



The Cost of Managing Glaucoma Increases with Worsening of Disease Stage

a report by

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DOI: 10.17925/EOR.2007.00.00.18

Glaucoma is a leading cause of blindness worldwide and is the second most frequent cause of non-accidental blindness in industrialised countries.^{1–8,13,14} In glaucoma, the optic nerve is progressively damaged, causing defects in the visual field, usually asymptomatic until the central vision is affected.¹⁰ Primary open angle glaucoma (POAG), the most common form of glaucoma observed in developed western countries,⁹ is associated with intraocular pressure (IOP) increased to a level likely to interfere with the health of the optic nerve. In normal-pressure glaucoma (NPG), there is no increase of IOP. Ocular hypertension (OH) defines a group of patients in whom the optic nerve and visual field are still normal, but IOP is elevated to potentially dangerous levels. The visual field examination is the standard practice to assess vision in glaucoma for detection, follow-up and staging. With this type of testing, the eye’s ability to detect small points of light of varying brightness centrally and peripherally is measured. With the automatic static threshold technique, values from age-matched normal individuals are compared with those of the patient being examined.¹⁰ The goal of glaucoma management is to preserve the patient’s quality of life.^{10,11} The only treatment option that has been proved to prevent the loss of vision is lowering the IOP to a level deemed safe for the eye.¹² The recommended steps for lowering IOP in POAG are topical medications first, followed by laser trabeculoplasty and, lastly, incisional surgery.¹⁰ The global prevalence of glaucoma was estimated at 67 million people in 2001. A projection of these data to European countries estimates 9.25 million glaucoma patients in Europe, of whom 4.6–6.9 million were undiagnosed and untreated.¹⁵

In 2000, the prevalence of glaucoma in the UK was estimated to be as high as 3.3% in people over 40 years of age, and up to 5% in those aged 80 years and over.¹⁶ In Italy, approximately 50,000 people are visually handicapped by glaucoma, while an estimated 540,000 people over 40 suffer from glaucoma, half of whom are undiagnosed.¹⁷ In Germany, glaucoma was reported as the third leading cause of blindness (1.6/100,000), and an estimated one-fifth of all cases of legal blindness in persons aged 75 and older were due to glaucoma (22.8/100,000).¹⁸ Approximately 500,000 patients in France are followed and treated for POAG, with a similar number of cases undiagnosed.^{19,20} Glaucoma costs the US healthcare system an estimated US\$2.5 billion annually: US\$1.9 billion in direct costs and US\$0.6 billion in indirect costs.²⁰ The annual direct medical cost of treating newly diagnosed open-angle glaucoma was estimated at

US\$1,055 per patient.²¹ Standard treatment costs were put at FFr2,289 per patient (France) and £380 (UK).²²

Several international retrospective chart reviews have considered the economic burden of the management of glaucoma, particularly in the first two years after diagnosis.^{20,21} However, limited data exist on resource consumption as a function of disease severity and, in particular, of treating advanced-stage disease. A study in Canada showed an increase in direct costs with more severe damage.²³ We have published data on resource utilisation and direct medical costs associated with the long-term management of glaucoma of different severities in five European countries (Austria, France, Germany, Italy and the UK), and showed that resource consumption and direct costs increase as disease severity worsens.²⁴ In our study, data collected included patient demographics, glaucoma risk factors, number of ophthalmologist visits, number and type of glaucoma medications and surgeries and visual field results. All clinical tests documented in the charts were recorded. Essential examinations, such as IOP assessments, optic nerve assessments, retinal or macular examinations, slit-lamp examinations and gonioscopies, as well as more specialised tests, such as diurnal curves of IOP measurements, retinal nerve fibre thickness assessments and optic disc photographs, were considered. The results can be summarised simply in one graph (see *Figure 1*). In examining medical resource consumption associated with a chronic, potentially blinding disease such as glaucoma, one may postulate that as disease severity worsens, greater medical effort will be prompted by the desire of physicians to slow disease progression, as well as by increased patient concern. In particular, as glaucoma is often asymptomatic in the early phases, resulting in delayed diagnosis, a consequently increased medical vigilance after diagnosis is likely as the disease progresses.

Patients with end-stage disease – stage 5 in *Figure 1* – typically have failed to adequately respond to conventional ocular hypotensive medications and may have already undertaken numerous surgical procedures with sub-optimal results. Direct ophthalmology resource utilisation – including physician visits, glaucoma surgeries and medications – was lower for patients with stage 5 compared with stage 4 disease in all countries except the UK. This may be explained by the fact that ophthalmologists have less to offer to such severely visually impaired patients in terms of therapy to preserve vision compared with patients with less severe disease. Moreover, low vision care, vision rehabilitation services and non-physician resources to which patients with end-stage disease may be referred for further management were not calculated as direct medical costs.

Data from our study²⁴ highlight the important role that the cost of glaucoma medications plays in driving the total direct healthcare cost of glaucoma care. When full compliance with medication is assumed, medication costs represent a minimum of 42% of total direct cost at any



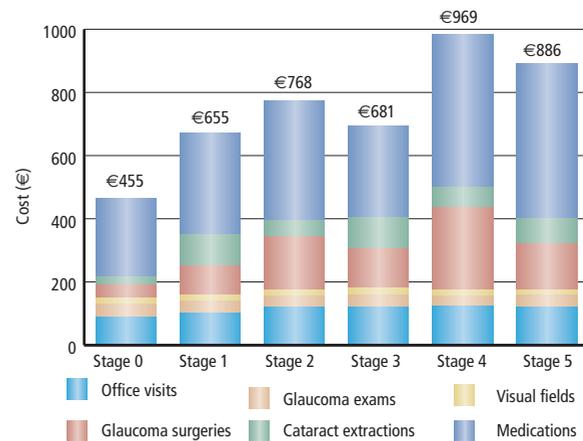
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disease stage. Since topical ocular hypotensive medications are as effective as early surgery in delaying the rate of progression,²⁵ the majority of physicians are likely to offer medication therapy before advising surgery. In general, preventing patients from progressing from early to severe stages will result in a projected decrease of between 30 and 50% of the costs,^{21–23,26,27} but there are methodological limitations. Glaucoma progression may be measured by ophthalmologists using visual field examination, optic nerve head clinical assessment or both.¹¹ Visual field examination is the standard of care to evaluate disease progression, and for clinicians it represents the need to adjust the management of the patient.^{10,26,28,29} There are limitations in interpreting data retrospectively collated from the previous five to seven years, i.e. the number of years for which a patient may have been in his or her baseline stage before the study entry could not be controlled, and patients with at least five years of follow-up data may differ from patients who do not seek persistent care for glaucoma for the same time period, thus creating a potential selection bias. Moreover, data on patients in end-stage disease who may have been referred to low vision care and vision rehabilitation centres were not collected, and the total medical and societal costs associated with end-stage disease were not fully estimated. Examining costs from a societal – as opposed to a financial – perspective may have an impact on treatment cost of end-stage glaucoma in particular: as costs for low vision care and vision rehabilitation centres are likely to be borne by the patient or society, such resources are inherently excluded from medical costing methods.

Medication costs are distributed over periods ranging from several months to several years, while surgical costs are incurred at a single point in time, and are represented in the analysis as costs divided over the period for which patients remain categorised within a given stage. For example, the relatively high unit cost of incisional surgery will be divided by the number of years of follow-up and may therefore be reported as a lower yearly cost. This costing approach still represents the best approximation of actual surgical costs given sample size and timelines. The ability of surgery to control IOP for years in the majority of patients is well documented.^{30–32} As reasonably expected, there is a significant linear trend in resource consumption and total direct

Figure 1: Direct Cost of Glaucoma Treatment in Europe per Person by Stage



Source: Traverso et al.²⁴

cost, with both increasing with worsening of disease severity. Glaucoma management strategies aimed at slowing or stopping disease progression, if effective, would be expected to significantly reduce the health-economic burden of this chronic disease over many years. Resources for healthcare are limited and competing interests exist in driving the distribution of public funds. General practitioners and health administrators have a set of European data demonstrating that managing glaucoma effectively – preventing progression beyond the early to moderate stages of the disease – will result in a decrease in direct costs. This should be used to offset the constraints on resource delivery to manage patients with an unquestionable diagnosis of progressive glaucoma. ■

Acknowledgement

This article is derived from the work: Traverso CE, Walt JG, Kelly SP, et al., Direct Costs of Glaucoma and Severity of the Disease: A Multinational Long-term Study of Resource Utilisation in Europe, *Br J Ophthalmol*, 2005;89(10):1245–9.

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