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The content of optometric eye examinations for a presbyopic patient presenting with flashing lights

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Running head: The content of optometric eye examinations

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Abstract

Background: Standardised patients are the gold standard methodology for evaluating clinical care. This approach was used to investigate the content of optometric eyecare for a presbyopic patient who presented with recent photopsia.

Methods: A total of 102 community optometrists consented to be visited by an actor for a recorded eye examination. This actor received extensive training to enable accurate reporting of the content of the eye examinations, via an audio recording and a checklist completed for each clinical encounter. The actor presented unannounced (incognito) as a 59 year old patient seeking a private eye examination and complaining of recent onset flashing lights. The results of each clinical encounter were recorded on a pre-designed checklist based on evidence-based reviews on photopsia, clinical guidelines, and the views of an expert panel.

Results: The presence of the 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. A total of 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 funduscopy to be carried out either by themselves or by another eyecare practitioner and 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.

Conclusion: Standardized patient (SP) encounters are an effective way of measuring clinical care within optometry and should be considered for further comparative measurements of quality of care. As in research using SPs in other healthcare disciplines, our study has highlighted substantial differences between different practitioners in the duration and depth of their clinical investigations. This highlights the fact that not all eye examinations are the same but inherently different and that there is no such thing as a 'standard sight test'. 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.

Introduction

Background

Investigating the typical content of optometric eyecare is important for several reasons. It allows the profession 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 involving 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 for primary care practice.

The content of undergraduate training and of training in the pre-registration period (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 (Harvey & Franklin, 2005). 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, 2008):

"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. 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.**

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 England, 2008) 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.**

During the training of optometrists, taking a thorough patient history is stressed in order to facilitate the communication of important 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 accurately, then the optometrist must ask pertinent questions to place the patient's requirements in the appropriate context (Harvey & Franklin, 2005). This information allows the eye examination to be adapted to the patient's needs, and for the optometrist to eliminate irrelevant tests, and to carry out any further tests indicated in response to the patient's symptoms.

To investigate the content of typical optometric eyecare in England we used a methodology new to optometry (standardised patients), found in a recent review to be the gold standard methodology for the evaluation of clinical care (Shah *et al.*, 2007).

This paper has four aims:

- ❖ To provide data on the content of typical optometric eye care in England for a presbyopic patient who presented with recent onset flashing lights.
- ❖ To evaluate how appropriately the eye examinations were carried out for that patient.
- ❖ To investigate differences between localities (rural and urban) and different types of practice (independent, small multiple and large multiple).
- ❖ To assess the appropriateness of the standardised patient approach to measure clinical care within optometry.

Standardised patients

During most optometric clinical consultations only two people are present: the practitioner and the patient. So, an appropriate method for determining what the practitioner does is to ask the patient, in particular a patient who has been trained to be an expert observer. There are numerous descriptors of the roles played by individuals during such simulated encounters. The term **standardised patient** is a well-accepted term in the literature (Shah *et al.*, 2007) 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 optometrists examine people who are simulating real patients. In UK optometry, this occurs during the final assessment at the end of the pre-registration period (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 (Alwitary *et al.*, 2002; Adamo, 2003) in order to accurately portray a specific complaint (Ebbert & Connors, 2004). Typically, the SP is a highly trained actor.

SPs are not the only method that has been used to investigate 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, 2002; Luck *et al.*, 2000; Luck & Peabody, 2002; Peabody *et al.*, 2000, 2004). In order to measure everyday clinical practice, it is important for the SPs to be unannounced (incognito): the practitioner must not believe that the SP is there to assess their clinical practice.

In research of this type the optometrist is the research subject. In accordance with the tenets of the Declaration of Helsinki, research participants should have the right to safeguard their integrity and should have the right to abstain from participation. Informed consent (Bachmann *et al.*, 2004; Barragan *et al.*, 2000; Bowman *et al.*, 1992; Dresselhaus *et al.*, 2000; Luck *et al.*, 2000; Luck & Peabody, 2002; Peabody *et al.*, 2000, 2004; Ramsey *et al.*, 1998) to participate in the study and anonymity (Bachmann *et al.*, 2004; Barragan *et al.*, 2000) of all participants was a prerequisite for the study. As a result, the SP only visited optometrists who had given prior consent to participate in the research. These optometrists did not know when the visit occurred and the visit was unannounced.

The requirement for informed consent inevitably reduces the participation rate. To encourage as high a participation rate as possible, we offered two levels of anonymity, and we believe this to be an innovation in SP research. The rationale behind this decision is that preliminary discussions with several practising optometrists revealed two main reasons why it was felt that optometrists might decline to participate. First, some practitioners may be anxious that the research would discover shortcomings in their clinical practice which might lead to criticism from colleagues or even disciplinary proceedings. To alleviate such concerns, we offered an option of **full anonymity** where only the actor knew the practitioner's name and this was not revealed to the other (optometric) members of the research team. The second reason why some optometrists may decline to participate is because there was no perceived benefit for the practitioner. To address this objection we offered the option of **partial anonymity**, which allowed the optometrists to receive information that could improve their standard of practice. With this option the researchers and actor, but no-one else, knew the practitioner's identity and the practitioner received feedback about the content of their eye examination compared with the 'gold standard' recommendation of the panel of experts.

Flashing lights and floaters

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. 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 occipital cortex 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, 1986). 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).

Floater or “flying spots” as perceived by patients are vitreous opacities casting a shadow on the retina during eye movement (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 vitreous collapses (Serpapoulos, 1997). If, however, they increase in number and/or are associated with photopsia, then further investigation is essential (Alwitary *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 any further delay (Alwitary *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). The quadrant 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 90° of one another (Kanski, 2000).

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 (Alwitary *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 dependent, and might vary from two to three months (College of Optometrists, 2005) to not at all (Coffee *et al.*, 2007).

Research Questions

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 a special interest in clinical optometry
- ❖ A lecturer at a UK optometry department
- ❖ A College of Optometrists' advisor, examiner and assessor and an expert witness in medico-legal cases
- ❖ A councillor for the Association of Optometrists
- ❖ A member of an Optometric Collaborative Research Network.

These views are summarised as primary and secondary research questions in Table 1. It is stressed that the list of possible tests and questions in Table 1 is not intended to define good practice, but more to be a list of possibly relevant investigations and of questions to which answers should be sought in our research. These are discussed in more detail below.

Methods

Developing the case scenario and case specific checklist

The case scenario and checklist for the SP were selected based on evidence-based reviews and clinical guidelines on flashing lights and/or floaters (Alwitary *et al.*, 2002; Chignell *et al.*, 2000; Tanner *et al.*, 2000; College of Optometrists, 2005; Kabat & Sowka, 2001). 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 actor role description, checklist and scenario outline. This checklist was designed to be completed by the SP immediately after each consultation was completed as a record of the consultation. The checklist (Appendix) consisted of questions and tests that the optometrist may or may not have carried out on the patient. Some of the questions and tests were specifically appropriate to the presenting symptoms, others may not have been specifically appropriate to the presenting symptoms but may nonetheless have been asked or carried out.

In addition to the quantitative description of the number and type of tests carried out, we believed it would be useful to obtain a subjective indication of the SP's impression of (a) the

thoroughness of the eye examination and (b) the extent to which their symptoms were addressed. These subjective impressions were made in comparison with the SP's training eye examinations carried out at the Institute of Optometry. The value of these subjective data is explored in the discussion.

Sample Selection

A random selection of 102 optometrists working within 1.5 hours travel from central London was recruited. Details of the process of random selection are in a previous publication (Shah *et al.*, 2008a). The participation rate, expressed as the proportion of optometrists who could be contacted who agreed to participate, was 27%.

Consenting practitioners were offered a choice of two levels of anonymity:

1. **Full Anonymity-** For practitioners who chose 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 in the form of feedback about the SP's findings. For practitioners who chose this option, the SPs recorded the name of the practitioner to enable the research team to provide feedback.

Consenting optometrists were advised in writing of the following points:

- ❖ A standardised patient would book into their practice for a routine eye examination. The patient may or may not be symptomatic or present with an ocular condition.
- ❖ The SP will have been carefully trained to act as convincing patients and would be unannounced. The optometrist would carry out a normal routine eye examination and the eye examination will be paid for in the usual way.
- ❖ The actors would carry an audio recorder to aid accurate completion of the checklist. If the practitioner had chosen the full anonymity option then the actor would only use the recording (through earphones) when completing the checklist after the eye examination. After this, the actor would delete the recording. If the practitioner had chosen the feedback option, the recordings will be handed over to the researcher to monitor quality control.

- ❖ Upon completion of the visit, the SP would fill in a detailed checklist as a full description of the eye examination.

Although the optometrists were expecting visits from SPs, steps were taken to ensure that the SP remained undetected. No SP visits took place within a month of the optometrist recruitment. The SP is a professional actor and, prior to visiting consenting optometrists, he underwent intensive one-to-one training on the different aspects of an eye examination (Shah *et al.*, 2008a). Specific to this 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. But the SP was not able to reliably detect when he was being tested by van Herick's technique.

At the end of the training the SP was given a list of all the consenting practitioners stating which anonymity option they had chosen, and designed 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.

During the SP visits, the eye examination was timed, starting from when the SP was taken through to start the first clinical test or symptoms and history. The timing stopped when 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 that for which he was not present (e.g., if the prescription of spectacles was checked on a focimeter).

A pre-designed checklist was completed by the SP immediately at the end of each consultation. The checklist consisted of questions and tests that the optometrist may or may not have carried out on the patient. The actor carried a digital audio recorder to facilitate accurate completion of the checklist. The confidential nature of these recordings was emphasised during the course of the study. Quality control of the actor's performance was monitored as described in Shah *et al* 2008a.

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) summarised in Table 2. The full script was a detailed (approximately 500 words) document.

Refractive error

In England, it is a requirement for an optometrist to issue a signed, written copy of the prescription (or statement if no prescription is required) at the end of every examination (General Optical Council, 2008a). If the practitioner did not issue a copy of the prescription at the end of the eye examination, the SP was advised to ask for a copy of his prescription before leaving the practice. This was recorded in the checklist. Although an assessment of the variability in refractive findings between optometrists visited is listed as a research question in Table 1, a detailed analysis of the refractive findings will be presented in a separate paper, together with analysis of the refractive findings for other SP studies carried out by our research team.

Results

Of the 600 letters sent, 109 optometrists no longer worked at the practice at which they were listed and 55 letters did not reach the addressee. A letter of invitation was resent to these 55 optometrists by email (obtained when the practice was telephoned) and/or to the correct 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%. Although 111 optometrists consented to participate, 102 were visited for this scenario.

During the early stages of the study participants were asked to choose which option they preferred, complete anonymity or the feedback option. Twenty-five chose full anonymity (this figure included some 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).

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. We therefore use data obtained from 102 visits for the symptoms and history and advice and management sections, and data obtained from 101 visits for the remainder of the results.

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, we used clinical guidelines on flashes and/or floaters and views from the expert panel to derive a list of questions to aid identification of the nature of the flashing lights. These questions are listed in Table 3. Although none of the optometrists asked all of these questions, 35% asked at least four of the seven questions.

85% of optometrists asked the patient if he 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.

During the early stages of the research, the expert panel 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.

Some testing was carried out by assistants (e.g., fundus photographs, tonometry, visual fields and autorefractometry). These tests were included as components of the eye examination in the data described below. A full summary of the contents of the eye examinations is included in the Appendix. Here, we concentrate on the tests most relevant to the presenting symptom of recent onset flashing lights. 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).

Sixty-seven optometrists (66%) recommended dilated funduscopy. Of these, 63 optometrists recommended that the dilation should be performed on the same day as the examination, 12 recommended dilation within one week of the initial visit, and 8 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 visits included pupil dilation, 77 were without dilation, and one practitioner referred the patient to Moorfield's Eye Hospital immediately. These figures do not take into account those optometrists who recommended dilation or referral at a later date, and we return to this below.

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).

Of the 24 optometrists who carried out a dilated examination, seventeen 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 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 carried out both a dilated and undilated fundus examination. Five optometrists carried out a dilated fundus examination only. 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.

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 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.

Of the 30 optometrists who obtained the patient's consent to refer him for a second opinion, 11 optometrists wrote a letter and asked the patient to consult his GMP, 17 optometrists wrote a letter to the patient's general medical practitioner or the HES but did not ask the patient to consult his GMP, and 2 optometrists 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.

General descriptive data

The general descriptive data are included in the Appendix and only the key features that have not already been described are highlighted here. The average time taken for the examination (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). Scatterplots show how the time taken for the eye examinations is related to cost: Figure 1 refers to the 77 eye examinations where dilation was not carried out; Figure 2 to the 24 consultations where it was. In Figure 1 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 SPs 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.

A total of 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, our estimation based on timings (Shah *et al.*, 2008b) 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).

Comparisons

An inspection of the Key Note report on Opticians and Optical Goods (Griffiths, 2006) reveals 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). In the analyses below, 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'. The randomisation process for participant selection resulted in the SP visiting 50 independent practices, 35 large multiples and 17

small multiple practices. In the analyses below, we compare the cost and duration of an eye examination for practices located in the “town centre” to those located “rurally”. Seventy-five of the practices visited were located within the town centre and are described as “urban”. We use the term “rural” for practices located more than a mile from the town centre. Twenty seven of the practices visited were located rurally.

There were no significant differences in both the duration ($p=0.12$) and cost of the eye examination ($p=0.09$) between the different types of practice (large multiple, small multiple, independent; Figure 3 **Error! Reference source not found.**). There was also no significant differences in both the duration ($p=0.94$) and cost of the eye examination ($p=0.59$) between the different location of practice (urban or rural).

The SP was required to complete a checklist recording details of their encounter immediately after each eye examination and, as the first item on each checklist; 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, $F=0.16$, $p=0.85$).

During the early stages of the study, the expert panel suggested tests (in the form of secondary research questions, Table 1) that they felt should be carried out on a patient presenting with recent onset flashing lights. Table 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.

Discussion

Floater 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 & Peabody, 2002; Peabody *et al.*, 2000; Ramsey *et al.*, 1998; Shah *et al.*, 2007).

Addressing the research questions

One possible approach in research of this type is to produce a prescribed list of questions and tests that are felt to be essential and to criticise optometrists who fail to conform to this prescribed list. We strove to avoid this over-simplistic approach. 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. There are some cases where it is straightforward to describe tests that are essential for competence (e.g., ophthalmoscopy) and for best practice (e.g., visual field testing in a patient with headaches of recent onset). From a legal point of view, an eye examination is adequate if it includes the tests that would have been carried out by a body of reasonably competent optometrists (Bolam and Bolitho tests; see Introduction). Our descriptive data are therefore useful in specifying the questions and tests that are thought appropriate by a large body of optometrists.

In answer to the primary research question, it is of concern 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 optometrists asked the SP at least one of the seven questions listed in Table 3. The College of Optometrists' document discussed above 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 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 optometrists did not ask the patient about the presence of floaters. Ten of these 15 optometrists 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. Alwitary *et al.* (2002) concluded that all patients should be questioned about the presence of a subjective visual field defect. In our study 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 above, the expert panel recommended two approaches to managing a patient presenting with photopsia and floaters. It is perhaps surprising 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 our study been extended to these areas. It is interesting 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. Although some members of our 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.

The College of Optometrists document discussed above recommends the minimum examination that should be carried out if a retinal break is suspected should include:

- **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)**

In view of this guidance it is of concern that 87% of optometrists did 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. All but one of the optometrists who performed a routine eye examination examined the fundus.

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 SPs 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. 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. 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 a clinical practice survey carried out in 1998, of the 4,000 optometrists who responded, around 50% stated they would carry out indirect ophthalmoscopy when examining a diabetic patient (Stevenson, 1998). Although the SP was unable to have dilated fundus examination for all 102 visits, 38% of optometrists examined the fundus undilated using indirect ophthalmoscopy. 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 68⁰-95⁰ (depending on the lens power used) of the fundus compared to 10⁰ using a direct ophthalmoscope, although recent advances have led to the development of a wide field direct ophthalmoscope with a 25⁰ 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 (Alwitary *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.

We have assumed in this paper that dilated fundoscopy is the gold standard for a patient presenting in this way because this is the consensus in the literature (Alwitary *et al.*, 2002), and is specified in the College of Optometrists' guidance (College of Optometrists, 2005). We did measure the patient's pupil diameter, 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 our sample either carried out dilated funduscopy on the day of the appointment, or carried out undilated funduscopy and attempted to arrange for dilated funduscopy at their practice within a day or two, or made an urgent referral for this. Our 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 above 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, 2003). 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 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 (Alwitary *et al.*, 2002). Our results 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 mydriasis was 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 (Alwitary *et al.*, 2002). The data of Alwitary and colleagues were derived from a questionnaire survey, which is a suboptimal method of determining clinical practice.

Our 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, 9% advised within a week and 2% advised the patient to go whenever it was convenient. The College of Optometrists' document discussed above 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 equates to 14 patients per month, or 168 per annum (Alwitary *et al.*, 2002). There are about 9,200 practising optometrists (The Information Centre, 2007), and 95% of practising optometrists work in community practice (Blakeney, 2002). 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.

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.

Optometrists in many practices are allocated 20 minutes to carry out a “routine” eye examination (Harvey & Franklin, 2005). In some practices, 30 minutes is allowed between appointments, but that often includes 10 minutes for dispensing (Harvey & Franklin, 2005). The average duration for optometrists who performed an undilated routine optometric eye examination was 25 minutes (range 2 minutes to 50 minutes). Eight optometrists carried out an eye examination in less than 21 minutes. The average duration of the eye examination for optometrists who carried out dilation was 36 minutes (range 25 to 50 minutes).

Although the present study was based on a patient presenting for a private eye examination, 71% (Federation of Ophthalmic & Dispensing Opticians, 2008) of eye examinations provided in the UK are funded by the National Health Service (NHS). To some extent the NHS fee sets the standard for most primary eyecare in the UK since in the authors’ experience the same appointment times are usually allowed for private and NHS consultations. The current NHS fee in England 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 in England funds 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 two to three times as long as the interval that would be predicted from the level of funding. In Scotland and Wales, recent eye examination funding changes have improved the quality of eye examinations (Ang *et al.*, 2007). Clearly a funding method that encourages enhanced quality rather than quantity of eye examinations is long overdue.

A survey of specified recall intervals for eye examinations found the average re-examination interval for an adult to be two years (Warburton *et al.*, 2000). 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 above, 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).

Comparisons

It is reassuring that the comparisons between different types of practice revealed no significant differences for all the data in Table 5 above, indicating that this type of patient would receive similar care and attention regardless of the type of practice that he consulted. Fundus examination using a fundus camera in different practice types approached significance ($p=0.06$). It is also reassuring that the location of practices, considered simply as urban or rural, makes no significant difference.

A survey carried out by *Which?* magazine found 36% of eye examinations took less than 20 minutes (*Which?*, 2007), which is more than our sample where only 8% who performed an undilated fundus examination, took less than 20 minutes. However, there are some important differences between the *Which?* survey and our research. We took great care to train our actors and monitor quality control, and 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 *Which?* survey raises the percentage of optometrists who 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. We think that the most likely explanation for the difference between our data and those in the *Which?* survey is that their survey involved students presenting for eye examinations. The average age of these students is likely to be much lower than that of our SP, and their presenting symptoms less demanding from the point of view of the depth of clinical investigation that

was required. Notably, it is unlikely that many, if any, of the students in the *Which?* survey required a fundus examination through a dilated pupil, a procedure that would lengthen the duration of the examination significantly.

Limitations of the study

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, our results may overestimate performance although we believe that the option of full anonymity will have helped to allay possible concerns about the research highlighting poor practitioner performance.

A potential limitation is the possibility of optometrists detecting the SP during their visit. In the initial information that was sent to participating optometrists we asked them to inform the researchers if they detected any of the SPs during their visits. None reported identifying this SP, and nothing that took place during any of the eye examinations led the SP to suspect that he 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) this SP. From the point of view of a professional actor, to portray a patient having an eye examination is an undemanding role. This is especially the case, as with the present SP, when they have already had many eye examinations in the past as a 'real' patient. From the point of view of the practitioner, they were unaware that this patient was the SP 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. Our experience with training the actor led us to have great confidence in his ability to detect and record optometric tests and instruments, and this confidence was supported by the quality control checks.

Another limitation is that our research only involved optometrists working within 1.5 hours travel from central London. We excluded optometrists working in the City of London, 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 our study could not reveal. We know of no data to suggest this. As a check, we did investigate for any difference between urban and rural practices in terms of three key variables: cost, duration of examination, and proportion of expert panel listed tests that were carried out. There were no significant differences ($p > 0.60$) between the means for any of these variables, which supports our assumption that standards of optometric practice are unlikely to vary greatly in different geographic regions within England. However, it should be noted that improved funding arrangements and expanded scope of practice for NHS primary eyecare in Scotland and Wales (Association of Optometrists, 2008) mean that our data are unlikely to reflect the situation in these regions.

Conclusions

Patients presenting with new onset flashes and/or floaters should, if possible undergo a dilated funduscopy 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 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 funduscopy 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. A total of 64% of the 102 optometrists that we sampled complied with the College of Optometrists' guidelines for a patient that was characterised by our SP.

The study has further demonstrated that standardized patient encounters are an effective way of measuring clinical care within optometry and should be considered for further comparative measurements of quality of care. The SP checklist approach is most powerful when used together with data from other methods of measuring the quality of care (Cohen *et al.*, 1996; Colliver, 1995) and we will shortly be reporting the results of record abstraction and computerised vignettes studies within optometry.

As in other research using SPs in other healthcare disciplines (Adamo, 2003; Ebbert & Connors, 2004; Maupome & Sheiham, 2000), our research has highlighted an inevitable variation in the standards of different optometrists. Future continuing education and training could usefully focus on the need to determine the prime symptom and on examination techniques and referral guidelines for patients presenting with symptoms of posterior vitreous detachment.

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Appendix

A presbyopic patient presenting with flashing lights

	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?	83%
i.e. Constant or intermittent	
❖ Is there a change in pattern of occurrence?	39%
i.e. More or less frequent	
❖ 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 practitioner:

	% of optometrists that performed the test
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 practitioner:

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 practitioner:

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 and Undilated	99%
• Using an ophthalmoscope	78%
• Using slit lamp biomicroscopy	38%
• Head Mounted (Indirect)	2%
• Fundus photography (as standard)	10%

Supplementary Tests - Did the practitioner:

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 practitioner:

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. Advise (verbally or with leaflet) you about the side effects of the drops?	87%
41. Advise you and/or obtain consent to refer for a 2 nd 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%

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Figures and Tables

Tables

Table 1: Research questions

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? [For ethical and practical reasons, the SP was not asked to undergo pupillary dilation, unless it is the SP's last practice visit of the day. If the optometrist tries to arrange mydriasis at an earlier slot in the day: ➤ The actor said that he had driven to the appointment and will arrange another appointment for the dilation. ➤ When he left the practice he telephoned the practice and cancelled this appointment, explaining if necessary that he is the SP. ➤ If the practitioner tried to arrange an immediate appointment for him at the hospital then, to avoid wasting the time of NHS staff, the actor identified himself as the SP.
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 recommend dilation, the SP acted in a nervous manner and asked what tests will be done at the dilation. When the optometrist explains that they will 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

<p>possible, he in this way determined, from the optometrist's description, what technique would be used if dilated funduscopy were arranged:</p> <ul style="list-style-type: none"> ➤ Monocular direct ➤ Slit lamp binocular indirect ➤ Headset binocular indirect
<p>10. What proportion of optometrists assessed the intraocular pressures?</p> <ul style="list-style-type: none"> ➤ Using contact tonometry? ➤ Using non-contact tonometry?
<p>11. What proportion of optometrists assessed the intraocular pressures?</p> <ul style="list-style-type: none"> ➤ Before dilation? ➤ After dilation?
<p>12. What proportion of optometrists would have referred the patient to the hospital:</p> <ul style="list-style-type: none"> ➤ 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 can determine what proportion of optometrists either recommended dilation or referred the patient]
<p>13. What proportion of optometrists recommended an appropriate refractive correction?</p>

Table 2: A summary of the standardized patient history, symptoms and responses 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 asked, 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 (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 condition.
- 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 music teacher. Your hobbies include teaching and playing music.

Table 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%

*the proportions quoted are based on the entire sample (N=102). The totals do not add up to 102 because several optometrists asked more than one question

Table 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).

Table 5: Table showing percentages of optometrists working in independents, small multiples and large multiples who carried out the tests suggested by the expert panel.

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	20%	0%	0%	2%
d) using head-mounted indirect	0%	6%	3%	2%
Tonometry	98%	100%	97%	98%
a) Using contact tonometry	16%	12%	3%	87%
b) Using non-contact tonometry	82%	88%	94%	11%
Tonometry				
a) Before dilation ¹	92%	100%	100%	96%
b) After dilation ¹	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 ²	90%	100%	96%	94%
b) within one week ²	19%	25%	13%	18%
c) whenever convenient ²	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 ³	44%	50%	40%	43%
b) within one week ³	28%	0%	30%	27%
c) whenever convenient ³	22%	0%	20%	17%
d) via the patient's GMP ³	33%	50%	50%	40%

¹ The percentages quoted are based on the number of optometrists who performed a dilated optometric eye examination (n=24).

² The percentages quoted are based on the total number of optometrists that 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.

³ The percentages quoted are based on the total number of optometrists that 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.

Figures

Figure 1: The duration of the eye examination plotted against the cost of the examination. Data were obtained from a sample of 77 optometrists who performed undilated eye examinations.

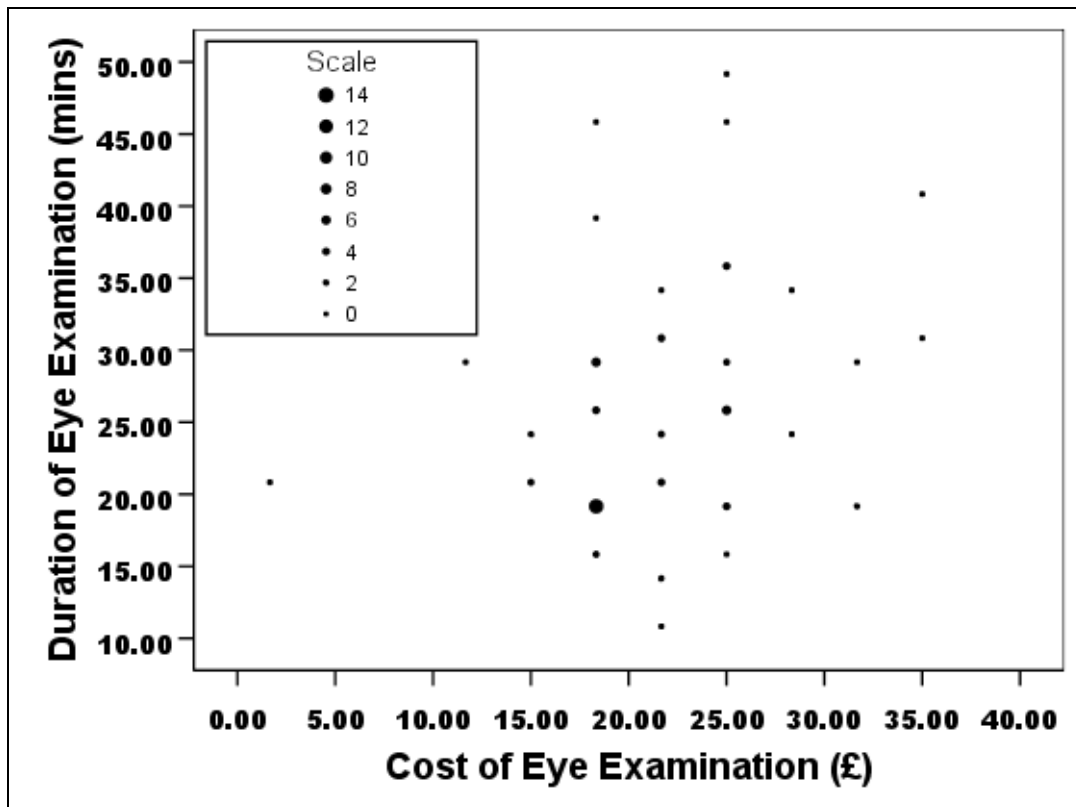


Figure 2: The duration of the eye examination plotted against the cost of the examination. Data were obtained from a sample of 24 optometrists who performed dilated eye examinations.

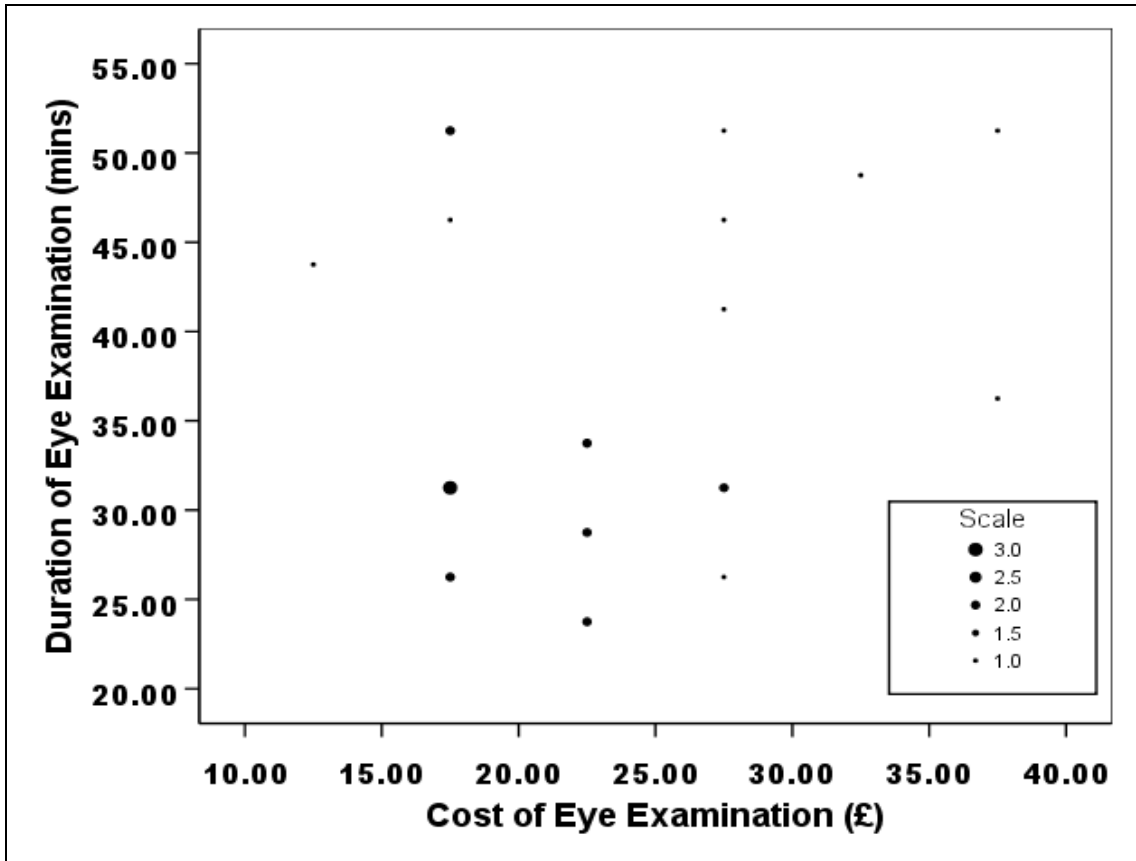


Figure 3: Mean duration and cost of the eye examination for independent practices, small and large multiples. The vertical axis represents both time (minutes) and cost (£). The error bars represent the upper and lower boundaries of the 95% confidence intervals for the means.

