Exploring patients’ expectations and preferences of glaucoma surgery outcomes to facilitate healthcare delivery and inform future glaucoma research

Bina Bhaskar Kulkarni 1, Paul Leighton,2 Anthony J King 1

ABSTRACT
Introduction Glaucoma is a lifelong condition often requiring surgical intervention. To allow us to inform patients’ expectations of surgery effectively, it is important to understand patients’ preferences and concerns regarding outcomes from glaucoma treatments including surgery.

Aims To explore what clinical and social outcomes of glaucoma surgery are important to patients.

Methods Forty-five glaucoma patients undergoing medical glaucoma treatments or surgery were recruited for focus group interviews to determine their opinions regarding the outcomes of glaucoma treatments. Thematic analysis was performed with NVivo software.

Results Themes identified were understanding glaucoma, understanding surgery treatments and understanding treatment outcomes. The most important outcomes of the glaucoma surgery reported by the patients were social factors. Patients felt that being able to maintain their driving licence is a strong indicator of successful glaucoma treatment/surgery. Other important outcomes were independent living, ability to care for their family and having a good-quality social life. When considering novel surgical treatments, most patients felt that certainty of successful outcome and proven longevity of the effect are the primary motivators for choosing these treatments.

Conclusions Patients understood that clinical measures were surrogates for maintaining visual function, but ability to maintain independent living was the most important outcome from their treatment. For newer treatments patients wished to know more about long-term outcomes when considering this option.

BACKGROUND
Glaucoma is a pressure-related optic neuropathy affecting 1%–2% of the population over 40 years of age and is the second most common cause of visual impairment registration in the over 65 years age group.1 2 Untreated glaucoma is a progressive condition1 which may severely impact on quality of life. It is a significant cause of falls,4 road traffic accidents,4 loss of driving licence1 and loss of independence4 6 9 and may lead to blindness.2

Lowering intraocular pressure (IOP) is the only known modifiable risk factor for glaucoma.3 10 11 IOP reduction can be achieved with medical, laser treatments or surgery.12 The criterion for clinical success of treatment is IOP reduction, which is associated with visual acuity retention and stabilisation of visual field progression. However, patients’ understanding and perception of glaucoma treatment, especially surgical treatment, outcomes are unknown. It remains unclear whether these clinical assessments translate into improvements recognised and valued by patients. It is also unclear how patients conceive the relative merits of IOP reduction, retention of visual acuity and stabilisation of visual field progression, or whether they might consider lifestyle influences of the treatment to be more important.

Prior work has shown that patients demonstrate a varied level of understanding about glaucoma, its causes and treatments. It also highlights that medical and surgical treatments are considered quite differently by some patients.11 Although both treatments are effective in controlling glaucoma,3 11 14 15 some patients regard surgery more sceptically as a treatment of last resort as it is associated with greater risk of side effects and more severe consequences if complications occur (eg, blindness).13 Consequently, it might be assumed that patients may expect more from surgical treatment, to counterbalance the perception of greater risks, and they will accept more moderate improvements from medical treatments, or that they might point to different types of benefits associated with different types of treatment (surgery to save sight, medical treatment to maintain lifestyle).

In recognition of the importance of patient-centred outcomes, some large clinical trials have used quality of life as their primary outcome measures.16 17 Consequently, there is a need to explore patients’ perspectives, hopes, concerns and expectations on the outcomes of glaucoma treatment, especially surgical treatment. A better understanding of these will improve patient counselling, by providing clearer and more explicit patient-defined success criteria which might inform the appropriateness of medical and surgical options available for glaucoma management in terms that are important to patients.

This study will address a lack of information about patients’ notions of glaucoma surgery outcomes and will explore if patients express different preferences and expectations of medical and surgical treatment outcomes. The unique insight of patients’ perspectives and treatment expectations will complement the clinical potential of medical and surgical glaucoma treatments.

METHODS
Patients attending the glaucoma service at Nottingham University Hospital were invited to participate in the
Part 1 - Patient experience of glaucoma

1. [as icebreaker and direct question to all participants]
   - How long have you had glaucoma, what impact does the condition have upon you?

2. Can you say what you think will happen to you in the future
   - How well do you feel your glaucoma is being managed? Are there things about your on-going condition / treatment that you don’t enjoy?

Part 2 – Patient preferences for treatment outcomes

1. Can you say a little about the sorts of treatment that you have received for glaucoma, and your experience of these treatments.
   - a. Which worked / didn’t work?
   - b. Which you liked / didn’t like.
   - c. What concerns about treatment do you have / did you have?

2. Can you remember what your hopes and expectations were for the treatments that you received?
   - a. What do you think treatment should achieve?
   - b. What is the minimum you think that treatment should offer?

3. We currently measure intraocular pressures and visual fields to establish the success of glaucoma surgery. Are there any other things that you think are important in indicating the success or otherwise of surgery?
   - a. Are there any other clinical outcomes that are important to you (prompts – pressure, sight, ocular comfort)
   - b. Are there any other glaucoma surgery outcomes which are important to you (prompts – no need to use eye drops or minimal use/continued use of drops, risk of recurrence, longevity of impact, recovery time)
   - c. Are there any lifestyle outcomes which are important to you?
   - (Prompts – independence, driving, …….)

4. If we had to choose one of these outcomes to indicate the success of treatment which do you think it should be? Why?

Part 3 – Conclusions.

Offer short summary of discussion.
Offer participants opportunity to ask questions and/or offer final comment.

Figure 1 Topic guide for focus group discussion.

Thematic evaluation

Initial coding recognised 781 data points, which were grouped into 24 distinct codes (concepts or ideas). These codes were broadly classified in three thematic areas (figure 2). The hierarchical organisation of the thematic map, with understanding outcomes considered as a result of a culmination of participants’ understanding of glaucoma, treatment and outcomes, highlights that attitudes about treatment outcomes are not detached from but informed by how the participants understand glaucoma and its management, leading to realistic expectations about their treatment outcomes.

Understanding glaucoma

At the beginning of the focus group meetings, the patients were asked to discuss their glaucoma condition and its impact on their lives. This part of the discussion was grouped into theme of ‘understanding glaucoma’. The patients in the medical treatment group had glaucoma of 1–10 years in duration and were on a variety of antiglaucoma eye-drops. Most patients in the medical treatment group had not noted any problems with vision at the time of diagnosis. Some patients had noted gradual deterioration of vision over a period due to progression of glaucoma or worsening of cataracts or both. In the surgery group patients had glaucoma for longer duration of approximately 30 years. Initially they were treated with glaucoma eye-drops before having glaucoma surgery.

The diagnosis of glaucoma had generated anxiety in both groups of patients about losing vision sufficiently to affect their driving, reading, watching television and maintaining independent lifestyles.

For most patients work was not an issue as most of them were retired.

“That’s gone out of my life style all together.”

Patients demonstrated good understanding of differences between visual acuity and visual fields and if given a choice they would consider retaining either of these visual functions depending on their lifestyles.
“I suppose it will depend on a person’s expectations in their lifestyle and someone who is a hermit and does lots of sewing and embroidery will probably go for acuity.”

**Understanding treatments**

Most of the patients were satisfied with their treatments and glaucoma control. Few patients had noted that their glaucoma was not well controlled with eye-drops only, and few anticipated further surgical treatment. Patients with glaucoma in the medically treated group described their experience of treatment regarding the effect of eye-drops on their lifestyle, compliance with treatment, IOP control and side effects of the treatment. Patients in both groups expressed their preference to be on anti-glaucoma eye-drops for as long as possible in order to avoid surgery. Even those already exposed to surgery expressed the following sentiments:

“If I’d had the choice, I would have stayed on the drops rather than have surgery I must admit…”

“when you come to the end of the line with the medications, as I have done now because nothing’s working any more, you can have an operation and that’s a sort of last resort and that seems to be quite successful.”

As did those who had not had surgery:

“Well from beginning I think I would prefer drops rather than surgery as its easier and not invasive.”

Patients in the surgery group mentioned that they did not notice any improvement in vision following surgery and still need to use glasses, although this was not a surprise to them:

“Surgery can’t make it (vision) better, he’s (consultant) always explained that.”

**Expectations of glaucoma surgery**

There were approximately 21 responses from patients in medical group on their expectations from glaucoma surgery and 43 comments from patients in surgery group. In the glaucoma surgery group this subtheme included preoperative perception of glaucoma surgery, operative and postoperative experience, expectations from glaucoma surgery and number of glaucoma surgeries. On the other hand, patients in the medical treatment group had variable information on glaucoma surgeries. Many patients would rely on the decision of the consultants regarding glaucoma surgery.

“And I thought no issues I’m happy to go with it, I said right, fine, I’ll have an op.”

The patients in both groups had expressed anxiety to have surgery the most important reason being losing the eye sight and there were no guarantees that the procedure (trabeculectomy) would work and for how long would it remain effective.

“Well the only concern I’ve got is about the operation is a trial and error process, you know, sort of, cutting some slots in your eyes and then you go in every day and he sews a bit up more up if the pressures are not quite right.”

Patients were interested to know the competency of the surgeon who is going to perform the surgery before they came for surgery as patients felt that the success rate of surgery depended on the surgeon’s experience. Patients preferred having a new procedure if it had high success rate and long-term effects. The concept of successful surgery varied among the participants; some felt it should improve sight, some felt it should stop the condition getting worse, and some wanted to protect the ability to drive, the ability to drive at night or just walking independently. Participants were quick to suggest that success might mean different things to different people, and that

“success means maintaining your life style in the way you want.”

They hoped this would reduce the number of eye drops they were taking.

In the surgery group, patients had described concerns regarding longevity of the surgery, aware that scarring could cause failure of the procedure:

“I mean trabeculectomy is supposedly 90% effective at start and then over 10 years it goes down to 60% because your eye changes
and heals, well 10 years is considered good outcome but not to someone who is young, it’s not very long.”

Building on this another participant indicated that

“I think for the individual you’d think about how long am I likely to live so that’s going to impact into that decision isn’t it?”

The main initiative for opting for surgery in both groups was the expectation that the surgery would stabilise their condition and heals, well 10 years is considered good outcome but not to someone who is young, it’s not very long.”

Building on this another participant indicated that

“I think for the individual you’d think about how long am I likely to live so that’s going to impact into that decision isn’t it?”

The main initiative for opting for surgery in both groups was the expectation that the surgery would stabilise their condition by restricting the visual field loss, reduce or stop the use of the eye drops possibly lifelong hence avoiding or minimising their side effects and reduce the amount of follow ups required to once or twice a year.

Understanding Outcomes

Consideration of treatment outcomes showed a complex and multi-faceted reasoning process where participants drew together factors which might be viewed as clinical (IOP), alongside more general concerns (expectations of surgery and lifestyle), and more specific issues (such as driving and follow-up procedures).

Few study participants did not appreciate the significance of IOP control, although most considered IOP reduction as an important outcome of any glaucoma treatment. However, many noted that the reduction of IOP was not in its own right a meaningful treatment outcome but was broadly conceived as a requirement or mediator for maintaining sight (table 2, row A, especially [1]).

More than this though, maintaining sight was considered key to maintaining normality and being able to live independently (table 2, row B), pursuing the sorts of activities that they want to do:

[treatment] Success means maintaining your lifestyle in the way you want.

Driving was a commonly used example of independent living, but again, even here, driving might be considered a proxy for some other bigger idea about lifestyle and independence:

It not the process of driving per se, it’s the fact that driving allows you to lead an independent life.

Driving was viewed in different context by the participants; those who were either married or were with partners, especially those who cared for their spouses, were more concerned to keep their driving licences:

“Depends entirely on your age and lifestyle to me driving and getting about is very important...My wife is disabled.”

On the contrary some participants were not keen on driving as their spouse drove them or they were not driving at all:

“I wouldn’t be bothered to drive, my husband is good, he drops me off...”.

Consideration of visual acuity and visual field as important treatment outcomes offered complex and nuanced perspectives, with personal circumstances, and the type of lifestyle and activities desired, again informing a preference for one over the other (table 1, row C). Hence it is the personal circumstances which dictate what outcomes a participant desires, rather than some abstract assessment of the relative merits of the different outcomes. Discussion of visual acuity and field did however expose more fundamental concerns about sight loss (table 2, row D).

| Understanding treatment outcomes—subthemes | Indicative data |
|-------------------------------------------|------------------|
| A Intraocular pressure                     | 1. “I don’t feel the glaucoma’s affected my eyes at all. Although every time I come to the hospital they say my pressure is high, we will put you on another drop... (Q. is pressure an important outcome?)...Yes, but [only because] the pressure needs to be down to protect the vision.”
2. “Thankfully you know the pressure seems to be controlled and therefore you know that’s never been an issue.”
3. “Lowering of intraocular pressure is important to protect vision.”
4. “Pressure reassures you that everything’s working.” |
| B Preserving lifestyle/ normality           | 1. “I want my life to be the same...I am quite an active person, so you know, I go to the gym and I go skiing. I do lots of things and I am concerned that I won’t be able to do some of these things.”
2. “I really want my life to be same because you know, it makes me just feel old I have to be careful going down and standing up and can’t hoover.”
3. “My leisure and driving come in because I play golf and without the driving I can’t go and play golf.”
4. “I like to go long distance walking, I don’t want to have to do that with a stick. You know, I like to enjoy my walks.”
5. “It certainly interfered with my lifestyle having to put those drops in, it sounds pathetic.”
6. “I have quite a few eye-drops and carry them with me, just thought, “God, Am I going to be trapped in the house doing these eye drops?” It felt overwhelming.” |
| C Field or acuity? (preserving lifestyle/normality) | 1. “I mean I am annoyed that I can’t focus on things. I do lot of DIY and trying to put a little screw in somewhere I can’t see annoys me, but I’d sooner have the broad vision than that because I can always get the magnifying glass out or put a very strong light on.”
2. “Choosing option of good visual field or visual acuity depends on what is more important to maintain your lifestyle of reading, driving, doing the things you are normally doing.”
3. “I suppose it depends on a person’s expectations in their lifestyle and someone who is a hermit and does lot of sewing and embroidery will probably go for acuity.”
4. “Again, you would come back to the effect on lifestyle and is field vision more important to maintain your lifestyle of reading, driving, doing the things you’re normally doing or is acuity going to be better?” |
| D Preserving vision                          | 1. “I’d like a guarantee that I’m not going to go blind before I die.”
2. “Basically, just ask me what I would like in my little life is I’d like to save my sight as much as possible in order to continue with my lifestyle.”
3. “So long as the sight is saved it is a sign of success we all agree.”
4. “Yeah, I don’t want my life to get any better, I don’t mind, it can deteriorate a bit but the thought of losing my vision.”
5. “Saving the vision protects your lifestyle, as well doesn’t it?”
6. “Keeping your sight is basically the most important thing.” |
Reduction of the burden associated with regularly administering eye-drops was considered a positive outcome of surgical treatment, although this needs to be weighed against several uncertainties of the surgery:

It is the scarring that’s the problem isn’t it, it works and then the scarring builds up so you have it taken away and then, you know, a few months later or probably a year later or so, its built up again the scar tissue.

It is notable that in the discussion of treatment development and about new surgical procedures, certainty of outcome was identified as an important and appealing potential. Some participants argued that certainty of outcome was more important to them than the scope and scale of outcome, and that they would accept less improvement if that improvement was guaranteed rather than uncertain.

A successful surgical outcome is either having an improvement of the existing condition or a sort of guarantee that it would stop the condition getting worse.

It is pertinent to reflect that in these discussions, participants reported a range of other factors (beyond treatment outcome), such as the nature of the procedure (how long, how unpleasant), the duration of treatment effect, how well-established a procedure is, and known risks and side effects. These factors might inform patients’ preference for any surgical outcome and hence the surgical procedure itself.

Participant 1: To be realistic as the glaucoma surgery is done under local anaesthesia rather than general and you are conscious, so speed is an important part, 10 min procedure under local anaesthesia is good and half an hour is bad.

Participant 2: I think, at the end of the day I wouldn’t mind how long the surgery was as long as you get best results from it.

Participant 3: I would prefer unconscious painless surgery any time for procedure longer than 15 min.

Patients were willing to undergo surgery with increased risk if their eyesight was not good:

“well if my eye sight was really bad, I’d take a big risk, if it was not too bad I wouldn’t want a big risk.”

Stable patients with a successful surgery were keen to have follow-ups at least once a year to ensure that the treatment is working. Most patients gave importance to keeping their follow-up irrespective of frequency and duration of the follow-up visits. However, they all preferred to know their review dates in advance, so they can plan accordingly.

Willingness to try new treatments
Patients expressed a willingness to try newer surgical treatments especially if it was suggested as beneficial by the clinicians. The idea of new treatments was seemingly attractive:

“Could we be kept up to date with any innovations, I mean I come on the internet and I flash my bit of paper at the consultant and then he tells me it doesn’t apply to me, but not everybody does, I mean it would be nice to know if there is something in the pipe line.”

“I think stent is a better one because its newer, its not going to be as their experience of glaucoma surgery and postoperative recovery of which they had personal experience. Patients on glaucoma eye-drops generally had limited knowledge of glaucoma surgery, and these patients discussed the importance of good IOP control to stabilise the visual fields.

In both groups, especially in the medical treatment group, surgical treatment was considered a ‘last resort’ and would consider it only when other treatment options were exhausted. Increased anxiety regarding surgical treatment was felt by patients in the medical group compared with patients in the surgical group who were going to have a repeat procedure. This was due to

**DISCUSSION**

This is the first focus group study to evaluate patients’ perception or understanding of glaucoma surgery outcomes. Previous studies to determine the impact of glaucoma on patients’ lifestyle have relied on questionnaires and surveys. The disadvantage of these methods is the lack of opportunity for patients to elaborate on their thoughts.

A concern for maintaining functional abilities and independent living influenced treatment outcome expectations, especially the sight-focused outcomes. Stable vision and visual fields were considered important and the first preferred outcomes of a successful surgery by patients to achieve a desired lifestyle; consequently, a consideration of individual lifestyle requirements in treatment planning was appreciated by the patients. Green et al have noted that self-referrals by patients in the early stages of glaucoma is a challenging aspect as patients naturally adapt to their gradually diminishing vision until they cannot cope any more, and by this time the disease would have progressed to moderate and to advanced stages; hence, early diagnosis and treatment become crucial for effective management.

Therefore, customising patients’ treatments to suit their lifestyle requirements would have positive impact on patients’ perceptions of glaucoma treatment outcomes.

IOP (in its own right) was not considered an important outcome by the patients as most of them failed to appreciate fluctuations or changes to their IOP due to their treatments. Rather stable IOP was recognised as a mediator of stable vision, which was considered an important outcome. Patients’ expectations of the surgical treatment were that it should halt the deterioration of glaucoma and ongoing treatment with eye-drops.

Several important themes that emerged from our study gave an insight into clinic visits and visual field testing from the patient’s perspective, which could help to inform patient-centred care in glaucoma. Although patients appeared frustrated by a number of aspects of their follow-up, they ultimately accepted that some compromises had to be made in order to save their eyesight. This has been demonstrated by other studies (eg, Kitzinger and Bhargava et al). Some of the viewpoints illustrated in the focus group discussions may in part explain why research-supported guidelines about more frequent visual field testing are not being implemented effectively in clinical practice. A holistic approach that embraces patients’ opinions may therefore be vital to help devise the most effective strategies for follow-up care for this chronic disease.

Differences in the themes of discussion between the medically and surgically treated focus groups were mainly noted in the categories of understanding glaucoma and understanding treatments. In the surgically treated groups, the patients discussed topics such as their experience of glaucoma surgery and postoperative recovery of which they had personal experience. Patients on glaucoma eye-drops generally had limited knowledge of glaucoma surgery, and these patients discussed the importance of good IOP control to stabilise the visual fields.

In both groups, especially in the medical treatment group, surgical treatment was considered a ‘last resort’ and would consider it only when other treatment options were exhausted. Increased anxiety regarding surgical treatment was felt by patients in the medical group compared with patients in the surgical group who were going to have a repeat procedure. This was due to
the risk of going blind from complications of surgery, weighed heavily on patients in the medical treatment group compared with patients who had previously undergone surgical treatment successfully. This experience had increased the confidence of the surgery group in the safety of the current glaucoma surgical treatments. Patients in both groups had expressed similar opinions regarding expectations from surgical treatment of glaucoma, which were mainly maintaining vision, maintaining their driving licence and independent living, and having a meaningful social life. Most of the patients considered blindness as the most important negative consequence of glaucoma surgery, and avoiding this risk for as long as possible was preferable. While it is important to acknowledge that surgery is associated with risks, the risk of blindness from modern glaucoma surgery is small. Similarly, medical treatments are not without potential complications and side effects, and may affect surgical success at a later stage. Discussion of surgery at an early stage of treatment may help to overcome the misconception that surgery is a treatment of last resort. However, the time constraints in clinical practice may make implementation of this practice difficult as the discussion to explore the risks and benefits of surgery would require additional consultation time. It was noted that different treatments did not result in differences in the expectations of outcomes, that is, patients did not want greater gains from surgery (to counteract perceived risks). Also transition from medical to surgical treatment was not associated with changes in the expectations of treatment outcomes.

This creates challenges as often newer surgical techniques have limited information on safety and efficacy and rarely have long-term success data available. This patient perspective on newer treatments is important when conducting clinical trials for new glaucoma treatments and when introducing novel procedures into practice.

Limitations
One of the major limitations of this study was the homogeneity of the study population as majority of the patients were Caucasians, above 60 years of age and residents of East Midlands, UK. It is likely that the younger service users may have differing views and experiences that also warrant investigation. Articulate, confident and motivated patients were chosen as they would contribute effectively to focus group discussions. Variable number of patients attended the focus groups; the smallest consisted of two participants due to late cancellations, but this is not a major limitation due to the adequate number of focus groups conducted in this study. Facilitators-introduced bias was minimised by taking care to adhere to the interview topic guide.

CONCLUSION
This is the first qualitative research study to evaluate patients’ perspective of the important outcomes of glaucoma surgery. While patients understand the relevance of clinical measure such as IOP control and visual field assessment, their perspectives of important glaucoma treatment outcomes are much more grounded in experience of daily living and maintenance of quality of life. Patients are not averse to considering newer surgical options but wished to have more information regarding long-term outcomes to inform their choice.

Recommendations
Patients’ perception of glaucoma surgery outcomes can mould future glaucoma consultations with patients to plan their surgical treatments. With the availability of various surgical options to manage glaucoma, the treatment plan could be customised for each patient based on their individual needs to suit their lifestyle requirements. Factors that could influence patients’ choices would be their health and fitness at the time of consultation, age, sex, social conditions, family and friend support, hobbies, driving requirements, and ability to manage independent living in the postoperative period with minimally induced disability due to surgery. Patients can be provided with details of the pathways of different treatments, including the amount of time spent in the hospital for the surgery, postoperative follow-ups required, the amount of medications and the visual recovery expected from each procedure, to allow them to make pertinent choices regarding their treatment. Following surgery, around the time of discharge, a survey could be conducted to determine how useful the patients felt this process was in order to facilitate any modifications required in the future.

Contributors BBK was the principal investigator and facilitator of the focus group study and was involved in recruiting and consenting the patients for the study. BBK transcribed and analysed the data on NVivo and prepared the manuscript. PL was a facilitator of the focus group discussions and advised on data analysis and troubleshooting NVivo software application of the qualitative data, and reviewed the manuscript. AJK conceived the study and had supervisory role, and overlooked the administration and financial aspect of the project. BBK, PL and AJK participated in its design. BBK submitted the project proposal to REC Midlands for ethics approval. BBK created a draft of the manuscript, and AJK and PL helped in editing and reviewing the manuscript. All authors have read and approved the manuscript.

Funding This work was supported by the International Glaucoma Association (IGA) (grant number 17GOY001).

Competing interests None declared.

Patient consent for publication Not required.

Ethics approval Ethics approval for this study was obtained from the REC West Midlands (REC reference number: 16WM/0172).

Provenance and peer review Not commissioned; externally peer reviewed.

ORCID iDs
Bina Bhaskar Kulkarni http://orcid.org/0000-0002-6219-1821
Anthony J King http://orcid.org/0000-0002-3091-911X

REFERENCES
1 Bunce C, Wormald R. Leading causes of certification for blindness and partial sight in England & Wales. BMC Public Health 2006;6.
2 Quartillo A, Simkiss P, Ezekle A, et al. Leading causes of certifiable visual loss in England and Wales during the year ending 31 March 2013. Eye 2016;30:602–7.
3 Garway-Heath DF, Crabb DP, Bunce C, et al. Latanoprost for open-angle glaucoma (UKGTS): a randomised, multicentre, placebo-controlled trial. Lancet 2015;385:1295–304.
4 Haymes SA, LeBlanc RP, Nicolela MT, et al. Risk of falls and motor vehicle collisions in glaucoma. Invest Ophthalmol Vis Sci 2007;48:1149–55.
5 Ang GS, Eke T. Lifetime visual prognosis for patients with primary open-angle glaucoma. Eye 2007;21:604–8.
6 Haymes SA, LeBlanc RP, Nicolela MT, et al. Glaucoma and on-road driving performance. Invest Ophthalmol Vis Sci 2008;49:3035–41.
7 Glen FC, Crabb DP, Smith ND, et al. Do patients with glaucoma have difficulty recognizing faces? Invest Ophthalmol Vis Sci 2012;53:3629–37.
8 Burton R, Saunders LI, Crabb DP. Areas of the visual field important during reading in patients with glaucoma. Jpn J Ophthalmol 2015;59:94–102.
9 Burton R, Smith ND, Crabb DP. Eye movements and reading in glaucoma: observations on patients with advanced visual field loss. Graefes Arch Clin Exp Ophthalmol 2014;252:1621–30.
10 Maier FC, Funk J, Schwarzer G, et al. Treatment of ocular hypertension and open angle glaucoma: meta-analysis of randomised controlled trials. BMJ 2005;331.
11 The advanced glaucoma intervention study (AGIS): 7. The relationship between control of intraocular pressure and visual field deterioration. The AGIS Investigators. Am J Ophthalmol 2000;130:429–40.
12 King A, Azuara-Blanco A, Tuulonen A. Glaucoma. BMJ 2013;346:f3518.
13 Leighton P, Lonsdale AJ, Tildesley J, et al. The willingness of patients presenting with advanced glaucoma to participate in a trial comparing primary medical vs primary surgical treatment. Eye 2012;26:300–6.
14 Lichter PR, Musch DC, Gillespie BW, et al. Interim clinical outcomes in the Collaborative initial glaucoma treatment study comparing initial treatment randomized to medications or surgery. Ophthalmology 2001;108:1943–53.
Clinical science

15 Gedde SJ, Schiffman JC, Feuer WJ, et al. Treatment outcomes in the tube versus trabeculectomy (TVT) study after five years of follow-up. Am J Ophthalmol 2012;153:789–803.

16 King AI, Fernie G, Azuara-Blanco A, et al. Treatment of advanced glaucoma study: a multicentre randomised controlled trial comparing primary medical treatment with primary trabeculectomy for people with newly diagnosed advanced glaucoma-study protocol. Br J Ophthalmol 2018;102:922–8.

17 Gazzard G, Konstantakopoulou E, Garway-Heath D, et al. Laser in glaucoma and ocular hypertension (light) trial. A multicentre, randomised controlled trial: design and methodology. Br J Ophthalmol 2018;102:593–8.

18 Kitzinger J. The methodology of focus groups: the importance of interaction between research participants. Sociology of Health and Illness 1994;16:103–21.

19 Kitzinger J. Qualitative research. Introducing focus groups. BMJ 1995;311:299–302.

20 Bhargava JS, Bhan-Bhargava A, Foss AJE, et al. Views of glaucoma patients on provision of follow-up care; an assessment of patient preferences by conjoint analysis. Br J Ophthalmol 2008;92:1601–5.

21 Bhargava JS, Patel B, Foss AJE, et al. Views of glaucoma patients on aspects of their treatment: an assessment of patient preference by conjoint analysis. Invest Ophthalmol Vis Sci 2006;47:2885–8.

22 Medeiros FA, GraCiTelli CPB, Boer ER, et al. Longitudinal changes in quality of life and rates of progressive visual field loss in glaucoma patients. Ophthalmology 2015;122:293–301.

23 McBane-Cowdin R, Wang Y, Wu J, et al. Impact of visual field loss on health-related quality of life in glaucoma: the Los Angeles Latino eye study. Ophthalmology 2008;115:941–8.

24 Green J, Siddall H, Murdoch I. Learning to live with glaucoma: a qualitative study of diagnosis and the impact of sight loss. Soc Sci Med 2002;55:257–67.

25 Glen FC, Baker H, Crabb DP. A qualitative investigation into patients’ views on visual field testing for glaucoma monitoring. BMJ Open 2014;4:e003996.

26 Wong TT, Kwah PT, Aung T, et al. The Singapore 5-fluorouracil trabeculectomy study: effects on intraocular pressure control and disease progression at 3 years. Ophthalmology 2009;116:175–84.

27 Broadway D, Hitchings R. Conjunctival damage induced by long-term topical anti-glaucoma therapy. Acta Ophthalmol Scand 1996;74.

28 Carlsen B, Glenton C. What about N? A methodological study of sample-size reporting in focus group studies. BMC Med Res Methodol 2011;11.

29 Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. Int J Qual Health Care 2007;19:349–57.