

This is an Open Access document downloaded from ORCA, Cardiff University's institutional repository:<https://orca.cardiff.ac.uk/id/eprint/139113/>

This is the author's version of a work that was submitted to / accepted for publication.

Citation for final published version:

Gunn, Patrick J. G., Marks, Joanne R., Au, Leon, Read, Simon, Waterman, Heather , Spry, Paul G. D. and Harper, Robert A. 2022. Virtual clinics for glaucoma care – patients' and clinicians' experiences and perceptions: a qualitative evaluation. *Eye* 36 , pp. 209-218. 10.1038/s41433-021-01467-4

Publishers page: <http://dx.doi.org/10.1038/s41433-021-01467-4>

Please note:

Changes made as a result of publishing processes such as copy-editing, formatting and page numbers may not be reflected in this version. For the definitive version of this publication, please refer to the published source. You are advised to consult the publisher's version if you wish to cite this paper.

This version is being made available in accordance with publisher policies. See <http://orca.cf.ac.uk/policies.html> for usage policies. Copyright and moral rights for publications made available in ORCA are retained by the copyright holders.



1 **Title**

2

3 Virtual clinics for glaucoma care – Patients’ and clinicians’ experiences and  
4 perceptions: a qualitative evaluation

5

6 **Running Title**

7

8 Virtual clinics for glaucoma care

9

10 **Authors**

11

12 Gunn, Patrick J G<sup>1,2</sup>; Marks, Joanne R<sup>1</sup>; Au, Leon<sup>1</sup>; Read, Simon<sup>3</sup>; Waterman,  
13 Heather<sup>3</sup>; Spry, Paul G D<sup>4</sup>; Harper, Robert A<sup>1,2,5</sup>

14 1. Manchester Royal Eye Hospital, Manchester University NHS Foundation Trust, UK

15 2. Faculty of Biology, Medicine and Health, University of Manchester, UK

16 3. School of Healthcare Sciences, Cardiff University, UK

17 4. Bristol Eye Hospital, University Hospitals Bristol and Weston NHS Foundation  
18 Trust, UK

19 5. Centre for Applied Vision Research, City, University of London, UK

20

21 **Contact for correspondence**

22

23 Mr Patrick Gunn, Principal Optometrist

24 Manchester Royal Eye Hospital, Manchester University NHS Foundation Trust, Oxford

25 Road, Manchester, M13 9WL. Email: [patrick.gunn@mft.nhs.uk](mailto:patrick.gunn@mft.nhs.uk) Telephone: 0161 226

26 6583

27

28 **Competing interests**

29

- 30 • PJGG – no relevant conflict of interest declarations
- 31 • JRM – no relevant conflict of interest declarations
- 32 • LA – no relevant conflict of interest declarations
- 33 • SR– no relevant conflict of interest declarations
- 34 • HW – no relevant conflict of interest declarations
- 35 • PGDS – provides independent consultancy service to Newmedica
- 36 • RAH – no relevant conflict of interest declarations

37

38 **Funding**

39

40 This project was funded by Glaucoma UK

41 **Abstract**

42

43 **Background**

44

45 The role of glaucoma virtual clinics has developed to help meet demand for capacity  
46 within busy glaucoma services. There is limited research of patient and clinician  
47 experiences and perceptions of these clinics and the aim of this study is to provide  
48 further information to help improve patient experience and guide service delivery.

49

50 **Methods**

51

52 A mixed methods research design was employed comprising of a patient satisfaction  
53 survey, and patient and clinician interviews. Consultant ophthalmologists were recruited  
54 from throughout the UK, and patients and data gathering clinical staff recruited from the  
55 Manchester Royal Eye Hospital and Bristol Eye Hospital.

56

57 **Results**

58

59 We received a total of 148 patient satisfaction questionnaires with an overall response  
60 rate of 55.4%. Most respondents were diagnosed with primary open angle glaucoma  
61 (33.9%) at Manchester and glaucoma suspect status at Bristol (50.6%). Patients had  
62 high levels of confidence in the person conducting the tests (94.8% Manchester, 98.8%  
63 Bristol), and most were likely to recommend the service to family or friends (94.8%  
64 Manchester, 92.6% Bristol). We interviewed 10 consultant ophthalmologists, 10 data  
65 gathering staff and 20 patients. A number of key themes emerged from the transcribed

66 interviews including: patient experience, clinician perception of patient experience,  
67 service delivery, staffing and staff experience, and patient safety.

68

69 **Conclusions**

70

71 Glaucoma virtual clinics can be acceptable to both clinicians and patients, including  
72 those with a varied complexity of glaucoma and glaucoma-related disease.  
73 Dissatisfaction seemed to relate to poor communication or processes and systems  
74 within the service rather than complexity of disease.

75

76

77

78

79 *The authors would like to dedicate this paper to the memory of their friend,*  
80 *colleague and co-author Joanne R Marks*

81

## 82 **Introduction**

83

84 Approximately 2% of those over 40 years old in the UK have chronic open angle  
85 glaucoma, rising to nearly 10% for those over 75<sup>1</sup>. As patients live longer and the  
86 population steadily rises, so too does the clinical demand of those with, or at risk of  
87 developing, glaucoma. Both the NHS England elective care transformation programme<sup>2</sup>  
88 and Getting It Right First Time (GIRFT) ophthalmology report<sup>3</sup> made recommendations  
89 in 2019 to meet demand in glaucoma care. In March 2020, the Coronavirus (COVID-19)  
90 pandemic led to NHS trusts suspending routine hospital outpatient appointments during  
91 lockdown, highlighting the urgent need for change in ophthalmic practice<sup>4</sup>.

92

93 To meet this significant demand for clinical review, innovations have developed in  
94 glaucoma service delivery, most notably the presence of “shared care” or co-  
95 management. Within this healthcare professionals (HCP) work under the supervision of  
96 a consultant ophthalmologist, or with appropriate qualifications independently, with roles  
97 ranging from data gathering through to decision-making and independent management<sup>1</sup>,  
98 <sup>5-7</sup>.

99

100 A “virtual clinic” describes clinics where face-to-face aspects of doctor-patient  
101 interactions are removed<sup>8</sup> by separation into two components: (i) clinical measurements  
102 (data collection); and (ii) clinical decision-making (review). Virtual clinics have developed  
103 throughout the world for a broad range of medical conditions including diabetes<sup>9</sup>,  
104 cancer<sup>10</sup>, bowel disease<sup>11</sup>, orthopaedics<sup>12</sup> and more. In a glaucoma virtual clinic (GVC)

105 patients attend a hospital outpatient's appointment, a community clinic or mobile unit for  
106 clinical measurements. Patient data are collected through a series of tests performed by  
107 technicians, non-specialist nurses, orthoptists or optometrists. Following the  
108 appointment results are reviewed by consultant ophthalmologists or other appropriately  
109 trained HCPs, with outcomes sent to the patient via letter<sup>13</sup>.

110

111 These clinics are intended to reduce time spent in clinic, provide a 'one-stop-shop' with  
112 all tests being performed on the day, and maximise appointment capacity<sup>14</sup>. A national  
113 survey of 42 clinical leads in the UK found half of all ophthalmology units were operating  
114 a GVC, and for those not, 42.9% were planning to establish one<sup>15</sup>. GVC are also being  
115 established for glaucoma throughout the world<sup>16, 17</sup>. Yet, despite this rise in use, little is  
116 known about the experiences of patients and clinicians within this care model, something  
117 of even greater relevance after the emergence of COVID-19.

118

119 The aims of this study were to determine how satisfied patients were with their glaucoma  
120 care across different GVC models, and to qualitatively evaluate both patient and clinician  
121 views and experiences of GVC.

122

## 123 **Methods**

124

125 A mixed methods research design was employed comprising of i) a patient satisfaction  
126 survey, and ii) patient/staff interviews. Lead or glaucoma specialist consultant  
127 ophthalmologists were recruited from around the UK, and patients and data gathering  
128 clinicians were recruited from the Manchester Royal Eye Hospital (MREH) and the  
129 Bristol Eye Hospital (BEH). The usual pathway for GVCs from these hospitals is detailed  
130 in Figure 1. Ethical approval was granted for this project (IRAS project ID 188595).

131

132 **i) Patient satisfaction survey**

133

134 A Patient Satisfaction Questionnaire (PSQ) was sent to patients of MREH and BEH. The  
135 PSQ was adapted from a well-validated General Practice survey<sup>18</sup> to suit patients  
136 attending a GVC that has previously been used in eye care<sup>19</sup>. Patients were asked to  
137 respond to a range of statements surrounding patient experience.

138

139 ***Method of recruitment and sampling***

140 Patient clinic lists were identified by collaborating clinicians from databases  
141 incorporating those seen in a GVC within the previous three weeks, May to July 2018.  
142 A random sample of patients were invited to complete a postal PSQ and return their  
143 responses.

144

145 ***Inclusion and exclusion criteria***

146 Adult patients ( $\geq 18$  years of age) with glaucoma or suspect glaucoma status attending  
147 a GVC in one of the two services around three weeks prior to receipt of the PSQ.  
148 Exclusion criteria were being aged under 18 years old or having not recently attended a  
149 GVC.

150

151 **ii) a) Patient interviews**

152

153 ***Method of recruitment and sampling***

154 A sample of patients with a range of glaucoma-related diagnoses were invited to  
155 undertake face-to-face interviews when attending a GVC in the two centres. Patients  
156 were provided with a patient information sheet and informed consent obtained. A range



157 of open-ended questions regarding the GVC were employed to allow for an exploration  
158 of issues pertinent to each patient. Interviewed patients were contacted four to six weeks  
159 later to complete a short telephone interview establishing how satisfied they were with  
160 their feedback letter and any subsequent reflections on the GVC.

161

162 ***Inclusion and exclusion criteria***

163 Adult patients with glaucoma, ocular hypertension (OHT) or suspect glaucoma seen in  
164 a virtual clinic at one of the two participating centres. Exclusion criteria were being aged  
165 under 18 years; not attending a GVC; and those unable to speak fluent English without  
166 translators or interpreters.

167

168 **b) Clinicians' interviews**

169

170 Lead or glaucoma specialist consultant ophthalmologists were interviewed face-to-face  
171 or by telephone. Data gathering clinical staff, including ophthalmic science practitioners  
172 (OSP) and ophthalmic technicians (OT), were interviewed face-to-face about their views  
173 and experiences of GVCs.

174

175 ***Method of recruitment and sampling***

176 Interviewed consultant ophthalmologists were recruited from a national survey,  
177 distributed to 92 lead ophthalmologists from the Royal College of Ophthalmologists'  
178 database, with 42 respondents (response rate 45.7%) about their views and opinions of  
179 the use of GVC<sup>15</sup>. As part of the survey, participants were asked if they would be happy  
180 to participate in an interview to provide further information. This convenience sample  
181 included a range of ophthalmologists from units who were delivering GVCs from all 4  
182 nations of the UK, as well as those who were not. Data gathering clinical staff were

183 recruited from the 2 collaborating sites via a written participant invitation letter, including  
184 a participant information sheet and consent form.

185

### 186 **Patient and clinician interviews and data analysis**

187 Semi-structured interviews were used to ensure that, whilst the primary topic areas  
188 would be covered, respondents were given flexibility in how they answered, guiding the  
189 interview and allowing for unanticipated areas raised by participants. The interviews  
190 were recorded digitally and transcribed anonymously. Data was analysed using the  
191 framework method, a systematic and widely recognised tool for qualitative data  
192 analysis<sup>20</sup>. Interviews from clinicians and patients were initially analysed separately  
193 within the same underlying framework, before relationships and interlinked themes  
194 between cohorts were identified using NVIVO 12 (QSR International, Cambridge,  
195 Massachusetts, USA).

196

## 197 **Results**

198

### 199 **Patient Satisfaction Questionnaire Results**

200

#### 201 ***Patient background***

202 We received 148 PSQs comprised of 67 patients from the MREH (response rate 48.9%)  
203 and 81 from the BEH (response rate 62.3%); an overall response rate of 55.4%. Nine  
204 patients were excluded from the MREH and we were unable to access notes for 2  
205 patients to determine their background. The female-to-male ratio was 52:48% at MREH  
206 and 61:39% at BEH. Most respondents described their ethnicity as White British (83% -  
207 MREH; 89% - BEH) followed by “not stated” (7% - MREH; 4% - BEH) then Black  
208 Caribbean (2% - MREH; 3% - BEH).

209

210 ***Glaucoma-related diagnosis***

211 The patients' glaucoma-related diagnoses (worst eye) are illustrated in table 1. At MREH  
212 most patients who responded were diagnosed with primary open angle glaucoma  
213 (POAG) (33.9%), whereas at BEH most patients who responded were glaucoma  
214 suspects (50.6%) and only 4.9% had POAG.

215

216 ***Previous glaucoma laser or surgery***

217 Ten patients from the MREH (17.9%) had undergone surgery (5 patients with  
218 trabeculectomy, 1 patient with bilateral Xen implants) or laser treatment (3 patients with  
219 YAG peripheral iridotomy and 1 selective laser trabeculoplasty). There were no patients  
220 who had previously undergone glaucoma-related surgery or laser from the BEH cohort.

221

222 ***Visual field status***

223 The extent of visual field loss in the eye with the best field of vision was classified using  
224 the mean deviation (MD) of the Humphrey 24-2 visual field assessment. The comparison  
225 results between MREH and BEH are detailed in chart 1. Patients from the BEH had less  
226 visual field loss (mean MD -0.42dB, range +2.40 to -6.13dB) than those from the MREH  
227 (mean MD -1.90dB, range +2.36 to -22.18dB) and this difference was statistically  
228 significant (two-tailed T test  $t(138) = -2.510, p=.013$ ).

229

230 ***Topical treatment***

231 Patients from BEH were on fewer medications (mean 0.54, range 0 to 3) than those from  
232 MREH (mean 0.88, range 0 to 4 medications). Whilst there was no statistically significant  
233 difference (chi-square) when comparing those on medications versus those on  $\geq 1$

234 medication between BEH and MREH, the value ( $X^2 (1, N=137) = 3.272$ ) did approach  
235 significance ( $p=.070$ ).

236

### 237 ***Questionnaire responses***

238 Responses to the PSQ are summarised in table 2. All patients felt they received  
239 adequate information from both sites prior to attending the GVC and both units scored  
240 highly on waiting times and staff interaction. Patients attending both GVCs had high  
241 levels of confidence in staff conducting tests (94.8% MREH, 98.8% BEH) and would  
242 recommend the service to family or friends (94.8% MREH, 92.6% BEH). There was a  
243 slightly higher reported preference from the MREH patients compared to BEH patients  
244 for attending a GVC over a traditional face-to-face clinic (81.0% MREH, 71.8% BEH).  
245 Feedback letters were received by a minority of patients at the point of responding to  
246 the PSQ (27.6% MREH, 22.2% BEH). However, 100% of patients who did receive a  
247 letter felt it was clear and helped them understand their condition.

248

### 249 **Patient, Consultant and Ophthalmic Science Practitioner/Technician Interviews**

250

251 We interviewed 10 consultant ophthalmologists from 10 different departments about  
252 their views and opinions of GVCs. There were 7 OSPs and 13 patients interviewed from  
253 MREH and 3 OTs and 7 patients interviewed from BEH. A number of key themes  
254 emerged including patient experience, clinician perception of patient experience, service  
255 delivery, staffing and staff experience, and patient safety. These are outlined below with  
256 further supporting evidence in figure 2.

257

### 258 ***Patient experience and clinician perception of patient experience***

259 All cohorts offered perspectives on how the GVC influence patient experience, with the  
260 main sub-themes relating to waiting times, communication, accessibility, and patient-  
261 clinician interactions. Waiting times were reported by all participants as a key aspect of  
262 positive experiences, reporting GVCs to provide quicker care delivery:

263

264 *“That benefits the staff and the patient, because you know we are in and out. So whereas*  
265 *you are always told to allow for two hours...under an hour and I am finished” (Patient*  
266 *10)*

267

268 *“Once they’ve gone through it once and realise that they’re in and out in less than an*  
269 *hour and they get a letter from their own consultant a week later they’re converts. Most*  
270 *of them don’t want to go back into a regular clinic” (Consultant 5)*

271

272 Some HCPs felt patients were sometimes unaware they were not seeing a doctor or  
273 optometrist on the day or receive the clinical outcome of their appointment, sometimes  
274 leading to OSP/OTs handling patient concerns:

275

276 *“Patients who are already in the system, who like it, it’s fantastic, but it’s the patients*  
277 *who first time, come along and they just don’t understand why they’re there and they’ve*  
278 *had absolutely no literature at all” (OSP/OT 6)*

279

280 Many Consultants made use of patient information sheets and specific clinic letters to  
281 advise their patients of differences between a GVC and more conventional clinic  
282 appointments:

283

284 *“We’ve actually designed a specific letter for them that goes out with the appointment to*  
285 *explain that we’re aware that their appointment is overdue, and so this is a way of getting*  
286 *all the information that we require on them, and to reassure them that they will still remain*  
287 *under the care of a consultant” (Consultant 2).*

288

289 For those attending GVCs outside of the main hospital sites, both patients and OSP/OT  
290 staff reported positive improvements to the clinical environment:

291

292 *“The patients feel more cared for and it’s in a smaller area as well so they’re not feeling*  
293 *they’re having to wonder around in that unfamiliar busy environment” (OSP/OT 8)*

294

295 *“It’s certainly a much better environment here. Because it’s a bit like a cattle market*  
296 *there, lots of people dashing around” (Patient 17)*

297

298 That said, some consultants were concerned about taking away the patient-clinician  
299 interaction:

300

301 *“I think the biggest disadvantage is not picking up on the nuances of a conversation*  
302 *about someone’s quality of life issues” (Consultant 6)*

303

304 One OSP stated they highlighted to patients that being referred to a GVC could be seen  
305 as an assurance about the stability of their condition:

306

307 *“We try to be positive and say you’re a very well managed patient, you’re obviously low*  
308 *risk, the consultant has reviewed your status and you’re so low risk you don’t need to*  
309 *see a doctor every single time” (OSP/OT 4)*

310

311 **Service Delivery**

312 GVCs were running mainly from Trust sites, although many were using satellite clinics  
313 or community centres. Some had part electronic records and software to view visual  
314 fields. However, most units did not have a fully electronic patient record and felt this was  
315 a limiting factor for service efficiency:

316

317 *“I can see a patient virtually in about 5 minutes. If I had a full electronic patient record, I*  
318 *could see a patient virtually in about 3 minutes. If I see a patient face-to-face it’s 10*  
319 *minutes. So I influence far more patients under my care by seeing a lot of them virtually”*  
320 *(Consultant 9).*

321

322 Use of paper records, poorly linked electronic records and unavailability of visual field  
323 progression analyses were often reported as constraints of running a GVC by  
324 Consultants. Additionally, staffing to provide data collection and virtual review were  
325 reported as challenges. Creating capacity was the driving force for service organisers to  
326 establish GVCs, alongside concerns about sustainability of the traditional clinic model  
327 due to lack of staff and clinic space.

328

329 **Staffing & Staff Experience**

330 Consultants reported their GVCs were staffed by a mixture of OTs, OSPs, orthoptists,  
331 ophthalmic nurses and optometrists gathering data for review, alongside consultant  
332 ophthalmologists, specialist trainee ophthalmologists and optometrists reviewing cases.  
333 One consultant felt it was important to select the right personality to work in a GVC:

334

335 *"It's very important to pick the appropriate personalities rather than just assume that a*  
336 *particular professional group can take a role on. The requirements for that role do*  
337 *demand a very good ability to interact well with patients, rather than just all the ability to*  
338 *do the tests"* (Consultant 2)

339

340 Relatedly, some OSP/OTs felt they would benefit from further training:

341

342 *"I would welcome a lot more training and a lot more understanding of the conditions of*  
343 *glaucoma. We're not given as much information as is available and it would help us to*  
344 *know whether or not the tests we're performing are of sufficient quality"* (OSP/OT 9)

345

346 An OSP reported satisfaction that their role helped support the overall glaucoma  
347 structure:

348

349 *"What I like best is knowing you're making the entire glaucoma structure work better,*  
350 *you're taking up a group of patients to allow everything else to fall into place, the more*  
351 *complicated cases to be seen by a consultant"* (OSP/OT 2)

352

### 353 **Patient Safety**

354 Patient safety was described by consultants as both an incentive for GVCs and a cause  
355 for concern. Some consultants were worried about missed pathology in a GVC, whereas  
356 others reported greater concerns over appropriate follow-up times in standard care:

357

358 *"It's much better to actually have some information on those backlog patients rather than*  
359 *no information at all, so we've used the virtual model to actually see some of those,*  
360 *which are far more complex"* (Consultant 2)



361

362 *“Patient safety is the primary concern isn’t it, so we were extremely cautious in rolling*  
363 *out the project and we had very strict inclusion criteria and now we are slowly increasing*  
364 *our numbers” (Consultant 7)*

365

366 There was a concern from one consultant that GVCs were creating a paradox where  
367 lower risk patients were getting timelier follow-up, and more frequent imaging and visual  
368 field testing:

369

370 *“We have this paradox that the patients who are less at risk of visual loss are now getting*  
371 *a whole raft of tests in a timely manner. Whereas the more complex patients who come*  
372 *to our clinic and are very much at risk of losing their vision maybe don’t get a visual field*  
373 *test as often as we would like” (Consultant 2)*

374

375 The additional capacity in GVC and availability of imaging and visual fields at each visit  
376 has led some units to use GVC for interim appointments to increase the timeliness of  
377 follow-ups as well as the frequency of diagnostic tests.

378

## 379 **Discussion**

380

381 The results of this study demonstrate a broad spectrum of opinion amongst patients and  
382 clinicians about the role of GVCs in delivering safe and effective care for glaucoma and  
383 glaucoma-related diagnoses. Patients responding to the PSQ were satisfied with clinic  
384 waiting times and demonstrated high levels of trust in the staff performing tests in the  
385 GVC. All patients felt they had been given prior advice of the type of clinic they were due  
386 to attend, highlighted by one OSP/OT as a potential cause for complaint with patients.

387 Almost all patients responding to the PSQ would recommend a GVC to family or friends  
388 (93.5%), although 10.8% of patients were not happy to receive clinic results by post, and  
389 12.2% of patients would have been happier to wait longer to see a doctor or optometrist  
390 on the day.

391

392 The qualitative interviews showed some patients preferred to hear their results directly  
393 from clinicians and some clinicians were also concerned about missing quality of life  
394 nuances that may be identified during conversations conducted in traditional clinics.  
395 Whilst 100% of those who received feedback letters from the GVC agreed they helped  
396 them understand their condition, just 24.5% of patients had received their letter following  
397 their clinic attendance, at the time of interviewing, suggesting delays in receipt of  
398 appointment outcomes. This limits the qualitative evidence we have from patients who  
399 completed the full patient journey within the GVC and is in contrast from Consultant 5  
400 working at another unit, quoted in the results to say patients receive their letter within a  
401 week. Addressing such delays and adding further quality of life questions in clinical  
402 questionnaires may aid acceptance. As some patients may have difficulties in reading  
403 letters due to visual impairment, disability or language barriers a letter may not be  
404 suitable for communicating clinic outcomes for all patients. With increased use of  
405 telephone and video consultations during COVID-19<sup>21</sup>, further research to which  
406 methods patients preferred for communicating GVC outcomes would be useful.

407

408 Despite having a more complex case mix in MREH than BEH, MREH patients reported  
409 a slightly higher preference on being seen in the GVC over a traditional glaucoma clinic.  
410 At the time this survey was conducted, a questionnaire was being used within the GVC  
411 in MREH, but not in BEH, potentially influencing responses. Some patients did report  
412 dissatisfaction with not having the opportunity to ask questions about their condition and

413 the MREH GVC model accommodates patient questions through the OSP completed  
414 questionnaire, thereby allowing clinicians to respond accordingly. Interviewed patients  
415 reported satisfaction with how calm and efficient the GVC environment was compared  
416 to the traditional clinics, suggesting those with more complex glaucoma may have  
417 experienced longer waits historically.

418

419 As well as overall satisfaction with GVC, patients often reported an understanding that  
420 GVC helped hospitals to prioritise traditional clinics for more complex cases. One  
421 respondent highlighted a case of someone that had lost sight in one eye and felt such  
422 patients were greater priority (figure 2). It was also noted by all cohorts that providing  
423 better patient information about the purpose of a GVC nurtures acceptance of this care  
424 model.

425

426 Staff working as OSP/OTs reported satisfaction in working within the glaucoma service.  
427 However, OSP/OTs commonly felt they would benefit from more detailed training,  
428 particularly around knowledge of the condition and medications. As some patients also  
429 highlighted concerns about GVC staff ability to answer condition-related questions,  
430 providing better education for OSP/OTs may enable them to respond to some queries,  
431 improving staff and patient experience.

432

433 This study is the first qualitative-based research to examine the experiences and  
434 perceptions of GVC from both patients and clinicians, including data gathering staff from  
435 two centres. Court and Austin undertook some early work on patient experience in GVCs  
436 <sup>22</sup>, looking at both patient acceptance of GVCs as well as comparing patient education  
437 in the GVC to standard clinics. Whilst Court and Austin's study showed a similar overall  
438 mean satisfaction score between clinics, as a questionnaire was used there was no

439 opportunity to probe patient views and this work was focussed more towards patient  
440 education, rather than patient experience attending this clinic.

441

442 In turn, Kotecha et al used a semi-structured qualitative approach, interviewing patients  
443 before and after attending standard glaucoma clinics at Moorfields Eye Hospital and the  
444 GVC<sup>23</sup>. This study usefully considers the views of both follow-up patients and those first  
445 seen in an NHS hospital-based glaucoma service. However, it only considers patients  
446 being seen for the first time in GVCs, whereas our study seeks the views of those who  
447 may have attended a GVC multiple times. As no patient surveyed had attended the GVC  
448 for more than three visits, further analysis of whether there is a fatigue effect in patient  
449 experience after multiple GVC visits would be beneficial. Our study also offers  
450 perspectives from the North and South West of England, complementing work by  
451 Kotecha et al in London, although both studies may not be representative of patient  
452 views across the UK given consultants interviewed reported different approaches to the  
453 GVC model. Like previous studies, a mainly Caucasian patient population was recruited,  
454 and the views may not reflect the wider glaucoma population. Further qualitative work  
455 on experiences of patients from different ethnic groups or where English is not their first  
456 language and different GVC models is needed. A limitation of this study is the response  
457 rate of the PSQ and it is possible patient satisfaction may have differed in those who  
458 didn't respond.

459

460 The present study was undertaken prior to the COVID-19 pandemic and much may  
461 change in how clinics are likely to be delivered. As further delays to routine outpatient  
462 appointments will increase the capacity burden, the role of GVC will become more  
463 important. The UK and Eire Glaucoma Society and the Royal College of  
464 Ophthalmologists' have recently released recommendations for glaucoma services in

465 the recovery phase of COVID-19, including the role of GVCs<sup>24</sup>. The Royal College of  
466 Ophthalmologists' also recently highlighted the role of telemedicine and remote  
467 consultation in increasing capacity<sup>25</sup>. Potentially GVCs could also include remote  
468 consultations for those requesting them, which may further increase patient acceptance.

469

470 This study shows GVCs can be acceptable to both clinicians and patients, including  
471 those with varied complexity of glaucoma and glaucoma-related disease. Whilst  
472 pressures on services may mean service planners expand GVCs to create capacity, our  
473 results indicate that ensuring services are set up to run safely and effectively across  
474 different risk profiles, rather than developing services just for those at lowest risk, may  
475 be key to successful GVCs.

476

#### 477 **Acknowledgements**

478

479 The team would like to acknowledge Glaucoma UK for funding this study.

480

#### 481 **Conflicts of interest**

482

483 PGDS – provides independent consultancy service to Newmedica

484 **References**

485

- 486 1. National Institute for Health and Care Excellence. Glaucoma: diagnosis and  
487 management. NICE guideline NG81. <https://www.nice.org.uk/guidance/ng812017>.
- 488 2. NHSE. Transforming elective care services ophthalmology.  
489 [https://www.england.nhs.uk/wp-content/uploads/2019/01/ophthalmology-elective-care-](https://www.england.nhs.uk/wp-content/uploads/2019/01/ophthalmology-elective-care-handbook-v1.1.pdf)  
490 [handbook-v1.1.pdf](https://www.england.nhs.uk/wp-content/uploads/2019/01/ophthalmology-elective-care-handbook-v1.1.pdf); 2019.
- 491 3. MacEwen C, Davis A, Chang L. GIRFT Programme National Specialty Report  
492 Ophthalmology. [https://gettingitrightfirsttime.co.uk/wp-](https://gettingitrightfirsttime.co.uk/wp-content/uploads/2019/12/OphthalmologyReportGIRFT19P-FINAL.pdf)  
493 [content/uploads/2019/12/OphthalmologyReportGIRFT19P-FINAL.pdf](https://gettingitrightfirsttime.co.uk/wp-content/uploads/2019/12/OphthalmologyReportGIRFT19P-FINAL.pdf); 2019.
- 494 4. Oliver D. David Oliver: Covid-19 will make us stop some activities for good.  
495 BMJ. 2020;369:m1148.
- 496 5. RNIB. Models of glaucoma care: ensuring patients are at the centre.  
497 [www.rnib.org.uk2017](http://www.rnib.org.uk2017).
- 498 6. Spencer IC, Spry PGD, Gray SF, Baker IA, Menage MJ, Easty DL, et al. THE  
499 BRISTOL SHARED CARE GLAUCOMA STUDY - STUDY DESIGN. Ophthalmic  
500 Physiol Opt. 1995;15(5):391-4.
- 501 7. Roberts HW, Rughani K, Syam P, Dhingra S, Ramirez-Florez S. The  
502 Peterborough Scheme for Community Specialist Optometrists in Glaucoma: Results of 4  
503 Years of a Two-Tiered Community-Based Assessment and Follow-up Service. Current  
504 Eye Research. 2015;40(7):690-6.
- 505 8. McGrail KM, Ahuja MA, Leaver CA. Virtual Visits and Patient-Centered Care:  
506 Results of a Patient Survey and Observational Study. J Med Internet Res.  
507 2017;19(5):e177.
- 508 9. Cox PRN, Maric T, Naik A, Northover E, Greg M, Alcayde D, et al. A pilot study  
509 assessing the safety of a virtual clinic for diabetes in pregnancy. Diabetic Medicine.  
510 2018;35:188-.
- 511 10. McIver A, Maddock N, Dunbar J, Hughes J, Ledson MJ, Smyth C, et al. THE  
512 USE OF A VIRTUAL CLINIC TO SPEED UP AND IMPROVE THE CANCER  
513 DIAGNOSTIC PATHWAY-2 YEAR EXPERIENCE. Thorax. 2016;71:A131-A.
- 514 11. Yarrow H, Irving P, Williams A, Hibberts F, Koumoutsos I, Darakhshan A, et al.  
515 Improving care for patients with perianal Crohn's disease; review of a perianal virtual  
516 clinic. Journal of Crohns & Colitis. 2017;11:S492-S.
- 517 12. Gupta S, Jones G, Shah S. Optimising orthopaedic follow-up care through a  
518 virtual clinic. International Journal of Orthopaedic and Trauma Nursing. 2018;28:37-9.
- 519 13. Wright H, Diamond J. Service innovation in glaucoma management: using a web-  
520 based electronic patient record to facilitate virtual specialist supervision of a shared care  
521 glaucoma programme. British Journal of Ophthalmology; 2015. p. 313-9.
- 522 14. Royal College of Ophthalmologists. Standards for Virtual Clinics in Glaucoma  
523 Care in the NHS Hospital Eye Service. [www.rcophth.ac.uk/wp-](http://www.rcophth.ac.uk/wp-content/uploads/2017/03/Virtual-Glaucoma-Clinics.pdf2016)  
524 [content/uploads/2017/03/Virtual-Glaucoma-Clinics.pdf2016](http://www.rcophth.ac.uk/wp-content/uploads/2017/03/Virtual-Glaucoma-Clinics.pdf2016).
- 525 15. Gunn PJG, Marks JR, An L, Waterman H, Spry PGD, Harper RA. Acceptability  
526 and use of glaucoma virtual clinics in the UK: a national survey of clinical leads. BMJ  
527 Open Ophthalmol. 2018;3(1):7.

- 528 16. Kassam F, Yogesan K, Sogbesan E, Pasquale LR, Damji KF. Teleglaucoma:  
529 improving access and efficiency for glaucoma care. *Middle East Afr J Ophthalmol.*  
530 2013;20(2):142-9.
- 531 17. Rathi S, Tsui E, Mehta N, Zahid S, Schuman JS. The Current State of  
532 Teleophthalmology in the United States. *Ophthalmology.* 2017;124(12):1729-34.
- 533 18. Paddison CAM, Saunders CL, Abel GA, Payne RA, Campbell JL, Roland M.  
534 Why do patients with multimorbidity in England report worse experiences in primary  
535 care? Evidence from the General Practice Patient Survey. *BMJ Open.*  
536 2015;5(3):e006172.
- 537 19. Baker H, Harper RA, Edgar DF, Lawrenson JG. Multi-stakeholder perspectives  
538 of locally commissioned enhanced optometric services. *BMJ Open.* 2016;6(10):e011934.
- 539 20. Ritchie J, Spencer L. Qualitative data analysis for applied policy  
540 research Analysing qualitative data by A Bryman and R G Burgess. London:  
541 Routledge1994. p. 173-94.
- 542 21. Safadi K, Kruger JM, Chowers I, Solomon A, Amer R, Aweidah H, et al.  
543 Ophthalmology practice during the COVID-19 pandemic. *BMJ Open Ophthalmol.*  
544 2020;5(1):e000487.
- 545 22. Court JH, Austin MW. Virtual glaucoma clinics: patient acceptance and quality  
546 of patient education compared to standard clinics. *Clin Ophthalmol.* 2015;9:745-9.
- 547 23. Kotecha A, Bonstein K, Cable R, Cammack J, Clipston J, Foster P. Qualitative  
548 investigation of patients' experience of a glaucoma virtual clinic in a specialist  
549 ophthalmic hospital in London, UK. *Bmj Open.* 2015;5(12):9.
- 550 24. UKEGS TRCoOa. Glaucoma Management Plans during Recovery  
551 Phase of COVID-19. 2020.
- 552 25. Royal College of Ophthalmologists. Overview of Digital Transformation and  
553 Telemedicine during COVID19. 2020.
- 554

555 **Titles and legends to figures**

556

557 *Figure 1: Patient pathway through the GVC at the MREH and BEH (summary of*  
558 *abbreviations: OSP (ophthalmic science practitioner), VA (visual acuity), HVF*  
559 *(Humphrey visual fields), GAT (Goldmann applanation tonometry), OCT (optical*  
560 *coherence tomography), OT (ophthalmic technician)*

561

562 *Table 1: Glaucoma-related diagnosis in eye with worst disease*

563

564 *Chart 1: Stage of glaucoma-related visual field loss in the eye with the best visual field*  
565 *(N, %) using a simplified Hoddap-Parrish-Anderson criteria (where early is MD <-6dB,*  
566 *moderate is MD ≥-6 and <-12dB and severe is MD ≥-12dB).*

567

568 *Table 2: Summary of the PSQ responses from patients attending the GVC at the MREH*  
569 *and BEH (N, %)*

570

571 *Figure 2: Summary of themes and sub-themes, as well as anonymised quotes from*  
572 *patient, OSP/OT and consultant interviews*