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Complete List of Authors:	Jones, Lee; City University, Optometry and Vision Science; Birmingham Institute for Glaucoma Research Taylor, Deanna; City University London, Division of Optometry and Visual Science, School of Health Sciences Sii, Freda; Birmingham Institute for Glaucoma Research; Queen Elizabeth Hospital Birmingham Masood, Imran; Queen Elizabeth Hospital Birmingham; Birmingham and Midland Eye Centre Crabb, David; City University London, Optometry and Visual Science Shah, Peter; Birmingham Institute for Glaucoma Research; Queen Elizabeth Hospital Birmingham
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Title:

Surgeon experiences of Only Eye Surgery (OnES): Emerging themes and recommendations for patient safety

Authors:

Lee Jones, MRes^{1;2}, Deanna J. Taylor, PhD¹, Freda Sii, MBBS^{2;3}, Imran Masood, FRCOphth^{3;4}, David P. Crabb, PhD¹, Peter Shah, FRCOphth^{2;3}

Corresponding Author:

Lee Jones, City, University of London, Northampton Square, London, EC1V 0HB, United Kingdom. Email: lee.jones@city.ac.uk

Affiliations:

1. Division of Optometry and Visual Science, School of Health Sciences, City, University of London.
2. Birmingham Institute for Glaucoma Research, Institute of Translational Medicine
3. Queen Elizabeth Hospital Birmingham, University Hospitals Birmingham NHS Foundation Trust
4. Birmingham Midland Eye Centre, Sandwell and West Birmingham Hospitals NHS Trust, Birmingham

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ABSTRACT

Objectives: Performing surgery on patients with only one seeing-eye presents unique challenges for the ophthalmic care team where complications may result in catastrophic vision loss. There is currently no evidence regarding how surgeons augment their care when treating only eye patients, and no guidelines for how these patients should be managed in hospital eye services. This study aimed to explore ophthalmic surgeons' experiences of only eye surgery and perceptions of current practice.

Design & participants: Ten ophthalmic surgeons were asked to relate their experiences and views on performing only eye surgery in in-depth semi-structured interviews. Interviews were audio-recorded and transcribed. Qualitative data were subjected to thematic analysis to identify key themes.

Setting: Hospital eye service.

Results: Five key themes emerged relating to surgeons' experiences and perceptions of only eye surgery: (1) consent, (2) strategies for risk reduction, (3) training, (4) mentorship, and (5) emotional impact. Recommendations for improving the surgical journey for both patient and surgeon related primarily to better recognition and understanding of the complexities inherent with only eye surgery.

Conclusions Outcomes of only eye surgery may be improved through a number of methods, including development of purpose-designed training fellowships, adoption of stress-reducing strategies, and enhancement of available support services. The findings identify emerging themes unique to only eye surgery and the need for guidelines on the provision of care for these high-stakes surgical patients.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- This is the first study to qualitatively investigate surgeons' experiences of performing only eye surgery.
- Semi-structured interviews gave the opportunity to gain knowledge about a wide range of aspects of only eye surgery.
- The broad range of identified themes provide a basis for further evidenced-based research.
- Limitations include a relatively small number of surgeons interviewed who were all glaucoma surgeons.

INTRODUCTION

All ophthalmologists will have patients under their care who have effectively only one seeing-eye. The fellow eye may have suffered severe vision loss from causes including trauma, surgical complications and advanced disease, or may have long-standing poor visual function from dense amblyopia. Patients with one seeing-eye ('only eye') are always a concern for their ophthalmologists, but particularly when the better-seeing eye requires surgical intervention. This better eye may, for example, have sight-threatening glaucoma or may have an urgent problem such as severe, uncontrolled intraocular pressure, acute macula-threatening retinal detachment, or a slowly progressive, non-urgent problem such as cataract. In moving into a surgical zone, both patient and surgeon are faced with the fact that surgical complications may result in sudden, total and permanent loss of vision, with life-changing consequences. Loss of vision in an only (i.e. 'better') eye can have a significant impact on patients' quality of life (QoL) ⁽¹⁻⁷⁾. It is for this reason we believe that only eye surgery is appropriately considered 'high-stakes' surgery.

Incisional ocular surgery, such as trabeculectomy for glaucoma, generally carries a low complication incidence rate ⁽⁸⁾. Yet, sight-threatening complications, such as postoperative infection and haemorrhage cannot be discounted, and unfortunately do occur following these procedures ⁽⁹⁾. Such incidents have been reported in only eye surgery ^(10, 11). Researchers have recognised the unique impact of ophthalmic surgery on patients' psychological wellbeing ^(12, 13). Indeed, only eye patients are often particularly fearful, citing blindness and surgical complications as primary concerns ⁽¹⁴⁾. Furthermore, perceived stress amongst surgical staff is heightened when operating on complex or high-risk patients ⁽¹⁵⁾, and only eye surgery often fits both these criteria. Thus, research into how surgeons approach only eye surgery, such as strategies for risk reduction, is warranted. Surgeons can provide valuable insight into the realities of performing these high-stakes procedures, the challenges to overcome, potential strategies for effective coping, and service delivery issues. The purpose of this study was to explore ophthalmic surgeons' experiences of only eye surgery, with the aim to improve the journey for both patient and surgeon, and to identify factors that could enhance surgeon resilience.

METHODS

Sampling and recruitment

As this study adopts an inductive approach, we do not seek generalisability based on large sample sizes, but rather the appropriateness of the sample to yield a meaningful balance between thick data, and rich data ⁽¹⁶⁾. Therefore, we conducted interviews with ten ophthalmic surgeons (See Table 1.). Purposive sampling was used whereby surgeons who were known to perform only eye surgery were invited to participate. Ten surgeons were approached, all of whom agreed to participate.

There are currently no standardised definitions for what constitutes an only eye, but when considering from both patient and surgical perspective, one could use characteristics that focus on impact of loss of the eye. The practical working-definition used for this study was: "An eye where significant loss of vision in this eye would be deemed life-changing with profound impact on the QoL by both the patient and surgeon". The vision in the fellow eye (usually <3/60 or worse +/- end-stage visual field loss) was considered insufficient to maintain the patient's current independent life-style and visual QoL. Loss of the only eye would likely result in substantial impact on areas such as occupation and potentially result in need for long-term social care, or have significant impact on family members required to help with caregiving.

Table 1. Participant characteristics listed in order of interview date.

ID	Sex	Speciality	Level of training	Location
P1	Male	G; AS	Consultant	UK
P2	Male	G; AS	Consultant	Non-UK
P3	Male	G; AS	Consultant	Non-UK
P4	Male	G; AS	Consultant	UK
P5	Male	G; AS	Consultant	Non-UK
P6	Male	G; AS	Consultant	UK
P7	Female	G; AS	Specialist registrar	UK
P8	Female	G; AS	Consultant	UK
P9	Female	G; AS	Consultant	Non-UK
P10	Male	G; P	Consultant	UK

Key. G = glaucoma, AS = anterior segment, P = paediatric

Data collection

The study was approved by the London - Chelsea Research Ethics Committee (Ref: 17/LO/1664) and conformed to the tenants of the Declaration of Helsinki. Consent from all participants was obtained prior to interview. Semi-structured, audio-recorded, face-to-face interviews were conducted by a male university-based PhD researcher (LJ) trained in collecting qualitative data. Details of the interview topic guide development are shown in Figure 1. Data were collected between November 2017 and April 2018. Median (Interquartile range) interview duration was 35 (31-40) minutes. Interviews were primarily carried out one-to-one in clinic rooms within the hospital eye service. The researcher corresponded with participants via email and telephone during recruitment and had met some previously through patient and public involvement (PPI) events.

<Figure 1 here>

Patient and Public Involvement

This study reports findings from surgeon interviews in the Only Eye Study (OnES). The OnES is a series of research projects investigating experiences of only eye surgery, and results of patient interviews will be described in a subsequent report. As described in Figure 1, patients with experience of only eye surgery were included in the advisory group who helped to develop the interview topic guide for this study. Following data analysis, a 'Bridging the Gap' event was hosted at Queen Elizabeth Hospital Birmingham which gave the opportunity to disseminate the research findings amongst surgeons, patients, and their carers.

Data management and analysis

The study was designed and reported following the guidance of the Consolidated Criteria for Reporting Qualitative Research (COREQ)⁽¹⁷⁾. Interviews were coded with manual and computer-based methods (NVivo V.11 [QSR International, Cambridge, Massachusetts, USA]) using thematic analysis⁽¹⁸⁾. Two members of the research team (LJ and DJT) read and re-read the transcripts and independently developed preliminary codes based on impressions of recurring themes. Inter-rater reliability was assessed using the kappa coefficient (κ) and was acceptable between the two coders, $\kappa = 0.46$. Following individual interpretation, the authors met to reflect on the entire interview data and discuss differences of opinion regarding themes. Once in agreement of the meaning of quotes and suitability of coding choices, a coding framework was created where several emerging themes were identified.

RESULTS

Five key themes emerged relating to: 'Consent'; 'Strategies for risk reduction'; 'Training'; 'Mentorship'; and 'Emotional impact'. Quotes taken from the transcripts are italicised and illustrate key themes that came from the interviews. All excerpts are annotated with a code given to the corresponding surgeon. Additional quotes are provided in Appendix 1.

Consent

Participants described concerns regarding consent and discussion of material risk in only eye surgery. While participants agreed that consent prior to only eye surgery is essential, there were differences regarding how extensive the information provided should be. In

1
2
3 some cases, participants expressed the importance of sufficiently disclosing the risks
4 involved with treatment, and that consent should be focused on what is material to the
5 patient.
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9 *The patient needs to know and understand what it means to be totally blind. If the*
10 *patient does go blind and they're not fully aware of what it means to be totally blind,*
11 *they'll be extremely distraught. (P4)*
12
13

14
15 *There are risks with this surgery, and you talk about the risks, including that the*
16 *operation itself might tip them over the edge and make them lose their vision. (P6)*
17
18

19 Yet, some participants described aversion to placing too much emphasis on potential for
20 total vision loss in only eye surgery, suggesting that it can be counter-productive to focus
21 on possible negative outcomes of surgery.
22
23

24
25 *You don't want to really hammer home the point that this is their only eye because*
26 *they're already anxious, and most people are aware if they had a complication in*
27 *their only eye the stakes are much higher. So I don't think it's useful or necessary to*
28 *dwell on it too much. (P7)*
29
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31

32
33 Moreover, participants explained that some patients appear to prefer not to know about
34 risks of surgery.
35
36

37 *There are patients who don't want to take part in that decision; they leave it entirely*
38 *into your own hands. That's fair; that's good enough. (P5)*
39
40

41 Participants explained how they attempt to demonstrate risks of surgery to patients.
42 Practical techniques used to exemplify what life might be like for the patient if the surgery
43 was unsuccessful were described.
44
45

46
47 *We patch them up for three hours in clinic and we sit them outside so they are totally*
48 *blind. So they've been totally blind for three hours when we consent them. (P1)*
49
50

51 The idea of a dual consent process was described, whereby a second or third opinion is
52 sought before agreement to proceed. It was suggested that dual consent can help the
53 patient's decision to proceed with surgery, and reassure the surgeon if their colleagues
54 agrees intervention is needed.
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3 *We're increasingly doing dual consenting. Patients that are high-risk only eye, it's*
4 *always useful if you've got two people doing consent. Certainly, joint clinics and*
5 *multi-disciplinary clinics allow for the opportunity. (P4)*
6
7
8

9 **Strategies for risk reduction**

10
11 Participants gave details about strategies they incorporate in only eye surgery to
12 optimise outcomes. Several pre-operative strategies were highlighted, typically
13 regarding logistics. One strategy was to ensure availability of correct and optimal surgical
14 instruments. One strategy was to ensure availability of correct and optimal surgical
15 instruments.
16
17

18
19 *If you don't ask for the best instruments you will get given an average set, which*
20 *usually has one or two things broken. There'd be a limited number of perfect*
21 *instrument sets within the theatre, so I have to make sure that I've got those. I have*
22 *a special only eye tray only I'm allowed to use. It's called the only eye tray. (P1)*
23
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25
26

27 Another method was for the surgeon to adopt physical and mental relaxation techniques,
28 such as task visualisation, whereby the surgical procedure is visualised and mentally
29 performed prior to surgery.
30
31

32
33 *I will visualise the steps that I will go through. Visualise what may go wrong, and*
34 *what I will do to undo that. I visualise even the routine, the basic steps. (P8)*
35
36

37 A positive and optimistic attitude before operating was also considered a benefit in only
38 eye procedures.
39

40
41 *If you think, I'm going to do that case successfully and it'll be great, I think you'd feel*
42 *a lot better than if you think: oh imagine if I have a complication. (P7)*
43
44

45 In other instances, surgeons relied on faith in order to cope with the stresses of surgery.
46

47
48 *Before I operate, I pray. I take on very difficult and crazy cases where sometimes I'll*
49 *be doing this surgery for the first time in my life. I do it because I have faith, and I*
50 *pray, and I believe God helps me. (P4)*
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54 One suggestion for reducing risk intra-operatively was to ensure only eye patients were
55 operated on by teams of highly experienced surgeons, rather than a single surgeon.
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3 *There's been instances where another surgeon being there has made a crucial*
4 *difference to the outcome, because they've spotted things that I may not have spotted*
5 *because I was busy with something else. (P4)*
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7

8
9 Yet, the consensus was that only eye patients are often operated on by just one surgeon.
10

11 *It's a good idea to do difficult cases together, but because our outcomes are usually*
12 *not lethal, it's not about life or death, we can't finance a second surgeon. (P3)*
13

14 *In many branches of surgery, high-risk cases where the impact of failure is massive,*
15 *are done by two surgeons, or teams of surgeons. In ophthalmology often there's just*
16 *one surgeon. I wonder if we are missing something just because it's a small organ.*
17 *(P1)*
18
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21
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23 Participants also expressed preference for avoiding this approach, and warned of
24 potential hazards of high-stakes procedures being performed by teams.
25

26 *I wouldn't prefer having someone around in the same operating theatre for moral*
27 *support. On the contrary, I think I'd be distracted. (P5)*
28
29
30

31 Finally, participants discussed post-operative strategies for risk reduction. Frequent and
32 timely follow-up appointments were often scheduled for only eye patients. In addition,
33 the issue of failure to rescue an only eye from surgical complications was addressed, with
34 suggestion for a protocol to reduce post-operative threats to only eye patients.
35
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38

39 *You do more when you know it's an only eye. That's not to say you care less [in non-*
40 *only eye surgery]. But knowing it's an only eye, you just add extra steps. In the follow-*
41 *up, you see them sooner, more frequently. (P8)*
42
43
44

45 *A lot of times, things go wrong because of a failure to rescue a simple problem. If an*
46 *only eye patient has problems following surgery, they need to be seen by a senior*
47 *doctor, and that should be part of the protocol in a hospital (P4)*
48
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50

51 **Training**

52

53 Many participants correlated lack of surgical experience with concerns about care
54 provision for only eye patients. For example, senior surgeons expressed doubt that the
55 current training programme in ophthalmology provides sufficient exposure to high-
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1
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3 stakes patients. One explanation for this dearth in experience was increased time
4 restrictions on surgical activity.
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6
7 *The trainees are not getting the training. The number of cases are dropping, they are*
8 *shortening the number of training years, so trainees are being compressed in both*
9 *ways. (P8)*
10
11

12
13 Time restrictions were perceived to have ramifications for future aptitude and resilience
14 of ophthalmologists-in-training.
15

16
17 *Looking at the last five years, I can't think of a single trainee who I feel had the*
18 *necessary technical ability, bravery, and surgical resilience to be safely allowed to do*
19 *these cases. I wonder what's going to happen when they become young consultants.*
20 *I don't think they will have the necessary skill set. (P1)*
21
22

23
24 *They will become a consultant with probably less than 50% experience as the*
25 *previous generation, so that will be a problem. (P8)*
26
27

28
29 There was a consensus that hospital eye services delegate only eye patients to
30 experienced staff only.
31

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33 *The head of the department or the Medical Director would do all the only eyes*
34 *themselves, just to take responsibility for it. (P3)*
35
36

37
38 *You wouldn't want a trainee doing an operation on an only eye, that would be*
39 *inappropriate and I think we'd be doing the wrong thing by the patient if that was*
40 *the case. (P10)*
41
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43
44 Participants believed more needs to be done to prepare ophthalmologists-in-training for
45 only eye procedures. There were recommendations on overcoming this issue, such as
46 specialised training programmes for only eye care.
47

48
49 *It's important we identify the best people and they are given focused training,*
50 *focused mentoring by senior surgeons who do that kind of surgery, and gradually get*
51 *them to that level. In this kind of surgery, you've got to get the best people, because*
52 *patients only have one chance. (P4)*
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56 57 **Mentorship**

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3 Participants emphasised that becoming a successful only eye surgeon relies heavily on
4 good mentorship. On several occasions, participants stressed the value of having a
5 mentor for transferring knowledge to assist in personal, professional, and educational
6 development.
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10
11 *You need to be a good surgeon to do only eyes with confidence, and that means you*
12 *need to have good teachers, who teach more than just the technique. A good mentor,*
13 *I would say is key. (P3)*
14

15
16
17 *Everyone needs to have a good mentor who can advise them, I think that's probably*
18 *the most important thing. My advice to anyone who does only eye surgery is to find*
19 *a mentor who's been doing this kind of surgery, talk to them, learn from them, how*
20 *they approached it. (P4)*
21
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23

24 Yet, a barrier to effective mentoring was time commitment issues, where there was
25 advocacy for formal recognition of mentoring programmes to alleviate these constraints.
26
27

28
29 *If trainees have a mentor who has been through lots of things, they can come through*
30 *for support when things don't go right. But obviously that role has to be recognised.*
31 *(P8)*
32
33

34 **Emotional impact**

35
36
37 Amongst our participants, some had experienced 'losing' an only eye, resulting in
38 catastrophic loss of vision for the patient. In these cases, participants described being
39 burdened with a sense of personal responsibility, and expressed how they have
40 shouldered the blame.
41
42
43

44
45 *We lost a true only eye, he went blind. It doesn't leave you, I still feel like I could have*
46 *done something different. I feel like if the time was slightly different, if we weren't so*
47 *stressed, if we weren't so under pressure, I think we would have said there's*
48 *something not right. I still feel partly responsible for him. (P8)*
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51

52 Participants expressed concern over how losing an only eye would affect their career and
53 the psychological sequelae of such an event.
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56
57 *I'm lucky not to have had an only eye disaster, yet. I'll probably remember that for*
58 *the rest of my life. (P10)*
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3 Participants described how they have witnessed changes in colleagues' demeanour after
4 adverse events following only eye surgery.
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7 *Colleagues who've gone through that experience, you can see it in their face and their*
8 *body language how damaging it can be. At your hands a life-changing event for the*
9 *worse has occurred. That immediacy, actually, is one of the unique burdens of being*
10 *a surgeon. (P10)*
11
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14
15 *For some of them, it will haunt them and they might not ever perform at their peak*
16 *again. (P8)*
17
18

19 There was recognition of the need for systems to support surgeons after losing an only
20 eye.
21
22

23 *There needs to be a better support mechanism. If someone has lost an only eye and*
24 *they're distraught by it, they need a mentor to talk to, someone who has lost an only*
25 *eye. (P4)*
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28

29 Yet, many perceived a lack of pathways to find professional support services in the event
30 of losing an only eye. Participants also noted barriers to seeking out such services.
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33 *There's no guidance on how surgeons can seek help for themselves when incidents*
34 *like this happen. (P8)*
35
36

37 *We're very busy. We don't have time to do that [seek support services]. Something*
38 *else would have to give. (P6)*
39
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41
42 *The thing is, we're too busy. That's taking time up and it's not strictly urgent. It can*
43 *be pushed to the bottom of the pile, even though I don't think that's the right thing*
44 *to do. (P7)*
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DISCUSSION

Surgery on an only eye can be described as high-stakes; if unsuccessful, patients may become blind for the rest of their lives. As such, only eye surgery can be challenging for surgeons and the ophthalmic care team. We sought to explore ophthalmic surgeons' experiences of performing high-stakes procedures on patients with only one seeing-eye.

Our findings highlight differences in how surgeons disclose material risks in only eye surgery. Participants stressed importance of patients' understanding of risks of surgery, regardless of how unlikely adverse outcomes may be. Yet, other participants voiced concerns over a heavy focus on risks of vision loss, as surgery is generally successful. This discordance is pertinent given the landmark change in the position of the Supreme Court regarding informed consent ⁽¹⁹⁾. Until recently, the UK Supreme Court followed the principles of the Bolam Test. Such principles state that, in the event of surgical complications, a surgeon would not be deemed negligent if they had acted the same way other competent surgeons would have ⁽²⁰⁾. However, this paternalistic approach to medicine is no longer tolerated, as demonstrated by the introduction of the Modified Montgomery Test ⁽²¹⁾. This standard of care obliges surgeons to provide sufficient information to patients, including disclosure of risks of proposed treatment. In medicine, there is concern over the use of a 'one-size-fits-all' approach applied to heterogeneous populations ⁽²²⁾. For example, greater material risk should be attached to surgery on an only eye, as opposed to the same surgery on a patient with good bilateral vision. Yet, participants expressed aversion to appearing pessimistic when discussing surgical risks, a belief in contrast to the principles of the Modified Montgomery Test. Methods of demonstrating risks of only eye surgery included occlusion of the only eye. Our results indicate variances between surgeons regarding discussion of material risks in only eye surgery, suggesting the principles of the Modified Montgomery Test are yet to be fully recognised in this area of ophthalmology.

Our study has notable findings regarding minimising risk in only eye surgery. One risk reduction strategy was to ensure all surgical equipment was of highest possible quality. Quality control exercises highlight a strikingly high percentage of defective surgical instruments delivered to UK hospitals ⁽²³⁾, and operating room incidents with potential to affect quality of care are most commonly equipment-related ⁽²⁴⁾. Indeed, Surgical environments are often busy and surgeons are rarely afforded time to optimise

1
2
3 all possible variables prior to surgery, and even meticulous scrutiny will not eliminate
4 risk. Yet, optimal instruments was deemed an important pre-operative strategy to
5 minimise risk in this study. There is advocacy for patients requiring specialised care, such
6 as only eye patients, to be managed under larger, high-volume hospitals, where they are
7 more likely to be treated using the most cutting-edge equipment ⁽²⁵⁾. However,
8 consideration must be given to what is the most suitable arrangement for the patient. Our
9 results raise the question as to whether specialised resources are required for treatment
10 of only eye patients.
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18 It was acknowledged that only eye procedures can be particularly stressful events
19 for surgeons. Self-reported anxiety is typically higher when the procedure is high-stakes
20 ⁽¹⁵⁾. Stress reducing strategies, such as mental imagery, optimistic attitude, and spiritual
21 activities, were described as a means of reducing performance anxieties and bolstering a
22 relaxed mental state before surgery. Psychological relaxation strategies are reported to
23 enhance surgical performance ⁽²⁶⁾. Moreover, evidence indicates that surgeons who
24 undertake mental skills training have better outcomes on measures of anxiety ⁽²⁷⁾. Our
25 results identify coping strategies used by surgeons before only eye surgery to optimise
26 performance during stressful situations.
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34 Our findings introduced the concept of only eye surgery being performed by two
35 or more surgeons. This intra-operative strategy for risk reduction was described as an
36 opportunity for another expert to critique the procedure, in an attempt to ensure nothing
37 is missed. However, some participants perceived this approach to be counter-productive,
38 suggesting team procedures can lead to adoption of more risk-averse or overly foolhardy
39 behaviours. The advocacy for only eye procedures performed by two or more surgeons
40 echoes how exceptional cases are managed in other fields of medicine, such as
41 cardiothoracic surgery. In this specialty, implementation of a Star Chamber, whereby
42 surgeons refer complex or high-stakes patients to the Star Chamber who assess what the
43 patient should be offered, has been used in an attempt to improve surgical outcomes ⁽²⁸⁾.
44 If the Star Chamber recommend surgery, it is a requirement that the procedure is
45 performed by a minimum of two consultants. Other disciplines in the UK are considering
46 implementation of a Star Chamber ⁽²⁹⁾, however there appears to be no such movement
47 in ophthalmology. Yet, such initiatives as the Star Chamber may help to minimise intra-
48 operative risks during only eye surgery.
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Participants reported following only eye patients up closely post-operatively, scheduling more frequent appointments to ensure that complications are quickly addressed. In only eye surgery, an appropriate and timely response is essential to prevent failure to rescue. Though many participants reported closer follow up of only eye patients, evidence suggests that patients with monocular vision undergoing surgery on their only eye do not receive more telephone calls or clinic visits pre or post-operatively⁽³⁰⁾. Analysis of doctor-patient interaction, such as time spent in clinic, may provide useful information regarding differences in follow-up patterns between only eye and non-only eye patients; this would be an interesting avenue for future research.

Participants described how medical training in the UK has experienced dramatic reform, and expressed concerns over how this may affect standards of care in ophthalmology. Changes in educational theory⁽³¹⁾, and the European Working Time Directive⁽³²⁾ have limited training opportunities for ophthalmologists-in-training. As a result, procedures such as trabeculectomy feature less often in trainees' timetabled clinical activity⁽³³⁾. Work-hour restrictions and a demise of the 'mentor' model in medical training may have damaging consequences for acquisition of technical skills and surgical resilience⁽³⁴⁾. Indeed, consultant surgeons have reported concerns over capabilities of the newer generation of trainees and how this may impact patient care⁽³⁵⁾. Although progress in technology has led to the advent of valuable training opportunities, such as 'wet-lab' simulations⁽³⁶⁾, such environments are unable to mimic the true reality of operating on a patient's only eye. Participants stressed the essentiality of combatting these training barriers, and gave suggestions for purpose-designed training programmes for complex procedures. Such programmes may enable appropriate access to high-stakes patients and nurture the learning processes for ophthalmologists-in-training. This finding spotlights concerns with surgical training in ophthalmology, a problem first identified almost two decades ago⁽³⁷⁾. If this trend continues, there may be necessity for specific training fellowships to gain clinical competency, and we propose that only eye training must not be overlooked.

Another emerging theme was the importance of mentoring in only eye surgery. Participants described how a good mentor has helped them to become an effective only eye surgeon. Typically, a mentor will be a senior member in the field who guides a trainee professionally and personally by facilitating learning through observation and modelling

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3 (34). There is concern that mentoring has become a lost art in medicine (38), and
4 participants in our study explained that a mentor can offer significant support when
5 caring for only eye patients, and formal recognition of mentoring may be needed. In line
6 with previous research, our results highlight barriers to mentorship as a lack of formal
7 recognition of the role, resulting in time commitment issues and a scarcity of appropriate
8 mentors (39). Fostering of strong relationships between mentor and trainee could play a
9 crucial role in alleviating concerns raised in this study about training in ophthalmology
10 and only eye surgery.
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18 A number of participants had experienced losing an only eye, resulting in total
19 extinction of vision for the patient. Participants described their responses to these
20 incidents and how the psychological sequelae have impacted their career. A recurring
21 sense of personal responsibility and blame was reported, and participants remarked on
22 lack of formal support for surgeons when unpredicted outcomes occur. In medicine, the
23 term 'second victim' was coined to recognise that the surgical team may suffer in the
24 event of negative outcomes (40). Often, long-lasting emotional distress of such outcomes
25 will affect all members of the patients' healthcare team, including surgeons, nurses, and
26 allied healthcare professionals (41). Proposals have outlined the needs of the second
27 victim, which include entitlement to psychological support services (42), though our
28 participants perceived a lack of avenues to seek professional support after losing an only
29 eye. Lack of time is a primary barrier to uptake of support services (43). However, growing
30 attention is being placed on the mental wellbeing of surgeons (44), and the importance of
31 such support services as the Practitioner Health Programme is being realised (45). Still, a
32 large number of UK hospitals remain without a policy for staff mental health support (46).
33 Participants in our study perceived a lack of options for support in the event of poor
34 outcomes in only eye surgery, reflecting lack of recognition and understanding of the
35 second victim phenomenon in ophthalmology.
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51 Many fields of medicine have adopted multi-disciplinary teams to manage
52 complex conditions. Our study suggests that only eye surgery might benefit from being
53 performed by teams of surgeons experienced in ophthalmic surgery, as well as in the
54 psychological preparation of patients and surgeons. Furthermore, these teams should
55 have the resources to identify, develop, and mentor inexperienced surgeons in order to
56 succession plan and ensure skill levels are maintained. National guidelines for teams
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3 performing only eye surgery should be drafted to ensure that the risk of total blindness
4 is reduced as far as possible.
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8 This study is the first of its kind in ophthalmic surgery. By adopting a qualitative
9 approach, important themes have emerged which provide an excellent basis for further
10 work. Our participants worked in a variety of geographical locations, thus a limitation is
11 that differing work cultures may restrict the comparability between experiences.
12 However, this can be considered a strength as we were able to capture the wide range of
13 surgeons' experiences, including strategies which may be transferrable between
14 countries and institutions. The study is limited in that a small number of surgeons were
15 interviewed and they were all experienced glaucoma surgeons. This may be due to the
16 nature of glaucoma in that there may be a greater proportion of patients who are only
17 eyed, particularly in complex glaucoma practices. It is important that future studies
18 consider views of less experienced surgeons.
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27 **CONCLUSIONS**

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29 The implications of losing an only eye are massive for both patient and surgeon. This
30 study clearly identifies important themes that are of great relevance to surgeons who
31 perform only eye surgery. These include risk management, training, psychology and
32 mentoring. Further evidence based studies are needed in each of these areas to clearly
33 define best practice and inform guidelines to enable a safe and seamless patient journey.
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42 guide, and the surgeons who provided their valuable time and thoughts in the study
43 interviews.
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47 **CONTRIBUTIONS**

48
49 LJ performed study design, data collection, data analysis, and manuscript preparation.
50 DJT performed data analysis and manuscript critique. FS performed data analysis and
51 manuscript critique. IM performed data analysis and manuscript critique. DPC performed
52 study design and manuscript critique. PS performed study design, data analysis, and
53 manuscript critique.
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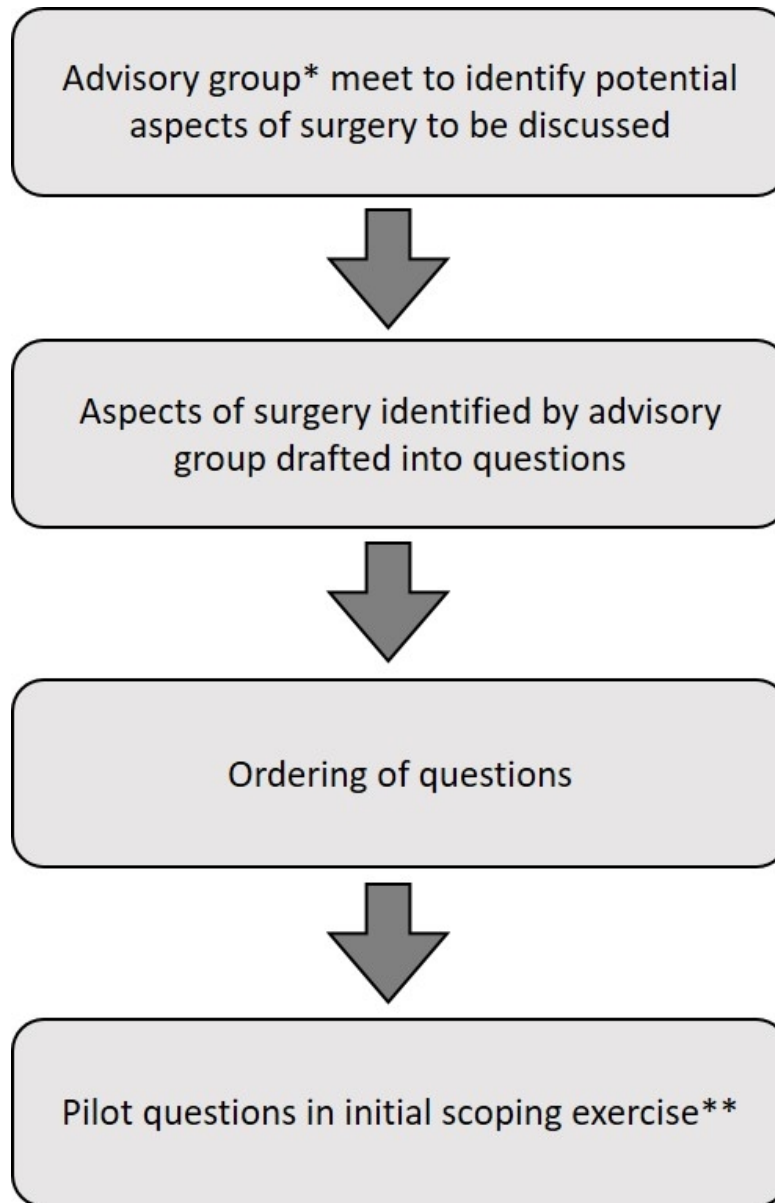


Figure 1. Process of interview topic guide formation. *Advisory group consisted of only eye patients, consultant ophthalmologists, ophthalmologists-in-training, a psychologist, an ophthalmic research nurse, and established researchers in the field of ophthalmology. **Scoping exercise consisted of a preliminary pilot interview where suitability of interview questions was assessed.

41x64mm (300 x 300 DPI)

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3 **Appendix 1. Additional quotations**
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Key theme	Quotation
<p>5 6 <i>Consent</i> 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27</p>	<p><i>It's really important that only eye patients know that when you go under the knife, although the risk is very small, there is a risk you will end up totally blind. We actually have to articulate it in those words. We're advised against using words like loss of vision, because loss of vision to one person might be one line on the chart, loss of vision for another person might be total. The issue is you have to communicate what the material risk is. If the material risk is blindness, you have to communicate it. We have to articulate total extinction of vision, and I think that's absolutely right and very important. (P1)</i> ** <i>We need to give them the information they need to make a decision for themselves. Therefore one of the things I do in clinic, the eye you are going to operate on, the only eye, you cover it, so you show the patient what it means. If a catastrophic complication happened, what would that mean for the patients' vision? It means that they won't be able to see anything. (P4)</i></p>
<p>28 <i>Strategies for risk reduction</i> 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46</p>	<p><i>I just think one step at a time. People have talked about this, sporting professionals in particular, positive imagery, so they think about how it would feel to score a goal, that kind of thing. (P7)</i> ** <i>I think if you throw any two surgeons together, it might not work. There has to be a high level of trust and respect. You have to be happy to admit your own failings in front of the other person. It's quite an intimate relationship, really, and not something that happens easily. There is a danger, two surgeons can become more brave and foolhardy than one surgeon, and almost be more reluctant to say, no,</i></p>

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I don't think we should do that. It's too risky. There can be this bravado kick in. That can be dangerous for patients. (P10)

I'll see them sooner, often at the next clinic I can. If the [intraocular] pressure is fine, they can go. I'd probably want to see them myself in clinic. (P6)

Training

One of the things that generally is consultant only is only eye [surgery]. I think we try to protect our trainees as much as possible. But there has to be a tipping point where they're going to have to deal with it at some stage. (P2)

What you do not want is get to the end of your training, become a consultant, and then all of a sudden be tasked to operate on one of those cases. (P7)

Only eyes get delegated to the most senior surgeon on the list, and I think rightly so, because although the risks for only eye are identical to any other eye, the risks to the patient are much greater, so it does influence who gets the case, and it's certainly not a trainee if it's an only eye. (P7)

Mentorship

Something that's very important for only eye procedures is that we debrief at the end of the session. I commend people on how supportive they were if they've been supportive and if they haven't I try to find out why. That strengthens the mutual support (P5)

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Consolidated criteria for reporting qualitative studies (COREQ): 32-item checklist

No. Item	Guide questions/description	Reported on Page #
Domain 1: Research team and reflexivity		
<i>Personal Characteristics</i>		
1. Interviewer/facilitator	Which author/s conducted the interview or focus group?	6
2. Credentials	What were the researcher's credentials? E.g. PhD, MD	6
3. Occupation	What was their occupation at the time of the study?	6
4. Gender	Was the researcher male or female?	6
5. Experience and training	What experience or training did the researcher have?	6
<i>Relationship with participants</i>		
6. Relationship established	Was a relationship established prior to study commencement?	6
7. Participant knowledge of the interviewer	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	N/A
8. Interviewer characteristics	What characteristics were reported about the interviewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	N/A
Domain 2: study design		
<i>Theoretical framework</i>		
9. Methodological orientation and Theory	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	7
<i>Participant selection</i>		
10. Sampling	How were participants selected? e.g. purposive, convenience, consecutive, snowball	5
11. Method of approach	How were participants approached? e.g. face-to-face, telephone, mail, email	5
12. Sample size	How many participants were in the study?	5
13. Non-participation	How many people refused to participate or dropped out? Reasons?	5
<i>Setting</i>		
14. Setting of data collection	Where was the data collected? e.g. home, clinic, workplace	6
15. Presence of non-participants	Was anyone else present besides the participants and researchers?	6
16. Description of sample	What are the important characteristics of the sample? e.g. demographic data, date	6
<i>Data collection</i>		
17. Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	6
18. Repeat interviews	Were repeat interviews carried out? If yes, how many?	N/A
19. Audio/visual recording	Did the research use audio or visual recording to collect the data?	6
20. Field notes	Were field notes made during and/or after the interview or focus group?	N/A
21. Duration	What was the duration of the interviews or focus group?	6
22. Data saturation	Was data saturation discussed?	N/A
23. Transcripts returned	Were transcripts returned to participants for comment and/or correction?	N/A
Domain 3: analysis and findings		

<i>Data analysis</i>		
24. Number of data coders	How many data coders coded the data?	7
25. Description of the coding tree	Did authors provide a description of the coding tree?	7
26. Derivation of themes	Were themes identified in advance or derived from the data?	7
27. Software	What software, if applicable, was used to manage the data?	7
28. Participant checking	Did participants provide feedback on the findings?	N/A
<i>Reporting</i>		
29. Quotations presented	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	7-13
30. Data and findings consistent	Was there consistency between the data presented and the findings?	7-18
31. Clarity of major themes	Were major themes clearly presented in the findings?	7
32. Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	N/A

Developed from:

Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

Once you have completed this checklist, please save a copy and upload it as part of your submission. When requested to do so as part of the upload process, please select the file type: *Checklist*. You will NOT be able to proceed with submission unless the checklist has been uploaded. Please DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.

BMJ Open

The Only Eye Study (OnES): Surgeon experiences of only eye surgery and recommendations for patient safety

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Primary Subject Heading:	Ophthalmology
Secondary Subject Heading:	Surgery, Medical education and training
Keywords:	Ophthalmology < SURGERY, Glaucoma < OPHTHALMOLOGY, SURGERY, QUALITATIVE RESEARCH

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Manuscripts

Title:

The Only Eye Study (OnES): Surgeon experiences of only eye surgery and recommendations for patient safety

Authors:

Lee Jones, PhD^{1;2}, Deanna J. Taylor, PhD¹, Freda Sii, MBBS^{2;3}, Imran Masood, FRCOphth^{3;4}, David P. Crabb, PhD¹, Peter Shah, FRCOphth^{2;3}

Corresponding Author:

Lee Jones, City, University of London, Northampton Square, London, EC1V 0HB, United Kingdom. Email: lee.jones@city.ac.uk

Affiliations:

1. Division of Optometry and Visual Science, School of Health Sciences, City, University of London.
2. Birmingham Institute for Glaucoma Research, Institute of Translational Medicine
3. Queen Elizabeth Hospital Birmingham, University Hospitals Birmingham NHS Foundation Trust
4. Birmingham Midland Eye Centre, Sandwell and West Birmingham Hospitals NHS Trust, Birmingham

COMPETING INTERESTS:

The authors declare no conflict of interest.

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ABSTRACT

Objectives: Performing surgery on patients with only one seeing-eye presents unique challenges for the ophthalmic care team where complications may result in catastrophic vision loss. There is currently no evidence regarding how surgeons augment their care when treating only eye patients, and no guidelines for how these patients should be managed in hospital eye services. This study aimed to explore ophthalmic surgeons' experiences of only eye surgery and perceptions of current practice.

Design & participants: Ten ophthalmic surgeons were asked to relate their experiences and views on performing only eye surgery in in-depth semi-structured interviews. Interviews were audio-recorded and transcribed. Qualitative data were subjected to thematic analysis to identify key themes.

Setting: Hospital eye service.

Results: Five key themes emerged relating to surgeons' experiences and perceptions of only eye surgery: (1) differences in approach to consent, (2) strategies for risk reduction, (3) Unmet training needs, (4) value of surgical mentor, and (5) emotional impact of unsuccessful outcomes. Recommendations for improving the surgical journey for both patient and surgeon related primarily to better recognition and understanding of the complexities inherent with only eye surgery.

Conclusions Outcomes of only eye surgery may be improved through a number of methods, including development of purpose-designed training fellowships, adoption of stress-reducing strategies, and enhancement of available support services. The findings identify emerging themes unique to only eye surgery and the need for guidelines on the provision of care for these high-stakes surgical patients.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- This is the first study to qualitatively investigate surgeons' experiences of performing only eye surgery.
- Semi-structured interviews gave the opportunity to gain knowledge about a wide range of aspects of only eye surgery.
- The broad range of identified themes provide a basis for further evidenced-based research.
- Limitations include a relatively small number of surgeons interviewed who were all glaucoma surgeons.

INTRODUCTION

All ophthalmologists will have patients under their care who have effectively only one seeing-eye. The fellow eye may have suffered severe vision loss from causes including trauma, surgical complications and advanced disease, or may have long-standing poor visual function from dense amblyopia. Patients with one seeing-eye ('only eye') are always a concern for their ophthalmologists, but particularly when the better-seeing eye requires surgical intervention. This better eye may, for example, have sight-threatening glaucoma or may have an urgent problem such as severe, uncontrolled intraocular pressure, acute macula-threatening retinal detachment, or a slowly progressive, non-urgent problem such as cataract. In moving into a surgical zone, both patient and surgeon are faced with the fact that surgical complications may result in sudden, total and permanent loss of vision, with life-changing consequences. Loss of vision in an only (i.e. 'better') eye can have a significant impact on patients' quality of life (QoL) ⁽¹⁻⁷⁾. It is for this reason we believe that only eye surgery is appropriately considered 'high-stakes' surgery.

Incisional ocular surgery generally carries a low complication incidence rate ⁽⁸⁾. Yet, sight-threatening complications, such as post-operative infection and haemorrhage cannot be discounted, and unfortunately do occur ⁽⁹⁻¹⁰⁾. The National Ophthalmology Database (NOD) reports on all National Health Service (NHS) funded cataract surgery in England and Wales ⁽¹⁰⁾. The 2018 audit highlighted intraoperative complications in 3.2% of all recorded procedures, the most prevalent being posterior capsular rupture (PCR). Over 3000 patients with PCR had post-operative visual acuity (VA) of 6/60 or worse, i.e. unable to read the top line of a typical VA chart. Post-operative complications were more prevalent, with one in twenty (over 8000) eyes having at least one complication. Glaucoma randomised clinical trials report serious complications, including retinal detachment, suprachoroidal haemorrhage, and endophthalmitis occurring in over one in five tube shunt and trabeculectomy patients ⁽¹¹⁾. Approximately half of patients experiencing a complication lost greater than two lines on Snellen VA. In other words, if these were only eye patients with very good VA (e.g. Snellen 6/6) before surgery, they certainly would no longer satisfy criteria for safe driving eyesight and would lose their driving licence. Serious complications have been reported in only eye surgery ^(12, 13).

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Researchers have recognised the unique impact of ophthalmic surgery on patients' psychological wellbeing^(14, 15). Indeed, only eye patients are often particularly fearful, citing blindness and surgical complications as primary concerns⁽¹⁶⁾. Furthermore, perceived stress amongst surgical staff is heightened when operating on complex or high-risk patients⁽¹⁷⁾, and only eye surgery often fits both these criteria. Thus, research into how surgeons approach only eye surgery, such as strategies for risk reduction, is warranted. Surgeons can provide valuable insight into the realities of performing these high-stakes procedures, the challenges to overcome, potential strategies for effective coping, and service delivery issues. The purpose of this study was to explore ophthalmic surgeons' experiences of only eye surgery, with the aim to improve the journey for both patient and surgeon, and to identify factors that could enhance surgeon resilience.

METHODS

Sampling and recruitment

As this study adopts an inductive approach, we do not seek generalisability based on large sample sizes, but rather the appropriateness of the sample to yield a meaningful balance between thick data, and rich data⁽¹⁸⁾. Therefore, we conducted interviews with ten ophthalmic surgeons (See Table 1.). Purposive sampling was used whereby surgeons who were known to perform only eye surgery were invited to participate. Ten surgeons were approached, all of whom agreed to participate. The majority of the surgeons worked within large general hospitals, or were based in a specialist eye hospital.

There are currently no standardised definitions for what constitutes an only eye, but when considering from both patient and surgical perspective, one could use characteristics that focus on impact of loss of the eye. The practical working-definition used for this study was: "An eye where significant loss of vision in this eye would be deemed life-changing with profound impact on the QoL by both the patient and surgeon". The vision in the fellow eye (usually <3/60 or worse +/- end-stage visual field loss) was considered insufficient to maintain the patient's current independent life-style and visual QoL. Loss of the only eye would likely result in substantial impact on areas such as occupation and potentially result in need for long-term social care, or have significant impact on family members required to help with caregiving.

Table 1. Participant characteristics listed in order of interview date.

ID	Sex	Speciality	Level of training	Location
P1	Male	G; AS	Consultant	UK
P2	Male	G; AS	Consultant	Non-UK
P3	Male	G; AS	Consultant	Non-UK
P4	Male	G; AS	Consultant	UK
P5	Male	G; AS	Consultant	Non-UK
P6	Male	G; AS	Consultant	UK
P7	Female	G; AS	Specialist registrar	UK
P8	Female	G; AS	Consultant	UK
P9	Female	G; AS	Consultant	Non-UK
P10	Male	G; P	Consultant	UK

Key. G = glaucoma, AS = anterior segment, P = paediatric

Data collection

The study was approved by the London – Chelsea Research Ethics Committee (Ref: 17/LO/1664) and conformed to the tenants of the Declaration of Helsinki. Consent from all participants was obtained prior to interview. Semi-structured, audio-recorded, face-to-face interviews were conducted by a male university-based PhD researcher (LJ) trained in collecting qualitative data. Details of the interview topic guide development are shown in Figure 1. Data were collected between November 2017 and April 2018. Median (Interquartile range) interview duration was 35 (31-40) minutes. Interviews were primarily carried out one-to-one in clinic rooms within the hospital eye service. The researcher corresponded with participants via email and telephone during recruitment and had met some previously through patient and public involvement (PPI) events. We used interviews as this method is particularly useful when little is already known about the study phenomenon, such as in the field of only eye surgery. Interviews are also appropriate for exploring potentially sensitive topics, like surgical experience. Semi-structured interviews consist of several key questions that help define areas to be explored, but also allow the interviewee to diverge in order to pursue an idea or response

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3 in more detail. This interview format is frequently used in healthcare-related research, as
4 it provides participants with some guidance on what to talk about, which many find
5 helpful. The flexibility of this approach, particularly compared to structured interviews
6 or surveys, allows for the discovery or elaboration of information that is important to
7 participants, but may not have previously been thought of as pertinent by the research
8 team.
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17 <Figure 1 here>
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21 **Patient and Public Involvement**

22 The Only Eye Study (OnES) is a series of research projects to investigate only eye surgery.
23 This is the first research output in the series and reports surgeon experiences of only eye
24 surgery. The outcomes of the patient interviews will be described in a subsequent report.
25 As described in Figure 1, patients with experience of only eye surgery were included in
26 the advisory group who helped to develop the interview topic guide for this study.
27 Following data analysis, a 'Bridging the Gap' event was hosted at Queen Elizabeth
28 Hospital Birmingham which gave the opportunity to disseminate the research findings
29 amongst surgeons, patients, and their carers.
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37 **Data management and analysis**

38 The study was designed and reported following the guidance of the Consolidated Criteria
39 for Reporting Qualitative Research (COREQ) ⁽¹⁹⁾. Interviews were coded with manual and
40 computer-based methods (NVivo V.11 [QSR International, Cambridge, Massachusetts,
41 USA]) using thematic analysis ⁽²⁰⁾. Open coding was used when analysing the data where
42 patterns in participants' responses were recorded. These patterns were further explored
43 by grouping responses into similar categories both within and across interviews and
44 finally were grouped into common themes which best described the content of the data.
45 The study was designed to recruit ten participants and so no direct decision was taken to
46 cease data collection; however, similar themes continued to emerge in the latter
47 interviews and so it is likely that 'data saturation' was achieved. Two members of the
48 research team (LJ and DJT) read and re-read the transcripts and independently
49 developed preliminary codes based on impressions of recurring themes. Inter-rater
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3 reliability was assessed using the kappa coefficient (κ) and was acceptable between the
4 two coders, $\kappa = 0.46$. There is debate in the literature regarding the sufficiency of the
5 kappa statistic, however scores between 0.40 and 0.75 typically reflect fair to good
6 agreement beyond chance ⁽²¹⁾. Following individual interpretation, the authors met to
7 reflect on the entire interview data and discuss differences of opinion regarding themes.
8 Once in agreement of the meaning of quotes and suitability of coding choices, a coding
9 framework was created where the key themes were finalised.

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12 A number of methods were employed to ensure the study had appropriate rigour
13 and maintained research integrity. As shown in Figure 1, the project was steered by a
14 number of relevant stakeholders including both patients and surgeons who assisted in
15 the study design and analysis. We piloted the interview topic guide with two surgeons,
16 leading to a slightly revised final topic guide. All members of the research team, including
17 surgeons, were involved in establishing the appropriateness of the generated codes. We
18 contributed to improving descriptive validity through the use of a strict verbatim
19 transcription service. In addition, member-checking was used with three interviewees to
20 assess our choice of coded themes in an attempt to improve the reliability and
21 trustworthiness of our findings. Finally, we ensured the design, conduct, and reporting of
22 the study followed COREQ guidelines ⁽¹⁹⁾.

23 24 25 26 27 28 29 30 31 32 33 34 35 36 **RESULTS**

37
38 Five key themes emerged relating to: 'Differences in approach to consent'; 'Strategies for
39 risk reduction'; 'Unmet training needs'; 'Value of surgical Mentor'; and 'Emotional impact
40 of unsuccessful outcomes'. Quotes taken from the transcripts are italicised and illustrate
41 key themes that came from the interviews. All excerpts are annotated with a code given
42 to the corresponding surgeon. Additional quotes are provided in Appendix 1.

43 44 45 46 47 48 **Differences in approach to consent**

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50 Participants described concerns regarding consent and discussion of material risk in only
51 eye surgery. While participants agreed that consent prior to only eye surgery is essential,
52 there were differences regarding how extensive the information provided should be. In
53 some cases, participants expressed the importance of sufficiently disclosing the risks
54 involved with treatment, and that consent should be focused on what is material to the
55 patient.
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3 *The patient needs to know and understand what it means to be totally blind. If the*
4 *patient does go blind and they're not fully aware of what it means to be totally blind,*
5 *they'll be extremely distraught. (P4)*
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9 *There are risks with this surgery, and you talk about the risks, including that the*
10 *operation itself might tip them over the edge and make them lose their vision. (P6)*
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13 Yet, some participants described aversion to placing too much emphasis on potential for
14 total vision loss in only eye surgery, suggesting that it can be counter-productive to focus
15 on possible negative outcomes of surgery.
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19 *You don't want to really hammer home the point that this is their only eye because*
20 *they're already anxious, and most people are aware if they had a complication in*
21 *their only eye the stakes are much higher. So I don't think it's useful or necessary to*
22 *dwell on it too much. (P7)*
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27 Moreover, participants explained that some patients appear to prefer not to know about
28 risks of surgery.
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31 *There are patients who don't want to take part in that decision; they leave it entirely*
32 *into your own hands. That's fair; that's good enough. (P5)*
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35 Participants explained how they attempt to demonstrate risks of surgery to patients.
36 Practical techniques used to exemplify what life might be like for the patient if the surgery
37 was unsuccessful were described.
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41 *We patch them up for three hours in clinic and we sit them outside so they are totally*
42 *blind. So they've been totally blind for three hours when we consent them. (P1)*
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45 The idea of a dual consent process was described, whereby a second or third opinion is
46 sought before agreement to proceed. It was suggested that dual consent can help the
47 patient's decision to proceed with surgery, and reassure the surgeon if their colleagues
48 agrees intervention is needed.
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53 *We're increasingly doing dual consenting. Patients that are high-risk only eye, it's*
54 *always useful if you've got two people doing consent. Certainly, joint clinics and*
55 *multi-disciplinary clinics allow for the opportunity. (P4)*
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58 **Strategies for risk reduction**

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3 Participants gave details about strategies they incorporate in only eye surgery to
4 optimise outcomes. Several pre-operative strategies were highlighted, typically
5 regarding logistics. One strategy was to ensure availability of correct and optimal surgical
6 instruments.
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11 *If you don't ask for the best instruments you will get given an average set, which*
12 *usually has one or two things broken. There'd be a limited number of perfect*
13 *instrument sets within the theatre, so I have to make sure that I've got those. I have*
14 *a special only eye tray only I'm allowed to use. It's called the only eye tray. (P1)*
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18 Another method was for the surgeon to adopt physical and mental relaxation techniques,
19 such as task visualisation, whereby the surgical procedure is visualised and mentally
20 performed prior to surgery.
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24 *I will visualise the steps that I will go through. Visualise what may go wrong, and*
25 *what I will do to undo that. I visualise even the routine, the basic steps. (P8)*
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29 A positive and optimistic attitude before operating was also considered a benefit in only
30 eye procedures.
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33 *If you think, I'm going to do that case successfully and it'll be great, I think you'd feel*
34 *a lot better than if you think: oh imagine if I have a complication. (P7)*
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37 In other instances, surgeons relied on faith in order to cope with the stresses of surgery.
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39 *Before I operate, I pray. I take on very difficult and crazy cases where sometimes I'll*
40 *be doing this surgery for the first time in my life. I do it because I have faith, and I*
41 *pray, and I believe God helps me. (P4)*
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45 One suggestion for reducing risk intra-operatively was to ensure only eye patients were
46 operated on by teams of highly experienced surgeons, rather than a single surgeon.
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49 *There's been instances where another surgeon being there has made a crucial*
50 *difference to the outcome, because they've spotted things that I may not have spotted*
51 *because I was busy with something else. (P4)*
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55 Yet, the consensus was that only eye patients are often operated on by just one surgeon.
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57 *It's a good idea to do difficult cases together, but because our outcomes are usually*
58 *not lethal, it's not about life or death, we can't finance a second surgeon. (P3)*
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3 *In many branches of surgery, high-risk cases where the impact of failure is massive,*
4 *are done by two surgeons, or teams of surgeons. In ophthalmology often there's just*
5 *one surgeon. I wonder if we are missing something just because it's a small organ.*
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8 *(P1)*
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11 Participants also expressed preference for avoiding this approach, and warned of
12 potential hazards of high-stakes procedures being performed by teams.
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15 *I wouldn't prefer having someone around in the same operating theatre for moral*
16 *support. On the contrary, I think I'd be distracted. (P5)*
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19 Finally, participants discussed post-operative strategies for risk reduction. Frequent and
20 timely follow-up appointments were often scheduled for only eye patients. In addition,
21 the issue of failure to rescue an only eye from surgical complications was addressed, with
22 suggestion for a protocol to reduce post-operative threats to only eye patients.
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27 *You do more when you know it's an only eye. That's not to say you care less [in non-*
28 *only eye surgery]. But knowing it's an only eye, you just add extra steps. In the follow-*
29 *up, you see them sooner, more frequently. (P8)*
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33 *A lot of times, things go wrong because of a failure to rescue a simple problem. If an*
34 *only eye patient has problems following surgery, they need to be seen by a senior*
35 *doctor, and that should be part of the protocol in a hospital (P4)*
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39 **Unmet training needs**

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41 Many participants correlated lack of surgical experience with concerns about care
42 provision for only eye patients. For example, senior surgeons expressed doubt that the
43 current training programme in ophthalmology provides sufficient exposure to high-
44 stakes patients. One explanation for this dearth in experience was increased time
45 restrictions on surgical activity.
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50 *The trainees are not getting the training. The number of cases are dropping, they are*
51 *shortening the number of training years, so trainees are being compressed in both*
52 *ways. (P8)*
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56 Time restrictions were perceived to have ramifications for future aptitude and resilience
57 of ophthalmologists-in-training.
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3 *Looking at the last five years, I can't think of a single trainee who I feel had the*
4 *necessary technical ability, bravery, and surgical resilience to be safely allowed to do*
5 *these cases. I wonder what's going to happen when they become young consultants.*
6 *I don't think they will have the necessary skill set. (P1)*
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11 *They will become a consultant with probably less than 50% experience as the*
12 *previous generation, so that will be a problem. (P8)*
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15 There was a consensus that hospital eye services delegate only eye patients to
16 experienced staff only.
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19 *The head of the department or the Medical Director would do all the only eyes*
20 *themselves, just to take responsibility for it. (P3)*
21
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23 *You wouldn't want a trainee doing an operation on an only eye, that would be*
24 *inappropriate and I think we'd be doing the wrong thing by the patient if that was*
25 *the case. (P10)*
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29 Participants believed more needs to be done to prepare ophthalmologists-in-training for
30 only eye procedures. There were recommendations on overcoming this issue, such as
31 specialised training programmes for only eye care.
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35 *It's important we identify the best people and they are given focused training,*
36 *focused mentoring by senior surgeons who do that kind of surgery, and gradually get*
37 *them to that level. In this kind of surgery, you've got to get the best people, because*
38 *patients only have one chance. (P4)*
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43 **Value of surgical mentor**

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45 Participants emphasised that becoming a successful only eye surgeon relies heavily on
46 good mentorship. On several occasions, participants stressed the value of having a
47 mentor for transferring knowledge to assist in personal, professional, and educational
48 development.
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53 *You need to be a good surgeon to do only eyes with confidence, and that means you*
54 *need to have good teachers, who teach more than just the technique. A good mentor,*
55 *I would say is key. (P3)*
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3 *Everyone needs to have a good mentor who can advise them, I think that's probably*
4 *the most important thing. My advice to anyone who does only eye surgery is to find*
5 *a mentor who's been doing this kind of surgery, talk to them, learn from them, how*
6 *they approached it. (P4)*
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10 Yet, a barrier to effective mentoring was time commitment issues, where there was
11 advocacy for formal recognition of mentoring programmes to alleviate these constraints.
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15 *If trainees have a mentor who has been through lots of things, they can come through*
16 *for support when things don't go right. But obviously that role has to be recognised.*
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18 *(P8)*
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20 21 **Emotional impact of unsuccessful outcomes**

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23 Amongst our participants, some had experienced 'losing' an only eye, resulting in
24 catastrophic loss of vision for the patient. In these cases, participants described being
25 burdened with a sense of personal responsibility, and expressed how they have
26 shouldered the blame.
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31 *We lost a true only eye, he went blind. It doesn't leave you, I still feel like I could have*
32 *done something different. I feel like if the time was slightly different, if we weren't so*
33 *stressed, if we weren't so under pressure, I think we would have said there's*
34 *something not right. I still feel partly responsible for him. (P8)*
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39 Participants expressed concern over how losing an only eye would affect their career and
40 the psychological sequelae of such an event.
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43 *I'm lucky not to have had an only eye disaster, yet. I'll probably remember that for*
44 *the rest of my life. (P10)*
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47 Participants described how they have witnessed changes in colleagues' demeanour after
48 adverse events following only eye surgery.
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51 *Colleagues who've gone through that experience, you can see it in their face and their*
52 *body language how damaging it can be. At your hands a life-changing event for the*
53 *worse has occurred. That immediacy, actually, is one of the unique burdens of being*
54 *a surgeon. (P10)*
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3 *For some of them, it will haunt them and they might not ever perform at their peak*
4 *again. (P8)*
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7 There was recognition of the need for systems to support surgeons after losing an only
8 eye.
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11 *There needs to be a better support mechanism. If someone has lost an only eye and*
12 *they're distraught by it, they need a mentor to talk to, someone who has lost an only*
13 *eye. (P4)*
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17 Yet, many perceived a lack of pathways to find professional support services in the event
18 of losing an only eye. Participants also noted barriers to seeking out such services.
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21 *There's no guidance on how surgeons can seek help for themselves when incidents*
22 *like this happen. (P8)*
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25 *We're very busy. We don't have time to do that [seek support services]. Something*
26 *else would have to give. (P6)*
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29 *The thing is, we're too busy. That's taking time up and it's not strictly urgent. It can*
30 *be pushed to the bottom of the pile, even though I don't think that's the right thing*
31 *to do. (P7)*
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DISCUSSION

Surgery on an only eye can be described as high-stakes; if unsuccessful, patients may become blind for the rest of their lives. As such, only eye surgery can be challenging for surgeons and the ophthalmic care team. We sought to explore ophthalmic surgeons' experiences of performing high-stakes procedures on patients with only one seeing-eye.

Our findings highlight differences in how surgeons disclose material risks in only eye surgery. Participants stressed importance of patients' understanding of risks of surgery, regardless of how unlikely adverse outcomes may be. Yet, other participants voiced concerns over a heavy focus on risks of vision loss, as surgery is generally successful. This discordance is pertinent given the landmark change in the position of the Supreme Court regarding informed consent ⁽²²⁾. Until recently, the UK Supreme Court followed the principles of the Bolam Test. Such principles state that, in the event of surgical complications, a surgeon would not be deemed negligent if they had acted the same way other competent surgeons would have ⁽²³⁾. However, this paternalistic approach to medicine is no longer tolerated, as demonstrated by the introduction of the Modified Montgomery Test ⁽²⁴⁾. This standard of care obliges surgeons to provide sufficient information to patients, including disclosure of risks of proposed treatment. In medicine, there is concern over the use of a 'one-size-fits-all' approach applied to heterogeneous populations ⁽²⁵⁾. For example, greater material risk should be attached to surgery on an only eye, as opposed to the same surgery on a patient with good bilateral vision. Yet, participants expressed aversion to appearing pessimistic when discussing surgical risks, a belief in contrast to the principles of the Modified Montgomery Test. Methods of demonstrating risks of only eye surgery included occlusion of the only eye. Our results indicate variances between surgeons regarding discussion of material risks in only eye surgery, suggesting the principles of the Modified Montgomery Test are yet to be fully recognised in this area of ophthalmology.

Our study has notable findings regarding minimising risk in only eye surgery. One risk reduction strategy was to ensure all surgical equipment was of highest possible quality. Quality control exercises highlight a strikingly high percentage of defective surgical instruments delivered to UK hospitals ⁽²⁶⁾, and operating room incidents with potential to affect quality of care are most commonly equipment-related ⁽²⁷⁾. Indeed, Surgical environments are often busy and surgeons are rarely afforded time to optimise

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3 all possible variables prior to surgery, and even meticulous scrutiny will not eliminate
4 risk. Yet, optimal instruments was deemed an important pre-operative strategy to
5 minimise risk in this study. There is advocacy for patients requiring specialised care, such
6 as only eye patients, to be managed under larger, high-volume hospitals, where they are
7 more likely to be treated using the most cutting-edge equipment ⁽²⁸⁾. However,
8 consideration must be given to what is the most suitable arrangement for the patient. Our
9 results raise the question as to whether specialised resources are required for treatment
10 of only eye patients.
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18 It was acknowledged that only eye procedures can be particularly stressful events
19 for surgeons. Self-reported anxiety is typically higher when the procedure is high-stakes
20 ⁽¹⁷⁾. Stress reducing strategies, such as mental imagery, optimistic attitude, and spiritual
21 activities, were described as a means of reducing performance anxieties and bolstering a
22 relaxed mental state before surgery. Psychological relaxation strategies are reported to
23 enhance surgical performance ⁽²⁹⁾. Moreover, evidence indicates that surgeons who
24 undertake mental skills training have better outcomes on measures of anxiety ⁽³⁰⁾. Our
25 results identify coping strategies used by surgeons before only eye surgery to optimise
26 performance during stressful situations.
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34 Our findings introduced the concept of only eye surgery being performed by two
35 or more surgeons. This intra-operative strategy for risk reduction was described as an
36 opportunity for another expert to critique the procedure, in an attempt to ensure nothing
37 is missed. However, some participants perceived this approach to be counter-productive,
38 suggesting team procedures can lead to adoption of more risk-averse or overly foolhardy
39 behaviours. The advocacy for only eye procedures performed by two or more surgeons
40 echoes how exceptional cases are managed in other fields of medicine, such as
41 cardiothoracic surgery. In this specialty, implementation of a Star Chamber, whereby
42 surgeons refer complex or high-stakes patients to the Star Chamber who assess what the
43 patient should be offered, has been used in an attempt to improve surgical outcomes ⁽³¹⁾.
44 If the Star Chamber recommend surgery, it is a requirement that the procedure is
45 performed by a minimum of two consultants. Other disciplines in the UK are considering
46 implementation of a Star Chamber ⁽³²⁾, however there appears to be no such movement
47 in ophthalmology. Yet, such initiatives as the Star Chamber may help to minimise intra-
48 operative risks during only eye surgery.
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Participants reported following only eye patients up closely post-operatively, scheduling more frequent appointments to ensure that complications are quickly addressed. In only eye surgery, an appropriate and timely response is essential to prevent failure to rescue. Though many participants reported closer follow up of only eye patients, evidence suggests that patients with monocular vision undergoing surgery on their only eye do not receive more telephone calls or clinic visits pre or post-operatively⁽³³⁾. Analysis of doctor-patient interaction, such as time spent in clinic, may provide useful information regarding differences in follow-up patterns between only eye and non-only eye patients; this would be an interesting avenue for future research.

Participants described how medical training in the UK has experienced dramatic reform, and expressed concerns over how this may affect standards of care in ophthalmology. Changes in educational theory⁽³⁴⁾, and the European Working Time Directive⁽³⁵⁾ have limited training opportunities for ophthalmologists-in-training. As a result, procedures such as trabeculectomy feature less often in trainees' timetabled clinical activity⁽³⁶⁾. Work-hour restrictions and a demise of the 'mentor' model in medical training may have damaging consequences for acquisition of technical skills and surgical resilience⁽³⁷⁾. Indeed, consultant surgeons have reported concerns over capabilities of the newer generation of trainees and how this may impact patient care⁽³⁸⁾. Although progress in technology has led to the advent of valuable training opportunities, such as 'wet-lab' simulations⁽³⁹⁾, such environments are unable to mimic the true reality of operating on a patient's only eye. Furthermore, recent evidence suggests many teaching programmes have not implemented specific policies for ophthalmologists-in-training performing cataract surgery on only eye patients⁽⁴⁰⁾. Our Participants stressed the essentiality of combatting these training barriers, and gave suggestions for purpose-designed training programmes for complex procedures. Such programmes may enable appropriate access to high-stakes patients and nurture the learning processes for ophthalmologists-in-training. This finding spotlights concerns with surgical training in ophthalmology, a problem first identified almost two decades ago⁽⁴¹⁾. If this trend continues, there may be necessity for specific training fellowships to gain clinical competency, and we propose that only eye training must not be overlooked.

Another emerging theme was the importance of mentoring in only eye surgery. Participants described how a good mentor has helped them to become an effective only

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3 eye surgeon. Typically, a mentor will be a senior member in the field who guides a trainee
4 professionally and personally by facilitating learning through observation and modelling
5 (37). There is concern that mentoring has become a lost art in medicine (42), and
6 participants in our study explained that a mentor can offer significant support when
7 caring for only eye patients, and formal recognition of mentoring may be needed. In line
8 with previous research, our results highlight barriers to mentorship as a lack of formal
9 recognition of the role, resulting in time commitment issues and a scarcity of appropriate
10 mentors (43). Fostering of strong relationships between mentor and trainee could play a
11 crucial role in alleviating concerns raised in this study about training in ophthalmology
12 and only eye surgery.
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21 A number of participants had experienced losing an only eye, resulting in total
22 extinction of vision for the patient. Participants described their responses to these
23 incidents and how the psychological sequelae have impacted their career. A recurring
24 sense of personal responsibility and blame was reported, and participants remarked on
25 lack of formal support for surgeons when unpredicted outcomes occur. In medicine, the
26 term 'second victim' was coined to recognise that the surgical team may suffer in the
27 event of negative outcomes (44). Often, long-lasting emotional distress of such outcomes
28 will affect all members of the patients' healthcare team, including surgeons, nurses, and
29 allied healthcare professionals (45). Proposals have outlined the needs of the second
30 victim, which include entitlement to psychological support services (46), though our
31 participants perceived a lack of avenues to seek professional support after losing an only
32 eye. Lack of time is a primary barrier to uptake of support services (47). However, growing
33 attention is being placed on the mental wellbeing of surgeons (48), and the importance of
34 such support services as the Practitioner Health Programme is being realised (49). Still, a
35 large number of UK hospitals remain without a policy for staff mental health support (50).
36 Participants in our study perceived a lack of options for support in the event of poor
37 outcomes in only eye surgery, reflecting lack of recognition and understanding of the
38 second victim phenomenon in ophthalmology.
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54 Many fields of medicine have adopted multi-disciplinary teams to manage
55 complex conditions. Our study suggests that only eye surgery might benefit from being
56 performed by teams of surgeons experienced in ophthalmic surgery, as well as in the
57 psychological preparation of patients and surgeons. Furthermore, these teams should
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3 have the resources to identify, develop, and mentor inexperienced surgeons in order to
4 succession plan and ensure skill levels are maintained. National guidelines for teams
5 performing only eye surgery should be drafted to ensure that the risk of total blindness
6 is reduced as far as possible.
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11 This study is the first of its kind in ophthalmic surgery. By adopting a qualitative
12 approach, important themes have emerged which provide an excellent basis for further
13 work. Our participants worked in a variety of geographical locations, thus a limitation is
14 that differing work cultures may restrict the comparability between experiences.
15 However, this can be considered a strength as we were able to capture the wide range of
16 surgeons' experiences, including strategies which may be transferrable between
17 countries and institutions. The study is limited in that a small number of surgeons were
18 interviewed and they were all experienced glaucoma surgeons, primarily based in large
19 hospital care centres which may restrict the transferability of our findings. This may be
20 due to the nature of glaucoma in that there may be a greater proportion of patients who
21 are only eyed, particularly in complex glaucoma practices. It is important that future
22 studies consider views of less experienced surgeons.
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32 **CONCLUSIONS**

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35 The implications of losing an only eye are massive for both patient and surgeon. This
36 study clearly identifies important themes that are of great relevance to surgeons who
37 perform only eye surgery. These include risk management, training, psychology and
38 mentoring. Further evidence based studies are needed in each of these areas to clearly
39 define best practice and inform guidelines to enable a safe and seamless patient journey.
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44 **ACKNOWLEDGEMENTS**

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47 The authors wish to thank the advisory group who helped develop the interview topic
48 guide, and the surgeons who provided their valuable time and thoughts in the study
49 interviews.
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52 **CONTRIBUTIONS**

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54
55 LJ performed study design, data collection, data analysis, and manuscript preparation.
56 DJT performed data analysis and manuscript critique. FS performed data analysis and
57 manuscript critique. IM performed data analysis and manuscript critique. DPC performed
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3 study design and manuscript critique. PS performed study design, data analysis, and
4 manuscript critique.
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6

7 **FIGURES**

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10 **Figure 1.** Process of interview topic guide formation. *Advisory group consisted of only
11 eye patients, consultant ophthalmologists, ophthalmologists-in-training, a psychologist
12 and an ophthalmic research nurse, and established researchers in the field of
13 ophthalmology. **Scoping exercise consisted of a preliminary pilot interview where
14 suitability of interview questions was assessed.
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19 **Data sharing statement:** No additional data are available.
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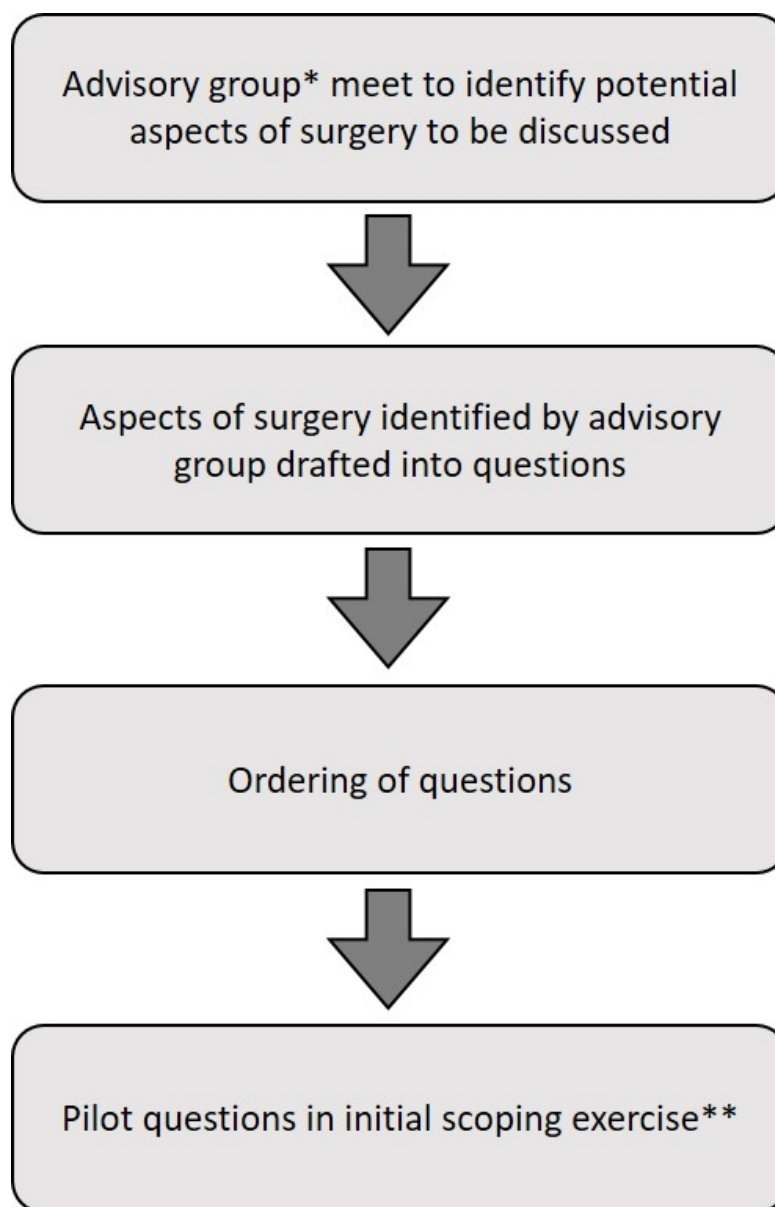


Figure 1. Process of interview topic guide formation. *Advisory group consisted of only eye patients, consultant ophthalmologists, ophthalmologists-in-training, a psychologist, an ophthalmic research nurse, and established researchers in the field of ophthalmology. **Scoping exercise consisted of a preliminary pilot interview where suitability of interview questions was assessed.

41x64mm (300 x 300 DPI)

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3 **Appendix 1. Additional quotations**
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6 **Key theme**

Quotation

7
8 *Consent*

9 *It's really important that only eye patients know that when you go*
10 *under the knife, although the risk is very small, there is a risk you will*
11 *end up totally blind. We actually have to articulate it in those words.*
12 *We're advised against using words like loss of vision, because loss of*
13 *vision to one person might be one line on the chart, loss of vision for*
14 *another person might be total. The issue is you have to communicate*
15 *what the material risk is. If the material risk is blindness, you have to*
16 *communicate it. We have to articulate total extinction of vision, and*
17 *I think that's absolutely right and very important. (P1)*

18 **

19 *We need to give them the information they need to make a decision*
20 *for themselves. Therefore one of the things I do in clinic, the eye you*
21 *are going to operate on, the only eye, you cover it, so you show the*
22 *patient what it means. If a catastrophic complication happened,*
23 *what would that mean for the patients' vision? It means that they*
24 *won't be able to see anything. (P4)*

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28 *Strategies for risk reduction*

29 *I just think one step at a time. People have talked about this, sporting*
30 *professionals in particular, positive imagery, so they think about how*
31 *it would feel to score a goal, that kind of thing. (P7)*

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33 *I think if you throw any two surgeons together, it might not work.*
34 *There has to be a high level of trust and respect. You have to be happy*
35 *to admit your own failings in front of the other person. It's quite an*
36 *intimate relationship, really, and not something that happens easily.*
37 *There is a danger, two surgeons can become more brave and*
38 *foolhardy than one surgeon, and almost be more reluctant to say, no,*
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I don't think we should do that. It's too risky. There can be this bravado kick in. That can be dangerous for patients. (P10)

I'll see them sooner, often at the next clinic I can. If the [intraocular] pressure is fine, they can go. I'd probably want to see them myself in clinic. (P6)

Training

One of the things that generally is consultant only is only eye [surgery]. I think we try to protect our trainees as much as possible. But there has to be a tipping point where they're going to have to deal with it at some stage. (P2)

What you do not want is get to the end of your training, become a consultant, and then all of a sudden be tasked to operate on one of those cases. (P7)

Only eyes get delegated to the most senior surgeon on the list, and I think rightly so, because although the risks for only eye are identical to any other eye, the risks to the patient are much greater, so it does influence who gets the case, and it's certainly not a trainee if it's an only eye. (P7)

Mentorship

Something that's very important for only eye procedures is that we debrief at the end of the session. I commend people on how supportive they were if they've been supportive and if they haven't I try to find out why. That strengthens the mutual support (P5)

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6 **Consolidated criteria for reporting qualitative studies (COREQ): 32-item checklist**
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No. Item	Guide questions/description	Reported on Page #
Domain 1: Research team and reflexivity		
<i>Personal Characteristics</i>		
1. Interviewer/facilitator	Which author/s conducted the interview or focus group?	6
2. Credentials	What were the researcher's credentials? E.g. PhD, MD	6
3. Occupation	What was their occupation at the time of the study?	6
4. Gender	Was the researcher male or female?	6
5. Experience and training	What experience or training did the researcher have?	6
<i>Relationship with participants</i>		
6. Relationship established	Was a relationship established prior to study commencement?	6
7. Participant knowledge of the interviewer	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	N/A
8. Interviewer characteristics	What characteristics were reported about the interviewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	N/A
Domain 2: study design		
<i>Theoretical framework</i>		
9. Methodological orientation and Theory	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	7
<i>Participant selection</i>		
10. Sampling	How were participants selected? e.g. purposive, convenience, consecutive, snowball	5
11. Method of approach	How were participants approached? e.g. face-to-face, telephone, mail, email	5
12. Sample size	How many participants were in the study?	5
13. Non-participation	How many people refused to participate or dropped out? Reasons?	5
<i>Setting</i>		
14. Setting of data collection	Where was the data collected? e.g. home, clinic, workplace	6
15. Presence of non-participants	Was anyone else present besides the participants and researchers?	6
16. Description of sample	What are the important characteristics of the sample? e.g. demographic data, date	6
<i>Data collection</i>		
17. Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	6
18. Repeat interviews	Were repeat interviews carried out? If yes, how many?	N/A
19. Audio/visual recording	Did the research use audio or visual recording to collect the data?	6
20. Field notes	Were field notes made during and/or after the interview or focus group?	N/A
21. Duration	What was the duration of the interviews or focus group?	6
22. Data saturation	Was data saturation discussed?	N/A
23. Transcripts returned	Were transcripts returned to participants for comment and/or correction?	N/A
Domain 3: analysis and findings		

<i>Data analysis</i>		
24. Number of data coders	How many data coders coded the data?	7
25. Description of the coding tree	Did authors provide a description of the coding tree?	7
26. Derivation of themes	Were themes identified in advance or derived from the data?	7
27. Software	What software, if applicable, was used to manage the data?	7
28. Participant checking	Did participants provide feedback on the findings?	N/A
<i>Reporting</i>		
29. Quotations presented	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	7-13
30. Data and findings consistent	Was there consistency between the data presented and the findings?	7-18
31. Clarity of major themes	Were major themes clearly presented in the findings?	7
32. Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	N/A

Developed from:

Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

Once you have completed this checklist, please save a copy and upload it as part of your submission. When requested to do so as part of the upload process, please select the file type: *Checklist*. You will NOT be able to proceed with submission unless the checklist has been uploaded. Please DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.