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Title:

Agreement between ophthalmologists and optometrists in the certification of vision impairment

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42 **Abstract**

43

44 *Background/Objectives:* The certification process to register patients as sight impaired or
45 severely sight impaired is undertaken by consultant ophthalmologists, in the UK. We sought
46 to assess the agreement between optometrists and a consensus panel, in identifying patient
47 eligibility for certification, relative to the agreement between ophthalmologists and the
48 consensus panel.

49

50 *Methods:* The consensus panel (4 consultant ophthalmologists and 3 optometrists with a
51 formal accreditation in low vision), 30 consultant ophthalmologists and 99 low vision
52 optometrists reviewed 40 randomly-selected abridged cases. The eligibility outcomes from
53 the ophthalmologists and the optometrists were compared to the consensus panel
54 outcomes.

55

56 *Results:* For ophthalmologists and optometrists, the median (IQR) number of cases in which
57 there was agreement with the consensus panel was 33.0 (31.0, 33.0) and 36.0 (34.0, 36.5),
58 respectively. In severely sight impaired cases, the probabilities of agreeing on eligibility for
59 certification were 76.0% (95% CIs 71.4%, 80.1%) for ophthalmologists and 61.8% (59.0%,
60 64.6%) for optometrists. In sight impaired cases, the comparable figures were 51.6%
61 (46.7%, 56.4%) for ophthalmologists and 72.2% (69.8%, 74.5%) for optometrists. In cases of
62 bilateral atrophic age-related macular degeneration (AMD), both groups were more likely to
63 agree with the consensus panel and the differences between optometrists and
64 ophthalmologists were less marked.

65

66 *Conclusions:* Optometrists demonstrated a comparable agreement relative to
67 ophthalmologists, with the consensus panel on the eligibility of randomly-selected, abridged
68 cases for certification. The findings support the clinical decision-making ability of low vision
69 optometrists in the certification of patients with vision impairment and provide evidence in
70 support of policy change to allow low vision optometrists to certify individuals with atrophic
71 AMD.

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76 **Keywords**

77 Vision disorders classification
78 Disability Evaluation
79 Consultants
80 Optometrists
81 Observer Variation
82 Ophthalmology standards
83 Clinical competence standards
84 Practice Patterns, Physicians
85 Reproducibility of Results
86 Visually Impaired Persons classification
87 Health Services research

88
89

90 **INTRODUCTION**

91 Patients who are eligible to be registered as sight impaired or severely sight impaired require a
92 certificate of vision impairment to be completed by a consultant ophthalmologist, in the UK. This is
93 undertaken with reference to the UK guidelines on certification.¹

94
95 Patients with a completed certificate of vision impairment can then choose to be registered with
96 the local government social services department, which then allows access to services and support;
97 although, such support can also be accessed without certification. A greater level of support is
98 available to those registered as severely sight impaired compared to sight impaired. In England, the
99 certificate of vision impairment is used to inform Government metrics of public health
100 improvement and protection,² and in Wales, it is used to indicate incident certifiable sight
101 impairment.³

102
103 An additional role of the certificate of vision impairment is the collection of epidemiological
104 information about the incidence and causes of certifiable sight loss in the UK^{4,5}. Whilst the
105 number of certificates issued in the UK accurately reflects those registered with social
106 services as having vision impairment⁶, it does not represent all individuals living with sight
107 loss. Indeed, it is estimated that up to 51% of those eligible for certification are not
108 certified⁷⁻⁹ and the incidence of certification varies across geographical locations¹⁰. From
109 studies involving medical record review^{7,8,11} and patient interviews,⁹ it was found that
110 those with a treatable condition or receiving ongoing treatment were more likely to be
111 certified than those with untreatable conditions. Additionally, those from ethnic minorities
112 were less likely to be certified than Caucasian patients^{7,9} and those with visual field loss
113 alone were less likely to be certified than those with reduced visual acuity.⁸

114

115 There is a mismatch in demand and capacity for available secondary care ophthalmology
116 appointments, and the long waiting times for appointments may put people at risk of
117 irreversible sight loss ⁴. Given the care capacity issues, the role of the primary care
118 optometrist has expanded, with the introduction and development of enhanced eye care
119 services ¹².

120

121 In Wales, over 8,500 individuals with low vision are examined by the primary care-based
122 Low Vision Service (LVSU) each year. Registration with vision impairment is not a
123 prerequisite for access to this service. The LVSU is provided by 184 practitioners (171
124 optometrists and 13 dispensing opticians) who have completed and continuously undergo
125 specialist training.

126

127 In order to assess the appropriateness of an expanded role of LVSU accredited optometrists
128 in the certification of vision impairment, there is a need to evaluate their clinical ability in
129 identifying the eligibility of a range of individuals for certification. The aims of this study
130 were twofold. Firstly, to assess the agreement between optometrists and a consensus
131 panel, in identifying patient eligibility for certification, relative to the agreement between
132 ophthalmologists and the consensus panel. The second aim was to explore whether the
133 agreement between clinician groups and the consensus panel was influenced by the
134 presence of bilateral atrophic age-related macular degeneration (AMD) as the cause of
135 vision impairment. This is important given the potential to influence policy in Wales in the
136 certification of patients with bilateral atrophic AMD by optometrists, as the clinical
137 management of this group is predominantly based in primary care.

138

139 **MATERIALS AND METHODS**

140 Case records from 40 individuals were selected at random (www.random.org), from 8,000
141 patients seen by the LVSW between April 2017 and April 2018, stratified by the three
142 categories of severity of sight loss and anonymised. The case records for each individual
143 conformed to the following inclusion criteria: consent had been given to use the data for
144 research and individuals were at least 18 years old.

145

146 Details from each case record were transferred to a proforma and consisted of: age, gender,
147 time since diagnosis, occupation, social and living situation, general health, the presence of
148 a hearing impairment, problems reported, support received to date, diagnosis (right and left
149 eye), refraction (distance and near), visual acuity (distance and near, monocular and
150 binocular), binocular contrast sensitivity (measured using the Pelli-Robson chart, reported in
151 terms of percentage loss and whether the loss was considered as: normal, noticeable loss,
152 significant loss, severe loss ¹³) and the visual field status. Visual field printouts were included
153 where available.

154

155 The consensus panel consisted of four consultant ophthalmologists and three LVSW
156 optometrists. Each consultant had been registered with the General Medical Council
157 specialist register for ophthalmology for at least 2 years and had undergone the standard
158 seven years of speciality training prior to this. Each of the LVSW optometrists had been
159 registered with the General Optical Council in addition to specialising in low vision for at
160 least 15 years and had each completed a Masters Level qualification in low vision. The

161 consensus panel met to determine the certification eligibility of each of the anonymised
162 case records based on the information presented. In cases of disagreement on the
163 certification outcome, the case was discussed until unanimous agreement was reached.

164

165 An anonymous online survey was then created (<https://www.onlinesurveys.ac.uk>), in order
166 to present each of the case records in a random order for each new respondent. All National
167 Health Service consultant ophthalmologists practicing in Wales (n=58) and all LVSW
168 optometrists (n=162) were invited to take part as raters in the online survey to evaluate the
169 40 case records. Consultant ophthalmologists and LVSW optometrists who were in either
170 the consensus panel and/or the research team were excluded from the survey. The survey
171 was completed without time or other restrictions in an unsupervised environment.

172

173 Raters were asked to decide on the certification eligibility status (not eligible, sight impaired
174 [SI], or severely sight impaired [SSI]) of each of the 40 cases, with reference to the English
175 guidelines (Department of Health 2013). These guidelines were provided at the start of the
176 online survey, and were available to be viewed within each of the 40 cases.

177

178 The survey was available for completion from the 23rd April 2018 until 3rd July 2018. An
179 incentive of 18 GBP was offered to optometrists to complete the survey. A pragmatic
180 decision was taken not to offer the incentive to the ophthalmologists. It was advised by the
181 ophthalmologists on the consensus panel that payment to the ophthalmologist participants
182 would not have a significant effect on participation and the administrative process of
183 claiming a payment could act as a disincentive to participation.

184

185 Ethical approval was gained from the School of Optometry and Vision Sciences Research
186 ethics and Audit committee (approval number 1443) at Cardiff University. Consent to take
187 part in the study was obtained at the beginning of the online survey. The research was
188 conducted according to the tenets of the Declaration of Helsinki.

189

190

191 **Analysis**

192 The agreement between each rater group and the consensus panel was determined using
193 eligibility as both a trichotomous variable (not eligible, SI, SSI) and a dichotomous variable
194 (not eligible or eligible, i.e. encompassing both SI and SSI).

195

196 Modelling was then undertaken using the outcome: exact agreement with panel/disagree
197 with panel. Given the 129 ratings for each case, i.e., one rating from each ophthalmologist
198 and optometrist, we used a multilevel model in which inter rater variability was quantified
199 using a random effect. Initially, the variable, agreement (exact agreement with
200 panel/disagree with panel), was modelled as an outcome in a logistic regression on rater
201 group (ophthalmologist/optometrist), consensus panel eligibility rating, and an interaction
202 term between the two. Additionally, bilateral atrophic AMD was then included as another
203 variable in the modelling.

204

205 Krippendorff's alpha was used to calculate inter-rater agreement within each clinician group
206 and is appropriate for use with the trichotomous rating outcomes ¹⁴.

207

208 All analyses were conducted in R Version 3.5.1 and mixed effects models were fitted using
209 the lme4 package ¹⁵.

210

211

212

213

214 **RESULTS**

215 The demographic and clinical details of each of the 40 cases are shown in Table S1 (online
216 only supplementary table) and in Figures 1a and 1b. Primary causes of vision loss in the 40
217 case records included: cataract, neovascular and atrophic AMD, Stargardts disease, cone
218 dystrophy, diabetic eye disease, glaucoma, optic neuritis, nystagmus, retinal detachment,
219 homonymous hemianopia resulting from stroke and retinitis pigmentosa.

220

221 Of the 40 cases, the consensus panel agreed that 12 were not eligible for certification, 15
222 were eligible to be certified as SI, and 13 certified as SSI (Table 1). There were no cases in
223 which a group agreement by the consensus panel was not reached.

224

225 Survey responses from 30 consultant ophthalmologists and 99 low vision optometrists were
226 received, accounting for 52% and 61% of those eligible to take part (i.e. the total number of
227 clinicians in Wales) from each rater group, respectively.

228

229 Each of the 40 cases therefore was rated by 129 clinicians, giving a total of 5,160 ratings.

230 Ophthalmologists produced 1,200 ratings; optometrists, 3,960 (Table 2). These were not

231 independent observations: each of the 129 raters classified the same 40 cases. The 28 cases
232 rated as eligible for certification by the panel thus provided $28 \times 30 = 840$ observations by
233 ophthalmologists and $28 \times 99 = 2,772$ observations by optometrists. Seventy-five % ($n=631$)
234 of the ophthalmologists' ratings of those cases were eligible for certification. Eighty-eight %
235 ($n=2,440$) were eligible in the optometrists' view (Table 2).

236

237 For each rater, a count was made of the number of cases classified to each category.

238 Ophthalmologists rated a median of 11 (IQR 9.25, 11) cases as SI and 10 (9.25, 10) as SSI.

239 Optometrists rated a median of 17 (15, 19) cases as SI and 8 (7, 11) as SSI.

240

241 Compared to the consensus panel who considered 12 of the cases to be ineligible, a median
242 of 19 (IQR 18.25, 20) cases were rated ineligible by ophthalmologists and 14 (12, 16) by
243 optometrists. Fifteen cases were rated as SI by the consensus panel, whilst 11 (9.25, 11) and
244 17 (15, 19) cases were rated as SI by the ophthalmologists and optometrists, respectively.

245 Thirteen cases were rated as SSI by the consensus panel, whilst 10 (9.25, 10) and 8 (7, 11)
246 cases were rated as SSI by ophthalmologists and optometrists, respectively. This, however,
247 does not indicate the level of agreement concerning individual cases. We then determined,
248 for each case and rater, whether the rater agreed with the consensus panel's outcome,
249 either when considering the dichotomous (eligible/not eligible) rating or the trichotomous
250 (not eligible/SI/SSI) rating.

251

252 The agreement between each rater group with the consensus panel is shown in Figure 1c.

253 Figure 1d is an alternative presentation of the same data. For the dichotomous rating, the
254 optometrists' distribution is clearly different to the ophthalmologists' and in better accord

255 with the consensus panel's outcome. For ophthalmologists, the median (IQR) number of
256 cases in which there was agreement with the consensus panel was 33.0 (31.0, 33.0);
257 comparable figures for optometrists were 36.0 (34.0, 36.5). For ophthalmologists, the mode
258 was 33, where 13 ophthalmologists (43%) agreed with the consensus panel. Similarly, for
259 optometrists, the mode was 36 cases, where 26 optometrists (26%) agreed with the
260 consensus panel. For the trichotomous rating, the median (IQR) number of cases in which
261 there was full agreement with the consensus panel was 30.0 (28.3, 30.0); comparable
262 figures for optometrists were 30.0 (27.0, 31.5).

263

264 Table 3 (charted in Figure 2a) shows the probability of rating the eligibility of the cases in
265 exact agreement with the consensus panel, for each rater group, together with 95%
266 confidence intervals derived from the fitted model. The greatest differences between
267 optometrists and ophthalmologists occurred for cases determined by the consensus panel
268 as SI: optometrists considered 72% of those cases as SI while ophthalmologists rated only
269 52% as SI (95% CIs 0.70, 0.75 cf. 0.47, 0.56). For cases rated as SSI by the consensus panel,
270 optometrists and ophthalmologists considered 62% and 76% as SSI, respectively (95% CIs
271 0.59, 0.65 cf. 0.71, 0.80). Agreement on cases that were, according to the consensus panel,
272 not eligible, was closer between clinician groups.

273

274 Bilateral atrophic AMD was then added in to the model as an explanatory variable (Figure
275 2a, bottom panel), which was selected for inclusion given its clinical significance. Overall,
276 both clinician groups were more likely to agree with the consensus panel outcomes for
277 cases of bilateral atrophic AMD than for cases in which it was not present. As previously, the
278 greatest differences between optometrists and ophthalmologists occurred for cases eligible

279 for certification as SI; however, these differences were less marked in cases of bilateral
280 atrophic AMD.

281

282 As Figure 2b (top panel) suggests both ophthalmologists and optometrists largely agreed
283 that those cases considered not eligible by the consensus panel were truly ineligible and
284 that the cases considered SSI by the panel were eligible. Figure 2b (top panel) shows that for
285 both groups, the classification of most cases was unambiguous: 19 of the cases were judged
286 as eligible by over 90% of the optometrists, while a further 6 of the cases were considered
287 eligible by less than 10% of the optometrists, i.e., over 90% of the optometrists considered
288 those 6 to be ineligible. Ophthalmologists demonstrated a similar pattern with near
289 unanimity over the classification of 16 cases as eligible and 12 cases were considered
290 eligible by less than 10% of the ophthalmologists. For the cases determined as SI by the
291 consensus panel (Figure 2b, bottom panel), there were 7 cases in which less than 50% of
292 ophthalmologists agreed with the consensus panel, but only 2 cases in which same was true
293 for optometrists.

294

295

296 There were 11 cases of complete agreement amongst all the ophthalmologists and
297 optometrists, one of which all considered ineligible, the others being eligible.

298

299 Moderate to substantial inter-rater agreement was demonstrated within each rater group.
300 Based on all 40 cases, for ophthalmologists, Krippendorff's alpha values were 0.72 (95% CI
301 0.62 – 0.81) and 0.8 (0.70 – 0.88), for the dichotomous and trichotomous classifications,
302 respectively. Similarly, the corresponding values for optometrists were 0.67 (0.53 – 0.78)
303 and 0.73 (0.63 – 0.81).

304

305

306 **DISCUSSION**

307 This study evaluated the clinical decision-making abilities of low vision optometrists and

308 consultant ophthalmologists in certifying patients as vision impaired. Unlike the

309 ophthalmologists, the optometrists were inexperienced in the process of certification

310 However, low vision optometrists are experienced in managing patients with low vision and

311 thus have a theoretical understanding of the certification of vision impairment, but not a

312 current role in the formal certification process.

313

314 The key finding of this study was that optometrists demonstrated comparable agreement

315 relative to ophthalmologists, with the consensus panel outcomes on the eligibility of cases

316 for certification. The similarity in performance between groups is demonstrated by the

317 number of cases in which there was agreement with the consensus panel and the overall

318 probability of rating the eligibility of cases in exact agreement with the consensus panel. For

319 cases rated as SI, the probability of agreement with the consensus panel was greater for

320 optometrists than for ophthalmologists, whilst the opposite was true for cases rated as SSI.

321 Both clinician groups rated fewer cases as eligible relative to the consensus panel.

322 Ophthalmologists were least likely to agree with the consensus panel outcome for cases

323 judged by the consensus panel as SI, whilst optometrists were least likely to agree with the

324 consensus panel for SSI cases. Whilst the results for SSI cases may reflect the naivety of the

325 optometrists in the certification process, and may be partly explained by a stronger

326 adherence to the clinical guidelines, the overall similarity between groups supports their

327 ability to provide this service to patients.

328

329 In one case (case 3), classified as SI by the consensus panel, interestingly, 90% of the
330 ophthalmologists classified this case as not eligible (Figure 2b). Although this individual had
331 better visual acuities than the guideline criteria for certification, she had a severe loss of
332 contrast sensitivity, recent diagnosis of AMD, and lived alone. This suggests the rating of
333 the consensus panel may have allocated more weighting to the circumstantial factors than
334 the visual acuity status, relative to that of the ophthalmologists. Whilst contrast sensitivity
335 is not specifically mentioned in the certification guidelines, clinicians may differ in their
336 consideration of this outcome when it is available. However, decisions are never made on
337 this outcome alone.

338

339 Both clinician groups were more likely to agree with the consensus panel across all eligibility
340 classifications in cases of bilateral atrophic AMD, relative to the other causes of vision
341 impairment. In these cases, the differences between clinician groups was less, relative to
342 those cases in which there was another cause of vision impairment i.e. not atrophic AMD.
343 This difference was most marked for the SI cases (Figure 2a).

344

345 AMD is the leading cause of certifiable vision impairment in England and Wales accounting
346 for 50% of all certifications of vision impairment ¹⁶ and of these cases, atrophic AMD is the
347 leading cause of vision loss in approximately 50% ¹⁷. Given the lack of clinical therapeutic
348 options for atrophic AMD, patients with this condition would not be routinely monitored
349 within the hospital eye service. Yet, the vision loss associated with severe atrophic AMD
350 meets the threshold for eligibility for certification. Therefore, these patients would

351 particularly benefit from access to certification through primary care optometry, should it
352 become available.

353

354 This is the first study to measure the agreement between optometrists and consultant
355 ophthalmologists in the consideration of eligibility for certification of patients with vision
356 impairment. Previous studies have examined the agreement between optometrists and
357 ophthalmologists, in other clinical tasks ¹⁸⁻²³. Some have shown moderate to substantial
358 agreement between these groups in the grading of anterior chamber angles ¹⁹ and in the
359 evaluation of glaucoma ²⁰⁻²³. Others have demonstrated poor levels of agreement between
360 and within consultant ophthalmologists, in classifying patients with glaucomatous visual
361 field defects ¹⁸. However, such comparisons to the present study are limited given the
362 different nature of these clinical tasks.

363

364 The strengths of the study include the substantial proportion of clinicians relative to the
365 overall workforce in Wales who took part in the study. A consensus panel was adopted to
366 provide a reference standard for clinical decision-making.

367

368 The limitations of the study include the online delivery of the survey, which may have
369 resulted in the self-selection of clinicians with a specific interest to act as participants. A
370 moderate number of anonymised cases were reviewed, although they were representative
371 of the variety of disease types and individual circumstances of such cases. The grading of
372 anonymised cases does not fully simulate the interaction that occurs between a clinician
373 and a patient. Additionally, whilst the ophthalmologists were experienced in the real life
374 process of certification, neither of the clinician groups were familiar with the task of

375 classifying abridged cases. A possible risk of bias could be attributed to the incentivisation
376 to optometrists but not ophthalmologists, however, the payment was offered
377 independently of performance in the classification task, and therefore should be expected
378 to be independent of the recorded outcomes for each participant.

379

380 The number of optometrist participants was consistent with the number who claimed the
381 incentive. Although the possibility that an ophthalmologist participant completed the
382 survey more than once cannot be excluded, it is unlikely, given the time taken to review
383 each case, which was presented in a random order in each survey.

384

385 Overall, the performance of optometrists was comparable to that of ophthalmologists in the
386 rating of eligibility of virtual patient cases for the certification of vision impairment. The
387 findings support the clinical decision-making ability of low vision optometrists in the
388 certification of patients with vision impairment, especially in cases of atrophic AMD. A
389 prospective study comparing the assessment of patients with bilateral atrophic AMD by low
390 vision optometrists against a reference standard is warranted.

391

392

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395 the consensus panel members and to all study participants.

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488

489 **FIGURE LEGENDS**

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491 Figure 1 (a) The percentage of cases by gender and consensus panel outcome, according to
492 demographic and clinical characteristics. (b) The consensus panel outcome with respect to
493 visual acuity and time since diagnosis. (c) The number of cases out of 40 in which
494 ophthalmologists (left) and optometrists (right) agreed with the consensus panel in the
495 assessment of eligibility for certification as a dichotomous variable (not eligible or eligible;
496 top) and as a trichotomous variable (bottom). (d) The distributions of the number of cases
497 out of 40 in which ophthalmologists and optometrists agreed with the consensus panel in
498 the assessment of eligibility for certification as a dichotomous variable (not eligible or
499 eligible; left panel) and a trichotomous variable (not eligible, sight impaired, or severely
500 sight impaired; right panel). Boxplot limits in (b) and (d) indicate the lower sample quartile,
501 sample median and upper sample quartile.

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503 Figure 2. (a) The probability of agreeing with the consensus panel outcome, for each rater
504 group. The vertical grey bars represent the 95% confidence intervals. The top panel in (a)
505 shows the overall agreement and the bottom panel shows the agreement for cases in which
506 the primary cause of vision impairment was (right) and was not (left) bilateral atrophic
507 AMD. (b) Distribution of cases by percentage of raters judging the cases to be eligible. The
508 top panel shows the overall distribution. The bottom panel shows the distribution for cases
509 determined by the consensus panel as sight impaired only.

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515 TABLES

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	Consensus panel outcome		
	Not eligible	Eligible	
		Sight impaired (SI)	Severely sight impaired (SSI)
			<i>Number of cases</i>
Total	12	15	13
Case characteristic:			
Sex			
Male	5	5	7
Female	7	10	6
Age-related macular degeneration	4	12	7
Bilateral atrophic age-related macular degeneration	3	4	5
Lives alone	1	10	7
Hearing impaired	1	4	2
			<i>Median(IQR)</i>
Age	78.5 (73.8, 86.0)	79.0 (71.5, 81.0)	79.0 (73.0, 81.0)
Binocular distance visual acuity (LogMAR)	0.44 (0.30, 0.70)	0.90 (0.84, 1.00)	1.30 (1.00, 1.30)
Years since diagnosis	6 (4, 10)	4 (2, 5.75) [†]	4.5 (2, 6.25) ^{††}

517 † based on 14 cases^{††} based on 12 due to missing data518 *Table 1. Case characteristics by consensus panel outcome*

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Rater group		Consensus panel outcome			
		Rater group's classification	Not eligible	Eligible	
				Sight impaired (SI)	Severely sight impaired (SSI)
Ophthalmologists					
	Not eligible	339	183	26	
	Sight impaired (SI)	19	232	68	
	Severely sight impaired (SSI)	2	35	296	
Optometrists					
	Not eligible	1042	328	4	
	Sight impaired (SI)	138	1071	488	
	Severely sight impaired (SSI)	8	86	795	

522 *Table 2. Number of ratings by trichotomous classification of cases by the consensus panel*
 523 *and by each rater group.*

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Rater group	Consensus panel outcome	Probability of rater group agreeing exactly with consensus panel	95% confidence interval	
			Lower limit	Upper limit
Ophthalmologists	Not eligible	0.942	0.913	0.962
Optometrists	Not eligible	0.878	0.858	0.896
Ophthalmologists	SI	0.516	0.467	0.564
Optometrists	SI	0.722	0.698	0.745
Ophthalmologists	SSI	0.760	0.714	0.801
Optometrists	SSI	0.618	0.590	0.646

536 *Table 3. Modelling outcomes showing the estimated probability of rating the eligibility of the*
537 *cases in exact agreement with the consensus panel, for each rater group, with 95%*
538 *confidence intervals derived from the fitted model.*

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546 **ONLINE ONLY SUPPLEMENTARY MATERIAL**

547 Table S1. Demographic and clinical details for the 40 cases, including; age (years), sex
548 (M=male, F=Female), time since diagnosis, whether the patient lives alone, whether there is
549 a patient reported hearing impairment, eye condition (NAMd= neovascular AMD, GA=
550 atrophic AMD, DR= diabetic retinopathy, DM= diabetic maculopathy), severity of binocular
551 contrast sensitivity loss [13] measured with Pelli-Robson chart, monocular and binocular
552 distance visual acuity (LogMAR), binocular near visual acuity, visual field status (as recorded
553 in original case record or as indicated by visual field printout), and consensus panel eligibility
554 criteria (NE=not eligible, SI= Sight Impaired, SSI= Severely Sight Impaired). Cases of bilateral
555 atrophic AMD are indicated by the term GA in both right eye (OD) and left eye (OS) columns.

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