



UNIVERSITY
OF YORK

**CENTRE FOR HEALTH ECONOMICS
HEALTH ECONOMICS CONSORTIUM**

Sight Testing and the Role of Optometry

by

Maria Goddard

DISCUSSION PAPER 64

UNIVERSITY OF YORK
CENTRE FOR HEALTH ECONOMICS

SIGHT TESTING AND THE ROLE OF OPTOMETRY

by

Maria Goddard

The author would like to acknowledge the support of the Association of Optometrists, for whom this report was prepared.

April 1990

The Author

Maria Goddard is Research Fellow in the Centre for Health Economics at the University of York.

Acknowledgements

The author would like to acknowledge the support of the Association of Optometrists and also thank Vanessa Waby for typing various drafts of the paper.

Further Copies

Further copies are available (at price £3.00 to cover the costs of publication, postage and packing) from:

The Publications Secretary
Centre for Health Economics
University of York
York YO1 5DD

Please make cheques payable to the University of York. Details of other Discussion Papers can be obtained from the same address or telephone (0904) 433648 or 433646.

Abstract

The optical services market has been altered substantially by government legislation over the past six years. Further deregulation has been proposed which would alter the content and structure of the eye test, resulting in a two-tier test. This would split the refractive sight test, aimed at establishing the need for optical appliances, from the eye examination, aimed at detecting signs of abnormality and eye disease.

In order to explore the potential consequences of such action, the current role of the optometrist in sight-testing is examined, with particular reference to two serious eye diseases, glaucoma and diabetic retinopathy. The potential effects of deregulation on both resource use and quality of life are considered in relation to these disorders, and the important role of the optometrist in both the detection of (often asymptomatic) eye disease and also in monitoring disease at the post-diagnosis stage is examined.

The report concludes that legislation which alters the structure and content of the sight test would have potentially detrimental effects on both resource use in the health care sector and quality of life for patients.

Sight Testing and the Role of Optometrists

Background

The position of optometrists (ophthalmic opticians) in the optical services market has been altered dramatically by government legislation since 1984. Prior to this, optometrists working mainly through the General Ophthalmic Service in the NHS, undertook the majority of eye testing and appliance dispensing services as contractors to the Family Practitioner Committee.

In late 1984 however, the market for the sale of spectacles was opened up, allowing unregistered (unqualified) opticians to sell prescription spectacles to the public. The eye examination and sight test necessary to make up the prescription however, still remained the province of the registered (qualified) optometrists. The rationale for this was to give the customer a wider choice of where to purchase their glasses rather than forcing them to buy their appliance from a monopoly provider (an idea originally broached in 1982 by the Office of Fair Trading, Borrie, 1982).

Subsequently, in 1986, the financing of the NHS spectacles scheme was also altered and the provision of NHS spectacles was replaced by a voucher scheme. This allowed certain low income groups (plus children under 16) to purchase appliances and lenses with vouchers set at several different levels to allow for variations in the complexity of eye problems. Later in April 1989, legislation was introduced to allow the sale of ready-made reading glasses to the general public by any outlet. This was seen as a further step in expanding consumer choice and freeing the market.

Finally, in April 1989, a charge for eye tests was introduced for those not eligible for the free NHS sight test. Again, eligibility for a free test was restricted to low income groups (including those under 16 years of age, and those under 19 years if in full-time education) and high risk groups which consist of those suffering from glaucoma or diabetes (and certain relatives of glaucoma sufferers), and those registered blind or partially sighted. For all other sight tests, the optician charges a fee, which varies, but is now around £11.50 and for NHS tests, the optometrist currently receives the fee of £11.20 for each test undertaken (from April 1990).

Policy Implications

The effects of such policy changes on the size and composition of the optical services market have been documented elsewhere (Association of Optometrists (a) and (b)) and indeed the effects on the consumer of charging for sight tests is still being vigorously debated. Although the introduction of charges has had important implications both for the health of the consumer and the optical services market, these issues are not the subject of this paper. What is considered here is the potential effect of further deregulation of the market which would influence the content and structure of the eye test.

In particular, it has been suggested that a system of two-tier eye testing might be introduced at some stage in the future, " ... opticians will be free to offer either a standard sight test or a fuller eye examination to meet their patients' needs and preferences." (HMSO, 1987). This would enable those who are not eligible for the NHS sight test to pay a low fee for a

refractive sight test which would establish their requirements for spectacles or other appliances, and then to also have the option of paying an additional sum to undergo an eye examination aimed at detecting signs of abnormality and eye disease.

Furthermore, it has been suggested that such division of the eye test might facilitate further deregulation of the market if the part of the test aimed at the detection of refractive errors was undertaken not by an optometrist, but perhaps by unqualified personnel using automatic instruments and new technical equipment (House of Commons, 14 June 1989, columns 1487-8, 1491). The eye examination, if required, could then be performed by the optometrist who is trained in the screening of eyes for detection of abnormalities and disease.

This has been a cause of concern for many practitioners as there are potentially detrimental effects for the consumer arising from such a policy. In particular, it could provide a disincentive to undergo the eye examination which may leave many asymptomatic eye diseases undetected and untreated until they have advanced to a symptomatic stage where treatment may be less effective. In addition, for sight tests undertaken privately, especially in the large retail sector, the optician may face financial incentives to undertake "quick" refractive tests rather than full examinations in order to maximise throughput and thus fee income. Finally, the issue of who performs the sight test raises questions relating to the quality of the service provided and the skills and training necessary for accurate and reliable testing. In order to examine the consequences for the consumer of such deregulation, it is necessary to look at the role currently played by the optometrist in eye health, and the nature of the work of this profession.

Optometrists operating in the General Ophthalmic Service (GOS) are bound, by their Terms of Service, to carry out both the sight test to determine errors of refraction which may be corrected or relieved by the prescription of an optical appliance, and secondly to undertake eye examinations to detect abnormalities, diseases or injuries to the eye. Under the rules pursuant to the 1958 Opticians Act, the optometrist has a statutory obligation to make referrals to General Practitioners in instances where such abnormalities are detected. From July 1989, the duties to be performed on sight testing have been detailed as part of the Health and Medicines Act 1988 and this does indeed include an examination of "the external surface of the eye", an "intra-ocular examination" and additional examinations thought to be "clinically necessary" for the purpose of "detecting signs of injury, disease, or abnormalities". (Department of Health, 1989). Thus, for the present at least, in theory the consumer seems to be safeguarded, but future further deregulation of the optometrists professional role in sight testing cannot be discounted and the potential effects of such action are therefore the subject of the remainder of this paper.

As stated earlier, the eye examination undertaken as part of the sight test has a screening function, in that the optometrist is able to detect signs of eye disease or abnormality even at an early stage, even before the patient has experienced any symptoms. In addition, continued skilled monitoring can detect changes in the eye which might occur at the post-diagnosis stage and may indicate progression of eye disease.

The role of the optometrist in the detection and prevention of eye disease is considered in relation to glaucoma, which can cause blindness if

not detected and treated at an early stage. The additional role of the optometrist in monitoring changes at the post-diagnosis stage is also considered with reference to diabetic retinopathy, another serious eye disease which can cause blindness.

Glaucoma

This eye disease is a very common cause of blindness, especially amongst the elderly. It develops when raised intraocular pressure causes damage to the optic nerve and visual fields and eventually leads to blindness. The most common type of glaucoma is open-angle glaucoma (chronic simple glaucoma) which is a slowly progressing and insidious disease which is difficult to detect as it is often asymptomatic (WHO, 1984). Central vision is usually retained until a late stage and thus the patient remains unaware that there is a problem unless some kind of screening process picks it up.

There are three methods of detection for open-angle glaucoma (OAG), the first of which is tonometry which measures the intraocular pressure of the eye. This can be undertaken by a doctor or optometrist. Secondly, an ophthalmoscope can be used to identify characteristics of the surface of the optic nerve. Lastly, perimetry involves the examination of visual fields to identify visual loss. Each method has certain limitations (Power et al, 1988; Wood and Bosanquet, 1987) in establishing the presence of glaucoma definitively, for example, many people with high intraocular pressures never develop glaucoma, whilst some people with very low pressures will go onto develop this disease. For such reasons, in practice, combinations of screening methods are often used to produce a final diagnosis of OAG. Once diagnosed, visual loss from glaucoma is irreversible, but if detected early it may be controlled more easily than if left to progress untreated. Thus, early diagnosis can significantly affect the results of treatment and the extent of visual loss experienced.

Research has shown that optometrists are responsible for the detection

and referral of a substantial proportion of glaucoma cases seen at hospital and outpatients settings (for example, Shaw et al, 1986; Crick, 1982; MacKean and Elkington, 1982; Brittain et al, 1988; Harrison et al, 1988; Tuck and Crick, 1989). It has therefore been suggested that if the screening function of the eye examination was to be split from the sight test, many of these cases would remain undetected, progressing unchecked until severe visual loss or blindness occurred. Whilst it is difficult to predict exactly the magnitude of this effect, some estimates can be made by looking at incidence, prevalence and referral patterns under the current system.

It has been estimated that glaucoma affects between 150,000-300,000 people in the UK, and prevalence rises sharply with age (Bankes et al, 1968; Graham, 1978; Crick, 1980). The most common form, OAG, has been estimated to affect between 0.5% and 1% of the population aged over 40 years (Bankes et al, 1968; Bengtsson, 1981). If the overall or age specific prevalence rates found in population surveys are taken, and applied to the 1988 population estimates for England and Wales (CSO, 1989), some indication of range of estimated prevalence of glaucoma in the population can be obtained. Table 1 summarises the results of such an exercise.

The population surveys are likely to produce more accurate estimates of the extent of glaucoma than surveys based on referrals to hospital departments. One reason for this is that there is likely to be a considerable number of people, especially amongst the elderly, who have glaucoma which remains undetected and therefore unreferred. For example, a recent study found that in a small sample of 50 elderly day patients, none of whom were believed to have a sight problem, 6% were found to have glaucoma (McMurdo and Baines, 1988). Although it is difficult to make reliable deductions from such

Table 1: Estimated Prevalence of Glaucoma

<u>Source of prevalence estimates^(c)</u>	<u>Type of glaucoma</u>	<u>Estimated no. of cases 1988</u>
Bankes et al, 1968	All primary glaucoma in 40+ age group	207,418 ^(a)
	OAG in 40+ age group	158,352 ^(a)
Hollows and Graham, 1966	All primary glaucoma	187,346
	OAG	95,903
Podger et al, 1983	OAG in 55+ age group	149,700 ^(b) to 167,687

Notes:

- (a) Probably an over-estimate as the survey invited people to attend for screening and thus self-selection of those with symptoms would occur.
- (b) Framingham survey, USA. The higher estimate is a result of applying age-specific rather than overall rates of prevalence.
- (c) Results should be treated with caution, as the definitions of glaucoma cases will vary between surveys.

a small sample, it seems likely that a substantial number of sufferers will not be recorded in referral statistics and indeed, other studies have supported this (Gibson et al, 1985).

Estimates of incidence are also difficult to make, as new cases detected and referred are again likely to be underestimates of the "true" incidence due to the extent of undiagnosed glaucoma in the community. However, the results of the Framingham survey of prevalence of OAG (Podger et al, 1983) allows incidence estimates to be made and again, if these are applied to the 1988

population of England and Wales, the following estimates of incidence of OAG are obtained:-

Table 2: Estimated Incidence of Glaucoma, 1988

<u>Age group</u>	<u>Framingham 1 year incidence estimates of OAG.</u>	<u>Estimates of new cases per year. England and Wales, 1988.</u>
55-59	0.04%	1060
60-64	0.06%	1564
65-69	0.10%	2555
70-74	0.14%	2700
75-79	0.22%	3655
80-84	0.22% ^(a)	2359 ^(a)
Total		13893

Although such estimates of the incidence and prevalence of glaucoma in the community reveal the potential for preventative health care in the area, this paper is concerned with the role of optometrists in the diagnosis of glaucoma and other eye diseases and therefore the next section examines the extent of diagnosed glaucoma and the contribution of optometry to case-finding.

Shaw et al (1986), have used the results of a survey of 3004 new patients referred to a hospital eye clinic over a 12 month period, to calculate the "demand incidence" of OAG. This is defined as the number of (confirmed) cases of OAG presenting for treatment as a proportion of the population at risk and can be seen as a measure of the diagnosed cases of glaucoma rather than the pool of undiagnosed cases which may exist in the community. If the age-specific demand incidence rates are again applied to

(a) Not available from original source. The estimate for ages 75-79 years is used as a substitute.

the general population of England and Wales in 1988, the results in Table 3 are obtained:

Table 3: Estimated Demand Incidence of OAG, 1988

<u>Age Group</u>	<u>Estimated "Demand Incidence"</u> <u>(per 10,000 population)^(a)</u>	<u>Estimated new cases of</u> <u>diagnosed OAG. England</u> <u>and Wales, 1988.</u>
<50	0.2	976
50-59	1.8	963
60-69	5.8	2994
70-79	9.7	3482
80+	10.9	1952
		<hr/>
		10,367
		<hr/>

(a) From Shaw, 1986.

The estimate made by Clearkin and Harcourt (1983) on the basis of a similar study showed a referral incidence (or 'demand' incidence) of one new patient with diagnosed OAG for every 7,281 of the general population. They compare this with the results of an earlier study by MacKean and Elkington (1982) where the findings implied a referral incidence of 1 new OAG case per 6,324 of the population. For England and Wales in 1988, these rates imply a demand/referral incidence of 6,921 and 7,969 new cases of OAG per year respectively. These are lower than the estimate derived from Shaw's study, and this is probably due to the fact that Shaw provides detailed disaggregated age specific rates rather than overall rates which do not account for the sharply increasing incidence with age.

Of particular importance in the context of potential deregulation of the

sight test and eye examination, is the proportion of these cases found and referred by the optometrist during the course of the sight test. Of equal significance is the extent to which optometrists detect glaucoma which is still asymptomatic and the accuracy of referrals of glaucoma when compared with other referral agents. These factors are considered in the following discussion.

The study undertaken by MacKean and Elkington (1982) involved interviews in a hospital department with 191 patients with a confirmed diagnosis of OAG. One hundred and twenty-one of these patients had symptoms causing them to actively seek advice and 38% sought the advice of their optometrist and were subsequently referred and diagnosed. However, of 70 patients who were asymptomatic at diagnosis, 46% were referred by an optometrist, with only 3% diagnosed by the GPs. Thus, the referrals by optometrists consisted of a large group of people who would otherwise have had no idea of their eye disorder until they progressed to an advanced symptomatic stage and sought advice.

A retrospective review of case-notes of patients referred to an out-patients department over 5 months, identified 363 cases of OAG, 59 incomplete OAG and 83 with ocular hypertension (a predictive factor in development of glaucoma) (Steinmann, 1982). Of these confirmed cases, optometrists were responsible for 57%, 63% and 29% of referrals for the 3 types of diagnosis respectively. Moreover, the presumed diagnosis for 270 of the cases was obtained from the notes and optometrists were responsible for 92% of the correctly diagnosed cases of OAG. In addition, of the patients who were asymptomatic, none were referred by GPs. These results lead the author to conclude that "ophthalmic practitioners and opticians detect most of the

glaucoma in patients referred". (Steinmann, 1982 (P. 1093)).

Similarly, Clearkin and Harcourt (1983) examined all referrals to an ophthalmic outpatient clinic over a 1 year period. Of 844 new referrals, 43 were referred with a diagnosis of glaucoma. Nine of these patients (21%) were referred by doctors, whilst 34 (79%) were referred by optometrists. Again, of more significance is the fact that all 9 of the doctors referrals were incorrect, whereas the optometrists correctly referred 32% who had glaucoma, 12% had related eye conditions and 56% were incorrectly diagnosed. Indeed, the optometrists were responsible for referring all 11 patients in whom glaucoma was subsequently confirmed.

A more recent review of the notes of over 1000 consecutive patients referred to a hospital ophthalmologist confirms this pattern. (Harrison et al, 1988). One hundred and forty-five of the patients were referred with a diagnosis of suspected glaucoma and optometrists were responsible for 81% of these, with GPs referring 17%. Accuracy of referral was assessed by comparing referral diagnosis with final diagnosis and optometrists were found to refer 80% of glaucoma patients correctly, compared with only 37% success for GPs. Thus the quality as well as the quantity of referrals was higher for the optometrists than for other agents. In addition, the study showed that of the 70 referrals for asymptomatic glaucoma, all of them were initiated by optometrists. Twenty of these had a diagnosis of glaucoma confirmed and 48 had borderline glaucoma or ocular hypertension.

A further recent study has been undertaken over a 6 month period in a hospital eye department in Leicestershire (Brittain et al, 1988). The prospective study was based on the completion of questionnaires by

ophthalmologists at the hospital, whenever a case of suspected glaucoma was seen. In addition, details were also recorded for glaucoma cases which had been referred with a wrong diagnosis. The survey revealed that over 72% of all referrals for suspected glaucoma were initiated by optometrists, whilst only 23% came from GPs. Again, perhaps of more importance is the accuracy of referrals and the following table shows again that optometrists fare better than other agents in this respect:

Table 4 : Accuracy of referral by referral agent

<u>Referring agent</u>	<u>Glaucoma confirmed</u>	<u>Glaucoma suspect^(b)</u>	<u>No evidence of glaucoma</u>	<u>Missed glaucoma</u>	<u>Total</u>
GP	4 (13%)	2 (7%)	23 (74%)	2 (7%)	31 (100%)
Optician	41 (43%)	20 (21%)	32 (34%)	2 (2%)	95 (100%)
Others ^(a)	-	1 (20%)	3 (60%)	1 (20%)	5 (100%)
<u>Total</u>	45 (34%)	23 (18%)	58 (44%)	5 (4%)	131 (100%)

Source: Brittain et al, 1988

- (a) Ophthalmic medical practitioners, accident and emergency.
- (b) Classified as requiring further follow up and counted as a "justifiable" referral.

Optometrists therefore made justifiable referrals in more than two-thirds of cases, whereas GPs were accurate in only one-fifth of cases. Of all true positives detected, optometrists were responsible for the detection of 90% of the cases. Moreover, optometrists missed less cases of glaucoma than GPs. When reasons for referral were examined, the authors found that it was once more the case that GPs tended to refer symptomatic patients whereas optometrists could detect asymptomatic cases.

In summary then, the available evidence clearly indicates three

important factors:-

- (i) that optometrists identify and refer for treatment the majority of suspected glaucoma patients.
- (ii) that they are far more accurate than other agents, referring proportionately less false positives and more true positives than other agents; and
- (iii) that optometrists are more skilled and well-equipped at the detection of asymptomatic cases of glaucoma, implying that they detect much higher numbers of patients with early disease which is subsequently more amenable to treatment.

The results of the studies outlined above, suggest that of all cases of true glaucoma detected and referred, optometrists are responsible for between 50-100% of the referrals. In addition, the results also imply that the majority of asymptomatic cases are detected solely through the screening procedures undertaken by optometrists. If the eye examination and screening role of the sight test was split from the refractive role, it is reasonable to assume that most asymptomatic patients would not seek to pay an additional sum to undergo such a test.

The estimates of "demand incidence" calculated earlier, suggest that between 7,000 and 10,400 new cases of confirmed glaucoma are detected every year at present. This excludes those who currently are treated privately, and may therefore be an underestimate of cases diagnosed. If it is then assumed that approximately 65% of such cases are asymptomatic (this was the proportion

of confirmed cases found to be asymptomatic at time of referral in Harrison et al, 1988), then potentially between 4,550 and 6,760 cases might be missed if eye examinations were not carried out routinely. Even allowing for 10-20% of asymptomatic patients requesting and paying for the examination, still leaves a minimum of 3,600 and a maximum of 6,000 cases undetected per year. In addition, many symptomatic cases may also be missed.

It is difficult to say exactly what would happen to such cases, but they would without doubt progress until a stage where treatment becomes less effective and thus there would be a significant reduction in quality of life for such people. Failure to detect these cases at an early stage will not affect the life expectancy of the individuals, but is likely to either increase the years spent with a visual impairment or blindness, or indeed lead to blindness which might have been completely preventable if detected early. In total, it has been estimated that 12% of the registered blind in England and Wales have glaucoma (Crick, 1980) which implies that in 1986, glaucoma was responsible for 14,500 cases of blindness (estimated from blind registrations, DHSS, 1988a). An analysis of blind registration certificates undertaken some years ago, suggested that almost one-third of those with blindness due to glaucoma were certified as blind because of late presentation (Perkins, 1978).

It is difficult to predict the outcome of late treatment, but an attempt is made here to provide a "ball-park" figure for quality-adjusted life years saved by early detection by identifying the asymptomatic cases which are assumed to otherwise be missed until a late stage in the disease⁽¹⁾. If it is

Footnote

- (1) For a discussion and explanation of the development and use of quality adjusted life years and the valuation of health states, see Williams, 1985; Torrance, 1986; Kind et al, 1982; Kind, 1988.

assumed that the average age at onset of COAG is 60 years (see Harrison et al, 1988; Clearkin and Harcourt, 1983) and that the average life expectancy of males and females at age 60 is 19 years⁽¹⁾, then potentially each glaucoma patient will live another 19 years either with normal sight, visual handicap or blindness. Two sets of assumptions are now necessary in order to calculate the effects on quality adjusted life span:

- (i) the proportion of the remaining life span spent in each state.
- (ii) the valuation of each visual state in relation to good vision.

Blindness or any visual handicap impinges on many aspects of quality of life, including physical mobility and psychosocial factors. However, the clinical literature does not address such issues very frequently. Ferguson et al (1988) have summarised the little evidence available from the clinical literature, but there is a paucity of information available regarding the broader measurement of health status. The literature instead focuses almost exclusively on measures of visual impairment, assessing visual acuity and visual field only. However, Drummond (1987) has used a model which includes the dimensions of physical functions, role function, social and economic function and health problems (Drummond et al, 1987), to calculate that a blind person would have a health state utility of between 0.35 and 0.48⁽²⁾ (this compares with a state of 1.0 for a sighted person).

Footnote

- (1) Governments Actuaries Department, OPCS.
- (2) This compares with the value of 0.5 taken by Evans and Murray (1987) in their study of blindness prevention.

Using this figure, the quality adjusted life years gained from early treatment can be calculated. There will be no gain in quantity/length of life, but life span spent in each visual state can be "valued" by using such factors to discount each year of life for each person. In other words, it is assumed that each year of life spent in the state of blindness is worth only 0.4 of a normal, healthy year of life (0.4 is the approximate average of the range suggested by Drummond, 1987). In addition, it is assumed that a year with a visual handicap is valued at 0.6 of a year of healthy life.

The following scenario is assumed:

- (a) If glaucoma is undetected, each person will spend 15% of their remaining 19 year life span with undisturbed sight (2.9 years); 35% with a visual handicap (6.7 years) and 50% with blindness (9.5 years). Valuing each year spent in each state as outlined above, gives a quality - adjusted life span of:-

$$2.9 (1) + 6.7 (0.6) + 9.5 (0.4) = \underline{10.72 \text{ years}}$$

- (b) If glaucoma is detected early (and treatment is successful at controlling the disease) each person will spend 50% of their remaining 19 year life span with undisturbed sight (9.5 years); 30% with a visual handicap (5.7 years) and 20% with blindness (3.8 years). This assumes that blindness is NOT prevented, but delayed. Of course if it could be prevented altogether, the gain in quality adjusted life years would be greater.

Valuing each year spent in each state as above, gives a quality - adjusted life span of:-

$$9.5 (1) + 5.7 (0.6) + 3.8 (0.4) = \underline{14.44 \text{ years}}$$

This implies that each person with glaucoma which is not detected early on "loses" 3.7 quality adjusted life years, which is the difference between early detection (14.44 years) and late detection (10.72 years). Applying this to the estimate made earlier of a range of 3,600-6,000 missed new asymptomatic cases, this results in a potential total loss of between 13,300 and 22,200 quality adjusted life years per annum.

It is evident that the benefits are distributed over the total 19 year life span and there are arguments for discounting such benefits as benefits gained in the future may be valued less than benefits accruing earlier (for more details, see Drummond et al, 1987). If discounting is undertaken at 6%, this produces a lower gain of 2.3 quality adjusted years per person which, overall, gives a range of 8,300 - 13,800.

Obviously more conservative estimates of treatment effect, quality of life effect or missed cases would reduce this estimate but it does imply that deregulation of the eye examination might have serious side effects for the quality of life of glaucoma sufferers.

In terms of impact on economic resources, the following factors should be considered. Firstly, the optometrist carries out the screening process with a good degree of accuracy, and although there are inevitably some referrals for suspected glaucoma which are false positives, other agents such as GPs, screen with a much lower degree of sensitivity and generate many more false positives. Indeed, when the optometrist refers cases of ocular hypertension which have not developed to primary glaucoma, it could be argued

that he or she is still performing a valuable case finding service as it has been estimated that quite a large number of those with high intraocular pressure (IOP) will go on to develop OAG within 5 years if untreated (Power et al, 1988). If other agents (GPs or unskilled personnel) are encouraged to take on the role of screening for eye disease it is likely that many more false positives will be referred to hospital departments. In 1987, the average cost of an outpatient attendance at an eye hospital in England was approximately £18.50 (DHSS, 1988a). Moreover, the average cost per new attendance was much higher at £111, implying that false positives are very expensive for the NHS.

In addition, as it is likely that many of the initially asymptomatic cases will be picked up at a later stage when the disease has progressed sufficiently to cause symptoms and subsequent referral, the costs for treatment and management of glaucoma will still be incurred; the only reduction in costs will then be due to the fact that they occur later rather than earlier (and thus if discounted into the future, they will be valued at a lower rate than costs occurring now). There might also be a possible reduction in the costs of surgical operations as if patients are older when they present, they are less likely to be good candidates for surgical treatment (Power et al, 1988).

However, the balancing factor would be the poor quality of life experienced unnecessarily by many sufferers if routine detection rates were reduced. For the elderly, this might not only reduce their quality of life, but might also reduce the ability to live independently and thus lead to institutionalisation. Indeed, a recent survey found that whereas 20% of those aged 60-74 and 40% of those aged 75 or more who were living in private households reported a "seeing" disability; the relevant figure for those

living in communal establishments was much higher, 59% and 70% for each age group respectively (OPCS, 1988). Although this does not of course, establish a causal link between sight problems and admission to institutions, it does indicate that sight difficulties are very prevalent amongst those who do not live independently. Loss of sight and consequent loss of mobility is likely to be one of the major contributing factors to loss of independence amongst the elderly.

In summary, the eye examination currently undertaken by optometrists as part of the sight test plays a very important role in the detection of glaucoma, especially asymptomatic glaucoma. If this role was either lost or taken into the remit of other agents, (for example, GPs, as suggested by Hitchings, 1989) the above estimates indicate that many cases of glaucoma might remain undetected until a late stage of the disease with a large subsequent loss of quality of life. In addition, other agents are likely to generate far higher rates of false positive referrals to the hospital sector, placing strain on departmental waiting lists and incurring additional costs to the NHS.

Diabetic Retinopathy

The major role of optometrists in this sector is in the post-diagnosis monitoring of diabetics in order to detect changes in the retina which might indicate the need for treatment (Bartlett, 1986). Although screening is routine at diabetic clinics, not all diabetics are registered at clinics (Yudkin, 1980) and optometrists undertake much of the monitoring on both a formal and informal basis, seeing patients referred by both diabetic clinics and by GPs. This is a vital role as the optometrist can look for indications of early retinopathy which require treatment.

There are an estimated 600,000 diabetics in the UK (Burns-Cox and Hart, 1985) and many of them will go on to develop exudative maculopathy, causing visual loss, or proliferative retinopathy which can lead to complete blindness. Diabetic retinopathy is the most common cause of blindness in the young and middle aged in the UK, and in 1985/86, of a total of 914 certificates of new registrations⁽¹⁾ of blindness amongst the 16-64 year age group, over 15% were due to diabetic retinopathy and over 12% of partial sight certificates were issued as a result of this cause (DHSS 1988c). However, retinal photocoagulation provides an effective treatment which can delay deterioration of vision and also prevent blindness if treatment is started early enough.

Foulds et al (1983) estimated that the incidence of diagnosed diabetes in the general population is 1%. Applying this to 1988 population estimates

Footnote

- (1) Note that certificates of new registrations does not equate to new registrations (as some forms are not returned) nor to new cases (as some people do not register).

reveals that there are approximately 503,900 diagnosed diabetics in England and Wales. Fould's study also produced estimates for the prevalence of retinopathy and serious retinopathy in the diabetic population. The prevalence of retinopathy (background retinopathy) was estimated at between 26-36% and for serious retinopathy (defined as exudative maculopathy, proliferative retinopathy or a pre-proliferative stage), the estimated range was 9.5%-11%.

As stated earlier, optometrists do not play as large a role in referring previously undetected cases of retinopathy as they do for glaucoma, but nevertheless this role is worth some consideration. For example, in the study undertaken by Harrison et al (1988), 36 people with diabetic retinopathy were referred over the 14 month period. Over half of these were referred from diabetic clinics, but 22% (8) of cases were in fact referred from optometrists. Moreover, 3 cases were asymptomatic and 2 of these had not had a diagnosis of diabetes until these visual signs had been discovered by optometrists.

Once more, the accuracy of referrals by optometrists tends to be very high. For example, an American study found that optometrists correctly diagnosed over 75% of eyes in a trial involving 14 diabetic patients (Kleinstein et al, 1987) and that in 57% of cases, the practitioner was also able to categorise correctly the severity and stage of retinopathy. In addition it was found that 77% of the eyes judged from fundus photography to be in need of treatment, were correctly referred by optometrists, and in only 2% of cases had the optometrist generated a false positive referral (where no retinopathy was present).

Similarly, Burns-Cox and Hart (1985), found that optometrists were very

accurate in diagnosing retinopathy in a large group of diabetics. The implied sensitivity of the optometrists screening procedure was 79% and the specificity, 96% (based on 197 cases re-checked at a hospital eye department) which is again very accurate. Indeed, the authors suggest that optometrists might fruitfully enter into local agreement with diabetologists and GPs for examining retinas for changes, and this is in fact what happens already in some areas.

However, as discussion regarding the appropriate agent for screening for retinopathy continues, the role of the optometrist has been challenged (eg, Bhopal and Hedley, 1985; Williams R., 1985; Williams R., et al, 1986). In particular, it has been suggested that very few cases of diabetic retinopathy are currently picked up by optometrists (Smith, 1988) and that their referrals are often for retinal lesions which are "of no clinical importance" (Scott and Flanagan, 1988). Although the referral study undertaken by Harrison et al (1988) would seem to contradict such assertions, it is evidently the case that optometrists do play a rather small role in case finding for diabetic retinopathy at present when compared, for instance, with glaucoma screening. Their main concern is with monitoring cases and detecting changes which require the need for treatment and Burns-Cox's study in one health district confirms that optometrists do have important skills in the assessment of retinal changes.

The implication of this is that the routine monitoring of diabetics by optometrists might well be advantageous both in terms of improved quality of life for those sufferers who are detected earlier than if screening was undertaken by a GP or clinic and also in terms of economic resources. Given the accuracy of the optometrists assessment skills, the rate of false referrals and thus unnecessary hospital appointments would be minimal.

Conclusion

In this paper, the potential impact of further deregulation of the sight test has been considered in the context of just two eye conditions, glaucoma and diabetic retinopathy. The results have shown that a two-tier test which splits the refractive sight test from the eye examination is likely to have a serious impact on the rate of detection of glaucoma, and thus on the quality of life of those with such conditions. Additionally, there is likely to be a substantial economic impact on hospital resources arising from higher rates of false positive referrals.

Whilst it is true that a proportion of people would still request and obtain eye examinations under a two-tier system, this is not likely to be so for the majority of asymptomatic cases and such people are likely to remain unaware of their condition until the disease has progressed to a later stage making treatment less effective and severe visual handicap or blindness more probable. In addition, the optometrists ability to monitor eye conditions such as diabetic retinopathy in order to detect crucial changes which would necessitate treatment, would also be diminished with potentially deleterious effects on the quality of life of diabetics.

It is also important to note that although this paper has considered only glaucoma and diabetic retinopathy, these are not the only eye conditions their examinations involve. The detection of malignancies (Lyons and Hungerford, 1990) and cataracts, injuries and damage is of additional benefit to the consumer undergoing a sight test and eye examination undertaken by an optometrist.

References

- Association of Optometrists (a). Primary Health Care. The Role of Optometry. London.
- Association of Optometrists (b). The Government's Competition Policies and Optometry. London.
- Bankes, J.L.K., Perkins, E.S., Tsolakis, S. and Wright, J.E. (1968). Bedford Glaucoma Survey. British Medical Journal, (1), 791-6.
- Bartlett, J.D. (1986) Optometry's role in retinal disease. Journal of the American Optometric Association, (57), 92.
- Bengtsson, B. (1981). The prevalence of glaucoma British Journal of Ophthalmology, (65), 46-9.
- Bhopal, R.J. and Hedley, A. (1985). Screening of diabetics for retinopathy by ophthalmic opticians. British Medical Journal, (290), 1589.
- Borrie, G. (1982) Opticians and Competition. HMSO, London.
- Brittain, G.P.H., Austin, D.J. and Kelly, S.P. (1988). A prospective survey to determine sources and diagnostic accuracy of glaucoma referrals. Health Trends, (2), 43-4.
- Burns-Cox, C.J. and Hart, J.C.D. (1985). Screening of diabetics for retinopathy by ophthalmic opticians. British Medical Journal, (290), 1052-4.
- Central Statistical Office (1989). Monthly Digest of Statistics. No 524, August 1989. HMSO, London.
- Clearkin, L. and Harcourt, B. (1983). Referral pattern of true and suspected glaucoma to an adult ophthalmic outpatient clinic. Transactions of the Ophthalmological Society UK, (103), 284-7.
- Crick, R.P. (1980). Computerised clinical data base for glaucoma - ten years' experience. Research in Clinical Forums, (2), 29-39.
- Crick, R.P., Creaby, E. and Freeman, S. (1982). Who detects primary glaucoma in the UK? The Dispensing Optician, (34), 192-4.
- Department of Health and Social Security (1988a). Health and Personal Social Services Statistics 1988. HMSO, London.
- Department of Health and Social Security (1988b). Health Service Costing Returns, year ending 1987. HMSO, London.
- Department of Health and Social Security (1988c). Causes of blindness and partial sight among adults aged 16 to 64 newly registered as blind and partially sighted in 1985/86. Statistical Bulletin 3/8/88. HMSO, London.

- Department of Health (1989) Health Circular (89) 22: Health Services Management. HMSO, London.
- Drummond, M.F. (1987). Economic aspects of cataract. Report to National Eye Institute, Bethesda, M.D.
- Drummond, M.F., Stoddart, G.L. and Torrance, G.W. (1987). Methods for the Economic Evaluation of Health Care Programmes. OUP, Oxford.
- Evans, T.G. and Murray, C.J.L. (1987). A critical re-examination of the economics of blindness prevention under the onchocerciasis control programme. Social Science and Medicine, (24), 241-9.
- Ferguson, B.A., Buxton, M.J. and Drummond, M.F. (1988) Measuring and Valuing Health States relating to visual impairment: a review of the literature, concepts and methods. Health Economics Research Group Report No 3, Brunel University, Middlesex.
- Foulds, W.S., McCuish, A., Barrie, T., Green, F., Scobie, I., Ghafour, I., McClure, E. and Barber, J.H. (1983). Diabetic retinopathy in the West of Scotland : its detection and prevalence, and the cost-effectiveness of a proposed screening programme. Health Bulletin (Edinb), (41), 318-26.
- Gibson, J.M., Rosenthal, A.R. and Lavery, J. (1985). A study of the prevalence of eye disease in the elderly in an English community. Transactions Ophthalmological Society UK, (104), 196-03.
- Graham, P.A. (1978). Prevalence of glaucoma : population surveys. Transactions of the Ophthalmological Society, UK, (98), 288-9.
- HMSO (1987). Promoting Better Health. Cmd 249, London.
- Harrison, R.J., Wild, J.M. and Hopley, A.J. (1988). Referral patterns to an ophthalmic outpatient clinic by general practitioners and ophthalmic opticians and the role of these professions in screening for ocular disease. British Medical Journal, (297), 1162-7.
- Hitchings, R.A. (1989) Visual disability and the elderly. British Medical Journal, (298), 1126-7.
- Hollows, F.C. and Graham, P.A. (1966). Introcular pressures, glaucoma and glaucoma suspects in a defined population. British Journal of Ophthalmology, 570-86.
- House of Commons, 14th June 1989, columns 1457-8.
- Kind, P., Rosser, R.M. and Williams, A. (1982). Valuation of Quality of Life : some psychometric evidence in : The Value of Life and Safety, Jones-Lee, M.W. (ed), North-Holland, Geneva.
- Kind, P., (1988). The Design and Construction of Quality of Life Measures, Centre for Health Economics, Discussion Paper 43, University of York.

- Kleinstein, R.N., Roseman, J.M., Herman, W.H., Holcombe, J. and Louv, W.C. (1987). Detection of diabetic retinopathy by optometrists. Journal of the American Optometric Association, (58), 879-82.
- Lyons, C.J. and Hungerford, J. (1990) Detection of ocular malignancies. Journal of the Royal Society of Medicine, (83), 165-7.
- MacKean, J.M. and Elkington, A.R. (1982). Referral routes to hospital of patients with chronic open-angle glaucoma. British Medical Journal, (285), 1093-5.
- McMurdo, M.E.T. and Baines, P.S. (1988). The detection of visual disability in the elderly. Health Bulletin (Edinb), (46), 327-9.
- Office of Population Census and Surveys (1988). The prevalence of disability among adults. OPCS surveys of disability in Great Britain. Report 1, HMSO, London.
- Perkins, E.S. (1978). Blindness from glaucoma and the economics of prevention. Transactions of the Ophthalmological Society, UK, (98), 293-5.
- Podger, M.J., Leske, M.C. and Ederer, F. (1983). Incidence estimates for lens changes, macular changes, open angle glaucoma and diabetic retinopathy. American Journal of Epidemiology, (118), 206-12.
- Power, E.J., Wagner, J.L. and Duffy, B.M. (1988). Screening for open-angle glaucoma in the elderly. Office of Technology Assessment, Washington DC.
- Scott, J.D. and Flanagan, D. (1988). Charging patients for eye tests. British Medical Journal, (296), 290-1.
- Shaw, D.E., Gibson, J.M. and Rosenthal, A.R. (1986). A year in a general ophthalmic outpatient department in England. Archives of Ophthalmology, (104), 1843-6.
- Smith, R.J.H. (1988). Charging patients for eye tests. British Medical Journal, (296), 290.
- Steinmann, W.C. (1982). The "who" and "how" of detecting glaucoma. British Medical Journal, (285), 1091-3.
- Torrance, G.W. (1986). Measurement of health status utilities for economic appraisal: a review. Journal of Health Economics, (5), 1-30.
- Tuck, M. and Crick, R. (1989). Testing and referral for chronic glaucoma. Health Trends, (21); 131-4.
- Williams, A. (1985). Economics of coronary artery bypass grafting. British Medical Journal, (291), 326-9.
- Williams, R. (1985). Screening for diabetic retinopathy. British Medical Journal, (290), 1349-50.

- Williams, R., Nussey, S., Humphrey, R. and Thompson, G. (1986). Assessment of non-mydratic fundus photography in detection of diabetic retinopathy. British Medical Journal, (293), 1140-2.
- Wood, C.M. and Bosanquet, R.C. (1987). Limitations of direct ophthalmoscopy in screening for glaucoma. British Medical Journal, (294) 1587-8.
- World Health Organisation (1984). Strategies for the Prevention of Blindness in National Programmes. A primary health care approach. WHO, Geneva.
- Yudkin, J.S. (1988). Charging patients for eye tests. British Medical Journal, (296), 64.