LEARNING OBJECTIVES

• Special Focus
  A comprehensive overview on the burden of glaucoma including the impact of disease and treatment, the societal impact of glaucoma as well as compliance and adherence issues.

• What's New
  A review of the current principles in preventing glaucoma, focusing on risk factors, prevention programs, cost of screening and issues around planning resource use.

• Clinical Issues
  A discussion on the burden of non-adherence and strategies on how to overcome obstacles in glaucoma management.

• Practical Tips
  A practical lesson on how to improve patient centered care including compliance with visits and adherence to treatment.

TARGET AUDIENCE
This educational program is aimed at general ophthalmologists, ophthalmology residents and glaucoma specialists.

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Main topic:
“GLAUCOMA: IMPACT OF DISEASE”

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Glaucoma encompasses several entities that have in common the progressive loss of retinal ganglion cells at a faster rate than the expected age-related physiological changes. After cataract, glaucoma remains the second commonest cause of blindness worldwide and is the leading cause of irreversible and preventable blindness.1 Many patients with glaucoma in the developed world do not have significant visual impairment, but the diagnosis, monitoring and management of their condition can strain resources to prevent sight loss and cause treatment- or condition-related side effects with concerns for the patient. We review the impact of glaucoma with particular focus on its effect on affected individuals’ quality of life, the reliance on caregivers to curtail the burden of disease and on the increased physical and financial strains on society and health care systems.

1. The Impact of Disease on the Individual

Quality of life (QoL) is affected in several aspects of living for persons with glaucoma. QoL may be influenced by problems accessing ophthalmic care, insecurities caused by visual field testing, side effects of treatment (medical or surgical) and, for several patients, anxiety of losing sight. In the Collaborative Initial Glaucoma Treatment Study for example, half of the patients at inclusion were afraid of glaucoma related blindness.2 Clinical depression is also common in glaucoma patients and has been shown to be associated with the severity of glaucoma and older age.3

The relationship between the self-reported decline in vision-related QoL and worsening glaucomatous visual field is unlikely to be linear and probably has different phases.4 For assessment of QoL in glaucoma, a specific, validated, time-efficient and comprehensive tool is not available: several current instruments lack appropriate precision when measuring dimensions of glaucoma-related QoL such as function and mobility.5 Nevertheless we will try to look at available evidence from patient-centered data and QoL analysis in glaucoma.

a) Quality of Life in glaucoma-related visual impairment

• Previous misconceptions

Visual field defects were initially thought to interfere with daily-life activities only at an advanced stage of glaucoma. We only test monocular visual fields clinically, but combined fields constitute real life, and a binocular field yields less alarming results. Even as tested, visual field impairment seems to impact much more frequently and earlier on QoL than previously thought.6 Another misconception is the so-called ‘black peripheral vision with remaining tunnel’ perception of visual fields by glaucoma patients. Glaucoma subjects do not report black holes in their sight or tunnel vision; none within a cohort of 50 patients mentioned this despite average mean deviations (MD) of −8.7 dB and −10.5 dB in their right and left eyes respectively.7 In this study, about 25% stated that were unaware of their defects, whereas others described blurred (54%) or missing patches (16%).

• Motor vehicle accidents

Glaucoma patients are at higher risk of being involved in motor vehicle accidents (MVAs), especially at fault MVAs, as confirmed by both insurance companies and police authorities.8 Studies have looked at factors associated with glaucoma-related driving impairment and have established links with longitudinal attention metrics such as slower low-contrast reaction times and divided attention for the longitudinal Useful Field of View (UFOV). Driving simulation has been shown to be better than conventional perimetry in predicting risk of MVAs.9 Many elderly people rely on driving to go about their daily activities, including getting to the shops and taking care of a disabled or ill spouse/partner. Visual field impairment can jeopardize the validity of one’s driving license, an outcome which can severely impact on patients’ independence and also occupation in younger patients.

• Falls

Falls are very common among the elderly and may lead to severe injuries such as hip fractures, which increase morbidity and mortality. They are more common in glaucoma patients and, while the etiology is multi-factorial, visual disability is recognized as a major cause for falls in older people.8,10 Both the risk and incidence of falls in glaucoma patients are higher within the home irrespective of field damage severity. With worsening field loss, more frequent ‘falls-per-step-taken’ occur both at and away from home.
Efforts such as home environment modification should be considered in significantly affected glaucoma patients to prevent falls whilst maintaining physical activity.

• More subtle impairments

Daily-life activities can be a challenge for glaucoma patients. They may have problems with grasping objects, recognizing faces, eye movements, postural control and reading.11-16 Reading may be affected even with preserved visual acuity as certain regions of the binocular visual field, especially inferior left, may be associated with impaired reading speed and performance.4 These subtle impairments can be difficult to quantify but must not be underestimated by the clinician when discussing QoL issues with glaucoma patients.

b) Quality of Life in glaucoma-related management

• Drug related side-effects

Most people diagnosed with glaucoma are initially prescribed eye drops to lower intraocular pressure (IOP), the latter being the major proven modifiable risk factor. Despite newer topical medications, preservative-free and fixed combination drops to aid adherence and reduce side effects, both factors remain an important problem for many patients. Local drop side effects include conjunctival hyperemia, itching and dry eye symptoms, peri-orbital erythema, discoloration and fat atrophy, whereas systemic effects are also possible particularly with beta-blocker and alpha-agonist agents.

It is impossible to quantify and even more qualify the effects that topical medication has on QoL in a glaucoma patient. Considerations must include chronic ocular discomfort, dependence on and additional expenses for lubricant drops, repeated extra visits to clinics or eye emergency centers with symptomatic local side-effects, possible systemic problems including respiratory issues, cardiac dysrhythmias and erectile dysfunction (all seen in our clinics) and potential visual field loss related to glaucoma progression secondary to treatment non-adherence and non-perseverance.

• Non-topical treatment implications

Because of the drug side effects discussed above there has been a recent drive to use alternative first line treatments: these include Selective Laser Trabeculoplasty (SLT) as evidenced by the recent LiGHT trial outcomes17 and consideration of Minimally Invasive Glaucoma Surgery (MIGS) as treatment prior to initiating drops.18 Research continues into alternative drug-release technologies such as slow-release injectable drugs, conjunctival rings and drug-eluting punctal plugs. The economic and cost-effectiveness implications of the major issues mentioned here are discussed later in this report but all these modalities have been developed, pursued and promoted with the main premise of safe IOP lowering and visual function preservation with minimal impact from frequent clinic visits and drop side-effects.

• Patient visits

The need for regular follow-up, including repeated visual field testing, can be a specific additional burden on the patient; efficient ways of monitoring and reviewing patients need to be in place to reduce this impact, not only on health care systems but also on the individual and their immediate families or carers (see below). Increasing frequency of visual fields early in glaucoma management and then increasing intervals between test when an individual’s risk of progression has been understood and treatment targets established appears to be cost-effective.19

2. The Impact of Disease on Society

Glaucoma is a chronic age-related ocular disease with an exponential prevalence with age in all ethnicities.20 With increasing population longevity, glaucoma prevalence will increase over the next decades; for instance, the proportion of people aged 85 and over (with their one-in-eight prevalence of glaucoma) in the United Kingdom is projected to double over the next 25 years.21 Managing glaucoma patients will continue to increase budget expenditure with more pressure on infrastructure and resources. Since healthcare systems in all nations are not infinitely expansible and many governments face the need for cost-effectiveness and efficiency savings, each medical specialty must thoroughly examine the resulting societal burden imposed by their clinical field.22

a) The Impact of Disease on Health Care Systems

Evaluation of the burden of a given disease is complex, with a variety techniques commonly applied by health economists.23 A ‘cost-of-illness’ analysis comprises the costs of treatment interventions (including in- and outpatient provider care, medications, devices, treatment side-effects cost) and disease-related non-medical and indirect costs (such as worker productivity losses, caregiver expenses and depletion of tax revenues both from patients and caregivers). Other approaches involve assessing the value of treatments that demonstrate intervention cost-savings and cost-effectiveness, the latter analysis being probably the best known among non-specialists. Critically, the perspectives of the various healthcare stakeholders should be specified as the benefits are different for patients, providers, payers and society.

• Glaucoma treatment expenditure

In the published literature from over a decade ago, the direct annual medical costs for glaucoma were estimated at $2.9 billion in the United States with topical medications accounting for 30-50% of the cost22. 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.24 These figures have been changed by generics and reduced drug prices from competition from other treatment modalities; however there are few publications looking at topical glaucoma treatment costs; most ongoing studies compare cost-effectiveness of surgery and devices versus drops rather than the drugs themselves.

One pivotal study just published, could change first line treatment in primary open angle glaucoma (POAG) and ocular hypertension (OHT). The LiGHT trial has
shown a 97% probability of SLT as first line treatment having a better cost-utility than initiating eye drops at a willingness to pay (WTP) of £20,000 per quality-adjusted life-year (QALY) gained (this amount is below the cost threshold postulated by the UK reimbursement authorities); the study therefore recommends a change in widespread clinical practice with SLT becoming first line treatment for POAG and OHT.17 Another study in a South Korean population showed equal cost-utility for topical medication for a given WTP per QALY compared with laser trabecuoplasty and trabeculectomy surgery in mild glaucoma but suggested that laser could be a more cost-effective alternative in more resource-limited settings.18 A recent systematic literature review comparing MIGS with trabeculectomy or other therapies concluded that larger randomized trials and real-world observational studies are needed for MIGS devices in order to better assess both clinical and economic effectiveness. This review highlighted a current unmet need for treatments that are easily implemented whilst reducing long-term need for treatments that are easily implemented whilst reducing long-term post-operative aftercare and cost.25

**Cost dependence on glaucoma severity**

Traverso et al. have shown that with increased disease severity comes more expensive glaucoma treatment across several European countries, with medical costs doubling from earlier stages to more advanced disease.26 In the United States this increased four-fold from suspected glaucoma to advanced cases, as confirmed in a large cohort of 181,922 Medicare beneficiaries with glaucoma.10 Funding should therefore be directed towards earlier glaucoma detection on the one hand and control of these cases over time on the other. The non-medical aspects of glaucoma-related visual impairment costs are much higher: in a European study, patients with advanced glaucoma had on average a three-fold greater cost for domiciliary assistance than for direct ocular healthcare costs, with wide variations between countries.27

Although large prevalence numbers of early glaucoma result in significant widespread cost to society, most of the resources are actually used by only a minority of these patients. Stein and colleagues evaluated the medical cost of 19,927 new POAG patients and followed them from 2001 to 2009.28 The most ‘expensive’ 5% of these patients consumed 24% of total resources; in contrast, the least expensive 50% of patients accounted for less than 19% of all resources. Glaucoma-related charges were greater during the first six months, halving for subsequent six month periods. This matches routine clinical practice because the efficacy and safety of treatment must be checked after initiation. In Stein’s 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. Advanced glaucoma markedly increases costs both for management and review, as well as the consequent implications of visual impairment that advanced glaucoma brings to society.

**The effect of non-adherence**

Adherence is unsurprisingly frequently sub-optimal in glaucoma patients as they are being treated for a “symptom-free” disease and may be more worried about the diagnostic tests, visits to professionals and the side-effects of treatments than by the disease itself.29 Therefore, a low estimate of non-adherence may reach up to 25%.29 Economically this means that 25% of the medical resources dedicated to glaucoma are wasted annually, which is unacceptable for payers.

**Cost burden differs by country and health care system**

There are large differences between countries in annual costs for glaucoma patients. This depends mainly on differences in drug prices and between currencies, on whether generics are available, on the costs of eye care providers (ophthalmologists or optometrists) and of diagnostic tests. Adjusted costs are on average half in Europe compared with the United States.31 Population size and prevalence of different types of glaucoma are also an important factor, especially countries such as India and China.32,33 Because most of the literature originates mainly from developed communities, the burden of glaucoma is more difficult to estimate in developing countries.34

**Reducing the economic burden of glaucoma**

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 can be difficult in practice. Data on prevention and cost-effectiveness of screening for glaucoma is presented in depth in the What’s New section of this issue.

Glaucoma causes 11% of the blindness in the US35, even though treatment is deemed cost-effective.36 When ‘no treatment’ in glaucoma is compared with ‘treatment’, extra costs are around €30,000 annually, within the range of QALY usually considered for other diseases (€20,000 to €80,000).37 These findings coincide with those from Rein et al., who estimated QALYs to range from $11,000 to $20,000 for glaucoma treatment versus no treatment respectively. The lower price of generic eye drops may help reduce glaucoma medical treatment expenditure, as might the avoidance of ‘drug switching’ as this leads to multiple additional ophthalmologist visits.38,39 A first-line therapy that balances efficacy and safety whilst achieving low target IOPs decreases costs and the options of SLT and MIGS may become of more relevant.37,39,40

The cost of face-to-face specialist care in glaucoma can also be addressed by service re-development and empowering other allied health professionals to take on the bulk of low-risk glaucoma and OHT reviews and monitoring. Systems such as community care services and ‘virtual’ glaucoma clinics have been established for many years in certain countries and form a successful template for focusing specialized glaucoma care, namely from highly trained ophthalmologists and fellowship trained glaucoma specialists, on the smaller percentage of complex and/or advanced glaucoma patients who will need sub-specialist tertiary care review with expert management plans which may include laser and surgery.40-42
b) The Impact of Disease on Family and Carers

Caregivers significantly assist patients whatever the disease stage, but particularly in individuals with visual impairment. They escort them to doctors’ visits and help in daily activities, which impacts on their working patterns (productivity loss) and leisure time. While most caregivers are family members, neighbors and friends are often involved, particularly in rural areas with limited 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 an accompanying adult. The social economic outlay was found to be higher than the actual direct medical expenditure; 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 Snellen. Patients were asked to keep a prospective diary of the quantitative and qualitative help they received from caregivers over a year. The need for a caregiver was not linearly related to visual deterioration and a threshold was found corresponding to loss of driver’s license. Mean yearly caregiver time dedicated to helping patients was around 152 hours (median just over 81 hours) with a wide range from zero to 851 hours. The median time accounted for 4.6% of a 35-h working week but could reach up to 50% for some individuals. The median estimated cost was $710 per year, once again with a wide range from zero to $7491. In this study, patients were helped by several caregivers, mainly for transport needs (78.9%), but also for banking and personal correspondence; healthcare and personal care time was relatively small.

Conclusions

Glaucoma has long been regarded as an IOP-related disease. Progressively, with the help of researchers in various disciplines, glaucoma has become a “human” condition impacting the daily-life activities of many individuals, including those diagnosed with the condition and those who help support them in various ways, usually with a consequent, 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. 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. At each step in our endeavor to become more cost-effective, it is imperative to adopt an approach which can be summarized as follows: the right services, to the right patients, at the right time, in the right place.

References:


Core Concepts
- In the world of finite resources, it is crucial to consider how to deliver health care services equally and cost-effectively.
- It is especially important to consider what to recommend when the evidence is missing, e.g. related to cost-effectiveness of screening for glaucoma.
- While waiting for the evidence, policies on what to do are still required.
- In addition to undiagnosed glaucomas, the concept of overdiagnosis is becoming slowly acknowledged also in glaucoma world.
- To avoid turning citizens into patients unnecessarily, Choosing Wisely recommendations have entered eye care, including glaucoma.
- In addition, new research concepts have been developed to aid decision making.
- Benchmarking Controlled Trials evaluate the differences in real-world outcomes and costs and System Impact Research aims to promote and evaluate accessibility, quality, effectiveness, safety, efficiency and equality.

1. Introduction

In the world of finite (tax) resources, it is crucial to consider how to deliver health care services equally and cost-effectively. Should some patient groups be allowed to have more resources than others and on what grounds? Or, could we just let the costs increase over time? If yes, does this policy ensure improved well-being?

Western countries spend more on health care and produce more services than ever before; citizens are healthier, live longer than ever before, yet demands and costs increase exponentially. As these cost increases are too high even for the developed countries, the same policies cannot be copied to developing countries.

In the long run everything is both cause and effect: as members of our health care systems, we are responsible both for its problems and solutions. The big question is: How to choose the right things to do and do them right? Who has the power to define what is ‘right’? Half the health care demand in the United States has been estimated to be created by professionals and organizations, not by the needs of the citizens. As citizens, we may also have variable values and priorities in different roles, e.g. as patients, tax-payers and voters in politics.

The 2008 World Glaucoma Association’s consensus meeting on screening highlighted the major shortcomings in glaucoma care, which are still relevant i.e. unequal access to care with large variations in services.2 As individual ophthalmologists, health units and systems claim basing their policies on the same evidence, can all be ‘right’? This question is especially tricky when the evidence is missing or weak, i.e. what should we do, or not do?

2. Data on screening

The Guidelines of the European Glaucoma Society (EGS) state that there are no systematic reviews or studies that provide evidence of direct or indirect links between glaucoma screening (Image 1) and visual field loss, visual impairment, optic nerve damage, intraocular pressure, or patient related outcomes. Economic simulation models on cost-effectiveness of screening report inconclusive results with large uncertainties (https://www.eugs.org/eng/egs_guidelines_download.asp).

In addition to patient care, it is important to consider - although seldom studied – how to spend research resources. Burr et al. estimated that a glaucoma screening trial in the UK is unlikely to be the best use of research resources.3 However, in their book ‘Screening – Evidence and Practice’, Raffle and Muir Gray highlighted that a well-conducted major screening RCT (Randomized Controlled Trial) would be far less costly than unplanned growth of poor quality screening.4 So far, a small study of all 856 individuals born in 1915 in one city in a high risk area for exfoliation in Sweden has been published; 40 % of the sample was randomly selected for screening. No difference on cumulative diagnosis was detected over 20 years.5

In Finland, half of the population-based birth cohort born in 1966 in Northern Finland has been randomized for screening. This unique cohort has been followed prospectively since the 24th gestational week. The Eye Study (initiated in 2012) addresses the following...
questions: (i) what is the best combination of diagnostic tests to detect glaucoma in an unscreened population, (ii) what are the benefits and disadvantages of the eye screening to the individual and to society, and (iii) is glaucoma screening both effective and cost-effective? As the baseline prevalence data have just been published it will take a long time to learn the outcomes.7

3. Current environment and mechanisms

While waiting for evidence, policies on what to do are still required. For example, the EGS vision aims to promote the best possible wellbeing and minimal glaucoma-induced visual disability in individuals with glaucoma within an affordable healthcare system (https://www.eugs.org/eng/about.asp). ‘Affordability’ refers to patients, citizens (tax-payers) and society.

The 2015 EGS Members’ Meeting recognized the major challenges in European glaucoma care, i.e. increased demand for services, and misdiagnosis, both under and over care, the latter leading to non-optimal use of resources as the same resource (money, time etc.) cannot be spent twice. In some regions during last decade, injections for age-related macular degeneration (AMD) have increased over 14-fold. When simultaneously the increase in total eye care costs have been very modest, this imbalance obviously influences other eye care activities which need to be reduced and/or produced more cost-effectively. Very few people want to pay more taxes.

What actually happens in real life with the missing evidence? Wide-spread direct-to-consumer advertising for private provision of screening flourishes, e.g. optician shops market ‘comprehensive eye examinations’ (intraocular pressure, fundus imaging, OCT, visual fields) and exert powerful lobbying, claiming to achieve huge cost savings. Ophthalmologists (mainly in private sector with a fee-for-service payment model) also generate unnecessary costs: for example, refractive surgeons ordering ‘all tests’ have created epidemics of non-existing glaucoma in young myopes for whom there are no relevant normal values for imaging instruments and in whom imaging artifacts are not rare.

Reading the evidence about screening has been equated intellectually to an unpleasant cold shower.4 Screening is more likely to detect cases with better prognosis, inducing several biases. E.g. screening seems to attract healthy people as well as slowly progressive (length time bias) and consequential cases (overdiagnosis bias). Raffle and Muir Gray refer in their book also to the popularity paradox. The greater the over-diagnosis and over-treatment, the more people think they owe their health to screening. When for example treating 40 cancer patients prevents one serious outcome, all 40 think ‘I am the lucky one’.

In addition, the high risk glaucoma cases often progress so rapidly4 that it would be impossible to screen the entire population frequently enough to detect them in a timely and meaningful manner. This would mean that the same number of patients could still become visually disabled. However, adding a large number of ‘non-glaucomas’ to the sample, would bias the result to look ‘better’ when a smaller percentage of those with ‘glaucoma’ would become blind.

When citizens are turned into patients unnecessarily, their care suffocates health care systems. Also ethical questions need to be asked. If there is not enough money to care for diagnosed patients, should we try to find even more? Do tests, diagnosis and treatments make people happy? These are relevant questions, especially when dealing with misdiagnosis of a potentially blinding disease.

Although overdiagnosis and overtreatment are still rarely acknowledged or accepted in the glaucoma world, the concept is not new. For example, Fisher and Welch published their paper ‘Avoiding the unintended consequences of growth in medical care - how might more be worse’ twenty years ago. Their list of barriers for changing established practices and thinking remain relevant, i.e. how our current cultural and legal environments exert tremendous pressure to do more. When we look for more to be better, data inconsistent with our underlying beliefs are often rejected or ignored. We witness how advanced, fast and seemingly easily interpretable diagnostic technologies and more frequent testing lead to more diagnosis. E.g. OCT findings associated with ‘disease’ have become so subtle that even experts disagree on the diagnosis. In Western societies, delays in making a diagnosis are strongly prioritized while the harms of treating pseudo-diseases are discounted or ignored. In addition, research efforts miss a system level of analysis.9

Other disciplines have noticed that when something is being systematically ignored, before long its nothingness becomes acknowledged reality. The number of ‘Too much medicine’ initiatives is increasing in which similar statements to those published 20 years ago are presented, e.g. too much screening leads to too much medicine. They also list means how to reduce over-detection (don’t screen), over-definition (don’t expand the definition by developing pre-disease or lowering treatment thresholds) and reduce medicalization (don’t give unnecessary labels).

4. Approaches to planning resource use

In 2013, the American Academy of Ophthalmology and the American Association for Pediatric Ophthalmology and Strabismus released their top five lists for interventions which ophthalmologists and patients should question.10 The second of them states ‘Don’t routinely order imaging tests for patients without symptoms or signs of significant eye disease.’ Examples of routine imaging include e.g. visual-field testing, OCT and fundus photography. If symptoms or signs of disease are present, then imaging tests may be needed to evaluate further and to help in treatment planning.

In Finland, Duodecim Society has published 92 “Choosing Wisely recommendations” for 55 medical entities based on Finnish national clinical practice guidelines, including glaucoma.11 The first five Finnish Choosing Wisely recommendations for ophthalmology were published in 2018: two for AMD and three for glaucoma11.
(1) Avoid diagnosing glaucoma only on the basis of automated imaging instruments.

**Justifications:** There is no consistent or generally approved definition of the diagnostic tests for glaucoma and their criteria in the scientific literature – nor is there evidence for either the most clinically effective or the most cost-effective tests and technologies to be used for the diagnosis and detection of progression to prevent glaucoma-induced visual disability. The Cochrane review of 106 studies concluded that the accuracy of automated imaging tests for detecting manifest glaucoma was variable across studies and accuracy may have been overestimated due to the case–control design, which is a serious limitation of the current evidence base. In the Health Technology Assessment of imaging devices in community practice, the specificity for severe glaucoma of the best device (OCT) was only 71%.

(2) Avoid non-targeted population screening for glaucoma because of lack of evidence that screening prevents glaucoma-induced visual disability.

**Justifications:** There is lack of high-quality studies indicating that any particular screening test or strategy policy reduces glaucoma-induced visual disability or is cost-effective.

(3) Avoid routine monitoring of diurnal intraocular pressure during follow up of glaucoma.

**Justifications:** The significance of measuring diurnal variation during follow-up in assessing the risk for progression of glaucoma is unclear. The number of studies is limited, with non-optimal quality.

The key is how we measure, research and evaluate health care. Although on an individual level, physicians carry the responsibility for testing and treatments, we should also consider system level evaluation in order to promote equity and equality. To aid our clinical and policy decisions, new concepts of Benchmarking Controlled Trials (BCT) and System Impact Research (SIR) have been developed. SIR aims to promote and evaluate accessibility, quality, effectiveness, safety, efficiency and equality. BCTs evaluate the differences in real-world outcomes and costs between health service providers (clinicians, units, districts and countries) and health care systems.

5. Conclusions

It is crucial to constantly and consciously consider adequacy of care: under-testing, under-diagnosing and under-treatment as well as over-testing, over-diagnosing and over-treatment. The latter increase the number of false positives, decrease quality of life and make it more difficult for severe cases to access appropriate care.

**References:**


1. Introduction

The World Health Organization issued a report in 2003 stating that in developed countries, only 50% of patients suffering from chronic disease were adherent to their prescribed medications.¹ The report concluded that increasing the effectiveness of adherence interventions may have a far greater impact on population health than any improvement in specific medical treatment. The previous article by Anja Tuulonen describes possible approaches to improve patient care.

2. Cost implications of non-adherence

But what about acceptance by the patients of methods now on offer? Non-adherence to disease management has health and economic considerations. In the US alone, poor adherence is estimated to cause 125,000 deaths costing $100 billion dollars annually, with a substantial proportion as a result of chronic diseases such as glaucoma.² Current available solutions are an improvement, but issues remain to be addressed. Fixed combination therapies still rely on patient adherence, sustained drug delivery systems and MIGS may only address a certain number of patients using only 1-2 eye drops. Those patients with more advanced disease will still require the need to instill eye drops, albeit fewer number of bottles and thus non-compliance will still be a concern. In general, the most successful adherence-promoting strategies that have been identified have moderate effect, are relatively costly, and raise availability, feasibility, and/or scalability issues.

Cost is a major factor that affects adherence towards glaucoma medication regimens or acceptance of new surgical implants, and thus it may also be a major factor for adoption. Insights from behavioral economics have been deployed in an effort to increase the effectiveness of medication adherence in a cost-effective and scalable manner.⁴ In this approach, an incentive strategy referred to as “adherence-contingent rebates” adopts a monetary incentive that addresses a key challenge that all chronic disease patients face. That is, they incur adherence costs in the present, but reap the benefits in the far future. In such situations, decision-makers have been shown to be biased towards the present and make suboptimal choices that their future self will regret.⁵ Therefore, by providing a near-term benefit for adherence, the monetary incentive aims at shifting patients towards greater adherence. “adherence-contingent rebates” extend the concepts of accountability, value-based insurance designs and conditional cash transfers by creating a strategy where cost sharing depends not only on the effectiveness of the medications but also on how effectively these medications are used.

3. Conclusions

With the explosion of health care costs that are increasingly driven by modifiable risk factors, including poor medication adherence, it is high time to extend accountable care all the way to the level of the patient. It is likely that a combination of approaches will be needed to make a dynamic shift in improving the greatest barrier to patient management in glaucoma that is both clinically effective and economically feasible.

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1. Introduction

Over the last decade, there has been a major evolution in glaucoma surgical techniques, especially those with less invasive approaches promising fewer side effects and better safety profiles, compared with prior conventional filtration surgery.

The number of possible strategies for the individual patient over the course of disease management has become more diverse, challenging decision-making for the ophthalmologist. While the more minimally invasive approaches seem to be safer, they also have a lesser pressure lowering effect.

We need more experience over time, with generation of high quality evidence to estimate the value and scope for application of these various strategies.

This could mean for example that a low risk intervention with an only moderate pressure lowering effect could be considered for a patient with early glaucoma, who is not in need of a very low target pressure. On the other hand this approach could also be viable for an older patient with more advanced disease, who would otherwise be in danger of severe vision loss caused by a higher risk interventions.

2. New technologies

There is a variety of novel drug delivery systems like in-situ gels, liposomes, niosomes, hydrogel, dendrimers, nanoparticles, solid lipid nanoparticles, microneedles or ocular inserts currently under investigation. Using the right system for the individual patient could likely lead to a better control of the disease and better preserve quality of life, especially in patients with currently low adherence or patients bothered by the side effects of topical anti-glaucomatous medications. However, most of these systems are not yet commercially available. Alternative drug delivery approaches – as well as the new surgical methods - broaden the treatment options for patients with glaucoma. Collectively they allow clinicians to customize treatment by selecting specific approaches based on each patient's individual needs.

3. Patient adherence

Patients with glaucoma need to understand the chronicity of the condition, and that - although we have very effective therapies – we may not be able entirely to stop progression. Usually we can slow it down so that the vast majority of our patients avoid visual handicap. To achieve optimal outcomes like this, we need to maximize patients’ adherence to anti-glaucomatous medications and the entire management process. Effective glaucoma therapy relies to a great extent on the patient’s ability to regularly self-administer eye drops. Non-adherence with glaucoma therapy is a significant barrier to therapeutic success for approximately one-third of patients.

As treating physicians we are often faced with unrealistic expectations: intense discussions may become necessary to create a good physician-patient relationship, which is essential for sustainable success in glaucoma treatment. This often involves time and effort. Fortunately, most glaucoma patients are not at high risk of progression to (statutory) blindness.

As the risk of patients suffering severe visual impairment is linked to the loss of visual field at presentation, it is vital to detect significant visual field defects reliably in primary ophthalmic care. One important aspect is the sensitivity in the visual field at presentation, which carries high prognostic impact when it is worse than -6 dB in at least one eye.

4. Impact on patients’ quality of life

When assessing the impact of the disease on patients’ quality of life it is very important to assess the location and pattern of the individual’s glaucomatous visual field defects, especially if they approach fixation. As glaucomatous visual field defects are present predominately in the mid-periphery and not in the center unless in case of very advanced disease, vision-related quality of life is impaired in a different manner compared with eye diseases affecting primarily central vision, such as age-related macular degeneration. In eye diseases affecting central vision, it is the level of vision in the better eye that predicts VR-QoL, whereas in glaucoma visual performance in both eyes and often the worse eye better predicts VR-QoL. Superior and inferior hemifield defects are of similar importance. This observation, that impairment of the worse eye drives vision-related quality of life underscores the imperative need to preserve vision also in worse eyes with advanced impairment.

References:


In order to maximize the learning effect, participants have the opportunity to register at our website and to answer a number of multiple choice questions for each of the four sections covering the key points of each section. Shortly after test completion, participants receive electronic feedback on successful accomplishment or failure. In case of failure, the participant is encouraged to review articles and retake the test. A successful test will earn the participant valuable CME credits needed for their continuous medical education efforts.

ACCREDITATIONS

Individual issues of Glaucoma Now are accredited for Continuing Medical Education (CME) by the Physicians’ Chamber of Baden-Württemberg, Germany (Local Medical Responsible: Andreas Buchholz, MD, PhD, ROpH). This accreditation automatically implies acceptance of credits throughout the European Union and associated countries.

Glaucoma Now is also recognized by the Royal Australian and New Zealand College of Ophthalmologists as a valid Continuing Professional Development activity.

The program is recognized by the Brazilian Council of Ophthalmology. Brazilian physicians successfully taking CME tests on our website are automatically awarded CME points by CBO.

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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DISCLAIMER

Participants have an implied responsibility to use newly acquired information to enhance patient outcomes and professional development. The information presented in this activity is not meant to serve as a guideline for patient care. Any procedures, medications, or other courses of diagnosis or treatment discussed or suggested in this activity should not be used by clinicians without evaluation of their patient’s conditions and possible contraindications or dangers in use, applicable manufacturer’s product information, and comparison with recommendations of other authorities.

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