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2 Immediate sequential bilateral cataract surgery: patient  
3 perceptions and preferences

4

5 **Running title:**

6 Bilateral Cataract Surgery: patient perceptions

7

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## Abstract

**Background:** Recent national data suggests that less than 0.5% of NHS cataract patients undergo immediate sequential bilateral cataract surgery (ISBCS). Since ISBCS improves service efficiency, increasing its practice may help tackle the ever-growing burden of cataract in the UK, and reduce the COVID-19 cataract backlog. Surgeon attitudes are known to be a significant barrier to increasing the practice of ISBCS. However, little is known about patient perceptions of ISBCS.

**Methods:** Patients at cataract clinics across three NHS hospital sites were recruited to complete an investigator-led structured questionnaire. Open-ended and closed-ended questions were used to assess awareness of ISBCS, willingness to undergo ISBCS and attitudes towards ISBCS.

**Results:** Questionnaires were completed by 183 patients. Mean participant age was 70.5 (9.9) years and 58% were female. Forty-three percent were aware of ISBCS, chiefly via clinic staff. Just over a third would choose ISBCS if given the choice, and participants that perceived they were recommended ISBCS were more likely to opt for it. The most common motivator and barrier to uptake of ISBCS was

49 convenience and the perceived risk of complications in both  
50 eyes respectively. Concerns related to the recovery period  
51 were common, including misunderstandings, such as the need  
52 to wear eye patches that obscure both eyes.

53

54 **Conclusions:** Our study indicates that significantly more NHS  
55 patients would be willing to undergo ISBCS if given the choice.  
56 The reluctance of surgeons to recommend ISBCS and patient  
57 misunderstandings regarding the recovery period may be  
58 limiting its uptake.

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## Introduction

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75 Cataract surgery is already the most frequently performed

76 operation in the NHS, and a 50% increase in cataract

77 prevalence is forecast by 2035 due to the UK's aging

78 population (1). This long term growth in demand,

79 compounded by the COVID-19 related backlog of unoperated

80 cataract, has provided impetus to consider what cataract

81 service redesign options exist (1,2).

82

83 Recent Royal College of Ophthalmologists National

84 Ophthalmology Database (NOD) data indicates that less than

85 0.5% of NHS patients undergoing cataract surgery in both eyes

86 undergo immediate sequential bilateral cataract surgery

87 (ISBCS) in which cataract surgery is performed in both eyes on

88 the same day (3). Since ISBCS is known to be cost-effective and

89 improve operating room efficiency, it has been proposed that

90 increasing its practice may help pave the way for more

91 sustainable cataract services (3–6).

92

93 Surveys conducted prior to the pandemic indicate that

94 hesitancy to offer ISBCS amongst UK based surgeons may be

95 limiting its practice in the NHS, largely due to concerns

96 regarding the risk of bilateral complications such as

97 endophthalmitis (7). Despite this, a large case series of ISBCS  
98 (95,606 patients) reported no incidences of bilateral  
99 endophthalmitis, and randomised controlled trials of ISBCS  
100 have identified no safety concerns (8–11).

101

102 The COVID-19 pandemic has sparked a greater interest in  
103 patient perceptions of ISBCS (12–14). A survey of 267 patients  
104 suggested that during the pandemic, 45% of patients on NHS  
105 cataract surgery waiting lists would undergo ISBCS if given the  
106 choice (13). While past surveys have provided some valuable  
107 insights into patient attitudes towards ISBCS, the use of  
108 closed-ended questions has limited participant responses to  
109 investigator-provided suggestions, which may overlook more  
110 nuanced motivators and barriers to uptake of ISBCS (12–15). In  
111 addition, since most surveys regarding patient perceptions  
112 were conducted during the pandemic, the future relevance of  
113 such studies is unclear (12–14).

114

115 The aim of this study is to quantify the awareness and  
116 acceptability of ISBCS and to gain a more complete  
117 understanding of patient attitudes by using a questionnaire  
118 including open-ended questions. This information will be  
119 useful for facilitating service redesign that reflects patient  
120 understanding and preferences in relation to ISBCS.

121

## Methods

122

123 A cross-sectional study was performed using an investigator-  
124 led structured questionnaire containing open-ended and  
125 closed-ended questions. The questionnaire was developed in  
126 consultation with ophthalmologists internal and external to  
127 the host institution and members of the institution's *Public*  
128 *and Patient Involvement and Service Improvement* teams. It  
129 was then pre-tested and iteratively refined to optimise  
130 comprehension.

131

132 Patients were recruited between the 14th of June to the 26th  
133 of July 2021 from twenty morning and thirteen afternoon  
134 cataract clinics across three hospitals sites of Moorfields Eye  
135 Hospital NHS Foundation Trust. Patient recruitment took place  
136 until responses to open-ended questions reached saturation  
137 and new themes or ideas were no longer being offered.

138

139 Ophthalmologists were verbally informed of the study design  
140 and asked to invite the following patients to complete the  
141 questionnaire at the end of their clinic appointment: 1)  
142 cataract surgery-naïve patients (patients that have never  
143 undergone cataract surgery) with visually significant bilateral  
144 cataract listed for first eye cataract surgery or ISBCS, 2) post-

145 operative patients listed for second eye cataract surgery  
146 following first eye cataract surgery and 3) post-operative  
147 patients that had undergone ISBCS or delayed sequential  
148 bilateral cataract surgery (DSBCS). Patients that required  
149 translation services or were under 18 years old were excluded.

150

151 Informed written consent was obtained from all participants  
152 prior to completing the questionnaire. Questions were read  
153 aloud, and responses were tabulated in summary and  
154 recorded in a computer spreadsheet. When there was a lack of  
155 clarity, the recorded response was read back to the participant  
156 to ensure its accuracy.

157

158 The study received ethical approval from the London School of  
159 Hygiene and Tropical Medicine Research Ethics Committee  
160 and was authorised by the host institution's audit department.

161 All data collection was performed in accordance with the  
162 Declaration of Helsinki.

163

164 Participant sex, age and cataract surgical status were obtained  
165 directly from hospital records, and employment status was  
166 assessed using a closed-ended question. The proportion of  
167 participants aware of ISBCS and how these participants

168 became aware was determined using a binary question and an  
169 opened-ended question respectively.

170

171 To assess patient willingness to undergo ISBCS and attitudes  
172 towards ISBCS, participants were asked whether they were  
173 given the choice of undergoing ISBCS using a binary question,  
174 and whether they had any concern about undergoing ISBCS  
175 using an open-ended question. Cataract surgery-naïve  
176 participants that reported to have been given the choice were  
177 asked why they chose to be listed for ISBCS or DSBCS using an  
178 open-ended question, and whether the surgeon  
179 recommended ISBCS, DSBCS or both options equally using a  
180 closed-ended question. The remaining participants were asked  
181 whether they would undergo ISBCS if given the choice using a  
182 five-point Likert scale, and the reason for this using an open-  
183 ended question (16).

184

185 Post-operative ISBCS participants were asked whether ISBCS  
186 was as expected using a five-point Likert scale and open-ended  
187 questions regarding what additional information they would  
188 have liked to receive before undergoing ISBCS (16).

189

190 For the complete questionnaire used, see the Supplementary  
191 Information.



192

193 Responses to closed-ended questions are summarised as a  
194 proportion of the respondents. Chi-squared tests and unpaired  
195 t-tests were conducted to assess for statistical differences in  
196 sex, mean age, and employment status between participants  
197 that would and would not choose ISBCS using STATA 16.1  
198 (StataCorp. 2019, College Station, TX, USA).

199

200 To analyse the responses to the open-ended questions  
201 regarding reasons given for choosing and not choosing ISBCS, a  
202 list of key phrases was inductively compiled to capture all  
203 reasons mentioned. The proportion of responses that  
204 contained each reason was calculated for all participants and  
205 surgery-naïve and post-operative participant subgroups. Due  
206 to the similarities in the responses given, reasons for not  
207 choosing ISBCS and concerns regarding ISBCS were analysed  
208 together. The same method was used for analysing the  
209 responses regarding awareness of ISBCS. To summarise  
210 responses to the additional questions for post-operative ISBCS  
211 participants, representative quotes are reported for each  
212 response.

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## Results

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### 218 **Patient characteristics**

219 Questionnaires were completed by 183 patients. This included  
220 15 (8.2%) cataract surgery-naïve participants listed for ISBCS,  
221 51 (27.9%) cataract surgery-naïve participants listed for first  
222 eye cataract surgery, 73 (39.9%) post-operative participants  
223 listed for second eye cataract surgery, 40 (21.9%) post-  
224 operative patients that had undergone DBSCS and 4 (2.2%)  
225 post-operative patients that had undergone ISBCS.

226

227 The mean age (standard deviation) of participants was 70.5  
228 (9.9) years. Seventy-seven (42.1%) participants were male and  
229 106 (57.9%) were female. Ten (5.5%) participants reported to  
230 be unemployed, 49 (26.8%) reported to be in full-time or part-  
231 time employment and 124 (67.8%) reported to be retired.

232

### 233 **Awareness of ISBCS**

234 Of the 183 participants, 78 (42.6%) reported being aware of  
235 ISBCS. Forty-six (59.0%) of these were aware of ISBCS via clinic  
236 staff and 20 (25.6%) were aware via a family member, friend,  
237 or acquaintance. Less common sources of awareness included  
238 online and hospital patient information, which was reported

239 by 7 (9.0%) and 6 (7.7%) participants respectively. One (1.3%)  
240 participant was unsure how they became aware of ISBCS.

241

#### 242 **Acceptability of ISBCS**

243 Amongst cataract surgery-naïve participants, 27/66 (40.9%)  
244 reported being offered ISBCS, 15 (55.6%) of which chose to be  
245 listed for ISBCS. Of the surgery-naïve participants listed for  
246 ISBCS, 6/15 (40%) perceived that the surgeon recommended  
247 ISBCS. Of the 12 surgery-naïve participants that declined the  
248 offer to be listed for ISBCS, 1 (8.3%) perceived that the  
249 surgeon recommended ISBCS, and 1 (8.3%) perceived that the  
250 surgeon recommended DSBCS. The remaining 19/27 (70.4%)  
251 surgery-naïve participants offered ISBCS perceived that ISBCS  
252 and DSBCS were recommended equally.

253

254 Of the 9/117 (7.7%) post-operative patients that reported  
255 being offered ISBCS in clinic, 4/9 (44.4%) underwent ISBCS.

256

257 Amongst surgery-naïve participants not offered ISBCS and  
258 post-operative participants, 15/39 (38.5%) and 36/117 (30.8%)  
259 agreed respectively that, if given the choice, they would  
260 choose ISBCS (figure 1). Of the 4 post-operative ISBCS  
261 participants included, 3 strongly agreed and 1 disagreed that  
262 they would choose ISBCS if given the choice again. The post-

263 operative ISBCS participant that disagreed that they would  
264 choose ISBCS if given the choice again also disagreed that  
265 ISBCS was as expected. Among the remaining post-operative  
266 ISBCS participants, 1 agreed, 1 disagreed and 1 strongly  
267 disagreed that ISBCS was as expected. Representative quotes  
268 expressing the reasons that participants did not find ISBCS as  
269 expected, and additional information participants would have  
270 liked to receive before undergoing ISBCS are shown in figure 1.

271

272 By combining the 15 surgery-naïve participants that chose to  
273 be listed for ISBCS and the 51 participants that agreed they  
274 would choose ISBCS if given the choice, it can be estimated  
275 that 66/183 (36.1%) participants in our study would choose  
276 ISBCS. Likewise, by combining the 12 surgery-naïve  
277 participants that chose not to be listed for ISBCS and the  
278 remaining 89 participants that disagreed they would choose  
279 ISBCS if given the choice, it can be estimated that 101/183  
280 (55.2%) participants in our study would not choose ISBCS. The  
281 remaining 16/183 (8.7%) participants were neutral towards  
282 ISBCS (figure 2).

283

284 As shown in table 1, there was no statistically significant  
285 difference ( $p>0.3$ ) in sex, age, and employment status  
286 between participants that would and would not choose ISBCS.

287

288 **Attitudes towards ISBCS**

289 Seventy-nine participants gave reasons for choosing ISBCS and  
290 142 participants gave reasons for not choosing ISBCS or had  
291 concerns regarding ISBCS.

292

293 Of the participants that gave responses in favour of ISBCS, the  
294 most common reason was convenience or time and travel  
295 savings, which was reported by 34/79 (43.0%) participants.  
296 The second most common reasons (both reported by 22/79  
297 (27.8%) participants) were to avoid the stress of additional  
298 operations or appointments and reduction of waiting time for  
299 surgery. The next most common reason (reported by 21/79  
300 (26.6%) participants) was to avoid visual imbalance between  
301 the first and second surgery. This included participants that  
302 reported concerns regarding having to wait until the second  
303 surgery for a new spectacle prescription and issues with  
304 reading, balance, and vision between operations. Other less  
305 common reasons for choosing ISBCS are shown in table 2.

306

307 The most common reason for not choosing ISBCS was the risk  
308 of complications in both eyes or concerns about safety, which  
309 was reported by 77/142 (54.2%) participants. The second most  
310 common concern reported in 48/142 (33.8%) responses was

311 the difficulty of coping with impaired vision in both eyes  
312 immediately following the operation.  
313  
314 The only other concerns mentioned in over 10% of responses  
315 were regarding the need to wear patches that obscure both  
316 eyes after surgery and the need for additional care and  
317 support while recovering. All expressed concerns are  
318 presented in table 3.  
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## Discussion

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337 Although NICE guidance [NG77] recommends offering ISBCS to  
338 most adult cataract patients, it is not widely performed in the  
339 NHS, and thus remains largely unheard-of by cataract patients  
340 in the UK (3,13,17). In our study, most patients were recruited  
341 in clinics that often offer ISBCS. However, only around 40% of  
342 participants reported awareness of ISBCS, most of whom  
343 became aware via clinic staff. This suggests that unless  
344 patients are actively informed about ISBCS, they are unlikely to  
345 be aware of it.

346

347 A survey conducted prior to and during the early phase of the  
348 COVID-19 pandemic indicated that 45% of patients on NHS  
349 cataract surgery waiting lists would undergo ISBCS if offered it  
350 (13). In our cross-sectional study conducted during the post-  
351 COVID-19 cataract service rebuild, just over a third (36%) of  
352 participants reported that they would undergo ISBCS if given  
353 the choice. This implies a slight decline in the acceptability of  
354 ISBCS as the pandemic has progressed, possibly due to greater  
355 concerns about contracting COVID-19 and longer waiting times  
356 for surgery during the earlier phase of the pandemic.

357 Nevertheless, since prior to the pandemic less than 0.5% of  
358 NHS cataract surgery recorded on the NOD was ISBCS, our

359 findings suggests that from the patient perspective, a post-  
360 pandemic increase in practice of ISBCS would be feasible and  
361 welcomed (18).

362

363 While our study was undertaken across only three NHS  
364 cataract provider sites, the demographics of our study  
365 population appeared representative of the UK cataract patient  
366 population compared to recent NOD data (18).

367

368 Since ISBCS improves operating room efficiency and requires  
369 fewer hospital visits, it has been suggested that adopting ISBCS  
370 as routine practice may help tackle the growing burden of  
371 cataract in the UK (3,4). This should make it an attractive  
372 option to clinicians looking to facilitate patient-centred service  
373 redesign. In our study, patient willingness to undergo ISBCS  
374 appeared to be influenced by surgeon recommendation in  
375 clinic. Forty percent (6/15) of participants listed for ISBCS  
376 perceived that they were recommended it, while only 8%  
377 (1/12) of the surgery-naïve participants that chose not to be  
378 listed for ISBCS perceived they were recommended it. A  
379 possible explanation is that since ISBCS is controversial,  
380 unconscious personal biases held by surgeons may cause  
381 patients to be persuaded either in favour or against ISBCS (7).  
382 Nonetheless, it was encouraging that most participants



383 offered ISBCS (70%) felt that the surgeon offered both choices  
384 equally and did not express any preference.

385

386 ISBCS is often considered a riskier surgical option than DSBCS,  
387 mainly due to concerns regarding complications such as  
388 bilateral endophthalmitis (3). Since research suggests that  
389 females and older adults tend to be more risk averse, it was  
390 anticipated that these patients would be less likely to be  
391 willing to undergo ISBCS (19). However, there was no  
392 significant statistical difference ( $p>0.3$ ) between the age and  
393 sex of participants that would and would not choose ISBCS. As  
394 demonstrated by the diverse list of reasons given by  
395 participants in table 2 and 3, this may be because decisions  
396 regarding ISBCS are highly dependent on individual  
397 circumstances. Thus, the decision-making process cannot be  
398 easily reduced to patient demographics.

399

400 The most popular response in favour of ISBCS was  
401 convenience or to save time and travel as there would be  
402 fewer hospital visits. It has been estimated that ISBCS requires  
403 two fewer hospital appointments than DSBCS (6). Since most  
404 cataract patients are older adults, many of whom have  
405 reduced visual function or fragilities, additional travel to and  
406 from hospital is often a significant undertaking requiring

407 support from carers and family members. It may also incur  
408 further economic costs due to time off work and travel  
409 expenses (5,6).

410

411 The risk of complications in both eyes and concerns about  
412 safety were reported by over half (54%) of participants that  
413 expressed concerns regarding ISBCS. Many ophthalmologists  
414 share these concerns with a recent survey finding the risk of  
415 bilateral endophthalmitis as the main reason for surgeons  
416 deciding not to perform ISBCS in the UK (7). In clinical practice,  
417 the estimated risk of bilateral endophthalmitis typically  
418 quoted to patients is “1/250 000” (20). However, since no  
419 cases of bilateral endophthalmitis have been reported  
420 following ISBCS adhering to aseptic protocol, it remains a  
421 theoretical risk (10).

422

423 Another common concern regarding ISBCS is that it removes  
424 the opportunity for refractive outcome refinement in the  
425 second eye based on outcomes in the first eye (7). Large case  
426 series and randomised controlled trials have not substantiated  
427 these fears, and report similar refractive and visual function  
428 outcomes for ISBCS and DSBCS (8,9,21).

429

430 Although fear is a well-recognised barrier to uptake of ISCBS,  
431 the role of other related emotions such as anxiety and stress in  
432 ISBCS decision-making are relatively unexplored (13). Anxiety  
433 and stress were common motivators for uptake with  
434 approximately a quarter (28%) of participants in favour of  
435 ISBCS wishing to undergo ISBCS to avoid the anxiety or stress  
436 of an additional operation or hospital appointment.

437

438 Of the post-operative responses against ISBCS, 4% included  
439 concerns regarding the operation length or the need to lie flat  
440 for a long time. An additional 4% felt that ISBCS is undesirable  
441 as it would be more uncomfortable. Although these were  
442 uncommon concerns in our study, this supports previous  
443 research suggesting that ISBCS may be less appropriate for  
444 patients anxious about undergoing a lengthy operation or  
445 those with difficulty lying flat (3).

446

447 One advantage of ISBCS is that it avoids suboptimum visual  
448 acuity between surgeries as both cataracts are removed in one  
449 sitting (11). Of the participants that gave reasons in favour of  
450 ISBCS, 30% of surgery-naïve participants and 17% of  
451 postoperative participants would undergo ISBCS to improve  
452 their eyesight more quickly. The higher rates amongst surgery-  
453 naïve participants may represent a greater eagerness of

454 patients with visually significant cataracts to restore their  
455 quality of life via ISBCS.  
456  
457 Anisometropia is often experienced between surgeries in  
458 DSBCS (11). Of the respondents in favour of ISBCS, 12.1% of  
459 surgery-naïve participants and 37.0% of postoperative  
460 participants reported that they would choose ISBCS to avoid  
461 issues associated with visual imbalance. In addition, 4.3% of  
462 the responses given by postoperative participants in favour of  
463 ISBCS mentioned the avoided expense of additional spectacles  
464 or a blank spectacle lens. The three-fold higher proportion of  
465 postoperative participants that cited difficulties related to  
466 anisometropia suggests that, although this is an important  
467 motivator for patients choosing ISBCS, patients only become  
468 aware of these issues after undergoing cataract surgery. Given  
469 that certain patients, such as high myopes and hyperopes, are  
470 at particular risk of anisometropia during DSBCS, this should  
471 be a consideration when counselling these patients.  
472  
473 Concerns related to the ISBCS recovery period were a common  
474 barrier to uptake. Amongst respondents that reported reasons  
475 against choosing ISBCS, around a third (34%) mentioned  
476 concerns regarding coping with visual impairment in both eyes  
477 while eyes recover. While this is understandable and some

478 degree of additional support may be required in the  
479 immediate hours after surgery, the implicit worry that ISBCS  
480 will leave patients debilitated for long periods of time is not  
481 substantiated. As demonstrated by the quotes given by the  
482 postoperative ISBCS patients in figure 1, recovery of visual  
483 function following ISBCS can be very quick, which is often  
484 unexpected by patients.

485

486 Another common misunderstanding amongst participants  
487 regarding the ISBCS recovery period was the need to wear  
488 patches that obscure both eyes. It is likely that this  
489 misunderstanding has arisen as postoperative patients  
490 sometimes wear opaque dressings following unilateral  
491 cataract surgery with sub-tenons anaesthesia. Although the  
492 fear of wearing patches on both eyes following ISBCS is  
493 reasonable, as this would leave participants with no visual  
494 perception, it is avoided in ISBCS, as patients have topical  
495 anaesthesia and clear shields placed after surgery.

496

497 Given that the mean age of the study population is over 70  
498 years, it is unsurprising that a majority (67.8%) reported to be  
499 retired. This may explain why relatively few (9%) of the  
500 participants would choose ISBCS to reduce time off work.

501 Overall, there was no significant statistical difference ( $p=0.62$ )

502 found in employment status between participants that would  
503 and would not undergo ISBCS. While this is perhaps  
504 unexpected due to the emphasis placed on lost worktime in  
505 prior ISBCS economic analysis, this is consistent with previous  
506 patient attitude surveys (5,6,13).

507

508 Cataract service delays were a common concern during the  
509 pandemic (22). Although we are moving into a post-COVID-19  
510 era and services are catching up, a residual cataract backlog  
511 exists and the demand for cataract surgery continues to grow  
512 (1,2). Since ISBCS is known to improve the efficiency and cost-  
513 effectiveness of cataract services, increasing its practice would  
514 offer significant benefits (4–6). This is reflected in the  
515 responses given by participants in favour of ISBCS with over a  
516 quarter (28%) reporting that they would opt for ISBCS to  
517 reduce the wait for surgery and 9% reporting that ISBCS would  
518 benefit the NHS. Although the desire to undergo ISBCS to  
519 reduce waiting time may be exaggerated in our study due to  
520 COVID-19 related delays, the need to reduce waiting lists and  
521 optimise services remains of paramount importance to ensure  
522 the sustainability of NHS cataract services.

523

524 This cross-sectional study suggests that significantly more NHS  
525 cataract patients would opt for ISBCS if given the choice. Given

526 the need for more efficient NHS cataract services, this is  
527 promising, and suggests that service redesign proposals to  
528 increase the practice of ISBCS are possible. However, for this  
529 to be realised in clinical practice, patient barriers to uptake of  
530 ISBCS, such as misunderstandings about the recovery period,  
531 must first be addressed. In addition, our data suggests that  
532 ophthalmic surgeons and clinic staff have substantial influence  
533 in facilitating patients to undergo ISBCS, both as sources of  
534 information about the surgery and as counsellors in clinic.  
535 Thus, it may be that patients will only be offered and accept  
536 ISBCS at scale once ophthalmic surgeons become convinced  
537 that ISBCS is in their patients' best interests.

538

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545

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547 declare.

548

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550

551 **Author contribution:** All authors conceptualised study and

552 designed questionnaire. JM, CL, and AD contributed to data

553 collection. JM conducted data analysis and produced draft and

554 final manuscript. JB revised draft manuscript. Final manuscript

555 reviewed and commented on by all authors.

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557 **Data availability:** The data generated and analysed during the

558 current study are available from the corresponding author on

559 reasonable request.

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## References

575

- 576 1. Buchan JC, Norman P, Shickle D, Cassels-Brown A,  
577 MacEwen C. Failing to plan and planning to fail. Can we  
578 predict the future growth of demand on UK Eye Care  
579 Services? *Eye*. 2019;33(7):1029–31.
- 580 2. Lin P-F, Naveed H, Eleftheriadou M, Purbrick R, Zarei  
581 Ghanavati M, Liu C. Cataract service redesign in the  
582 post-COVID-19 era. *Br J Ophthalmol*. 2020;105(6):745–  
583 50.
- 584 3. Buchan JC, Donachie PHJ, Cassels-Brown A, Liu C, Pyott  
585 A, Yip JLY, et al. The Royal College of Ophthalmologists’  
586 National Ophthalmology Database study of cataract  
587 surgery: Report 7, immediate sequential bilateral  
588 cataract surgery in the UK: Current practice and patient  
589 selection. *Eye*. 2020;34(10):1866–74.
- 590 4. O’Brart DP, Roberts H, Naderi K, Gormley J. Economic  
591 modelling of immediately sequential bilateral cataract  
592 surgery (ISBCS) in the National Health Service based on  
593 possible improvements in surgical efficiency. *BMJ Open*  
594 *Ophthalmol*. 2020;5(1):e000426.
- 595 5. Leivo T, Sarikkola A-U, Uusitalo RJ, Hellstedt T, Ess S-L,  
596 Kivelä T. Simultaneous bilateral cataract surgery:  
597 Economic analysis; Helsinki Simultaneous Bilateral

- 598 Cataract Surgery Study Report 2. J Cataract Refract Surg.  
599 2011;37(6):1003–8.
- 600 6. O’Brien JJ, Gonder J, Botz C, Chow KY, Arshinoff SA.  
601 Immediately sequential bilateral cataract surgery versus  
602 delayed sequential bilateral cataract surgery: Potential  
603 hospital cost savings. Can J Ophthalmol.  
604 2010;45(6):596–601.
- 605 7. Lee E, Balasingam B, Mills EC, Zarei-Ghanavati M, Liu C.  
606 A survey exploring ophthalmologists’ attitudes and  
607 beliefs in performing Immediately Sequential Bilateral  
608 Cataract Surgery in the United Kingdom. BMC  
609 Ophthalmol. 2020;20(1).
- 610 8. Sarikkola A-U, Uusitalo RJ, Hellstedt T, Ess S-L, Leivo T,  
611 Kivelä T. Simultaneous bilateral versus sequential  
612 bilateral cataract surgery: Helsinki Simultaneous  
613 Bilateral Cataract Surgery Study Report 1. J Cataract  
614 Refract Surg. 2011;37(6):992–1002.
- 615 9. Serrano-Aguilar P, Ramallo-Fariña Y, Cabrera-Hernández  
616 JM, Perez-Silguero D, Perez-Silguero MA, Henríquez-De  
617 La Fe F, et al. Immediately sequential versus delayed  
618 sequential bilateral cataract surgery: Safety and  
619 effectiveness. J Cataract Refract Surg.  
620 2012;38(10):1734–42.
- 621 10. Arshinoff SA, Bastianelli PA. Incidence of postoperative

- 622 endophthalmitis after immediate sequential bilateral  
623 cataract surgery. *J Cataract Refract Surg.*  
624 2011;37(12):2105–14.
- 625 11. Lundström M, Albrecht S, Nilsson M, Åström B. Benefit  
626 to patients of bilateral same-day cataract extraction:  
627 Randomized clinical study. *J Cataract Refract Surg.*  
628 2006;32(5):826–30.
- 629 12. Naderi K, Maubon L, Jameel A, Patel DS, Gormley J, Shah  
630 V, et al. Attitudes to cataract surgery during the COVID-  
631 19 pandemic: a patient survey. *Eye.* 2020;34(12):2161–  
632 2.
- 633 13. Shah V, Naderi K, Maubon L, Jameel A, Patel DS,  
634 Gormley J, et al. Acceptability of immediate sequential  
635 bilateral cataract surgery (ISBCS) in a public health care  
636 setting before and after COVID-19: A prospective  
637 patient questionnaire survey. *BMJ Open Ophthalmol.*  
638 2020;5(1):e000554.
- 639 14. Wang H, Ramjani V, Raynor M, Tan J. Practice of  
640 immediate sequential bilateral cataract surgery (ISBCS)  
641 since COVID-19: a patient and surgeon survey. *Eye.*  
642 2021. <https://doi.org/10.1038/s41433-021-01521-1>.
- 643 15. Carolan JA, Amsden LB, Lin A, Shorstein N, Herrinton LJ,  
644 Liu L, et al. Patient Experience and Satisfaction with  
645 Immediate Sequential and Delayed Sequential Bilateral

- 646 Cataract Surgery. Am J Ophthalmol. 2021.  
647 <https://doi.org/10.1016/j.ajo.2021.09.016>.
- 648 16. Likert R. A technique for the measurement of attitudes.  
649 Arch Psychol. 1932;22(140):55.
- 650 17. Cataracts in adults: management 2017. NICE guideline  
651 [NG77]. 2017. <https://www.niceorguk/guidance/ng77>.
- 652 18. Day AC, Donachie PHJ, Sparrow JM, Johnston RL. The  
653 Royal College of Ophthalmologists' National  
654 Ophthalmology Database study of cataract surgery:  
655 Report 1, visual outcomes and complications. Eye.  
656 2015;29(4):552–60.
- 657 19. Rolison JJ, Hanoch Y, Wood S, Liu PJ. Risk-taking  
658 differences across the adult life span: A question of age  
659 and domain. Journals Gerontol Ser B Psychol Sci Soc Sci.  
660 2014;69(6):870–80.
- 661 20. Moorfields Eye Hospital NHS Foundation Trust Patient  
662 information: Cataract. 2020.  
663 [https://www.moorfields.nhs.uk/sites/default/files/Cata](https://www.moorfields.nhs.uk/sites/default/files/Cataract%20service_1.pdf)  
664 [ract%20service\\_1.pdf](https://www.moorfields.nhs.uk/sites/default/files/Cataract%20service_1.pdf).
- 665 21. Herrinton LJ, Liu L, Alexeeff S, Carolan J, Shorstein NH.  
666 Immediate Sequential vs. Delayed Sequential Bilateral  
667 Cataract Surgery: Retrospective Comparison of  
668 Postoperative Visual Outcomes. Ophthalmology.  
669 2017;124(8):1126–35.

670 22. Sii SSZ, Chean CS, Sandland-Taylor LE, Anuforum U,  
671 Patel D, Le GT, et al. Impact of COVID-19 on cataract  
672 surgery- patients' perceptions while waiting for cataract  
673 surgery and their willingness to attend hospital for  
674 cataract surgery during the easing of lockdown period.  
675 Eye. 2020;35(11):3156–8.

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## Figure and table legends

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696 **Figure 1.** Willingness of participants to undergo ISBCS, and

697 quotations from post-operative ISBCS participants

698

699 **Figure 2.** Diagram summarizing the acceptability of ISBCS to

700 the participants in our study

701

702 **Table 1.** Characteristics of participants that would and would

703 not choose to undergo ISBCS

704

705 **Table 2.** Reasons given by participants in favour of choosing

706 ISBCS

707

708 **Table 3.** Reasons given by participants against choosing ISBCS

709

710 **Supplementary information.** Questionnaire

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712

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***“If given the choice (again), I would choose to have cataract surgery in both eyes on the same day”, n (%)***

	Surgery-naïve participants not offered ISBCS	Post-operative participants	Overall
Strongly agree	10 (25.6%)	25 (21.4%)	35 (22.4%)
Agree	5 (12.8%)	11 (9.4%)	16 (10.3%)
Neutral	3 (7.7%)	13 (11.1%)	16 (10.3%)
Disagree	6 (15.4%)	22 (18.8%)	28 (17.9%)
Strongly disagree	15 (38.5%)	46 (39.3%)	61 (39.1%)
Total participants	39	117	156

**Explanations provided by patients reporting that ISBCS was not as expected**

*“I thought I would not be able to see after, but I was able to walk home within an hour and live a normal life...”*

*“It was far better. I recovered within a few hours... I was worried I would have to wait for weeks to see again”*

*“Surgery was longer than expected as my eyes had problems”*

**Additional information patients would have liked to receive before undergoing ISBCS**

*“You have to be brave... my family said it would be bad... I remember being worried I wouldn't be able to see when I open my eyes [after surgery], but I could”*

*“...need to make it clear that the things you put over your eyes after are clear and not dark...”*

*“I thought it would be painful, but it wasn't”*

Surgery-naïve participants  
offered ISBCS  
(n = 27)

Surgery-naïve participants not  
and post-operative parti  
(n = 156)

Accepted  
ISBCS  
(n = 15)

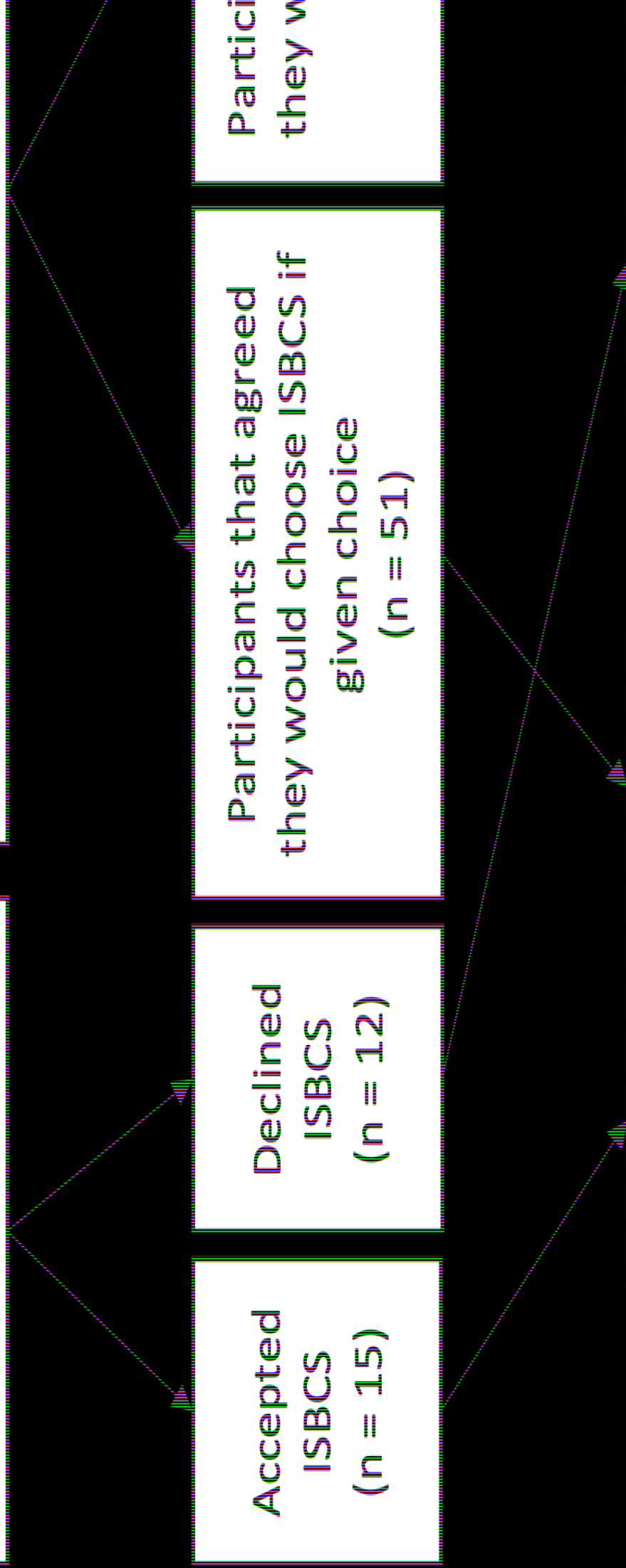
Declined  
ISBCS  
(n = 12)

Participants that agreed  
they would choose ISBCS if  
given choice  
(n = 51)

Particip  
they w

Participants that would  
choose ISBCS  
(n = 66)

Participants that  
not choose IS  
(n = 101)





<b>Patient characteristics</b>	<b>Patients that would choose ISBCS</b>	<b>Patients that would not choose ISBCS</b>	<b>P value*</b>
Sex, n (%)			0.32
Male	32 (48.5%)	41 (40.6%)	
Female	34 (51.5%)	60 (59.4%)	
Age (years)**			
Mean (standard deviation)	71.2 (10.4)	70.6 (9.6)	0.70
Employment status, n (%)			0.62
Full-time/part-time employment	14 (21.2%)	49 (26.8%)	
Retired	49 (74.2%)	124 (67.8%)	
Unemployed	3 (4.5%)	10 (5.5%)	
Total patients	66	101	

\*Chi-squared tests used for sex and employment status and unpaired t-test used for age

\*\*Age data missing for 2 participants

Reasons given for choosing ISBCS, n (%)*	Surgery-naïve	Post-operative	Overall
Convenience/to save time and travel (as there would be fewer hospital visits)	18 (54.5%)	16 (34.8%)	34 (43.0%)
To avoid the anxiety/stress of an additional operation/additional hospital appointments	11 (33.3%)	11 (23.9%)	22 (27.8%)
To reduce waiting time for surgery	7 (21.2%)	15 (32.6%)	22 (27.8%)
To avoid visual imbalance between the 1 <sup>st</sup> and 2 <sup>nd</sup> surgery**	4 (12.1%)	17 (37.0%)	21 (26.6%)
To improve eyesight more quickly	10 (30.3%)	8 (17.4%)	18 (22.8%)
To minimize the time requiring eye drops	2 (6.1%)	7 (15.2%)	9 (11.4%)
To reduce time off work	2 (6.1%)	5 (10.9%)	7 (8.9%)
More efficient/beneficial for the NHS	3 (9.1%)	4 (8.7%)	7 (8.9%)
To minimize the time not being able to care for others (e.g., family or dependents)	2 (6.1%)	1 (2.2%)	3 (3.8%)
To avoid the expense of additional spectacles/a blank lens between the 1 <sup>st</sup> and 2 <sup>nd</sup> surgery	0 (0.0%)	2 (4.3%)	2 (2.5%)
The discomfort of surgery is over in one sitting	0 (0.0%)	2 (4.3%)	2 (2.5%)
Total participants	33	46	79

\*Percentages add up to more than 100 as many participants mentioned more than one reason in their response.

\*\*The need for new spectacles after the 1<sup>st</sup> surgery but having to wait until after the 2<sup>nd</sup> surgery was mentioned in 8/79 (10.1%) responses; issues with reading, vision and balance between the 1<sup>st</sup> and 2<sup>nd</sup> surgery were each mentioned in 5/79 (6.3%) responses.

<b>Reasons given for not choosing ISBCS/concerns regarding ISBCS, n (%)*</b>	<b>Surgery-naïve</b>	<b>Post-operative</b>	<b>Overall</b>
The risk of complications (e.g., infection) in both eyes/concerns about safety	27 (57.4%)	50 (52.6%)	77 (54.2%)
The difficulty of coping with impaired vision in both eyes while eyes recover	12 (25.5%)	36 (37.9%)	48 (33.8%)
The need for additional care/support while recovering	8 (17.0%)	11 (11.6%)	19 (13.4%)
The need to wear patches that obscure both eyes after surgery	3 (6.4%)	16 (16.8%)	19 (13.4%)
The difficulty of administering eye drops during the recovery period	2 (4.3%)	9 (9.5%)	11 (7.7%)
Not having sufficient eyesight to travel home after surgery	2 (4.3%)	8 (8.4%)	10 (7.0%)
It would be more painful/uncomfortable	1 (2.1%)	4 (4.2%)	5 (3.5%)
Being less able to care for others (e.g., family or dependents) while recovering	1 (2.1%)	4 (4.2%)	5 (3.5%)
The operation would be longer/the difficulty of lying flat for a long time	0 (0.0%)	4 (4.2%)	4 (2.8%)
Being less able to work while recovering	0 (0.0%)	3 (3.2%)	3 (2.1%)
The difficulty of wearing eye shields on both eyes after surgery	0 (0.0%)	2 (2.1%)	2 (1.4%)
<b>Total participants</b>	<b>47</b>	<b>95</b>	<b>142</b>

\*Percentages add up to more than 100 as many participants mentioned more than one reason in their response.