Main topic:
The Burden of Disease in Glaucoma

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Special Focus:
The burden of disease in glaucoma

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Core Concepts

• As the population grows and life expectancy increases, so do the numbers of glaucoma patients and thus the glaucoma burden increases.
• Expenditures related to glaucoma care increase with the severity of the disease.
• From population-based studies, 50–80% of glaucoma patients are not aware of their disease.

The “glaucomas” encompass several entities that have in common a greater loss of retinal ganglion cells than their age-related physiological loss. After cataract, the glaucomas remain the second cause of blindness worldwide; they are the leading cause of irreversible and preventable blindness.1 We review the expenditures for glaucoma management, the role of caregivers and consider how glaucoma may affect patients’ quality of life.

Glaucoma expenditures

Glaucoma belongs to age-related eye diseases such as ARMD and cataract. With human longevity increasing, glaucoma prevalence will increase dramatically through the next two decades (Image 1). For instance, the number of Americans older than 65 is projected to increase by 50% by 2020.2 Quigley has shown an exponential prevalence of glaucoma with age for all ethnicities.5 Therefore, managing and treating glaucoma patients will increase society’s expenditures. Since healthcare expenditures for all countries are not infinitely expandable and since most governments face economic crisis, each medical specialty must thoroughly examine diseases and the resulting societal burden.6

Evaluation of the burden of a given disease is complex: see the detailed review by Lee and Matchar on techniques used by health economists.6 We can consider cost-of-illness analyses that comprise the costs of treatment interventions (including provider care for in- and outpatient care, medications, devices and aids and costs related to the side effects of treatments) and disease-related non medical and indirect costs (such as loss of worker productivity, caregiver productivity and loss of government tax revenue from the patient and the caregivers). Another approach is assessment of the value of treatments that demonstrate that an intervention is cost-effective and cost-saving, for instance. The cost-effectiveness analysis is probably the best known among non specialists, but others are also used. Finally, the point of view of the different actors involved in healthcare should be specified because the benefits are different for patients, providers, payers and society.5

Overall, the direct annual medical costs for glaucoma have been estimated at $2.9 billion in the United States.7 If we consider only medical treatment, medications account for 30–50% of the cost, but this will probably change with the introduction of generics. During 2000–2006, medication costs increased from $445 to $557 per year with an increased cost for prostaglandins and a decreased cost for beta-blockers.8 However, the non-medical part of the cost of glaucoma visual impairment is much higher: in a European study, patients with advanced glaucoma had an average total healthcare cost of € 830 versus € 2703 euros for home help, with wide variations between countries.9

The costs depend on glaucoma severity

The more severe the disease, the costlier is its treatment, as shown by Traverso et al. across several European countries with medical costs ranging from € 455 for earlier stages to € 969 for more advanced disease.10 In the Unites States this ranged from $623 for suspected glaucoma to $2511 for advanced cases, as confirmed in a large cohort of 181,922 Medicare beneficiarries with glaucoma.11 Therefore, funding should be directed to the earlier detection of glaucoma on one hand and the control of these cases over time on the other hand.

Most of the resources are used by a minority of patients

Stein and colleagues evaluated the medical cost of 19,927 new open-angle glaucoma patients and followed them from 2001 to 2009.12
The costliest 5% of these patients consumed 24% of the resources. In contrast, the less costly 50% of patients accounted for only 18.9% of the resources. Glaucoma-related charges were greater during the first 6 months ($955) and then decreased to about $500 every 6 months. This accords with routine clinical practice because the efficacy and safety of treatment must be checked after initiation. In this study, resources were distributed as follows: 32% for visits to eye care providers, 31% for glaucoma medications, 16% for glaucoma diagnostic tests, and 20% for laser and surgical procedures.

**The amount of the burden differs depending on the country**

As expected, there are large differences between countries concerning annual costs for glaucoma patients. This is mainly from differences in drug prices, and between currencies, whether generics are available and the costs of eye care providers (ophthalmologists or optometrists) and of diagnostic tests. Adjusted costs are on average half in Europe of what they are in the United States.

While this literature mainly comes from developed communities, the burden of glaucoma is more difficult in developing countries. Another point is country size and prevalence of different types of glaucoma, especially for India and China.

**Non adherence always needs to be considered**

Adherence is non optimal in glaucoma patients being treated for a “symptom-free” disease and who are more worried by diagnostic tests, visits to professionals and the side effects of treatments than by the disease itself. Therefore, a low estimate of non adherence may reach 25%. Economically this means that 25% of the medical resources dedicated to glaucoma are wasted annually, which is unacceptable for payers.

**Can we decrease glaucoma expenditures?**

The best way to reduce glaucoma expenditures would be early detection and effective treatment of glaucoma to avoid evolution to advanced damage with severe visual impairment. However, early glaucoma detection is difficult in practice. Glaucoma causes 11% of the blindness in the US, even though treatment is very cost-effective. When no treatment in glaucoma is compared with glaucoma treatment, extra costs are around €30,000 annually. This is within the range of the quality-adjusted life years (QALY) usually considered for other diseases (€20,000 to €80,000). These findings accord with those from Rein et al., who estimated QALYs to range from $11,000 to $20,000 for glaucoma treatment versus no treatment, respectively. Today these costs can be reduced given that switching drugs is costly, mainly because of ophthalmologist visits. A first-line therapy that balances efficacy and safety and achieves a low target intraocular pressure decreases costs. The lower price of generics may also decrease glaucoma medical treatment expenditures.

**Caregivers’ burden**

Caregivers significantly assist patients whatever the disease stage, but particularly for individuals with visual impairment. They escort them for doctor’s visits and help in daily activities, which impacts their working time (productivity loss) and leisure time. While most caregivers are family members, neighbors and friends are often involved, particularly in rural areas with insufficient public transport. A few papers have addressed the real costs of caregivers. In a sample of glaucoma patients attending six ophthalmology units across London, about 50% arrived with a companion. The social cost was higher than the direct medical cost and travel expenses accounted for 20% of total patient cost. An Australian study investigated the role of caregivers in 114 adults with visual acuity worse than 20/40. Patients were asked to diarize prospectively the quantitative and qualitative help they received from caregivers over a year. The need for a caregiver was not linearly related...
to visual deterioration. A threshold was found corresponding to loss of driver’s license. Mean yearly caregiver time dedicated to helping patients was 152.2 h (median, 81.3 h) with a wide range 0 to 851 h. The median time accounted for 4.6% of a 35-h work week but could reach 50% for some individuals. The median estimated cost was $710 per year, again with a wide range from 0 to $7491. Patients were helped by several caregivers, mainly for transport (78.9%), but also for banking and personal correspondence; healthcare and personal care time was small.

Quality of life in glaucoma-related visual impairment

Quality of life (QOL) covers several aspects of living for patients diagnosed with glaucoma or ocular hypertension (OHT).

We will discuss QOL only in terms of glaucoma-related visual impairment. QOL may be influenced by the side effects of treatments (medical and/or surgical), problems reaching the ophthalmologist’s office, the anxiety related to taking a visual field test and for some patients the anxiety of losing sight. In the Collaborative Initial Glaucoma Treatment Study, half the patients at inclusion were afraid of glaucoma related blindness. Depression is associated with the severity of glaucoma and older age.

The older beliefs

Visual field defects were thought to interfere with daily-life activities only at an advanced stage of glaucoma: we use monocular visual fields clinically, but the brain utilizes both fields, and a binocular field gives less alarming results than monocular fields. However, visual impairment seems to have a much more frequent and earlier impact on QOL than previously thought. Another older and erroneous belief, which is still often taught in textbooks, is the black tunnel perception of the visual fields by glaucoma patients. Crabb et al. have recently reported that none of 50 glaucoma patients mentioned this with an average mean defect (MD) of −8.7 dB and −10.5 dB in the right eye and left eye, respectively. About 25% were unaware of their defect, but others depicted blurred or missing patches: 54% and 16%, respectively.

Motor vehicle accidents

Glaucoma patients are at higher risk of having motor vehicle accidents and to be the driver at fault; this has been confirmed both by insurance companies and the police. Visual field impairment also makes it difficult to obtain or to maintain a driver’s license and this is often the threshold requiring a caregiver.

Falls

Falls are very common among the elderly and may lead to severe injuries such as hip fracture that could shorten life. They are more common in glaucoma patients. While the etiology of these falls is multi-factorial, visual disability is recognized as a major cause for falls in older persons.

More subtle impairments

Daily-life activities are a challenge for glaucoma patients. Glaucoma patients may have difficulties with the following activities: grasping objects, recognizing faces, reading and eye movements and postural control.

Conclusion

Glaucoma has long been regarded as an IOP-related disease. Progressively, with the help of researchers in various disciplines, glaucoma has become a “human” disease impacting the daily-life activities of many individuals, those suffering from glaucoma and those who help them in their daily tasks, at a substantial cost to society. With the advent of more refined tools, it is now possible to decipher the sometimes subtle impact of glaucoma on routine tasks more carefully. Another field of interest, which has not yet been fully investigated, is the involvement of caregivers (family, neighbors) assisting glaucoma sufferers. Since we cannot afford to do everything for everybody and the amount of resource spending is not always associated with increased QOL, it is perhaps time to consider new paradigms in the management of glaucoma. Medications are becoming less expensive with generics, and some authors propose that care be delivered by professionals with less training than doctors (therefore lowering care-provider costs) for some diagnostic tests and prescriptions. However, many professionals and patients may regard this as hazardous. This approach is summarized as follows: the right services to the right patients at the right time in the right place.

All these attempts will help policymakers to allocate adequate resources for glaucoma management, glaucoma patients, and to those who are directly or indirectly impacted in helping our patients.

References

Despite increasing numbers of new diagnostic and therapeutic interventions for glaucoma and spending more resources on glaucoma care than ever before, even developed countries have been unable to prevent glaucoma-induced visual disability. Patients still go blind under our care. Health care systems around the world suffer from several major shortcomings, including unequal access to care, wide variations in service distribution, and more than half glaucoma patients remain unaware of their disease.

What could we do to make the existing systems work ‘better’? Could even more spending address these shortcomings? Does ‘better’ mean ‘more’ of what we are currently doing? Would patient-related outcomes improve, if we initiated systematic screening to find the undiagnosed patients?

How reliably can we measure intraocular pressure (IOP)?

IOP is the only modifiable risk factor in ocular hypertension (OHT) and glaucoma. Although tonometry is regarded as a ‘simple’ test, alone it is inadequate for both glaucoma diagnosis and screening as it misses half the patients with manifest disease and may incorrectly identify OHT suspects as having disease. Yet it is the parameter on which management decisions and plans are based.

Variability in IOP is important when diagnosing and monitoring response to treatment and was evaluated in a rigorous systematic review. One hundred and two studies were identified comparing eight tonometers with Goldmann applanation tonometry. Although central corneal thickness is known to influence IOP measurement, the systematic review did not identify its impact, assumed to result from the poor reporting of the studies.

Sizeable inter- and intra-observer variability was reported for all tonometers, including Goldmann applanation tonometry. From the evidence Goldmann applanation tonometry may not be the most appropriate reference standard.

Using their dataset, Moorfields Eye Hospital estimated the tonometric signal-to-noise relationship with repeated IOP measures in OHT patients. For most patients any true change in IOP (the ‘signal’) was smaller than the estimated ‘noise’ (the variability in the measurement). IOP levels remained fairly constant and true changes in IOP within 2 years were unlikely. The ‘noise’ was lower in those with higher baseline IOP (≥26mmHg). Using this data, economic modeling suggested biennial IOP monitoring for untreated or stable treated ocular hypertension.

Added to these uncertainties in ‘simple’ IOP measurements, evidence concerning cost-effectiveness of screening and diagnostic and follow-up tests (including their optimal frequency) in ocular hypertension and glaucoma is missing (Image 2); there is a lack of randomized controlled trials. Published simulation models are based on characteristics of participants in small and tightly randomized controlled trials which may not include important predictors in the population in general and in every-day practice.
Should we monitor and/or treat this risk factor to ‘prevent’ glaucoma?

As only a minority of OHT patients will develop glaucoma and a minority of them suffer visual disability, how often should such patients be monitored? Should we try to detect and treat only those most at risk or should we treat all OHT patients?

IOP reduction has prevented glaucomatous progression in randomized controlled trials. Treating manifest glaucoma appears to be cost-effective compared with ‘no treatment’. Uncertainty remains whether it is cost-effective to treat none, some or all ocular hypertensives (defined as IOP of >21mmHg without clinical signs of glaucoma).

The UK Health Technology Assessment compared five alternative surveillance and treatment pathways in OHT. The two most intensive pathways were based on the NICE guidelines (reviews from every 4-12-month to 6-24-month intervals depending on initial risk), two further pathways followed biennial follow-up schemes differing in location (surveillance in hospital or in primary care), and in the fifth ‘Treat all’ pathway, all IOPs > 21 mmHg were treated with prostaglandins. In the ‘Treat all’ pathway, IOP was measured annually by community optometrists with referral to a hospital only if IOP reduction was <15%.

This UK modeling study demonstrated no clear benefit from intensive monitoring in OHT. ‘Treat all’ was the least and ‘NICE intensive’ (check up every 4-12 months) was the most costly pathway. Compared with the ‘Treat all’ strategy, however, the pathway with 2-year reviews in an eye hospital (and treatment with >5% glaucoma risk in 5 years) reduced the incidence of conversion to glaucoma and provided more quality adjusted life years. However, this pathway cost considerably more than the limit of society’s willingness to pay in the UK. For the cost-benefit analysis, the biennial hospital pathway was the only pathway compared favorably with ‘no surveillance’.

Built also on systematic evaluation of literature, another simulation model in Holland suggested that treating all OHT patients with IOP > 21 mmHg would be cost saving compared with watchful waiting – even if 43% of the simulated untreated OHT patients never converted to glaucoma in their entire lifetime. However, the Dutch model ignored non-adherence to medications; it assumed adherence would have a small impact on outcomes while unnecessarily increasing model complexity. Quite to the contrary, the UK model was sensitive to treatment adherence. Owing to sparse evidence, based only
on expert opinion, the UK model assumed adherence of 50% in the ‘Treat all’ pathway and 75% in the other four monitoring pathways. As laser has been simulated to be cost-saving compared with glaucoma medications, it could simplify the challenges of non-adherence to medications both in modeling studies and in real life. Many costs could be redirected as prostaglandins become generic. Until now, drug costs account for up 73% of total glaucoma costs.  

How about improving current practices?

An Australian model estimated a decrease in disability adjusted life years, if every-day diagnostics could be improved by educating clinicians (without considering education-induced costs). However, because more patients would be treated and monitored, overall healthcare costs would increase. In the UK, however, the real-life impact of evidence-based NICE guidelines has been less encouraging. Post NICE guidelines, there was no improvement in accuracy to detect an abnormal IOP and there was a reduction in accuracy to detect an abnormal optic disc. In addition, the rising number of referrals did not lead to identifying more glaucoma patients.  

Should we spend more resources to manage manifest glaucoma?

Although these two economic evaluations suggested no clear benefit from intensive monitoring to detect glaucoma in ocular hypertensives, should we still monitor patients with manifest glaucoma more often than we do in current every-day practice? In lieu of ‘guessing’ the initial target pressure and redefining it according to rate of progression in manifest glaucoma, the Dutch model suggested a standard IOP < 15 mmHg in all glaucoma patients - even if that meant that 72% would need combination therapy and 46% would require glaucoma surgery. According to this model, these simplified strategies would decrease demand for intensive monitoring in OHT and glaucoma.  

In real life, when comparing patients in two cities in Finland over 11 years, increasing frequency of monitoring, 28% higher medication costs, 46% higher diagnostic testing and follow-up costs, 3 times more laser therapies and twice more surgery did not improve quality of life for glaucoma patients. There was a statistically significant counter-intuitive difference in the early glaucoma group in which patients consuming more resources reported worse quality of life.  

Conclusions

There is limited evidence of the cost-effectiveness of improving case finding and systematic screening. Very different and confusing conclusions can be drawn from the same (and often sub-optimal) ‘evidence’. In addition, economic evaluations are region-specific with variable care practices, costs, and willingness to pay. Nevertheless, as the costs of health care spending exponentially outpace overall economic growth, we cannot afford everything for everybody. To balance under- versus over care in glaucoma (over-diagnosing / treating too early versus late diagnosis), it seems logical to allocate most resources to patients with greatest risk of visual disability. For example, the increase in the number of injections for age-related macular degeneration vastly outpaces any increasing costs in glaucoma care. Would it be appropriate to treat all patients with IOPs > 21mmHg (preferably with laser) in order to help those with this risk factor? What about those subjects without increased IOP who might develop normal pressure glaucoma?  

To make health care more affordable and of better quality, we need to thoroughly, bravely and radically challenge our thinking, attitudes and behavior. A disruptive innovation is typically not a breakthrough improvement. It brings to market a product or service that may actually be as good as traditional or leading companies have been selling in their markets, similar to the development of personal computers versus the early main frame computers.  

For example, as it seems adequate to use the same tonometer for an individual, and could we transfer many IOP measurements to citizens and patients themselves, similar to measuring blood-sugar and blood pressure? This would free professionals’ time for patients who need more of their time as well as improve adherence and persistence. 

In glaucoma care we have many unknown unknowns. Higher resource allocation as such does not lead to measurable benefits to patients or society in terms of less glaucoma-induced visual disability and/or better quality of life. Regardless of the strategy of ‘more’, we would always need more money at decision time. A very important ‘more’, however, needs to be considered: we need more reliable and ‘realistic’ data for economic evaluations, preferably data from pragmatic randomized trials with ‘real world patients’.  

References

3. Maier PC, Funk J, Schwarzer G et al.: Treatment of ocular hypertension and open angle glau-

Clinical Issues:
Patient acceptance of ocular implants for Glaucoma Drug Delivery

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Core Concepts
• Different methods are currently being developed to improve drug delivery to the eye and thus treatment outcomes in glaucoma.
• Many approaches aim to control IOP over a period of several months.
• Delivery systems include contact lenses, punctual plugs, biodegradable and non-biodegradable implants.
• Micro-and nanoparticles act as vehicles for sustained drug release.
• The site of delivery varies from topical through subconjunctival to intraocular.
• With all new approaches one must always consider patient needs and preferences.
• Based on recent survey results around 75% of glaucoma patients would trade their eye drops for a subconjunctival injection at 3 monthly intervals.


Challenges with patient adherence and drop instillation techniques result in suboptimal health outcomes in many chronic illnesses requiring lifelong management. Glaucoma is no exception. Lowering intraocular pressure (IOP) is imperative to limit optic nerve damage and progressive visual field loss, but research on adherence to anti-glaucoma treatment reveals regular departure from their recommended medication regimen by a significant proportion of patients. Although ophthalmologists encourage proper medication use by their patients, ocular drug delivery methods are being developed to help patients by improving drug delivery and thus treatment outcomes.

The many approaches currently under development all aim to increase clinical efficacy of IOP control through sustained drug release over several months. These delivery systems include contact lenses that release drugs, bio-degradable implants made of micro or nanoparticles and non-biodegradable reservoirs leaching the drug of interest. The routes of administration of these drug delivery systems for glaucoma vary. They include topical application via contact lenses releasing drugs such as timolol, punctual plugs as a sustained release route for the delivery of travoprost or latanoprost, subconjunctival injection of nanoliposomes loaded with latanoprost or intra-cameral implantation releasing bimatoprost. With potentially so many potential choices for route of sustained drug delivery in glaucoma, it is an exciting time in a changing landscape of medical glaucoma management. However, with all this interest and excitement of emerging new technologies, one must include preferences of the patient using the drug.

There are only a few studies reporting on glaucoma patients’ opinions and acceptance of sustained drug delivery systems, should they be made available commercially. In a Singapore study, Chong et al. interviewed 151 glaucoma patients regarding their acceptance of a sub-
conjunctival injection at 3 monthly intervals to replace their current anti glaucomatous eye drops. A large majority (74%) would trade their eye drops in for the subconjunctival injections. Unsurprisingly, those individuals who accepted the glaucoma implant were on more bottle medications, medicating more frequently as well as those admitting to non-adherence to the treatment regime prescribed by their ophthalmologist.

As cost may be a major factor affecting adherence to glaucoma medication regimens, it may also influence acceptance of an implant. In this study, subjects who accepted the implant were also asked about the cost of such a product. Over 90% of subjects would accept the implant if the cost was the same as their current medications, and even when the proposed cost was higher than eye drops, over 85% were still willing to accept the implant. However, the exact increase in cost that subjects deemed to be acceptable was not indicated in the study questionnaire. Foo and colleagues reported that one-quarter of glaucoma subjects interviewed were willing to pay up to double the current costs of their conventional treatment. Based on these reports, glaucoma patients seem receptive to having an implant for their medication, at least in Singapore. It would be interesting to compare the views of glaucoma patients from other countries, as well as the rates of acceptance of different routes for sustained drug delivery. Sustained release implants for glaucoma may be here to stay.

An ageing population coupled with improved methods for glaucoma detection and treatment indicates many patients will be living with glaucoma for 20 or more years. The need for regular monitoring and ongoing treatment will increase demand for eye care services. (Image 3)

References
To understand patients’ perspectives, patients from the Royal Victorian Eye and Ear Hospital were interviewed about their experiences after attending outpatient clinic appointments. Patients were asked to reflect on both good and bad aspects of care (Table 1). Themes identified from these responses included doctor-patient communication, professionalism, reduction of patient fear and anxiety, sensitive delivery of news and provision of information. The patient-informed themes identified from the interviews were used to develop and provide an education program for trainee clinicians on patient-centred care and communication. Patient-centred care, based on good doctor-patient communication, gives doctors an opportunity to enhance patients’ understanding of their condition and its consequences with realistic expectations, which in turn is likely to lead to greater compliance with ongoing treatment.3

Living with a chronic eye condition can be difficult owing to the physical, mental and social restrictions caused by long term eye diseases such as glaucoma and from progressive vision impairment. With the well-established link between vision impairment and depression, eye health and rehabilitation professionals need training to detect and initiate appropriate referral for psychological and rehabilitation services.4 Although older adults with vision impairment are at a greater risk of depression, depression is often missed and untreated in this population.5 The problem is not lack of awareness of symptoms and treatment options but in the confidence of eye health professionals to discuss these issues with patients and their families.5 After a depression training program (1.5 hours over three consecutive weeks) eye health and rehabilitation personnel reported they more confidently screened for depression, provided information and made appropriate referrals.4 Thus depression training programs can be beneficial to improve the confidence of eye health professionals to address depression as part of routine care when treating patients with vision impairment.

Assessing functional vision using visual acuity, contrast sensitivity and visual field loss can provide useful information to eye health professionals regarding the need for referral to low vision rehabilitation services.6 Timely referrals to rehabilitation services for assessment and training such as for mobility and low vision aids can assist visually impaired patients to maximize independence but can also protect against depression.

Table 1: Examples of patient perceptions aspects of care.

<table>
<thead>
<tr>
<th>What were the best things about your visit?</th>
<th>What were the worst things about your visit?</th>
</tr>
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<tbody>
<tr>
<td>“The doctor explaining what was happening”</td>
<td>“The doctor was rushed”</td>
</tr>
<tr>
<td>“Being informed and clarifying the state of my eyes”</td>
<td>“Didn’t have the opportunity to see the same doctor”</td>
</tr>
<tr>
<td>“Speaking to surgeon before and after operation”</td>
<td>“Waiting time to see the specialist”</td>
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References
STATEMENT OF NEED AND
PROGRAM DESCRIPTION
Recent months and years have seen significant advances in our understanding of glaucoma. Much has been learned, not only about damage mechanisms and pathogenesis, but also about diagnosis and management. Treatment options – both medical and surgical – continue to expand. This program will review this new knowledge with an emphasis on incorporating recent insights into day-to-day practice.

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