulty with near vision is likely to be linked to the patient's occupation as a project manager. 13% of optometrists did not ask the patient about her occupation; 23% did not ask the patient about the sort of visual tasks that her work or hobbies involve and 5% did not ask the patient if she was a driver. These three factors and the patient's reason for visit can greatly influence the optometrists' management advice at the end of the examination and advice on options for vision correction.

The previous ocular history is an important part of history taking, particularly for new patients. The standardised patient in this case presented as a new patient for the eye examination visits. The information gathered during the first eye examination for a patient forms the baseline for their future records, hence it is of some concern that 4% of optometrists did not ask about any previous ocular history and 11% did not ask about any previous injuries, surgeries or infections to the eye. The history of the patient gathered at the beginning of the examination also forms the basis of the eye examination the optometrist is about to carry out. As the majority of the optometrists used a focimeter to check the patient's spectacles prior to beginning the eye examination, they would have been aware that the patient was hyperopic with anisometropia. As the left eye was the more hyperopic eye in this case, this would have raised suspicion of amblyopia and/ or possible patching treatment as a child. But only 41% of optometrists asked the SP about any history of a lazy eye. In Chapter 7 the investigation and management of this SP's anisometropia is discussed in detail.

The results from this study show the average time for an eye examination to be 23 minutes. It is however noteworthy that this average can range from 15 minutes to 30 minutes. Forty-one optometrists carried out an eye examination in less than 23 minutes.

5.4.3 Comparisons

Results relating to the SP's subjective assessment of the thoroughness of the eye examination and the extent to which symptoms were addressed found only very small differences which were not statistically significant between different types of practice. As these data were purely subjective, it is possible that there was some element of SP bias. During her training the SP was asked to complete this section prior to starting the rest of the checklist in an effort to reduce bias.

In many large multiples, IOPs, visual fields and autorefraction are carried out by assistants as pre-tests before the actual eye examination. Data were not obtained from this SP concerning which optometric tests were delegated. There was no significant difference between the proportions of optometrists working for different practice types carrying out the tests recommended by the expert panel.

5.5 Chapter Summary

In summary, there were slight differences between different practitioners in the duration and depth of their clinical investigations. This is not surprising, since practitioners are individuals with different levels of experience and therefore variations in approach are inevitable. But this does highlight that, quite appropriately, not all eye examinations are identical, suggesting that a 'standard sight test' does not exist. Overall, the differences between different types of practice were small, and mostly not statistically significant, indicating that for a patient of this type the thoroughness of eyecare cannot be predicted reliably from the type of practice.

Approximately 90% of new cases of glaucoma seen in hospital outpatient clinics have been initiated by an optometrist (Bowling et al., 2005). Detection rates for glaucoma are likely to vary across the optometric profession because criteria for the use of screening tests and referral of suspect patients have been shown to vary widely between

optometrists (Vernon & Ghosh, 2001). Patel and colleagues demonstrated that ongoing training of optometrists resulted in an increased rate of detection of glaucoma within the community (Patel et al., 2006). The use of all three diagnostic tests (IOP, visual fields and disc evaluation) helps reduce the number of inappropriate referrals as does the routine use of contact applanation tonometry and binocular optic nerve head assessment which are perceived to be more accurate than non-contact tonometry and direct ophthalmoscopy (Shields & Tiedeman, 1993). This and the results of this scenario suggest the need for further continuous education and training in glaucoma screening.

The next chapter focuses on the content of optometric eye examinations for a presbyopic patient presenting with recent onset flashing lights.

6 Scenario 3: The Content of Optometric Eye Examinations for a Presbyopic Patient Presenting with Flashing Lights

6.1 Introduction

The need to measure clinical care within optometry was discussed in section 1.2 and the need for standardised patient research discussed in section 3.1. The standardised patient approach was used in this chapter to investigate the content of optometric eyecare for a presbyopic patient who presented with recent onset photopsia. Optometrists often encounter patients complaining of floaters and/or flashing lights, both of which are classical symptoms of acute posterior vitreous detachment (PVD) and retinal detachment, typically in a patient aged over 40 years (Chignell et al., 2000). PVD occurs as an ageing process of the vitreous and its prevalence increases proportionally with age and degree of myopia. Dynamic vitreoretinal traction at the time of the PVD could result in a retinal break.

Flashing lights, floaters, a visual field defect and loss of vision are the four most common presenting symptoms relating to a PVD, retinal break or retinal detachment (Tanner et al., 2000). Patients experiencing flashing lights and/or floaters often present to their community optometrist in the first instance and the College of Optometrists has issued specific guidance on this topic (discussed below). The differential diagnosis of these symptoms could vary from ocular migraine or an uncomplicated PVD to a retinal tear with associated retinal detachment. In a series of 200 patients with PVD, 13% presented with flashes only and in a series of 115 patients with retinal detachment 2.6% had presented with flashes only, which was similar to the proportion with floaters only (3.4%) and greater than the proportion (0.8%) with floaters and flashes (Tanner et al., 2000).

Flashing lights (photopsia) can be perceived by a patient as a result of tractional forces between the retina and vitreous at sites of vitreoretinal adhesion (Kanski, 2000). The only stimulus that the retina acknowledges is light. When the retinal photoreceptors experience mechanical stimulation, a signal is sent to the brain in the form of disorganised light, which is perceived by the patient as a “flash”. These flashes usually

stop when the vitreous has separated from a point of adhesion or when the vitreous has detached completely, possibly tearing away a piece of the retina resulting in an associated retinal break (Kanski, 2000). It is important to diagnose whether the flashing lights are as a result of a migraine or due to a PVD. Flashes of light as a result of a PVD are almost always monocular and noticed in dim rather than bright illumination (Kanski, 2000). Photopsia in these patients may be induced by eye movements and perceived as a swift flash temporally in an arc fashion by the patient (Kanski, 2000). In migraine patients, the flashing lights ("aura") are almost always binocular but rarely migraine can affect the anterior visual pathway and produce monocular symptoms (Harle & Evans, 2004). The visual aura in migraine patients is usually described as a central black patch or positive scotoma when first noticed, then bordered by luminous zig-zag lines on one side, which enlarges into one half of the visual field and subsequently fades out of the peripheral visual field after 20 to 25 minutes (Gobel et al., 1994; Henry et al., 1992; Hupp et al., 1989).

When patients perceive floaters or "flying spots" these are usually vitreous opacities casting a shadow on the retina (Kanski, 2000). Patients with an acute posterior vitreous detachment may experience floaters either in the form of a single ring-shaped opacity, representing detachment of the vitreous at the optic disc margins resulting in the Weiss ring; or as 'cobwebs' caused by general condensation of collagen fibres, or as a shower of floaters possibly indicating a vitreous haemorrhage secondary to peripheral tearing of a retinal blood vessel. Floaters may slowly disappear over time as they move into the anterior vitreous as the PVD collapses (Serpetopoulos, 1997). If, however, the floaters (longstanding/of a recent onset) increase in number and/or are associated with photopsia, then further investigation is essential (Alwitry et al., 2002).

A visual field defect associated with a retinal break is typically perceived as a "black curtain" due to an accumulation of sub-retinal fluid in the posterior pole. The quadrant in which the visual field defect occurs often helps to locate the primary retinal break. The patient may lose their central vision as a result of the fluid progressing to the macular region. Patients should be questioned about the possible presence of a visual field defect. If patients notice a subjective field defect, they should be referred to the most appropriate Accident and Emergency department without further delay (Alwitry et al., 2002).

Although a vitreous detachment may be asymptomatic, in cases where the patient presents with symptoms suggestive of a posterior vitreous detachment, the practitioner has the opportunity to detect a retinal break. If a retinal break is present, the patient can be referred for prophylactic treatment before a retinal detachment occurs (Davies, 1974; Robertson & Norton, 1973). A primary break is defined as one responsible for the retinal detachment (Kanski, 2000).

The quadrantic distribution of breaks in eyes with retinal detachments is: 60% in the upper temporal quadrant, 15% in the upper nasal quadrant, 15% in the lower temporal quadrant and 10% in the lower nasal quadrant (Kanski, 2000). 50% of eyes with retinal detachment have more than one break and in most eyes these are located within 90º of one another (Kanski, 2000). In a questionnaire survey to determine the opinion of vitreoretinal consultants in the UK on the treatment of asymptomatic retinal breaks, Ahmad and West 2007 concluded that surgery is the most commonly recommended management of these patients. A striking outcome however was the variability in responses for any given scenario, ranging from surgical intervention to the patient being discharged having been offered advice.

Key risk factors can be elucidated by taking a careful history and symptoms, and by looking for signs during the examination. Despite performing a dilated fundus examination, a proportion of retinal breaks will not be visualised (Alwitry et al., 2002). It would be ideal for all patients with symptoms suggestive of a recent PVD to be examined urgently (Byer, 1994) by a trained retinal expert (trained in indirect ophthalmoscopy with scleral depression and contact/ non contact lens examination). This is impractical in the UK given the large number of patients presenting with these symptoms (Chignell et al., 2000).

The College of Optometrists document on “How to deal with a patient complaining of Flashes and Floaters” offers guidance and advice to optometrists in the UK on the management of patients with these presenting symptoms (College of Optometrists, 2005). The document recommends that when a patient presents with symptoms suggestive of an acute PVD, the optometrist has to make a decision as to whether to examine the patient. If the optometrist decides to examine these patients, it is their duty to perform an examination appropriate to the patient’s needs and the advice stipulates dilated fundal examination using an indirect viewing method. If the optometrist is unable to do this because the patient is unable to attend the practice or due to time

constraints, or because the optometrist feels uncomfortable with their level of training and experience in this area, it is their duty to refer the patient to someone who is able to perform an adequate examination (College of Optometrists, 2005).

It has been suggested that the detection of retinal pigment granules ('tobacco dust') in the anterior vitreous is a reliable indicator of the presence of a retinal break (Brod et al., 1991; Lightman & Brod, 1994) and has been called "Shafer's sign" (Shafer, 1965). The prevalence of a retinal break following acute PVD is reported to be 8-46% (Novak & Welch, 1984). Mastering the detection of pigment in the gel (full dilation and high magnification biomicroscopy of the gel) is quicker and a great deal easier to learn than the technique of indirect ophthalmoscopy and scleral depression (Chignell et al., 2000). Practising optometrists are likely to be aware (Kabat & Sowka, 2001; Parnaby-Price, 1999; Bruce et al., 2008) that it is important for all patients presenting with new onset flashes and/or floaters to undergo dilated binocular indirect ophthalmoscopy. This is especially pertinent in patients with risk factors for retinal detachment.

Provided other peripheral retinal disease is not present, Shafer's sign can be used to differentiate between those symptomatic patients requiring treatment and those who can be monitored (College of Optometrists, 2005). The recall interval is patient dependant, and might vary from two to three months (College of Optometrists, 2005) to not at all (Coffee et al., 2007).

The literature reviewed highlights the need to investigate the symptoms, history, clinical investigation and management of a patient with symptoms of photopsia by optometrists. This chapter forms part of a paper that has published in *Ophthalmic and Physiological Optics* (Shah et al., 2009a). This part of the thesis had three main aims:

- Provide data on the content of typical optometric eye care in England for a presbyopic patient who presented with recent onset flashing lights.
- Evaluate how appropriately the eye examinations were carried out for that patient.
- Investigate differences between different types of practice (independent, small multiple and large multiple).

6.2 Methods

The case scenario and checklist for the SP were developed based on evidence-based reviews, clinical guidelines and the recommendations of a panel of experts as discussed in Chapter 3 (section 3.3.1, p.57). The selection of participating optometrists, actor recruitment and training, and quality control and actor validation have also been described in detail in the General Methods in Chapter 3 (section 3.3, p.63-69). In this section, methods used in this particular case scenario have been described.

6.2.1 Standardised patient description (Case Scenario)

The actor was asked to simulate a 59 year old patient presenting with recent onset flashing lights in one eye in the dark using a script (presenting symptoms and standardised answers to questions) illustrated in *Table 6.1*.

Table 6.1: An overview of the third standardised patient's symptoms, and answers to questions asked during the eye examination.

- Your last eye examination was 2 years ago when you needed new reading glasses. If asked, you don't think that any other problems were detected.
- If asked, your distance and near vision appear to be fine. If you are asked the reason for your reason for visit or if you are having any problems, then inform the optometrist you have experienced some flashing lights when in the dark (i.e., at night before going to bed/or when you wake up in the middle of the night). Also mention these if the optometrist asks you about any visual difficulties or flashing lights. If the optometrist does not ask you anything that would lead you to mention the flashing lights then please mention these at the end of the history and symptoms, as a patient who is concerned about the flashing lights would do.
- You describe the flashes as being in the right eye on the right hand side. The flash appears as quick flash (in a downward motion) and lasts 1-2 seconds. You have noticed them about 3 times over the last week. There hasn't been a change in the pattern of occurrence but you are concerned about your symptoms. If asked, you have always seen the odd one or two floaters. There has been no change in occurrence of the floaters (i.e., no change in frequency or number) since the onset of the flashing lights. You are unsure whether the floaters are in one or both eyes, but you think that they have been there for years without changing.
- You have not experienced any other visual symptoms (e.g. double vision). You are in good health (no diabetes, no high blood pressure) as far as you are aware. You don't take any prescribed medication and have never attended the hospital eye clinic (for injury, surgery). You don't suffer from glaucoma. There is no family history of any ocular or medical conditions.
- You do drive. If asked, you did drive in to the practice today. You don't have anyone accompanying you for the appointment. You are a music teacher. Your hobbies include

teaching and playing music.

- It is quite likely that the optometrist will ask to do some more tests using drops. Although there are different types of drops used in optometric practice, one particular set of drops make your pupils (the black hole in the middle of the coloured part of your eye) bigger (pupil dilation). Before the optometrist does this, s/he would usually check you didn't drive in for the appointment or are not doing any tasks that require critical vision. At this time you need to inform the optometrist you are driving today and would like to arrange the appointment for another day. The optometrist may during the conversation mention the urgency and importance of the dilation appointment. If this is not mentioned, ask the optometrist how soon the appointment needs to be. The optometrist may mention what further tests will be done during this appointment. If however this is not mentioned, ask the optometrist if the tests done during the follow up appointment will be similar to those done today. The optometrist may decide not to dilate and refer you for a second opinion instead due to your presenting symptoms. At this point you look concerned and ask the optometrist how soon this needs to be (i.e., same day, within a week, within a month, whenever convenient).

6.2.2 Defining the case specific checklist

Optometrists often encounter patients who complain of floaters and/or flashing lights presenting for an eye examination. As described in the previous section, the SP in this scenario presented for an eye examination complaining of recent onset flashing lights. To elicit the exact nature of the flashing lights, a detailed assessment of the symptoms and case history is essential to assist in a preliminary differential diagnosis (College of Optometrists, 2005). As highlighted in chapter 4 (section 4.2.2), during optometrists' training and in CET articles it is stressed that the minimum history for any presenting symptoms should include questions regarding the Location/Laterality, Onset, Frequency, Type/Severity, Self treatment and its effectiveness, Effect on patient and Associated factors (mnemonic LOFTSEA) of their symptoms (Elliott, 2003b; Harvey & Franklin, 2005; Davies, 2007; Brown, 2008). This mnemonic, using questions listed (for these presenting symptoms) in a book commonly used during optometrists training and the College of Optometrists guidance on a patient presenting with flashes and floaters (discussed later in this section), was used to derive a list of questions used in the case specific checklists to elicit the nature of the flashing lights and floaters. Alwitry et al (2002) suggest that all patients presenting with new onset of flashes and/or floaters should be questioned about the presence of a subjective visual field defect (Alwitry *et al.*, 2002). This question was also included in the case specific checklist.

The literature reviewed and members of the expert panel both highlighted two approaches to examining a patient with symptoms of this nature once the case history

has been established. The first approach is to perform a full routine eye examination incorporating tests and questions to address the patient's symptoms within the examination. The second approach is a symptom-led assessment addressing the patient's reason for visit and concentrating on appropriate posterior segment investigation. Throughout both approaches, the optometrist must decide what additional tests are required to aid differential diagnosis and the management of that patient (Elliott, 2003a). Whether a symptom-led assessment is performed or a full eye examination incorporating tests to address the patient's symptoms is performed, the literature highlighted a few key tests that are important in a patient presenting with the symptoms discussed in *Table 6.1*.

The College of Optometrists document on how to deal with a patient complaining of flashes and floaters recommends that if an optometrist encounters a patient presenting with these symptoms, they have to make a decision as to whether to examine these patients. The minimum examination that should be carried out if a retinal break is suspected should include (College of Optometrists, 2005):

- **History and symptoms, looking for particular risk factors**
  - **Are the floaters of recent onset and are they intermittent or permanent?**
  - **Are the floaters associated with photopsia?**
  - **Is there a sudden shower of floaters?**
  - **Is the patient in a high-risk group?**
  - **Is there a history of head trauma?**
  - **Is there a field defect or reduction in visual acuity?**
- **A dilated fundus examination using an indirect viewing technique**
- **An examination of the anterior vitreous to look for pigment cells**
- **Appropriate advice to the patient (supported by a written information sheet)**

For ethical and practical reasons, the SP was asked not to undergo pupillary dilation unless it was his last practice visit of the day. If the optometrist being visited wanted to carry out a dilated fundus examination, the SP would act in a nervous manner and ask the practitioner if this would affect his vision, if this information had not already been volunteered by the practitioner. At this time, the SP would inform the optometrist that he had driven to the practice and would prefer to arrange the dilated examination for another day. The SP would try to elicit what further tests would be carried out during this appointment. Two different checklists were designed (appendix 14 & 15). The first checklist was designed to be completed at the end of eye examinations during which

no dilation was performed. The second checklist was designed to be completed at the end of eye examinations during which dilation was performed. This checklist included questions to establish whether tonometry was performed before and after dilation; whether fundus examination was performed before and after dilation and whether or not a different instrument was used to examine the fundus on the two occasions.

The presence of pigment granules in the anterior vitreous (Shafer's sign) is known to be a sensitive, and relatively specific, indicator of a retinal break (Tanner *et al.*, 2000; Sharma *et al.*, 1999) and an indication for immediate hospital referral to Eye casualty (Alwitry *et al.*, 2002). In all patients in whom the optometrist suspects a retinal tear, examination of the anterior vitreous (through a dilated pupil) should be performed (College of Optometrists, 2005). This was therefore included in the case-specific checklist.

In cases where a dilated fundus examination is going to be performed, an estimation of the anterior chamber angle is important (Elliott, 2003a) although the risk of inducing acute glaucoma following mydriasis with tropicamide alone is close to zero, no case being identified in a review (Pandit & Taylor, 2000). The risk with long-duration agents (e.g., atropine) or combined agents is between 1 in 3,380 and 1 in 20,000 (Pandit & Taylor, 2000). An anterior eye examination of the cornea, iris, lens and anterior chamber is also important prior to instillation of a mydriatic hence these were included in the case specific checklist.

All patients presenting with new onset of flashes and/or floaters should, if possible, undergo dilated fundoscopy using a Volk-type lens (Alwitry *et al.*, 2002). The College of Optometrists document advises that for adequate examination of the peripheral retina, the appropriate technique must be used and this will always require dilation (College of Optometrists, 2005). A direct ophthalmoscope, even through a dilated pupil, will only allow visualisation up to the posterior equatorial area. This is therefore inadequate for eliminating the possibility of peripheral retinal tears or breaks. A headset BIO gives a field of view of up to 75 degrees (static) with a 30D lens (Harvey & Franklin, 2005) but this may still miss the examination of the peripheral retina unless indentation is used. The gold standard specialist examination of the fundus is using a contact fundus lens or head-mounted indirect with scleral indentation. The use of either of these techniques is unlikely in optometric practice hence the optometrist should make a reasoned judgement whether a referral is necessary for such an examination (College of

Optometrists, 2005). As discussed earlier in this chapter, due to ethical and practical reasons the SP was unable to undergo dilated fundus examination during all visits. Hence, the checklist consisted of questions to elicit the method of fundus examination used during undilated fundus examination and whether the practitioner would use a different method of fundus examination following dilation (if the practitioner suggested performing dilated fundus examination).

The College of Optometrists' advice cited earlier in this section recommends that tonometry and visual fields should be considered for confirmatory purposes especially if the optometrist is unable to examine or obtain a satisfactory view of the peripheral retina. As discussed in chapter 3 (section 3.3.2.1), tonometry is an important supplementary test in this age group and a reduction in IOP may be linked to a retinal detachment (Doshi & Harvey, 2005; Elliott, 2003a). Some authors still advocate the measurement of IOP prior and subsequent to mydriasis in case of induced angle closure (Doshi & Harvey, 2005). For the reasons discussed here, tonometry and visual field examination were included in the case specific checklist.

Appropriate management of patients presenting with symptoms of flashes and/or floaters is imperative. The College of Optometrists document referred to earlier in this section advises if the optometrist cannot examine the patient, because the patient is unable to attend the practice, or due to time constraints or because the optometrist feels uncomfortable with their level of training or expertise, they should direct the patient to someone who is able to conduct an examination of an appropriate standard (College of Optometrists, 2005). As discussed previously in this section the presence of pigment in the anterior vitreous is an indication for immediate hospital referral to a hospital eye casualty unit or similar (Alwitry *et al.*, 2002). Patients should be counselled that if they become aware of a visual field loss, they should re-attend, contact their GP for referral to eye casualty or attend eye casualty (Alwitry *et al.*, 2002).

Gupta and Prasad (2001) suggest that all patients presenting with posterior vitreous detachment, no vitreous pigment and no retinal holes or tears at initial examination should be safely discharged with an explanation of the warning symptoms which should prompt the patient to re-attend (Gupta & Prasad, 2001). Regardless of the method of examination performed, the optometrist should advise the patient that if their symptoms worsen they should seek medical advice; this should be supported by written information (College of Optometrists, 2005). The case specific checklist was

designed to list management options to cover all options discussed previously in this section based on the literature reviewed and management options recommended by the College of Optometrists.

6.2.3 Expert panel feedback

The panel of experts was asked to review in detail and modify the case scenario and checklist prepared by the researcher for this SP. The feedback received for these documents from members of the expert panel for this scenario is included in the appendix 3.

6.2.4 Research questions specific to Scenario 3

Firstly, the views of a panel of optometric experts were sought to establish the questions and tests that might be appropriate for an optometrist when examining a patient presenting with recent onset flashing lights. The panel of experts consisted of four members; each an expert in clinical optometry. They came from broad range backgrounds:

- All were experienced (qualified >10 years) community and hospital optometrists with special interests in clinical optometry
- A lecturer at a UK optometry department
- College of Optometrists' advisor, examiner and assessor and an expert witness in medico-legal cases
- A councillor for the Association of Optometrists

These views are summarised as primary and secondary research questions in *Table 6.2*. It is stressed that the list of possible tests and questions in *Table 6.2* is not intended to define good practice, but more to be a list of possibly relevant investigations and of questions whose answers should be sought from the research described in this thesis.

Table 6.2: Primary and secondary research objectives relating to scenario 3.

Primary Research Question
Is the eye examination appropriate for the detection of the cause of the presenting symptom (flashing lights in the visual field of one eye)?
Secondary Research Questions
1. What proportion of optometrists proactively identified the patient's presenting symptom (flashing lights) prior to the patient having to inform the optometrist of this symptom?
2. What proportion of optometrists identified the long-standing history of floaters?
3. What proportion of optometrists carried out a symptom-led assessment concentrating on appropriate posterior segment investigation rather than a "routine sight test" that would include refraction and binocular vision tests?
4. What proportion of optometrists assessed the anterior chamber angles? ➢ What methods were used? Specifically, how many carried out gonioscopy?
5. What proportion of optometrists performed fundoscopy using: ➢ A monocular instrument (ophthalmoscope/monocular indirect)? ➢ Slit lamp BIO? ➢ A fundus camera?
6. What proportion of optometrists performed dilated fundoscopy using: ➢ A monocular instrument (usually, monocular direct ophthalmoscope; possibly monocular indirect)? ➢ Slit lamp BIO? ➢ A fundus camera?
7. What proportion of optometrists recommended dilated fundoscopy?
8. Of the optometrists who recommended mydriasis in question 7 how many recommended dilation should be done: ➢ On the same day? ➢ Within a week? ➢ Whenever convenient?
9. When optometrists recommended dilation, the SP acted in a nervous manner and asked what tests would be done at the dilation. When the optometrist explained that they would look inside the eyes (or similar), the actor was instructed to ask "Will you look inside my eyes the same way as you have today?" If possible, he in this way determined, from the optometrist's description, what technique would be used if dilated fundoscopy were arranged: ➢ Monocular direct? ➢ Slit lamp binocular indirect? ➢ Headset binocular indirect?
10. What proportion of optometrists assessed the intraocular pressures? ➢ Using contact tonometry? ➢ Using non-contact tonometry?
11. What proportion of optometrists assessed the intraocular pressures? ➢ Before dilation? ➢ After dilation?
12. What proportion of optometrists would have referred the patient to the hospital: ➢ On the same day? ➢ Within a week? ➢ Within a month? ➢ Via the GP? ➢ [Note, from the answer to an earlier question and to this question, the proportion of optometrists that **either** recommended dilation **or** referred the patient can be determined]
13. What proportion of optometrists recommended an appropriate refractive correction?

6.3 Results

As described in the general methods (section 3.3.3), consenting optometrists were asked to choose which option they preferred, complete anonymity or the feedback option. Twenty-five optometrists visited by the SP in this scenario chose full anonymity (this figure included twenty practices where a locum practitioner was standing in for the consenting practitioner), 61 chose feedback, and 16 did not state a preference (these were given the option of receiving feedback when the results were available). Although 111 optometrists consented to participate as described in chapter 3 (section 3.4), 102 were visited for this scenario.

Of the 102 optometrists visited by the SP, 99% of optometrists (n = 101) carried out a routine optometric eye examination: this is defined here as an examination including tests of ocular health, refraction, visual acuity, and orthoptic status. None of the optometrists visited carried out a purely symptom-led assessment. The one optometrist who did not carry out a routine eye examination asked the patient the date of his last eye examination, his reason for visit and further questions relating to the symptoms of flashing lights and how bright the flashes were. This practitioner did not ask the SP about floaters but asked if he noticed any shadows in his vision and if there was a family history of glaucoma. The practitioner did not ask any further questions or carry out any further tests but advised the SP to go straight to Moorfields Eye Hospital, commenting that all symptoms of flashing lights now have to be referred to an ophthalmologist as they are suggestive of a retinal tear. The practitioner did not write a referral letter but asked the SP to go straight to eye casualty. The SP was advised to come back for a full eye examination once he had been given the 'all clear' by the hospital. The data obtained from 102 visits has been used in the analysis for the symptoms and history and advice and management sections, and data obtained from 101 visits for the remainder of the results.

6.3.1 Addressing the research questions

Concerning the primary research question, the presenting symptom of flashing lights was proactively identified in 87% of cases; in 80% of cases simply by asking the patient their reason for attendance, and in a further 7% of cases, where the reason for the visit was not established, by the practitioner specifically asking about flashing lights. 13% of

optometrists did not ask the SP's reason for visit or ask specifically about flashing lights. In these cases the SP informed the optometrist he had recently been seeing flashing lights and was concerned. During the early stages of the research, clinical guidelines on flashes and/or floaters and views from the expert panel were used to derive a list of questions to aid identification of the nature of the flashing lights. These questions are listed in *Table 6.3*. Although none of the optometrists asked all of these questions, 35% asked at least four of the seven questions.

Table 6.3: Questions appropriate to identifying the nature of the patient's presenting symptom of flashing lights, giving the percentage of optometrists who asked each question.

Questions appropriate to identifying the nature of the flashing lights	**%**
1. Where in your vision do you see the flashing lights?	53%
2. Are the flashing lights in one eye or both eyes?	72%
3. Describe the flashes?	26%
4. Is there a pattern to the occurrence of the flashes?	83%
5. Is there a change in pattern of occurrence?	39%
6. How long ago did you first notice them?	94%
7. How long do they last?	34%

85% of optometrists asked the patient if he had noticed any floaters in his vision. 21% proactively identified the longstanding history of floaters, 9% asked whether the floaters were in one or both eyes and 51% asked if there had been a recent increase in the number of floaters seen or if there was a change in the pattern of the floaters (more or less frequent). 31% of optometrists asked the SP if he noticed any floaters but did not ask any further questions regarding this symptom.

36% of optometrists asked if the patient had noticed any shadows in his vision and 18% asked if the SP had suffered any head trauma. 92% asked if the SP had experienced any problems with their distance vision and 95% asked about any problems with near vision.

Some testing was carried out by assistants (e.g., tonometry, visual fields and autorefraction). These tests were included as components of the eye examination in the data described in this section. A full summary of the contents of the eye examinations is included in appendices 16 and 17. Here, tests most relevant to the presenting symptom of recent onset flashing lights are described in most detail. 100% of optometrists visited checked the patient's distance vision. 48% of optometrists

examined the anterior surfaces of the eye using a slit lamp biomicroscope. These optometrists may have carried out van Herick assessment of the anterior chamber angle, although this was not assessed by the SP (during SP training it was established that this test could not reliably be detected). None of the optometrists visited inspected the anterior chamber angle using gonioscopy. 13% of optometrists looked for the presence of pigment granules in the anterior vitreous (Shafer's sign or tobacco dust). This was recognisable when, during biomicroscopy, the patient was asked to rapidly look to each side and/or up and down and then look straight ahead.

Sixty-seven optometrists (66%) recommended dilated fundoscopy. Of these, 63 (94%) optometrists recommended that the dilation should be performed on the same day as the examination, 12 (18%) recommended dilation within one week of the initial visit, and 8 (12%) optometrists recommended that the patient return for dilation whenever it was convenient for him. These figures do not total 67 as 15 optometrists recommended more than one option. For ethical and practical reasons, the SP was asked by the research team not to undergo pupillary dilation unless it was his last practice visit of the day. If the optometrist visited wanted to carry out a dilated fundus examination, the SP acted in a nervous manner and asked the practitioner if this would affect his vision, if this information had not already been volunteered by the practitioner. 58% of optometrists (87% of those recommending dilation) voluntarily advised the SP of the adverse effects associated with mydriasis. The SP informed the optometrist that he had driven to the practice and would prefer to arrange the dilated examination for another day. The SP tried to elicit what further tests would be carried out during this appointment. The SP also tried to ascertain if the optometrist would use a similar method to examine his fundus as used on the day of the initial visit. Of the 102 examinations, 24% of visits included pupil dilation, 77% were without dilation, and one practitioner referred the patient to Moorfields Eye Hospital immediately. These figures do not take into account those optometrists who recommended dilation or referral at a later date, and this issue is addressed in the discussion.

Ninety-eight percent of optometrists visited carried out tonometry: 87% non-contact tonometry and 11% contact tonometry. None of the optometrists carried out both contact and non-contact tonometry. It is of concern that three optometrists did not check the intraocular pressure using any method on a patient of this age group.

Of the 77 optometrists who carried out undilated fundus examinations, 77% of these optometrists used monocular direct ophthalmoscopy, 26% used binocular indirect ophthalmoscopy with the slit lamp biomicroscope, and 9% used both methods. Two optometrists carried out head mounted binocular indirect ophthalmoscopy; one of these optometrists carried out both binocular indirect ophthalmoscopy with the slit lamp biomicroscope and with head mounted equipment and the other carried out head mounted only. Three optometrists took fundus photographs in addition to performing ophthalmoscopy. Three optometrists took fundus photographs but did not examine the fundus by other means. One optometrist did not assess the ocular fundus by any means (see Discussion, section 6.4.1).

Of the 24 optometrists who carried out a dilated examination, seventeen (71%) examined the anterior surfaces of the eye using a slit lamp biomicroscope. These optometrists may have carried out van Herick assessment of the anterior chamber angle, although this was not assessed by the SP. Nine of these 24 (38%) optometrists looked for the presence of pigment granules in the anterior vitreous (Shafer's sign). Of the optometrists who carried out dilated fundoscopy, 96% performed tonometry before the dilation and 63% assessed the intraocular pressure after dilation. 58% assessed the intraocular pressure both before and after dilation, and a non-contact tonometer was used on every occasion. None of the optometrists who used contact tonometry assessed the intraocular pressure before and after dilation. Nineteen of the 24 optometrists (74%) carried out both a dilated and undilated fundus examination. Five optometrists (21%) carried out a dilated fundus examination only. Twenty of the 24 optometrists (83%) examined the fundus using monocular direct ophthalmoscopy, 18 (75%) used binocular indirect ophthalmoscopy, and 14 (58%) used both monocular direct ophthalmoscopy and binocular indirect ophthalmoscopy.

Thirty-nine percent of the sample recommended an update of the current spectacles and 92% issued a prescription. However, only just over half (57%) of practitioners issued a prescription without prompting, with a further 34% providing the prescription when the SP asked for a copy.

In answer to the question, "What proportion of optometrists visited would have referred this patient to the Hospital Eye Service (HES) and with what urgency?" there were several possible responses detailed in *Table 6.4*. Thirty optometrists' would have

referred the SP to the HES for a second opinion. All of these practitioners obtained the patient's consent to refer him to the HES for a second opinion.

Table 6.4: Outcomes* that emerged from the question: "What proportion of optometrists' would have referred this patient to the Hospital Eye Service (HES) and with what urgency?"

Urgency with which optometrists referred the patient to the Hospital Eye Service (n=30)	% of total sample	% of those referred
Practitioners who carried out undilated fundus examination (n=20):		
• On the same day	9%	31%
• Within a week	6%	20%
• Whenever convenient	2%	6%
• Via the General Medical Practitioner	8%	27%
Practitioners who carried out dilated fundus examination (n=10):		
• On the same day	4%	14%
• Within a week	2%	6%
• Whenever convenient	4%	14%
• Via the General Medical Practitioner	4%	14%

*the percentages quoted are based on the entire sample (n=102). The totals add up to 39 because nine optometrists recommended more than one option (e.g., recommended that the patient must be seen within a week, preferably on the same day).

Of the 30 optometrists who obtained the patient's consent to refer him for a second opinion, 11 optometrists (37%) wrote a letter and asked the patient to consult his GMP, 17 (57%) optometrists wrote a letter to the patient's GMP or the HES but did not ask the patient to consult his GMP, and 2 optometrists (7%) asked the patient to go to the HES A&E without a referral letter. Only two optometrists who wrote a referral letter to the patient's GMP sent a copy of the letter to the patient.

6.3.2 General descriptive data

The general descriptive data are included in appendices 16 and 17, only the key features that have not already been described are highlighted here. The average time taken for the eye examinations (including any screening) was 28 minutes (95% confidence interval: 25.9-29.5). The average cost of a consultation was £22 (20.41-22.72). For eye examinations during which the fundus was examined undilated, the average duration of the examination was 26 minutes (range 12 to 50 minutes). For eye examinations during which the fundus was examined dilated, the average duration of the examination was 36 minutes (range 25 to 50 minutes). *Figure 6.1* shows how the

time taken for the 77 eye examinations where dilation was not carried out, is related to cost. The r^2 for the correlation is 0.06, indicating that only 6% of the variability in the data is explained by the association between the time taken and the fee charged. The one optometrist who referred the patient to the HES upon learning of the SP's symptoms did not charge for the consultation but asked the SP to return for a full eye examination once he had been discharged from the HES. The data point from this optometrist is not included in the graph.

52% carried out visual field testing, almost invariably using perimeters (of the five optometrists who carried out confrontation, three carried out an automated visual field test as well). Although it is difficult to say for certain without having access to the results of the visual field examinations, the estimation based on timings, as described in chapter 5 (section 5.3.1), is that 90% of optometrists (or assistants) who performed visual field testing carried out a supra-threshold test.

Sixty-eight percent of optometrists advised a re-examination interval. A minimum interval of 12 months was advised and a maximum of 24 months. Most (55%) advised two years, with 11% advising one year and the remainder (2%) advising 18 months (32% made no recommendation).

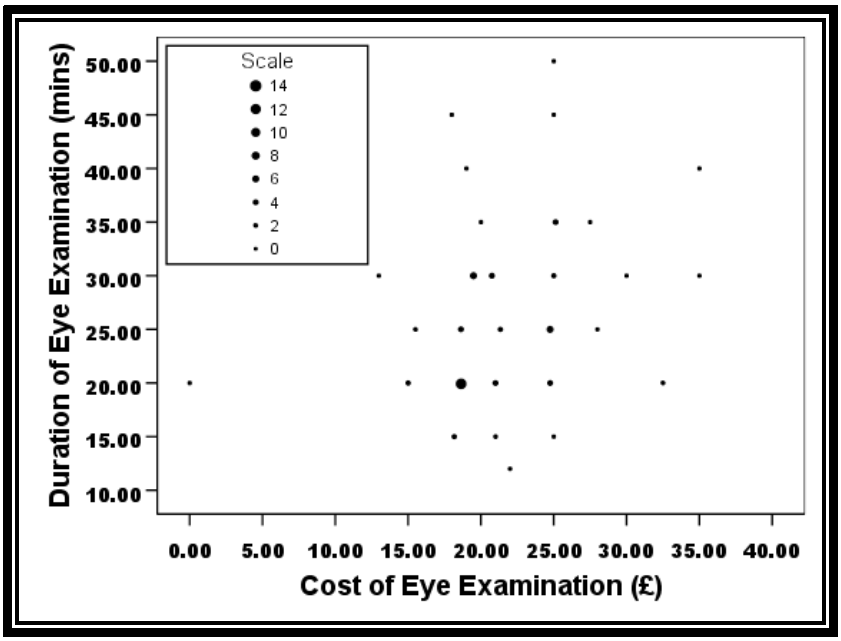


Figure 6.1: A scatter plot showing the duration of an eye examination plotted against the cost of the examination for the third patient scenario. Data were obtained from a sample of 77 optometrists who performed undilated eye examinations.

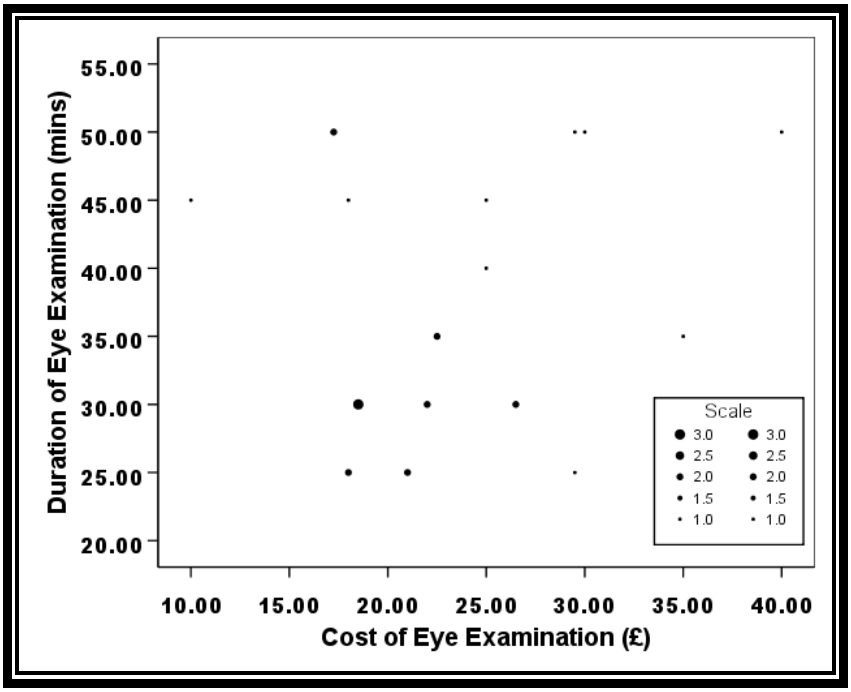


Figure 6.2: A scatter plot showing the duration of an eye examination plotted against the cost of the examination for the third patient scenario. Data were obtained from a sample of 24 optometrists who performed dilated eye examinations.

6.3.3 Comparisons

The randomisation process for participant selection resulted in the SP visiting 50 independent practices, 35 large multiples and 17 small multiple practices.There were no significant differences in either the duration (p=0.12) or cost of the eye examination (p=0.09) between the different types of practice (large multiple, small multiple, independent; *Figure 6.3*).

As described in chapter 3 (section 3.3.2) the SP was required to complete a checklist recording details of their encounter immediately after each eye examination. The SP subjectively rated the thoroughness of the eye examination and the extent to which his presenting symptoms were addressed. The SP completed this section before the remainder of the checklist to encourage a non-biased subjective assessment. In answer to the question “How thorough do you feel the eye examination was?” the average score was 72%. There were no statistically significant differences between the different practice types (ANOVA: F=0.36, p=0.70). In answer to the second question, “To what extent do you feel you presenting symptoms were addressed?” the average

score was 77% and this score did not differ significantly according to the type of practice (ANOVA, F=0.16, p=0.85).

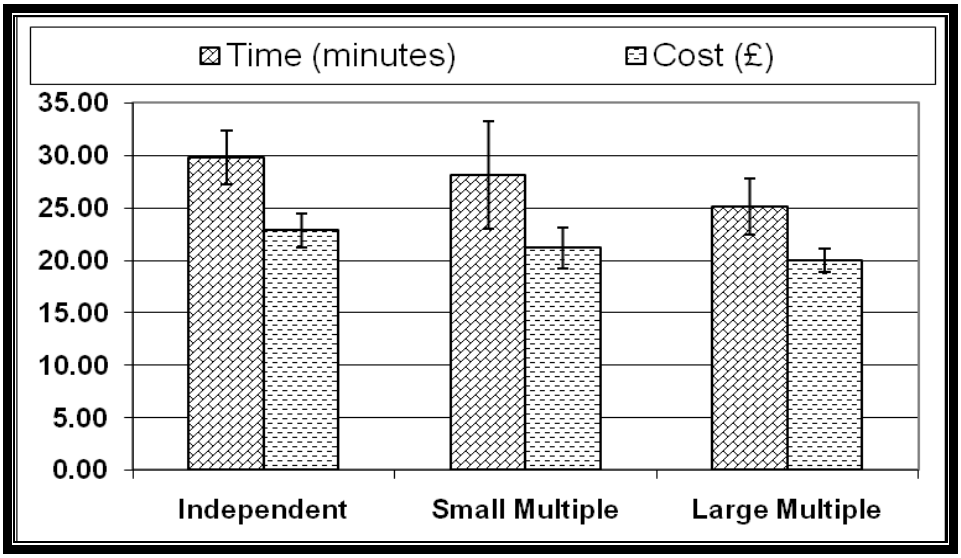


Figure 6.3: Mean duration and cost of the eye examination for independent practices, small and large multiples visited by the third standardised patient. The vertical axis represents both time (minutes) and cost (£). The error bars represent the upper and lower boundaries of the 95% confidence intervals for the means.

As described in chapter 3 (section 3.3.1) a list of tests and questions (in the form of research questions) important when examining a patient presenting with recent onset flashing lights was derived based on clinical guidelines and suggestions from a panel of experts. *Table 6.5* compares the percentages of optometrists working in independent, small and large multiple optical practices who performed these suggested tests. Overall, optometrists performed an average of six of the nine tests (minimum 3, maximum 9) suggested as being of possible relevance by the expert panel. Two optometrists performed all nine tests recommended by the expert panel and 68% performed more than half of the recommended tests.

Table 6.5: Table showing percentages of optometrists working in independents, small multiples and large multiples who carried out the tests suggested by the expert panel in case scenario 3.

Test	Independent (n=49)	Small Multiple (n=17)	Large Multiple (n=35)	Total Sample (n=101)
Slit lamp assessment	51%	53%	40%	48%
a) Shafer's sign	12%	18%	9%	12%
Fundus Examination	100%	100%	97%	99%
a) using direct ophthalmoscopy	84%	65%	77%	78%
b) using slit lamp BIO	37%	53%	31%	38%
c) using a fundus camera	12%	0%	0%	6%
d) using head-mounted indirect	0%	6%	3%	2%
Tonometry	98%	100%	97%	98%
a) Using contact tonometry	16%	12%	3%	11%
b) Using non-contact tonometry	82%	88%	94%	87%
Tonometry				
a) Before dilation[2]	92%	100%	100%	96%
b) After dilation[2]	54%	50%	86%	63%
Objective assessment of refractive error	80%	76%	91%	83%
Subjective refraction	98%	100%	100%	99%
Subjective assessment of cylindrical element	86%	75%	89%	86%
Recommended a dilated fundus examination	63%	71%	69%	66%
a) on the same day[3]	90%	100%	96%	94%
b) within one week[3]	19%	25%	13%	18%
c) whenever convenient[3]	10%	8%	17%	12%
Performed a dilated fundus examination	26%	24%	20%	24%
Management/advice	**Independent (n=50)**	**Small Multiple (n=17)**	**Large Multiple (n=35)**	**Total Sample (n=102)**
Referred the patient to the Hospital Eye Service	36%	12%	29%	29%
a) on the same day[4]	44%	50%	40%	43%
b) within one week[4]	28%	0%	30%	27%
c) whenever convenient[4]	22%	0%	20%	17%
d) via the patient's GMP[4]	33%	50%	50%	40%

[2] The percentages quoted are based on the number of optometrists who performed a dilated optometric eye examination (n=24).

[3] The percentages quoted are based on the total number of optometrists who recommended a dilated fundus examination for each practice type. The totals do not add up to 100 because several practitioners recommended more than one option.

[4] The percentages quoted are based on the total number of optometrists who referred the patient to the Hospital Eye Service for each practice type. The totals do not add up to 100 because several practitioners recommended more than one option.

6.4 Discussion

Floaters and photopsia are common symptoms reported by patients who consult optometrists, although symptoms are a poor predictor of whether a retinal break is present (Tanner *et al.*, 2000). A standardised patient encounter provides an insight into an optometrist's ability to obtain essential information during the eye examination, including information relating to relevant presenting symptoms such as photopsia. Although other methods such as surveys, and paper or computerised vignettes can be used to elicit this information, standardised patients are the recognised gold standard for assessing the quality of clinical care in qualified optometrists (Bachmann *et al.*, 2004; Barragan *et al.*, 2000; Dresselhaus *et al.*, 2004; Glassman *et al.*, 2000; Luck *et al.*, 2000; Peabody *et al.*, 2000; Ramsey *et al.*, 1998).

6.4.1 Addressing the research questions

In answer to the primary research question, it is of concern that 13% of optometrists did not identify, without prompting, the patient's presenting symptom of flashing lights. The actor was instructed to report the longstanding history of floaters if the practitioner specifically asked about floaters during history and symptoms. The SP prompted these optometrists by informing them of his anxiety regarding the flashing lights when the practitioner had completed asking the patient about any symptoms and history. Following the prompting, all 13% of optometrists asked the SP at least one of the seven questions listed in *Table 6.3*. The College of Optometrists' document discussed in the methods section, advises that it is important for the optometrist to ascertain if the patient has experienced any photopsia and if there are any associated floaters. Although all of the optometrists visited asked at least one question relating to the flashing lights it is of some concern that only 35% asked four or more of the questions listed in *Table 6.3*.

Photopsia or floaters, or both, are classical symptoms of acute PVD in patients aged over 40 years (Chignell *et al.*, 2000). In view of this it is noteworthy that 15% of optometrists did not ask the patient about the presence of floaters. Ten of these 15 optometrists (67%) had asked the patient his reason for visit, hence had ascertained the patient's symptoms of flashing lights. Five optometrists had not asked the patient his reason for visit or asked specifically about flashing lights; hence the SP informed

them of his concerns. Although the SP in this case had a longstanding history of floaters, it is of concern that 79% of optometrists did not ask whether the floaters were longstanding, 91% did not ask whether the floaters were in one or both eyes and 49% did not ask if there was an increase in the number of floaters seen. Recent onset floaters, an increase in the number of floaters or the presence of floaters in the same eye as the photopsia might have raised further concerns. Alwitry et al. concluded that all patients should be questioned about the presence of a subjective visual field defect (Alwitry *et al.*, 2002). 64% of optometrists did not ask the SP about the presence of any shadows in his vision and only 18% asked if he had recently had any head trauma which could explain the symptoms.

One practitioner referred the patient to Accident and Emergency upon learning about the patient's symptoms without performing any further tests. His rationale for referring without performing any tests is questionable as he advised the SP that all cases of floaters and flashes need to be referred directly to an eye casualty. However, it could be that the practitioner felt uncomfortable with his level of training and expertise in dealing with the patient's symptoms and it is consistent with the College of Optometrists' guidelines for an optometrist to refer these cases to someone who is able to perform an adequate assessment.

As mentioned earlier in this chapter, the expert panel recommended two approaches to managing a patient presenting with photopsia and floaters. It is interesting that none of the optometrists visited performed a solely symptom-led assessment by addressing the SP's reason for the visit and concentrating on a posterior segment investigation. Due to the recent changes in primary eyecare in Wales and Scotland, this finding may have been different had this research study been extended to these areas. It is notable that 99% of optometrists carried out a routine eye examination (e.g., including the determination of refractive error) in a patient whose presenting symptom was not indicative of refractive problems. However, it should be noted that this examination included a fundus examination in all but one case, and this one case advised the patient to seek immediate care in the HES. Although some members of the expert panel criticised an examination that included tests of refractive error and orthoptic status as lacking relevance to the presenting symptom, it could on the other hand be argued that a patient has a right to a full eye examination and there was an implicit contract for the optometrist to provide this.

Practitioners can detect pigment granules in the anterior vitreous by one of two methods: (1) by asking the patient to rapidly look to each side and/or up and down and then look straight ahead steadily during biomicroscopy or (2) by asking the patient to look straight ahead whilst the practitioner focuses on the posterior lens capsule/anterior vitreous phase (usually through a dilated pupil) using a biomicroscope. It would have been difficult for the SP to reliably detect if the second of the two methods described here was used. Optometrists in the UK are taught that the optimum method for detecting pigment granules is by method (1) and this method (Harle, 2003) is by far the most widely used in UK, hence the figure stated below is for optometrists who asked the patient to make rapid eye movements to detect the presence/absence of tobacco dust. However, it is of concern that 87% of optometrists may not examine the anterior vitreous (Shafer's sign) for the presence of pigment cells and 34% of optometrists did not recommend a dilated fundus examination. It is encouraging that 94% of the optometrists who recommended a dilated examination advised the SP that it should be performed on the same day.

Of the 101 optometrists who carried out an eye examination, one optometrist did not check the ocular fundus by any method but did perform other tests carried out as part of a routine optometric eye examination and identified the symptoms of flashing lights by asking the patient his reason for visit. This practitioner advised the patient that he would have liked to perform a dilated fundus examination but was unable to do so until later the same day because of time constraints. During the initial consultation the practitioner did not examine the fundus by any means. The SP agreed to arrange the appointment for dilation whilst at the practice but telephoned the practice upon leaving to cancel this appointment and identified himself as the SP actor.

During the examination, the optometrist asked if his distance and near vision were good, asked 5 of the 7 questions relating to flashing lights recommended by the expert panel, asked if the SP had seen any floaters in his visual field and if they had increased or changed in number. The practitioner asked about the SP's general health, if he was taking any medication, if he had ever had any infections or injuries to his eyes and about the family ocular and medical history. The practitioner did check the patient's distance vision and near visual acuity but did not check pupil reactions, motility, or the cover test. The practitioner performed retinoscopy, subjective refraction and established a near and intermediate reading addition. However, the practitioner did not carry out slit lamp biomicroscopy or check the patient's intraocular pressures but did

perform a visual field assessment using a perimeter. The practitioner issued the SP with a copy of his spectacle prescription and advised the patient he would refer him to the eye hospital for a second opinion following the dilation that evening. The practitioner's eye examination was completed in 20 minutes. It is of some concern that the practitioner did not examine the fundus by any means during the initial consultation although an appointment was arranged for later the same day and the practitioner had identified that the photopsia had been occurring for a week.

In view of the fact that the SP was unable to have dilated fundus examination for all 102 visits, it is interesting to note that 38% of optometrists examined the fundus undilated using indirect ophthalmoscopy and 75% of optometrists who performed a dilated fundus examination used an indirect viewing technique.

A total of 57% of optometrists who performed a non dilated fundus examination and 25% of the 24 optometrists who performed a dilated fundus examination used monocular direct ophthalmoscopy only. A binocular indirect viewing technique such as slit lamp BIO provides a wider field of view: approximately 68º-95º (depending on the lens power used) of the fundus compared to approximately 10º using a direct ophthalmoscope, although recent advances have led to the development of a wide field direct ophthalmoscope with a 25º field of view. The wider field of view obtained using slit lamp BIO allows easier localisation of lesions and provides magnification, which varies depending on the magnification of the lens used (Doshi & Harvey, 2005). Scleral indentation can also be used in conjunction with head mounted BIO to examine the far peripheral fundus. This is the best technique for examining the peripheral retina up to the ora serrata, for peripheral retinal breaks (Alwitry *et al.*, 2002), although both fundus imaging (Mackenzie *et al.*, 2007) and slit lamp BIO can give good results (Natkunarajah *et al.*, 2003) and are used routinely by optometrists.

For this patient scenario, it has been assumed that dilated fundoscopy is the gold standard for a patient presenting in this way because this is the consensus in the literature (Alwitry *et al.*, 2002), and is specified in the College of Optometrists' guidance (College of Optometrists, 2005). The patient's pupil diameter was measured, and this was typical for the patient's age: 3 mm in diameter under normal room lighting and 4 mm in dim illumination typical of that found in a darkened consulting room.

The College of Optometrists' (College of Optometrists, 2005) advice recommends either a dilated fundus examination or referral to a colleague for this to be performed. 64% of optometrists visited by this SP either carried out dilated fundoscopy on the day of the appointment, or carried out undilated fundoscopy and attempted to arrange for dilated fundoscopy at their practice within a day or two, or made an urgent referral for this. The researcher's interpretation is that 64% of optometrists would have complied with College guidance.

It is note-worthy that only 52% of optometrists performed visual field testing and two optometrists did not perform tonometry. The College of Optometrists' advice cited in section 6.2.2, recommends that tonometry and visual fields should be considered for confirmatory purposes especially if the optometrist is unable to examine or obtain a satisfactory view of the peripheral retina. Tonometry is an important supplementary test in this age group and a reduction in IOP may be linked to a retinal detachment (Doshi & Harvey, 2005; Elliott, 2003a). Some authors still advocate the measurement of IOP prior and subsequent to mydriasis in case of induced angle closure (Doshi & Harvey, 2005). Although the SP was not at risk of angle closure glaucoma, 29% of optometrists who dilated this patient did not examine the anterior chamber angle using a slit lamp biomicroscope and 42% of optometrists did not check the intraocular pressures before and after dilation. Altogether, 50% of those who carried out pupillary dilation did not either assess the anterior chamber angle and/or measure intraocular pressures before and after dilation.

Section 26(2) of the Opticians Act 1989 and the Sight Testing (Examination and Prescription) (No 2) Regulations 1989 require that immediately upon completion of the examination, the patient shall either be given a copy of the prescription, or a signed statement stating that the patient does not require a prescription or that there has been no change to the patient's current prescription (General Optical Council, 2008b). The duty which section [26(2)] of the Act imposes on doctors and optometrists (to issue a prescription or a statement after testing a patient's sight) shall not arise where the doctor or optometrist who has tested the patient's sight refers the patient to his doctor for further investigation or treatment (General Optical Council, 2008b). In view of this, it is noteworthy that 24% of optometrists visited by the SP issued a copy of the prescription to the patient although they were referring the SP for a second opinion.

It is estimated that 8% of patients attending for eye examinations present with symptoms of flashes and/or floaters (Alwitry *et al.*, 2002). The results highlighted in section 6.3.1 for this SP show that the optometric management of these patients is very variable. A survey of the management of patients presenting to their optometrists with flashes and floaters found that optometrists stated in a questionnaire that mydriasis would be routinely performed in 52% of patients with flashes, 25% of patients with floaters and 68% of patients presenting with both symptoms. In the same study, 8% of optometrists were unfamiliar with the practice of identification of vitreous pigment and 17% of those who could identify it, would not refer the patients to the hospital eye service (Alwitry *et al.*, 2002). The data of Alwitry and colleagues were derived from a questionnaire survey, which is a suboptimal method of determining clinical practice.

The data obtained with an unannounced SP actor reveal that 19 (25%) of the 77 optometrists who examined the fundus undilated referred the patient to the hospital eye service. 10 (42%) of the 24 optometrists who performed a dilated fundus examination referred the patient to the HES. Of the 102 optometrists visited, 13% advised the patient to present to eye casualty on the same day, 8% advised within a week and 6% advised the patient to go whenever it was convenient. The College of Optometrists' document discussed in section 6.2.2 advises optometrists who are unable to perform the minimum examination for a patient presenting with symptoms of flashes and floaters to refer the patient to someone who is able to perform an adequate examination (College of Optometrists, 2005).

The management of this patient does raise an interesting question: should community optometrists refer all patients with symptoms suggestive of a PVD? Patients with symptoms of a PVD are commonly seen by community optometrists, representing 8% of their workload which Alwitry and colleagues calculated as equating to 14 patients per month, or 168 per annum (Alwitry *et al.*, 2002). There are currently about 9,200 practising optometrists (Federation of Ophthalmic & Dispensing Opticians, 2008), and 95% of practising optometrists work in community practice (College of Optometrists, 2008b). This indicates that about 1.5 million patients with symptoms of PVD are managed by community optometrists each year. There are approximately 2,200 ophthalmologists (including trainees) in the UK (The Royal College of Ophthalmologists, 2006). If community optometrists referred all cases with symptoms of PVD, then this would equate to another 670 cases to be seen per annum by each consultant or trainee ophthalmologist. Even if the preliminary tests (e.g., visual acuities,

anterior chamber angle assessment, tonometry, mydriatic instillation) are carried out by ophthalmic nurses, the ophthalmologist is still likely to spend about 15 minutes with each patient, representing about five weeks additional work for each consultant and trainee ophthalmologist. Clearly, it would not be practical for community optometrists to refer all these cases.

6.4.2 General descriptive data

The SP presented as a new patient and it is of some concern that 32% of optometrists did not ask about previous ocular history. In the case of this patient it was important to elicit if he had experienced similar symptoms or a retinal detachment previously (a risk factor in the fellow eye) and whether these symptoms were investigated. One risk factor for retinal detachment is a strong family history of retinal detachments (Alwitry *et al.*, 2002). 77% asked about a family history of any eye conditions other than diabetes, high blood pressure and glaucoma. In view of the differential diagnosis for a patient presenting with flashing lights, it is noteworthy that 39% of optometrists did not ask about headaches. It is of some concern that 4% of practitioners did not ask a patient in this age group about his general health or if he is taking any prescribed medication.

Of those optometrists who advised a re-examination interval for the SP, 55% recommended two years. For patients with recent onset symptoms as in this case (one week), a recall interval of 2-3 months is recommended by the College of Optometrists. Dayan et al. (1996) concluded that a follow-up visit for patients with an isolated posterior vitreous detachment can be justified to detect the small percentage of asymptomatic retinal breaks (Dayan *et al.*, 1996). As discussed in section 6.2.2, other literature reviewed on management of patients presenting with symptoms suggestive of posterior vitreous detachment but normal examination findings advises that the patient can be safely discharged with an explanation of warning symptoms which should cause these patients to re-attend (Richardson *et al.*, 1999; Gupta & Prasad, 2001; Coffee *et al.*, 2007).

6.4.3 Comparisons

It is reassuring that the comparisons between different types of practice revealed no significant differences for all the data in *Table 6.5*, indicating that this type of patient would receive similar care and attention regardless of the type of practice that he

consulted. However, fundus examination using a fundus camera in different practice types approached significance (p=0.06).

6.5 Chapter summary

In summary, patients presenting with new onset flashes and/or floaters should, if possible undergo a dilated fundoscopy using a binocular indirect viewing technique. Classical symptoms of photopsia and/or floaters are unreliable indicators of a posterior vitreous detachment which has been complicated by retinal break formation (Tanner *et al.*, 2000). But the presence of pigment in the anterior vitreous in patients with new symptoms, or patients presenting with new symptoms of a positive scotoma are indications of a retinal break and such patients may benefit from an urgent assessment by a vitreo-retinal sub-specialist. If following a dilated fundoscopy no retinal break is found and there is no pigment in the anterior vitreous, the patient should be educated on the symptoms of a retinal detachment. 64% of the 102 optometrists who were sampled during this study complied with the College of Optometrists' guidelines for a patient that was characterised by the SP in this case scenario.

The presence of the presenting symptom of photopsia was proactively detected in 87% of cases. Although none of the optometrists visited asked all seven gold standard questions relating to the presenting symptoms of flashing lights, 35% asked four of the seven questions. 85% of optometrists asked the patient if he noticed any floaters in his vision and 36% of optometrists asked if he had noticed any shadows in his vision. The proportion of the tests recommended by the expert panel that were carried out varied from 33% to 100% with a mean of 66%. Specifically, 66% recommended dilated fundoscopy to be carried out either by themselves or by another eyecare practitioner. 29% of optometrists asked the patient to seek a second opinion regarding the photopsia. Of those who referred, 70% asked for the referral to be on the same day or within a week.

In the next chapter the reproducibility in refractive findings obtained for all three standardised patients is discussed.

7 The Reproducibility of Refractive Error Measurement

7.1 Introduction

Optometrists are primary healthcare specialists trained to examine the eyes to detect defects in vision, signs of injury, ocular diseases or abnormality and problems with general health (College of Optometrists, 2008f). Optometrists in the UK make a diagnosis, offer advice and when necessary prescribe, fit and supply contact lenses or spectacles (College of Optometrists, 2008f). From the above statements, we could say a typical eye examination has two "core" components: the evaluation of the health status of the eye and the evaluation of the optical characteristics of the eye (i.e., vision and visual function).

During optometrists' training great emphasis is placed on the "routine eye examination" as most optometrists spend the greater part of their working day carrying out routine examinations. The term "routine examination" can be used to describe the various procedures required during a full eye examination in order to properly assess both the optical status of a patient (and be able to prescribe an appropriate optical correction) and their ocular health. As described in chapter 3 (section 3.3.2.1), guidance on what a routine eye examination may include is published in the College of Optometrists' Code of Ethics and Guidance for professional conduct. For the routine eye examination this states (College of Optometrists, 2008a):

"The optometrist has a duty to carry out whatever tests are necessary to determine the patient's needs for vision care as to both sight and health. The exact format and content will be determined by both the practitioner's professional judgement and the minimum legal requirements."

The legal requirements are defined in the Sight Testing (Examination and Prescription) (No 2) Regulations issued in 1989, following measures contained in the Health and Medicines Act 1989. As discussed earlier in this section, professional guidelines exist within optometry (College of Optometrists, 2008a) and these are clearly valuable as they provide a plan for standards of professional practice. Over recent years, substantial attention has been paid to improving the consistency of clinical care within optometry, the diagnosis of ocular diseases and the appropriate referral of patients, yet

far less attention has been given to improving consistency of prescribing spectacles (O'Leary & Evans, 2003). Since the core function of optometrists is the prescribing of refractive correction, it is remarkable that there is a lack of evidence based research on reproducibility of refractive error testing and criteria for prescribing a refractive correction. There have been attempts to gain an insight into the clinical activities of optometrists through questionnaires (O'Leary & Evans, 2003), most notably in the UK by surveys administered by the College of Optometrists (Stevenson, 1998; College of Optometrists, 2008b). These are useful, but there is likely to be a bias, with human nature causing replies to indicate higher standards of practice than may actually pertain. A literature review to gain an insight into methods of measuring clinical care revealed that during direct observation the practitioner is likely to give better than normal levels of quality of care (Franco *et al.*, 1997). The literature reviewed also revealed little evidence based research on reproducibility of refractive error testing using unannounced standardised patients presenting for an eye examination.

As discussed in chapter 3 (section 3.3.6.2), although an assessment of the reproducibility in refractive findings between practitioners visited is listed as a research question for each case scenario, a detailed analysis of the refractive findings obtained for each SP was not included in chapters relevant to each case scenario. The reproducibility of refractive error testing in England was investigated using the three standardised patients described in earlier chapters and discussed in detail in this chapter. This chapter forms part of a paper that has been published in *Optometry and Vision Science* (Shah et al., 2009c).

7.1.1 Refraction and refractive error

Typically, a clinical evaluation of refractive error comprises two different approaches: objective refraction (which requires minimal participation from the patient) and subjective refraction (based on the patient's feedback on different trial lenses). Objective refraction includes the use of an autorefractor or retinoscopy, and in most cases the objective refraction is not issued as the final prescription, but instead it facilitates the subjective refraction which follows. Retinoscopy is an extremely useful technique, although the skill of the examiner will influence both the accuracy and repeatability of the results obtained (Harvey & Franklin, 2005; Borish & Benjamin, 1998). Retinoscopy has been successfully used in the evaluation of refractive status in non-verbal patients (Duckman & Meyer, 1987), as well as in patients with unreliable

subjective responses and those with visual impairment. Both retinoscopy and autorefraction provide a starting point for the subjective refraction and increase the accuracy of the eye examination (Campbell *et al.*, 1998). During an automated objective refraction (using an autorefractor) the refractive error of the eye is measured without the need for judgement by either a clinician or the patient. Autorefractors are now being used more frequently within optometric practice either as an alternative to, or in addition to, retinoscopy.

The subjective refraction on the other hand is a clinical procedure during which a practitioner communicates with the patient, performing specific tests to obtain information useful in determining the most accurate optical prescription for each eye. The information obtained from a subjective refraction can be used by itself or combined with objective data (using retinoscopy or autorefraction) to provide the patient with a prescription for corrective lenses (Eskridge *et al.*, 1991). It may also serve as the starting point for modifications leading to a final prescription based on other results and the clinician's own experience. An accurate refraction may also be a valuable diagnostic indication of ocular disease, for example an episodic variation in refractive error could be indicative of uncontrolled diabetes (Eskridge *et al.*, 1991) or lenticular changes. Hence the results of the subjective refraction are important both to the optometrist and to the patient, because most patients judge all aspects of the eyecare they have been provided based on the clarity and comfort of their prescription (Eskridge *et al.*, 1991). In view of this, it is surprising that there is a lack of evidence based research on reproducibility of refractive error testing.

The subjective refraction routine usually consists of a series of steps. Refraction can either be performed monocularly (one eye occluded) or binocularly (both eyes are unoccluded although one eye is fogged). The routine may vary slightly depending on whether the refraction is performed monocularly or binocularly. The practitioner usually starts by inserting the patient's previous refractive error (habitual spectacle correction) or refractive error obtained by objective refraction into a trial frame or phoropter head. The lenses are centred such that the patient is looking through the optical centre of the lens and the appropriate back vertex distance and pantoscopic angle are used. The practitioner will then aim to control the accommodation by maintaining a relaxed state using fogging lenses and determine the "best vision sphere". Any astigmatic correction present is corrected at this stage. Monocular spherical end point for each eye is the next step to ensure maximum visual acuity in each eye (Borish & Benjamin, 1998). The

accommodative state of the two eyes is then equalised as closely as possible. The final binocular spherical endpoints are determined for the two eyes simultaneously using maximum plus or minimum minus powers which provide maximum binocular visual acuity at distance (Borish & Benjamin, 1998). The steps described above may also vary from patient to patient depending on their age and accommodative status, presence or absence of ocular abnormalities and whether the patient is monocular or binocular.

In the UK, primary eyecare examinations are carried out almost exclusively (> 95%) by optometrists (Blakeney, 2002;College of Optometrists, 2008b) and are governed by the archaically-named Opticians Act (1989). Section 26(2) of the Opticians Act 1989 and the Sight Testing (Examination and Prescription) (No 2) Regulations 1989 require that immediately upon completion of the examination, the practitioner will issue a written copy of the prescription, or a signed statement stating that the patient does not require a prescription, or that there has been no change to the patient's current prescription and if the practitioner is or (as the case may be) is not referring the patient to a registered medical practitioner.

As discussed in chapter 3 (section 3.3.2 and 3.3.6.2), during training the SPs were advised that it is a requirement for a practitioner to issue a signed, written copy of the spectacle prescription at the end of every sight test (General Optical Council, 2008e). If the practitioner visited did not immediately issue a copy of the prescription, the SP was advised to ask for a copy of the prescription before leaving the practice. This was recorded in the checklist as prescription issued before or after prompting. The spectacle prescriptions obtained for each SP were used to calculate the reproducibility of the refractive findings. The refractive findings for each SP were transformed into their components using astigmatic decomposition calculations (discussed in detail in section 7.2.3) and the results were used to calculate the frequency distributions of the refractive findings.

7.1.2 Reproducibility of refractive error

The consistency, repeatability and reproducibility of refractive error measurements is important in both clinical patient management decisions as well as research applications (Goss & Grosvenor, 1996). It is important to know whether a small difference from one consultation to another constitutes a real change in refractive error

(Goss & Grosvenor, 1996). In the context of refractive error findings, the term "repeatability" is used when several refractive measures of a subjective refraction are obtained by one examiner or instrument on the same subject under the same conditions (Rosenfield & Chiu, 1995; Leinonen *et al.*, 2006; Bullimore *et al.*, 1998). "Reproducibility" on the other hand is when several measures of a subjective refraction have been obtained by different practitioners and the agreement between their findings assessed (Goss & Grosvenor, 1996; Perrigin *et al.*, 1982).

Validity (a term related to reliability) is an assessment of whether a given method of measurement accurately measures what it aims to measure (Goss & Grosvenor, 1996). In order to be able to assess the validity of a result there must be an assumed standard against which the result can be compared. In the area of refraction the standard is subjective refraction, because it yields spectacle lens values most likely to be accepted by patients (Goss & Grosvenor, 1996) and is the gold standard against which all refraction devices are compared. There have been no refraction methods with both the level of validity and the practicality of application to replace conventional subjective refraction as the standard method of refraction (Goss & Grosvenor, 1996).

There have been various attempts to gain an insight into reproducibility of refractive findings (Leinonen *et al.*, 2006; Bullimore *et al.*, 1998; Perrigin *et al.*, 1982; Zadnik *et al.*, 1992), albeit using students as subjects and two (Leinonen *et al.*, 2006; Bullimore *et al.*, 1998; Zadnik *et al.*, 1992; Johnson *et al.*, 1996) or three (Perrigin *et al.*, 1982; Goss & Grosvenor, 1996) practitioners as refractionists. The levels of agreement between examiners in some of these studies are shown in *Table 7.1*. In all of the studies listed in *Table 7.1*, apart from the recent study by MacKenzie, the practitioners were aware that the results of their refractive findings were being assessed to investigate their reproducibility.

MacKenzie investigated the reproducibility of refractive error for an asymptomatic 29 year old patient using forty registered optometrists. This study concluded that refractions performed by multiple optometrists on a single eye will differ in the spherical equivalent refraction by over 0.78D on average not more than once in 20 refractions (Mackenzie, 2008). It should be noted that MacKenzie calculated both the limits of agreement and the reproducibility limits for the components of refractive error, and it is useful to describe the difference between these two variables. The 95% limits of agreement (e.g., Bland & Altman 1986; Bullimore 1998) give the range of

measurements within which 95% of optometrists' readings lie. The reproducibility limit is a variable described by the ISO (1994) (International Organisation for Standardisation, 1994) and, in context of the present research; it is the maximum expected difference in measures of refractive state obtained by any two optometrists. Mathematically, the 95% limits of agreement are calculated as the mean ±1.96 (SD), whereas the reproducibility limit is calculated as 1.96 (SD) (√2). MacKenzie gives both the limits of agreement (based on residuals) and the reproducibility limit in his paper, and these are included in *Table 7.1*.

Table 7.1: A summary of previous studies of reproducibility of refractive error assessments.

Study	Setting	Percentage agreement		95% limits of agreement	95% reproducibility limit
		≤±0.25	≤±0.50		
Sloane et al. (Perrigin *et al.*, 1982)					
Spherical Equivalent	2 Ophthalmologists and 1 Optometrist refracted 21 young myopic subjects aged 14-18	73%	97%		
Sphere		79%	90%		
Cylinder Power		81%	99%		
French and Jennings. (Perrigin *et al.*, 1982)					
Spherical Equivalent	17 first year optometry students refracted each other	73%			
Sphere		68%			
Cylinder Power		85%			
Perrigin et al. (Perrigin *et al.*, 1982)					
Spherical Equivalent	3 examiners refracted 32 students	86%	98%		
Sphere		93%	99%		
Cylinder Power		93%	99%		
Bullimore et al.- subjective refraction (Bullimore *et al.*, 1998)					
Spherical Equivalent	2 examiners refracted 86 subjects aged between 11 and 60 years			-0.90 to +0.65D*	
Astigmatic-J_0				-0.37 to +0.39D*	
Astigmatic-J_{45}				±0.31D*	
MacKenzie (Mackenzie, 2008)					
Spherical Equivalent	40 optometrists refracted one subject			±0.55D	0.78D
Astigmatic-J_0				±0.17D	0.24D
Astigmatic-J_{45}				±0.17D	0.24D

* The 95% limits of agreement were calculated using ± 2(SD) rather than ±1.96 (SD) as described elsewhere in this chapter.

As described in chapter 3 (section 3.3.6.1), an inspection of the Keynote report on Opticians and Optical Goods (2006) revealed that the largest five optical corporate

bodies (Specsavers, Dollond and Aitchison, Boots Opticians, Vision Express, and Optical Express) account for approximately 25% of practices and each has more than 150 practices (or more than 2% of the total number of optical practices). In the analyses in this chapter, the refractive findings from different practice types are compared, with these five corporate bodies classified as 'large multiples', other groups with more than one practice classified as 'small multiples', and the remaining practices classified as 'independents'.

7.2 Methods

7.2.1 Standardised patient training

The standardised patient training, quality control and validation are described in detail in chapter 3 (section 3.3.4 and 3.3.5). However, in particular the actors made a note of the method used for objective assessment of refractive error (autorefraction or retinoscopy), whether a subjective refraction was performed, the technique used by the practitioner to assess any astigmatism (fan and block or cross cylinder) and whether an intermediate and reading addition (if applicable) were established. Given that the SP used for the first patient scenario was an experienced optometrist, she was advised to make a note of whether a monocular or binocular refraction was performed and whether binocular balancing was carried out. During the training, the actors were also advised of the importance of giving accurate and consistent responses throughout the visits.

7.2.2 Case scenarios

The standardised patient case scenarios used to obtain the refractive findings analysed in this chapter are those described in detail in chapters relevant to each scenario. In the first of the three scenarios, the SP presented for a private eye examination as a 20 year-old student complaining of headaches (first ever headache 4 weeks ago, resembling a migraine). This SP was a myope and presented for the examinations "to see if her glasses were OK", reporting that her last check-up was about two years ago (Chapter 4, section 4.2.1). The second SP presented as a 44 year-old patient of African racial origin for a private eye examination having experienced recent difficulty with her near vision (Chapter 5, section 5.2.1). The third SP presented for a private eye

examination as a 59 year-old patient, with recent onset flashing lights (over the last week) in one eye in the dark (Chapter 6, section 6.2.1).

During the SP training, the actors were each examined by 3-4 staff clinicians at the Institute of Optometry, who were masked to each other's results. These clinicians all had several years experience in primary and specialist eyecare clinics and are involved in optometric education. For each actor, the mean of these expert refractive findings (the final prescribed findings rather than the subjective findings) was taken as a 'benchmark' refractive error.

7.2.3 Refractive error analysis

Refractive errors were analysed using both the raw data and the components following astigmatic decomposition calculations (Bennett, 1984), which use the cylindrical components of the astigmatic error, rather than the cross-cylinder components used by Thibos and colleagues (Thibos *et al.*, 1997). Humphrey's principle of astigmatic decomposition represents the cylindrical power C as a combination of two obliquely crossed cylinders, C_0 at axis 0° and C_{45} at 45°, and has been suggested as a method which allows the statistical analysis of optical prescriptions (Rabbetts, 1998), because all cylinders are put on a common basis.

A given prescription of Sphere S, Cylinder C and Axis θ can be used to calculate:

$$C_0 = C\cos 2\theta$$

$$C_{45} = C\sin 2\theta$$

and it follows that:

$$C=\sqrt{(C_0^2+C_{45}^2)}$$

The spherical equivalent power M is the algebraic mean of the two principal powers S and (S+C) such that:

$$M = S+(C/2)$$

For any given optical prescription, the total sphero-cylindrical power can be represented by a single scalar quantity (u) (Harris, 1996; Rabbetts, 1996) as:

$$u=\sqrt{(M^2+C_0^2+C_{45}^2)}$$

On the basis that an astigmatic error causes approximately half the blur as a spherical refractive error of the same dioptric amount, the influence of astigmatism can be reduced (Rabbetts, 1996) by using:

$$v=\sqrt{(M^2+{}^1/_4C_0{}^2+{}^1/_4C_{45}{}^2)}$$

This equation gives identical results to

$$v=\sqrt{(M^2+J_0{}^2+J_{45}{}^2)}$$

where J_0 and J_{45} are the Thibos cross-cylinder components (Thibos *et al.*, 1997).

The scalar quantity has been calculated using the above equation and is represented as “v” in the results section. It is noteworthy that all three SPs used in the present study had low levels of astigmatism and the results should be viewed within this context.

Anisometropia can be investigated by calculating the difference in spherical equivalents (M) between the two eyes and/or by calculating the difference in scalar values (v) between the two eyes. Both these approaches were adopted for the first two scenarios. These approaches have limitations with the third scenario because in some practitioner’s refractive findings the sign of the refractive error differed in each eye (one eye hypermetropic, the other myopic). The approach that was adopted, for each practitioner’s refractive findings, was to calculate M1, $C_0$1 and C_{45}1 from the right eye data and M2, $C_0$2 and C_{45}2 for the left eye. The differences for each of the three pairs were then calculated and the formula above applied to calculate a single scalar difference (v) for each patient.

The equivalent sphere (M), C_0 and C_{45} values for each prescription were used to calculate 95% reproducibility limits. The reproducibility limit is the value within which the absolute difference between two test results obtained under reproducibility conditions may be expected to lie with a probability of 95% (International Organisation for Standardisation, 1994). It can also be interpreted as the maximum expected difference in measures of refractive state collected by any two optometrists.

It is well known that the distribution of refractive errors in the population is not, strictly speaking, normally distributed but has a leptokurtotic distribution (Carroll, 1980; McKendrick & Brennan, 1996; Sampath & Bedell, 2002; Wood *et al.*, 1995). However, for the purposes of this study, which evaluates approximately 100 practitioners’

measurements of one person's refractive error (for each scenario), the distribution of their results is likely to be a close enough approximation to a normal distribution for parametric statistics to be appropriate, a procedure in line with the approach taken by most other workers in the field (Logan *et al.*, 2005; Goldschmidt & Fledelius, 2005; Kee *et al.*, 2005). The distribution of refractive error was tested for normality by inspecting frequency distributions and carrying out the Komolgrov-Smirnov test of normality.

Therefore, parametric statistics have been used to describe and analyse the refractive error data in this study. In particular, the 95% limits of agreement (the range within which 95% of measurements would fall) is calculated using parametric assumptions (1.96xSD), rather than using ranking methods, in line with previous work on reproducibility of refractive error (Mackenzie, 2008). Data are also summarised in figures using box-and-whisker plots, which show non-parametric variables. When comparing the refractive findings obtained by different practice types, the non-parametric Kruskal Wallis test has been used.

7.3 Results

The means and ranges of the refractive findings obtained by the staff clinicians at the Institute of Optometry that were taken as mean 'benchmark' estimates of the refractive errors of the SPs are given in *Table 7.2*. In the subsequent analysis of the refractive findings obtained by optometrists during the SP visits comparisons were made with these mean benchmark results. The mean cylinder power and cylinder axis were calculated using astigmatic decomposition. The results for each SP are discussed separately. The 100 spectacle prescriptions obtained by each of the three SPs were used initially to calculate the mean equivalent sphere and the mean ± 2SDs (*Table 7.3*).

Table 7.2: The mean refractive findings (benchmark) for the three standardised patients obtained from eye examinations carried out at the Institute of Optometry. The standardised patients' visual acuities are also presented.

	Mean Sphere (D)	Mean Cylinder (DC)	Mean Axis	Visual Acuity
Scenario 1				
Right	-3.94 (range -3.75 to -4.00)	-0.13 (range 0.00 to -0.25)	180° (zero range)	6/5
Left	-3.94 (range -3.75 to -4.00)	-0.25 (zero range)	57° (range 50° to 60°)	6/5
Scenario 2				
Right	2.00 (range+1.75 to +2.25)	-0.15 (range 0.00 to -0.25)	180° (range 4° to 175°)	6/5
Left	3.80 (range+3.75 to +4.25)	-0.29 (range -0.25 to -0.50)	180° (range 165° to 180°)	6/6-
Near-Right	3.00 (range+2.75 to +3.25)	-0.15 (range 0.00 to -0.25)	180° (range 4° to 175°)	N5
Near-Left	4.80 (range+4.50 to +5.25)	-0.29 (range -0.25 to -0.50)	180° (range 165° to 180°)	N5
Scenario 3				
Right	0.06 (range 0.00 to 0.25)	-0.12 (range 0.00 to -0.25)	180° (range 175° to 180°)	6/5
Left	0.12 (range 0.00 to 0.25)	-0.12 (range 0.00 to -0.25)	56° (range 50° to 60°)	6/5
Intermediate-Right	1.56 (range+1.25 to +2.00)	-0.12 (range 0.00 to -0.25)	180° (range 175° to 180°)	N6
Intermediate-Left	1.62 (range+1.50 to +2.00)	-0.12 (range 0.00 to -0.25)	56° (range 50° to 60°)	N6
Near-Right	2.32 (range+2.00 to +2.75)	-0.12 (range 0.00 to -0.25)	180° (range 175° to 180°)	N5
Near-Left	2.37 (range+2.00 to +2.75)	-0.12 (range 0.00 to -0.25)	56° (range 50° to 60°)	N5

Table 7.3: Descriptive statistics of the spectacle prescriptions (expressed as equivalent spheres) obtained for the standardised patients.

	Mean	Mean ± 2SDs
Scenario 1		
Right Equivalent Sphere	-4.06D (S.D.=0.20D)	(-4.46D to -3.66D)
Left Equivalent Sphere	-4.01D (S.D.=0.20D)	(-4.41D to -3.61D)
Scenario 2		
Right Equivalent Sphere	2.05D (S.D.=0.25D)	(1.55D to 2.55D)
Left Equivalent Sphere	3.65D (S.D.=0.27D)	(3.11D to 4.19D)
Near Right Equivalent Sphere	2.96D (S.D.=0.32D)	(2.32D to 3.60D)
Near Left Equivalent Sphere	4.56D (S.D.=0.39D)	(3.78D to 5.34D)
Scenario 3		
Right Equivalent Sphere	0.09D (S.D.=0.16D)	(-0.23D to 0.41D)
Left Equivalent Sphere	0.01D (S.D.=0.15D)	(-0.29D to 0.31D)
Intermediate Right Equivalent Sphere	1.63D (S.D.=0.23D)	(1.17D to 2.09D)
Intermediate Left Equivalent Sphere	1.55D (S.D.=0.24D)	(1.07D to 2.03D)
Near Right Equivalent Sphere	2.12D (S.D.=0.23D)	(1.66D to 2.58D)
Near Left Equivalent Sphere	2.03D (S.D.=0.25D)	(1.53D to 2.53D)

As seen from the mean benchmark findings in *Table 7.2* all three SPs had minimal astigmatism in each eye. The number of practitioners who found astigmatism ranging from 0.25-1.00DC is illustrated in *Figure 7.1*.

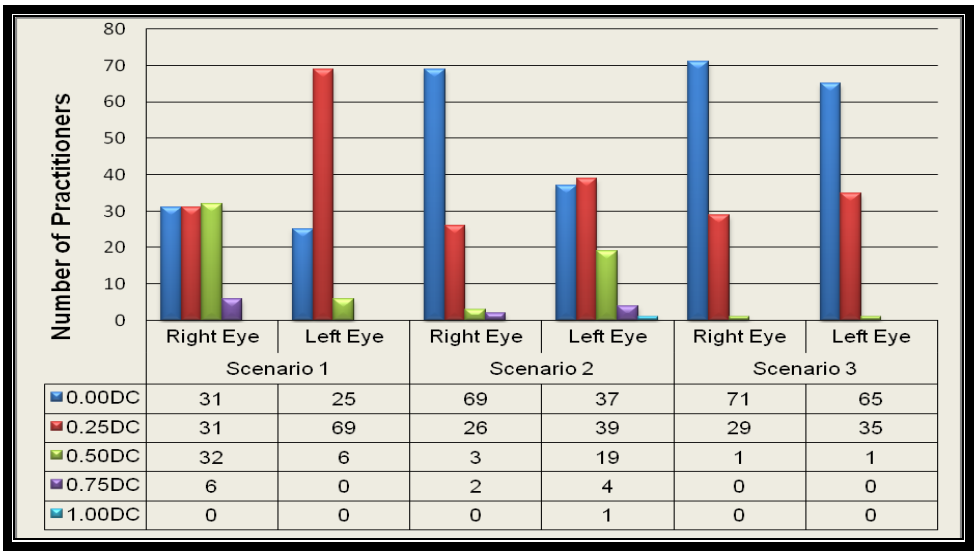


Figure 7.1: The number of practitioners who found various degrees of astigmatism for the right and left eyes for the three standardised patients.

The reproducibility of the measurement of refractive error between practitioners is an important factor when making clinical management decisions. *Table 7.4* highlights the

percentage of practitioners who were in agreement within ±0.25D, ±0.50D, ±0.75D, and ±1.00D of the mean benchmark refractions for spherical equivalent power, spherical and cylindrical power.

Table 7.4: Percentage agreement for refractive error between different practitioners.

	Percentage Agreement							
	≤±0.25		**≤±0.50**		**≤±0.75**		**≤±1.00**	
	RE	**LE**	**RE**	**LE**	**RE**	**LE**	**RE**	**LE**
Scenario 1								
Spherical Equivalent	92%	83%	97%	97%	100%	100%		
Sphere	94%	93%	100%	99%		100%		
Cylinder Power	94%	100%	100%					
Scenario 2								
Spherical Equivalent	58%	63%	92%	93%	98%	98%	100%	100%
Sphere	91%	68%	97%	94%	100%	100%		
Cylinder Power	98%	63%	100%	100%				
Near Spherical Equivalent	58%	65%	93%	83%	99%	91%	100%	100%
Scenario 3								
Spherical Equivalent	94%	98%	100%	100%				
Sphere	92%	99%	100%	100%				
Cylinder Power	100%	100%						
Intermediate Spherical Equivalent	45%	66%	97%	98%	100%	100%		
Near Spherical Equivalent	73%	70%	97%	94%	100%	100%		

The 95% limits of agreement and 95% reproducibility limits for spherical equivalent and astigmatic data for the three standardised patients are highlighted in *Table 7.5*. The 95% limits of agreement and 95% reproducibility limits for intermediate and near spherical equivalents for the second and third patient scenarios have also been included.

Table 7.5: The 95% limits of agreement and 95% reproducibility limits for the spherical equivalent, C_0 and C_{45} components, and for the intermediate and near spherical equivalents for prescriptions obtained from the three standardised patients.

	95% Limits of Agreement	95% Reproducibility Limits	95% Limits of Agreement	95% Reproducibility Limits
	Right Eye		Left Eye	
Scenario 1				
Spherical Equivalent	-4.06D ± 0.39	0.55D	-4.01D ± 0.39	0.55D
C_0	-0.20D ± 0.43	0.61D	0.06D ± 0.22	0.30D
C_{45}	-0.14D ± 0.33	0.47D	-0.17D ± 0.25	0.36D
Scenario 2				
Spherical Equivalent	2.05D ± 0.49	0.69D	3.65D ± 0.53	0.75D
C_0	0.00D ± 0.25	0.36D	-0.17D ± 0.43	0.61D
C_{45}	-0.05D ± 0.25	0.36D	0.09D ± 0.27	0.39D
Near Spherical Equivalent	2.96D ± 0.63	0.89D	4.56D ± 0.76	1.08D
Scenario 3				
Spherical Equivalent	0.09D ± 0.31	0.44D	0.01D ± 0.29	0.42D
C_0	-0.01D ± 0.25	0.36D	0.04D ± 0.18	0.25D
C_{45}	-0.03D ± 0.16	0.22D	-0.08D ± 0.22	0.30D
Intermediate Spherical Equivalent	1.63D ± 0.45	0.64D	1.55D ± 0.47	0.67D
Near Spherical Equivalent	2.12D ± 0.45	0.64D	2.03D ± 0.49	0.69D

7.3.1 Scenario 1

All the practitioners visited by the SP for this scenario carried out focimetry, either personally or delegated, of the patient's existing spectacles. 59% carried out an objective assessment of the refractive error. 23% used an autorefractor (personally or delegated), 30% carried out retinoscopy and an additional 6% used both methods. All the optometrists performed subjective testing of the spherical element of the refractive error and 94% checked subjectively for the cylindrical element. 14% of practitioners carried out a binocular refraction (Humphriss, 1988). Of the 86% who carried out a monocular refraction, 36% binocularly balanced the prescription. In total, 50% of practitioners binocularly balanced this young adult patient and 75% checked the patient's near visual acuity. Four percent checked the intermediate visual acuity. Thirty-six percent of practitioners checked the patient's accommodation, and 35 of these

checked both accommodation and near visual acuity. 53% of the sample recommended an update of the current spectacles and 99% issued a prescription. However, only just over half (57%) of practitioners issued a prescription without prompting, with a further 42% providing the prescription when the SP asked for it. The one practitioner who did not issue a prescription did not refuse, but told the SP to return for the prescription later. Ultimately, for data analysis, this prescription was obtained over the telephone.

As noted in *Table 7.3* the mean spherical equivalent for the right eye was -4.06D and -4.01D for the left eye. The mean astigmatic refractive error (calculated using astigmatic decomposition) for the right eye was -0.24DC (range: 0 to 0.75D) and -0.17DC (range: 0 to 0.50D) for the left eye. For the right eye, the mean C_0 was -0.20D (S.D. =0.22D; 95%CI for the mean -0.25D to -0.16D) and the mean C_{45} was -0.14D (S.D. =0.17D; -0.17D to -0.10D). For the left eye, the mean C_0 was 0.06D (S.D. =0.11D; 0.04D to 0.08D) and the mean C_{45} was -0.17D (S.D. =0.13D; -0.19D to -0.14D). Box plots for the C_0 and C_{45} components are shown in *Figure 7.2*.

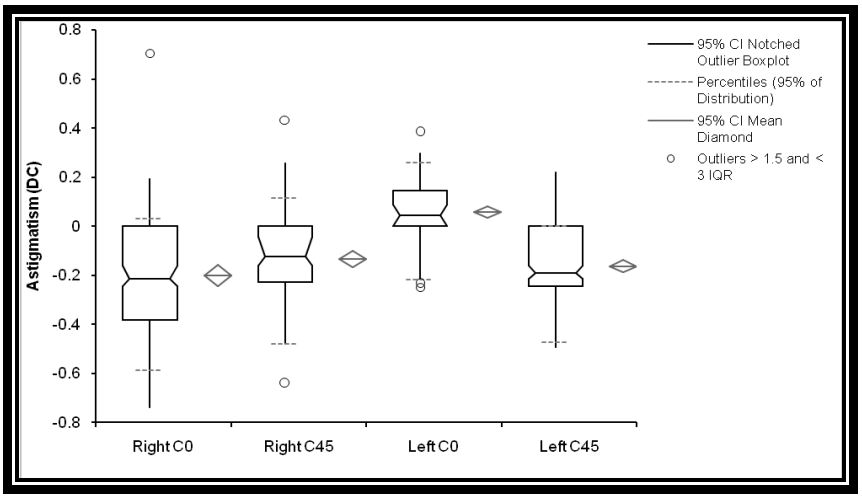


Figure 7.2: Box plots showing the distribution of the right and left astigmatic powers determined for Scenario 1 expressed as C_0 and C_{45} components. The centre of the diamond shows the mean and the top and bottom of the diamond show the 95% confidence interval for the mean (parametric statistics). The notched box and whiskers show non-parametric statistics. The centre line of the box is the median, the notch is the 95% confidence interval for the median and the overall size of the box is the inter-quartile range (IQR). The lines extending vertically from the upper and lower quartiles connect the nearest observations with the 1.5IQRs. The "o" symbols indicate near outliers between 1.5 and 3.0 IQRs away.

For the refractive findings obtained following the SP visits, the mean scalar value (v) for the right eye was 4.06 (mean ± 2SDs 3.64 to 4.48) and 4.01 (mean ± 2SDs 3.61 to 4.41) for the left eye. Box plots for these scalar values are illustrated in *Figure 7.3*. The average inter-eye difference using scalar values was 0.12 (range 0 to 0.38). This difference was identical using spherical equivalents [0.12D (range: 0 to 0.38D)]. Analysis of the scalar values (right, left and inter-eye difference) revealed no significant difference between type of practice (p>0.35).

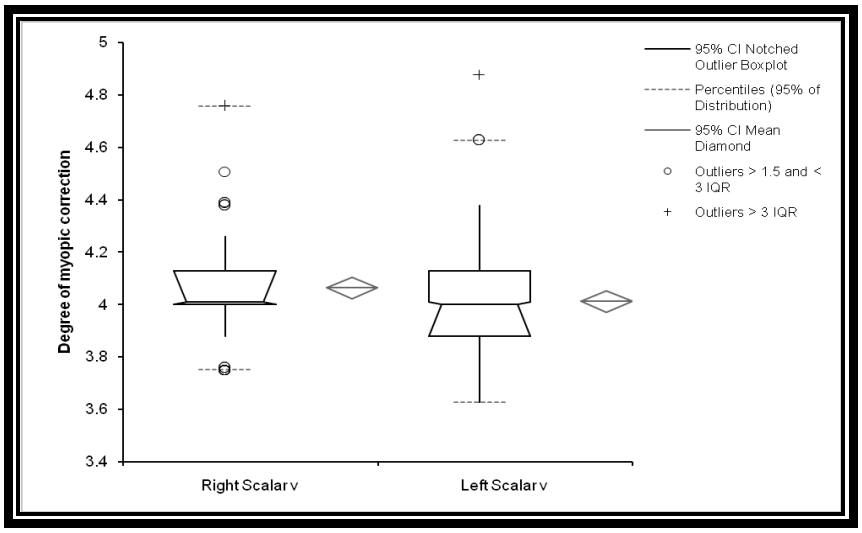


Figure 7.3: Box plots showing the distribution of the scalar values for the right and left eyes for the refractive findings obtained from the scenario 1 SP visits. The centre of the diamond shows the mean and the top and bottom of the diamond show the 95% confidence interval for the mean (parametric statistics). The notched box and whiskers show non-parametric statistics. The centre line of the box is the median, the notch is the 95% confidence interval for the median and the overall size of the box is the inter-quartile range (IQR). The lines extending vertically from the upper and lower quartiles connect the nearest observations with the 1.5IQRs. The "o" symbols indicate near outliers between 1.5 and 3.0 IQRs away. The "+" symbol indicates outliers over 3.0 IQRs away.

7.3.2 Scenario 2

All of the optometrists visited by the SP in this scenario carried out focimetry, either personally or delegated, of the patient's existing spectacles. 83% carried out an objective assessment of the refractive error. 23% used an autorefractor (personally or delegated), 48% carried out retinoscopy and 12% used both methods. All the optometrists performed subjective testing of the spherical element of the refractive error and 76% checked subjectively for the cylindrical element. The patient presented as a project manager (87% asked this), and 77% of the optometrists asked the patient

about the nature of the visual tasks regularly undertaken (e.g., computer use). The SP presented for the eye examinations with a single vision hypermetropic prescription. 74% of optometrists established a prescription for near vision and 45% of these also established a prescription for intermediate vision. None of the optometrists prescribed a different addition for intermediate vision hence it was concluded that the same addition was prescribed for both intermediate and near vision. All optometrists checked the SP's near visual acuity and 62% checked her intermediate visual acuity. 50% of the optometrists visited checked the range of clear near vision.

Seven optometrists advised the SP about visual hygiene when using the computer. The patient was advised to take regular breaks when using the computer for long periods of time. Only one optometrist explained the need for a reading correction due to the onset of presbyopia. Sixty-nine percent recommended an update of the current spectacles. Seventy percent of optometrists issued a prescription without prompting, but a further 28% gave this when the SP asked for it. The two optometrists who did not issue a prescription did not refuse, but told the SP to return for the prescription later.

The mean spherical equivalent for the right eye (*Table 7.3*) was 2.05D and for the left eye was 3.65D. The mean astigmatic refractive error (calculated using astigmatic decomposition) for the right eye was 0.05DC (range: 0 to 0.75DC) and 0.19DC (range: 0 to 1.00DC) for the left eye. For the right eye, the mean C_0 was 0.00D (S.D. =0.13D; 95%CI for the mean -0.03 to 0.03) and the mean C_{45} was -0.05D (S.D. =0.13D; -0.07 to -0.02). For the left eye, the mean C_0 was -0.17D (S.D. =0.22D; -0.22 to -0.13) and the mean C_{45} was 0.09D (S.D. =0.14D; 0.07 to 0.12). Box plots for the C_0 and C_{45} components are shown in *Figure 7.4*.

For the refractive findings obtained following the SP visits, the mean scalar value (v) for the right eye was 2.06 (mean ± 2SDs 1.56 to 2.56) and 3.65 (mean ± 2SDs 3.11 to 4.19) for the left eye. Box plots for these scalar values are illustrated in *Figure 7.5*.

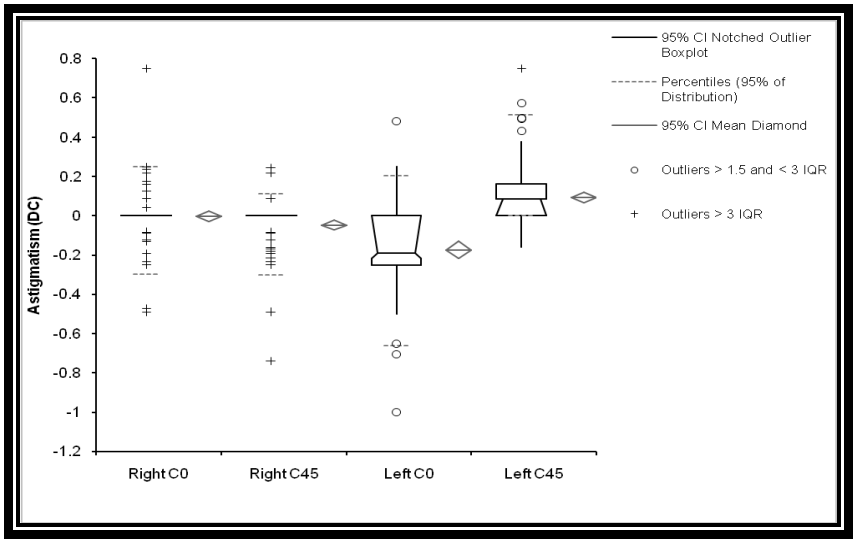


Figure 7.4: Box plots showing the distribution of the right and left astigmatic powers determined for Scenario 2 expressed as C_0 and C_{45} components. For a description of the elements of the box plots please see Figure 7.2. A lack of the notched box for the right C_0 and C_{45} components indicates that the 95% confidence interval for the median and the inter-quartile range are equal to the median.

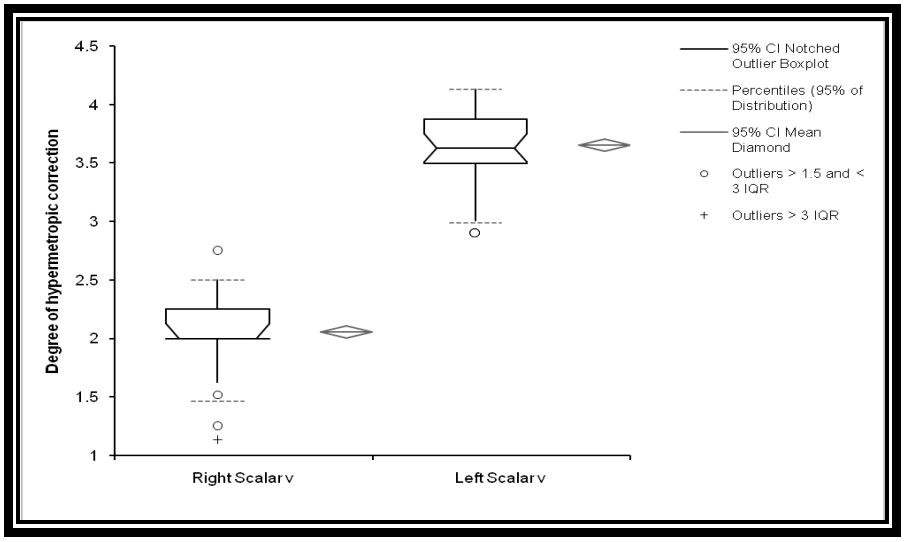


Figure 7.5: Box plots showing the distribution of the scalar values for the right and left eyes for refractive findings obtained from the scenario 2 visits. For a description of the elements of the box plots please see Figure 7.3.

The mean inter-eye difference (Anisometropia variable, AV) using the spherical equivalent was 1.60D (SD 0.33, 95%CI for the mean 1.53 to 1.66), with a range of values for AV of 0.75 to 2.50D, and mean ± 2SDs 0.96 to 2.23. The distribution of the anisometropia variable using spherical equivalent is shown in *Figure 7.6*. The mean

inter-eye difference using scalar values was also 1.60D (range: 0.75 to 2.49D, mean ± 2SDs 0.94 to 2.26).

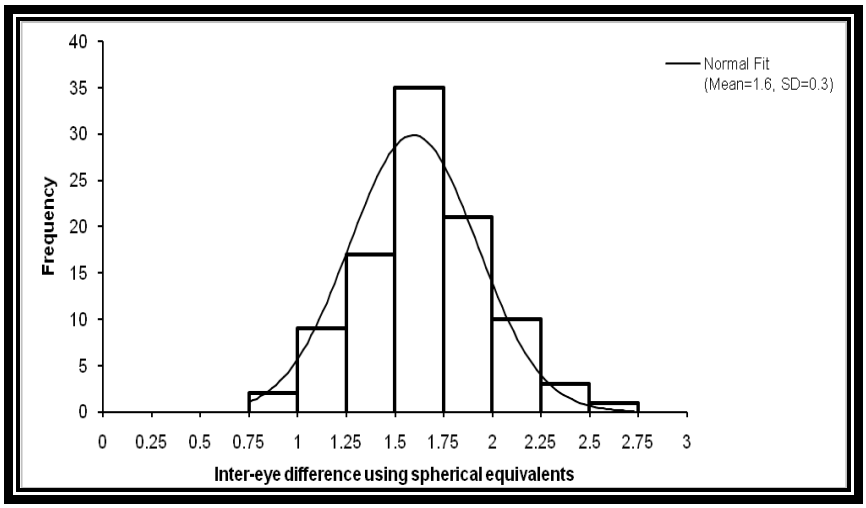


Figure 7.6: The distribution of the anisometropia variable (AV). AV is the difference between the right and left equivalent spheres for 98 spectacle prescriptions for the standardised patient in scenario 2.

The average near reading addition was 0.92DS (range: 0.25-1.50DS, mean ± 2SDs 0.32 to 1.52). In view of the fact that the near prescription astigmatic component is likely to be identical to the subjective "distance" prescription found, the astigmatic component of the refractive errors at near was not analysed. Rather, the means and means ± 2SDs for the right and left near spherical equivalents were calculated (*Table 7.3*). The 95% reproducibility limit for the right near spherical equivalent was 0.89D and was 1.08D for the left near equivalent sphere.

Analysis of the scalar values using the Kruskal-Wallis test to compare different practice types showed a significant difference between the means for the right eye (p=0.02). The disparity between the means for the inter-eye difference approached significance (p=0.09). There was no significant difference for the left scalar value (p=0.40). All three practice types found a higher mean right scalar value than the benchmark (1.930). For the left eye, small multiple practices revealed a lower (3.58) average scalar value, independent practices revealed a higher (3.68) average scalar value and large multiples revealed the same average scalar value as the benchmark (3.65). These differences were not significant (p=0.43). The results are illustrated in *Figure 7.7*. Eighty five per cent of the large multiples visited by the SP prescribed a

reading addition compared to 71% of independent practices and 69% of small multiple practices.

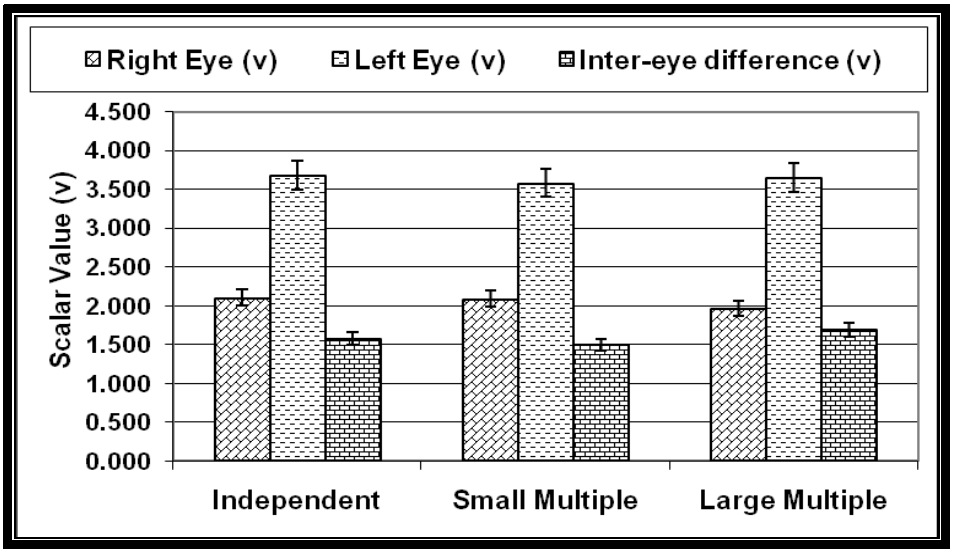


Figure 7.7: Graph showing the right and left scalar values (total subjective refraction) and inter-eye difference using scalar values. The 95% confidence intervals of the means for independent, small multiple and large multiple practices are also shown.

7.3.3 Scenario 3

Eighty three per cent of optometrists visited carried out an objective assessment of the refractive error. 25% used an autorefractor (personally or delegated), 47% carried out retinoscopy and 11% used both methods. 99% of optometrists carried out subjective testing of the spherical element of the refractive error and 86% checked subjectively for the cylindrical element. The patient presented as a music teacher (74% asked this), and 67% of optometrists asked the patient about the types of visual tasks he performs (i.e., use of intermediate vision). The SP presented for the eye examinations with single vision near spectacles and intermediate non-prescribed spherical eyeglasses. 99% of optometrists established a prescription for near vision and 56% of these also established a prescription for intermediate vision. All of these 56% of optometrists prescribed a different addition for intermediate vision to that prescribed as the near addition. All of the optometrists who prescribed a reading addition checked the SP's near visual acuity but only 13% checked his intermediate visual acuity.

Thirty-nine percent of the sample recommended an update of the current spectacles and 92% issued a prescription. However, only just over half (57%) of practitioners

issued a prescription without prompting, with a further 34% providing the prescription when the SP asked for a copy.

The mean spherical equivalent (*Table 7.3*) for the right eye was 0.09D and 0.01D for the left eye. The average of the astigmatic refractive error (calculated using astigmatic decomposition) from the right eye was -0.08DC (range: 0 to 0.50D) and -0.10DC (range: 0 to 0.50D) for the left eye. For the right eye, the mean C_0 was -0.01D (S.D. =0.13D; 95%CI for the mean -0.03 to 0.02) and the mean C_{45} was -0.03D (S.D. =0.08D; -0.04 to -0.01). For the left eye, the mean C_0 was 0.04D (S.D. =0.09D; 0.02 to 0.06) and the mean C_{45} was -0.08D (S.D. =0.11D; -0.10 to -0.06). Box plots for the right and left C_0 and C_{45} components are shown in *Figure 7.8*.

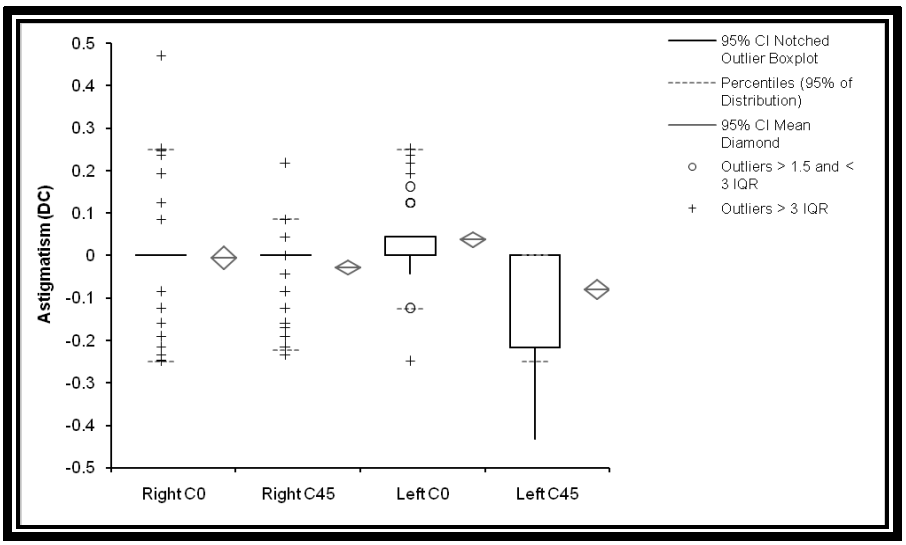


Figure 7.8: Box plot showing the distribution of the right and left astigmatic powers determined for Scenario 3 expressed as C_0 and C_{45} components. For a description of the elements of the box plots please see Figure 7.2. A lack of the notched box for the right C_0 and C_{45} components indicates that the 95% confidence interval for the median and the inter-quartile range are equal to the median.

For the refractive findings obtained following the SP visits, the mean scalar value (v) for the right eye was 0.15 (mean ± 2SDs -0.11 to 0.41) and 0.12 (mean ± 2SDs -0.10 to 0.34) for the left eye. Box plots for these scalar values are illustrated in *Figure 7.9*. The average inter-eye difference using scalar values was 0.17 (range: 0-0.64, mean ± 2SDs -0.09 to 0.43) and 0.14 (range: 0-0.63, mean ± 2SDs -0.12 to 0.40) using equivalent spheres. The average intermediate addition was 1.53DS (range: 1.00-2.00DS, mean ± 2SDs 1.13 to 1.93) and average near reading addition was 2.02DS (range: 1.50-2.50DS, mean ± 2SDs 1.62 to 2.42). The near and intermediate additions

are usually established once a subjective “distance” prescription has been obtained. Using the mean and S.D. values from *Table 7.3*, the 95% limit of reproducibility for the intermediate and near right spherical equivalents was 0.64D; it was 0.67D for the intermediate left spherical equivalent and 0.69D for the left near spherical equivalent. Analysis of the scalar values (right, left and inter-eye difference) revealed no significant difference between type of practice (p>0.13).

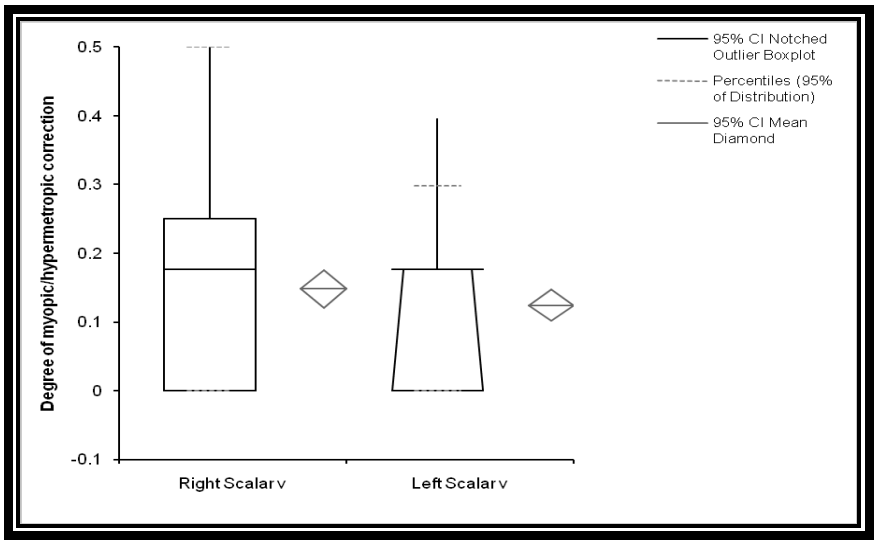


Figure 7.9: Box plots showing the distribution of the scalar values for the right and left eyes for the refractive findings obtained from the scenario 3 visits. For a description of the elements of the box plots please see Figure 7.3.

7.4 Discussion

The General Optical Council’s revised competencies for registration as an optometrist in the UK, state that an optometrist should have the ability to refract a range of patients with common optometric problems by objective and subjective means. S/he should also be able to make appropriate prescribing and management decisions based on refractive and ocular motor status (General Optical Council, 2008f).

As discussed in the introduction, during objective refraction the practitioner is able to establish a patient’s refractive error without any subjective input from the patient. It provides an objective first measure of the refractive error that can be refined by subjective refraction (Elliott, 2003a). A greater proportion of optometrists performed an objective assessment of refractive error for the SPs in the second and third scenarios

(83%) compared to the first scenario (59%). Although both retinoscopy and autorefraction can be used to determine an objective refraction, retinoscopy has several advantages over autorefraction. If retinoscopy is used, signs of ocular aberrations, either spherical or irregular, can be identified. Retinoscopy provides a more accurate result of refractive error in a greater array of patients than autorefraction, although autorefraction is a reliable alternative in uncomplicated adult patients (Elliott, 2003a).

It is noteworthy that in each scenario a greater proportion of optometrists performed retinoscopy compared with autorefraction. The preference for retinoscopy as the method of objective refraction was less marked in scenario 1 (retinoscopy 36%; auto-refraction 29%) than in scenarios 2 and 3 (retinoscopy 60% and 58% respectively; auto-refraction 35% and 36% respectively). If the main reason for a lay person to operate an autorefractor is to save the optometrist chair time, it can be argued that the time saved is small since an experienced optometrist requires on average one minute per eye for retinoscopy (Goss & Grosvenor, 1996). On the other hand, two minutes is approximately 10% of the average time taken for a routine eye examination (Harvey & Franklin, 2005) and this may represent significant time saved in a busy practice. Additionally, clinical trials and studies investigating the repeatability of objective refractions often use autorefractors (Bullimore *et al.*, 1998;Rosenfield & Chiu, 1995;Zadnik *et al.*, 1992). Using autorefraction as an alternative to retinoscopy also has several potential disadvantages. First, the patient may feel the optometrist is dependent on instrumentation rather than knowledge or skill, although patients may be impressed by the use of sophisticated instrumentation. Second, the practitioner may miss subtle but important clinical signs by not performing retinoscopy in cases of accommodative dysfunction or ocular media opacities; for example, a changing retinoscopic reflex due to fluctuations in accommodation or ciliary spasm in latent hyperopia (Goss & Grosvenor, 1996).

Subjective refraction is the term used to describe one lens being compared to another, using changes in vision as the criterion, to arrive at the dioptric lens combination that results in maximum visual acuity (Eskridge *et al.*, 1991). Subjective refraction is the benchmark against which all refractive devices are measured (Mackenzie, 2008). It is encouraging that all but one of the practitioners visited by the three standardised patients in this study performed a subjective refraction on every patient. This one practitioner did not perform a subjective refraction on SP 3. This SP presented with

symptoms suggestive of a posterior vitreous detachment and it may be that this practitioner felt that the determination of refractive error was not a priority for this patient.

All three SPs had relatively small amounts of astigmatism or no astigmatism in their current spectacles. The SPs in the first and second scenarios both had no cylindrical correction in the right eye and -0.25DC in the left eye in their current spectacles. The SP in the third scenario presented for the eye examinations with no distance correction and used non-prescribed ready readers for near and intermediate work. It is noteworthy that 25 practitioners visited by the SP in scenario two, six practitioners in scenario one and 14 practitioners in scenario three did not subjectively check for a cylindrical element to the prescription. These practitioners may take the view that if a patient is not wearing a cylinder in their current prescription and is achieving good visual acuity without the cylinder then it is not necessary to include a cylinder in any new prescription (College of Optometrists, 2008g). In this case it can be argued that there is no logic in checking for a cylinder in the subjective refraction, especially if no cylinder or only a -0.25DC is found objectively.

The steps used to determine the final subjective result may vary from patient to patient as the reproducibility of refractive error is a function of both age and refractive state. For example, children and pre-presbyopes require greater control of their accommodation during the refraction compared to presbyopes. Differences in the quality of practitioner-patient communication in children compared to adults are likely to affect the final subjective end point. Hence there is likely to be a greater inter-examiner variability in the refractive results obtained from children compared to adults. In the case of patients who have higher degrees of spherical ametropia and/or astigmatism, small differences in vertex distance are likely to influence the measurement of refractive error. This in turn can influence the reproducibility of refractive error by different practitioners. One of the main difficulties when performing a subjective refraction is that, by definition, the practitioner is relying exclusively on subjective responses from the patient, and patient responses are highly influenced by the question asked by the optometrist.

Whilst several studies have provided an insight into the reproducibility of refractive error, the majority of the findings of these studies are based on small samples of practitioners (two, three or a maximum of five) and in some cases students were used

as subjects (Perrigin *et al.*, 1982; Goss & Grosvenor, 1996) rather than “real” patients. These studies, despite the use of only two or three practitioners, found clinically significant differences in results despite similarities in the education and training of these practitioners. Whilst this study was markedly different from those quoted earlier in this section, in that prescriptions obtained from 100 eye examinations on three different patients were used, it must be stressed that the three standardised patients are not representative of the general population.

The spherical equivalent refractions obtained for the three SPs in this study were within ±0.25D on average 81% of the time, within ±0.50D 97% of the time, within ±0.75D 99% of the time and within ±1.00D 100% of the time. The spherical powers for the prescriptions obtained were found to be within ±0.25D 90% of the time, within ±0.50D 98% of the time and within ±0.75D 100% of the time. The cylindrical powers were within ±0.25D 93% of the time and within ±0.50D 100% of the time.

The findings of this study are comparable with other studies that have investigated the reproducibility of refractive errors (*Table 7.1*). However, the repeatability of spherical and cylindrical powers becomes poorer as these powers increase, whereas the repeatability of the cylindrical axis finding improves as the cylindrical power increases (Borish & Benjamin, 1998). Hence the results for agreement for cylindrical powers in this study should be interpreted with caution since the astigmatic corrections were minimal for all three SPs. MacKenzie (2008) concluded that whereas a single optometrist may be able to perform refractions with a precision of ±0.25D, refractions performed by different optometrists on age and ametropia-matched subjects may differ in their spherical equivalent component by 0.75D or more; conclusions in close agreement with those from the current study.

The mean ± 2SD ranges for the spherical equivalent refraction (*Table 7.3*) show that for the 100 practitioners visited by the first SP in the present study, 95% of the refractive errors determined lie within an 0.80D (approximately 0.75D) range for the right and left eyes. In the case of practitioners visited by the second SP, 95% of the refractive errors lie within a 1.00D range for the right eye and a 1.08D (approximately 1.00D) range for the left eye, and for the third patient scenario 95% of the refractive errors lie within a 0.64D (approximately 0.75D) range for the right eye and 0.60D (approximately 0.50D) for the left eye.

Based on reproducibility limit data obtained for all six eyes from the standardised patients, we can conclude that any two optometrists will differ in their estimation of distance spherical equivalent refraction on a single eye by no more than 0.75D in 95% of repeated measures. Similarly, the astigmatic data (C_0 and C_{45}) show that optometrists will differ in their estimation of the C_0 component by between 0.25D and 0.61D and for the C_{45} component by between 0.22D and 0.47D in 95% of repeated measures. Two optometrists will differ by no more than 0.67D in 95% of repeated measures in their estimation of intermediate spherical equivalent and by no more than 1.08D in 95% of repeated measures for near spherical equivalent refractions.

MacKenzie investigated the reproducibility of sphero-cylinder prescriptions provided by 40 optometrists and concluded that refractions performed by multiple optometrists on a single eye will differ in their spherical equivalent component by over 0.78D on average not more than once in 20 refractions (Mackenzie, 2008). The same study also concluded that optometrists will differ in their estimation of the J_0 and J_{45} components of astigmatism [which are half the magnitude of the C_0 and C_{45} components (Rabbetts R.B., 2007)] of refraction by no more than 0.24D (approximately 0.50D cylinder) in 95% of repeated measures (Mackenzie, 2008). The agreement between the data obtained from the present research and the results of the study by MacKenzie (2008) support the conclusion that spherical equivalent findings are reproducible to approximately ±0.75D when performed by multiple optometrists in patients of different age groups and levels of ametropia.

Based on the limits of agreement given by Bullimore et al. the reproducibility limits for spherical equivalent refraction have been calculated to be 1.10D, and for the J_0 and J_{45} components of astigmatism to be 0.54D (approximately 1.00D cylinder). However, their study design (based on the examination of 86 subjects by two examiners) was markedly different from the current study and from that of MacKenzie, so comparisons should be made with caution (Bullimore *et al.*, 1998; Mackenzie, 2008).

Rosenfield and Chiu investigated the repeatability of clinical refractions by one examiner on 12 subjects on five separate occasions (Rosenfield & Chiu, 1995). It should be noted that this study assessed repeatability (repeated measures by same observer) which would be expected to be less variable than the reproducibility (different observers) assessed in the present research. Although astigmatic decompensation was not used in Rosenfield and Chiu's statistical analysis, the findings of their study

revealed that the 95% limits of agreement for spherical equivalent refraction were ±0.29D, ±0.27D for sphere, and ±0.16D for cylinder power (Rosenfield & Chiu, 1995). The equivalent parameter for reproducibility used in the present study (columns 2 and 4 in *Table 7.5*) has approximately twice the variability reported by Rosenfield and Chiu under repeatability conditions.

The presence of anisometropia later in life does not necessarily imply that there was a significant refractive difference between the eyes in infancy, when the development of vision is at its most rapid and critical stage (Rabbetts, 1998). In the second scenario, the benchmark eye examinations found a mean inter-eye difference using spherical equivalents of 1.73D (range: 1.38 to 2.13D). The mean inter-eye difference from the 98 spectacle prescriptions obtained was 1.60D (range: 0.75-2.50D, mean ± 2SDs 0.94 to 2.25).

These results reflect on the different prescribing philosophies adopted by optometrists for anisometropic patients with or without the presence of significant amblyopia. Some optometrists prescribe the full anisometropia findings obtained following subjective refraction; some prescribe a balance lens to the worse eye, due to the fear of a non-tolerance if the full subjective refraction was prescribed, and the remaining practitioners give a compromise prescription. In the case of optometrists who prescribe a balance lens or a compromise prescription, there is bound to be a difference between the subjective findings and the final prescription issued. In cases where a spectacle prescription is being prescribed for the first time, a compromise correction may be accepted more readily by the patient. However, the SP in the second case scenario presented for the eye examinations wearing spectacles with a spherical equivalent inter-eye difference of 1.25D. In view of this, it is interesting to note that the range of inter-eye difference prescribed by the optometrists visited varied from 0.75D to 2.50D.

In a study of this nature where the actors had several eye examinations with different practitioners, the differences in subjective refraction findings could be explained by: (1) changes in the patients' subjective state between examinations, (2) a change in the patients' subjective response as a result of factors such as "eyelid squinting" or misunderstanding instructions, (3) the examiners using different refracting procedures or different endpoint criteria, (4) some practitioners failing to completely relax the patients' accommodation (Perrigin *et al.*, 1982). It is difficult to control all of these factors although, in response to point one above, all of the visits were completed within

a three month period; hence it is unlikely that the patients' subjective state will have changed between the examinations. By monitoring the patient for quality control after every 20-25 visits, variations in refractive findings due to factor (2) above can be kept to a minimum.

In addition to patient symptoms, several factors need to be taken into consideration when deciding whether to prescribe a refractive error or recommend a change in optical prescription or current spectacles. These include the patient's previous ocular history, age, occupation, hobbies, their current spectacle prescription and the condition of their present spectacles (Elliott, 2003a). In many patients it can be assumed that the power of new spectacles should be the final subjective result although this is not always the case. The standardised patients in this study presented for the eye examinations wearing their current spectacles hence the practitioners visited were not masked from their previous prescriptions.

The mean benchmark prescriptions noted in the results section above were within ±0.25D (sphere and cylindrical power) of their current spectacle prescriptions for all three standardised patients. It is interesting to note that 53% of practitioners visited by the SP in the first scenario, 69% in scenario 2 and 93% in scenario 3 advised the patient to update their spectacles. This latter figure is particularly surprising because the standardised patient in the third scenario was not experiencing any difficulties with his distance or near vision. It could be argued that in the case of the SP in scenario 2, a small change in the hypermetropic prescription would help alleviate the difficulties experienced whilst reading at near.

The standardised patient in the first scenario presented with headaches (resembling a migraine) that start at the back of the head and work their way forward on the left hand side of the head. The SP advised the optometrist that there was no real pattern to the occurrence of the headaches and no known triggers. The International Headache Society (Olesen & Steiner, 2004) provides diagnostic criteria for headaches associated with refractive error (section 11.3.2 of the International classification of headaches disorders, second edition) as follows: (a) recurrent mild headaches in the frontal regions and in the eyes themselves, (b) uncorrected or miscorrected refractive errors e.g., hypermetropia, astigmatism, presbyopia and wearing of incorrect glasses, (c) pain absent on awakening, and aggravated by prolonged visual tasks at distance or the

angle[5] where vision is impaired (d) headache and eye pain resolve within 7 days and does not recur after full correction of refractive error. According to these criteria, it is unlikely that the headaches described by the SP were due to a change in refractive error.

Analysis of the scalar values (right, left and inter-eye difference) revealed no significant difference between type of practice (independent, small multiple and large multiple practices) for the first and third patient scenarios. In the case of the second SP scenario, it is interesting to note that large multiple practices prescribed a weaker right total subjective prescription (v) and total subjective prescription (Mean v) compared to small multiple and independent practices. In addition to this it is also interesting that a greater proportion of large multiple practices prescribed a reading addition compared to small multiple and independent practices. These differences were not statistically significant (p=0.81).

The data analysed in this study were the prescriptions issued to the SPs at the end of each examination. It is improbable that these prescriptions were identical to the final subjective findings in every case because optometrists may modify their final subjective for various reasons when prescribing. Variations between the final subjective results and the prescriptions given to the SP are unlikely to be a major issue in Scenarios 1 and 3, but may have increased the reproducibility of refractive data for the anisometropic SP in scenario 2. In all three scenarios some optometrists may have found a 0.25 cylinder subjectively, but decided not to prescribe this correction, a decision based on the absence of a cylinder in the SP's current spectacles and the excellent levels of visual acuity achieved with a spherical correction.

The patients in this research study did not have very high spherical refractive errors, had minimal astigmatism, and in terms of the determination of their refractive error could be classified as fairly straightforward, although one patient did have a significant degree of anisometropia. It is recommended that future research could usefully use the methods outlined here to determine the reproducibility of optometric measurements for more complex refractive errors. A potential limitation of the present study is that optometrists were not masked to the SPs' current spectacle prescription hence it would be interesting if, in future work, some SPs were to attend without bringing their current spectacles.

[5] This is the terminology used in the IHS criteria and its meaning is not clear to the author.

7.5 Chapter summary

The data presented here agree with the results of other similar studies leading to the conclusion that subjective refractive findings are reproducible when performed by multiple optometrists in patients of different age groups and levels of ametropia. The spherical equivalent refractions were found to be within ±0.25D of the mean benchmark 81% of the time and within ±0.50D 97% of the time. The spherical power was within ±0.25D 90% of the time and within ±0.50D 98% of the time. The cylindrical power agreed within ±0.25D 93% of the time and within ±0.50D 100% of the time. Based on limits of reproducibility data obtained for all six eyes, optometrists differed in their estimation of spherical equivalent refraction by no more than 0.75D in 95% of repeated measures. The astigmatic data (C_0 and C_{45}) show that optometrists will differ in their estimation of the C_0 component by between 0.25D and 0.61D (approximately 1.00DC) and for the C_{45} component by between 0.22D and 0.47D (approximately 0.50DC) in 95% of repeated measures.

The next chapter discusses how well record abstraction quantifies the content of optometric eye examinations established via a comparison of standardised patients to clinical records.

8 How Well Does Record Abstraction Quantify the Content of Optometric Eye Examinations in the UK? A Comparison of Standardised Patients to Clinical Record Cards

8.1 Introduction

Standardised patients are not the only method of investigating clinical practice and standards, but unannounced SPs with completed standardised patient checklists have been regarded as the gold standard for quality measurement in clinical practice (Dresselhaus *et al.*, 2000; Dresselhaus *et al.*, 2002; Luck *et al.*, 2000; Luck & Peabody, 2002; Peabody *et al.*, 2000; Peabody *et al.*, 2004a). In order to measure everyday clinical practice, it is important for the SPs to be unannounced: the practitioner must not believe that the SP is there to assess their clinical practice.

As discussed in the first chapter (section 1.3.1), record abstraction has been described as the most widely used method of measuring quality of clinical care (McDonald *et al.*, 1997; Rubin *et al.*, 1992; Gilbert *et al.*, 1996). There are widespread concerns regarding the use of this method due to the validity and reliability of results obtained (Norman *et al.*, 1985; Rethans *et al.*, 1994; McLeod *et al.*, 1997). One of the main limitations is that record abstraction does not identify false negative results [(tests carried out but not documented in the clinical record, (Luck *et al.*, 2000; Dresselhaus *et al.*, 2000)]. Busy practitioners may not record everything that was examined during the consultation. On the other hand, good record keepers may not necessarily be good physical examiners. The opposite form of bias can also occur; concern over clinico-legal attention might lead some practitioners to record tests that they have not completed (Luck *et al.*, 2000; Dresselhaus *et al.*, 2000). These limitations could therefore skew the results leading to an overestimation or underestimation of the quality of care (Lawthers *et al.*, 1995; Katz *et al.*, 1996).

As highlighted in chapter 1, record abstraction only provides a limited insight into the practitioner's clinical skills and practitioner-patient interactions. Other limitations associated with record abstraction include illegibility, incomplete or unavailable records and differing skills between abstractors (Dresselhaus *et al.*, 2000; Dresselhaus *et al.*, 2002; Peabody *et al.*, 2000).

As reported by Dresselhaus et al. (2002), clinical record abstraction lacks both sensitivity due to the presence of false negatives; where the test was carried out but not recorded and specificity due to false positives; where the test was recorded but not carried out. The presence of false positives gives rise to further questions about the reliability of the record card as a measure of the quality of care provided. SPs are a gold standard measure of the level of clinical care against which both false positives and false negatives in the record card can be measured (Glassman *et al.*, 2000). Several studies within medicine have compared data obtained from record abstraction to that reported by the SP. However, a literature review revealed no research within optometry or ophthalmology that has investigated the information gathered from optometrists' clinical record cards.

The standardised patient approach was used to investigate the content of optometric eyecare for three different patient scenarios (Chapter 4, 5 and 6). The aim of the present chapter is to evaluate how appropriately optometric clinical record cards quantify the content of optometric eye examinations, via a comparison of the standardised patients to clinical records. This chapter forms part of a paper that has been accepted for publication in *Ophthalmic and Physiological Optics*.

8.2 Methods

8.2.1 Data collection

A random selection of 111 optometrists working within 1.5 hours travel from central London was recruited. During the early stages of the study design, it was anticipated that each actor would visit 100 consenting practitioners. A greater number of consenting optometrists than required were recruited to allow for optometrists who may withdraw or change their place of work during the duration of the study. Prior to commencing the visits, the actors were given a list stating the names of all consenting practitioners. The actors were therefore able to select, from this list, the practitioners that they would visit during the course of the study. 100 consenting practitioners were visited by the SPs in the first and second patient scenario and 102 consenting practitioners by the third SP for a routine eye examination, each representing a different patient scenario (i.e., different ages, races, presenting symptoms, and clinical features). Of the 111 consenting practitioners, 84 optometrists were visited by all three

SPs; 5 optometrists by the first and second SPs; 8 optometrists by the first and third SPs; 10 optometrists by the second and third SPs; 3 optometrists by the first SP only and 1 optometrist by the second SP only. One consenting optometrist was not visited by any of the three SPs. The selection of participating optometrists and actor recruitment and training has been described in detail in chapter 3 (section 3.3.3 and 3.3.4). The methodology detailing the case scenarios and case specific checklists are described in chapters relevant to each scenario.

Upon completion of all the standardised patient visits, a letter was written to practitioners who had opted for the partial anonymity option to advise them all three actors had completed their visits and requested copies of the clinical records for the SP consultations (appendix 20). Practitioners were advised that it was important not to make any changes to their records prior to photocopying them. All relevant information was extracted from the records by the researcher. The case specific checklists prepared during the early stages of the study and completed by the SPs at the end of each consultation were used to abstract the relevant information from the clinical records. The information gathered during record abstraction about the content of eye examinations for each case scenario from the clinical records obtained was recorded and summarised in spreadsheets for analysis.

8.2.2 Case scenarios

A detailed description of the case scenarios for each standardised patient is given in chapters relevant to each scenario. In the first of the three scenarios, the SP presented for a private eye examination as a 20 year-old student complaining of headaches (first ever headache 4 weeks ago, resembling a migraine). This SP was a myope and presented for the examinations “to see if her glasses were OK”, reporting that her last check-up was about two years ago (Chapter 4, section 4.2.1). The second SP presented as a 44 year-old patient of African racial origin for a private eye examination having experienced recent difficulty with her near vision (Chapter 5, section 5.2.1). The third SP presented for a private eye examination as a 59 year-old patient, with recent onset flashing lights (over the last week) in one eye in the dark (Chapter 6, section 6.2.1).

8.2.3 Analysis

In this part of the study, the clinical care provided by optometrists was determined by two methods for each of the three standardised patients; first using data gathered from the checklists completed by the SPs at the end of each consultation and second abstraction of information from records obtained from practitioners upon completion of all SP visits. As discussed earlier, the checklists completed by the SPs were taken as the gold standard method of assessing clinical care. Using the SPs as the gold standard, the data gathered from the clinical records were classified for each quality criterion as true positive (reported by SP and documented on the record card), false negative (reported by SP but not documented on the record card), false positive (not reported by SP but recorded on the record card) and true negative (not reported by SP and not recorded on the record card).

8.3 Results

As described in chapter 3 (section 3.3.3), during the early stages of the study participants were asked to choose which option they preferred, complete anonymity or the feedback option. Approximately one third chose full anonymity and approximately two thirds chose feedback or did not state a preference (these were given the option of receiving feedback when the results were available). From those practitioners who opted for the feedback option, 37 practitioners visited by the first SP sent copies of the patient records upon request, as did 34 practitioners visited by the second SP and 40 practitioners visited by the third SP. In total 111 patient records were returned for analysis. Twenty seven optometrists were visited by all 3 SPs and, of these, 23 optometrists sent copies of record cards from all three standardised patient visits, 3 optometrists sent copies from two SP visits and one optometrist for one SP visit. Fourteen optometrists were visited by two SPs. Of these, 12 optometrists sent copies of clinical record cards from both the SP visits and 2 optometrists from one SP visit. Nine optometrists were visited by one SP and all nine practitioners sent copies of the clinical record card from these visits.

A question that may arise is ‘were the practitioners who returned record cards a representative sample of the entire population visited by the SPs?’ To investigate (from the SP data) whether the proportion of optometrists who performed a test in the record

abstraction group for each scenario (n=34-40 depending on the scenario) differed from the proportion of optometrists whose clinical record cards were not obtained (n=62-66 depending on the scenario), a statistical test was performed (chi-square test) on the tests which were of the greatest clinical significance for each scenario. The results showed no significant difference (p>0.09) between the two groups.

Compared to the gold standard of standardised patients, on average false positives (over-reporting) were identified during record abstraction in approximately 4% of cases and false negatives (under-reporting) in approximately 18% of cases (these figures are obtained based on averaging the FPs and FNs across the three SPs reported individually in *Table 8.1*). Expressed as a proportion, false positives were higher in the first (4.7%) and third patient scenarios (4.8%) than in the second scenario (3.2%). False negatives were found to be highest in the second scenario (22.9%) and lowest for the first scenario (13.3%).

Table 8.1: 2x2 tables comparing the gold standard (SP) findings to the information gathered from record abstraction for three different patient scenarios. The figures represent the total number of measured items (from the case-specific checklists) reported by the SP and findings noted in clinical records (TP); measured items not reported by the SP but documented in clinical records (FP); measured items reported by the SP but findings not noted in clinical records (FN) and measured items not reported by the SP and findings not noted in records (TN).

Case Scenario 1	**Standardised patient**	
	Documented (% total responses)	**Not documented (% total responses)**
Record Abstraction Reported Not reported	TP=1031 (32.1%) FN=428 (13.3%)	FP=152 (4.7%) TN=1596 (49.8%)
Case Scenario 2	**Standardised patient**	
	Documented (% total responses)	Not documented (% total responses)
Record Abstraction Reported Not reported	TP=902 (42.2%) FN=490 (22.9%)	FP=68 (3.2%) TN=676 (31.6%)
Case Scenario 3	**Standardised patient**	
	Documented (% total responses)	Not documented (% total responses)
Record Abstraction Reported Not reported	TP=1169 (33.6%) FN=597 (17.1%)	FP=167 (4.8%) TN=1543 (44.4%)

The results in *Table 8.2* show that on average optometrists carry out more tests than is indicated by their clinical records. For symptoms and history, the proportion of false

negatives ranged from 15-25%. For example, 10-12% of practitioners under-recorded asking the SPs if they were taking any prescribed medication, approximately half did not record asking about a family history of diabetes and glaucoma although these questions had been reported by the SPs. Practitioners also commonly under-recorded information relating to the SP's occupation (7-21%) and whether or not the SP was a driver (10-20%).

Table 8.2: The proportions of true positive, false positive, true negative and false negative findings for individual domains of eye examinations performed on three standardised patients. An overall percentage score for each case scenario is shown in brackets.

	True Positive/ Total Responses (proportion)	**False Positive/ Total Responses (proportion)**	**False Negative/ Total Responses (proportion)**	**True Negative/ Total Responses (proportion)**
Case Scenario 1				
Overall	1031/3207 (32.1%)	152/3207 (4.7%)	428/3207 (13.3%)	1596/3207 (49.8%)
Symptoms and History	500/1545 (32.4%)	63/1545 (4.1%)	236/1545 (15.3%)	746/1545 (48.3%)
Examination	434/996 (43.6%)	56/996 (5.6%)	116/996 (11.6%)	390/996 (39.2%)
Management	97/666 (14.6%)	33/666 (5.0%)	76/666 (11.4%)	460/666 (69.1%)
Case Scenario 2				
Overall	902/2136 (42.2%)	68/2136 (3.2%)	490/2136 (22.9%)	676/2136 (31.6%)
Symptoms and History	374/842 (44.4%)	28/842 (3.3%)	209/842 (24.8%)	231/842 (27.4)
Examination	489/1226 (39.9%)	30/1226 (2.4%)	268/1226 (21.9%)	439/1226 (35.8%)
Management	39/68 (57.4%)	10/68 (14.7%)	13/68 (19.1%)	6/68 (8.8%)
Case Scenario 3				
Overall	1169/3476 (33.6%)	167/3476 (4.8%)	597/3476 (17.2%)	1543/3476 (44.4%)
Symptoms and History	531/1517 (35.0%)	62/1517 (4.1%)	346/1517 (22.8%)	578/1517 (38.1%)
Examination	541/1399 (38.7%)	79/1399 (5.6%)	181/1399 (12.9%)	598/1399 (42.7%)
Management	97/560 (17.3%)	26/560 (4.6%)	70/560 (12.5%)	367/560 (65.5%)

Specific to the first scenario, 10-60% of practitioners visited under-recorded information relating to different aspects of the patient's presenting symptoms. For example, 57% did not record asking about the description of the onset of the headaches, 30% did not record headache duration and 35% did not record asking about the visual associations relating to the headaches. 10-50% of practitioners visited by the SP in the third

scenario did not record information relating to different aspects of his presenting symptoms of recent onset photopsia. Information describing where in the visual field the SP saw the flashing lights was not recorded in 27% of cases, the presence/absence of a pattern to the occurrence of the photopsia in 32% of cases and 46% did not record if there was a change in the pattern of the flashing lights, although all of these had been reported by the SP as being asked.

The proportion of false positives ranged from 3-4% for symptoms and history. Information relating to the patients previous ocular history was commonly over-recorded. For example, 19-37% of optometrists recorded that they asked if the SPs had ever been seen at an eye hospital, and 29% recorded that they asked the SP in the second scenario if she had a lazy eye, although neither question had been reported by the SP as being asked. 19% of optometrists recorded that they had asked the SP in the first scenario about the duration of the symptoms of the headaches and 11% about the description of the onset of the headaches, although for both symptoms the SP had not reported that these questions were asked.

Another parameter that can be derived from the data in *Table 8.2* is the positive predictive value (PPV). This is the probability that a test was carried out when the test result is recorded and is derived from the formula:

$$\frac{\text{number of true positives}}{(\text{number of true positives} + \text{number of false positives})}.$$

PPV will be poor in cases where there is a high degree of over-recording (false positives). Also derived from the data in *Table 8.2*, and highlighted in the Discussion, is the negative predictive value (NPV). This is the probability that a test that has not been recorded was not carried out and is derived from the formula:

$$\frac{\text{number of true negatives}}{(\text{number of true negatives} + \text{number of false negatives})}.$$

NPV will be poor in cases where there is a high degree of under-recording (false negatives). The PPV and NPV values, expressed as percentages, are given in *Table 8.3*.

The proportion of false negatives for tests performed during the eye examinations ranged on average from 12-22% and false positives ranged from 2-6%. *Table 8.4*

highlights those tests of particular clinical significance to each patient scenario that were commonly under- and over-recorded.

Table 8.3: A table of the positive and negative predictive values (PPV and NPV), expressed as percentages, for various domains of eye examinations performed on three standardised patients.

	Scenario 1		**Scenario 2**		**Scenario 3**	
	PPV	**NPV**	**PPV**	**NPV**	**PPV**	**NPV**
Motility	68%	94%	86%	70%	76%	96%
Pupil Reactions	78%	60%	96%	20%	85%	54%
Inter-pupillary distance (PD)	77%	83%	91%	70%	78%	81%
Objective Assessment a) Retinoscopy b) Autorefractor	 67% 100%	 55% 100%	 100% 100%	 43% 72%	 83% 100%	 41% 75%
Subjective testing of cylindrical element	100%	0%	68%	33%	89%	14%
Binocular Balancing	80%	59%	N/A	N/A	N/A	N/A
Accommodation	100%	74%	N/A	N/A	N/A	N/A
Establish a prescription for Intermediate Vision	N/A	N/A	50%	38%	20%	100%
Assess Near Visual Acuity (NVA)	N/A	N/A	100%	0%	87%	100%
Cover test (at distance or near)	100%	83%	100%	0%	97%	44%
Fixation Disparity (Distance) Fixation Disparity (Near)	71% 60%	80% 97%	100% 100%	79% 93%	100% 50%	88% 100%
Anterior Eye Examination	25%	66%	50%	66%	93%	50%
Shafer's sign	N/A	N/A	N/A	N/A	70%	97%
Fundoscopy a) Ophthalmoscopy b) Slit lamp BIO	97% 71% 100%	0% 100% 77%	100% 84% 83%	0% 0% 86%	98% 89% 86%	0% 75% 82%
Visual Fields	100%	79%	90%	100%	86%	79%
Tonometry a) Non-contact tonometry b) Contact tonometry c) Before Dilation d) After Dilation	N/A N/A N/A N/A N/A	N/A N/A N/A N/A N/A	100% 93% 100% N/A N/A	50% 80% 94% N/A N/A	100% 93% 100% 83% 100%	25% 90% 93% 93% 86%

It can be inferred from *Table 8.2* that practitioners offer patients more management advice and options than their clinical records indicate (false negatives, 11-19%). Specific to the first patient scenario where the SP was presenting with recent onset headaches, 16-35% of optometrists offered, but did not record, management advice regarding the headache diagnosis (i.e., whether the headache was migraine or a tension type headache) and 11-24% offered, but did not record, advice about seeking a medical opinion regarding the symptoms. In the case of the SP presenting with recent onset flashing lights, the SP was advised by optometrists of the need for a dilated fundus examination although this information was not recorded in 15% of cases. This SP reported that 43% of optometrists advised him of the potential adverse reactions from mydriatics, but did not record, this advice or record that a leaflet was issued. 10-

13% of optometrists visited in this scenario either advised the SP to go directly to the hospital eye service or via their GP but did not record this advice.

Table 8.4: The percentage of optometrists visited by the SPs who under-recorded or over-recorded specific tests.

	Scenario 1		Scenario 2		Scenario 3	
	% under-recording	% over-recording	% under-recording	% over-recording	% under-recording	% over-recording
Motility	3	16	18	6	3	10
Pupil Reactions	5	19	24	3	15	10
Inter-pupillary distance (PD)	11	8	21	3	15	5
Objective Assessment	46	0	62	0	65	0
a) Retinoscopy	38	5	47	0	23	0
b) Autorefractor	0	0	26	0	50	3
Subjective testing of cylindrical element	8	0	18	24	48	5
Binocular Balancing	35	3	N/A	N/A	N/A	N/A
Accommodation	22	0	N/A	N/A	N/A	N/A
Establish a prescription for Intermediate Vision	N/A	N/A	N/A	N/A	0	60
Assess Near Visual Acuity (NVA)	16	19	9	0	0	13
Cover test (at distance or near)	3	0	0	0	13	3
Fixation Disparity (Distance)	16	5	18	0	10	0
Fixation Disparity (Near)	3	5	6	0	0	8
Anterior Eye Examination	27	16	24	6	18	3
Shafer's sign	N/A	N/A	N/A	N/A	3	8
Fundoscopy	0	3	0	0	0	0
a) Direct Ophthalmoscopy	0	27	9	15	3	10
b) Slit lamp BIO	22	0	12	3	15	3
Visual Fields	8	0	0	3	10	8
Tonometry	N/A	N/A	3	0	3	0
a) Non-contact tonometry	N/A	N/A	3	6	3	6
b) Contact tonometry	N/A	N/A	6	0	6	0
c) Before Dilation	N/A	N/A	N/A	N/A	4	8
d) After Dilation	N/A	N/A	N/A	N/A	8	0

On the other hand optometrists sometimes record advice that has not been verbally given to the patient. For example, 5-15% of practitioners visited by the three SPs recorded patient management details and advice issued to the patient that was not reported by the SPs. Advising the SPs of whether an update in spectacles was required and recommending a re-examination interval were two items commonly found to be over-recorded in all three scenarios.

8.4 Discussion

An accurate record of the eye examination is important both for ongoing patient care and to defend the practitioner in the event of litigation. Guidance on what patient record cards may include is published in the College of Optometrists' *Code of Ethics and Guidance for professional conduct*. The College considers that the optometrist has a duty to keep complete and legible records of patients under his/her care (College of Optometrists, 2008b). In addition the General Optical Council states that optometrists must 'maintain adequate patients' records' (General Optical Council, 2008a). The College of Optometrists advice on record keeping includes the following key points:

- The patient record should provide an ongoing picture of the patient's need for vision care (both sight and health) as identified during visits to the practice, of how those needs are met, and all subsequent services provided
- The patient record should provide details of any sign of injury, disease or abnormality, which the eye examination may have revealed
- Whatever the design of the record card, what matters is to record the relevant information in an accurate and detailed manner.

In view of the guidelines discussed above, good clinical records should summarise discussions between the patient and the practitioner, summarise test results, and summarise conclusions (Warburton, 2004). Accurate records help the optometrist make a decision at the time of the consultation based on the patient's presenting symptoms and provide a contrast with any symptoms the patient may develop at a later date (College of Optometrists, 2003). As an example, an optometrist may have noticed early lenticular changes during an eye examination although the patient may be asymptomatic at the time. The patient returns at a later date with symptoms attributable to the cataract. If the lenticular changes had been clearly recorded, it would be easier to explain the cause of the symptoms to the patient (College of Optometrists, 2003).

8.4.1 Reliability of standardised patients and record abstraction

It has been assumed in this part of the study that SPs are the gold standard against which clinical records should be compared. The safety of this assumption will now be evaluated. As discussed in chapter 1 (section 1.5.1), previous research has described

unannounced SPs (and completed standardised patient checklists) as the gold standard for quality measurement in clinical practice (Dresselhaus *et al.*, 2000; Dresselhaus *et al.*, 2002; Luck *et al.*, 2000; Luck & Peabody, 2002; Peabody *et al.*, 2000; Peabody *et al.*, 2004a). Luck and Peabody demonstrated the validity of SPs to measure the quality of physicians' practice, as the gold standard, by covertly tape recording the SP visit (Luck & Peabody, 2002). At the end of the visit, the SPs reported on the physician's performance by completing a checklist to "score" the consultation in the usual way, but the tape recordings were also independently "scored" by experts. The level of agreement was very high (sensitivity 95%, specificity 85%) and the authors concluded that SP assessment is a valid measure of the quality of care (Luck & Peabody, 2002).

One of the main drawbacks of using the same SP for several clinical encounters is the need for them to continue to portray themselves as a "non-expert" patient. Having undergone several examinations, SPs may begin to volunteer information during the course of the examination thereby prompting the practitioner (Adamo, 2003). It is therefore usual practice and important in SP research to train and monitor the SPs' performance for quality assurance (Adamo, 2003; Peabody *et al.*, 2004a). This is usually achieved either by video-taping or by directly monitoring a clinical encounter (Luck *et al.*, 2000). In order to ensure the checklists were completed accurately in this study and that SPs were consistent in their responses, further measures were taken, in addition to those used in previous SP studies, by listening to the audio recording obtained from the visits and performing video-recorded eye examinations after every 20-25 visits.

Luck and colleagues showed that medical records were neither a sensitive nor a specific report of the clinical encounter (Luck *et al.*, 2000). Moreover, since the differences in scores they measured between record abstraction and standardised patient checklists ranged from an under-recording of 10% to an over-recording of 23% for different aspects of the consultation, it is not possible to apply a "correction factor" to convert scores based on record abstraction to an equivalent for SP data. The points summarised in this section therefore highlight that there is a large body of research supporting the choice of SPs as the gold standard with which clinical records should be compared.

The study was designed to assess clinical records using optometrists' normal recording procedures and, therefore, a standardised record card was not used by the consenting practitioners. The essence of the SP approach is that it recreates as far as is possible the normal environment for each practitioner's clinical activities. Using a standardised record card would introduce an element of artificiality, and SP research is based on reducing artificiality to a minimum. Furthermore, any study that imposed a standardised record card on the participating optometrists would run the risk of introducing bias, as practitioners may modify their routine and style of record keeping to suit the record card. In this study, our participating optometrists inevitably used a range of record card types and a range of styles of record keeping. The record abstraction was performed by the researcher (RS) who frequently works as a locum optometrist in a wide variety of practices. As a result, she is familiar with different types and methods of record keeping. Most importantly, her interpretation of the records is likely to reflect the interpretation by a typical locum optometrist who may examine the patient at the practice on the patient's subsequent visit.

8.4.2 The clinical significance of over- and under-recording

From a literal perspective, it could be argued that clinical records should accurately reflect what actually happened in the consultation and any over- or under-recording is unacceptable. However, a fairer view might be that records can only be a summary of the clinical event, and in a busy clinical setting it is almost inevitable that some over- or under-recording will on occasion occur. Some instances of over-recording may, arguably, seem to reflect reasonable assumptions. For example, recording near acuities as N5 although they were not actually measured, since distance acuities were 6/5 and an appropriate addition was given in the absence of media opacities. Although recording a test result when the test was not carried out can only be described as an error, this circumstance could be described as a minor error. It is important to note that the distinctions between minor and major errors discussed here are arbitrary and reflect the views of the researcher.

This research has also identified more serious errors. For example in case of the SP in scenario 3, 8% (3 optometrists) of optometrists whose records were obtained, recorded checking for pigment cells in the anterior vitreous (Shafer's sign) although this had not been reported by the SP and 3% (1 optometrist) checked for Shafer's sign but did not record his/her findings. Practitioners can detect pigment granules in the anterior

vitreous by one of two methods: (1) by asking the patient to rapidly look to each side and/or up and down and then look straight ahead steadily during biomicroscopy or (2) by asking the patient to look straight ahead whilst the practitioner focuses on the posterior lens capsule/anterior vitreous phase (usually through a dilated pupil) using a biomicroscope. It would have been difficult for the SP to reliably detect if the second of the two methods described here was used. Optometrists in the UK are taught that the optimum method for detecting pigment granules is by method (1) and this method (Harle, 2003) is by far the most widely used in UK hence the figure stated below is for optometrists who asked the patient to make rapid eye movements to detect the presence/absence of tobacco dust. It is possible that at least some of the over-recording noted (8% of cases) represented cases in which the optometrists used the second of the two methods described above. The SP in this scenario presented for an eye examination with recent onset symptoms of flashing lights. The detection of retinal pigment granules ('tobacco dust') in the vitreous is a reliable indicator of the presence of a retinal break (Brod *et al.*, 1991; Lightman & Brod, 1994). It is therefore not only worrying that 87% of optometrists visited in this scenario did not examine the anterior vitreous for the presence of pigment cells (Brod *et al.*, 1991) but of concern that optometrists are checking for this important sign and not recording the results of the test and vice versa.

A second example of a potentially serious error is recording the results of a fundus examination despite it not being performed. One practitioner visited by the actor in the first patient scenario did not examine the ocular fundus by any method although they had identified the headaches as the key symptom (chapter 4, section 4.3.1). This optometrist recorded their findings as if ophthalmoscopy had been carried out. The practitioner's guess of the C/D ratio as 0.2 was markedly different from the actual C/D ratio of 0.5 in each eye. In the normal order of events, the patient would have returned for their next examination two years or so later and the error may have caused alarm and possibly an unnecessary referral.

Optometrists often over-recorded motility (SP1 = 16%, SP2 = 6%, SP3 = 10%) and pupil reactions (SP1 = 19%, SP2 = 3%, SP3 = 10%) in a similar pattern for each test, although for both tests there were marked differences between the results for each scenario (*Table 8.4*). It has been recommended that optometrists carry out motility on all new patients, on children during every eye examination, and on adults presenting with new symptoms, and periodically over the years as adults are monitored (Evans,

2005). In view of the importance of this test and the fact that all three SPs were new patients to the practices visited, it is notable that motility was performed by only 38% of optometrists visited by SP1, 50% visited by SP2 and 35% visited by SP3, with interesting patterns of under-recording (SP1 = 3%, SP2 = 18%, SP3 = 3%) and over-recording (SP1 = 16%, SP2 = 6% and SP3 = 10%).

Clinical assessment of the pupil responses to light is a neurological test that elicits important information about the health of the iris, retina, visual pathway, sympathetic and parasympathetic pathways (Doshi & Harvey, 2005). Again, in view of the clinical significance of this test, it is notable that pupil reactions were only assessed by 73% of optometrists visited by the first SP, 91% visited by the second SP and 73% visited by the third SP, with interesting patterns of under-recording (SP1 = 5%, SP2 = 24%, SP3 = 15%) and over-recording (SP1 = 19%, SP2 = 3% and SP3 = 10%). In scenario 2, pupil reaction testing had a very low NPV (20%), indicating that when pupil reactions were not described in the clinical records then it was still very likely that they had in fact been tested.

As seen from *Table 8.4*, 60% of optometrists visited by the SP in the third scenario recorded prescribing a correction for intermediate vision different to that established for near/reading although testing at this distance had not been reported by the SP. It could be argued that these optometrists estimated the intermediate addition based on their knowledge of the SP's intermediate working distance and the near addition established for a different working distance (near visual acuity, N5). It is questionable whether this is a valid approach, particularly in this scenario where the SP presented as a music teacher (Chapter 6, *Table 6.1*), using different strengths of ready readers depending on the distance at which he was working.

Objective assessment of the refractive error (autorefractor and retinoscopy) was commonly found to be under-recorded for all three SPs. The importance of recording these data is debatable as these results are not essential for providing a final prescription. However, results of objective assessment, particularly retinoscopy, could be invaluable to the optometrist for reference in the future care of the patient. For example, retinoscopy might reveal that a patient (new to the practice) had significant hyperopia either because the patient was amblyopic or had latent hyperopia. The optometrist may not prescribe the full hyperopic prescription following subjective testing. If the patient returns to the same practice for an eye examination and is

examined by a different optometrist, it would be useful for the optometrist to have the previous retinoscopy findings.

Thirty-five percent of optometrists whose records were obtained following visits from the first SP, did not record performing binocular balancing at the end of the monocular subjective refraction although this had been reported by the SP. The aim of binocular balancing is to balance the accommodative effort in the two eyes, by uncovering any extra hyperopia which is manifest when the patient is binocular (Harvey & Franklin, 2005). In cases where a full monocular subjective refraction has been performed with binocular balancing incorporated as part of the routine, it is debatable whether it is necessary to record the findings of binocular balancing separately. Furthermore, 14% of optometrists visited by this SP performed a binocular refraction and in these cases binocular balancing of the accommodation is not a discrete process and therefore would not be recorded (Elliott, 2003a). Binocular balancing and the +1.00D blur test can be considered part of the subjective refraction routine, at the end of which the final subjective prescription is recorded. 22% of optometrists visited by this SP also under-recorded their findings of the SP's accommodation. Although the importance of recording accommodative findings in an asymptomatic patient is debatable, records of previous findings could be helpful in the future care of the patient.

The results of fixation disparity tests were also commonly under-recorded for all three SPs. Although minimal under-recording was found for the cover test, it is important to record the results if fixation disparity was checked. This is particularly important in the first scenario since decompensated heterophoria can be associated with migraine (Harle & Evans, 2006c). The PPV for fixation disparity testing in scenario 1 was 71% for distance and 60% for near, indicating that results were often recorded (typically, as normal) even when the test had not been carried out.

Optometrists who sent copies of their clinical records upon completion of the SP visits, commonly under-recorded (SP1 = 27%, SP2 = 26%, SP3 = 29%) having carried out an anterior eye examination with the biomicroscope. However, there was also an apparent over-recording (SP1 = 16%, SP2 = 12%, SP3 = 3%) by practitioners of their findings of anterior eye examination using a slit lamp biomicroscope. It is likely that at least part of this apparent over-recording resulted from optometrists who used a direct ophthalmoscope to examine the anterior eye, a method which would not have been detected by the SP.

The Optician's Act 1989 requires a doctor or optometrist to perform an examination of the external surface of the eye and its immediate vicinity for the purpose of detecting signs of injury, disease or abnormality in the eye or elsewhere (General Optical Council, 2008b). The Act does not state that a biomicroscope has to be used, although these are readily available in most practices today. Alternatives to a biomicroscope, which would be particularly relevant in a domiciliary setting, are a direct ophthalmoscope or a simple hand-held loupe with a pen torch or hand-held slit beam torch (Harvey & Franklin, 2005). It is notable that 65-84% of practitioners whose record cards were obtained did not record the examination of the anterior eye by any means.

The results in *Table 8.4* relating to fundoscopy show that optometrists do not always record the instrument used to examine the fundus. Optometrists who examined the fundus using binocular indirect ophthalmoscopy (BIO) with a slit lamp biomicroscope frequently failed to record (SP1=22%, SP2=12%, SP3=15%) that this was the method used nor did they record the type of lens used. The method of fundus examination is important, as this dictates the view of the fundus obtained. For example, the SP in the third scenario presented with recent onset photopsia.

A binocular indirect viewing technique such as slit lamp BIO provides a wider field of view (e.g., a static field of view of approximately 20-30˚ using slit lamp BIO compared to 10˚ using a direct ophthalmoscope although recent advances have led to the development of a wide field direct ophthalmoscope with a 25˚ static field of view) allowing easier localisation of lesions and providing greater magnification depending on the magnification of the lens used (Doshi & Harvey, 2005). Hence peripheral retinal examination in this patient using a direct ophthalmoscope and slit lamp BIO may result in different findings depending on the instrument used and whether the fundus was examined in 'one view' or 'with peripheral gaze'. If the optometrist used a "Super Vitreo Fundus" lens, this would give a better view of the periphery than if for example a 78D lens was used. Not recording the technique used, particularly in the case of this patient, does not in itself mean the optometrist is not taking reasonable care, but a detailed record facilitates future patient care and makes it easier to defend any clinico-legal allegations.

Optometrists visited by the SP in the first (8%) and third (10%) patient scenarios under-recorded performing a visual field assessment on the SPs although this information was reported in the case-specific checklists. It could be argued that the findings were

not recorded because the visual fields were full. However, a record of a normal finding could be important if a defect was found at subsequent appointments. Although none of the optometrists visited by the first SP over-recorded performing this test; 3% of optometrists visited by the second SP and 8% visited by the third SP over-recorded the visual field test findings. All these optometrists recorded that the visual fields were normal. In these cases, if the same patients were to present for an eye examination at a later date during which a loss in their visual field is noted, the optometrist could unknowingly mismanage the case.

Table 8.4 illustrates that optometrists also under-recorded tonometry findings (intraocular pressure; IOP), albeit to a lesser degree than the proportion who under-recorded visual fields. It is useful to have a baseline measurement of IOP on all patients to aid interpretation of future readings (Doshi & Harvey, 2005). Hence in the case of the two optometrists (3%) who assessed the patients' IOPs but did not record their findings, future reference to these results would not be possible. IOP should be quantified as it is a risk factor for glaucoma (College of Optometrists, 2003).

A record of the instrumentation used, individual readings taken and the time at which the readings were taken may be valuable in the future care of the patient. For example, if a non-contact tonometer was used; good practice dictates that more than one reading should have been taken (College of Optometrists, 2003). Noting down the individual readings would give the optometrist extra information when building the overall picture of the consultation. If only a single reading was noted, with no record of the instrument used, it would be difficult to distinguish whether this was indicative of an average of 3 or 4 readings or whether a contact tonometer was used, in which case only a single reading would normally be taken.

As highlighted in the results section, most practitioners ask more questions relating to the patients' history and symptoms than they record and similarly give more management advice than they record. These findings are understandable in a busy clinical setting, but are nonetheless undesirable (Warburton, 2004). The proportions of false positives were found to be higher for the first and third patient scenarios compared to the second scenario. It could be argued that these findings reflect the fact that the second scenario was the least symptomatic of the three and a number of optometrists visited by the patient in the second scenario seemed to be unaware of the link between race and glaucoma (section 5.1.1). It was speculated that optometrists

visited by the SPs in the first and third scenarios were more likely to associate a risk of clinico-legal action due to the nature of the patients' presenting symptoms which may have increased the tendency to 'over-record' in these cases.

As discussed in the Introduction, practitioners working in busy clinical settings are more likely to under-record tests performed, history obtained and management advice offered due to time constraints (Luck *et al.*, 2000; Dresselhaus *et al.*, 2000). Although information relating to the practice ambience (busy/quiet) was not gathered in the present research it would be useful when performing future research, for the SP to record this information on the checklist completed at the end of the visit. It would also be useful to have a record of whether the optometrist was running behind in their clinic. The data gathered would allow for comparisons on under- and over- reporting in a busy versus quiet practice setting. A record of the optometrist's year of qualification would be beneficial for future comparative analysis on whether differences in the period of qualification have a bearing on the proportion of under- and over- reporting on clinical records cards.

8.4.3 Limitations

Only about one third of practitioners who were visited by SPs returned their clinical records for the record abstraction study. This was only appropriate for practitioners who had consented to the 'feedback' option, approximately sixty practitioners for each SP; and practitioners who had not stated a preference (full anonymity or feedback), approximately thirteen for each scenario. So, of the 219 requests that were sent for clinical records to be returned, a participation rate of 51% was achieved. Practitioners who were concerned about their clinical thoroughness or record keeping may have been more likely to decline the invitation to participate in the research, to opt for the 'full anonymity' option, or to decline to send in their clinical records. Therefore, the findings of this study are likely to over-estimate the standards of record-keeping in the UK optometric profession.

An additional limitation of this study is that some practitioners (23) contributed clinical records for all three scenarios, some to two (15) and some to just one scenario (12). Therefore, the total sample of 111 responses is not an independent sample; for example an optometrist over-recording a test in the first scenario could also be over-recording the same test in the second and/or the third scenario. For this reason, the

use of overall estimates has been avoided, in general, for false positives or false negatives based on averaged data across all three scenarios. But the data obtained in this study from the three scenarios can be used to provide the likely range of responses. Similarly, the use of average figures for PPV, NPV and over- and under-recording has been avoided.

As described in the methods section, the SP for the first patient scenario was the researcher (RS), who is an optometrist with previous acting experience. Whilst all SPs received extensive training to ensure that they could remember and accurately record details of the clinical encounter and to ensure that their acting skills were adequate to avoid detection by participating practitioners, a potential limitation arises in using an optometrist as an SP. The researcher (RS) in this case could be classed as an 'expert' and therefore may assess the practitioners' behaviour and/or approach to the examination differently when compared to the 'non-expert' SPs. It is important to note that previous studies using standardised patients used 'non-expert' SPs (Dresselhaus *et al.*, 2000; Luck *et al.*, 2000; Dresselhaus *et al.*, 2002; Glassman *et al.*, 2000).

As discussed in section 8.2, the actors used for the second and third patient scenarios were trained to recognise all the techniques used within an optometric eye examination. Specific to the third scenario, the actor was trained in recognising various techniques that are carried out with the slit-lamp biomicroscope. The actor, who was a science graduate before pursuing an acting career, was easily able to identify binocular indirect ophthalmoscopy. During the training sessions, it was established that the actor was also able to reliably detect when the optometrist was testing for Shafer's sign. This was recognisable when, during biomicroscopy, the patient was asked to rapidly look to each side and/or up and down and then look straight ahead steadily.

Whilst every effort was made to ensure that the actors were able to identify accurately the various techniques used, it is important to note that they were unable to assess the precision with which the technique was performed (i.e. the quality of the results obtained). For example, if an optometrist performed slit lamp biomicroscopy using a 90D lens, although the actor could recognise the technique they would not be able to comment on the quality of the view of the fundus obtained.

Computerisation is changing optometric practice, as in many other areas of life. Most practices now have computerised patient recall systems, but it is still relatively rare for

practices to have computerised clinical records. Indeed, less than 10% of the clinical records that were obtained for this study were print-outs from computerised systems. This proportion is likely to increase over the next few years and it is not entirely clear what impact this will have on clinical record keeping. Computerised optometric clinical records can result in both more false positives and more false negatives. False positives are increased because it is very easy (one key stroke) to enter the standard, default, entry for a test result as the practitioner rapidly 'tabs' through the various fields in the record. Conversely, because different groups of tests are recorded on different 'pages' within the system it is easier for the practitioner to forget to complete a complete group of tests than with paper records, where all the test results are typically completed on one page so that omissions can be readily detected at a glance.

8.5 Chapter summary

The findings of the present study suggest that optometric clinical records are an imperfect representation of the content of an optometric eye examination. Given time constraints and sometimes the complexity of presenting symptoms, one could argue that optometrists are unable to record every detail of the clinical consultation. Based on the findings of the gold standard eye examinations from SPs, the findings of this study show clinical records include both under- and over-estimations of the clinical consultation. To take extreme examples, in a young adult a near fixation disparity test had only been carried out in 60% of the cases where a test result was reported. In an older patient at risk of glaucoma, in 80% of the cases where pupil reactions were not recorded the practitioner had actually tested these.

Future optometric continuous education and training on record keeping could usefully focus on the importance of recording key tests performed during the eye examination. For example, the importance of recording pupil reactions and visual field examination findings in a patient presenting with headaches (scenario 1) and Shafer's (positive/negative) in a patient presenting with recent onset flashing lights (scenario 3).

An inaccuracy in the recording of clinical findings raises barriers to the provision of appropriate continued clinical care. It also has implications for clinico-legal cases. If the clinical findings are not recorded, subsequent legal analysis may conclude that they were not performed (Elliott, 2003a). Clinical investigations are quite often performed without being reported in records. Less commonly, clinical investigations are recorded,

but not performed. What is undoubtedly true is that practitioners will find it much harder to convince a court or disciplinary hearing that they carried out a clinical investigation if this is not documented in their clinical records. Accurate record-keeping serves the interests of the practitioner as well as those of the patient.

The findings of the standardised patient visits have been discussed individually in chapters representing the three standardised patient profiles. The record abstraction findings for clinical record cards obtained for all three standardised patient visits were discussed in this chapter. The next chapter highlights key aspects of the standardised patient research and discusses the limitations of the standardised patient study.

9 General Discussion of Study 2

9.1 General Discussion

As discussed in Chapter 1 (section 1.1), there have been previous attempts to gain an insight into the clinical activities of optometrists through questionnaires (O'Leary & Evans, 2003) most notably those administered by the College of Optometrists (Stevenson, 1998; College of Optometrists, 2008b). These are useful, although there is likely to be a sampling bias since conscientious practitioners are more likely to respond. Additionally, there is a further source of bias with human nature likely to result in replies which indicate higher standards of practise than may actually pertain.

A literature review (chapter 1, section 1.1.1) highlighted a lack of systematic research that aimed to investigate the upper level (i.e., actual performance in habitual practice) of Miller's pyramid (*Figure 1.1*) within optometry. A literature review (chapter 1, section 1.5.1) revealed that standardised patients are not the only method of assessing clinical care although unannounced SPs (and completed standardised patient checklists) are regarded as the gold standard for quality measurement in clinical practice (Dresselhaus *et al.*, 2000; Dresselhaus *et al.*, 2002; Luck *et al.*, 2000; Luck & Peabody, 2002; Peabody *et al.*, 2000; Peabody *et al.*, 2004a). The literature review (chapter 1) also revealed other methods used in assessing clinical care such as record abstraction and vignettes.

As part of the second study, standardised patients were used to investigate the content of optometric eye examinations for three different standardised patients. The standardised patient approach provided a method of assessing optometrists' ability to elicit important information relating to the patient's reason for visit; perform relevant tests in response to the patient's symptoms and offer appropriate management advice. The results highlight optometrists' strengths and weaknesses in history-taking, performing relevant tests in response to the patient's presenting symptoms and offering appropriate management advice.

It is noteworthy that although the present study used patients presenting for private eye examinations, approximately two thirds of eye examinations provided in the UK are funded by the NHS (Federation of Ophthalmic & Dispensing Opticians, 2008). To some extent the NHS fee sets the standard for most primary eyecare in the UK since the

same appointment times are usually allowed for private and NHS consultations. The current NHS fee is just under £20 and, since the typical overheads of a community optometric practice are £100-£120 per optometrist hour (Association of Optometrists, 2007), this means that the usual fees received for an NHS or private appointment actually fund about 10-15 minutes of an optometrist's time. Allowing for appointments that are not kept, this means that the average duration of an eye examination is about twice as long as the interval that would be economically justified from the level of funding.

As noted by an anonymous reviewer of the manuscript Shah et al. 2008 (supporting published work): 'The system is clearly flawed as it puts pressure on the loss leading eye exam to be as quick as possible so as not to lose too much income and also puts pressure on optometrists to prescribe spectacles or a change in spectacles'. This reviewer went on to note that the new system in Scotland represents a considerable improvement as regards funding and potentially as regards the standards of clinical care, with an appropriate level of payment now in place for the eye examination, another fee for supplementary tests, a restriction on the number of examinations in one day (thus leading to longer eye examinations) and a more thorough eye examination required. One report has already highlighted the improved quality of eye examinations in Scotland since this change in funding (Ang *et al.*, 2007). The points noted here highlight the need for a funding method that encourages enhanced quality rather than quantity of eye examinations.

A survey carried out by Which? magazine found 36% of eye examinations took less than 20 minutes (Which?, 2007), similar to the sample used in this research where 39% took less than 20 minutes. However, there are some important differences between the Which? survey and this research study. The actors used in this research study were carefully trained and monitored for quality control, which may not have been the case in the Which? survey. Also, the Which? survey included 8 examinations from Scotland, all of which took 20 minutes or more [the NHS funds primary eyecare more fully and for all people in Scotland, and limits the number of eye examinations carried out in a day (Optometry Scotland, 2008)]. Excluding the eight visits carried out in Scotland from the total of 39 visits carried out during the survey raises the percentage of practitioners that took less than 20 minutes from 36% to 45%. The Which? report did not state whether the eye examination times included delegated vision screening tests.

Standardised patients are better suited to assessing the content of eye examinations periodically rather than routinely. The use of standardised patients routinely could prove expensive due to the costs involved in training the actors, monitoring the actors for quality control, travelling to and from the practices and the cost of the eye examination. As described in chapter 1 (section 1.3.1), another method that is commonly used to measure clinical care is record abstraction. However, the requirement of skilled expertise means record abstraction can also be expensive to perform. As noted in previous research (Dresselhaus *et al.*, 2000; Luck *et al.*, 2000) and from the findings of this study (described in chapter 8), clinical record cards are subject to false negatives (i.e., tests carried out but not documented in the record card) and, to a lesser extent, false positives (i.e., tests not performed but documented in the record card).

The benefits of clinical governance are not limited to improving the quality of patient care but can also include improvements in efficiency and procedures. Although the driving force for clinical governance has been the NHS (and it is expected that participation in Clinical Governance will be a requirement of practice in the NHS), it applies equally to private patients and should be seen as an opportunity to improve the service optometrists can offer to all patients (College of Optometrists, 2002). Optometrists can meet the challenge of clinical governance by adopting the following:

- ***Conformance with clinical guidelines and advice contained in the College Guidance for Professional Conduct***
- ***Clinical Audit***
- ***Risk Management***
- ***Peer Review***
- ***Quality Assurance and Accreditation***
- ***Continuing Professional Development (CPD)***
    - ***Personal Development Plans (PDP)***
    - ***Continuing Education and Training (CET)***
    - ***Higher Qualifications***
- ***Audit of systems to ensure that they are functioning effectively***

Optometrists should have reasons for the decisions they make (e.g., what tests they perform on patients. These reasons should be accurately recorded on the patient's record card in order to be able to justify the decisions made. Performing a clinical audit on documentation and clinical record cards to ensure they are a legible, comprehensive record of the patient consultation, and that they conform to clinical

guidelines and advice contained in the College Guidance for Professional Conduct on record keeping, would be beneficial to the ongoing care of the patient.

Based on the findings of the gold standard eye examinations from SPs, the record abstraction findings show clinical records include both under- and over-estimations of the clinical consultation. Abstraction of clinical information from optometric record cards obtained following the SP visits revealed that optometric clinical records are not a perfect representation of the content of an optometric eye examination.

9.2 Limitations of standardised patient research

Optometrists who volunteered to participate in a study of this nature may be more confident of their skills and may have performed better than those who declined participation (Ramsey *et al.*, 1998). Hence, the results of this study may overestimate performance although the full anonymity option will have helped to allay possible concerns about the research highlighting poor practitioner performance.

During the study design, it was noted that a potential limitation would be the possibility of optometrists detecting the SP during their visit. In the initial information that was sent out to participating optometrists, practitioners were asked to inform the researchers if they detected any of the SPs during their visits. As discussed in chapter 8 (section 8.2.1), upon completion of all the standardised patient visits, a letter was written to practitioners who had opted for the partial anonymity option to advise them all three actors had completed their visits and requested copies of the clinical records for the SP consultations. At this stage, optometrists were once again asked to advise the research team if they had detected any of the SPs during their visits. None of the optometrists visited by the SPs reported identifying any of the three SPs, and nothing that took place during any of the eye examinations led the SP to suspect that they had been detected.

With any research of this type, it is possible that differences in the communication styles of both the SP and the practitioner might have influenced results. However, as regards the SP, variations in communication style were unlikely because of the considerable steps that were taken to select, train, and validate (with quality control checks) the SPs. From the point of view of a professional actor, to portray a patient having an eye examination is an undemanding role. This is especially true when each SP has had several eye examinations in the past as a ‘real’ patient, as was the case in

this research. From the point of view of the practitioner, they were unaware that the patients were the SPs so would have used the communication style that they usually adopt with patients. Another potential source of error was that the actor could have misinterpreted a test carried out by the practitioner. The experience gained whilst training the actors led the researcher to have great confidence in their ability to detect and record optometric tests and instruments, and this confidence was supported by the quality control checks.

Another limitation is that the present research only involved optometrists working within 1.5 hours travel from central London. Optometrists working in the City of London were excluded, since these practices are likely to have an atypical patient demographic (e.g., relatively few children and older people). It is also possible that there are geographic variations in the content of optometric eyecare in England that the present research study could not reveal. No data obtained in this study supported this possibility.

It should be noted that improved funding arrangements and expanded scope of practice for NHS primary eyecare in Scotland and Wales (Association of Optometrists, 2008d) mean that the data obtained in this study are unlikely to reflect the situation in these regions, and there is evidence already that indicates that standards have been raised (Ang *et al.*, 2007).

9.3 Chapter summary

Whilst standardised patients have proved successful in assessing the content of optometric eye examinations and measuring the quality of clinical care within optometry, they can also be expensive if used routinely. Record abstraction revealed optometric clinical records are not a perfect representation of the content of an optometric eye examination due to under- and over-recording by optometrists. The use of a skilled expert to abstract clinical information from optometric record cards means record abstraction could also prove to be expensive. As described in chapter 1 (section 1.3.2), the literature reviewed revealed clinical vignettes are a cost-effective way of assessing levels of clinical care and can be easily administered and therefore used in a great variety of settings.

The next chapter describes the use of computerised clinical vignettes in assessing clinical care provided within optometry.

10 Study 3: Clinical Vignettes in Assessing Clinical Care within Optometry

10.1 Introduction

A literature review (chapter 1) revealed that clinical practice is commonly assessed by three methods: (1) abstraction of clinical records, (2) using clinical vignettes and (3) use of standardised patients who present unannounced to clinics. As already described in this thesis, the content of typical community optometric eyecare in England was investigated using standardised patients (chapters 3-7), and record abstraction of clinical records (chapter 8) following the standardised patient visits.

As described in chapter 1 (section 1.3.2), vignettes are written or computerised case simulations that have been widely used by educators and health service researchers to measure processes in a range of practice settings (Glassman *et al.*, 1997; O'Neill *et al.*, 1995; Sriram *et al.*, 1990). Clinical vignettes are not only designed to simulate a range of medical conditions but also to evaluate skills required in the care of the patient. Each practitioner could be asked to complete several vignettes to simulate diverse clinical conditions (Peabody *et al.*, 2004a). Vignettes are a cost-effective way of assessing levels of clinical care and can be easily administered and therefore used in a great variety of settings. For example, they are well suited to large scale (Epstein *et al.*, 2001; Morita *et al.*, 2002) quality assessments or for cross-system comparisons (Nordyke, 2002; O'Connor *et al.*, 1996) or if ethical issues preclude the use of patients or their records (Aitken *et al.*, 1998; Gould, 1996; Rosen *et al.*, 1995). A detailed description of vignettes and their use in assessing clinical care is discussed in chapter 1 (section 1.3.2).

Although standardised patients are widely recognised as the gold standard method of assessing clinical care, clinical vignettes have been shown to provide valuable information (Peabody *et al.*, 2000; Luck *et al.*, 2000) particularly when using computerised vignettes (Peabody *et al.*, 2004a; Dresselhaus *et al.*, 2004). The practitioner completing the vignette “sees the patient” on a computer. Most previous studies that have used vignettes for assessing clinical care have used written vignettes. Peabody et al. (2004) however used computerised vignettes. Computerised vignettes allow for real time responses that more closely simulate practitioner-patient interaction

(Peabody *et al.*, 2004a). Computerisation also reduces the time and money required to score either handwritten responses to vignettes or during record abstraction (Peabody *et al.*, 2004a).

This part of the thesis has three main aims:

- Provide data on the content of virtual eye examinations for three different patient scenarios.
- Evaluate how appropriately the virtual eye examinations were 'carried out' for the patients as they presented.
- Assess whether clinical vignettes are a valid measure of clinical care within optometry.

10.2 Methods

10.2.1 Development of vignettes

Three computerised vignettes were developed based on the three standardised patient profiles. The checklists appropriate to each case scenario in the SP study were used as a template to design the computerised clinical vignettes. Prior to launching the clinical vignettes, a prototype of the first vignette was piloted extensively on optometrists at the Institute of Optometry. Any final modifications were made prior to launching the study at Optrafair 2007 (this is a biannual optical trade exhibition held at the National Exhibition Centre in Birmingham). Leaflets were handed out to optometrists visiting the Institute of Optometry stand at the exhibition. The leaflets highlighted that all participating optometrists would be awarded two continuous education and training (CET) points for each computerised vignette completed. The study was publicised in the College of Optometrists' monthly newsletter, the Association of Optometrists' monthly newsletter (*Blink*) and the UK optometry e-mail discussion list.

The vignettes were accessed via a website (www.ioo-vignettes.org). Each vignette was accessible for two months. The web-based simulations and the on-screen instructions were designed to encourage participating optometrists to adopt the same thought processes as they would in everyday practice.

The first page of the website required the practitioner to complete preliminary details: name, e-mail address, year of qualification, postcode of the town/city in which they practice, GOC number and their testing time (time taken for a patient presenting for a routine sight test). Upon completion of this information, practitioners received a confirmation email of their username and password to access the clinical vignettes. The subsequent screen illustrated a summary of the three clinical vignettes. A headshot and brief details (name and age) of the three patients were displayed. The vignette scenario that was "open" for completion at the time was shown at the top of the page. Prior to completing the vignette, the practitioner was also prompted to read through the instructions. Participating optometrists were advised to only select tests and questions they would ask and perform had this patient presented in practice for an eye examination.

The computerised clinical vignettes were in the form of online "virtual record cards". In the UK, community optometric consultations are typically recorded on cards that contain headed 'boxes' for all the commonly performed tests. Some practices routinely use computerised clinical records, but these are typically designed to resemble conventional paper record cards. The most commonly used types of record card used in optometric practice were analysed and used to create a "virtual record card". This was readily recognisable to all practitioners as a typical optometric record card, with the usual headings and abbreviations (*Figure 10.1*).

The record card appeared on-screen, with general instructions at the top (e.g., "Move the cursor over the screen, starting with the *Symptoms and History* section"). For symptoms and history, if the practitioner "clicked on" symptoms, all questions relating to the patient symptoms would appear in alphabetical order. The practitioner was reminded to only "select" questions that they would routinely ask had this patient presented in practice. A similar procedure was followed for history (i.e. general health, medication, previous ocular history and family history) and management. All the usual tests that might be included in a routine eye examination were represented by "boxes" on the on-screen record card. As the cursor was moved over each area of the record card, the test name would be highlighted and the practitioner could select if they would have performed that test. In cases where several options were available for one particular test (e.g., visual fields, stereopsis, colour vision) a list of options appeared in a drop down box. If selected, the results for the virtual patient appeared on the record card (*Figure 10.2*). A timer displayed the time that it would typically have taken to carry

out the procedures that had been selected so far. This was to discourage practitioners from being over-zealous in selecting tests that they might not have completed in a real eye examination.

Practitioners were instructed to select only tests and questions that they would ordinarily carry out for a patient with the presenting symptoms encountered in each computerised vignette. For each question or test that the practitioner selected, the program automatically presented the results on the screen. Participating practitioners completed each vignette by selecting specific management options. An advantage of using the computerised vignette over written vignettes was that it allowed for an interactive element. Practitioners were able to interrogate the software to decide what tests to do and be presented with the appropriate results. As is normally the case in a real-life situation, practitioners were unable to "undo" a test or question: the results remained displayed.

Following the publicity, several optometrists registered on the website but did not complete the vignettes. All optometrists that had registered but not completed the vignettes (or the vignette open at the time) were sent emails regularly advising them of the vignette that was open for completion.

As described in chapter 3 (section 3.3.1), a panel of experts, shown to be a reliable approach for setting standards for clinical competence (Ross *et al.*, 1996) was recruited to provide a detailed peer review analysis of the case scenario and checklists completed by the standardised patients described earlier in this thesis. The feedback received from members of the expert panel for each case scenario was also used and applied in the design of the computerised vignettes. Upon completion of the study (i.e., once data had been collected for all three vignettes), participating optometrists were provided with feedback. The feedback consisted of their results contrasted with the expert panel recommendations. The expert panel recommendations (described in section 4.2.3, 5.2.3 and 6.2.3) were different for each case scenario.

10.2.2 Case scenarios

A detailed description of the case scenarios for each standardised patient is given in chapters relevant to each scenario. As stated in section 10.2.1, the three computerised vignettes were developed based on the three standardised patient profiles. In the first of the three scenarios, the patient presented for an eye examination as a 20 year-old

student complaining of headaches (first ever headache 4 weeks ago, resembling a migraine). This patient was a myope and presented for the examination “to see if her glasses were OK” (Chapter 4, section 4.2.1). The second patient presented as a 44 year-old patient of African racial origin for an eye examination having experienced recent difficulty with her near vision (Chapter 5, section 5.2.1). The third patient presented for a private eye examination as a 59 year-old patient, with recent onset flashing lights (over the last week) in one eye in the dark (Chapter 6, section 6.2.1).

10.3 Results

The clinical vignette for each of the three patient scenarios consisted of between 70-100 items of data. As described in chapter 3 (section 3.3.2), during the early stages of the study, clinical guidelines, literature reviews and suggestions from a panel of experts were used to derive tests and questions (in the form of research questions) that were felt to be appropriate for the three standardised patients. These research questions have been used to focus on key data that is of greatest clinical significance for each vignette. It is once again stressed that this list of tests is not intended to define good practice, but rather to be a list of possibly relevant clinical investigations and of relevant research questions.

Three hundred and eighteen optometrists completed the registration to participate in this study. 233 optometrists completed the vignette for the first scenario, 187 for the second scenario and 167 completed the vignette for the third scenario.

10.3.1 Scenario 1

Concerning the primary research question for this scenario, “Is the eye examination appropriate for the identification of headaches of a suspicious nature and for the appropriate management of these?” the presence of headache was ‘identified’ in 100% of cases simply by ‘asking’ the patient the reason for their visit. The percentages of optometrists who ‘asked’ various questions to identify the nature of the headaches are shown in *Table 10.1*. Twenty-seven percent of the 233 optometrists who completed this vignette ‘asked’ all questions listed in *Table 10.1*.

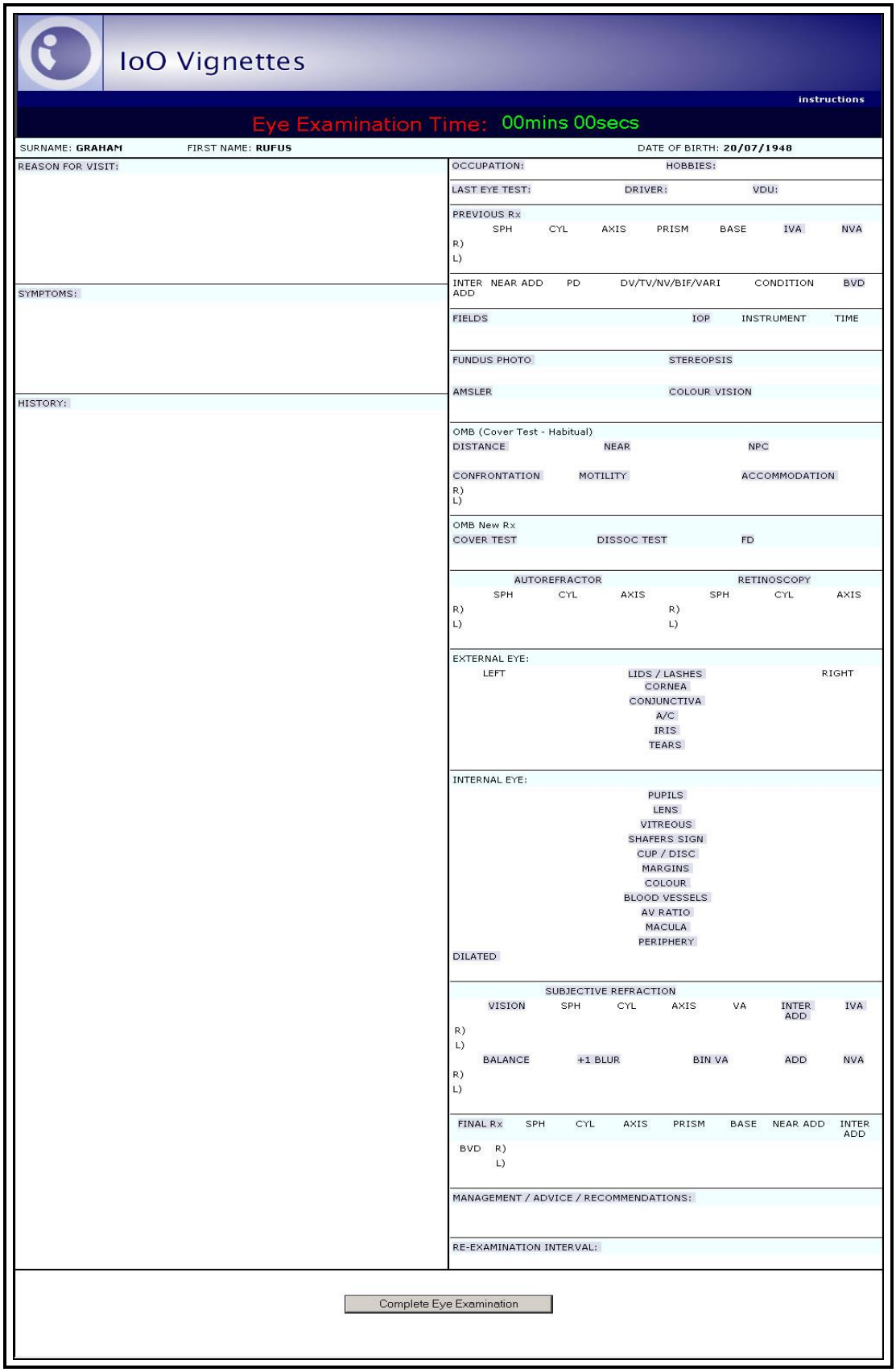


Figure 10.1: An illustration of an uncompleted computerised clinical vignette for one of the patient scenarios.

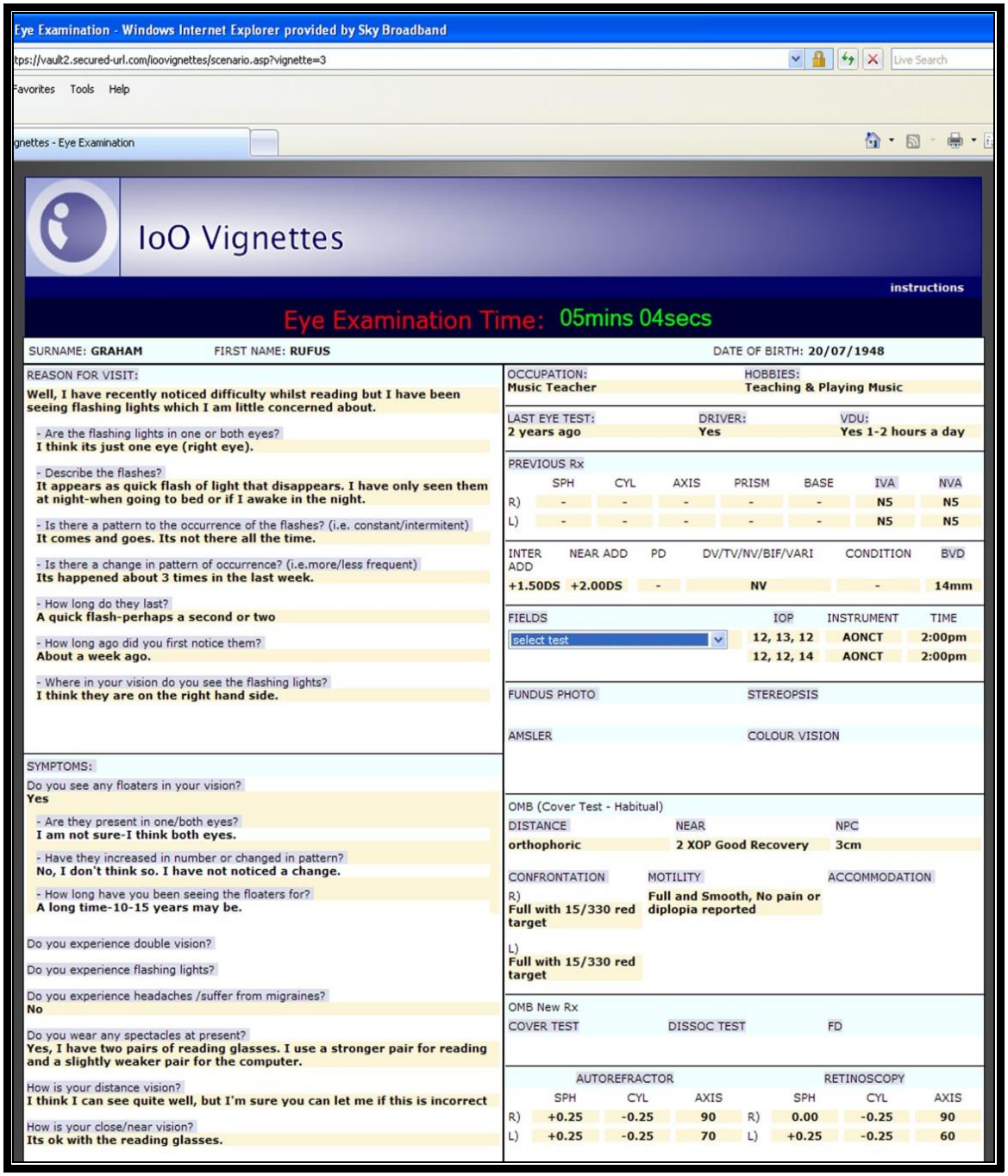


Figure 10.2: An illustration of a part-completed computerised clinical vignette for one of the patient scenarios.

Table 10.1: Questions appropriate to identifying the significant nature of the patient's headaches, giving the percentage of practitioners who 'asked' each question.

Questions appropriate to identifying the significant nature of the headaches	**%**
a) Can you describe how the headaches start and how they progress	74%
b) Duration of symptoms	88%
c) How long do the headaches last	89%
d) Location of headaches	77%
e) How severe are the headaches	67%
f) How often do you get the headaches	93%
g) Is there a change in pattern to the occurrence of the headaches	44%
h) Have you consulted a medical practitioner about the headaches	88%
i) Do you feel nauseous when you get the headaches	74%
j) Do you experience any visual disturbances	85%
k) Do the headaches start at a particular time of the day	89%
l) Are there any visual associations	80%
m) Are there any non-visual associations	80%

A full summary of the contents of the completed vignettes is included in appendix 21. Here, the thesis focuses on tests most relevant to the presenting symptom of headaches. 92% of practitioners 'identified' the patient's symptoms of visual aura. 7% specifically asked whether the patient had encountered any flashing lights and 85% asked if the patient was experiencing visual disturbances either prior to or at the time of the headaches. *Table 10.2* summarises the proportion of optometrists that asked further questions relating the nature of the flashing lights. 28% of optometrists 'asked' all five questions listed in *Table 10.2* to establish the exact nature of the patient's symptoms of flashing lights.

Table 10.2: A table showing the percentage of optometrists visited that asked questions relating to the exact nature of the patient's symptoms of flashing lights.

Further questions asked relating to the symptoms of flashing lights (n=142).*	**%**
Do the flashing lights precede the headaches?	48%
Are the flashes in one or both eyes?	42%
Describe the flashes?	43%
Where in your vision do you see the flashing lights?	46%
How long do they last?	46%

*the percentages quoted are based on the entire sample (N=233). The totals do not add up to 61% (the percentage of optometrists who asked further questions) because several practitioners asked more than one question.

All optometrists who completed the vignette 'examined' the fundus. Sixteen percent of optometrists would have taken fundus photographs as standard. 84% of optometrists who completed the vignette declared they would have performed visual field testing and 59% 'measured' the intraocular pressure.

Table 10.3: The percentages of optometrists who 'performed' visual field testing using various methods for vignette scenario one.

Method of visual field examination	%
Supra threshold central test	36%
Full threshold central test	6%
Supra threshold wide field test	19%
Full threshold wide field test	6%
Frequency Doubling Technology (FDT)	11%
Another method	2%

*the percentages quoted are based on the entire sample of optometrists who completed vignette 1 (N=233). The totals do not add up to 84% (optometrists who 'performed' visual field testing) because 4% of optometrists did not select any one of the options stated in the table.

In answer to the question, "Would you ask the patient to seek a medical opinion regarding the headaches?" there were several possible options. The percentages of optometrists who 'advised' various options are stated in *Table 10.4*. 94% of practitioners 'asked' the patient to seek a medical opinion regarding the headaches. 62% of optometrists 'asked' the patient to keep a diary of when the headaches occur in an effort to identify any pattern.

Table 10.4: Table listing the percentages of optometrists who provided further advice in response to the question "Would you 'ask' the patient to seek a medical opinion regarding the headaches?"

'Ask' the patient to seek a medical opinion regarding the headaches:	%
On the same day	0.5%
Within a week of the eye examination	28%
Whenever it was convenient for the patient	25%
If there was no improvement in the symptoms or if the symptoms worsened	10%
Yes, but did not state the urgency of the appointment	18%

*the percentages quoted are based on the entire sample of optometrists who completed vignette 1 (N=233). The totals do not add up to 94% (optometrists who 'asked' the patient to seek a medical opinion) because 14% of optometrists did not select any one of the options stated in the table.

100% of practitioners would have 'carried out' focimetry of the patient's existing spectacles. 91% 'carried out' an objective assessment of the refractive error: 14% using an autorefractor; 63% using retinoscopy and 14% 'used' both methods. All the optometrists 'carried out' a subjective assessment of the refractive error. 87% of practitioners binocularly balanced the prescription. 61% 'checked' the patient's near visual acuity.

61% of virtual eye examinations included a distance cover test and 58% of practitioners 'performed' a cover test at near. Sixty percent 'measured' accommodation, 81%

convergence, 74% ocular motility, 99% pupil reactions, and a test for fixation disparity was 'carried out' by 48% at distance and 47% at near.

15% of optometrists 'recommended' an update of the current spectacles and 94% 'issued' a prescription. 90% of practitioners 'advised' a re-examination interval. The various re-examination interval options recommended and the percentage of optometrists who recommended each option is illustrated in *Table 10.5*. The average time taken to complete the virtual eye examination for this patient scenario was 26 minutes. As described in the methods section (section 10.2), practitioners who completed the vignette were asked to record their testing time in practice. The average of the testing times reported was 28 minutes.

Table 10.5: The percentages of optometrists who 'advised' various re-examination interval options for vignette one.

Re-examination interval 'advised'	%
3 months	2%
6 months	3%
12 months	26%
18 months	3%
24 months	64%
36 months	1%

10.3.2 Scenario 2

Concerning the primary research question, "Is the eye examination appropriate for the investigation of glaucoma", 74% of optometrists 'carried out' all three of the main 'glaucoma tests' (ophthalmoscopic assessment of optic discs, tonometry, and visual field testing) and 97% 'carried out' optic disc assessment and tonometry. Only one optometrist who 'carried out' a visual field assessment and ophthalmoscopy did not carry out tonometry. A full summary of the contents of the completed vignettes is included in appendix 22. Here, the thesis focuses on tests most relevant to the primary research objective and the patient's presenting symptom of difficulty with near vision.

Ninety-eight percent 'asked' the patient when they last had an eye examination and 99% of optometrists who completed the vignette 'asked' the reason for visit. 54% 'asked' if the patient had experienced any pain or discomfort around the eyes. 44% of optometrists 'asked' if the patient had glaucoma and 43% 'enquired' about a family history of glaucoma. As described in section 10.2.1, in this scenario, the patient presented for an eye examination having experienced recent difficulty with near vision.

88% of optometrists 'asked' the patient how long they had experienced the difficulty for; 87% 'asked' the patient if spectacles were worn for near vision and 73% 'asked' if the difficulty with near vision was worse at any particular time of the day.

Ninety-eight percent of optometrists who completed this vignette 'examined' the anterior surfaces of the eye using a slit lamp bio-microscope. 84% 'carried out' an anterior chamber assessment, most likely using the van Herick technique. Ninety-nine percent of optometrists 'carried out' an examination of the ocular fundus. Eighteen percent of optometrists would have taken fundus photographs as standard. 97% of the 187 optometrists who completed the vignette 'performed' tonometry and 75% of optometrists who completed the vignette declared they would have performed visual field testing.

Table 10.6: The percentages of optometrists who 'performed' visual field testing using various methods for vignette scenario two.

Method of visual field examination	**%**
Supra threshold central test	47%
Full threshold central test	9%
Supra threshold wide field test	3%
Full threshold wide field test	1%
Frequency Doubling Technology (FDT)	13%
Another method	1%

*the percentages quoted are based on the entire sample of optometrists who completed vignette 2 (N=187). The totals do not add up to 75% (optometrists who 'performed' visual field testing) because 2% of optometrists did not select any one of the options stated in the table.

99% of practitioners 'performed' focimetry of the patient's existing spectacles. 93% 'carried out' an objective assessment of the refractive error: 10% using an autorefractor; 65% using retinoscopy and 18% 'used' both methods. 99% of optometrists 'carried out' a subjective assessment of the refractive error. 79% of practitioners binocularly balanced the prescription. 96% subjectively 'tested' the patient for a near reading addition and 88% 'checked' the patient's near visual acuity. 55% subjectively 'examined' the patient for an intermediate reading addition and 43% 'checked' the patient's intermediate visual acuity. 95% of virtual eye examinations included a distance cover test and 92% of practitioners 'performed' a cover test at near. Fifty-nine percent 'measured' accommodation, 64% convergence, 68% ocular motility, and 97% pupil reactions.

Table 10.7: The various management options offered for the second vignette and the percentage of optometrists who 'advised' each option.

Advice and Management	%
'Explained' the onset of presbyopia as the reason for the patients presenting symptoms	81%
'Issued' a copy of the prescription to the patient: • 'stating' a new/changed prescription was issued • 'stating' no change in prescription	98% 97% 1%
'Recommended' an update of the spectacles for distance vision only	2%
'Recommended' new spectacles for near vision only	19%
'Recommended' an update of spectacles currently used for distance vision and an additional pair of spectacles for near vision.	76%

Ninety-eight percent of practitioners 'advised' a re-examination interval. The various re-examination interval options recommended and the percentage of optometrists who recommended each option is illustrated in *Table 10.8*. The average time taken to complete the virtual eye examination for this patient scenario was 26 minutes. On average, practitioners who completed this vignette reported a testing time in practice of 25 minutes.

Table 10.8: The percentages of optometrists who 'advised' various re-examination interval options for vignette two.

Re-examination interval 'advised'	%
6 months	1%
12 months	22%
18 months	5%
24 months	68%
36 months	1%

10.3.2 Scenario 3

Concerning the primary research question, the presenting symptom of flashing lights was 'identified' by all optometrists who completed this clinical vignette simply by asking the patient their reason for attendance. As described in chapter 6 (section 6.2.2), clinical guidelines on flashes and/or floaters and views from the expert panel were used to derive a list of questions to aid identification of the nature of the flashing lights. These questions are listed in *Table 10.9*. 49% of the 187 optometrists who completed the vignette 'asked' all seven questions listed in *Table 10.9*.

Table 10.9: Questions appropriate to identifying the nature of the patient's presenting symptom of flashing lights, giving the percentage of optometrists who 'asked' each question.

Questions appropriate to identifying the nature of the flashing lights	%
1. Where in your vision do you see the flashing lights?	92%
2. Are the flashing lights in one eye or both eyes?	98%
3. Describe the flashes?	98%
4. Is there a pattern to the occurrence of the flashes?	69%
5. Is there a change in pattern of occurrence?	65%
6. How long ago did you first notice them?	98%
7. How long do they last?	83%

*the percentages quoted are based on the entire sample (N=167). The totals do not add up to 100% because several optometrists asked more than one question.

96% of optometrists 'asked' the patient if they had noticed any floaters in their vision. *Table 10.10* highlights further questions 'asked' by optometrists to ascertain the nature of the floaters. 84% 'asked' if the patient had suffered any head trauma. 94% 'asked' about the patient's distance vision and 83% asked about any problems with near vision. 89% of optometrists 'asked' the patient about the presence/absence of headaches. 96% 'asked' if the patient was a driver.

Table 10.10: The percentage of optometrists who 'asked' further questions relating to the floaters.

Questions 'asked' relating to the symptoms of floaters	%
'Identified' the longstanding history of floaters	93%
'Asked' whether the floaters were in one or both eyes	86%
'Asked' if there had been an increase/change in pattern of the floaters	94%
'Asked' the patient if he had seen any floaters but did not ask any further questions	10%

A full summary of the contents of the completed vignettes is included in appendix 23. Here, the thesis focuses on tests most relevant to the presenting symptom of recent onset flashing lights. All of the optometrists who completed the vignette for this scenario 'examined' the anterior surfaces of the eye using a slit lamp biomicroscope. 91% of optometrists 'assessed' the anterior chamber using a slit lamp bio-microscope. 93% of optometrists 'examined' the anterior vitreous for the presence of pigment granules (Shafer's sign or tobacco dust).

Table 10.11: The percentage of optometrists who 'selected' various options relating to the urgency of dilation, method of dilation and method of fundus examination post-dilation.

Option selected:	**%**
'Recommended' dilated fundoscopy: • On the same day • Within one week • Did not state urgency	96% 86% 4% 6%
Method of dilation: • Using tropicamide as mydriatic of choice • Using an anaesthetic and tropicamide as mydriatic of choice • Did not select method of dilation used	 80% 7% 9%
Method of fundus examination post dilation: • A monocular direct method • Using slit lamp binocular indirect ophthalmoscopy • Using head mounted binocular indirect ophthalmoscopy • Using a different method to those stated above	 4%* 76%* 9%* 1%*

*the percentages quoted are based on the entire sample of optometrists who completed vignette 3 (N=167). The totals do not add up to 96% (optometrists who 'recommended' dilation) because 6% of optometrists did not select any one of the options stated in the table.

22% of optometrists who completed the vignette 'took' fundus photographs as a standard procedure during the examination, while 27% would have done so at an additional cost to the patient. 98% of optometrists who completed this vignette 'carried out' tonometry and 90% of optometrists who completed the vignette 'performed' visual field testing.

Table 10.12: The percentages of optometrists who 'performed' visual field testing using various methods for vignette scenario three.

Method of visual field examination	**%**
Supra threshold central test	20%
Full threshold central test	6%
Supra threshold wide field test	42%
Full threshold wide field test	10%
Frequency Doubling Technology (FDT)	9%
Another method	1%

*the percentages quoted are based on the entire sample of optometrists who completed vignette 3 (N=167). The totals do not add up to 90% (optometrists that 'performed' visual field testing) because 2% of optometrists did not select any one of the options stated in the table.

99% of practitioners would have 'carried out' focimetry of the patient's existing spectacles. 87% 'carried out' an objective assessment of the refractive error: 12% using an autorefractor; 62% using retinoscopy and 14% 'used' both methods. 78% of optometrists 'assessed' the patient's vision; 90% 'carried out' a subjective assessment of the refractive error; 99% subjectively 'tested' the patient for a near reading addition and 87% 'checked' the patient's near visual acuity. 93% subjectively 'examined' the

patient for an intermediate reading addition and 80% 'checked' the patient's intermediate visual acuity.

In answer to the question, "What proportion of optometrists visited would have referred this patient to the Hospital Eye Service (HES) and with what urgency?" there were several possible responses detailed in *Table 10.13*. Seventy-three optometrists' would have referred the patient to the HES for a second opinion.

Table 10.93: Outcomes that emerged from the question: "What proportion of optometrists would have referred this patient to the Hospital Eye Service (HES) and with what urgency?"

Urgency with which optometrists 'referred' the patient to the Hospital Eye Service (n=73)	**% of total sample**	**% of those referred**
• On the same day	5%	12%
• Within a week	19%	44%
• Whenever convenient	5%	11%
• Did not select one of the three options	14%	33%

Seventy-two percent of the 73 optometrists who would have referred this patient would have written a referral letter to the patient's GP and/or hospital eye service; 4% would have asked the patient to consult their GP without a referral letter; 3% would have sent a copy of the referral letter to the patient. 92% of optometrists 'advised' the patient of the symptoms of a retinal detachment (a sudden increase in the number of floaters seen, an increase in the frequency of flashing lights and or a curtain or cloud over the vision). 5% of the 153 optometrists who selected this management option 'advised' the patient to return for further tests; 16% 'advised' the patient to return for a re-examination; 1% 'advised' the patient to see his GP for a second opinion; 5% 'advised' seeing the GP for a referral and 73% 'advised' going directly to an accident and emergency hospital clinic should he experience any of these symptoms.

96% 'issued' a copy of the prescription to the patient: 44% of prescriptions stating a new/changed prescription was issued and 37% stating no prescription was found. 14% of optometrists 'recommended' an update in the spectacles used for distance and near vision; 30% of optometrists 'recommended' new spectacles for near vision only. The average time taken by practitioners, who did not perform a dilated fundus examination, to complete the virtual eye examination for this patient scenario was 25 minutes. Practitioners who performed a dilated fundus examination on average took 31 minutes to perform the virtual eye examination. Practitioners who completed this vignette

reported a testing time in practice of 29 minutes. All 187 practitioners 'advised' a re-examination interval. The various re-examination interval options recommended and the percentage of optometrists who recommended each option is illustrated in *Table 10.14*.

Table 10.14: The percentages of optometrists who 'advised' various re-examination interval options for vignette three.

Re-examination interval 'advised'	%
3 months	5%
6 months	4%
12 months	51%
18 months	1%
24 months	37%
36 months	1%

10.4 Discussion

Clinical vignettes can be a valuable tool for measuring quality of clinical practice (Gould, 1996; Cornfeld *et al.*, 2001). The scope of optometric eye examinations (i.e. range of tests performed and/or questions asked) is fairly standard within primary eyecare hence the clinical record cards used in practices as a record of clinical information do not vary greatly from practice to practice. None of the optometrists who participated in the study and provided feedback reported difficulty in understanding and/or completing the vignettes. The use of a virtual clinical record card proved to be a successful approach to the design of the vignettes.

10.4.1 Overview of results

Headache is a common symptom reported by patients who consult optometrists (Barnard & Edgar, 1996) and the use of a clinical vignette to simulate this symptom as part of a patient scenario provides an insight into the practitioner's ability to elicit essential information and perform essential tests during the virtual eye examination. It is encouraging that all optometrists who completed the first vignette 'ascertained' the patient's reason for visit and 27% of the 233 optometrists who completed this vignette 'asked' all questions listed in *Table 10.1*. Compared to the proportion of optometrists who 'asked' some of the questions listed in *Table 10.1*, it is noteworthy that only 67% of optometrists asked about the severity of headaches, yet significant headaches are sometimes identified by severity (Goadsby, 2004).

A change in the pattern of the headaches could significantly affect a person's quality of life and can be a warning sign for a pathological cause for the headaches (Adamczyk, 1999) yet only 44% of the sample used in the present research asked about this. Although 92% of optometrists 'identified' the patient's symptoms of flashing lights, only 61% asked further questions relating to the flashing lights. 31% of optometrists identified the symptoms of visual aura but did not ask any further questions to elicit the exact nature of the fortification spectra. As discussed in chapter 4 (section 4.4.1), not all patients may relate their symptoms of flashing lights to the headaches hence it would be helpful for the optometrist to identify the symptoms and put the patient's mind at rest.

Interestingly, 84% of optometrists who completed the first vignette declared they would have performed visual field testing on a patient presenting with headaches of a recent onset. As described in chapter 4 (section 4.4.1), investigation of the visual field is a common component of an eye examination as it helps detect early ocular and neurological disease processes which can be missed with other investigations (Harvey & Franklin, 2005).

Of the 4,000 members who responded to the College of Optometrists clinical practice questionnaire in 1998 (Stevenson, 1998), 69% of optometrists said they would routinely check patients' ocular motility. However, it is noteworthy that in the present research 74% 'carried out' ocular motility, 61% carried out the cover test at distance and 58% 'performed' cover test at near. In view of the possible link between migraine and binocular vision anomalies (Harle & Evans, 2004; Harle & Evans, 2006c) it would be desirable to have a detailed binocular vision assessment for this patient.

The presence of headaches was 'identified' in 100% of cases and 94% of optometrists offered further advice regarding seeking a medical opinion regarding the headaches. A survey of specified recall intervals for eye examinations found the average re-examination interval for a young adult to be two years (Warburton *et al.*, 2000). 64% of the practitioners who 'advised' a re-examination interval advised two years. These results are consistent with the findings from the survey.

In response to the primary research question for the second patient scenario (*Table 5.2*), it is notable that only 138 optometrists of the 187 (74%) who completed this vignette 'carried out' all of the three tests important for the accurate diagnosis of

POAG. In a clinical survey carried out by Willis et al. 2000 investigating glaucoma in optometric practice, optometrists were asked on which patients they would carry out tonometry, 9% said on all patients. Of the remainder, 61% would carry out tonometry on patients over the age of 40, 30% on patients with suspicious discs and 23% on patients with a family history of glaucoma (Willis *et al.*, 2000).

Although it is encouraging that 97% of the optometrists in the current vignette study 'carried' out at least two of the key tests (ophthalmoscopy and tonometry), it is of some concern that one optometrist who 'carried out' a visual field assessment and ophthalmoscopy did not carry out tonometry. Optometrists play an important role in the early detection of glaucoma, particularly as patients are usually asymptomatic until the disease is in its late stages. Therefore by performing ophthalmoscopy in combination with tonometry and visual field assessment, optometrists can help in the early detection of glaucoma.

As discussed in chapter 5 (section 5.1.1) the prevalence of glaucoma is higher in people described as Afro Caribbean and West African, with onset at a younger age compared to people described as Caucasian (Rudnicka *et al.*, 2006). Late presentation with advanced disease is a risk for blindness from glaucoma (Fraser *et al.*, 1999). In view of this, it is noteworthy that 44% of optometrists 'asked' if the patient had glaucoma and 43% 'enquired' about a family history of glaucoma. According to the CoO clinical practice survey more than 90% of optometrists who completed the survey have access to a slit lamp biomicroscope (College of Optometrists, 2008b). It is interesting that 98% of optometrists, who completed the second vignette in the present study, 'examined' the anterior surfaces of the eye using a slit lamp bio-microscope and 84% 'carried out' an anterior chamber assessment most likely using the van Herrick technique.

As discussed previously in this thesis, a recent CoO Clinical Practice Survey of UK optometrists (N = 2751) focussed on several different areas and included questions on tests that would be performed on an over 40-year-old 'black African-Caribbean' adult with no family history of glaucoma. The patient described in the second vignette did not have a family history of glaucoma but a photograph presented on the log-in page revealed she was of an African racial origin. It is interesting to note that 75% of optometrists who completed the second vignette 'performed' visual field testing on this

patient. Comparatively, in the CoO survey, 43% of respondents would always carry out perimetry on a similar patient, although 51% would perform perimetry 'sometimes'.

In the present study, 97% of optometrists 'performed' tonometry compared to 96% in the CoO clinical practice survey for a similar patient category. While 97% of practitioners 'performed' tonometry, it is of concern that six optometrists failed to measure IOP in a patient in this age group and of African racial origin and/or 'perform' a visual field examination, although all six practitioners 'examined' the fundus. Measurement of IOP alone is not effective for glaucoma screening (Weinreb & Khaw, 2004). As described in chapter 5 (section 5.4.1), Harper et al. (2000) concluded that the diagnostic accuracy of disc assessment in isolation is inadequate for screening. Hence, a combined strategy of IOP measurement, optic disc and visual field assessment is necessary (Weinreb & Khaw, 2004; Harper & Reeves, 1999; Vernon & Ghosh, 2001).

In answer to the primary research question for the third patient scenario (*Table 6.2*), it is encouraging that all optometrists who completed the third vignette 'identified' the patient's presenting symptom of flashing lights simply by 'asking' the patient's reason for visit. The College of Optometrists' document discussed in chapter 6 (section 6.2.2) advises that it is important for the optometrist to ascertain if the patient has experienced any photopsia and if there are any associated floaters. Although all of the optometrists who completed the vignette 'asked' at least one question relating to the nature of the flashing lights, it is interesting to note that 49% of optometrists asked all seven questions listed in *Table 10.9* and 72% asked four or more of the questions listed in the same table.

As discussed in chapter 6 (section 6.4.1), photopsia or floaters, or both, are classical symptoms of acute PVD in patients aged over 40 years (Chignell *et al.*, 2000). In view of this it is perhaps surprising that 7 optometrists did not 'ask' the patient about the presence of floaters. Although the patient in this case had a longstanding history of floaters, it is noteworthy that 7% of optometrists did not 'ask' whether the floaters were longstanding, 14% did not 'ask' whether the floaters were in one or both eyes and 6% did not 'ask' if there was an increase in the number of floaters seen. Recent onset floaters, an increase in the number of floaters or the presence of floaters in the same eye as the photopsia might have raised further concerns.

As discussed in chapter 6 (section 6.2.3), the expert panel for this patient scenario recommended two approaches to managing a patient presenting with photopsia and floaters. The first approach is to perform a full routine eye examination incorporating tests and questions to address the patient's symptoms and the second is a symptom-led assessment addressing the patient's reason for visit and concentrating on appropriate posterior segment investigation. It is interesting that all optometrists who completed the vignette 'carried out' a routine eye examination (e.g., including the determination of refractive error) in a patient whose presenting symptom was not indicative of refractive problems.

The routine eye examination included a fundus examination in all cases. Although some members of the expert panel for this patient scenario criticised an examination that included tests of refractive error and orthoptic status as lacking relevance to the presenting symptom, it could be argued that a patient has a right to a full eye examination and there was an implicit contract for the optometrist to provide this. Indeed, it could be argued that the Opticians Act (General Optical Council, 2008e) requires the optometrist to meet the minimum statutory requirements of a sight test (examine external and internal eye, refraction resulting in prescription), so that a purely symptom led eye examination is not appropriate.

Although 10% of optometrists who completed the vignette did not 'perform' a subjective assessment of the distance correction, 99% subjectively 'checked' the patient's reading addition. Of the two optometrists who did not subjectively 'assess' the patient's reading addition; one optometrist 'performed' a subjective assessment of the distance correction and the other optometrist did not 'perform' a subjective assessment although an objective assessment was 'performed' using an autorefractor and retinoscopy. Hence none of the optometrists who completed the vignette performed a symptom-led assessment.

Ninety percent of optometrists 'performed' visual field testing and four optometrists (2%) did not 'perform' tonometry. The College of Optometrists' advice cited in chapter 6 (section 6.2.2) of this thesis, recommends that tonometry and visual fields should be considered for confirmatory purposes especially if the optometrist is unable to examine or obtain a satisfactory view of the peripheral retina. Additionally, tonometry is an important supplementary test in this age group and a reduction in IOP may be linked to a retinal detachment (Doshi & Harvey, 2005; Elliott, 2003a).

In view of the guidance offered regarding the examination and management of a patient presenting with the symptoms described in section 10.2.2, it is of concern that 7% of optometrists did not 'examine' the anterior vitreous (Shafer's sign) for the presence of pigment cells and 4% of optometrists did not 'recommend' a dilated fundus examination. It is encouraging that 86% of the optometrists who 'recommended' a dilated examination advised the SP that it should be performed on the same day. For this patient scenario, it has been assumed that dilated fundoscopy is the gold standard for a patient presenting in this way because this is the consensus in the literature (Alwitry *et al.*, 2002), and is specified in the College of Optometrists' guidance (College of Optometrists, 2005).

The CoO advice also recommends either a dilated fundus examination or referral to a colleague for this to be performed. 87% of optometrists visited by this SP either 'carried out' dilated fundoscopy on the day of the appointment, or 'carried out' undilated fundoscopy and attempted to arrange for dilated fundoscopy at their practice within a day or two, or made an urgent referral for this. The researcher's interpretation is that 87% of optometrists would have complied with College guidance.

It is estimated that 8% of patients attending for eye examinations present with symptoms of flashes and/or floaters (Alwitry *et al.*, 2002). The results highlighted in section 10.3.2 for the third clinical vignette show that the optometric management of patients is very variable. The data obtained from completed vignettes for the third scenario reveal that only 2 (29%) of the 7 optometrists who would have examined the fundus undilated referred the patient to the hospital eye service. 63 (39%) of the 160 optometrists who 'recommended' a dilated fundus examination referred the patient to the HES. The College of Optometrists' advise optometrists who are unable to perform the minimum examination for a patient presenting with symptoms of flashes and floaters to refer the patient to someone who is able to perform an adequate examination (College of Optometrists, 2005). Hence it is interesting that, of the 167 optometrists who completed the vignette, 5% advised the patient to present to eye casualty on the same day, 19% advised within a week and 5% advised the patient to go whenever it was convenient.

Table 10.15: The average duration of eye examinations recorded by the standardised patients compared to the average duration of the 'virtual' eye examinations obtained from the completed computerised vignettes.

Scenario	Standardised patient study (Study 2)		Vignette study (study 3)	
	Average duration of eye examination	**Range**	**Average duration of virtual eye examination**	**Average testing time in practice**
Scenario 1	21 mins	5-50 mins	26 mins	28 mins
Scenario 2	23 mins	20-30 mins	26 mins	25 mins
Scenario 3-undilated fundoscopy	25 mins	12-50 mins	25 mins	29mins
Scenario 3-dilated fundoscopy	36 mins	25-50 mins	31 mins	

The average durations of the 'virtual' eye examinations for scenarios 1 and 2 (*Table 10.15*) are higher than the average durations for the eye examination recorded by the SPs in the second study. This may be a further indication that vignettes tend to over-estimate clinical care. The mean duration is identical for both SP and vignette examinations for the undilated fundus examinations for scenario 3. The average duration of the eye examination during which dilated fundus examination was performed (as obtained by the SP) was higher than the average duration of the 'virtual' eye examination. This suggests that the time allocated to the dilated fundus examination in the vignette is shorter than the time taken by many practitioners when they examined the SP.

As discussed earlier in this thesis, in many practices optometrists are allocated between 20-30 minutes to carry out a "routine" eye examination (Harvey & Franklin, 2005). In view of this, it is interesting to note that optometrists who completed the computerised vignettes reported average testing times in practice of between 25-29 minutes.

In summary, the results of the present research suggest vignettes are a useful method of assessing clinical practice within optometry. However, Peabody et al. reasoned that a social desirability bias in vignette responses and the vignettes' potential to emphasise knowledge over actual clinical practice would result in higher scores that overestimate the process of care (Peabody *et al.*, 2000; Kopelow *et al.*, 1992; Aronow *et al.*, 1995). Computerised vignettes are a novel way of assessing clinical practice within optometry although their accuracy and validity in comparison with other methods of assessing clinical care will be discussed in the next chapter.

10.4.2 Use of vignettes in measuring clinical practice

Valid measures of clinical competence and practice are the basis for improvement of clinical practice. Despite the widespread use of vignettes there is uncertainty and controversy about whether vignettes reflect actual clinical practice or merely competence (Peabody *et al.*, 2000). By using vignettes to measure clinical practice, the practitioner's ability to use their knowledge in a particular context is being assessed; the second level of Miller's pyramid (chapter 1, section 1.1.1). Some investigators argue that vignettes only reflect what providers are competent enough or knowledgeable enough to do (Rethans *et al.*, 1991; Everitt *et al.*, 1990). Vignettes have been used to measure clinical practice (Gould, 1996; Cornfeld *et al.*, 2001) but their use has been limited due to unaddressed concerns about their validity and ability to discern variations in quality (Peabody *et al.*, 2004b). Vignettes used to measure a process of care must be carefully constructed (Peabody *et al.*, 2000). The responses should be linked to explicit outcomes or evidence based guidelines and should be open-ended (Peabody *et al.*, 2000). Although the vignettes used in this study were not open-ended they were based on evidence based guidelines and the views of a panel of experts (chapter 3, section 3.2 and 3.3).

Vignettes are a cost-effective way of assessing levels of clinical care and can be easily administered and are therefore used in a great variety of settings e.g., to assess regional variations in clinical practice across the country. With the recent changes in optometry in Scotland and Wales, the use of clinical vignettes for further comparative analysis should be explored.

Although other methods such as surveys and questionnaires can be used to elicit information about clinical practice within optometry, the use of computerised vignettes adds a different dimension to measuring clinical practice by assessing the practitioner's ability to deal with different patient scenarios whilst providing real time responses. The computerised vignettes that were used in the present research create a more 'life-like' clinical setting that paper forms. The data gathered from completed optometric vignettes provide significant information about the practitioner's knowledge hence providing feedback for future continuous education and training.

10.4.3 Use of vignettes for continuous education and training (CET)

One of the greatest challenges for optometric CET is for it to bring about changes in everyday clinical practice. Using continuous education and training that closely replicates the clinical decision-making process helps meet this challenge. Many of the innovative initiatives by DOCET (Directorate of Optometric Continuing Education & Training) over the years have taken this approach, and the use of clinical vignettes is believed to be a development that builds on this previous work.

As described in the introduction (section 10.1), vignettes have been widely used by educators and health service researchers to measure processes in a range of practice settings (Sriram *et al.*, 1990; O'Neill *et al.*, 1995; Glassman *et al.*, 1997). Specifically, they have been used to simulate patient visits and to measure practitioners' abilities to evaluate, diagnose and treat specific medical conditions (Peabody *et al.*, 2004a). The aim of this study was to create a web-based virtual eye examination, which immersed the participating practitioners in a situation resembling a routine eye examination. This environment, and the on-screen instructions, encouraged practitioners to adopt the same thought processes as they would in everyday practice hence allowing the researcher to determine the content of optometric eye examination using clinical vignettes.

Continuous education and training courses and articles frequently focus on the signs, symptoms and management of ocular conditions commonly encountered in optometric practice. Although CET articles require the optometrist to complete multi-choice questions and obtain a certain score prior to CET points being awarded, practitioners attending CET courses are not assessed prior to being awarded CET points. Clinical vignettes could be used in these instances to assess the practitioner's knowledge gained during the course, prior to awarding CET points.

Identifying limitations in specific aspects of clinical practice provided by optometrists allows the development of strategies to improve these limitations. For example, by identifying limitations in history taking in a group of optometrists, a vignette can be designed to focus on this particular aspect of the examination. If, on the other hand, the management of patients presenting with floaters and photopsia requires further attention, a vignette can be designed to focus on this aspect.

10.4.4 Limitations of vignette study

A limitation of the design of computerised vignettes is the inevitable problem of participating optometrists 'asking' questions that they may not necessarily ask in a real life situation and/or 'performing' tests not necessarily performed in routine optometric practice; a manifestation of the Hawthorne effect (chapter 1, section 1.5.8.2). The Hawthorne effect is the positive impact on behaviour that sometimes occurs in a study as a result of the interest shown by the experimenter in humans who are being treated, studied, or observed (Lied & Kazandjian, 1998). Prior to beginning each vignette participating optometrists were advised (in the instructions) to only select a test or question if they would ask or perform the test in routine optometric practice. Whilst completing the vignette, optometrists were constantly reminded by a change in the message displayed on the mouse cursor advising them to only select the question or test if they would perform the test in practice.

As described in the methods (section 10.2.1), when completing the preliminary details, optometrists were asked to record their testing time (time taken for a patient presenting for a routine sight test). The time recorded as the test time was used as a guide whilst the practitioner was completing the vignette. A timer displayed the time that an optometrist would typically have taken to carry out the procedures that had been selected so far. This was to discourage practitioners from being over-zealous in selecting tests that they might not have completed in a real eye examination. Prior to beginning the examination and during the early stages of the examination the numbers on the timer appeared in green. If during the course of the 'examination', the optometrist took longer than the time recorded in the preliminary details, the timer changed colour to red, indicating to the optometrist they had gone over their normal testing time. Although it was inevitable that some optometrists would select a question or test they may not necessarily have performed in practice, the change in colour of the timer was aimed to deter practitioners 'performing' every test and/or 'asking' every question.

In many practices optometrists are allocated 20 minutes to carry out a "routine" eye examination (Harvey & Franklin, 2005). In smaller practices, 30 minutes is often allowed for each appointment, but this normally includes 10 minutes for dispensing (Harvey & Franklin, 2005). Optometrists working in practice, particularly busy community practices are therefore likely to be under time pressure. Hence it may not

always be feasible for the optometrist to perform all the clinical tests they would have liked to but rather carry out a symptom-led assessment addressing the patient's symptoms. Although a change in colour of the timer as discussed in the introduction was used to deter practitioners 'performing' every test and/or 'asking' every question, practitioners completing the vignette were not under time constraints as in a real life situation.

Another limitation of the vignettes is, although they simulate an eye examination or consulting room environment using a clinical record card, each vignette remains a simulation and not a real life situation. Optometrists completing the vignettes are likely to feel their clinical skills are being assessed and hence 'perform' a more detailed eye examination than they would carry out on that patient had they presented for an eye examination in a real life situation. In some cases optometrists may 'select' a test in order to reveal the answer. If a question was 'asked' or test 'selected', this was immediately logged on the results database as having been performed or asked. Once the practitioner clicked the complete eye examination button, all questions that were not 'asked' or tests that were not 'performed' were logged as not having been performed. During the course of the virtual eye examination practitioners were unable to go back or undo a test as in a real life situation. Therefore instances where a practitioner may have intentionally or unintentionally selected a test were logged resulting in an over-estimation of the clinical care provided.

It was hoped that the offer of free CET points for completing the vignettes would result in a high proportion of the UK profession (10,000) choosing to take part. However, the participation rate, although satisfactory for providing a good data sample for research, was disappointing in this respect: 233, 187 and 167 optometrists participated in vignettes 1, 2, 3 respectively. The reason for the low participation rate is unclear, but it is not encouraging that the number participating reduced with each vignette. A possible explanation for the low participation rate may be that practitioners felt it would take longer than predicted to complete each vignette. Furthermore, although the computerised vignettes were launched relatively early in the CET cycle (optometrists are required to gain 36 CET points in each three year cycle); some optometrists may have already gained the points required for the present cycle hence had no need to complete the computerised vignettes to gain additional CET points. Other optometrists may choose to overlook CET points opportunities until towards the end of the cycle, when participation in CET activities becomes unavoidable! Finally, the low participation

rate could be attributed to poor 'computer literacy' although this is perhaps unlikely in the present day.

10.4.5 Suggestions for improvement of vignette design

A different approach to the vignette design is using open-ended responses. In this case, the practitioner is exposed to the presenting problem and asked to provide open-ended responses identifying the most important element(s) of history for each case scenario. A similar stepwise process is repeated for the examination, and management plan (Dresselhaus *et al.*, 2000). Practitioners are not allowed to return to and modify previously completed answers as new information is provided at each stage. Skilled experts score the completed vignettes in a similar way to that used in record abstraction (described in Chapter 1, section 1.3.1). This approach could be trialled, although the cost of using a skilled expert to abstract the relevant information from the vignettes would need to be taken into account.

Future computerised vignettes could also be designed to be more interactive and simulate more closely a consulting room environment e.g., when performing a refraction the optometrist is able to use a combination of tests (e.g., duochrome, Jackson cross cylinder, fan and block chart, plus one blur test, binocular balancing) as they would in optometric practice to obtain the end result.

10.5 Chapter summary

Valid measures of clinical competence and practice are the basis of improvement of clinical practice. Despite the widespread use of vignettes in measuring clinical practice (Gould, 1996; Cornfeld *et al.*, 2001) there is uncertainty and controversy about whether vignettes reflect actual clinical practice or merely competence (Peabody *et al.*, 2000). Some investigators argue that vignettes only reflect what practitioners are competent enough or knowledgeable enough to do (Rethans *et al.*, 1991; Everitt *et al.*, 1990), which places vignettes at the second level of Miller's pyramid as described in chapter 1. The use of vignettes has been limited due to unaddressed concerns about their validity and ability to discern variations in quality (Peabody *et al.*, 2004b). Computerised vignettes are a novel way of assessing clinical practice within optometry, and their accuracy and validity will be discussed in the next chapter.

11 A Comparison of Standardised Patients, Record Abstraction and Clinical Vignettes

11.1 Introduction

A literature review (chapter 1) revealed that clinical practice is commonly assessed by three methods: (1) abstraction of clinical records, (2) using clinical vignettes and (3) use of standardised patients who present unannounced to clinics. A fourth approach, questionnaire surveys (e.g., College of Optometrists), is likely to result in overestimates of quality of care (College of Optometrists, 2008b; Stevenson, 1998). As already described in this thesis, the content of typical community optometric eyecare in England was investigated using standardised patients (chapters 3-7), record abstraction of clinical records (chapters 8) following the standardised patient visits and using clinical vignettes (chapter 10). In this chapter the gold standard (SPs) findings are compared to clinical records describing the content of optometric eye examinations and computerised vignettes to assess whether record abstraction and vignettes are accurate measures of optometric clinical care.

11.2 Methods

Clinical care provided by community optometrists in this thesis was determined using three methods: (1) using data gathered from checklists completed by the SPs at the end of each consultation; (2) abstraction of information from clinical records obtained from practitioners upon completion of all SP visits; (3) using data obtained from completion of online clinical vignettes.

As described in chapter 3 (section 3.4), 111 optometrists consented to being visited by three standardised patients representing three different patient scenarios. 100 consenting practitioners were visited by the first (chapter 4) and second (chapter 5) standardised patients and 102 consenting practitioners by the third standardised patient for a routine eye examination, each representing a different patient scenario (i.e., different ages, races, presenting symptoms, and clinical features). The methodology detailing the case scenarios and case specific checklists, sample selection of participating practitioners and actor training are described in the relevant chapters earlier in this thesis. Upon completion of all the standardised patient visits, practitioners who opted to receive feedback were invited to send copies of their clinical

records. This and the process of record abstraction are discussed in detail in chapter 8 (section 8.2.1). The researcher did not look at the actual checklist obtained for practitioners whose record cards were received: in other words, the SP results and the record abstraction results were obtained using a masked protocol.

All qualified optometrists in the UK were invited to complete three computerised clinical vignettes. As described in chapter 10 (section 10.2), the computerised vignettes were based on the case scenarios used in the standardised patient study. Participating optometrists performed a virtual eye examination using an on-line optometric record card. The development of the vignettes is described in detail in chapter 10.

11.2.1 Analyses

The results (section 11.3) are analysed using: the proportion of optometrists who actually performed a test or asked a particular question (gold standard, SP findings); the proportion of optometrists who recorded performing a test or asking a particular question (record abstraction); and the proportion of optometrists who simulated performing a test or asked a question during the virtual eye examination (vignettes).

11.3 Results

During the early stages of the standardised patient study, optometrists who consented to be visited by the SPs were offered complete anonymity or the option of receiving feedback (chapter 3, section 3.3.3). Approximately one third chose full anonymity and two thirds chose to receive feedback or did not state a preference (these were given the option of receiving feedback when the results were available). Of those practitioners who opted for the feedback option, 37 practitioners visited by the first SP sent copies of the patient records upon request, as did 34 visited by the second SP and 40 visited by the third standardised patient. 233 optometrists completed the vignette for the first scenario, 187 for the second scenario and 167 completed the vignette for the third scenario (section 10.3). As noted here, there is a difference in the sample size between the three methods of assessing clinical care used in this research (*Figure 11.1*).

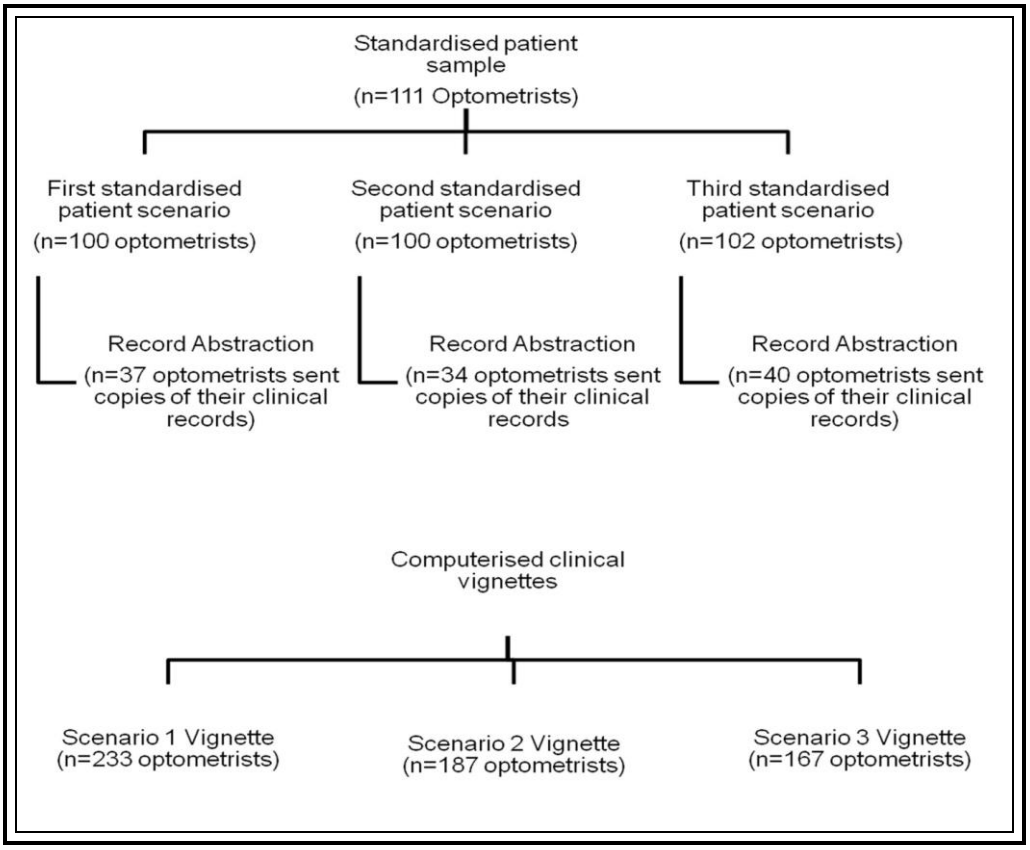


Figure 11.1: An overview of the study design.

The ideal approach to analysing the data obtained from the three studies would be to use results obtained from the same practitioners throughout; i.e., an optometrist would be included if s/he had been visited by a standardised patient, and that optometrist had consented to receiving feedback so was therefore sent a copy of the record card following the SP visit, and that same optometrist completed the online vignette for that case scenario. This approach has been used in other similar studies where standardised patients have been compared to record abstraction and clinical vignettes (Dresselhaus *et al.*, 2000; Peabody *et al.*, 2000).

However, this approach could only be used if the data were obtained for a significant proportion of optometrists for each of the methods of assessing clinical care. In this research, only 5 practitioners visited by the SP in the first scenario sent copies of clinical records from the SP visits **and** completed the clinical vignettes. None of the practitioners visited by the SP in the second and third scenarios sent copies of clinical records from the SP visits **and** completed the clinical vignettes.

A different approach to analysing these data would be to investigate whether the 32-40 optometrists for whom record abstraction data have been obtained are representative of the whole sample visited by SPs. To investigate (from the SP data) whether the proportion of optometrists who performed a test in the record abstraction group for each scenario differed from the proportion of optometrists whose clinical record cards were not obtained (n=62-66 depending on the scenario), a statistical test was performed (chi-square test) on the tests which were of the greatest clinical significance for each scenario. The results showed no significant difference ($p>0.09$) between the two groups. The practitioners invited to participate in the SP study were selected at random from the 'Opticians' Register (section 3.3.3) and it is believed that the practitioners completing the vignettes formed a representative cross-section of the optometric profession since the vignettes were publicised to all optometrists as a free method of obtaining their CET points. It therefore seems likely that the separate samples for the SP study and the vignette study both fairly closely represent typical cross-sections of the UK optometric profession. Hence the actual sample sizes are used in the data analysed in this section. The results analysed are shown as percentage of participating practitioners.

The checklists completed by the SPs at the end of each eye examination consisted of between 70-100 items of data. A similar body of data was obtained during record abstraction and from the clinical vignettes for the three patient scenarios. As described earlier in this thesis, during the early stages of the study, a panel of experts suggested tests (in the form of research questions) that they felt could be appropriate for the three standardised patients. These questions have been used to focus on key data that is of greatest clinical significance for each specific scenario instead of analysing all the data obtained following the standardised patient visits, record abstraction and completion of clinical vignettes.

For each scenario, and for each test in each scenario, the proportions of practitioners who carried out the test in the SP study, in the record abstraction study, and in the clinical vignette study were calculated. These proportions were compared to give 'errors', using the SP data as the gold standard. Positive values indicated that a greater proportion of practitioners would have recorded or performed a test as determined by the record abstraction or vignette data respectively compared to the SP findings. For example, in the comparison between SP and vignette data for visual field testing, the error in the second patient scenario was +39%, indicating that the proportion of

practitioners who stated in their vignette response that they would have performed visual field tests was 39% greater than the proportion of optometrists who actually carried out a visual field test during the SP visit.

To give an overview of the data, the average errors for each scenario are reported based on the means of individual test errors grouped into three domains of an eye examination (i.e., symptoms & history, examination, and management) plus the mean overall error for each scenario. The average errors between the gold standard (SP) and record abstraction findings and the average errors between the gold standard and the vignette results were calculated in these domains (*Table 11.1*). These results for the three methods of measuring clinical practice are contrasted and statistically compared in *Table 11.2.* In view of the multiple comparisons, an adjustment to the p-value that is taken as being statistically significant is appropriate and this issue is considered further in the Discussion.

Table 11.1: The average error between the record abstraction and vignette results compared to the gold standard (SP) findings for different domains of an eye examination. A positive value indicates that a higher proportion of practitioners carried out the test in the SP visit than recorded the test in their records or stated in the vignettes that they would have carried out the test.

	Average Error	
	Standardised patient/ Record abstraction	**Standardised patient/ Vignette**
Scenario 1		
Symptoms and History	[1] -9%	+26%
Examination	[2] +2%	+20%
Management	-4%	+8%
Overall	-5%	+22%
Scenario 2		
Symptoms and History	-26%	+2%
Examination	-24%	0%
Management	-4%	+11%
Overall	-25%	+1%
Scenario 3		
Symptoms and History	-19%	+22%
Examination	-7%	+18%
Management	-1%	+1%
Overall	-12%	+18%

[1] (-): Under-reporting, reported by SP but not recorded as having been performed on clinical record or not "performed" by the optometrist when completing the clinical vignette.
[2] (+): Over-reporting, not reported by SP but recorded as having been performed on clinical record or "performed" by the optometrist when completing the clinical vignette.

Table 11.2: A table of the proportion of optometrists who a) performed a range of tests during an eye examination of a standardised patient b) recorded performing the tests on submitted clinical records and c) who "performed" a range of tests during a virtual eye examination conducted by completing clinical vignettes. Two-way chi-square analyses were performed for the standardised patient (SP): record abstraction (RA) findings and standardised patient (SP): vignette (Vig.) findings.

Test	Scenario 1						
	SP(100)	**RA (37)**	**Vig (233)**	**SP/RA**	**U-R/O-R**	**SP/Vig**	**U-R/O-R**
Pupil reactions	65/100	32/37	231/233	p=0.14	[1]O-R	p<0.0001	O-R
Motility	31/100	19/37	172/233	p=0.03	O-R	p<0.0001	O-R
Retinoscopy	36/100	6/37	178/233	p=0.03	[2]U-R	p<0.0001	O-R
Autorefractor	29/100	4/37	66/233	p=0.03	U-R	p=0.90	U-R
Subjective refraction	100/100	37/37	226/233	N/A	N/A	p=0.08	U-R
Fundus examination	99/100	37/37	231/233	p=0.54	O-R	p=0.90	N/A
Cover test (D)	91/100	37/37	93/233	p=0.06	O-R	p<0.0001	U-R
Cover test (N)	100/100	37/37	168/233	N/A	N/A	p<0.0001	U-R
Fixation Disparity (D)	29/100	7/37	112/233	p=0.23	U-R	p=0.001	O-R
Fixation Disparity (N)	14/100	5/37	110/233	p=0.94	N/A	p<0.0001	O-R
Accommodation	36/100	6/37	140/233	p=0.03	U-R	p<0.0001	O-R
Visual fields	61/100	23/37	195/233	p=0.90	O-R	p<0.0001	O-R
	Scenario 2						
	SP(100)	**RA (34)**	**Vig (187)**	**SP/RA**	**U-R/O-R**	**SP/Vig**	**U-R/O-R**
Pupil reactions	94/100	24/34	182/187	p=0.0003	U-R	p=0.16	O-R
Motility	62/100	14/34	128/187	p=0.03	U-R	p=0.01	O-R
Retinoscopy	60/100	6/34	152/187	p<0.0001	U-R	p<0.0001	O-R
Autorefractor	35/100	2/34	52/187	p=0.001	U-R	p=0.21	U-R
Subjective refraction	100/100	33/34	187/187	p=0.09	U-R	N/A	N/A
Slit lamp examination	36/100	13/34	183/187	p=0.82	O-R	p<0.0001	O-R
Fundus examination	91/100	34/34	186/187	p=0.56	O-R	p=0.17	O-R
Cover test (D)	100/100	26/34	178/187	p<0.0001	U-R	p=0.03	U-R
Cover test (N)	100/100	22/34	172/187	p<0.0001	U-R	p=0.004	U-R
Fixation Disparity (D)	30/100	5/34	73/187	p=0.08	U-R	p=0.13	O-R
Fixation Disparity (N)	14/100	4/34	80/187	p=0.74	U-R	p<0.0001	O-R
Intraocular pressure	96/100	32/34	181/187	p=0.65	U-R	p=0.73	O-R
Visual fields	36/100	10/34	140/187	p=0.49	U-R	p<0.0001	O-R
	Scenario 3						
	SP(101)	**RA (40)**	**Vig (167)**	**SP/RA**	**U-R/O-R**	**SP/Vig**	**U-R/O-R**
Pupil reactions	70/101	27/40	161/167	p=0.84	U-R	p<0.0001	O-R
Motility	24/101	17/40	153/167	p=0.07	O-R	p<0.0001	O-R
Retinoscopy	59/101	6/40	126/167	p<0.0001	U-R	p=0.004	O-R

Autorefractor	36/101	4/40	43/167	p=0.002	U-R	p=0.09	U-R
Subjective refraction	100/101	39/40	151/167	p=0.49	U-R	p=0.01	U-R
Slit lamp examination	48/101	14/40	167/167	p=0.18	U-R	p<0.0001	O-R
Shafer's sign	13/101	10/40	156/167	p=0.08	O-R	p<0.0001	O-R
Fundus examination	100/101	40/40	167/167	p=0.53	O-R	p=0.20	O-R
Cover test (D)	82/101	30/40	151/167	p=0.41	U-R	p=0.03	O-R
Cover test (N)	46/101	22/40	142/167	p=0.31	O-R	p<0.0001	O-R
Intraocular pressure	99/101	40/40	163/167	p=0.37	O-R	p=0.83	N/A
Visual fields	53/101	21/40	151/167	p=0.998	U-R	p<0.0001	O-R

[1]O-R: Over-reporting, not reported by SP but recorded as having been performed on clinical record or "performed" by the optometrist when completing the clinical vignette.
[2]U-R: Under-reporting, reported by SP but not recorded as having been performed on clinical record or not "performed" by the optometrist when completing the clinical vignette.

11.3.1 Scenario 1

Concerning the primary research question for this patient scenario, "Is the eye examination appropriate for the identification of headaches of a suspicious nature and for the appropriate management of these", although all optometrists providing record cards recorded identifying the patients presenting symptoms of headaches, 98% of optometrists actually identified the SP's presenting symptoms during the SP visits. In the case of the two optometrists who did not identify the patient's presenting symptoms either by asking for her reason for having the eye examination or by directly asking if she was experiencing any headaches, the SP advised the optometrist towards the end of the examination about her concern over the recent onset headaches. All optometrists who completed the clinical vignettes identified the SP's presenting symptom by 'asking' the reason for visit.

The gold standard findings' relating to the patient's presenting symptoms of headaches and advised management options; the proportion of optometrists that recorded this information; and the proportion of optometrists whose vignette response indicated that they would have asked the question are given in *Table 11.3*. The results in *Table 11.3* show that, overall, optometrists under-recorded their actions during the examination of this SP (i.e., SP results are on average higher than those from record abstraction scores). For example, a greater proportion of optometrists asked the SP about visual disturbances associated with the headaches compared to those who recorded asking this question (Error: -11%). A comparison of the gold standard findings to the data gathered from the vignette study shows that, in a 'virtual' eye examination, a greater

proportion of optometrists would ask questions relating to the significant nature of the headaches and a greater proportion would offer management advice regarding the headaches compared to the actual (gold standard) findings.

Table 11.3: The gold standard (SP), record abstraction and clinical vignette findings relating to the patient's presenting symptoms of headaches and the advised management options regarding the headaches. The percentages indicate the proportion of optometrists.

Symptoms and History	Standardised Patient	Record Abstraction	Clinical Vignettes
Identify the presenting symptom of headaches	98%	100%	100%
Frequency of headaches	68%	51%	93%
Location of headaches	84%	81%	78%
Descriptions of onset of symptoms	68%	35%	74%
Associations (Visual/Non Visual)	45%	14%	80%
Duration of symptoms	50%	73%	88%
Severity of headaches	14%	5%	67%
Symptoms of nausea/vomiting with the headache	20%	19%	74%
Visual disturbances associated with the headaches	33%	22%	85%
Ask about the presence/ absence of flashing lights	15%	19%	61%
Ask whether the flashing lights precede the headaches	8%	3%	48%
Ask if flashes are in one or both eyes	5%	0%	42%
Description of flashing lights	12%	3%	43%
Location of flashing lights in the visual field	1%	0%	46%
How long the flashing lights last	7%	0%	46%
Management	**Standardised Patient**	**Record Abstraction**	**Clinical Vignettes**
Advise the patient to seek a medical opinion regarding the headaches	69%	60%	94%
Advise patient to see their GP within a week	2%	0%	28%
Advise patient to see their GP whenever it was convenient	10%	30%	25%
Advise patient to see GP if patient is concerned or if headaches worsen	43%	27%	24%
Advise patient to keep a headache diary	14%	0%	62%
Advise a re-examination interval	80%	68%	99%

None of the optometrists visited by the SP in this scenario asked all of the questions in *Table 11.3* relating to the nature of the headaches. Of the 233 optometrists who completed the vignette relevant to this scenario, 70 (27%) would have 'asked' all of the questions listed relating to the headaches. Compared to the gold standard SP results, a greater proportion of optometrists who completed the vignette stated that they would ask a patient presenting with headaches of this nature about visual disturbances. Indeed, only one practitioner asked the SP all five questions listed in *Table 11.3* to evaluate the type of the flashing lights/visual disturbances while 28% of optometrists who completed the clinical vignette 'asked' all five questions relating to the flashing lights during the virtual eye examination.

It can also be inferred from *Table 11.3* that practitioners generally offer more verbal advice to patients than their clinical records would indicate (five management areas giving negative errors ranging from -2% to -16%). The exception to this trend was that a greater proportion of optometrists recorded advising the SP to seek a medical opinion regarding the headaches whenever it was convenient to do so compared to the percentage reported by the SP (Error: +20%). On the other hand, compared to the SP study a greater proportion of optometrists declared in the vignette that they would offer management advice regarding the headaches, particularly the recommendation that the SP should keep a headache diary (Error: +48%) and seeking a medical opinion regarding the headaches (Average error: +25%).

For the clinical vignette relevant to this scenario, in general a greater proportion of optometrists would perform the tests listed in *Figure 11.2* (with the notable exceptions being the distance and near cover tests) during an eye examination on a patient presenting with headaches of this nature compared to the gold standard findings (average error for all 12 tests: +20%, *Table 11.1*). Overall 65% of optometrists visited by the SP carried out an objective assessment of refractive error compared with only 27% of optometrists recording the results of objective refraction on their submitted record cards, suggesting marked under-recording of the results of this test. On the other hand, compared to the proportion of optometrists who performed motility and checked pupil reactions during the SP visits, an additional 20% of optometrists who submitted records noted having performed these two tests, suggesting considerable over-recording of motility and pupil reactions. Compared to the gold standard findings, an additional 35% of optometrists who completed the vignette stated that they would have performed these two tests.

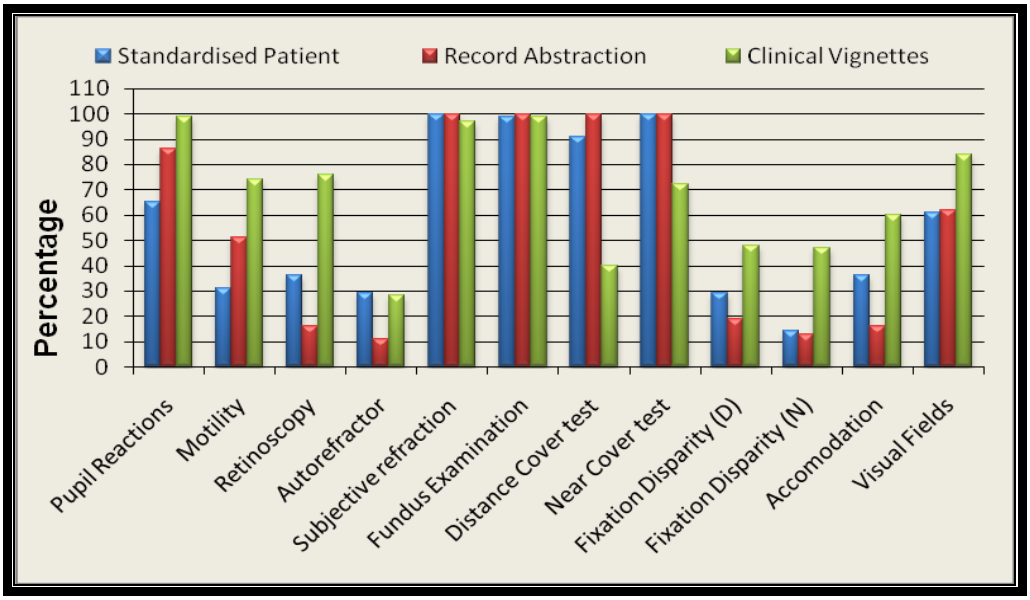


Figure 11.2: A three way comparison, for a) the examination of a standardised patient, b) submitted clinical records and c) clinical vignettes, of the percentage of practitioners who "performed" a range of tests during an eye examination of a patient presenting with headaches of a recent onset.

11.3.2 Scenario 2

Concerning the primary research question for this patient scenario, "Is the eye examination appropriate for detecting glaucoma", 35% of optometrists visited by the SP carried out all three of the tests typically used to screen for glaucoma (ophthalmoscopic assessment of optic discs, tonometry, and visual field testing) and 95% carried out optic disc assessment and tonometry. 29% of optometrists who submitted record cards recorded having performed all three tests and 94% recorded intraocular pressures and evidence of a fundus examination. Of the 187 optometrists who completed the vignette relevant to this scenario, 74% declared that they would have performed all three tests and 97% would have checked the intraocular pressures and examined the fundus.

Compared with the SP data, a greater proportion of optometrists (*Table 11.4*) who completed the vignette would have asked the patient in this scenario if she had been diagnosed with glaucoma (error: +14%) compared to the proportion reported by the SP as actually having asked this question. Although 30% of optometrists visited asked the SP if she had glaucoma, record abstraction findings suggested marked under-recording, with no optometrists having recorded this information (error: -30%). Similarly, whilst 95% of optometrists visited by the SP have asked about the presence/absence of glaucoma in the immediate family, only 24% of those who

submitted record cards had recorded this finding (error: -71%). Surprisingly, only 43% of optometrists who completed the vignette 'asked' about a family history of the condition.

Table 11.4: The gold standard (SP), record abstraction and clinical vignette findings relating to the patient's presenting symptoms of difficulty with near vision; their "at risk" status for glaucoma; and the management options to address these signs and symptoms.

Symptoms and History	Standardised Patient	Record Abstraction	Clinical Vignettes
Identify the patient's reason for visit	100%	91%	99%
Ask the patient about their distance vision	97%	65%	97%
Ask the patient about their near vision (if unknown from reason for visit)	95%	82%	66%
Ask if the patient has ever been seen at the Hospital Eye Service	96%	76%	81%
Ask if the patient has a lazy eye	41%	35%	74%
Ask if the patient has glaucoma	30%	0%	44%
Ask about the presence/ absence immediate family history of glaucoma	95%	24%	43%
Ask the patient's occupation	87%	71%	95%
Ask the patient about the type of visual tasks she does	100%	76%	72%
Management	**Standardised Patient**	**Record Abstraction**	**Clinical Vignettes**
Advise the patient to update their current spectacles due to a clinically significant change is prescription	69%	62%	76%
Advise a re-examination interval	83%	82%	98%

Eighty-three percent of optometrists visited by the SP advised a re-examination interval. Most (76%) advised two years, with 22% advising one year and two optometrists advising 18 months. Of those optometrists who completed the vignette, 68% advised two years, 22% advised one year, 5% advised 18 months, 2% advised 3 years and 1% advised 6 months.

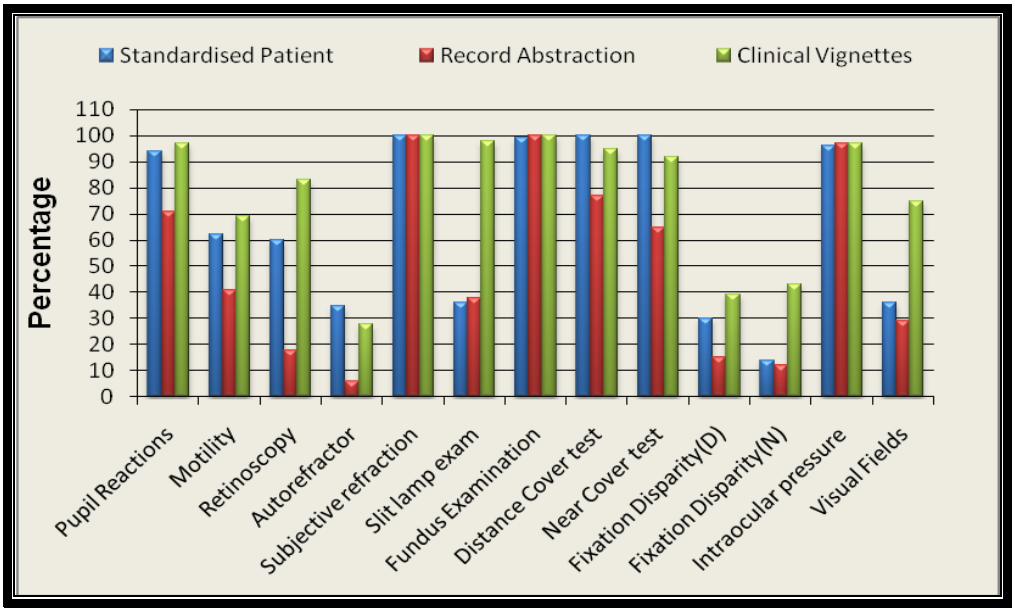


Figure 11.3: A three way comparison, for a) the examination of a standardised patient, b) submitted clinical records and c) clinical vignettes, of the percentage of practitioners who "performed" a range of tests during an eye examination of a presbyopic patient of African racial origin presenting with difficulty with near vision.

Figure 11.3 includes the tests suggested by the expert panel (in the form of research questions) that were felt to be appropriate for a patient who is of African racial origin in this age group (40-50 year olds) presenting with near vision difficulties. As a general trend, optometrists again under-recorded their actions during the examination of this SP. Apart from the distance and near cover tests and autorefraction, a greater proportion of optometrists who completed the vignette would have performed the tests in *Figure 11.3* compared to the proportion of optometrists who performed the tests during the SP visits.

Interestingly, 98% of optometrists who completed the online vignette declared they would have performed a biomicroscope aided anterior eye examination on this patient, although only 37% of optometrists performed this test during the SP visits. These differences were statistically significant (chi-square, $p<0.0001$). The difference between the proportions of optometrists who performed a biomicroscope aided anterior eye examination as reported by the SP and those who recorded performing this test was not statistically significant ($p=0.82$).

As described previously in this thesis, the College of Optometrists recently conducted a clinical practice survey in the form of a questionnaire (College of Optometrists, 2008b). Several different areas were covered in the questionnaire, for example, the equipment

that optometrists use, the type of practice in which they work and primary care activities they may be involved in. One section of the questionnaire focussed on how optometrists check for glaucoma in different patients depending on their age, race and the presence/absence of a family history of glaucoma (e.g., white adult over the age of 40 with no family history of glaucoma, black African-Caribbean over the age of 40 with a family history of glaucoma etc). One of the categories of patient used in this section was a 'black African-Caribbean' patient, over the age of 40 with no family history of glaucoma. This patient profile is comparable to the standardised patient profile used in this scenario; hence the findings of this research are compared in *Table 11.5* and in the Discussion to the results of the clinical practice survey.

Table 11.5: A comparison of the results obtained from the College of Optometrists' clinical practice survey (2008) to the gold standard (SP), record abstraction and clinical vignette findings of this study for the three main tests used for checking for glaucoma in a patient of African racial origin over 40 years of age.

Test	Standardised Patient	Record Abstraction	Clinical Vignettes	College of Optometrists Survey
Disc assessment	99%	100%	100%	94%
Tonometry	96%	94%	97%	96%
Visual Fields	36%	29%	75%	43%

11.3.3 Scenario 3

Concerning the primary research question, the presenting symptom of flashing lights was identified in 87% of cases during the SP visits; in 80% of these cases simply by asking the patient their reason for attendance, and in a further 7% of cases, where the reason for the visit was not established, by the practitioner specifically asking about flashing lights. In the case of the 13% of optometrists who did not identify the patient's presenting symptom, the SP advised the optometrist during the course of the examination of their reason for visit. The error (+6%, not reported by the SP but recorded on the clinical record) between record abstraction and gold standard findings could be attributed, at least in part, to those cases where the optometrist was advised of the symptoms during the course of the examination. All optometrists who completed the clinical vignette relevant to this scenario established the patient's presenting symptom by 'asking' the reason for their visit.

As described in chapter 6 (section 6.2.2), clinical guidelines on flashes and/or floaters and views from the expert panel were used to derive a list of questions to aid identification of the nature of the flashing lights. These questions are listed in *Table 11.6* with the results from the three methods of measuring clinical practice. Optometrists visited by the SP on average tended to under-record the questions asked to establish the nature of the flashing lights (average error: -22%). Conversely, a greater proportion of optometrists who completed the online vignette for this scenario 'asked' questions relating to the flashing lights compared to the gold standard findings (average error: +29%).

Of the 102 optometrists visited by the SP, none of the optometrists asked all seven questions listed in *Table 11.6* relating to the patient's presenting symptoms and none of the records from which information was abstracted contained answers to all these seven questions. Interestingly, 49% of practitioners who completed the vignette asked all seven questions. Although the patient in this scenario had a long-standing history of floaters, only 85% of optometrists asked the patient about the presence/absence of floaters and there is evidence of considerable under-recording from the submitted records (error: -22%). However, 96% "asked" about floaters in the vignette (error: +11%). Although 71% of optometrists who completed the vignette declared that they would have asked all four questions listed in *Table 11.6* relating to the history of the floaters, only one optometrist visited by the SP actually asked all four of these questions.

Table 11.6: The gold standard (SP), record abstraction and clinical vignette findings relating to the patient's presenting symptoms of flashing lights and the advised management options regarding these symptoms.

Symptoms and History	Standardised Patient	Record Abstraction	Vignettes
Identified the patient's presenting symptoms of flashing lights	87%	93%	100%
Location of flashing lights in the visual field	53%	22%	92%
Ask if the flashing lights are in one or both eyes	72%	61%	98%
Description of flashing lights	26%	29%	98%
Ask if there is a pattern to the occurrence of the flashing lights	83%	49%	69%
Ask if there is a change in the pattern of the flashing lights	39%	0%	65%
Description of onset of symptoms (i.e., when the symptoms were first noticed)	94%	76%	98%
How long the flashes of lights last	34%	7%	83%
The presence/absence of floaters	85%	63%	96%
Description of onset of the floaters (i.e., when the floaters were first noticed)	21%	12%	93%
Ask if the floaters are in one or both eyes	9%	0%	86%
Ask if there has been a change in the number or pattern of the floaters seen	51%	10%	94%
Ask about the presence/ absence of a shadow in the patient's visual field	36%	12%	55%
Ask if the patient had recently banged their head	18%	5%	84%
Ask if the patient has ever been seen at the Hospital Eye Service	44%	61%	88%
Management	**Standardised Patient**	**Record Abstraction**	**Clinical Vignettes**
Advise the patient of further tests required (using drops) to address the presenting symptoms: • On the same day • Within one week • Whenever convenient	 66% 94% 18% 13%	 51% 95% 5% 14%	 96% 86% 4% 0%
Advise the patient and/or obtain the patient's consent to refer them for a second opinion: • On the same day • Within one week • Whenever convenient	 25% 52% 32% 16%	 24% 60% 10% 10%	 44% 12% 44% 11%
Advise a re-examination interval	68%	78%	100%

As seen from *Table 11.6*, two thirds of optometrists visited by the SP recommended a dilated fundus examination, with the majority recommending that the dilation be performed on the day of the visit. Evidence from submitted records again suggests under-recording of this recommendation of dilation (error: -15%), and under-recording of this nature could have important implications for any subsequent clinico-legal cases. Ninety-six percent of optometrists who completed the vignette stated that they would have performed a dilated fundus examination on a patient presenting with flashing lights of this nature. The majority of these optometrists would have performed the dilation on the same day. Ten percent of optometrists selected dilation as a management option but did not select their preference from the three options relating to the urgency of the mydriatic examination. Forty-four percent of optometrists (*Table 11.6*) who completed the vignette chose to refer this patient for a second opinion regarding his symptoms. 160 optometrists who completed the clinical vignette chose to dilate this patient. Thirty-nine percent of the 160 optometrists who chose to dilate this patient would have also referred the patient. Sixty-nine percent of optometrists who would have referred the patient for a second opinion would have written a letter to the patient's General Medical Practitioner (GMP). Five percent of optometrists would have written a letter of information to the patient's GMP regarding the patient's presenting symptoms.

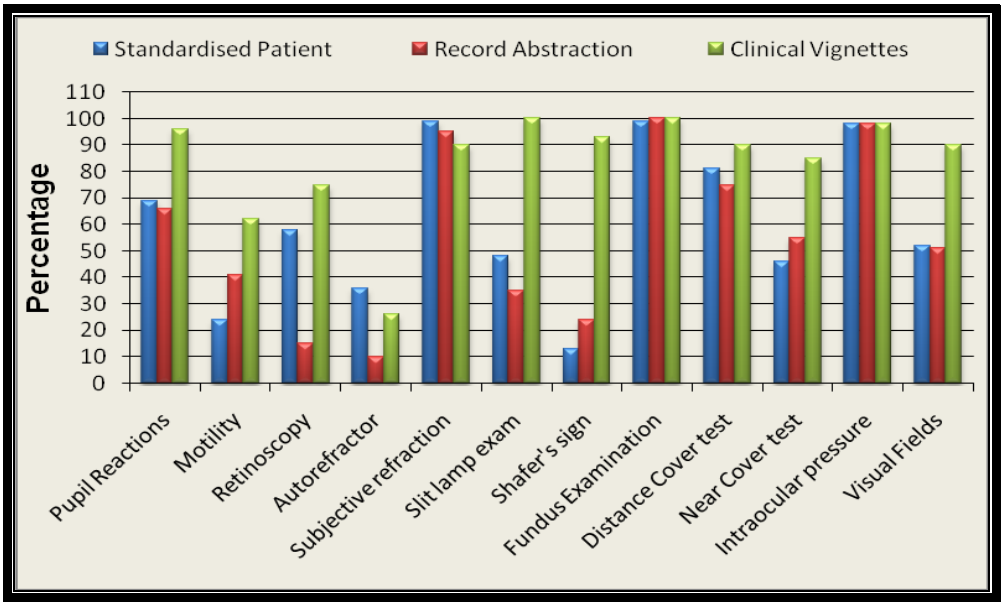


Figure 11.4: A three way comparison, for a) the examination of a standardised patient, b) submitted clinical records and c) clinical vignettes, of the percentage of practitioners who performed a range of tests during an eye examination of a patient presenting with flashing lights of a recent onset.

As noted in the two previous scenarios and in *Figure 11.4* optometrists generally under-recorded their actions during the examination of this patient. However, there were some tests for which optometrists tended to over-record in this scenario, for example motility (error: +18%), near cover test (+8%) and examining the vitreous for pigment cells (+11%). Of those optometrists who completed the online vignette, the proportion who reported that they would have performed the tests listed in *Figure 11.4* was generally greater than findings from the SP visits and record abstraction. Although a greater percentage of optometrists who completed the online vignette for this scenario would have performed retinoscopy on this patient (error: +17%), a lower percentage would have performed autorefraction (-10%) and a subjective assessment of the refractive error (-9%).

As described in chapter 6 (section 6.2.2), the expert panel for this case scenario suggested two appropriate approaches for the optometric examination of a patient presenting with symptoms of this nature. The first approach is to perform a full routine eye examination incorporating tests and questions to address the patient's symptoms and the second is a symptom-led assessment addressing the patient's reason for visit and concentrating on appropriate posterior segment investigation. None of the optometrists visited by the SP in this case scenario or those who completed the vignette performed a purely symptom-led assessment. One optometrist who completed the vignette concentrated on the patient's symptoms although s/he would have checked the patient's oculomotor balance, performed an objective but not subjective assessment of the refractive error, checked the patient's intraocular pressure and assessed their visual field.

As explained in Chapter 6, during the course of the standardised patient visits, the SP was asked by the research team not to undergo pupillary dilation unless it was his last practice visit of the day for ethical and practical reasons. If the optometrist visited wanted to carry out a dilated fundus examination, the SP acted in a nervous manner and asked the practitioner if this would affect his vision, if this information had not already been volunteered by the practitioner. Twenty-four optometrists carried out a dilated fundus examination. Twenty of the 24 optometrists examined the fundus using monocular direct ophthalmoscopy, 18 used binocular indirect ophthalmoscopy, and 14 used both monocular direct ophthalmoscopy and binocular indirect ophthalmoscopy.

In this vignette, 84% of the 160 optometrists who would have performed a dilated examination would have used tropicamide as the mydriatic for dilation, 8% would have used the combination of tropicamide and an anaesthetic and 8% of optometrists who selected the dilation option did not select the their drug(s) of choice for dilation. Following dilation, 4% would have examined the fundus using a monocular direct method, 76% using slit lamp binocular indirect ophthalmoscopy, 9% using head mounted binocular indirect ophthalmoscopy, 1% using a different unspecified method, 1% would not have examined the fundus and 8% of optometrists did not select any of the choices listed.

Ten percent of optometrists visited by the SP (as a private eye examination) took fundus photographs as a standard procedure during the eye examination and 4% offered fundus photography albeit at an additional charge. 22% of optometrists who completed the vignette stated that they would have taken fundus photographs as a standard procedure during the examination, while 27% would have done so at an additional cost to the patient.

Fifty-two percent of optometrists visited by the SP carried out visual field testing, almost invariably using perimeters (of the five optometrists who carried out confrontation, three also carried out an automated visual field test). Although it is difficult to say for certain without having access to the results of all the visual field examinations, an estimation based on timings is that 90% of optometrists (or assistants to whom this task was delegated) who performed visual field testing carried out a supra-threshold test. This interpretation is supported from the clinical records that were obtained, in which 90% of optometrists who had performed visual field testing used a supra-threshold test.

Ninety percent of optometrists who completed the vignette declared they would have performed visual field testing: 22% would have performed a supra threshold central test, 7% a full threshold central test, 46% a supra threshold wide field test, 11% a full threshold test, 10% would have used frequency doubling technology (FDT), 1% would have used another unspecified method and 3% of optometrists did not select any of the options listed.

11.4 Discussion

A standardised patient encounter provides an insight into an optometrist's ability to obtain essential information during the eye examination, including information relating to relevant presenting symptoms such as photopsia and headaches. An accurate record of the eye examination is important both for the ongoing care of the patient and to defend the practitioner in the case of litigation or a disciplinary proceeding. Good clinical records should summarise discussions between the patient and the practitioner, test results, and the conclusions (Warburton, 2004). Accurate records help the optometrist to make a decision at the time of the consultation based on the patients presenting symptoms and provide a comparator for any symptoms the patient may have at a later date.

Vignettes have been used to measure clinical practice (Gould, 1996;Cornfeld *et al.*, 2001) but their use has been limited due to unaddressed concerns about their validity and ability to discern variations in quality (Peabody *et al.*, 2004a). They are however less expensive to administer than standardised patients and record abstraction and could be constructed in such a way as to allow the measurement of clinical care in different practice settings and to allow cross system and cross national comparisons (Morita *et al.*, 2002; O'Connor *et al.*, 1996). If validated, vignettes also offer the prospect of a more thorough measurement of clinical practice compared to other methods used for quality measurement that measure a few qualities per case (Peabody *et al.*, 2004a).

Table 11.2 compares the results of the three methods using chi-squared tests. In view of the large number of comparisons in this table, it is likely that some of the variations between the methods will be statistically significant purely by chance. It could therefore be argued that the p-value that is taken to be statistically significant should be adjusted to take account of this. One adjustment that is frequently used in such situations is the Bonferroni correction, where the p-value is multiplied by the number of paired comparisons. However, this approach has been criticised for large numbers of comparisons as being 'highly conservative' (Altman, 1991). In considering *Table 11.2*, it is therefore suggested that a p-value is likely to be significant if it is less than or equal to 0.005, which is ten times more conservative than the usual value. In fact, many of the p-values for the comparisons in *Table 11.2* are <0.0001 and it is recommended that greatest emphasis is placed on these comparisons.

This table does reveal several comparisons, mainly from Scenario 2, where record abstraction underestimates the SP results at a $p<0.0001$ level of significance, indicating a tendency for optometrists to under-record their findings. In the comparisons between SP and vignette data, there are many comparisons for which the p-values reach this level of significance, indicating a marked tendency for vignette data to overestimate clinical care. The data in *Table 11.2* indicate which clinical tests investigated are most likely to be associated with over- or under-reporting.

The results indicate that optometrists ask more questions relating to the patients' symptoms and history; perform more clinical tests and offer more advice than they report in their clinical records. Clinical vignettes overestimate the quality of care compared with SPs and record abstraction. When considered alone, clinical records underestimate clinical care provided to patients. It could be argued that clinical records should accurately reflect what actually happened in the consultation and any over- or under-recording is unacceptable. However, a fairer view might be that records can only be a summary of the clinical event, and in a busy clinical setting it is almost inevitable that some over- or under-recording will occur. The clinical significance of over- and under- recording is discussed in greater detail in chapter 8. In this chapter, the findings from the three studies are discussed.

Optometrists visited by the standardised patients asked more questions relating to the patients' symptoms and history than were recorded in the clinical records. Excluding a few questions (e.g., location of headache in the first patient scenario and pattern of occurrence of flashing lights in the third patient scenario), it is interesting to note that optometrists who completed the vignettes (particularly the first and third clinical vignettes), declared that they would ask more questions relating to the patient's presenting symptoms compared to the gold standard findings. Headaches and flashing lights are symptoms frequently encountered in optometric practice (Gutteridge & Cole, 2000; Chignell *et al.*, 2000).

The overall over-reporting of history and symptoms in the vignettes could be explained by the fact that optometrists completing the vignettes were not given an 'open' opportunity to list the questions they would ask to establish information relating to the patients' history and symptoms. Instead, if the optometrist selected 'symptoms' on the online record card (i.e., if they would ask the patient about any symptoms such as floaters, headaches etc), then the patient's presenting symptoms would appear on the

screen as an answer with an additional list of questions relating to the presenting symptoms that could be asked. The patient's presenting symptoms would also be displayed if the optometrist selected reason for visit followed by an additional list of questions relating to the presenting symptoms that could be asked. If the optometrist selected a particular question, an answer to that question would be revealed.

Although optometrists were asked to select only those questions that they would have asked in an actual eye examination, there is likely to be bias with some practitioners selecting questions they may not necessarily have asked during a typical eye examination. This approach was used in all three vignettes for the symptoms and history and management sections of the "examination" and the over-reporting in both these sections of the vignettes for all three patient scenarios may be the result of this bias.

The recent survey by the College of Optometrists asked optometrists how often they would use a slit lamp biomicroscope to examine the anterior eye or anterior segment during a routine eye examination of an adult patient. Thirty-seven percent of optometrists said they would always use a biomicroscope, 60% they would use this sometimes, 1% would never used a biomicroscope and 1% did not reply (College of Optometrists, 2008b). From the gold standard findings of this study, in which all three patients were symptomatic adults, on average 40% of optometrists visited by the three SPs examined the anterior eye using a slit lamp, 25% of optometrists recorded performing an anterior eye examination using a slit lamp and 98% of optometrists who completed the vignettes declared that they would have performed a slit lamp aided anterior eye examination.

In *Table 11.5*, the SP findings are compared to the data gathered from record abstraction, clinical vignettes and a recent College of Optometrists' questionnaire. The similarity of both the SP for Scenario 2, and the equivalent vignette patient profile, to the "patient" who formed the basis for a set of questions in the College survey presents a unique opportunity to compare four different methods of assessing clinical practice. For this patient scenario, a comparison of the SP findings to the College survey revealed no significant difference for visual field examination ($p=0.15$) and tonometry ($p=0.96$) although a significant difference was found for fundus examination ($p=0.04$). No statistically difference was found between the SP and vignette findings for fundus examination ($p=0.17$) and tonometry ($p=0.73$), but there was a statistically significant

difference ($p<0.0001$) between the proportion of optometrists that the SP detected performing a visual field examination and those who stated in the vignette that they would have performed a visual field examination had this patient presented for an eye examination. For the same three tests, chi-square analysis (*Table 11.2*) revealed no significant difference ($p>0.48$) when comparing the SP findings to information abstracted from the clinical record cards.

Interestingly, according to the College of Optometrists survey, 94% of optometrists would always assess the optic disc of an 'African-Caribbean' patient over the age of 40 with no family history of glaucoma and 2% would assess the disc sometimes. The gold standard SP findings in this study show 99% of optometrists visited by the SP in this patient scenario performed fundoscopy; all of the optometrists whose records were obtained had recorded fundus examination findings and all optometrists who completed the vignette would have examined this patient's fundus.

Although it is difficult to establish with certainty that the optic disc was examined during the SP visit, or whether it would have been examined in the case of the optometrists who completed the vignette, it has been assumed that optometrists who perform fundus examination would examine the optic disc. The figure of 94% of optometrists who responded in the College survey that they would carry out disc assessment in this patient is a little incongruous since, in the same survey, 96% of practitioners declared that they would always 'assess the patient's optic disc' for a patient who was 'white over age 40 with no FH of glaucoma'. It may be that different practitioners were interpreting 'assess optic disc' in different ways, perhaps some interpreting this as using binocular indirect ophthalmoscopy. Nonetheless, it is still unclear why fewer would assess the disc with a patient of African racial origin than with a white patient from the same age group.

The vignettes were displayed as a typical optometric record card with the usual headings and abbreviations. All the usual tests that may be included in a routine eye examination were represented by "boxes" on the on-screen record card. Although optometrists were advised to only select those investigations that they would perform on that particular patient, it is likely (due to human bias or simply through curiosity) that optometrists who completed the vignettes may have 'clicked' on tests that they may not have performed in a real eye examination. This again could help to explain the over-reporting in the vignette results.

A different approach to the design of the clinical vignettes would be to expose the practitioner to the patient's presenting problem and ask the practitioner open-ended questions (e.g., 'How would you assess the patient's ocular health?'). These would allow participating optometrists to list questions they would ask regarding the patient's symptoms and history, tests they would perform during the examination and management advice that would be given to the patient. There would have been some advantages to this approach, but it would have less closely resembled a typical eye examination and optometrists might have forgotten some tests that they would routinely carry out when placed in this artificial situation.

Another disadvantage is that this approach would have required a skilled person to extract all the relevant information from the vignettes and would make data analysis much more time consuming and complex. Furthermore, it may have required participating optometrists to be more computer literate and would have made the vignette more time-consuming for the respondents to complete. It would also have been difficult to incorporate the timer (to discourage practitioners from being over-zealous in selecting tests) as practitioners' different typing speeds would have to be taken into account. Finally, such an approach would have required subjective judgements on behalf of the person categorising the results, which would have been another source of error.

Despite the widespread use of vignettes, there is uncertainty and controversy about whether vignettes reflect actual clinical practice or merely the practitioner's competence (Peabody *et al.*, 2000) and/or knowledge (Rethans *et al.*, 1991; Sandvik, 1995). To maximise the validity of vignettes, they must incorporate several features which were included in this research study. These include providing online real time responses, imposing time constraints to ensure participating optometrists were not simply "ticking" every box, and ensuring that the vignettes reflect the complexity found in a real life situation.

As described earlier in this chapter, a timer was displayed in the top half of each of the three vignettes. Prior to completing a vignette, optometrists were required to complete some preliminary details: name, e-mail address, year of qualification, postcode of the town/city in which they practice, GOC number and their testing time (time taken for a patient presenting for a routine sight test). The testing time recorded was used as a guideline. If a practitioner took longer to complete the vignette than the time recorded

during the initial registration, the timer displayed on the top of each vignette changed colour from green to red indicating to the practitioner that they had gone over their normal test time. This was to discourage practitioners from being over-zealous in selecting tests that they might not have completed in a real eye examination. However, some optometrists, perhaps because of unfamiliarity with the process and/or to give themselves more thinking time, may have entered a longer testing time than they would normally take to perform a routine eye examination in practice (see *Table 10.15*). This would allow, and indeed encourage, a more detailed examination when completing a vignette than in their normal practice environment.

Computerisation of the clinical vignettes reduces the time and funding required to score hand-written responses for vignettes and record cards (Peabody *et al.*, 2004a). Administering computerised vignettes is also easier and more realistic than written vignettes. The main advantage of computerised vignettes is that they allow real time responses which are more likely to simulate an actual eye examination. Previous studies found vignettes to be superior to record abstraction for most measures but, compared with SPs, non-computerised vignettes over-estimated the quality of examinations and were inaccurate at reporting treatment plans (Peabody *et al.*, 2000). A later study by these authors used computerised clinical vignettes, which were a significant improvement on record abstraction (Peabody *et al.*, 2004a).

This study was subject to a few limitations. Only about one third of practitioners who were visited by SPs returned their clinical records for the record abstraction study. This was only appropriate for practitioners who had consented to the 'feedback' option, a total of approximately sixty practitioners for each SP; and for practitioners who had not stated a preference (full anonymity or feedback), approximately thirteen for each scenario. So, for the 219 requests for clinical records to be returned, a participation rate of 51% was achieved. Practitioners who were concerned about their clinical thoroughness or record keeping may have been more likely to decline the invitation to participate in the research; to opt for the 'full anonymity' option; or to decline to send in their clinical records. Therefore, the researcher believes that the data obtained from record abstraction are likely to over-estimate the standards of record-keeping in the UK optometric profession.

The differences in sample sizes and in their composition for the three methods of assessing clinical care are potential limitations to this study. The ideal approach to

comparing results of this nature would be to have the same optometrists providing data in each of the three methods. However, although all optometrists visited by the standardised patients were invited to complete the clinical vignettes, only a handful chose to participate. It would be useful to perform this study again using the same practitioners throughout.

An additional limitation is the possibility of "compensating errors". For example, *Table 11.1* reports average errors calculated for each scenario and over-reporting in some tests within one domain of the eye examination will tend to cancel out some under-reporting of another test within the same domain. Such a compensating error would not be revealed by an average result across all sets in the domain. Similarly, if on average more practitioners record a test (e.g., motility) than carry it out this does not preclude the possibility that some practitioners do the test but do not record it.

The data gathered from completion of the clinical vignettes (chapter 10, section 10.3) showed consistently higher proportions of optometrists who declare that they would ask questions relating to the patient's history and symptoms; perform tests and offer management advice compared to the percentage of optometrists who actually asked those questions, performed those tests and offered that management advice, and was consistently higher than the proportions of those who recorded this information during the SP visit. These results imply that optometrists' knowledge and competence is better than their practice. Vignettes are a novel way of measuring clinical care within optometry, although the results obtained show the limitations of this approach. In particular, they over-estimate standards of clinical care and the researcher believes that they are therefore inappropriate as an absolute measure of what is likely to happen in a real consulting room. Vignettes may, however, be useful for providing comparisons between different groups of practitioners. With the recent changes in community optometry in Scotland and Wales, the use of clinical vignettes for further comparative analysis should be explored.

The findings of this research indicate that record abstraction underestimates clinical care and although novel to optometry, the results closely mirror research results in other healthcare disciplines. For future research on clinical practice, record abstraction is not a valid method of determining the tests that take place in a real consulting room. In other words, record abstraction reflects record-keeping skills as much as it does clinical skills. These findings have implications for litigation and disciplinary cases. It is

clear that practitioners frequently carry out investigations that they do not record. Whilst it is best practice to record all investigations (Warburton, 2004), it may be that many practitioners try to make the most of the available clinical time by recording only those results that in their opinion will be relevant and useful to the next practitioner.

11.5 Chapter summary

Different methods of measuring clinical care capture different elements of clinical practice and are prone to different biases. The results of this three-way comparison show that clinical records tend to under-estimate actual care provided and vignette scores were consistently higher when compared to the SP and record abstraction data. Although standardised patients are expensive for routine application, they are the gold standard method of assessing the content of optometric eye examinations. The next and final chapter will focus on ideas for further research and conclusions drawn from the present research.

12 Ideas for Further Research and Final Summary

12.1 Ideas for further research

This research raises many interesting questions and highlights the need for further work in this area. Since the telephone survey to assess the availability of state-funded primary eyecare in the UK for two patient categories (chapter 2) was carried out, a CET DVD on binocular vision anomalies has been circulated to all optometrists in the UK by DOCET [The Directorate of Optometric Continuing Education and Training, (DOCET, 2007)]. It is hoped that the launch of DOCET's Paediatric Eyecare Project will lead to an increase in the proportion of optometrists who provide eyecare to pre-school children. In view of these two initiatives, it would be useful to carry out a follow-up telephone survey using a similar scenario as described in chapter 2 (section 2.4) to establish whether these CET aims have been achieved. Only a minority of respondents in the telephone survey were from Scotland and Wales. Using a similar study design, it would be interesting to investigate the impact of the various eye care schemes that have recently been introduced in both Scotland and Wales. Such research could investigate whether there were any trends in responses depending on the type of practice (independent, small multiple, large multiple).

As discussed in chapter 9 (section 9.2), the level of funding available for the present research limited the standardised patient visits to those optometrists working within 1.5 hours travel from central London (excluding the City of London). It would be valuable to extend the boundaries of the study to investigate any regional variations in the content of optometric eyecare in England. Additionally, it would be beneficial to gather information relating to the practitioners' date of first registration and initial training institution to allow further comparative analysis to be performed.

Standardised patient encounters have proved to be a successful and viable method of assessing the content of optometric eye examinations in England. However, it would be fascinating to extend the focus of SP research beyond the three patient scenarios described in this thesis. Other aspects of optometric eyecare, such as binocular vision anomalies, contact lenses, and dispensing, could be explored in future SP research. Additionally, it would be beneficial to gather data on date of first registration and initial

training institution for all consenting practitioners and perform further comparative analysis.

In view of the improved funding arrangements and expanded scope of practice for NHS primary eyecare in Scotland and Wales (Association of Optometrists, 2008d), a further study investigating the content of optometric eye examinations in Scotland and Wales would be beneficial. Comparisons between the results of such a study and those from the present thesis (plus additional data from England, if required), would be beneficial and could have important implications for the future of the NHS General Ophthalmic Services in England.

Although at present it is rare for practices to have computerised clinical record cards (as noted in chapter 8), most practices use computerised recall systems. However, the proportion of practices using computerised clinical records is likely to increase over the next few years. Further research to investigate the impact of computerised clinical record cards on record keeping would be useful. Computerised optometric clinical records could potentially result in an increased proportion of false positives and false negatives either because the optometrist entered a default entry for a test result by 'tabbing' through the various fields in the record (false positive) or because they forgot to complete a group of tests due to the tests being presented on different pages of the system (false negative). Further research to investigate these hypotheses would be useful.

As discussed in chapter 10, vignettes are an easily administered, cost-effective way of assessing levels of clinical care and can therefore be used in a great variety of settings i.e., to assess regional variations in clinical practice across the country. With the recent changes in optometry in Scotland and Wales, the use of clinical vignettes for further comparative analysis should be explored.

12.2 Final summary and conclusion

A literature review (chapter 1) highlighted a lack of systematic research investigating standards of clinical practice within optometry. Evidence-based research to determine the content of typical optometric eye examinations was thought to be valuable for several reasons, including gathering data on current optometric services, developing priorities for optometric continuing professional development, and to evaluate the

outcome of training initiatives. Objective data on the current scope of optometric activities may influence governmental, NHS, and professional policy decisions. The factual information will make it easier for the Bolam and Bolitho tests (Herring, 2006;Jones, 1996) to be applied in a fair and consistent way in clinicolegal cases (both for civil litigation and disciplinary cases instigated by the General Optical Council). Evidence-based research on the content of typical optometric eye examinations will help to develop guidelines that differentiate between realistic minimum standards of clinical competence (e.g., an important test that nearly all optometrists are using) and aspirational goals (best practice, which is still not achieved by a significant body of reasonably competent optometrists).

Chapter 1 revealed three main approaches of measuring clinical practice: (1) abstraction of medical records, (2) use of clinical vignettes and (3) use of standardised patients who present unannounced to clinics. The use of these different methods for assessing the content of clinical consultations was compared and contrasted in this chapter.

A telephone survey was carried out to investigate the availability of General Ophthalmic Service (GOS) sight tests for two categories of eligible patients. A total of 200 primary eyecare practices were randomly selected, of which 100 were telephoned to establish the availability of a sight test for a child aged one year whose mother is concerned due to the presence of a family history (parental) of strabismus. The other 100 practices were telephoned to investigate the availability of a sight test for a person aged 90 years who was described as having dementia.

99.5% of UK optical practices that participated in the study provided GOS sight tests. The mean age at which practices declared that they start examining children was 3.1 years and about half of the practices contacted would not offer a GOS sight test to a one-year-old child whose mother is concerned the child may have an ‘eye turn’. The GOS Terms of Service do not permit practitioners to exclude categories of patients from GOS services, although this interpretation is equivocal. Indeed, it is suggested that clinical and ethical reasons may sometimes require practitioners to decline to examine certain categories of patient. However, it is worrying that one quarter of practices did not recommend an eye examination for a young child with a family history of strabismus.

Similarly, 7% of the practices contacted during the survey declined to offer an appointment at a stage in the questioning when all they knew was that the patient was aged 90 and had dementia. The results of the survey highlighted an important issue for primary eyecare practitioners in the UK. Practitioners who lack the skills, experience, or aptitude to deal with a certain category of patient are faced with a dilemma. However, in view of the infrequent attendance of this very young age group (Guggenheim & Farbrother, 2005) and of certain other categories of patient (e.g., people with intellectual disabilities) in some optical practices, it may be impossible for all practitioners to maintain sufficient levels of experience to meet the professional guidelines.

The literature review revealed that the use of standardised patients is the "gold standard" methodology for assessing "real life" clinical practice (chapter 1). This methodology was used to investigate the content of optometric eyecare for three different patient scenarios. In chapter 4, the content of optometric eyecare for a young myope presenting with recent onset headaches was investigated. A trained actor presented unannounced as a 20 year old student, complaining of symptoms suggestive of migraine headaches, to 100 community optometrists for an audio-recorded eye examination. The results were recorded on a pre-designed checklist based on evidence-based reviews on headaches, clinical guidelines, and the views of an expert panel of optometrists.

The presence of headache was detected in 98% of cases visited by the first SP. Although none of the optometrists asked all of eight standard headache questions that were considered to be appropriate for primary care headache investigation, 22% asked at least four of the eight questions. 69% of practitioners asked the patient to seek a medical opinion regarding the headaches. The proportion of the tests that were recommended by the expert panel that were carried out varied from 33% to 89% and the durations of the eye examination varied from 5 to 50 minutes. Optometrists in primary care practice can expect approximately 10% of their male patients and one quarter of their female patients to be migraine sufferers or to have a history of migraines (Gutteridge & Cole, 2000); therefore they will spend a significant period of time in practice discussing migraines. In view of the findings of the present research, it is recommended that future optometric continuing education and training (CET) could usefully focus on migraine diagnosis and assessment.

In chapter 5, the content of optometric eyecare for an early presbyopic SP of African racial descent, an 'at risk' patient group for Primary Open Angle Glaucoma (POAG), was investigated. A trained actor presented unannounced as a 44-year-old of African racial descent, complaining of recent near vision difficulties, to 100 community optometrists for an audio-recorded eye examination. 95% of optometrists visited by the SP in this scenario carried out optic disc assessment and tonometry, which conforms to College of Optometrists' advice that those over 40 years should receive at least two of tonometry, optic disc assessment, or visual field testing. 35% of optometrists carried out all of these tests and 6% advised the SP of the increased POAG risk in those of African racial descent.

The detection rates for glaucoma are likely to vary across the optometric profession because criteria for the use of screening tests and referral of suspect patients have been shown to vary widely between optometrists (Vernon & Ghosh, 2001). However, Patel and colleagues demonstrated that ongoing training of optometrists resulted in an increased rate of detection of glaucoma within the community (Patel *et al.*, 2006). This and the results of the present research suggest the need for further CET in glaucoma screening, which emphasises increased POAG risk in those of African racial descent.

In chapter 6 the content of optometric eyecare for a presbyopic patient who presented with recent photopsia was investigated. 102 consenting optometrists were visited by an actor (incognito) who presented as a 59 year old patient seeking an eye examination and complaining of recent onset flashing lights. The presence of photopsia was proactively detected in 87% of cases. Although none of the optometrists visited asked all seven gold standard questions relating to the presenting symptoms of flashing lights, 35% asked four of the seven questions. 85% of optometrists asked the patient about the presence of floaters in his vision and 36% of optometrists asked if he had noticed any shadows in his vision. 66% recommended dilated fundoscopy to be carried out by either themselves or by another eyecare practitioner.

Twenty-nine percent of optometrists asked the patient to seek a second opinion regarding the photopsia. Of those who referred, 70% asked for the referral to be on the same day or within a week. 64% of the 102 optometrists who were sampled during this study complied with the College of Optometrists' guidelines for a patient who was characterised by the SP in this case scenario. In view of these findings, future optometric continuing education could focus on history taking, examination techniques

and referral guidelines for patients presenting with symptoms of posterior vitreous detachment, retinal breaks and secondary retinal detachment.

The reproducibility of refractive error measurements using prescriptions obtained by three SPs is discussed in chapter 7. The three SPs were independently examined by 3-4 expert optometric clinicians to obtain 'benchmark' estimates of refractive error. The spectacle prescriptions obtained by the SPs from community optometrists were analysed for spherical equivalent refraction, spherical power and cylindrical power, and using astigmatic decomposition. The spherical equivalent refractions were found to be within ±0.25D of the benchmark on average 81% of the time and within ±0.50D 97% of the time. The spherical power was within ±0.25D 90% of the time and within ±0.50D 98% of the time. The cylindrical power agreed within ±0.25D 93% of the time and within ±0.50D 100% of the time.

Based on reproducibility limits data obtained for all six eyes, any two optometrists would differ in their estimation of spherical equivalent refraction by no more than 0.75D in 95% of repeated measures. The astigmatic data (C_0 and C_{45}) show that optometrists will differ in their estimation of the C_0 component by between 0.25D and 0.61D and for the C_{45} component by between 0.22D and 0.47D in 95% of repeated measures. The agreement between the data obtained from the present research and the results of other similar studies support the conclusions that subjective refractive findings are reproducible to approximately ±0.75D when performed by multiple optometrists in patients of different age groups and levels of ametropia. Standardised patients are an effective way of measuring reproducibility of refractive error and should be considered for further comparative analysis in different age groups and different levels of ametropia.

A literature review (chapter 1) revealed abstraction of information from clinical record cards to be an accepted method of measuring clinical practice. In chapter 8, clinical records describing the content of optometric eye examinations were compared to the actual content, as revealed by SPs. Upon completion of the standardised patient visits, copies of the clinical record cards were requested. Using the SP findings as the gold standard, the information gathered from the clinical record was classified for each quality criterion as true positive, false negative, false positive and true negative. Compared to the gold standard, false positives were identified during record abstraction in approximately 4% of cases and false negatives in approximately 18% of

cases. For symptoms and history, the proportion of false negatives ranged from 15-24% and 3-4% for false positives. The proportion of false negatives for tests performed during the eye examinations, ranged from 12-22% and false positives ranged from 2-6%. Optometrists give patients more verbal advice than is indicated in their records (false negatives, 11-19%). On average, 5-15% of practitioners' recorded patient management and advice that was not reported by the SPs.

The findings of optometric consultations mirror the findings in other healthcare disciplines: clinical records are an imperfect representation of the content of a clinical consultation. Clinical records are subject to a recording bias leading to both under- and over-estimation of the care provided due to the presence of false negatives and false positives. The present research has important implications for clinico-legal cases, where clinical records are a key item of evidence; and these findings indicate that accurate record-keeping should be a priority for optometric continuing education.

A literature review revealed clinical vignettes to be the third accepted method of measuring clinical practice. Three computerised vignettes were developed based on the three standardised patient profiles. 233 optometrists completed the vignette for the first scenario, 187 for the second scenario and 167 completed the vignette for the third scenario. All optometrists who completed the first vignette 'identified' the patient's reason for visit and 27% 'asked' all the standard headache questions that were considered to be appropriate for primary care headache investigation. The presence of headaches was 'identified' in 100% of cases and 94% of optometrists offered further advice regarding seeking a medical opinion regarding the headaches.

Seventy-four percent of optometrists who completed the second vignette 'carried out' all of the three tests important for the accurate diagnosis of POAG; 97% of the optometrists 'carried' out at least two of the key tests (ophthalmoscopy and tonometry) and one optometrist 'carried out' a visual field assessment and ophthalmoscopy but did not perform tonometry. All optometrists who completed the third vignette 'identified' the patient's presenting symptom of flashing lights. 49% of optometrists 'asked' all seven gold standard questions relating to the presenting symptoms of flashing lights and an additional 35% asked four of the seven questions. 85% of optometrists 'asked' the patient about the presence of floaters in his vision and 36% of optometrists 'asked' if he had noticed any shadows in his vision. 96% 'recommended' dilated fundoscopy and

44% of optometrists asked the patient to seek a second opinion regarding the photopsia.

Of those who referred, 24% 'asked' for the referral to be on the same day or within a week. 86% of the 102 optometrists who were sampled during this study complied with the College of Optometrists' guidelines for a patient that was characterised by the SP in this case scenario. The results in this chapter reveal clinical vignettes to be an easily administered, cost-effective way of assessing levels of clinical care and can therefore be used in a great variety of settings. The accuracy and validity of vignettes was discussed in the subsequent chapter, in which these findings were compared to the gold standard method of assessing clinical care.

Standardised patient methodology is the gold standard method for evaluating clinical care (chapter 1). Alternative methods include record abstraction and computerised clinical vignettes. Chapter 11 compares the SP findings from the present research (chapters 4-6) to clinical records describing the content of the optometric eye examinations (chapter 8) and to the results from computerised vignettes (chapter 10) in order to assess whether record abstraction and vignettes are accurate measures of optometric clinical care. The average overall error for information gathered from record abstraction compared to the gold standard eye examination ranged from +2 to -26% (positive values indicate items recorded on the clinical records but not reported by the SP).

For history and symptoms, the average error ranged from -9 to -26%; for tests performed during the examination this value ranged from +2 to -24% and for management issues the error ranged from -1 to -4%. The average overall error for the vignette data compared to the gold standard eye examination ranged from 0 to +26% (positive values indicate items that were not carried out in a clinical setting, as recorded by the SP, but were described by optometrists who completed the vignette as tests they would have carried out). For history and symptoms, the average error for the vignette data ranged from +2 to +26%; from 0 to +20% for tests performed during the eye examination and from +1 to +11% for management.

This three-way comparison shows that clinical records tend to under-estimate actual care provided, while vignette scores tend to over-estimate clinical performance. The

significance of these findings for future research and for litigation and disciplinary cases is discussed in this chapter.

In summary, valid measures of clinical competence and practice are the basis of improvement of clinical practice. Clinical competence could be described as “the degree to which a clinician can use their associated knowledge, aptitude, attitude and good judgement in the course of their professional practise and be able to work in an effective way in all situations that correspond to their field of practice” (Miller, 1990). Different methods of measuring clinical care capture different elements of clinical practice and are prone to different biases.

Chapter 1 also drew attention to other attempts to gain an insight into the clinical activities of optometrists through questionnaires (O'Leary & Evans, 2003) most notably those administered by the College of Optometrists (Stevenson, 1998; College of Optometrists, 2008b). Although these are useful there is likely to be a sampling bias since conscientious practitioners are more likely to respond. Additionally, there is a further source of bias with human nature likely to result in replies which indicate higher standards of practise than may actually pertain. Whilst questionnaires about current standards of practice are valuable in assessing the practitioner’s knowledge of skills required in performing his or her professional responsibilities effectively, they do not assess the actual performance in clinical practice.

Although record abstraction has been described as being the most widely used method of measuring quality of clinical care (Gilbert *et al.*, 1996; McDonald *et al.*, 1997; Rubin *et al.*, 1992); in line with the findings of other researchers in this field, the results of the present research emphasised that clinical record cards are subject to false positives and false negatives. Similarly, despite the widespread use of vignettes, there is uncertainty and controversy about whether vignettes reflect actual clinical practice or merely practitioners’ competence at the vignette task (Peabody *et al.*, 2000). The findings of the present study reveal vignette scores tend to over-estimate clinical performance. This is likely because practitioners will give their “best answer” when responding to a vignette as they are in an assessment scenario. Both record abstraction and vignettes assess the “knows how” element of Miller’s pyramid (*Figure 1.1*) which describes a practitioner’s ability to use their knowledge in a particular context.

As described by Miller, the “action” component of professional behaviour is the most difficult to measure reliably and accurately (Miller, 1990). The "does" level refers to actual performance in habitual practice and is best assessed using unannounced standardised patients and completed standardised patient checklists. The use of standardised patients in assessing the content of optometric eye examinations has proved to be very successful and highlights that SP encounters are an effective way of measuring clinical care within optometry.

As in research using SPs in other healthcare disciplines, the SP encounters described in this thesis have demonstrated substantial differences between different practitioners in the duration and depth of their clinical investigations. This is not surprising, since practitioners are individuals with different levels of experience and therefore variations in approach are inevitable. This highlights the fact that not all eye examinations are the same and that there is no such thing as a ‘standard sight test’. Using standardised patients to measure the quality of care and assess the content of optometric eye examinations is practical. A challenge is incorporating observable evidence based criteria into realistic scripts and objective checklists. Although standardised patients are expensive for routine application, they are the gold standard method of assessing the content of optometric eye examinations.

Appendices & Supporting Published Work

Appendices Summary

The appendices are enclosed on a CD-ROM, the contents of which are listed below.

Appendix 01	Expert panel feedback (checklist & research questions) Scenario 1
Appendix 02	Expert panel feedback (checklist & research questions) Scenario 2
Appendix 03	Expert panel feedback (checklist & research questions) Scenario 3
Appendix 04	Letter of invitation/ Information sheet sent to practitioners
Appendix 05	Consent form signed by practitioners
Appendix 06	Letter of confirmation sent to practitioners confirming receipt of consent form
Appendix 07	'Journey through an eye examination' document
Appendix 08	Consent form signed by actors during the course of the training
Appendix 09	Consent form signed by actors upon completion of training
Appendix 10	Case scenario 1: Checklist completed by the standardised patient at the end of every visit
Appendix 11	Case scenario 1: Checklist including the average percentage of optometrists who completed each test or asked each question
Appendix 12	Case scenario 2: Checklist completed by the standardised patient at the end of every visit
Appendix 13	Case scenario 2: Checklist including the average percentage of optometrists who completed each test or asked each question
Appendix 14	Case scenario 3: Checklist completed by the standardised patient at the end of visits during which no dilation was performed
Appendix 15	Case scenario 3: Checklist completed by the standardised patient at the end of visits during which a dilated fundus examination was performed
Appendix 16	Case scenario 3: Checklist including the average percentage of optometrists who completed each test or asked each question
Appendix 17	Case scenario 1: Checklist including the average percentage of optometrists who recorded performing each test or asking each question
Appendix 18	Case scenario 2: Checklist including the average percentage of optometrists who recorded performing each test or asking each question
Appendix 19	Case scenario 3: Checklist including the average percentage of optometrists who recorded performing each test or asking each question
Appendix 20	Letter sent to practitioners (who opted to receive feedback) to obtain copies of the standardised patients clinical record cards
Appendix 21	Vignette Scenario 1: Checklist including the average percentage of optometrists who 'performed' each test and 'asked' each question
Appendix 22	Vignette Scenario 2: Checklist including the average percentage of optometrists who 'performed' each test and 'asked' each question
Appendix 23	Vignette Scenario 3: Checklist including the average percentage of optometrists who 'performed' each test and 'asked' each question

Supporting Published Work Summary

The supporting published work is enclosed on a CD-ROM, the contents of which are listed below.

Shah et al. 2007a	Shah R, Edgar D, & Evans BJ (2007a). Measuring clinical practice. *Ophthalmic Physiol Opt* **27**, 113-125.
Shah et al. 2007b	Shah R, Evans BJ, & Edgar D (2007b). A survey of the availability of state-funded primary eye care in the UK for the very young and very old. *Ophthalmic Physiol Opt* **27**, 473-481.
Shah et al. 2008	Shah R, Edgar D, Rabbetts R.B., Blakeney SL, Charlesworth P, Harle DE, & Evans BJ (2008). The content of optometric eye examinations for a young myope with headaches. *Ophthalmic Physiol Opt* **28**, 404-421.
Shah et al. 2009a	Shah R, Edgar D, Harle DE, Weddell L, Austen D, Burghardt D, & Evans BJW (2009). The content of optometric eye examinations for a presbyopic patient presenting with recent onset flashing lights. *Ophthalmic Physiol Opt* **29(2)**, 105-126.
Shah et al. 2009b	Shah R, Edgar D, Spry P, Harper RA, Kotecha A, Rughani S, & Evans BJW (2009). Glaucoma detection: The content of optometric eye examinations for a presbyopic patient of African racial descent. *Br J Ophthalmol*. 93(4), 492-6.
Shah et al. 2009c	Shah R, Edgar D.F., Rabbetts R.B., Harle DE, Evans BJ. Standardised Patient Methodology to Assess Refractive Error Reproducibility 2009. Optom Vis Sci; 86(5):517-528.

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Scenario 1: 20 year old patient with suspicious headaches

Summary of feedback from members of the expert panel

Scenario 1 Checklist Feedback

Category	Question	A	B	C	D
History & Symptoms-Did the practitioner ask you:	1. Date of last eye examination?				
	2. Do you have spectacles?				
	3. Reason for visit?				
	4. Is your vision OK? a. at distance b. at near?				
	5. Have you been getting any headaches recently? a) Description of onset b) Duration of symptoms c) Location d) Severity e) Frequency f) Is there a change in pattern? g) Have you consulted a medical practitioner about the headaches? h) Do you experience nausea/vomiting? i) Any visual disturbances? j) Timings?		**5Q: Is the emphasis on "recently". Does it help to include recently?** A: The emphasis is not on "recently". Question rephrased as : • Did the practitioner ask you whether you experience headaches?	**Q: A lot of these questions use specific phrases. Would it not be better to stick to subject areas rather than specific phrases? To avoid leading statements.** **So 5 would be:** **Did the practitioner ask you: Whether you had experienced headache recently?** A: Questions rephrased using this pattern.	**Q: 5a) Additional question: Description of onset and how long they last?** A: question added

Scenario 1: 20 year old patient with suspicious headaches

Summary of feedback from members of the expert panel

	k) Visual associations? l) Non-visual association?				
	6. Do you get any flashing lights in your vision?			**Q: Change to: Whether you see flashing lights in your vision?** A: Question rephrased	
	7. Do you see any floaters in your vision?				
	8. Do you experience double vision?				
	9. General Health a. General questions about health (E.g. are you in good health?) b. Are you diabetic? c. Do you have high blood pressure?				
	10. Do you take any medication on a regular basis?				
	11. Ocular Health a. Have you ever attended an eye hospital? b. Have you ever had an eye injury/surgery/	**Q11d: I doubt if I would ever ask this for a patient of this age group. It would follow on from 11a.** A: Question	**Q11d: I wouldn't ask this of this patient, but that may be what you are trying to establish here!** A: Question		**Q: 11c) [why is this important – if VAs are equal on examination no need for this Q]**

Scenario 1: 20 year old patient with suspicious headaches

Summary of feedback from members of the expert panel

	infection? c. Have you ever been told you have a lazy eye? d. Do you have glaucoma?	deleted	deleted		A: Question was initially included as practitioner may be unaware of equal VAs during history taking. Question deleted.
	12. Family History a. Does any one in your family have diabetes? b. Does any one in your family have high blood pressure? c. Does any one in your family have glaucoma? d. Is there a history of any eye problems in the family?			**Q: More example of changes:** **a) Diabetes?** **b) High blood pressure?** **c) Glaucoma?** **d) Any eye problems?** A: questions rephrased	**Q: 12a) [how important is this?]** A: Question included in checklist as practitioners some times ask these questions to form part of a baseline history for future records? **Q: 12b) [how important is this in a young patient?]** A: Question deleted
	13. Do you drive?				
	14. Occupation?				
	15. Did the optometrist ask about the sorts of visual tasks you				

Scenario 1: 20 year old patient with suspicious headaches

Summary of feedback from members of the expert panel

	do (e.g., computer, hobbies)?				
Preliminary Tests-Did the practitioner:	16. Test your habitual vision with/without current spectacles for: a. Distance b. Near				
	17. Perform cover test: a. Distance b. Near				
	18. Do motility				
	19. Check convergence				
	20. Test pupil reactions				
	21. Check interpupillary distance				

Scenario 1: 20 year old patient with suspicious headaches

Summary of feedback from members of the expert panel

Retinoscopy & Subjective Refraction -Did the practitioner:	22. Do retinoscopy to obtain objective refraction?	**Q: retinoscopy/auto-refraction** A: question rephrased as: • Did the practitioner obtain an objective using: i)an Autorefractor ii)retinoscopy	**Q: Thinking of Q22 should you specifically include automated refn? It might be difficult for some of your SPs to know exactly what this was but not impossible.** A: Question added to ask about use of an autorefractor.		
	23. Do a subjective refraction to establish visual acuity for each eye?		**Q23: Rephrase: Do a subjective refraction to establish a refractive error for each eye?** A: Question rephrased **Q: Additional question: How are you going to tease out from this if astigmatism was tested for?** A: Question added		

Scenario 1: 20 year old patient with suspicious headaches

Summary of feedback from members of the expert panel

	24. Do binocular balancing and check binocular visual acuity?		**Q: Does training allow actors to detect a binocular refraction [I realise RS will know!]** A: Yes, actors will be taught this during the training		
	25. Perform cover test for: a. Distance b. Near				
	26. Assess accommodation				
	27. Check Fixation Disparity for: a. Distance b. Near				
	28. Assess near and intermediate visual acuity		**Q: I wonder how useful/relevant these measurements are in this case.** A: question put in for completeness but also check the patient is able to read at near etc and there is no significant accommodative		

Scenario 1: 20 year old patient with suspicious headaches

Summary of feedback from members of the expert panel

			problem Question rephrased to: Assess near visual acuity.		
Slit Lamp & Ophthalmoscopy- Did the practitioner:	29. Examine the front surface of the eye using a slit lamp: -With Fluorescein	**Q: Could do both with and without, though I would not expect a high incidence of compliance for an anterior-segment-asymptomatic patient** A: Without fluorescein inserted as part (b).	**Q: Should you allow for the SL examination to be either with or without fluorescein or both with and without? As written a non fluorescein SL exam would count as a no, as would no SL exam**. A: Without fluorescein inserted as part (b).	**Q: Insert without fluorescein as well?** A: Question inserted as part (b)	
	30. Examine the back surface of the eye: a. Using an ophthalmoscope b. Using slit lamp biomicroscopy		**Q: (maybe delete "surface")** A: "surface" deleted	**Q: Using another method (specify)?** A: Question added	**Q: 30c) Using a fundus camera** A: question added

Scenario 1: 20 year old patient with suspicious headaches

Summary of feedback from members of the expert panel

Supplementary Tests- Did the practitioner and/or a member of staff:	31. Assess intra-ocular pressures?				
	32. Test visual fields?				
	33. Carry out any other tests? - Describe other tests undertaken?.....				
Advice-Did the practitioner:	34. Recommend a refractive correction?		**Q: Do you need both 34 and 36 in this case? 34 looks redundant here.** A: Question 34 deleted.		
	35. Issue a copy of the prescription: a. Without prompting? b. After prompting?				
	36. Recommend an update in spectacles?				
	37. Advise you to seek a medical opinion regarding the headaches?				**Q: Advise you to keep a note of the pattern of the headaches should they return?** A: Question

Scenario 1: 20 year old patient with suspicious headaches

Summary of feedback from members of the expert panel

					added
	38. Recommend informing your GP about the headaches?				
	39. Advice you a re-examination interval? a. What was the re-examination interval? b. Any other advice?				
Additional Data	1. Duration of eye examination?				
	2. Was the examination funded by the: a. NHS b. Privately				
	3. If private, cost of eye examination?				
	4. Cost of any further tests recommended?				
	Additional questions recommended			**Q: Could ask for a subjective opinion of the test and practitioner. - A comparative test of the SP's overall opinion. This might help link what it is that makes the patient feel like they've had a good**	

Scenario 1: 20 year old patient with suspicious headaches

Summary of feedback from members of the expert panel

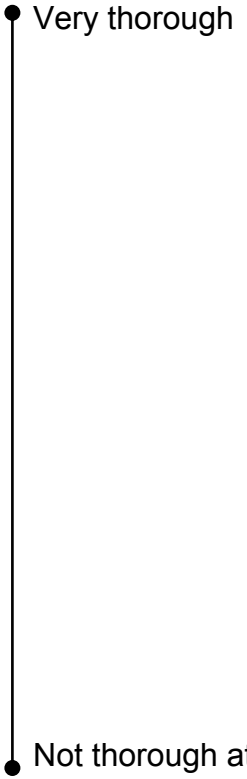
				test. Is it the no. of tests done, the duration of the test, the cost of the test or is it something else? A: Question added – see below	

Scenario 1: 20 year old patient with suspicious headaches

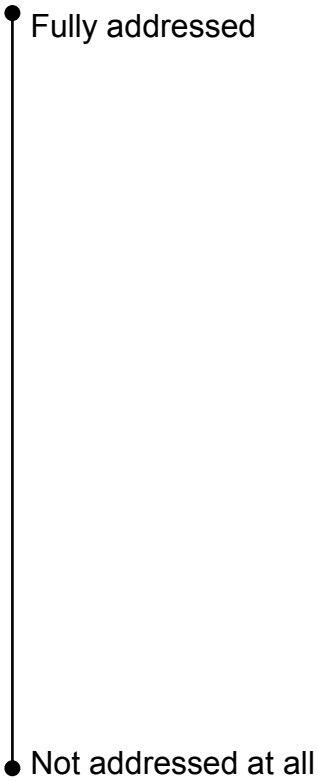
Summary of feedback from members of the expert panel

The following questions have been added at the beginning of the checklist document as well.

How thorough do you feel
the eye examination was?



To what extent were your
presenting symptoms were addressed?



Scenario 1: 20 year old patient with suspicious headaches

Summary of feedback from members of the expert panel

Scenario 1: Research Questions Feedback

	A	**B**	**C**	**D**
Standardized patient description 20-25 year old Asian student (RS) complaining of headaches (first ever headache 4 weeks ago, resembling a migraine). This person is a myope (-3.75DS R&L) and presents for a private eye examination “to see if my glasses are OK” reporting the last check-up about a year before.				

Scenario 1: 20 year old patient with suspicious headaches

Summary of feedback from members of the expert panel

Primary Research Questions 1. Is the eye examination appropriate for the identification of headaches of a suspicious nature and for appropriate management for the investigation of these?				
2. Is the eye examination appropriate for the prescribing of an accurate refractive correction?				

Scenario 1: 20 year old patient with suspicious headaches

Summary of feedback from members of the expert panel

Secondary Research Questions: Headache 1. What proportion of optometrists asked about headaches? 2. What proportion of optometrists asked questions relating to the headache history? 3. What proportion of optometrists tested pupil reactions? 4. What proportion of optometrists carried out fundoscopy? 5. What proportion of optometrists gave management advice about a headache diagnosis? Of these, what proportion: ❖ Diagnosed migraine ❖ Indicated headache may be migraine ❖ Indicated headache may be tension type headache ❖ Indicated headache may be of another type ❖ Other:..... ..... 6. What proportion of	**4Q: What proportion of optometrists carried out ophthalmoscopy – *I would hope that the practitioner did rack through the lenses to view both anterior and posterior eye, though I am sure one assistant I had never did look at anterior eye with anything apart from his spectacles?*** **Q: Additional question:** **Should we expect**		**5Q: Are parts d&e under Q5 the same thing?** A: Yes, they are the same. Part 5e deleted.	

Scenario 1: 20 year old patient with suspicious headaches

Summary of feedback from members of the expert panel

optometrists gave referral advice specific to the headaches? Of these, what proportion: ❖ Made a written referral to the GP? ❖ Advised the patient to consult the GP, but without a written referral? ❖ Advised the patient to consult the GP, but only if more headaches occurred? ❖ Other:..... ..... 7. What proportion of optometrists proactively identified the patient's symptoms (flashing lights) prior to the patient having to actively inform the optometrist of their concerns? **Refractive error** 1. What proportion of optometrists carried out focimetry	**visual fields to be checked for a headache patient – perhaps not if H A definitely migraineous?** A: Question added to secondary research questions (Headache) **1Q: Cynically, I ask before or after subjective – I always (unless poor media) prefer to do ret and subjective 'blind' to the habitual Rx in order to be unbiased, both for my own and new patients.** A: although we agree this is best practice, we think it may be unfair for many practitioners who work in multiples, where focimetry is carried out before they ever meet the patient. **2Q: What about autorefraction – very likely to be delegated in many practices?** A: this question has been added as:	**1Q: I cannot find this on the checklist** A: Question added to checklist. **4Q: This is an interesting one. If the Rx is spherical and yields good VAs**		**Q: Additional question: What proportion of optometrists advised the patient to keep a diary of when the headaches occur to see if a pattern can be discerned?** A: Question added to secondary research questions (headache).

Scenario 1: 20 year old patient with suspicious headaches

Summary of feedback from members of the expert panel

(personally or delegated) of the patient's existing spectacles? 2. What proportion of optometrists carried out retinoscopy? 3. What proportion of optometrists carried out subjective testing of the spherical element of the refractive error? 4. What proportion of optometrists carried out a subjective testing of the cylindrical element of the refractive error? 5. What proportion of optometrists issued a prescription? 6. How variable were the refractive findings? ❖ The refractive findings will be translated to the components of astigmatic compensation calculations and this will be used to calculate the frequency distributions of the refractive findings.	What proportion of optometrists carried out an objective assessment of the refractive error using: a)an Autorefractor b)retionoscopy **4Q: – both axis and power – I have seen a practitioner check power only. Can be checked – if after first – second trial, is the lens changed or only moved.** A: the SP only has 0.25DC (some days no cyl), so we think it might be unfair to include this. **6Q: Expect more variability at this age than for a mature presbyope.** A: We have noted to mention this in the paper on this scenario. **7Q: How accurate are the present ones? It would be interesting to have a 'not bad' habitual correction to**	**many practitioners may miss out determination of cyl and you could argue that this is quite legitimate. This may well be worth finding out! The problem is that you don't know whether the determination of cyl has been left out for a logical clinical reason or because of neglect. Comparison with the other SPs will help of course.** A: this SP (the researcher) has only 0.25DC. So, we will try and find an SP actor for scenario 2 who has more significant cyls so that this comparison can be made.	**Q: Additional question: Should there be a specific secondary question(s) about other causes of headache - eg Binocular anomalies** A: Secondary questions relating to cover test and associated phoria added as: • What proportion of optometrists carried out a cover test for distance and/or near? • What proportion of optometrists measured the associated heterophoria for distance and/or near?	**Q: Additional question: What proportion of optometrists carried out a cover test for distance and/or near?** A: Question added **Q: What proportion of optometrists measured the associated heterophoria for distance and/or near?** A: Question added **Q: What proportion of optometrists advised upon visual hygiene when reading/using computer?** A: Question added

Scenario 1: 20 year old patient with suspicious headaches

Summary of feedback from members of the expert panel

Specifically, the 95% confidence limits of the recommended refractive correction will be identified. 7. What proportion of optometrists recommended new spectacles? 8. What re-examination interval is advised?	**see if commercial pressures outweigh optometric ones.** A: We will use a correction that gives the SP 6/6 (usual VA 6/4)			

Scenario 1: 20 year old patient with suspicious headaches

Summary of feedback from members of the expert panel

Scenario 2: Patient of Afro-Caribbean racial origin aged 44 years complaining of difficulty with near vision

Summary of feedback from members of the expert panel

Scenario 2: Checklist Feedback

Category	Question	A	B	C	D
History & Symptoms-Did the practitioner ask you:	1. Date of last eye examination?				
	2. Do you have spectacles?				
	3. Reason for visit?				
	4. Is your vision OK? a. at distance b. at near?				
	5. Have you been getting any headaches recently?	**Q) Add in questions about migraine etc. as above?** A) question rephrased to : ○ Whether you experience any headaches/migrai nes?			
	6. Do you get any flashing lights in your vision?	**Q: Additional question:** ○ **Whether you experience any pain or discomfort of the eyes?**			
	7. Do you see any floaters in your vision?				
	8. Do you experience double vision?				
	9. General Health a. General questions				

Scenario 2: Patient of Afro-Caribbean racial origin aged 44 years complaining of difficulty with near vision

Summary of feedback from members of the expert panel

	about health (E.g. are you in good health?) b. Are you diabetic? c. Do you have high blood pressure?				
	10. Do you take any medication on a regular basis?				
	11. Ocular Health a. Have you ever attended an eye hospital? b. Have you ever had an eye injury/surgery/ infection? c. Have you ever been told you have a lazy eye? d. Do you have glaucoma?	**Q11a) Probably best to ask about "Eye Department" or "Specialist eye Dr."** A: question rephrased			
	12. Family History a. Does any one in your family have diabetes? b. Does any one in your family have high blood pressure? c. Does any one in your family have glaucoma? d. Is there a history of any eye problems in the				

Scenario 2: Patient of Afro-Caribbean racial origin aged 44 years complaining of difficulty with near vision

Summary of feedback from members of the expert panel

	family?				
	13. Do you drive?				
	14. Occupation?				
	15. Did the optometrist ask about the sorts of visual tasks you do (e.g., computer, hobbies)?				
Preliminary Tests- Did the practitioner:	16. Test your habitual vision with/without current spectacles for: a. Distance b. Near				
	17. Perform cover test: a. Distance b. Near				
	18. Do motility				
	19. Check convergence				
	20. Test pupil reactions				
	21. Check interpupillary distance				
Retinoscopy & Subjective Refraction -Did the practitioner:	22. Do retinoscopy to obtain objective refraction?				
	23. Do a subjective refraction to establish visual acuity for each eye?				

Scenario 2: Patient of Afro-Caribbean racial origin aged 44 years complaining of difficulty with near vision

Summary of feedback from members of the expert panel

	24. Check for uncorrected astigmatism using cross-cyl or fan & block?				
	25. Perform cover test for: a. Distance b. Near				
	26. Check Fixation Disparity for: a. Distance b. Near				
	27. Assess accommodation				
	28. Establish a correction for: a. Near b. Intermediate/ occupation specific?				
	29. Assess visual acuity: a. Near b. Intermediate/ occupation specific?				
Slit Lamp & Ophthalmoscopy- Did the practitioner:	30. Examine the front surface of the eye with a slit lamp a. with fluorescein b. Inspect the anterior chamber angle: 1. Hand Slit Torch 2. Van Herrick Method 3. Gonioscopy				**Q: Curious to know how many would dilate their patients?**

Scenario 2: Patient of Afro-Caribbean racial origin aged 44 years complaining of difficulty with near vision

Summary of feedback from members of the expert panel

	31. Examine the back surface of the eye: a. Using an ophthalmoscope b. Using slit lamp biomicroscopy				
Supplementary Tests- Did the practitioner and/or a member of staff:	32. Assess intra-ocular pressures? a. Using an air puff instrument? b. Using a contact method (drops & blue light)?				
	33. Test visual fields?				**Q) Instrument used for visual field testing?** A) We think that it would be impractical to ask the SP to identify visual field equipment. However, we will ask them to state whether the testing was single stimulus or multiple stimulus. We appreciate that these terms are not always synonymous with full threshold or supra-threshold (e.g., C40), but we feel that this the most that we can realistically expect from the SP actors.
	34. Carry out any				

Scenario 2: Patient of Afro-Caribbean racial origin aged 44 years complaining of difficulty with near vision

Summary of feedback from members of the expert panel

	other tests? - Describe other tests undertaken?.....				
Advice-Did the practitioner:	35. Recommend a refractive correction?				
	36. Issue a copy of the prescription: a. Without prompting? b. After prompting?				
	37. Recommend an update in spectacles?				
	38. Advice you a re-examination interval? -What was the re-examination interval?				
	39. Any other advice?				
Additional Data	1. Duration of eye examination?				
	2. Was the examination funded by the: a. NHS b. Privately				
	3. If private, cost of eye examination?				
	4. Cost of any further tests recommended?				
	Additional questions recommended	**Q) Add a question on whether pupils were pharmacologically dilated?** A) The actor will be advised there may be a			

Scenario 2: Patient of Afro-Caribbean racial origin aged 44 years complaining of difficulty with near vision

Summary of feedback from members of the expert panel

		chance the practitioner may chose to dilate. For ethical reasons we will instruct the actor to refuse dilation. If the practitioner recommends a dilation on that visit, the actor will inform the practitioner s/he is driving and would prefer to come back for this appointment. The appointment will be booked. Upon leaving the practice, the actor will then call and inform the practitioner s/he was the actor and would like to cancel the appointment.			
		Q)Do you want to know whether any form of fundal imaging technology was employed? A) This question has been included			

Scenario 2: Patient of Afro-Caribbean racial origin aged 44 years complaining of difficulty with near vision

Summary of feedback from members of the expert panel

Scenario 2: Research Questions Feedback

	A	B	C	D
Comments on the general methodology	**Q: As you say, the actors are the instruments of your research. As such your results are completely dependent upon them correctly interpreting what the examiner does/asks. The training you intend to provide sounds fine. However, I believe that you should go one stage further to avoid the potential criticism (from reviewers/examiners etc when you submit) of "actors not being able to tell one test from another" or not being able to answer any questions about exactly how good they were at determining what had been done etc. The way to do this is assess the validity of their reporting i.e. test and quantify the accuracy of their interpretation of the tests performed/questions asked. You can do this by 'piloting' the actors abilities i.e. once trained you can have them tested by a given number of your colleagues who perform tests and ask questions that are predetermined by you. You can then compare the actor's checklist result with the actual examination. This should be done for each actor a number of**	**Q: I understand that the optometrists participating will have consented to the proposed study and in this way, they are immediately not necessarily representative of 'all optometrists' and moreover may, it could be argued, change their approach to clinical practice (albeit this would be sustained for many months). Is there some way of adding a questionnaire to a larger group of optometrists asking them what they would do (a sort of 'what if' scenario, not dissimilar to the College practice surveys and those of the IGA) - I would see this approach as complimentary to the main research** A: We are planning a follow-on study looking at computerised completion of scenarios (clinical vignette). This will be open to all optometrists across the country and will assess the "what if" scenarios. Q: **In respect of the SP, I wonder if they might be assessed to check that their**		

Scenario 2: Patient of Afro-Caribbean racial origin aged 44 years complaining of difficulty with near vision

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	times. Also, you COULD use this as a way of weeding out/giving extra training to actors who are poor at the task and will give you misleading results. Some actors may be better than others, and it would be unrealistic to expect them all to be completely accurate after the same amount of training. They may learn at different rates. A: We now plan to audio record examinations of the SPs by IoO staff towards the end of their training and to use these audio recordings (after every 10 visits) to audit their checklist accuracy and provide extra training as required. During the training the actors performance will be monitored using video recording devices. **Q: Piloting and validity studies are an important and usually essential element of research. Gaining your higher degree is mostly about learning and executing good methodology plus interpretative skills than the results obtained. I would therefore urge you to seriously consider this. Pilot validation studies would form a higher degree chapter.** **A:** We have carried out a telephone survey as a pilot study. Although the methodology is rather different, this has been useful. Nonetheless, we do accept this	**training has been successful, i.e. give them a 'test' to validate their expertise (video could be used to 'test' them all, for example in the same sitting). Alternatively, since I presume from what you have said that the optometrists are aware that some form of recording may be undertaken to aid the patient in completing the checklist, then in cases of doubt or for quality control, could an expert be called upon to cross check these recordings to assess the 'quality' of the patient checklist completion (at least in a proportion of cases)?** A: We now plan to audio record examinations of the SPs by IoO staff towards the end of their training and to use these audio recordings (from consenting practitioners after every 10 visits) to audit their checklist accuracy and provide extra training as required. During the training the actors performance will be monitored using video recording devices.		

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	point. Our plan is for Scenario 1, in which I am the SP, to be piloted on several practitioners first and we will monitor the results closely and learn from the lessons that no doubt will arise. **Q: Perhaps you should set a time window for how soon the checklist should be completed. You don't want poor actor memory to invalidate results if they leave a long time between attending and recording. The actors will not be as motivated as you and so you should consider this.** A: The actors will asked to complete the checklist immediately after their eye examination (within 15mins-Glassman et al, 2000) **Q: Make sure that the local ethics committee approve know that you intend to tape record the examinations. Sometimes that can be slightly touchy about this sort of this so be sure you provide succinct justification for it.** A: This is a slight change from the protocol that originally received REC clearance, and we are in the process of informing the REC of this and other minor changes.			

Scenario 2: Patient of Afro-Caribbean racial origin aged 44 years complaining of difficulty with near vision

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Standardized patient description A 45-55 year old person off African racial origin, who presents for a private eye examination, requesting new reading spectacles. No personal history or family history of glaucoma, and the patient will not mention (or indication any knowledge of) the increased risk of glaucoma in people of African origin. It is not intended to select a patient who has any clinical signs of glaucoma (although if such an actor presents themselves then we may re-evaluate this intension). The patient will state that they have not had an eye examination for about five years.	**Q: You have specified a person of African origin presumably because of their higher risk of glaucoma. Be aware that it is specifically West Africans (hence also those that were sent to the Caribbean) that that have higher glaucoma risk, not other regions of Africa.** A: Thank you for this comment. We will change the Actor script for them to stress that their ethnic origin is West African (we will explain the significance of this to the actor, but ask them not to discuss this with the practitioners).			
Primary Research Question Is the eye examination appropriate for the detection of primary open angle glaucoma?	**Q: For your 1ary research question, you ask specifically about POAG. This wording excludes secondary glaucomas, those at risk of angle closure, and (dependent upon semantics) NTG because some clinicians consider that a POAG diagnosis requires raised IOP. You may wish to re-think precise working. Obviously, as primary eyecare providers, Optometrists should be capable of identifying**			

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	individuals at risk of any of the glaucomas, rather than specific glaucoma sub-types. A: Primary open angle has been deleted and rephrased as: • Is the eye examination appropriate for the detection of glaucoma?			

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Secondary Research Questions 1. What proportion of optometrists asked about family history of glaucoma? 2. What proportion of optometrists inspected anterior chamber angle? 3. What proportion of optometrists carried out fundoscopy? 4. What proportion of optometrists carried out tonometry? ❖ Using contact tonometry? ❖ Using non-contact tonometry? 5. What proportion of optometrists tested visual fields? ❖ Using supra-threshold testing? ❖ Using full-threshold testing? 6. What advice is given about re-examination interval? ❖ What proportion of optometrists explain the increased risk of	**1Q: Perhaps you should broaden the net on this question? I think this may be beneficial because optometrists should be trying to do is establish whether an individual presenting for examination is at higher risk of glaucoma than average, rather than just thinking about FH. Therefore, although FH is important, other 'exposures' are as well e.g. age, race, vascular factors. Now, it may be hard to determine the examining optometrists thoughts on age and race, but certain vascular factors are widely known as being associated with glaucoma (DM, migraine, Raynaud's, high/low BP, Hx haemodynamic crises.) You could add those that you have not already specified to your checklist.** A: We appreciate that this is valid, but we feel that our checklist is already rather too detailed and that it is probably unfair to expect the typical community optometrist to know of these factors. However we have, in response to another comment from the expert panel, included an additional item in the checklist for the SP to record any additional questions that they were asked (or tests). **To get at age and race, you could get the actor to 'casually' ask the practitioner whether**		**2Q) My concern is that the patient may not know whether the anterior chamber is being assessed during the slit lamp procedure, so will not be able to answer the "Van Herrick" or even "torchlight assessment" question". How do you propose to overcome this issue?** A) We have discussed this point and agree with your thoughts. Many practitioners do however check the AC depth routinely prior to dilation for completeness and/or as a caution (to warn patients who may be at a greater risk due to narrower angles perhaps). As one of the primary aims of the research is to evaluate or establish what majority of practitioners would have done, we had	

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glaucoma in people of African racial origin and/or stress the need for more frequent re-examinations than the previous occasion (five years)? 7. What proportion of optometrists recommended a new refractive correction? 8. What proportion of optometrists issue a prescription? 9. How variable were the refractive findings? ❖ The refractive findings will be translated to the components of astigmatic compensation calculations and this will be used to calculate the frequency distributions of the refractive findings. Specifically, the 95% confidence limits of the recommended refractive correction will be identified.	**they are at risk of certain eye problems. Obviously, you/they would have to make sure this did not appear staged (try and get actors who are good at improv!!)** A: We think that this is a great idea and have included it. **Q: Additional questions:** • **What proportions of optometrists assessed the disc in stereo?** **This is legitimately very important in the context of nerve head evaluation, being the standard glaucoma clinic method.** • **What proportions of optometrists take an objective image of the fundus?** A: Both these questions have been added **Q9. A cautionary note on stats here. You have mentioned 95% CLs. Confidence intervals are inferential statistics that tell us about interval in which the true population value is likely to be with 95% confidence. For this study, the 95% CI would tell you the likely range within which ALL optometrists (not just those in your sample) would determine the true refractive error of the patient. I think that this probably is not what you are interested in (I might be wrong…) I am guessing but think that you may**		included this question as part of the checklist and secondary research question. On thinking about it further, we do agree it would be extremely difficult for the actor to recognise whether this was done (unless the practitioner gives a running commentary of what they are doing). For the above reasons we have now excluded this question from both the checklist and secondary research question.	

	be more interested in quantifying the variation of refractive results amongst your sample. In which case you should probably use the '95% limits of agreement'. This quantity tells you where the measured values lie on 95% of occasions within you sample (i.e. quantifying variation between your samples of optometrists). It is easily calculated as 1.96 x SD (of the mean vale, provided the distribution is normal, if not you can determine multiplicative factor for 95% from the t-distribution). Perhaps seek some stat advice on this if you are unsure. A: Thank you again for this point. We meant "the mean and central 95th percentile range" (1.96 x SD), not confidence interval (1.96 x SEM) and we have amended this.			

Scenario 3: Person aged 59 years presenting with flashing lights of a recent onset.

Summary of feedback from members of the expert panel

Scenario 3: Checklist Feedback

Category	Question	A	B	C	D
History & Symptoms-Did the practitioner ask you:	1. Date of last eye examination?	***Q)* Rephrase Did the practitioner ask you:** to **Were you asked:** A) Questions rephrased	**Q) The outline suggests a patient aged 50-59 & the checklist an age of 65-75. Which one is right?** A) The patient will be aged between 50-59.	**Q) In each section should you not include any other questions asked?** A) Included	
	2. Do you have spectacles?				
	3. Reason for visit?				
	4. Is your vision OK? a. at distance b. at near?				
	5. Have you been getting any headaches recently?	**Q5) No need for this question** A) Question included for completeness and to rule out the flashing lights are not migraine related.			
	6. Do you get any flashing lights in your vision? a. Where in your vision do you see the flashing lights? b. Are the flashing lights in one or both eyes?	**Q6) No need for this question as it is the presenting symptom!** A: Question left in as actor may/may not be asked reason for visit			

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	c. Describe the flashes? d. Is there a pattern to the occurrence of the flashes? ❖ Constant/ Intermittent e. Is there a change in pattern of occurrence? ❖ More/Less frequent? f. How long ago did you first notice them? g. How long do they last?				
	7. Do you see any floaters in your vision?			**Q) Additional question: Should there also be a section asking about shadows in the field of vision.** A) question added	
	8. Do you experience double vision?	**8Q) No need for this question**			
	9. General Health a. General questions about health (E.g. are you in good health?) b. Are you diabetic? c. Do you have high blood pressure?	**9Q) Unsure about the closed question in relation to the presenting symptom.**			
	10. Do you take any medication on a				

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	regular basis?				
	11. Ocular Health a. Have you ever attended an eye hospital? b. Have you ever had an eye injury/surgery/ infection? c. Have you ever been told you have a lazy eye? d. Do you have glaucoma?	**Q: 11c) No need for this question**			
	12. Family History a. Does any one in your family have diabetes? b. Does any one in your family have high blood pressure? c. Does any one in your family have glaucoma? d. Is there a history of any eye problems in the family?				
	13. Do you drive?				
	14. Occupation?				
	15. Did the optometrist ask about the sorts of visual tasks you do (e.g., computer, hobbies)?				

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Preliminary Tests-Did the practitioner:	16. Test your habitual vision with/without current spectacles for: a. Distance b. Near	**Q16) Rephrase: Ask you to read letters on a letter chart:** **a) at the end of a room or reflected in a mirror** **b) when reading a book or page with writing on it** A: Question rephrased		**Q) Additional question-Arc perimetry?** A) question added	
	17. Perform cover test: a. Distance b. Near	**17Q) Rephrase: cover and then uncover each eye when you were looking at the end of a room or reflected in a mirror** A: Question rephrased			
	18. Do motility	**18Q) Rephrase: ask you to move your eyes in different directions, perhaps following by a pen,torch light or something else** A: Question rephrased			
	19. Check convergence				
	20. Test pupil reactions				
	21. Check interpupillary distance				

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Retinoscopy & Subjective Refraction -Did the practitioner:	22. Do retinoscopy to obtain objective refraction?	**22Q) Why are we doing retinoscopy on this patient?**			
	23. Do a subjective refraction to establish visual acuity for each eye?				
	24. Check for uncorrected astigmatism using cross-cyl or fan & block?				
	25. Perform cover test for: a. Distance b. Near				
	26. Check Fixation Disparity for: a. Distance b. Near				
	27. Establish a near vision correction?				
	28. Assess near visual acuity				
Slit Lamp & Ophthalmoscopy- Did the practitioner:	29. Examine the front surface of the eye with a slit lamp a. with fluorescein b. Inspect the anterior chamber angle: 1. Hand Slit Torch 2. Van Herrick Method 3. Gonioscopy			**Q29c) How would you know if the practitioner checked for shafer's sign (note spelling)? Are you relying on a running commentary? If**	

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	c. Check for Shafer's Sign			**the pupils are not dilated then absence of this test is very likely as a very poor view of the vitreous would be achieved in this age group, so what can be inferred by the presence or absence of this test?** A: The actor will either pick this up from the running commentary or if they are asked to look in different positions of gaze quickly.	
	30. Examine the back surface of the eye: a. Using an ophthalmoscope b. Using slit lamp biomicroscopy c. Using binocular headset				

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Supplementary Tests- Did the practitioner and/or a member of staff:	31. Assess intra-ocular pressures? a. Using an air puff instrument? b. Using a contact method (drops & blue light)?				
	32. Test visual fields?				
	33. Carry out any other tests? - Describe other tests undertaken?.....				
Advice-Did the practitioner:	34. Recommend a refractive correction?				
	35. Issue a copy of the prescription: a. Without prompting? b. After prompting?				
	36. Recommend an update in spectacles?				
	37. Advise you that further tests with drops are required? a. Ideally on the same day? b. Within a week? c. Whenever possible?				
	38. Advice you on the side effects of the drops?				
	39. Advice you and/or obtain consent to refer for a 2nd				

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	opinion? a. Ideally on the same day? b. Within a week? c. Whenever possible?				
	40. Advice you a re-examination interval? -What was the re-examination interval?				
	41. Any other advice?				
Additional Data	1. Duration of eye examination?				
	2. Was the examination funded by the: a. NHS b. Privately				
	3. If private, cost of eye examination?				
	4. If NHS, were you informed of this: a. With prompting? b. Without prompting?				
	5. Cost of any further tests recommended?				
	6. If a referral was recommended; a. Was a letter written to the GP? b. Or were you asked to consult your GP? c. Was a copy of the letter sent to you?				
	Additional questions recommended				

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Scenario 3: Research Questions Feedback

	A	B	C	D
Standardized patient description 50-59 year old Caucasian, presenting with recent onset flashing lights in one eye in the dark. The patient will present for a private eye examination and, if asked why they arranged the appointment, they will say that it is because of concern over the flashing lights. If the optometrist does not ask why they have presented, or if they are having any problems, then at the end of the appointment the patient will report this symptom.		**Q: I suspect it is ethically & practically more difficult to have the SP undergo dilated examination but I wonder without going through this process whether you are going to get an accurate picture as to actually what goes on in practice?** A: We have discussed the ethics and we feel that we cannot insist on an actor consenting to up to 100 dilations. Also, this would limit the number of appointments to one a day, which would make the study prohibitively expensive. Additionally, we suspect that it would prove very difficult to find an actor who would consent. Nonetheless, when we are recruiting the actors we will enquire about whether they would be willing to undergo dilation in the last visit of		

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		the day, if so requested by the optometrist. Additionally, we are planning a follow-on study looking at computerised completion of scenarios, and we will seek to assess this in that study.		
Primary Research Questions 1. Is the eye examination appropriate for the detection of the cause of the symptoms (flashing lights in the visual field of one eye)?				
2. Does the eye examination result in the prescribing of an appropriate refractive correction?	**Q)I am not sure if you can ask this question since the outcome of the examination is not likely to results in a refractive investigation or treatment plan for this patient**	**Q: What is the purpose of the second primary aim in the research?** **If a patient with sudden onset of flashing lights presents to my practice, they will be seen same day as an emergency (a suspected retinal tear until proved otherwise). There would be no question of performing refraction and the patient would be warned to arrange transport before they arrived so the**		

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		examination would be focused on evaluating the symptoms and not performing an "eye examination". So even if they were in need of a refractive check it would be rarely carried out at this consultation. No Rx would be given at this visit, though they may be recommended to return for refraction at a later date. What might be an appropriate refractive correction in these circumstances? I can only think of a few. A: We have deleted this as a primary research question, keeping it as a secondary research question. Our motivation for asking this question is to discover what proportion of practitioners either (a) carry out a "standard sight test", with a refraction and no additional tests relevant to the presenting symptoms or (b) do not waste time on a refraction but seek to concentrate on tests appropriate to the investigation of symptoms indicative of a PVD/detachment or (c) do both (a) and (b).		

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Secondary Research Questions 1. What proportion of optometrists proactively identified the patient's symptoms (flashing lights) prior to the patient having to actively inform the optometrist of their concerns? 2. What proportion of optometrists identified the longstanding history of floaters? 3. What proportion of optometrists assessed the anterior chamber angles? ❖ Van Herrick method? ❖ Hand Slit torch? ❖ Gonioscopy? 4. What proportion of optometrists performed fundoscopy? 5. What proportion of optometrists recommended dilated fundoscopy? ❖ [For ethical and practical reasons, the actor	**Q3) Why do we need to do this for flashing lights?** A) We have discussed this point and agree with your thoughts. Many practitioners do however check the AC depth routinely prior to dilation for completeness and/or as a caution (to warn patients who may be at a greater risk due to narrower angles perhaps). As one of the primary aims of the research is to evaluate or establish what majority of practitioners would have done, we had included		**Q3) I wonder why you ask this question? It may well be that you are reacting to a paper published in 2000 which looked retrospectively at the number of CAG's resulting from dilation with Tropicamide, it concluded that the risk was almost zero. As a result the NICE recommendations for diabetic screening do not include assessment of AC depth and the College have incorporated this into their guidelines by advising a practitioner may check the AC, or words to that effect. Thus its not that they are omitting it to "cut corners."** **I wonder how you can tell that a practitioner uses the van Herrick technique? How do you know they are not just looking at the cornea or lens with a slit-lamp? Personally I find that van herricks tends to be too cautious I just examine the central AC**	

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standardized patient will not be asked to undergo pupillary dilation. If the optometrist tries to arrange this: o The actor will say that she has driven to the appointment and will arrange another appointment for the dilation. o When she has left the practice she will telephone and cancel this appointment, explaining if necessary that she is the SP. o If the practitioner tries to arrange an immediate appointment for her at the hospital then, to avoid wasting the time of NHS staff, the actor will identify herself as the SP. 6. Of these how many recommended dilation should be	this question as part of the checklist and secondary research question. On thinking about it further, we do agree it would be extremely difficult for the actor to recognise whether this was done (unless the practitioner gives a running commentary of what they are doing). Also for this particular case, as the practitioner will often ask the SP to return for dilation, some practitioners may chose to check the AC depth during the primary visit (first visit when patient presents with the symptoms) where as other may chose to check it during the dilation appointment. For the above reasons we have now excluded this question from both the checklist and secondary research question.		**depth. So how can an actor determine this? Others may use the ??? method, the name escapes me but essentially the AC depth is measured using a slit=lamp technique and a table (I can find the exact ref if you need it).** **Similarly if a pen torch is picked up how can actors or even an experienced optometrist acting as a patient be sure whether the pupils are being assessed or the AC depth estimated?** A) Please see comment in first column. **Q) I accept that you would not want your actor to be dilated but surely this in itself will provide valuable information.** A) We have discussed the ethics and we feel that we cannot insist on an actor consenting to up to 100 dilations. Also, this would limit the number of appts to one a	

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done: ❖ On the same day? ❖ Within a week? ❖ Whenever convenient? 7. When practitioners recommend dilation, the SP will act nervous and will ask what tests will be done at the dilation. When the optometrist explains that they will look inside the eyes (or similar), the actor will say "Will you look inside my eyes the same way as you have today?". If possible, she will in this way determine, from the optometrist's description, what technique would be used if dilated fundoscopy were arranged: ❖ Monocular direct ❖ Slit lamp binocular indirect ❖ Headset binocular indirect ❖ Not known 8. What proportion of optometrists	**Q: 7d) I think this bit might be open to a lot of concerns that the SP will be able to correctly get this info in this way** A: Deleted 7d **Q: 8) Why? Is this because of dilation concerns or related to the symptoms?**		day, which would make the study prohibitively expensive. Also, we suspect that it would prove very difficult to find an actor who would consent. Nonetheless, when we are recruiting the actors we will enquire about whether they would be willing to undergo dilation in the last visit of the day, if so requested by the optometrist. Additionally, we are planning a follow-on study looking at computerised completion of scenarios, and we will seek to assess this in that study. **Q) Was IOP measured before and after dilation, that would be interesting, given the small possibility of CAG following the instillation of tropicamide?** A) We agree that this would be interesting. We are planning a follow-on study looking at computerised completion of scenarios, and we will seek to assess this in that study.	

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assessed the intraocular pressures? ❖ Using contact tonometry? ❖ Using non-contact tonometry? 9. What proportion of optometrists would have referred the patient to the hospital: ❖ On the same day? ❖ Within a week? ❖ Within a month? ❖ Via the GP? ❖ [Note, from the answer to an earlier question and to this question, we will determine what proportion of optometrists **either** recommend a dilation **or** refer] 10. What proportion of optometrists recommended an appropriate refractive correction?	A: Both. We don't seek to make a judgement about whether it is necessary to check the pressures before dilation, but we feel that it would be interesting to discover how often practitioners do this in a px where they might be considering dilation, or indeed in any px of this age. **10) For flashing lights!!!!** Our motivation for asking this question is to discover what proportion of practitioners either (a) carry out a "standard sight test", with a refraction and no additional tests relevant to the presenting symptoms or (b) do not waste time on a refraction but seek to concentrate on tests appropriate to		**Q) Was the vitreous inspected for shaffer's sign?** A) We have included this, assuming that the SP will be able to recognise this test based on being asked to make rapid eye movements and then look steadily. **Q) You are going to ask you how the eye was going to be examined following pupil dilation but you have not incorporated monocular indirect ophthalmoscopy into your list. How can you be sure that this was not the selected technique?** A) We think the actor would easily be able to differentiate between monocular techniques (i.e. ophthalmoscopy and monocular indirect) and binocular (slit lamp BIO or head mounted). It would be difficult for the however to differentiate between the different monocular instruments.	

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	the investigation of symptoms indicative of a PVD/detachment or (c) do both (a) and (b). So, we have not included refraction because we think it is appropriate, but rather to see how many practitioners think that it is appropriate.			

Appendix 4

Letter of invitation/ information sheet to practitioners

An evidence-based investigation of the content of optometric eye examinations in the UK

We are inviting about 300 optometrists practising in the UK to participate in a research study to investigate the content of typical optometric eye examinations. We would like to stress at the outset that we are not seeking to make judgements about the content of eye examinations and our results will be anonymous and confidential. There are several important reasons, listed below, why we feel that it is important to discover what takes place in typical eye examinations.

Why is the research necessary?

- The purpose of the proposed research is to obtain an objective insight into the content of typical optometric eye examinations in the UK.
- It has become increasingly common for optometrists to be investigated by the GOC or to be involved in civil litigation. When this occurs, an optometrist's actions are successfully defended when it is shown that there is a body of reasonably competent optometrists who would have acted in the same way. This defence is often hard to apply since little is known about the actual content of typical optometric eye examinations. Our research will provide this information and will ultimately help to reach a fair outcome in disciplinary and litigation cases.
- The results of this research are likely to have other wide ranging implications, including: setting priorities for continuing education and training (CET), evaluating the outcomes of CET, determining the scope of NHS General Ophthalmic Services (GOS), influencing appropriate professional guidelines, and determining priorities for undergraduate training.

What will happen in the research?

The scientific literature reveals several studies in other healthcare professions that have evaluated the content of clinical consultations. The literature clearly reveals a "gold standard" methodology involving **standardised patients** (SPs; described below). Surprisingly, we have found no evidence of SP research within optometry. Our proposed research will use unannounced SPs to investigate the content of typical optometric eye examinations in the UK.

Your name has been selected at random from the Opticians Register. If you consent to participate in the study then the procedure will be as follows:

- Three standardised patients will book in to your practice for a routine eye examination, as if they were a normal patient. Most, but not all, of the practitioners who consent to participate will receive visits from SPs.
- Each appointment might be arranged at any time over the next two years. Each patient may or may not have symptoms or ocular conditions.
- The SPs will be carefully trained to act as convincing patients and they will not tell you that they are trained actors. You will therefore be able to carry out your normal routine and the eye examination will be paid for in the usual way.
- We expect that most practitioners will not realise when they have been examining a "patient" who is in fact an actor. However, at the end of the eye examination if you suspect that you have been visited by an SP, then the research team would like to hear from you (the contact details are below).
- After they leave you, the SP will fill in a detailed checklist that they have been trained to complete to give the research team a full description of their examination.

Will the results relating to my examination be confidential?

We are very keen to encourage as many optometrists as possible to participate. To try and make the study more attractive to optometrists, we will offer participating practitioners the option

of either remaining completely anonymous (even to the researchers) or of obtaining feedback for personal professional development. These options are detailed below:

1. **Full Anonymity-** For practitioners choosing this option, the SPs will be given a list of consenting practitioners for them to visit. When the actor leaves each practitioner and records the eye examination on the checklist they **will not** record the practitioner's name or any other identifying features. There will be no way for the researchers at the Institute of Optometry or anyone else to subsequently identify the practitioner who saw the patient.

2. **Feedback for professional development and anonymity in research-** This option is designed to give practitioners something in return for their participation. Practitioners who request this option will be sent a letter summarizing the SP's score sheet checklist relating to their appointment, with comments on suggested "best practice" based on published clinical guidelines and on the views (obtained before the research starts) of an expert panel. This serves three purposes. First, for the optometrist the information might be useful as individualised feedback for their professional development. Second, it will give the optometrist the right of reply which will give the research team useful criticism and checks on the performance of the SPs. Finally, as an additional option for practitioners requesting feedback for professional development, we will invite the practitioner to send us a photocopy of their record card. This will be checked by the research team to identify any discrepancy between the SP record and the practitioner record.

It is important to note that whichever option you choose, the results of the research are confidential. No details that would identify any practitioner or practice will ever be published, presented, or disclosed to any other party. If you choose the **full anonymity** option then the only two people who will know what happens in your eye examination are the actor and you. Even if you choose the **feedback for professional development** option, still the only people to know what happens will be you, the actor, and the two researchers (Rakhee Shah and Bruce Evans). We will require the actors to sign a confidentiality agreement to ensure that the results they obtain will be confidential to the research study.

Am I suitable to participate in the research?

Optometrists who examine at least three new patients in a typical working week are eligible to participate.

What do I have to do in order to participate?

If you are keen to take part in this research project, please sign the consent form and send it to the research team in the enclosed envelope. If you decide to take part you will be free to withdraw from the research at any time without having to explain why.

If you are concerned or have any questions about any matters regarding the research please contact Rakhee Shah: Research Fellow, The Neville Chappell Research Clinic, The Institute of Optometry, 56-62 Newington Causeway, London. SE1 6DS. Tel No: [redacted] Email: [redacted].

Appendix 5

An evidence-based investigation of the content of an optometric eye examination in the UK

Consent Form

I agree to take part in the above research project. I have read the information sheet, which I may keep for my records. I understand that agreeing to take parts means I am willing to:

- Perform eye examinations on up to three standardized patients (actors trained to be patients) who will present unannounced at any time over the next two years. I understand that my practice will be remunerated for the eye examinations in the usual way.
- Be audio recorded during these consultations to aid accurate completion of the checklist.
- Contact the research team if I think I have seen a standardized patient.

Data Protection

Information gathered in the research will be held and processed for the purpose of completing the research study to investigate the content of an eye examination in the UK.
I understand that any information I provide is confidential, and that no information could lead to the identification of any individual will be disclosed in any reports on the project, or to any other party. No identifiable personal data will be published. The identifiable data will not be shared with any other organisation.

Withdrawal from study

I understand that my participation is voluntary; that I can choose not to participate in part or all of the project, and that I can withdraw at any stage of the project without being penalised or disadvantaged in any way.

Options

Please select, by deleting one option below, whether you would like to participate with **full anonymity** or if you would like to obtain **feedback for professional purposes**:

- **full anonymity**: only the actors and the practitioner will know what happens in a given practitioner's eye examination. The researchers will receive data from the actors regarding the contents of the eye examination, but **will not** know with which optometrist these data were obtained.
- **Feedback for CET purposes:** the researchers will know the name of the optometrist and will give them feedback about the SP actors' findings. The results will only be known to the researchers, the actors, and the practitioners and will not be disclosed to any other parties.

Name: …… (Please print)

Signature:……..Date: ……

Daytime telephone No:……

Appendix 06

An evidence-based investigation of the content of an optometric eye examination in the UK

I am writing to confirm receipt of your consent to participate in the above research project. We have now started training the actors who, as standardised patients, may be visiting your practice over the course of the next one to two years.

During the training we have realised how difficult it will be for the actors to accurately remember the entire contents of an eye examination. The use of audio recording has been suggested and is proving highly successful in ensuring that accurate data is recorded by standardized patients. Please rest assured that during this process strict confidentiality policies are adhered to. If you have chosen the option of full anonymity then the actor will only use the recording (through earphones so that no-one else can hear) when completing the checklist after the eye examination. After this, the actors will delete the recording. The checklist will not include your name or any other features that can identify you and will be sent to us (the researchers) in a bundle of other completed checklists.

Should you have any reservations about the use of audio recording, or any other questions about the research, please do not hesitate to contact Rakhee Shah; Research Fellow, The Neville Chappell Research Clinic, The Institute of Optometry, 56-62 Newington Causeway, London. SE1 6DS; [redacted]

Yours sincerely,

Rakhee Shah
Post Graduate Fellow
Neville Chappell Research Clinic
The Institute of Optometry

The Journey through an eye examination

The purpose of this document is to describe the journey through an eye examination. As you read this, please keep referring to the tables at the end of this section. Table 1 summarises the journey, and both Tables 1 and 2 define the terminology for the tests included in the eye examination and will be useful for looking up some of the terms used below. This is important because when you come to complete checklists for each eye examination in the research you will need to be familiar with the terminology for the various tests.

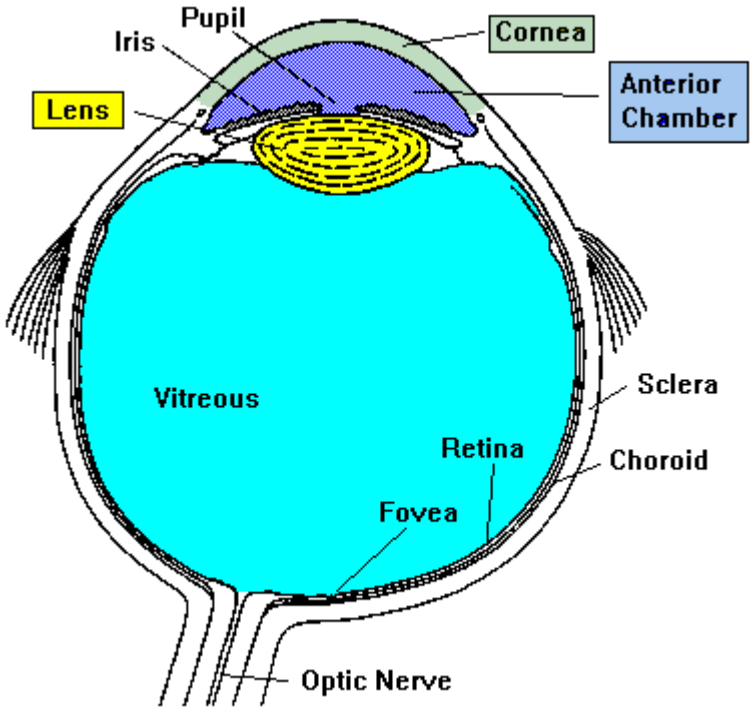


Figure 1: Structures of the eye

An eye examination (sight test or eye test) is carried out by an optometrist (ophthalmic optician) and usually takes 20-30 minutes. The eye examination can be considered to have two parts: testing sight and a check of the health of your eyes.

Most eye tests start with the optometrist asking about what they refer to as “history”. They might ask when your last eye examination was, whether you wear glasses and about any family history of eye (e.g., glaucoma) or other health problems (diabetes, high blood pressure). The optometrist may ask about your general health (i.e. if you are diabetic or suffer from high blood pressure) and about any previous eye problems (i.e. if you have visited an eye hospital, have glaucoma or have any previous eye injuries or surgery, or have a lazy eye).

The optometrist will also ask about any “symptoms”. What eye problems are you having? Can you see clearly to drive? Is your reading vision clear? Have you been

experiencing any headaches recently? Do you see any “floaters” (black/clear floating bits) or flashes of light in your vision? Do you experience “double vision”?

The optometrist may ask if you drive to ensure you meet the visual standards for driving. You may be asked about your occupation (e.g. does your work involve use of a computer or VDU) and any hobbies. These questions are to establish your visual requirements and to advise you on a prescription or spectacles that would be most appropriate.

Most commonly the next test is to record what you can read on the letter chart. Your distance sight (

Table 2) is usually checked first, followed by your near sight. This is usually done in your habitual state (

Table 2) first followed by an unaided check (without any glasses) but can be done in any order.

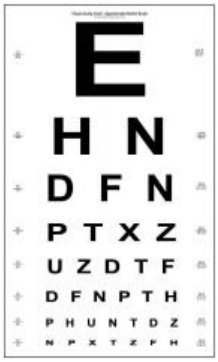


Figure 2: Distance Test Chart

Some optometrists don't start with this test, but instead start by looking at the health of your eyes (ophthalmoscopy, see below). The health of your eyes can be checked in one of two ways:

1. Using a hand-held instrument called an "ophthalmoscope" (Figure 3). The ophthalmoscope is a special "torch" which shines light through the pupil (Figure 1) to examine the internal structures of the eye. This test requires the optometrist to get fairly close to your eye in order to get a good view. You may hear a clicking sound as the optometrist changes the lenses in the ophthalmoscope to examine the different structures of the eye.



Figure 3: Ophthalmoscope

2. The other main method of examining the eye is to use an instrument called a "slit lamp" microscope. This instrument is effectively a microscope with a light attached to it and is used by optometrists to look at both the front and back surfaces of the eye under high magnification. When examining the front surface of your eye, the optometrist will first have a look with white light. S/he may then put a yellow dye into both eyes. Amongst other things, this is used to examine the quality and quantity of the tears. The dye does not sting and the effect (colouration) only lasts a few minutes.

The optometrist may during this part of the examination look for pigment cells in the jelly (Vitreous Jelly-Figure 1) of your eyes. The optometrist would usually check for these using a slit lamp in patients who present with visual symptoms (floaters, or flashing lights -

Table 2). The optometrist will ask you to look up, down and then straight ahead quickly. S/he may also ask you to look right, left and then straight ahead quickly. This may be done a few times as it causes movement of the vitreous jelly which in turn makes it easier to see the pigment cells in the jelly. Some practitioners do this with the aid of the volk lens (Figure 4).

A lens (Volk lens) is often used with the slit lamp to look at the back surface of the eye. This lens does not touch the eye surface but is held by the optometrist just in front of your eye. You will see a bright reflection of the light from the microscope.



Figure 4: Slit lamp exam

Whilst looking at the front surface of your eyes, the optometrist evaluates the depth of the front chamber of the eye (anterior chamber). This is relevant because if this chamber is too shallow then it can cause the pressure inside the eye to increase in a certain form of glaucoma. The anterior chamber can be assessed in one of three ways:

- Hand Slit Torch: The optometrist will hold a strong lens in front of your eye and use a vertical slit on the ophthalmoscope (Figure 3) to check the drainage angle. Alternatively, they may hold a pen torch up close to the eye.
- van herrick Method: The optometrist usually does this when looking at the front surface of your eye with a slit lamp. During your training, we will teach you how to detect this test.

Optometrists often check how well your pupils (Figure 1) react to light. This is usually done either just before or just after assessing the health of your eyes and can be done using a penlight or an ophthalmoscope (Figure 3). The optometrist will shine a bright white light to each eye in turn and then alternate between the two eyes.



Figure 5: Test for checking pupil reactions

Some practitioners start off the examination with tests to check eye co-ordination. For example, they may do a test (the "cover test") where they get you to look at a letter or a spotlight (in the distance) and cover each eye in turn to see how well the eyes are lined up. This test is usually repeated at a closer distance of about 30-35cms using a spotlight, a letter or the tip of a pen.

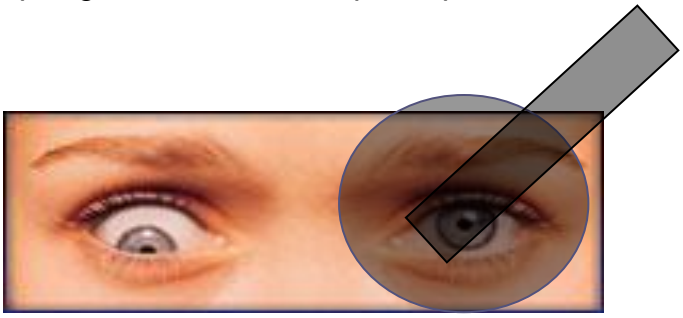


Figure 6: Cover test

The cover test is usually followed by the optometrist checking for good function of all your eye muscles ("motility"). During this test the optometrist will ask you to follow a penlight (occasionally the tip of a pen) to different positions. You will be asked to report any eye pain or if the light splits into two (i.e. you are seeing double). This is usually done in a star pattern with the target (pen/penlight) about 30-40 cms in front of you.

The optometrist may then check how well your eyes can turn in together (converge) using the tip of a pen or a target (perhaps a vertical line on a black instrument - RAF rule in Figure 7that resembles a meter ruler). S/he will ask you to concentrate on a target from a distance of about 40cms as they bring it towards your eyes. You will be asked to report when the target splits into two. The picture in Figure 9 shows the RAF rule being used for a different test (accommodation - see below). When it is used to measure how well the eyes converge, both eyes will be uncovered.



Figure 7: RAF rule

Following this test the optometrist may use the same instrument (Figure 7) to check how easily your eyes can adjust the “power” or “focus” of the eyes (“accommodation”). This adjustment is generally involuntary and is brought about by a change in the shape of the lens. A young person’s ability to accommodate allows him or her to see clearly both far away and up close. At about the age of 40 years (in Caucasians, but slightly earlier in those of Asian and African origin), the lens becomes less flexible and accommodation is gradually lost, making close-range work increasingly difficult. This is known as presbyopia. Some optometrists may do the accommodation test towards the end of the examination, once they have determined the new spectacle correction.

The next stage of the journey would be to find out the degree of long- or short-sightedness (i.e. the prescription for any spectacles you may require). This stage is called the refraction and the aim is to determine the best visual acuity (

Table 2 & Figure 2) with corrective lenses. Before starting the refraction, the optometrist would measure the distance between your eyes by placing a ruler on your forehead and asking you to fixate on (or look at) a pen (or other target) as they move it across from one of their eye's to the other.

There are two ways of checking the refraction (to help determine any spectacles you may require) of your eyes:

- An Objective assessment- This is done using tests which **do not** require any responses from you (see below). The objective assessment is usually done first, to give the optometrist a rough idea of the prescription you may require. The results from this test are usually fine-tuned by the subjective assessment.
- A Subjective assessment -This part of the examination requires responses from the patient to questions from the Optometrist (e.g. "Do the black rings appear darker and bolder on the red or green backgrounds?")

The objective assessment can be done in either one of two ways:

- Using an "autorefractor"- a machine that works out a rough estimate of a prescription to help improve your vision (Figure 8). During this test you will be asked to place your chin on a chin rest with your forehead against a bar. You will usually be asked either to focus to the end of a long road or on a hot air balloon (or some other distant object) whilst the machine works out the refraction of each eye in turn. This test is sometimes done before the eye examination by a non-Optometrist member of staff (usually at the time of the "puff" test).



Figure 8: Autorefractor

- Using a "retinoscope"- a handheld device used by the optometrist to work out the focussing error of your eyes. The room lights will be dimmed during this test and you will be asked to focus on a target (usually a spot light, or the red and green backgrounds) in the distance. The optometrist will place various lenses in front of your eyes. This can either be done with a spectacle **trial frame** (Figure 10) to hold the lenses (usually a big white or metal frame) or a machine (**phoropter;** like a very large pair of glasses; Figure 11) placed in front of the patient.



Figure 9: Retinoscopy

If the optometrist is using the frame, s/he will be manually changing the lenses in the frame. If this is being done using a machine through which you will be looking, you will here a clicking sound as the lenses are changed.

Once the optometrist has got a rough estimate of the focusing power of your eyes with an objective method, s/he will fine tune the result by doing a subjective assessment (see below). Some optometrists might not do an objective refraction, but go straight to the subjective.

The subjective assessment can also be done in either one of two ways:

- Using a "trial frame" (Figure 10) - lenses of different strengths are manually slotted in and out of the frame.



Figure 10: An optometrist using a trial frame

- Using a "phoropter" (Figure 11) - lenses of different strengths are changed using a knob or keypad (patients often hear a clicking sound as lenses are changed from one to another)

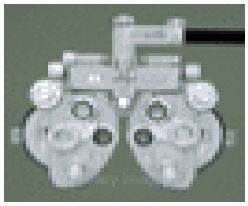


Figure 11: Phoropter

During the subjective assessment, you will be asked questions such as:

- Does this lens make the letters on the chart look better, worse, or the same?
- Do the black rings look bolder and sharper on the red or green backgrounds?

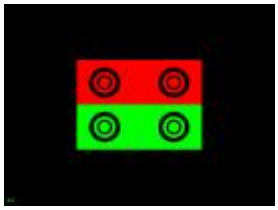


Figure 12: Black rings on Red & Green Backgrounds

- Looking at one (or two) pair(s) of black rings on the WHITE background (one inside another, do the black rings look bolder and clearer with lens 1 or lens 2? The optometrist may use the two pairs of black rings as a target for this part of the examination as described above or, alternatively, may use what looks like a fan of lines (made up of several straight black lines – Figure 15) with two blocks of black lines below the fan.

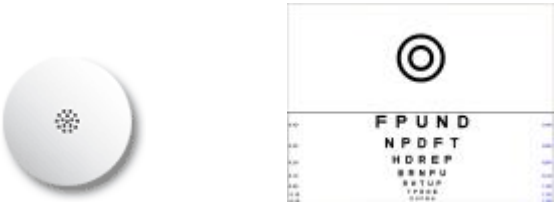


Figure 13: Targets used to workout the cylindrical component of the prescription

This is to work out the cylindrical component of your prescription (referred to as the “astigmatism”).



Figure 14: Fan & Block test

- Do the letters on the chart look clearer with this lens or just smaller and darker?
- This lens is going to blur the letters on the chart back a few lines: what line of letters can your read now?

The distance correction is usually checked first. You will be asked to look at targets in the distance. These could either be targets on a chart mounted on a wall or targets projected from a projector. Often, these charts are reflected in a mirror to increase the viewing distance. Having established your best corrected vision, the optometrist may check your eye coordination once again (see below). This will be done for distance (i.e. whilst you are looking at a target on the letter chart) at this stage. The check for near is repeated once the near vision correction has been checked.

Once the distance correction has been established the optometrist will probably check the prescription for reading glasses. They may do this with a hand-held near vision chart if you are wearing a trial frame, or by suspending a near vision chart from the phoropter if it is being used for the examination. Depending on what you can read and what you need to be able to read, the optometrist may add additional lenses to help you read the

required size of print. This is called a “reading addition” (and usually appears as ADD on your copy of the prescription).

After the subjective refractive error has been determined, either at distance or near or both, the optometrist may carry out some more tests of eye co-ordination. They may repeat the cover test, or carry out other tests to investigate how well the two eyes work together. The most common test is the OXO test, where you will look at an OXO target such as those in (Figure 15 and Figure 16)Figure 16. Another test is the “Maddox Rod” test, where the lights are dimmed and one eye sees a spot of light and the other eye sees a line, usually a red line. One other test that is sometimes used is a Maddox Wing test (Figure 17).



Figure 15: Distance OXO test

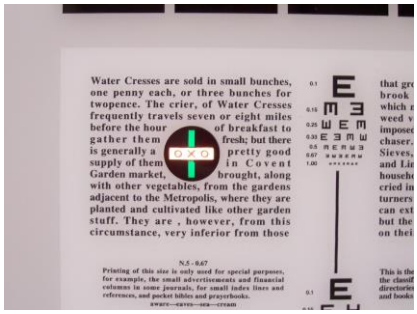


Figure 16: Near OXO test



Figure 17: Maddox Wing test

A non-Optometric member of staff or the optometrist may at some point during the eye examination check the “pressure within the eye” (Intraocular pressure-

Table 2). This test is called “tonometry” and is used in the detection of glaucoma. Most patients are aware of this as the “puff” test. However, there are two ways of checking the intraocular pressure:

- Using the “air puff instrument”- There are two widely used air puff machines. One is handheld and the other is table-mounted. With the table-mounted test the optometrist will ask you to rest your chin in the chin rest with your head against the bar.



Figure 18: Non contact tonometer (air puff test): hand held instrument

- Using a contact method- If this test is carried out it would be performed by the optometrist. S/he will put one drop of anaesthetic in each eye to numb the front surface (cornea-Figure 1) of your eye. The drops sting a little for a few seconds when they first go in and the effect of the drops usually lasts about 20 minutes. The optometrist will then either use a tonometer attached to a slit lamp (Figure 19) or a hand-held device to check the eye pressure. You (the patient) will be instructed to look straight ahead and will see a blue light from the tonometer.



Figure 19: Contact method- Slit lamp mounted tonometer device

The pressure test is usually followed by or preceded by a “visual field” examination. There are various different types of visual field plotters. Most have a white bowl with a small fixation light (for you to concentrate on) in the centre of the bowl (Figure 20). Alternatively, you may be asked to look at a light in the centre of a flat screen. The visual field test measures both your central and “side” vision (i.e. everything you can see with one eye open). This test is straightforward and painless but can be tiring. One eye is tested at a time and you will be asked to keep looking at the light in the centre of the bowl or at the centre of the screen. Other very small spots of light will flash on very briefly, only being present for less than a second at a time. You will be asked either to

report how many spots of light you see each time they are flashed, or you will be asked to press a response button when the light(s) come on. The flashes can vary from very bright to very dim through different stages of the test, and sometimes you may not see any flash at all. This is quite normal.



Figure 20: Visual field test

Some optometrists check the central and side vision using a red/white (depending on the colour of the walls in the consulting room) target. The target is brought in from behind you to a point when you can just see it. You will have one eye covered and will be looking at a fixation target selected by the optometrist. This test is called the "confrontation" field test and is done in the consulting room by the optometrist.

The optometrist may, as a result of your symptoms, decide to "dilate" your pupils to have a more thorough look at the back surface of the eye. The aim is to make the pupil, which is the black hole in the centre of the coloured part of your eye (the "iris"-Figure 1) bigger. The iris is very similar in action to the shutter on a camera (i.e. when you take a picture on a bright day the shutter becomes smaller hence allowing less light to enter). The pupil also becomes smaller when you shine a bright light into it making it difficult to look at the back of the eye. If the optometrist decides to dilate your pupils s/he will usually put one drop of a dilating drug in eye each. You will feel a slight stinging, which wears off in about 30 seconds. The dilating drops take about 20 minutes to work fully. The optometrist will ask you if you drove to the appointment in a car or motorbike before putting the drops in. This is because the drops can make your vision blurry and can make you notice glare symptoms for up to a few hours. At this time you need to ask the optometrist if you can return for this part of the test. Also ask the optometrist how urgently this test needs to be done.

Once your pupils are dilated, the optometrist will examine the back of your eyes using one of the three methods listed below:

- Using an ophthalmoscope-see Figure 3 above and accompanying text.
- Using a slit lamp and a volk lens- see Figure 4 above and accompanying text.
- Using a binocular headset (Figure 21) and a lens (similar to the volk lens but bigger) to aid magnification.



Figure 21: Binocular Headset

At the end of the eye examination the optometrist will advise you on his/her findings for the following aspects of your eyes and vision:

- The health of your eyes
- If you require new spectacles/ a change in your current prescription/ no change in prescription/ no spectacles.

The optometrist will often recommend:

- A lens type- to suit your occupation, prescription etc.
- A frame type- to suit your prescription, face etc.
- A re-examination interval.

S/he will usually hand you over to a non-optometric member of staff who will assist you and guide you through the selection of any spectacles you may require.

Table 1: Overview of tests done during an eye examination

Test Name	General Description	Details
History	Asking about your medical history and the history of any eye problems	Ask about your reason for visit, general health, medication, any previous eye problems, family history
Symptoms	Asking about any visual problems you are having	Ask about headaches, floaters, flashing lights, double vision
Ophthalmoscopy	Look at the health of the back of the eyes (ocular health)	Special hand-held instrument used to assess the health of the back of the eyes. (Can also be done with a slit-lamp)
Slit Lamp	Look at the health of the front and the back of the eyes (ocular health)	A microscope with a light attached to it that can be used to assess both the front and back surfaces of the eye under high magnification
Cover Test	Check for eye coordination	Black/opaque cover used to cover each eye in turn to look at muscle coordination
Convergence	Check to see how well the eyes converge	Check to see how well the eyes can turn in together towards the same point. This is tested using the RAF rule (Figure 7)
Accommodation	Assessing the eyes' ability to naturally adjust their focussing distance.	Testing the ability to focus close to, usually with the RAF rule (Figure 7)
Pupil reactions	How well do pupils react to light	This is checked using a pen light or ophthalmoscope light (Figure 3)
Motility	Check for eye muscle integrity	This test checks that all the eye muscles are functioning well. A pen light is used for this at a distance of 30-40 cms
Confrontation test	Test for central and "side" vision in each eye	This test is usually done using a red/white target (depending on the colour of the walls of the consulting room) , which is brought in from behind you to a point where you can see it.
Retinoscopy	Objective assessment of the refractive error of the eye	A hand-held instrument called a retinoscope is used to work out a rough estimate of the prescription the patient may require
Subjective refraction	Subjective assessment of the refractive error	Whilst you look at a letter chart, you are asked lots of questions comparing the clarity of targets on the chart with different lenses
Fixation Disparity	Test to evaluate how well	This is most commonly done using

	the two eyes work together	the OXO test (Figure 15and Figure 16)
Tonometry	Measurement of the “pressure within the eye”	Often known as the “puff” of air test. Occasionally done using an instrument that touches the eye (Contact method-see above)
Visual fields test	Test for central and “side” vision	Almost always done one eye at a time. The patient is asked to look at a light in the centre of a bowl (or at the centre of a flat screen) and report if a flash of light is seen, or how many flashes of light are seen
Binocular headset	Instrument used to examine the health of the eyes (ocular health)	An instrument (Figure 21) used in combination with a high powered lens to examine the back surface of the eyes once you have been dilated

Table 2: Terms used within Optometry. Please note, this table is provided to help explain terminology that is used earlier in this document and that might be used during this training. Normal patients would not use most of the terminology in the left hand column below, so these technical terms should be avoided during your eye examinations.

Term Used	Details
Diplopia	Double vision
Floaters	Black or clear floating bits in your vision
Visual acuity	**Distance:** letter chart at end of room (often seen in a mirror) **Near:** chart you hold with words or sentences on it **Unaided:** with no glasses **Aided:** when wearing your glasses **Habitual:** under the usual conditions for you, i.e. with glasses if you wear them or without glasses if you don't
Anterior eye	Front surfaces of the eye (e.g. Iris, Cornea, Lens etc)
Posterior eye	Back surfaces of the eye (Retina, Choroid etc)
Interpupillary distance	Distance between the 2 eyes
Objective assessment	Not requiring any responses from the patient
Subjective assessment	Requires responses from you: the optometrist requires active participation from the patient.
Autorefractor	A machine (Figure 8) that that works out a rough estimate of a prescription (e.g., degree of long-sightedness) to help improve your vision
Duochrome	Black letters, numbers or concentric circles on red and green backgrounds
Fluorescein dye	An orange dye used in the examination of the front surface of the eye. The dye fluoresces to a green colour under blue light. This just colours the tears and does not sting.
Volk Lens	High powered lens used with a slit lamp (Figure 4) to examine the back surface of the eye
Phoropter	An instrument used in place of the trial frame. This contains lenses of different strengths which are changed by the optometrist
Intraocular pressure	The pressure within the eyeball occurring as a result of constant formation and drainage of the fluid from the front

	chamber of the eye.
Spherical prescription	The long sighted or short sighted component of the spectacle prescription
Astigmatism	In astigmatism the cornea is oval like a rugby ball instead of spherical like a football. Astigmatic corneas cause light from a point object to focus on more than one point in the eye, resulting in blurred vision at distance and near.
Presbyopia	This is also known as the "short arm syndrome," and is a term used to describe an eye in which the natural lens gradually loses its ability to focus close to. Eventually, reading correction in the form of reading glasses, bifocals, or varifocals is needed for close work. However, short-sighted people can simply take their glasses off because they naturally see best close-up.
Near Add	The lens prescription to help patients see objects/ print at a close working distance.
Near (short) sightedness-Myopia	This occurs when light entering the relaxed eye from an object in the far distance focuses in front of the retina instead of directly on it. This is usually caused by a cornea that is more powerful, or an eye that is longer, than a normal eye. Nearsighted people typically see well up close, but have difficulty seeing far away.
Far (long) sightedness-Hyperopia	This occurs when light entering the relaxed eye from an object in the far distance focuses behind the retina, instead of directly on it. This is usually caused by a cornea that is less powerful, or an eye that is shorter, than a normal eye. Farsighted people usually have trouble seeing up close, but may also have difficulty seeing far away as well if their less has insufficient accommodation to focus light from far away onto the retina.

Appendix 08

An evidence-based investigation of the content of an optometric eye examination in the UK

Data Protection

As part of the training (Stage 2), I understand I will be observing consenting normal patients having eye examinations at the Institute of Optometry. This is important so that tests which are part of routine optometry practice in the UK can be explained to me in detail. I understand that any information pertaining to the personal identification and medical history of the patient being examined is strictly **confidential**. By signing this document I agree to non-disclosure of such information in accordance with the Data Protection Act 1998.

Consent for video recording

In stage 3 of training, I consent to being examined by staff members of the Institute of Optometry whilst being video recorded. I understand this video-recording forms an important part of the training and will be used:

- by the researchers and expert panels to check and compare the findings with the checklist I complete at the end of the eye examination
- and to check how convincingly I (standardized patient), act as a real patient

You acknowledge that all rights and ownership of such footage belong to the Institute of Optometry.

Withdrawal from study

I understand that my participation is voluntary; that I can choose not to participate in part or all of the project, and that I can withdraw at any stage of the project without being penalised or disadvantaged in any way.

Name: …… (Please print)

Signature:……Date: ……

I believe that …….. understands the above project and gives her/his consent voluntarily.

Name: …… (Please print)

Signature:……Date: ……

Appendix 09

An evidence-based investigation of the content of an optometric eye examination in the UK

Consent Form

I agree to take part in the above research project. I have undergone full training at the Institute of Optometry in the contents of eye examinations, as outlined below:

1. The individual tests and questions in the checklist have been fully explained.
2. I have observed consenting normal patients having eye examinations, whilst the tests are again explained in detail.
3. I have had eye examinations by members of the Institute of Optometry staff, whilst being video recorded (prior consent was obtained) using all tests that I am likely to experience in the research, and have become familiar with these tests.
4. I have been educated in the components of a normal eye examination in the UK.
5. I understand that during the research I will be subjected to tests by optometrists. The optometrists will believe that I am a normal patient, so the tests are likely to be routine tests that are carried out in eye examinations.
6. It is possible that the tests might include drops to dilate the pupil of the eye. I understand that this may blur my vision and make me sensitive to bright lights for a few hours. I will not drive or operate dangerous machinery if my vision is affected in this way.
7. These drops are commonly used in eye examinations, and only carry a very small risk of complications. Specifically, there is an approximately 1 in 5,000 chance of the drops causing a significant ocular reaction. The tests I have received at the Institute of Optometry suggest that I am not prone to this reaction. However, if I do experience any unusual symptoms (other than blurring and light sensitivity) after the drops then I will telephone the researchers immediately.
8. I have adequate knowledge about the contents of an eye examination in order to be able to complete a checklist at the end of an eye examination.
9. After every 25 SP visits, I consent to be video-recorded during an eye examination at the Institute of Optometry to check I am still performing as a convincing patient and am completing the checklist accurately.

Data Protection

Information gathered in the research will be held and processed for the purpose of completing the research study to investigate the content of an eye examination in the UK.

I understand that any information gathered during the eye examinations is confidential and will be used solely for the completion of the checklist provided.

Confidentiality and Options for Consenting Practitioners

OPTION 1:Full Anonymity- For practitioners choosing this option, I will be given a list of consenting practitioners to visit. Upon leaving each practitioner, I will record the contents of the eye examination on the checklist. I agree to maintain the practitioner's

confidentiality and **will not** record the practitioner's name or any other identifying features.

OPTION 2:Feedback for professional development and anonymity in research- For practitioners choosing this option, I will be given a list of consenting practitioners to visit. Upon leaving each practitioner, I will record the contents of the eye examination on the checklist.

The researchers (Rakhee Shah & Bruce Evans) will be given access to the names of the optometrists who agree to this option in order to provide them with feedback about my findings. The results will only be known to the researchers, the actors, and the practitioners and will not be disclosed to any other parties.

Use of Audio Recording

I understand I will be audio recording the eye examinations to help me in the accurate completion of the checklists. The researchers (Rakhee Shah & Bruce Evans) will only be given access to the audio recording for practitioners consenting to the feedback option (Option 2). These recordings will be used as quality control to monitor accurate completion of the checklists. I understand the confidential nature of these recordings.

Withdrawal from study

I understand that my participation is voluntary; that I can choose not to participate in part or all of the project, and that I can withdraw at any stage of the project without being penalised or disadvantaged in any way.

Name: …… (Please print)

Signature:……Date: ……

I believe that …….. understands the above project and gives her/his consent voluntarily.

Name: …… (Please print)

Signature:……Date: ……

Option 1/2: If Option 2 Name of Practitioner:

Practice type: Independent/ Small multiple/ Large multiple

Location of practice: Town Centre/ Rural

Appendix 10

Scenario 1: 20 year old patient with suspicious headaches

How thorough do you feel the eye examination was?

Very thorough

Not thorough at all

To what extent were your presenting symptoms were addressed?

Fully addressed

Not addressed at all

History and Symptoms- Did the practitioner ask you:

1. The date of last eye examination? Yes No
2. If you have spectacles? Yes No
3. Your reason for visit? Yes No
4. Is your vision OK?
   - at distance Yes No
   - at near? Yes No
5. Whether you experience any headaches/migraines? Yes No Known

Option 1/2: If Option 2 Name of Practitioner:

Practice type: Independent/ Small multiple/ Large multiple

Location of practice: Town Centre/ Rural

- Description of onset and how long you have had them? Yes No
- Duration of symptoms? Yes No
- How long the headaches last? Yes No
- Location Yes No
- Severity Yes No
- Frequency Yes No
- Is there a change in pattern? Yes No
- Have you consulted a medical practitioner about the headaches? Yes No
- Do you experience nausea/vomiting? Yes No
- Any visual disturbances? Yes No
- Timings? Yes No
- Visual associations? Yes No
- Non-visual associations? Yes No

6. Whether you see flashing lights in your vision? Yes No Known
   - Do the flashing lights precede the headaches? Yes No
   - Are the flashes in one eye or both eyes? Yes No
   - Describe the flashes? Yes No
   - Where in your visual field do you see the flashes? Yes No
   - How long do the flashes last? Yes No
7. Whether you see floaters in your vision? Yes No
8. Whether you experience double vision? Yes No
9. About your general health
   - General questions about health (E.g. are you in good health?) Yes No
   - Are you diabetic? Yes No
   - Do you have high blood pressure? Yes No
10. If you take any medication on a regular basis? Yes No
11. Do you have any allergies? Yes No
12. About your previous ocular health
    - Have you ever attended an eye hospital? Yes No
    - Have you ever had an eye injury/surgery/ infection? Yes No
    - Have you ever been told you have a lazy eye? Yes No
13. If there is a family history of:
    - Diabetes? Yes No
    - Glaucoma? Yes No
    - Any other eye problems? Yes No
14. Whether you drive? Yes No
15. What you do for a living (Occupation)? Yes No
16. About the sorts of visual tasks you do (e.g., computer, hobbies)? Yes No
17. Any other questions?.....

Option 1/2: If Option 2 Name of Practitioner:

Practice type: Independent/ Small multiple/ Large multiple

Location of practice: Town Centre/ Rural

……

Preliminary Tests-Did the practitioner:

18. Ask you to read letters on a letter chart (with/without your current spectacles):
    - For distance Yes No
    - For near Yes No
19. Cover and uncover each eye when you were looking at:
    - For distance fixation Yes No
    - For near fixation Yes No
20. Check your eye muscle integrity by asking you to follow a pen or pen light in different directions(motility) Yes No
21. Check how well your eyes converge (convergence) Yes No
22. Test how well your pupils react to light (pupil reactions) Yes No
23. Check distance between your eyes (interpupillary distance) Yes No
24. Check your central and side vision using a red/white target (confrontation) Yes No

Retinoscopy & Subjective Refraction -Did the practitioner:

25. Or a member of staff, check the prescription on your current spectacles? Yes No
26. Obtain an objective refraction using:
    - An Autorefractor Yes No
    - Retinoscopy Yes No
27. Do a subjective refraction to establish a refractive error for each eye? Yes No
28. Check for uncorrected astigmatism using cross-cyl or fan & block? Yes No
29. Do binocular balancing and check binocular visual acuity? Yes No
30. Cover and uncover each eye when you were looking at:
    - For distance fixation Yes No
    - For near fixation Yes No
31. Check your eyes ability to naturally adjust the focussing distance (accommodation) Yes No
32. Check how well the two eyes work together using the OXO test:
    - For distance Yes No
    - For near Yes No
33. Assess near visual acuity (using a book or page with writing on it) Yes No
34. Do any other tests……

Option 1/2: If Option 2 Name of Practitioner:

Practice type: Independent/ Small multiple/ Large multiple

Location of practice: Town Centre/ Rural

……

Slit Lamp & Ophthalmoscopy- Did the practitioner:

35. Examine the anterior surface of the eye using a slit lamp:
    - ❖ With fluorescein Yes No
    - ❖ Without fluorescein Yes No
36. Examine the inside (back) of the eye:
    - ➢ Using an ophthalmoscope Yes No
    - ➢ Using slit lamp biomicroscopy Yes No
    - ➢ Using a fundus camera? Yes No
    - ➢ Using another method (specify) Yes No

      …….

Supplementary Tests- Did the practitioner and/or a member of staff:

37. Assess pressure within the eye? Yes No
38. Test your central and side vision (visual fields)? Yes No
    - ➢ Approximately how long did the test take for each eye?

      ……
39. Carry out any other tests? Yes No
    - ❖ Describe other tests undertaken?

      ……..……

      …….....

Advice-Did the practitioner:

40. Issue a copy of the prescription:
    - ➢ Without prompting? Yes No
    - ➢ After prompting? Yes No
41. Recommend an update in spectacles? Yes No
42. Advise you to seek a medical opinion regarding the headaches? Yes No
    - ➢ Told to go to hospital now Yes No
    - ➢ Told to go to GP now Yes No
    - ➢ Told to go to GP within one week Yes No
    - ➢ Told to go to GP whenever convenient (or no timescale) Yes No
    - ➢ Told good idea to go to GP, not definite recommendation Yes No
    - ➢ Told go to GP if no better with new specs Yes No
    - ➢ Told to go to GP if concerned or if worsens Yes No

Option 1/2: If Option 2 Name of Practitioner:

Practice type: Independent/ Small multiple/ Large multiple

Location of practice: Town Centre/ Rural

43. Advise you to keep a note of the pattern of occurrence of the headaches?
44. Advise you on a re-examination interval? Yes No
    - ❖ What was the re-examination interval?
      ……..
    - ❖ Any other advice?
      ……
      ……

Additional Data

1. Duration of eye examination?
2. What was the cost of eye examination?
3. Cost of any further tests recommended?

Appendix 11

Scenario 1: 20 year old patient with suspicious headaches

	Average Score
How thorough do you feel the eye examination was?	61.7
To what extent do you feel you presenting symptoms were addressed?	58.7

History and Symptoms-Did the optometrist ask you:

	% of practitioners that asked the question
1. The date of your last eye examination?	94%
2. Whether you have spectacles?	100%
3. Your reason for visit?	82%
4. Is your vision OK?	
➢ at distance	69%
➢ at near	58%
5. Whether you experience any headaches/migraines?	11%
(74% known from reason for visit)	
➢ Description of onset?	68%
➢ Duration of symptoms?	50%
➢ How long the headaches last?	41%
➢ Location	84%
➢ Severity	14%
➢ Frequency	68%
➢ Is there a change in pattern?	9%
➢ Have you consulted a medical practitioner about the headaches?	23%
➢ Do you experience nausea/vomiting?	20%
➢ Any visual disturbances?	32%
➢ Timings?	56%
➢ Visual associations?	38%
➢ Non-visual associations?	7%
6. Whether you see flashing lights in your vision?	21%
(5% Known from visual disturbances above)	
➢ Do the flashing lights precede the headaches?	8%
➢ Are the flashes in one eye or both eyes?	5%
➢ Describe the flashes?	12%

- Where in your visual field do you see the flashes? 1%
- How long do the flashes last? 7%

7. Whether you see floaters in your vision? 22%
8. Whether you experience double vision? 25%
9. About your general health
   - General questions about health 92%
     (E.g. are you in good health?)
   - Are you diabetic? 7%
   - Do you have high blood pressure? 3%
10. If you take any medication on a regular basis? 96%
11. Do you have any allergies? 13%
12. About your previous ocular health
    - Have you ever attended an eye hospital? 64%
    - Have you ever had an eye injury/surgery/ infection? 44%
    - Have you ever been told you have a lazy eye? 4%
    - Do you wear contact lenses? 40%
13. If there is a family history of:
    - Diabetes? 65%
    - Glaucoma? 63%
    - Any other eye problems? 68%
14. Whether you drive? 78%
15. What you do for a living (Occupation)? 91%
16. About the sorts of visual tasks you do (e.g., computer, hobbies)? 77%

Preliminary Tests-Did the optometrist:

17. Ask you to read letters on a letter chart (with/without your current spectacles):
    - For distance 91%
    - For near 21%
18. Perform cover test:
    - For distance fixation 72%
    - For near fixation 57%
19. Perform motility 31%
20. Check your convergence 51%
21. Test pupils reactions 65%
22. Check distance between your eyes (interpupillary distance) 30%
23. Check your central and side vision using a red/white target

(confrontation) 1%

Retinoscopy & Subjective Refraction-Did the optometrist:

24. Did the practitioner, or a member of staff, check the prescription on your current spectacles? 100%
25. Obtain an objective refraction using:
    - An Autorefractor 29%
    - Retinoscopy 36%
26. Do a subjective refraction to establish a refractive error for each eye? 100%
27. Check for uncorrected astigmatism using cross-cyl or fan & block? 94%
28. Do binocular balancing and check binocular visual acuity? 42%
29. Perform a cover test using their subjective findings:
    - For distance fixation 12%
    - For near fixation 15%
30. Check your accommodation 36%
31. Check fixation disparity:
    - For distance 29%
    - For near 14%
32. Assess near visual acuity 64%

Slit Lamp & Ophthalmoscopy-Did the optometrist:

33. Examine the anterior eye using a slit lamp:
    - With fluorescein 1%
    - Without fluorescein 34%
34. Examine the inside (back) of the eye:
    - Using an ophthalmoscope 73%
    - Using slit lamp biomicroscopy 29%
    - Using a fundus camera? 7%
    - Using another method
        i. Scanning Laser Ophthalmoscope 1%
        ii. Head Mounted (Indirect) 1%

Supplementary Tests-Did the optometrist:

35. Assess pressure within the eye? 42%

36. Test your central and side vision (visual fields)? 61%

37. Carry out any other tests:

    i. Keratometry 1%

    ii. Colour Vision 1%

    iii. Red Desaturation 1%

Advice and Management-Did the optometrist:

38. Issue a copy of the prescription:

- Without prompting? 57%
- After prompting? 42%

39. Recommend an update in spectacles? 53%

40. Advise you to seek a medical opinion regarding the headaches? 69%

- Told to go to hospital now 0%
- Told to go to GP now 0%
- Told to go to GP within one week 1%
- Told to go to GP whenever convenient (or no timescale) 10%
- Told good idea to go to GP, not definite recommendation 7%
- Told go to GP if no better with new specs 13%
- Told to go to GP if concerned or if worsens 44%

41. Advise you to keep a note of the pattern of occurrence of the headaches? 14%

42. Advise you on a re-examination interval? 80%

- What was the re-examination interval? 21 months average

Additional Data

43. Average duration of eye examination? 21 minutes

44. Average cost of an eye examination? £22.55

Option 1/2: If Option 2 Name of Practitioner:

Practice type: Independent/ Small multiple/ Large multiple

Location of practice: Town Centre/ Rural

Appendix 12

Scenario 2: Patient of Afro-Caribbean racial origin aged 44 years complaining of recent difficulty with near vision

How thorough do you feel the eye examination was?

- Very thorough
- Not thorough at all

To what extent were your presenting symptoms were addressed?

- Fully addressed
- Not addressed at all

History and Symptoms- Did the practitioner ask you:

1.	The date of last eye examination?	Yes No
2.	If you have spectacles?	Yes No
3.	Your reason for visit?	Yes No
4.	Is your vision OK?	
	a. at distance	Yes No
	b. at near?	Yes No

Option 1/2: If Option 2 Name of Practitioner:

Practice type: Independent/ Small multiple/ Large multiple

Location of practice: Town Centre/ Rural

5. Whether you experience any headaches/migraines? Yes No
6. Whether you see flashing lights in your vision? Yes No
7. Whether you see floaters in your vision? Yes No
8. Whether you experience double vision? Yes No

9. Whether you experience any pain/discomfort of the eyes? Yes No
10. About your general health
    a. General questions about health (E.g. are you in good health?) Yes No
    b. Are you diabetic? Yes No
    c. Do you have high blood pressure? Yes No
11. Do you take any medication on a regular basis? Yes No
12. Ocular Health
    a. Have you ever attended a hospital eye department? Yes No
    b. Have you ever had an eye injury/surgery/ infection? Yes No
    c. Have you ever been told you have a lazy eye? Yes No
    d. Do you have glaucoma? Yes No
13. If there is a family history of:
    a. Diabetes? Yes No
    b. High blood pressure? Yes No
    c. Glaucoma? Yes No
    d. Any other eye problems? Yes No
14. Whether you drive? Yes No
15. What you do for a living (Occupation)? Yes No
16. About the sorts of visual tasks you do (e.g., computer, hobbies)? Yes No
17. Any other questions?.....
    ……

Preliminary Tests-Did the practitioner:

18. Ask you to read letters on a letter chart (with/without your current spectacles):
    a. For distance Yes No
    b. For near Yes No
19. Cover and uncover each eye when you were looking at:
    a. For distance fixation Yes No
    b. For near fixation Yes No
20. Check your eye muscle integrity by asking you to follow a pen or pen light in different directions(motility) Yes No
21. Check how well your eyes converge (convergence) Yes No
22. Test how well your pupils react to light (pupil reactions) Yes No

Option 1/2: If Option 2 Name of Practitioner:

Practice type: Independent/ Small multiple/ Large multiple

Location of practice: Town Centre/ Rural

23. Check distance between your eyes (interpupillary distance) Yes No
24. Check your central and side vision using a red/white target (confrontation) Yes No

Retinoscopy & Subjective Refraction -Did the practitioner:

25. Or a member of staff, check the prescription on your current spectacles? Yes No
26. Obtain an objective refraction using:
    a. An Autorefractor Yes No
    b. Retinoscopy Yes No
27. Do retinoscopy to obtain objective refraction? Yes No
28. Do a subjective refraction to establish visual acuity for each eye? Yes No
29. Check for uncorrected astigmatism using cross-cyl or fan & block? Yes No
30. Cover and uncover each eye when you were looking at:
    a. For distance fixation Yes No
    b. For near fixation Yes No
31. Check how well the two eyes work together using the OXO test:
    a. For distance fixation Yes No
    b. For near fixation Yes No
32. Check your eyes ability to naturally adjust the focussing distance (accommodation) Yes No
33. Establish a prescription for:
    a. Near Yes No
    b. Intermediate/ occupation specific distance Yes No
34. Assess how well you see (visual acuity):
    a. Near Yes No
    b. Intermediate Yes No
35. Do any other tests?.....
    ……

Slit Lamp & Ophthalmoscopy- Did the practitioner:

36. Examine the anterior surface of the eye with a slit lamp
    a. with fluorescein Yes No
    b. without fluorescein Yes No
    c. Inspect the anterior chamber angle using:
        ❖ Gonioscopy Yes No
37. Examine the inside of the eye:
    a. Using a monocular instrument (ophthalmoscope/monocular indirect) Yes No

Option 1/2: If Option 2 Name of Practitioner:

Practice type: Independent/ Small multiple/ Large multiple

Location of practice: Town Centre/ Rural

b. Using slit lamp biomicroscopy Yes No
c. Using a fundus camera Yes No

Supplementary Tests- Did the practitioner and/or a member of staff:

38. Assess pressure within the eye? Yes No
    a. Using an air puff instrument? Yes No
    b. Using a contact method (drops & blue light)? Yes No
39. Test your central and side vision (visual fields)? Yes No
    - ❖ Approximately how long did the test take for each eye?.....
40. Carry out any other tests? Yes No
    - ❖ Describe other tests undertaken?

    ……..
    ……..

Advice-Did the practitioner:

41. Issue a copy of the prescription:
    a. Without prompting? Yes No
    b. After prompting? Yes No
42. An update in spectacles recommended? Yes No
43. Advice you a re-examination interval? Yes No
    - ❖ What was the re-examination interval?.....
44. When you asked “am I at a risk of any particular eye problems”, did they inform you of people who are at a greater risk of developing glaucoma? If yes, please list these below:……
    ……..
45. Any other advice?
    ……
    ……..

Additional Data

1. Duration of eye examination?
2. Cost of eye examination?
3. Cost of any further tests recommended?

Appendix 13

Scenario 2: Patient of Afro-Caribbean racial origin aged 44 years complaining of recent difficulty with near vision

	Average Score
How thorough do you feel the eye examination was?	92.27
To what extent do you feel you presenting symptoms were addressed?	91.97

History and Symptoms-Did the optometrist ask you:

	% of practitioners that asked the question
1. The date of your last eye examination?	94%
2. Whether you have spectacles?	98%
3. Your reason for visit?	100%
4. Is your vision OK?	
➢ at distance	97%
➢ at near	95%
5. Whether you experience any headaches/migraines?	86%
6. Whether you see flashing lights in your vision?	54%
7. Whether you see floaters in your vision?	49%
8. Whether you experience double vision?	48%
9. Whether you experience any pain/discomfort of the eyes?	75%
10. About your general health	
➢ General questions about health (e.g. are you in good health?)	97%
➢ Are you diabetic?	29%
➢ Do you have high blood pressure?	13%
11. If you take any medication on a regular basis?	99%
12. Do you have any allergies?	19%
13. About your previous ocular health	
➢ Have you ever attended an eye hospital?	96%
➢ Have you ever had an eye injury/surgery/ infection?	89%
➢ Have you ever been told you have a lazy eye?	41%
➢ Do you have glaucoma?	30%
14. If there is a family history of:	

- Diabetes? 93%
- Glaucoma? 95%
- High blood pressure? 25%
- Any other eye problems? 89%

15. Whether you drive? 95%
16. What you do for a living (Occupation)? 87%
17. About the sorts of visual tasks you do (e.g., computer, hobbies)? 77%

Preliminary Tests-Did the optometrist:

18. Ask you to read letters on a letter chart (with/without your current spectacles):
    - For distance 100%
    - For near 96%
19. Perform cover test:
    - For distance fixation 96%
    - For near fixation 94%
20. Perform motility 62%
21. Check your convergence 40%
22. Test pupil reactions 94%
23. Check distance between your eyes (interpupillary distance) 57%
24. Check your central and side vision using a red/white target (confrontation) 1%

Retinoscopy & Subjective Refraction-Did the optometrist:

25. Did the practitioner, or a member of staff, check the prescription on your current spectacles? 100%
26. Obtain an objective refraction using:
    - An Autorefractor 35%
    - Retinoscopy 60%
27. Do a subjective refraction to establish a refractive error for each eye? 100%
28. Check for uncorrected astigmatism using cross-cyl or fan & block? 76%
29. Perform a cover test using their subjective findings:
    - For distance fixation 99%
    - For near fixation 97%
30. Check your accommodation 21%
31. Establish a prescription for:

- Near 74%
- Intermediate 45%

32. Assess your visual acuity (using a book or page with writing on it) for:
    - Near 100%
    - Intermediate 62%
33. Check how well the two eyes work together using the OXO test:
    - For distance fixation 30%
    - For near fixation 14%

Slit Lamp & Ophthalmoscopy-Did the optometrist:

34. Examine the anterior surface of the eye using a slit lamp:
    - With fluorescein 4%
    - Without fluorescein 33%
35. Examine the inside (back) of the eye:
    - Using an monocular instrument (direct ophthalmoscope/monocular indirect) 86%
    - Using slit lamp biomicroscopy 22%
    - Using a fundus camera? 8%
    - Using another method
        i. Scanning Laser Ophthalmoscope 0%
        ii. Head Mounted (Indirect) 2%

Supplementary Tests-Did the optometrist:

36. Assess pressure within the eye? 96%
    - Using a contact method? 12%
    - Using a non-contact method? 84%
37. Test your central and side vision (visual fields)? 36%
38. Carry out any other tests:
        i. Keratometry 0%
        ii. Colour Vision 0%
        iii. Red-desaturation 0%
        iv. Stereopsis 3%

Advice and Management-Did the optometrist:

39. Issue a copy of the prescription:
    - Without prompting? 70%
    - After prompting? 28%
40. Recommend an update in spectacles? 69%
41. Advise you on a re-examination interval? 83%
    - What was the re-examination interval? 21 months

Additional Data

42. Average duration of eye examination? 23 minutes
43. Average cost of an eye examination? £22.32

Option 1/2: If Option 2 Name of Practitioner:

Practice type: Independent/ Small multiple/ Large multiple

Location of practice: Town Centre/ Rural

Appendix 14

Scenario 3: Person aged 59 years with flashing lights of a recent onset.

How thorough do you feel the eye examination was?

- Very thorough
- Not thorough at all

To what extent were your presenting symptoms were addressed?

- Fully addressed
- Not addressed at all

History and Symptoms- Did the practitioner ask you:

1. The date of last eye examination?	Yes	No
2. If you have spectacles?	Yes	No
3. Your reason for visit?	Yes	No
4. Is your vision OK?		
a. at distance	Yes	No
b. at near?	Yes	No
5. Whether you had experienced any headaches?	Yes	No

Option 1/2: If Option 2 Name of Practitioner:

Practice type: Independent/ Small multiple/ Large multiple

Location of practice: Town Centre/ Rural

6. Whether you see flashing lights in your vision? Yes No Known
    a. Where in your vision do you see the flashing lights? Yes No
    b. Are the flashing lights in one or both eyes? Yes No
    c. Describe the flashes? Yes No
    d. Is there a pattern to the occurrence of the flashes?
        - ❖ i.e. Constant/Intermittent Yes No
    e. Is there a change in pattern of occurrence?
        - ❖ i.e. More/ Less frequent Yes No
    f. How long ago did you first notice them? Yes No
    g. How long do they last? Yes No
7. Whether you see floaters in your vision? Yes No
    a. How long have you been seeing the floaters for? Yes No
    b. Are they present in one/both eyes? Yes No
    c. Have they increased in number or changed in pattern? Yes No
8. Whether you experience double vision? Yes No
9. Whether you had seen any shadows in your field of vision? Yes No
10. About your general health
    a. General question about health
    (E.g. are you in good health?) Yes No
    b. Are you diabetic? Yes No
    c. Do you have high blood pressure? Yes No
    d. Have you recently had banged your head? Yes No
11. Do you take any medication on a regular basis? Yes No
12. Do you have any allergies? Yes No
13. Ocular Health
    a. Have you ever attended the hospital eye department? Yes No
    b. Have you ever had an eye injury/surgery/ infection? Yes No
    c. Have you ever been told you have a lazy eye? Yes No
    d. Do you have glaucoma? Yes No
14. If there is a family history of:
    a. Diabetes? Yes No
    b. High blood pressure? Yes No
    c. Glaucoma? Yes No
    d. Any other eye problems? Yes No
15. Whether you drive? Yes No
16. What you do for a living (Occupation)? Yes No
17. About the sorts of visual tasks you do (e.g., computer, hobbies)? Yes No
18. Any other questions?.....
    .....

Preliminary Tests-Did the practitioner:

Option 1/2: If Option 2 Name of Practitioner:

Practice type: Independent/ Small multiple/ Large multiple

Location of practice: Town Centre/ Rural

19. Ask you to read letters on a letter chart (with/without your current spectacles):
    a. For distance Yes No
    b. For near Yes No
20. Cover and uncover each eye when you were looking at:
    a. For distance fixation Yes No
    b. For near fixation Yes No
21. Check your eye muscle integrity by asking you to follow a pen or pen light in different directions(motility) Yes No
22. Check how well your eyes converge (convergence) Yes No
23. Test how well your pupils react to light (pupil reactions) Yes No
24. Check your side and central vision using a small red/white target (usually brought in from behind you to when you can just see it) Yes No
25. Check distance between your eyes (interpupillary distance) Yes No

Retinoscopy & Subjective Refraction -Did the practitioner:

26. Do retinoscopy to obtain objective refraction? Yes No
27. Use an Autorefractor (looking at a lond road or hot air balloon) to obtain an objective refraction? Yes No
28. Do a subjective refraction to establish visual acuity for each eye? Yes No
29. Check for uncorrected astigmatism using cross-cyl or fan & block? Yes No
30. Cover and uncover each eye when you were looking at:
    a. For distance fixation Yes No
    b. For near fixation Yes No
31. Check how well the two eyes work together using the OXO test:
    a. For distance fixation Yes No
    b. For near fixation Yes No
32. Establish a prescription near? Yes No
33. Assess how well you see for near? Yes No
34. Do any other tests?.....
    ……

Slit Lamp & Ophthalmoscopy- Did the practitioner:

35. Examine the anterior surface of the eye with a slit lamp
    a. with fluorescein Yes No
    b. without fluorescein Yes No
    c. check for Schafer's Sign Yes No
36. Examine the inside (back) of the eye:

Option 1/2: If Option 2 Name of Practitioner:

Practice type: Independent/ Small multiple/ Large multiple

Location of practice: Town Centre/ Rural

a. Using an ophthalmoscope Yes No
b. Using a slit lamp biomicroscopy (volk lens) Yes No
c. Using binocular headset Yes No

Supplementary Tests- Did the practitioner and/or a member of staff:

37. Assess pressure within the eye? Yes No
    a. Using an air puff instrument? Yes No
    b. Using a contact method (drops & blue light)? Yes No
38. Test your central and side vision (visual fields test)? Yes No
    - ❖ Approximately how long did the test take for each eye? ……
39. Carry out any other tests? Yes No
    - ❖ Describe other tests undertaken? ……
    ……..

Advice-Did the practitioner:

40. Issue a copy of the prescription:
    a. Without prompting? Yes No
    b. After prompting? Yes No
41. An update in spectacles recommended? Yes No
42. Advise you that further tests with drops are required? Yes No
    a. Ideally on the same day Yes No
    b. Within a week Yes No
    c. Whenever convenient Yes No
43. Advice you on the side effects of the drops? Yes No
44. Advice you and/or obtain consent to refer for a 2nd opinion? Yes No
    a. Ideally on the same day Yes No
    b. Within a week Yes No
    c. Whenever convenient Yes No
45. Advice you a re-examination interval? Yes No
    a. What was the re-examination interval?.....
46. Any other advice?……
……

Additional Data

1. Duration of eye examination?
2. Cost of eye examination?
3. Cost of any further tests recommended?

Option 1/2: If Option 2 Name of Practitioner:

Practice type: Independent/ Small multiple/ Large multiple

Location of practice: Town Centre/ Rural

4. If a referral was recommended;
    a. Was a letter written to the GP/Hospital Eye Service? Yes No
    b. Or were you asked to consult your GP? Yes No
    c. Was a copy of the letter sent to you? Yes No

Option 1/2: If Option 2 Name of Practitioner:

Practice type: Independent/ Small multiple/ Large multiple

Location of practice: Town Centre/ Rural

Appendix 15

Scenario 3: Person aged 59 years with flashing lights of a recent onset.

How thorough do you feel the eye examination was?

Very thorough

Not thorough at all

To what extent were your presenting symptoms were addressed?

Fully addressed

Not addressed at all

History and Symptoms- Did the practitioner ask you:

1. The date of last eye examination?	Yes	No
2. If you have spectacles?	Yes	No
3. Your reason for visit?	Yes	No
4. Is your vision OK?		
a. at distance	Yes	No
b. at near?	Yes	No
5. Whether you had experienced any headaches?	Yes	No

Option 1/2: If Option 2 Name of Practitioner:

Practice type: Independent/ Small multiple/ Large multiple

Location of practice: Town Centre/ Rural

6. Whether you see flashing lights in your vision? Yes No Known
    a. Where in your vision do you see the flashing lights? Yes No
    b. Are the flashing lights in one or both eyes? Yes No
    c. Describe the flashes? Yes No
    d. Is there a pattern to the occurrence of the flashes?
        - ❖ i.e. Constant/Intermittent Yes No
    e. Is there a change in pattern of occurrence?
        - ❖ i.e. More/ Less frequent Yes No
    f. How long ago did you first notice them? Yes No
    g. How long do they last? Yes No
7. Whether you see floaters in your vision? Yes No
    a. How long have you been seeing the floaters for? Yes No
    b. Are they present in one/both eyes? Yes No
    c. Have they increased in number or changed in pattern? Yes No
8. Whether you experience double vision? Yes No
9. Whether you had seen any shadows in your field of vision? Yes No
10. About your general health
    a. General question about health
    (E.g. are you in good health?) Yes No
    b. Are you diabetic? Yes No
    c. Do you have high blood pressure? Yes No
    d. Have you recently had banged your head? Yes No
11. Do you take any medication on a regular basis? Yes No
12. Do you have any allergies? Yes No
13. Ocular Health
    a. Have you ever attended the hospital eye department? Yes No
    b. Have you ever had an eye injury/surgery/ infection? Yes No
    c. Have you ever been told you have a lazy eye? Yes No
    d. Do you have glaucoma? Yes No
14. If there is a family history of:
    a. Diabetes? Yes No
    b. High blood pressure? Yes No
    c. Glaucoma? Yes No
    d. Any other eye problems? Yes No
15. Whether you drive? Yes No
16. What you do for a living (Occupation)? Yes No
17. About the sorts of visual tasks you do (e.g., computer, hobbies)? Yes No
18. Any other questions?.....
    .....

Preliminary Tests-Did the practitioner:

Option 1/2: If Option 2 Name of Practitioner:

Practice type: Independent/ Small multiple/ Large multiple

Location of practice: Town Centre/ Rural

19. Ask you to read letters on a letter chart (with/without your current spectacles):
    a. For distance Yes No
    b. Ford near Yes No
20. Cover and uncover each eye when you were looking at:
    a. For distance fixation Yes No
    b. For near fixation Yes No
21. Check your eye muscle integrity by asking you to follow a pen or pen light in different directions(motility) Yes No
22. Check how well your eyes converge (convergence) Yes No
23. Test how well your pupils react to light (pupil reactions) Yes No
24. Check your side and central vision using a small red/white target (usually brought in from behind you to when you can just see it) Yes No
25. Check distance between your eyes (interpupillary distance) Yes No

Retinoscopy & Subjective Refraction -Did the practitioner:

26. Do retinoscopy to obtain objective refraction? Yes No
27. Use an Autorefractor (looking at a lond road or hot air balloon) to obtain an objective refraction? Yes No
28. Do a subjective refraction to establish visual acuity for each eye? Yes No
29. Check for uncorrected astigmatism using cross-cyl or fan & block? Yes No
30. Cover and uncover each eye when you were looking at:
    a. For distance fixation Yes No
    b. For near fixation Yes No
31. Check how well the two eyes work together using the OXO test:
    a. For distance fixation Yes No
    b. For near fixation Yes No
32. Establish a prescription near? Yes No
33. Assess how well you see for near? Yes No
34. Do any other tests?.....
    ……

Slit Lamp & Ophthalmoscopy- Did the practitioner:

35. Examine the anterior surface of the eye with a slit lamp
    a. with fluorescein Yes No
    b. without fluorescein Yes No
    c. Check for Shafer's Sign Yes No
36. Examine the inside (back) of the eye:

Option 1/2: If Option 2 Name of Practitioner:

Practice type: Independent/ Small multiple/ Large multiple

Location of practice: Town Centre/ Rural

a. Dilated Yes No
b. Undilated Yes No
c. Using an ophthalmoscope Yes No
d. Using a slit lamp biomicroscopy (volk lens) Yes No
e. Using binocular headset Yes No

Supplementary Tests- Did the practitioner and/or a member of staff:

37. Assess pressure within the eye? Yes No
    a. Using an air puff instrument? Yes No
    b. Using a contact method (drops & blue light)? Yes No
    c. Before pupillary dilation Yes No
    d. After pupillary dilation Yes No
38. Test your central and side vision (visual fields test)? Yes No
    - ❖ Approximately how long did the test take for each eye?
      ……
39. Carry out any other tests? Yes No
    - ❖ Describe other tests undertaken? ……
      ……..

Advice-Did the practitioner:

40. Issue a copy of the prescription:
    a. Without prompting? Yes No
    b. After prompting? Yes No
41. An update in spectacles recommended? Yes No
42. Advise you that further tests with drops are required? Yes No
    a. Ideally on the same day Yes No
    b. Within a week Yes No
    c. Whenever convenient Yes No
43. Advice (verbally or with leaflet) you on the side effects of the drops? Yes No
44. Advice you and/or obtain consent to refer for a 2nd opinion? Yes No
    a. Ideally on the same day Yes No
    b. Within a week Yes No
    c. Whenever convenient Yes No
45. Advice you a re-examination interval? Yes No
    a. What was the re-examination interval?.....
46. Any other advice?……
……

Option 1/2: If Option 2 Name of Practitioner:

Practice type: Independent/ Small multiple/ Large multiple

Location of practice: Town Centre/ Rural

Additional Data

1. Duration of eye examination?
2. Cost of eye examination?
3. Cost of any further tests recommended?
4. If a referral was recommended;
    a. Was a letter written to the GP/Hospital Eye Service? Yes No
    b. Or were you asked to consult your GP? Yes No
    c. Was a copy of the letter sent to you? Yes No

Appendix 16

Scenario 3: Person aged 59 years with flashing lights of a recent onset.

	Average Score
How thorough do you feel the eye examination was?	74.5
To what extent do you feel you presenting symptoms were addressed?	77.4

History and Symptoms - Did the optometrist ask you:

	% of optometrists that asked the question
1. The date of your last eye examination?	88%
2. Whether you have spectacles?	96%
3. Your reason for visit?	80%
4. Is your vision OK?	
❖ at distance	92%
❖ at near	95%
5. Whether you experience any headaches/migraines?	61%
6. Whether you see flashing lights in your vision?	35%
(80% known from reason for visit above)	
❖ Where in your vision do you see the flashing lights?	53%
❖ Are the flashes in one eye or both eyes?	72%
❖ Describe the flashes?	26%
❖ Is there a pattern to the occurrence of the flashes? i.e. Constant or intermittent	83%
❖ Is there a change in pattern of occurrence? i.e. More or less frequent	39%
❖ How long ago did you first notice them?	94%
❖ How long do they last?	34%
7. Whether you see floaters in your vision?	85%
❖ How long have you been seeing the floaters for?	21%
❖ Are they present in one/both eyes?	9%
❖ Have they increased in number or changed in pattern?	51%
8. Whether you experience double vision?	42%
9. Whether you had seen any shadows in your field of vision?	36%
10. About your general health	
❖ General questions about health	96%

(e.g. are you in good health?)

- ❖ Are you diabetic? 46%
- ❖ Do you have high blood pressure? 19%
- ❖ Have you recently had banged your head? 18%

11. If you take any medication on a regular basis? 96%
12. Do you have any allergies? 19%
13. About your previous ocular health
    - ❖ Have you ever attended an eye hospital? 44%
    - ❖ Have you ever had an eye injury/surgery/ infection? 68%
    - ❖ Have you ever been told you have a lazy eye? 3%
    - ❖ Do you have glaucoma? 42%
14. If there is a family history of:
    - ❖ Diabetes? 76%
    - ❖ High Blood Pressure? 30%
    - ❖ Glaucoma? 76%
    - ❖ Any other eye problems? 77%
15. Whether you drive? 95%
16. What you do for a living (occupation)? 74%
17. About the sorts of visual tasks you do (e.g., computer, hobbies)? 67%

Preliminary Tests - Did the optometrist:

18. Ask you to read letters on a letter chart (with/without your current spectacles):
    - ❖ For distance 100%
    - ❖ For Near 66%
19. Perform cover test:
    - ❖ For distance fixation 75%
    - ❖ For near fixation 38%
20. Perform motility 24%
21. Check your convergence 30%
22. Test pupil reactions 69%
23. Check inter-pupillary distance 37%
24. Check your central and side vision using a red/white target (Confrontation) 5%

Retinoscopy & Subjective Refraction - Did the optometrist:

25. Obtain an objective refraction using:
    - ❖ An Autorefractor 36%
    - ❖ Retinoscopy 58%
26. Do a subjective refraction to establish a refractive error for each eye? 99%
27. Check for uncorrected astigmatism using cross-cyl or fan & block? 86%
28. Perform a cover test using their subjective findings:
    - ❖ For distance fixation 12%
    - ❖ For near fixation 13%
29. Check fixation disparity:
    - ❖ For distance 22%
    - ❖ For near 8%
30. Establish a near reading addition 99%
31. Assess near visual acuity 99%

Slit Lamp & Ophthalmoscopy - Did the optometrist:

32. Examine the anterior eye using a slit lamp:
    - ❖ With fluorescein 5%
    - ❖ Without fluorescein 43%
    - ❖ for Shafer's Sign 13%
33. Examine the inside (back) of the eye:
    - ❖ Dilated: 24%
        - Using an ophthalmoscope 20%
        - Using slit lamp biomicroscopy 18%
        - Head Mounted (Indirect) 0%
        - Fundus photography (as standard) 4%
    - ❖ Undilated 76%
        - Using an ophthalmoscope 58%
        - Using slit lamp biomicroscopy 20%
        - Head Mounted (Indirect) 2%
        - Fundus photography (as standard) 6%
    - ❖ Dilated or Undilated 99%
        - Using an ophthalmoscope 78%
        - Using slit lamp biomicroscopy 38%
        - Head Mounted (Indirect) 2%
        - Fundus photography (as standard) 10%

Supplementary Tests - Did the optometrist:

34. Assess pressure within the eye?	98%
❖ Using a non-contact method?	87%
❖ Using a contact method?	11%
❖ Before pupil dilation?	96%
❖ After pupil dilation?	63%
35. Test your visual fields?	52%
36. Carry out any other tests:	
❖ Amsler	1%

Advice and Management - Did the optometrist:

37. Issue a copy of the prescription:	
❖ Without prompting?	57%
❖ After prompting?	34%
38. Recommend an update in spectacles?	39%
39. Advise you that further tests with drops are required?	66%
❖ Ideally on the same day	94%
❖ Within a week	18%
❖ Whenever convenient	12%
40. Advice (verbally or with leaflet) you about the side effects of the drops?	87%
41. Advice you and/or obtain consent to refer for a 2nd opinion?	30%
❖ Ideally on the same day	13%
❖ Within a week	8%
❖ Whenever convenient	6%
❖ Via the General Medical Practitioner	12%
42. Advise you on a re-examination interval?	68%
❖ What was the re-examination interval?	22 months average

Additional Data

43. Average duration of eye examination?	28 mins
44. Average cost of an eye examination?	£22
45. Average cost of any further tests recommended?	£16.86
46. If a referral was recommended;	

- Was a letter written to the GP/Hospital Eye Service? 82%
- Or were you asked to consult your GP? 54%
- Was a copy of the letter sent to you? 9%

Appendix 17

Scenario 1: 20 year old patient with suspicious headaches

History and Symptoms-Did the optometrist record:

	% of practitioners that recorded asking the question
1. The date of your last eye examination?	68%
2. Whether you have spectacles?	100%
3. The reason for visit?	97%
4. Is your vision OK?	
➢ at distance	65%
➢ at near	62%
5. Whether you experience any headaches/migraines?	3%
	(97% known from reason for visit)
➢ Description of onset?	35%
➢ Duration of symptoms?	73%
➢ How long the headaches last?	24%
➢ Location	81%
➢ Severity	5%
➢ Frequency	51%
➢ Is there a change in pattern?	19%
➢ Have you consulted a medical practitioner about the headaches?	0%
➢ Do you experience nausea/vomiting?	19%
➢ Any visual disturbances?	22%
➢ Timings?	8%
➢ Visual associations?	3%
➢ Non-visual associations?	11%
6. Whether you see flashing lights in your vision?	5%
	(22% Known from visual disturbances above)
➢ Do the flashing lights precede the headaches?	3%
➢ Are the flashes in one eye or both eyes?	0%
➢ Describe the flashes?	3%
➢ Where in your visual field do you see the flashes?	0%
➢ How long do the flashes last?	0%
7. Whether you see floaters in your vision?	11%
8. Whether you experience double vision?	19%

9. About your general health
    - General questions about health (E.g. are you in good health?) 87%
    - Are you diabetic? 8%
    - Do you have high blood pressure? 0%
10. If you take any medication on a regular basis? 87%
11. Do you have any allergies? 11%
12. About your previous ocular health
    - Have you ever attended an eye hospital? 68%
    - Have you ever had an eye injury/surgery/ infection? 0%
    - Have you ever been told you have a lazy eye? 3%
13. If there is a family history of:
    - Diabetes? 27%
    - Glaucoma? 30%
    - Any other eye problems? 76%
14. Whether you drive? 73%
15. What you do for a living (Occupation)? 81%
16. About the sorts of visual tasks you do (e.g., computer, hobbies)? 57%

Preliminary Tests-Did the optometrist:

17. Ask you to read letters on a letter chart (with/without your current spectacles):
    - For distance 87%
    - For near 24%
18. Perform cover test:
    - For distance fixation 73%
    - For near fixation 65%
19. Perform motility 51%
20. Check your convergence 62%
21. Test pupils reactions 85%
22. Check distance between your eyes (interpupillary distance) 35%
23. Check your central and side vision using a red/white target (confrontation) 0%

Retinoscopy & Subjective Refraction-Did the optometrist:

24. Did the practitioner, or a member of staff, check the prescription on your current spectacles? 100%

25. Obtain an objective refraction using:
    - An Autorefractor 37%
    - Retinoscopy 11%
26. Do a subjective refraction to establish a refractive error for each eye? 100%
27. Check for uncorrected astigmatism using cross-cyl or fan & block? 92%
28. Do binocular balancing and check binocular visual acuity? 14%
29. Perform a cover test using their subjective findings:
    - For distance fixation 24%
    - For near fixation 22%
30. Check your accommodation 16%
31. Check fixation disparity:
    - For distance 19%
    - For near 14%
32. Assess near visual acuity 68%

Slit Lamp & Ophthalmoscopy-Did the optometrist:

33. Examine the anterior eye using a slit lamp:
    - With fluorescein 0%
    - Without fluorescein 22%
34. Examine the inside (back) of the eye:
    - Using an ophthalmoscope 95%
    - Using slit lamp biomicroscopy 8%
    - Using a fundus camera? 3%
    - Using another method
        i. Scanning Laser Ophthalmoscope 0%
        ii. Head Mounted (Indirect) 0%

Supplementary Tests-Did the optometrist:

35. Assess pressure within the eye? 41%
36. Test your central and side vision (visual fields)? 62%
37. Carry out any other tests:
    i. Keratometry 0%
    ii. Colour Vision 0%
    iii. Red Desaturation 0%

Advice and Management-Did the optometrist:

38. Recommend an update in spectacles?	54%
39. Advise you to seek a medical opinion regarding the headaches?	60%
➢ Told to go to hospital now	0%
➢ Told to go to GP now	0%
➢ Told to go to GP within one week	0%
➢ Told to go to GP whenever convenient (or no timescale)	30%
➢ Told good idea to go to GP, not definite recommendation	3%
➢ Told go to GP if no better with new specs	0%
➢ Told to go to GP if concerned or if worsens	27%
40. Advise you to keep a note of the pattern of occurrence of the headaches?	5%
41. Advise you on a re-examination interval?	68%
➢ What was the re-examination interval?	22 months average

Appendix 18

Scenario 2: Patient of Afro-Caribbean racial origin aged 44 years complaining of recent difficulty with near vision

History and Symptoms-Did the optometrist record:

	% of practitioners who recorded asking the question
1. The date of your last eye examination?	65%
2. Whether you have spectacles?	97%
3. Your reason for visit?	91%
4. Is your vision OK?	
➢ at distance	65%
➢ at near	82%
5. Whether you experience any headaches/migraines?	50%
6. Whether you see flashing lights in your vision?	18%
7. Whether you see floaters in your vision?	18%
8. Whether you experience double vision?	32%
9. Whether you experience any pain/discomfort of the eyes?	6%
10. About your general health	
➢ General questions about health (e.g. are you in good health?)	85%
➢ Are you diabetic?	3%
➢ Do you have high blood pressure?	0%
11. If you take any medication on a regular basis?	88%
12. Do you have any allergies?	12%
13. About your previous ocular health	
➢ Have you ever attended an eye hospital?	77%
➢ Have you ever had an eye injury/surgery/ infection?	3%
➢ Have you ever been told you have a lazy eye?	35%
➢ Do you have glaucoma?	0%
14. If there is a family history of:	
➢ Diabetes?	65%
➢ Glaucoma?	24%
➢ High blood pressure?	12%
➢ Any other eye problems?	56%

15. Whether you drive? 77%
16. What you do for a living (Occupation)? 71%
17. About the sorts of visual tasks you do (e.g., computer, hobbies)? 56%

Preliminary Tests-Did the optometrist:

18. Ask you to read letters on a letter chart (with/without your current spectacles):
    - For distance 77%
    - For near 38%
19. Perform cover test:
    - For distance fixation 68%
    - For near fixation 59%
20. Perform motility 41%
21. Check your convergence 35%
22. Test pupil reactions 71%
23. Check distance between your eyes (interpupillary distance) 32%
24. Check your central and side vision using a red/white target (confrontation) 0%

Retinoscopy & Subjective Refraction-Did the optometrist:

25. Check the prescription on your current spectacles? 94%
26. Obtain an objective refraction using:
    - An Autorefractor 6%
    - Retinoscopy 18%
27. Do a subjective refraction to establish a refractive error for each eye? 100%
28. Check for uncorrected astigmatism using cross-cyl or fan & block? 74%
29. Perform a cover test using their subjective findings:
    - For distance fixation 15%
    - For near fixation 12%
30. Check your accommodation 12%
31. Establish a prescription for:
    - Near 79%
    - Intermediate 6%
32. Assess your visual acuity (using a book or page with writing on it) for:
    - Near 91%
    - Intermediate 6%

33. Check how well the two eyes work together using the OXO test:
    - For distance fixation 15%
    - For near fixation 12%

Slit Lamp & Ophthalmoscopy-Did the optometrist:

34. Examine the anterior surface of the eye using a slit lamp:
    - With fluorescein 0%
    - Without fluorescein 18%
    - Assess anterior chamber depth 6%
35. Examine the inside (back) of the eye:
    - Using an monocular instrument (direct ophthalmoscope/monocular indirect) 91%
    - Using slit lamp biomicroscopy 18%
    - Using a fundus camera? 3%
    - Using another method
        i. Scanning Laser Ophthalmoscope 0%
        ii. Head Mounted (Indirect) 0%

Supplementary Tests-Did the optometrist:

36. Assess pressure within the eye? 94%
    - Using a contact method? 9%
    - Using a non-contact method? 85%
37. Test your central and side vision (visual fields)? 29%
38. Carry out any other tests:
        i. Keratometry 0%
        ii. Colour Vision 0%
        iii. Red-desaturation 0%
        iv. Stereopsis 3%

Advice and Management-Did the optometrist:

39. Recommend an update in spectacles? 44%
40. Advise you on a re-examination interval? 82%
    - What was the re-examination interval? 21 months

Appendix 19

Scenario 3: Person aged 59 years with flashing lights of a recent onset.

History and Symptoms - Did the optometrist ask you:

	% of optometrists that recorded asking the question
1. The date of your last eye examination?	61%
2. Whether you have spectacles?	93%
3. Your reason for visit?	83%
4. Is your vision OK?	
❖ at distance	54%
❖ at near	56%
5. Whether you experience any headaches/migraines?	42%
6. Whether you see flashing lights in your vision?	10%
(83% known from reason for visit above)	
❖ Where in your vision do you see the flashing lights?	22%
❖ Are the flashes in one eye or both eyes?	61%
❖ Describe the flashes?	29%
❖ Is there a pattern to the occurrence of the flashes? i.e. Constant or intermittent	49%
❖ Is there a change in pattern of occurrence? i.e. More or less frequent	0%
❖ How long ago did you first notice them?	76%
❖ How long do they last?	7%
7. Whether you see floaters in your vision?	63%
❖ How long have you been seeing the floaters for?	12%
❖ Are they present in one/both eyes?	0%
❖ Have they increased in number or changed in pattern?	10%
8. Whether you experience double vision?	22%
9. Whether you had seen any shadows in your field of vision?	12%
10. About your general health	
❖ General questions about health (e.g. are you in good health?)	90%
❖ Are you diabetic?	5%
❖ Do you have high blood pressure?	5%

- ❖ Have you recently had banged your head? 5%

11. If you take any medication on a regular basis? 85%
12. Do you have any allergies? 10%
13. About your previous ocular health
    - ❖ Have you ever attended an eye hospital? 61%
    - ❖ Have you ever had an eye injury/surgery/ infection? 15%
    - ❖ Have you ever been told you have a lazy eye? 0%
    - ❖ Do you have glaucoma? 5%
14. If there is a family history of:
    - ❖ Diabetes? 24%
    - ❖ High Blood Pressure? 15%
    - ❖ Glaucoma? 32%
    - ❖ Any other eye problems? 54%
15. Whether you drive? 73%
16. What you do for a living (occupation)? 76%
17. About the sorts of visual tasks you do (e.g., computer, hobbies)? 51%

Preliminary Tests - Did the optometrist:

18. Ask you to read letters on a letter chart (with/without your current spectacles):
    - ❖ For distance 90%
    - ❖ For Near 22%
19. Perform cover test:
    - ❖ For distance fixation 70%
    - ❖ For near fixation 50%
20. Perform motility 43%
21. Check your convergence 23%
22. Test pupil reactions 68%
23. Check inter-pupillary distance 23%
24. Check your central and side vision using a red/white target (Confrontation) 3%

Retinoscopy & Subjective Refraction - Did the optometrist:

25. Obtain an objective refraction using:
    - ❖ An Autorefractor 10%
    - ❖ Retinoscopy 15%

26. Do a subjective refraction to establish a refractive error for each eye? 98%
27. Check for uncorrected astigmatism using cross-cyl or fan & block? 45%
28. Perform a cover test using their subjective findings:
    - ❖ For distance fixation 5%
    - ❖ For near fixation 5%
29. Check fixation disparity:
    - ❖ For distance 15%
    - ❖ For near 15%
30. Establish a near reading addition 100%
31. Establish an intermediate addition 75%
32. Assess near visual acuity 85%

Slit Lamp & Ophthalmoscopy - Did the optometrist:

33. Examine the anterior eye using a slit lamp:
    - ❖ With fluorescein 0%
    - ❖ Without fluorescein 35%
    - ❖ for Shafer's Sign 25%
34. Examine the inside (back) of the eye:
    - ❖ Dilated: 30%
        - Using an ophthalmoscope 25%
        - Using slit lamp biomicroscopy 10%
        - Head Mounted (Indirect) 0%
    - ❖ Undilated 73%
        - Using an ophthalmoscope 65%
        - Using slit lamp biomicroscopy 8%
        - Head Mounted (Indirect) 0%
    - ❖ Dilated and Undilated 8%
        - Using an ophthalmoscope 3%
        - Using slit lamp biomicroscopy 3%
        - Head Mounted (Indirect) 0%

Supplementary Tests - Did the optometrist:

35. Assess pressure within the eye? 100%
    - ❖ Using a non-contact method? 93%

- ❖ Using a contact method? 8%
- ❖ Before pupil dilation? 91%
- ❖ After pupil dilation? 58%

36. Test your visual fields? 53%
37. Carry out any other tests:
    - ❖ Amsler 0%

Advice and Management - Did the optometrist:

38. Recommend an update in spectacles? 8%
39. Advise you that further tests with drops are required? 51%
    - ❖ Ideally on the same day 49%
    - ❖ Within a week 2%
    - ❖ Whenever convenient 14%
40. Advice (verbally or with leaflet) you about the side effects of the drops? 22%
41. Advise you and/or obtain consent to refer for a 2nd opinion? 24%
    - ❖ Ideally on the same day 15%
    - ❖ Within a week 2%
    - ❖ Whenever convenient 2%
42. Advise you on a re-examination interval? 78%
    - ❖ What was the re-examination interval? 20 months average

Additional Data

43. If a referral was recommended;
    - ❖ Was a letter written to the GP/Hospital Eye Service? 17%
    - ❖ Or were you asked to consult your GP? 10%
    - ❖ Was a copy of the letter sent to you? 2%

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Appendix 20

An evidence-based investigation of the content of an optometric eye examination in the UK

Dear colleague,

As you may recall I wrote to you a year ago to invite you to participate in a research study to investigate the content of typical optometric eye examinations. In the letter of invitation, we had offered all participating practitioners one of two options:

1. **Full Anonymity-** For practitioners that opted for this option, the standardized patient actors (SPs) were given a list of consenting practitioners for them to visit. At the end of the visit, the actor **did not** record the practitioner's name or any other identifying features relating to the practitioner.

2. **Feedback for professional development and anonymity in research-** This option was designed to give practitioners something in return for their participation feedback about the SP's findings. For practitioners that chose this option, the SPs recorded the name of the practitioner to enable the research team to feedback to the practitioner. 87% of the participating optometrists that agreed to participate chose this option.

All three actors recently completed their visits as standardized patients. Most but not all of the consenting practitioners were visited by all three actors. Below are the details of the standardised patient(s) that visited your practice. The research team is currently in the process of preparing individualised feedback of the standardized patient's score sheet checklist relating to the SP visits. In addition to the feedback we will enclose comments on suggested "best practice" based on published clinical guidelines and on the views of an expert panel. We trust this information will be useful to you as an optometrist. Upon receipt of this information the research team would appreciate any feedback from you. In particular, we would be very grateful to know if you detected the standardized patient (whose name appears below) and to receive any criticisms or comments about the research.

Finally, as an additional option for practitioners requesting feedback for professional development, we think that it would be interesting to look at the record cards for the SP eye examinations. This would have several advantages: it will let us check the information provided by the SP actor, it will allow us to provide you with feedback about your record-keeping (e.g., we will tell you if the actor found that you did a test but that the result was not recorded), and it will allow us to gather data on 'typical' standards of optometric record-keeping. We would stress that, as with all our research, any information that we gather will be treated with the strictest confidence and would never be disclosed to any third parties.

We very much hope that you will help with this aspect of our research. If you are happy to do so, we would be grateful if you could send us a **photocopy** of the record card from the following patient visits:

1. Miss [redacted] (Date of Birth [redacted]
2. Ms [redacted] (Date of Birth [redacted])
3. Mr [redacted] (Date of Birth [redacted]

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These records will be checked by the research team to identify any discrepancy between the SP record and the practitioner record. It is important not to make any changes to record cards before photocopying them as this will make it difficult identify any discrepancies.

Attached is a copy of the information regarding the research that was sent to you during the initial stages of the study (for your reference).

If you are concerned or have any questions about any matters regarding the research please contact Rakhee Shah: Research Fellow, The Neville Chappell Research Clinic, The Institute of Optometry, 56-62 Newington Causeway, London. SE1 1DS. Tel No: [redacted] Email: [redacted].

Yours sincerely,

Rakhee Shah
Postgraduate Research Fellow
Neville Chappell Research Clinic

Appendix 21

Vignette Scenario 1: 20 year old patient with suspicious headaches

History and Symptoms-Did the optometrist ask:

	% of practitioners that 'asked' the question
1. The date of your last eye examination?	97%
2. Whether you have spectacles?	82%
3. The reason for visit?	100%
4. Is your vision OK?	
➢ at distance	89%
➢ at near	83%
➢ at intermediate	55%
5. Whether you experience any headaches/migraines?	0%
	(100% known from reason for visit)
➢ Description of onset?	88%
➢ Duration of symptoms?	89%
➢ How long the headaches last?	75%
➢ Location	78%
➢ Severity	68%
➢ Frequency	94%
➢ Is there a change in pattern?	46%
➢ Have you consulted a medical practitioner about the headaches?	90%
➢ Do you experience nausea/vomiting?	76%
➢ Any visual disturbances?	85%
➢ Timings?	89%
➢ Visual associations?	83%
➢ Non-visual associations?	83%
6. Whether you see flashing lights in your vision?	8%
	(85% Known from visual disturbances above)
➢ Do the flashing lights precede the headaches?	48%
➢ Are the flashes in one eye or both eyes?	42%
➢ Describe the flashes?	43%
➢ Where in your visual field do you see the flashes?	46%
➢ How long do the flashes last?	46%

7. Whether you see floaters in your vision? 58%
8. Whether you experience double vision? 64%
9. About your general health
   - General questions about health 91%
     (E.g. are you in good health?)
   - Are you diabetic? 55%
   - Do you have high blood pressure? 52%
10. If you take any medication on a regular basis? 89%
11. Do you have any allergies? 45%
12. About your previous ocular health
   - Have you ever attended an eye hospital? 65%
   - Have you ever had an eye injury/surgery/ infection? 71%
   - Have you ever been told you have a lazy eye? 30%
   - Do you have glaucoma? 25%
13. If there is a family history of:
   - Diabetes? 72%
   - Glaucoma? 83%
   - Any other eye problems? 83%
14. Whether you drive? 95%
15. What you do for a living (Occupation)? 95%
16. About the sorts of visual tasks you do (e.g., computer, hobbies)? 86%

Preliminary Tests-Did the optometrist:

17. Ask you to read letters on a letter chart (with/without your current spectacles):
   - For distance 78%
   - For near 78%
18. Perform cover test:
   - For distance fixation 95%
   - For near fixation 88%
19. Perform motility 74%
20. Check your convergence 81%
21. Test pupils reactions 99%

Retinoscopy & Subjective Refraction-Did the optometrist:

22. Did the practitioner, or a member of staff, check the prescription on your current spectacles? 100%

23. Obtain an objective refraction using:
    - An Autorefractor 28%
    - Retinoscopy 76%
24. Do a subjective refraction to establish a refractive error for each eye? 97%
25. Do binocular balancing and check binocular visual acuity? 87%
26. Perform a cover test using their subjective findings:
    - For distance fixation 61%
    - For near fixation 58%
27. Perform a dissociation test (Maddox rod/Maddox wing)
    - For distance fixation 30%
    - For near fixation 29%
28. Check your accommodation 60%
29. Check fixation disparity:
    - For distance 48%
    - For near 47%
30. Assess near visual acuity 61%

Slit Lamp & Ophthalmoscopy-Did the optometrist:

31. Examine the anterior eye using a slit lamp 99%
32. Examine the inside (back) of the eye 99
33. Fundus photographs taken:
    - As standard 17%
    - If patient paying 18%
    - If requested by patient 1%

Supplementary Tests-Did the optometrist:

34. Assess pressure within the eye? 59%
35. Test your central and side vision (visual fields)? 82%
    - Supra-threshold central field test 36%
    - Full central field test 6%
    - Supra-threshold wide field test 19%
    - Full wide field test 6%
    - FDT 11%
    - Other field test 2%
36. Carry out any other tests:

i. Colour Vision 16%
ii. Stereopsis 25%

Advice and Management-Did the optometrist:

37. Issue a copy of the prescription 94%
38. Recommend an update in spectacles? 15%
39. Advise you to seek a medical opinion regarding the headaches? 94%
    - Told to go to hospital now 0%
    - Told to go to GP now 0%
    - Told to go to GP within one week 28%
    - Told to go to GP whenever convenient (or no timescale) 25%
    - Told good idea to go to GP, not definite recommendation 9%
    - Told to go to GP if concerned or if worsens 24%
40. Advise you to keep a note of the pattern of occurrence of the headaches? 62%
41. Advise you on a re-examination interval? 99%
    - 3 months 2%
    - 6 months 3%
    - 12 months 26%
    - 18 months 3%
    - 24 months 64%
    - 36 months 1%

Appendix 22

Scenario 2: Patient of Afro-Caribbean racial origin aged 44 years complaining of recent difficulty with near vision

History and Symptoms-Did the optometrist ask:

	% of practitioners that 'asked' the question
1. The date of your last eye examination?	99%
2. Whether you have spectacles?	60%
3. Your reason for visit?	99%
4. Is your vision OK?	
➢ at distance	97%
➢ at near	66%
5. Whether you experience any headaches/migraines?	88%
6. Whether you see flashing lights in your vision?	45%
7. Whether you see floaters in your vision?	50%
8. Whether you experience double vision?	60%
9. Whether you experience any pain/discomfort of the eyes?	54%
10. About your general health	
➢ General questions about health (e.g. are you in good health?)	97%
➢ Are you diabetic?	72%
➢ Do you have high blood pressure?	58%
11. If you take any medication on a regular basis?	96%
12. Do you have any allergies?	47%
13. About your previous ocular health	
➢ Have you ever attended an eye hospital?	81%
i. Which is the amblyopic eye?	84%
ii. Did you have one eye patched as a child?	23%
➢ Have you ever had an eye injury/surgery/ infection?	70%
➢ Have you ever been told you have a lazy eye?	74%
➢ Do you have glaucoma?	44%
14. If there is a family history of:	

- Diabetes? 69%
- Glaucoma? 43%
- High blood pressure? 86%
- Any other eye problems? 86%

15. Whether you drive? 95%
16. What you do for a living (Occupation)? 95%
17. About the sorts of visual tasks you do (e.g., computer, hobbies)? 95%

Preliminary Tests-Did the optometrist:

18. Ask you to read letters on a letter chart (with/without your current spectacles):
    - For distance 72%
    - For near 72%
19. Perform cover test:
    - For distance fixation 91%
    - For near fixation 85%
20. Perform motility 68%
21. Check your convergence 64%
22. Test pupil reactions 97%

Retinoscopy & Subjective Refraction-Did the optometrist:

23. Did the practitioner, or a member of staff, check the prescription on your current spectacles? 99%
24. Obtain an objective refraction using:
    - An Autorefractor 28%
    - Retinoscopy 83%
25. Do a subjective refraction to establish a refractive error for each eye? 10099%
26. Perform a cover test using their subjective findings:
    - For distance fixation 60%
    - For near fixation 61%
27. Check your accommodation 59%
28. Establish a prescription for:
    - Near 96%
    - Intermediate 55%
29. Assess your visual acuity (using a book or page with writing on it) for:
    - Near 88%

- Intermediate 43%

30. Check how well the two eyes work together using the OXO test:
    - For distance fixation 39%
    - For near fixation 43%

Slit Lamp & Ophthalmoscopy-Did the optometrist:

31. Examine the anterior surface of the eye using a slit lamp 98%
32. Examine the inside (back) of the eye 99%
33. Fundus photographs taken:
    - As standard 18%
    - If patient paying 20%
    - If requested by patient 3%

Supplementary Tests-Did the optometrist:

34. Assess pressure within the eye? 97%
35. Test your central and side vision (visual fields)? 75%
    - Supra-threshold central field test 47%
    - Full central field test 9%
    - Supra-threshold wide field test 3%
    - Full wide field test 1%
    - FDT 13%
    - Other field test 1%
36. Carry out any other tests:
    i. Colour Vision 9%
    ii. Stereopsis 29%

Advice and Management-Did the optometrist:

37. Issue a copy of the prescription 98%
38. Recommend an update in spectacles? 97%
39. Advise you on a re-examination interval? 98%
40. Advise and discuss presbyopia 81%
41. Advise patient of refractive amblyopia in left eye 60%

Appendix 23

Scenario 3: Person aged 59 years with flashing lights of a recent onset.

History and Symptoms - Did the optometrist ask:

	% of optometrists that 'asked' the question
1. The date of your last eye examination?	96%
2. Whether you have spectacles?	87%
3. Your reason for visit?	100%
4. Is your vision OK?	
❖ at distance	94%
❖ at near	83%
5. Whether you experience any headaches/migraines?	89%
6. Whether you see flashing lights in your vision?	0% (100% known from reason for visit above)
❖ Where in your vision do you see the flashing lights?	92%
❖ Are the flashes in one eye or both eyes?	98%
❖ Describe the flashes?	98%
❖ Is there a pattern to the occurrence of the flashes? i.e. Constant or intermittent	69%
❖ Is there a change in pattern of occurrence? i.e. More or less frequent	65%
❖ How long ago did you first notice them?	98%
❖ How long do they last?	83%
7. Whether you see floaters in your vision?	96%
❖ How long have you been seeing the floaters for?	93%
❖ Are they present in one/both eyes?	86%
❖ Have they increased in number or changed in pattern?	94%
8. Whether you experience double vision?	51%
9. Whether you had seen any shadows in your field of vision?	36%
10. About your general health	
❖ General questions about health (e.g. are you in good health?)	98%
❖ Are you diabetic?	78%

- ❖ Do you have high blood pressure? 75%
- ❖ Have you recently had banged your head? 84%

11. If you take any medication on a regular basis? 96%
12. Do you have any allergies? 47%
13. About your previous ocular health
    - ❖ Have you ever attended an eye hospital? 88%
    - ❖ Have you ever had an eye injury/surgery/ infection? 85%
    - ❖ Have you ever been told you have a lazy eye? 41%
    - ❖ Do you have glaucoma? 51%
14. If there is a family history of:
    - ❖ Diabetes? 72%
    - ❖ High Blood Pressure? 47%
    - ❖ Glaucoma? 82%
    - ❖ Any other eye problems? 92%
15. Whether you drive? 96%
16. What you do for a living (occupation)? 95%
17. About the sorts of visual tasks you do (e.g., computer, hobbies)? 80%

Preliminary Tests - Did the optometrist:

18. Ask you to read letters on a letter chart (with/without your current spectacles):
    - ❖ For distance 99%
    - ❖ For Near 43%
19. Perform cover test:
    - ❖ For distance fixation 87%
    - ❖ For near fixation 80%
20. Perform motility 62%
21. Check your convergence
    50%
22. Test pupil reactions 96%

Retinoscopy & Subjective Refraction - Did the optometrist:

23. Obtain an objective refraction using:
    - ❖ An Autorefractor 26%
    - ❖ Retinoscopy 75%

24. Do a subjective refraction to establish a refractive error for each eye?
    90%
25. Perform a cover test using their subjective findings:
    - For distance fixation 44%
    - For near fixation 43%
26. Check fixation disparity:
    - For distance 27%
    - For near 27%
27. Establish a near reading addition
    99%
28. Assess near visual acuity
    87%

Slit Lamp & Ophthalmoscopy:

29. Examine the anterior eye using a slit lamp 100%
    - for Shafer's Sign 93%
30. Examine the inside (back) of the eye 100%
    - Dilated 87%
    - Undilated 13%
31. Method of fundus examination following dilation
    - Using a monocular direct method 4%
    - Using binocular indirect ophthalmoscopy (slit lamp bio-microscope) 73%
    - Using binocular indirect ophthalmoscopy (head mounted) 9%
    - Using another method not stated here 1%
32. Fundus photographs taken:
    - As standard 22%
    - If patient paying 27%
    - If requested by patient 2%

Supplementary Tests - Did the optometrist:

33. Assess pressure within the eye?
    98%
34. Test your visual fields? 90%
    - Supra-threshold central field test 20%

- ❖ Full central field test 6%
- ❖ Supra-threshold wide field test 42%
- ❖ Full wide field test 10%
- ❖ FDT 9%
- ❖ Other field test 1%

35. Carry out any other tests:
    - ❖ Amsler 31%

36. Dilation would be performed using:
    - ❖ Cyclopentalate 0%
    - ❖ Anaesthetic and Cyclopentalate 0%
    - ❖ Anaesthetic and Tropicamide 7%
    - ❖ Tropicamide 80%
    - ❖ Other 0%

Advice and Management - Did the optometrist:

37. Issue a copy of the prescription 96%
38. Recommend an update in spectacles? 44%
39. Advise you that further tests with drops are required? 96%
    - ❖ Ideally on the same day 95%
    - ❖ Within a week 4%
    - ❖ Whenever convenient 0%
40. Advice and/or obtain consent to refer for a 2nd opinion? 39%
    - ❖ Ideally on the same day 5%
    - ❖ Within a week 19%
    - ❖ Whenever convenient 5%
    - ❖ Via the General Medical Practitioner 3%
    - ❖ Perform dilated fundus examination and refer the patient 38%
41. Advised patient of signs and symptoms of retinal detachment 96%
    - ❖ Change in frequency of photopsia 81%
    - ❖ Increase in the number of floaters seen 89%
    - ❖ Or if there was a cloud in the visual field 92%

    Than the patient should
    - ❖ Return for further tests 5%
    - ❖ Return for a re-examination 14%
    - ❖ See their GP for a second opinion 1%

- ❖ See their GP for a referral to the HES 5%
- ❖ Go straight to an A&E 66%

42. Advise you on a re-examination interval? 100%