

ORIGINAL ARTICLE

A prospective evaluation of the clinical safety and effectiveness of a COVID-19 Urgent Eyecare Service across five areas in England

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Abstract

Purpose: Although urgent primary eye care schemes exist in some areas of England, their current safety is unknown. Accordingly, the aim of the present study was to quantify the clinical safety and effectiveness of a COVID-19 Urgent Eyecare Service (CUES) across Luton, Bedford, Hull, East Riding of Yorkshire and Harrogate.

Methods: Consenting patients with acute onset eye problems who had accessed the service were contacted to ascertain what the optometrist's recommendation was, whether this worked, if they had to present elsewhere and how satisfied they were with the CUES.

Results: A total of 27% (170/629) and 6.3% (28/445) of patients managed virtually and in person, respectively, did not have their acute eye problem resolved. Regression analysis revealed that patients who attended a face-to-face consultation were 4.66 times more likely to be correctly managed [$\text{Exp}(\beta) = 5.66$], relative to those solely managed virtually. Optometrists' phone consultations failed to detect conditions such as stroke, intracranial hypertension, suspected space occupying lesions, orbital cellulitis, scleritis, corneal ulcer, wet macular degeneration, uveitis with macular oedema and retinal detachment. Of referrals to hospital ophthalmology departments, in total, 19% were false-positives. Patients, however, were typically very satisfied with the service. Uptake was associated with socioeconomic status.

Conclusion: The present study found that a virtual assessment service providing optometrist tele-consultations was not effective at resolving patients' acute-onset eye problems. The range and number of pathologies missed by tele-consultations suggests that the service model in the present study was detrimental to patient safety. To improve this, optometrists should follow evidence based guidance when attempting to manage patients virtually, or in person. For example, patients presenting with acute-onset symptoms of flashing lights and/or floaters require an urgent dilated fundus examination. Robust data collection on service safety is required on an ongoing basis.

KEYWORDS

COVID-19 Urgent Eye Care Service, CUES, MECS, ophthalmology, optometry, socio-economic status

INTRODUCTION

COVID-19 altered the way that health care was provided in many ways. In particular, emphasis was placed on managing patients remotely where possible.¹ This is an area novel to optometrists in the UK, who typically manage patients in person, and the College of Optometrists (UK) rapidly issued advice on this.² However, most optometrists have had little or no training on conducting remote consultations.

Unlike in neighbouring Scotland and Wales, the provision and commissioning of eye care in England is fragmented. Sight tests performed for symptoms that are refractive in nature are covered and commissioned nationally, whereas all other services (e.g., automated visual field tests, repeated tonometry and acute eye problem consultations) are provided either at a cost to the patient, the practice or in some areas, covered by local National Health Service (NHS) teams known as Clinical Commissioning Groups.³ This lack of consistent commissioning across the country leads to local variations in service provision and patient care. Therefore, while some countries of the UK already had national provision of emergency eye care in the community, England did not. Some areas of England, such as those in the present study, had existing Minor Eye Condition Services (MECS, also known as Primary Eyecare Acute Referral Schemes: PEARS), examples of which have been previously reported.⁴ In these services patients could self-present to, or be referred to, an accredited optometrist who was funded to provide an assessment beyond the scope of a sight test at no charge to the patient.⁵ Accordingly, the existing MECS across the areas of the present study (the Hull, East Riding of Yorkshire, Harrogate, Bedfordshire and Luton Clinical Commissioning Group areas) needed to be altered by each of the respective Clinical Commissioning Groups to incorporate remote consultation. Contracts were altered from March 2020, and an initial telephone triage service was added to the patient journey. This adapted service, known as COVID Urgent Eyecare Service (CUES), commenced across the Hull, East Riding of Yorkshire and Harrogate Clinical Commissioning Group areas from 17 April 2020 and is provided by Primary Eyecare North Yorkshire and Humber (PENYH). Subsequently, Bedfordshire and Luton Clinical Commissioning Groups opted to provide CUES, commissioned through Ocular Outcomes (a private company directed by some of the staff involved in PENYH). This service was commissioned in line with the national specification published by NHS England and NHS Improvement.⁶ Some of the aims of CUES are similar to MECS: to reduce unnecessary presentation to secondary care, with a second aim of managing patients virtually where possible. CUES provided care beyond that seen in a typical MECS by enabling the addition of remote (e.g., telephone based) consultation that could provide care for those clinically vulnerable or unable to visit an optometrist in person. Additionally, in the CUES examined by the present study, instead of offering a payment structure of cost per patient episode, the

Key points

- 27% of patients reported that a tele-consultation delivered by an optometrist did not resolve their presenting symptoms. Undetected pathology included retinal detachment, uveitis, scleritis, orbital cellulitis, and wet macular degeneration.
- Patients seen face-to-face were 4.66 times more likely to report that the consultation led to a resolution of their presenting symptoms [Exp (β) = 5.66], relative to patients managed virtually.
- Optometrists should follow evidence-based guidance when attempting to manage patients, with audit and system learning built into all commissioned services.

payment structure was changed to a block contract on a month-to-month basis, which provides a budget for the service to operate in and a more accurate financial forecast for the Clinical Commissioning Group. However, this could impact patient care. Specifically, a company could reduce the quality of care (i.e., less face-to-face (F2F) consultations) in order to: (a) maximise profit and/or (b) to meet the finite set budget. Overall, the amendments of the MECS were to: (a) reduce unnecessary traveling and encounters between people in the COVID-19 pandemic and (b) reduce costs to the Clinical Commissioning Groups.

The design of CUES has been published elsewhere.⁷ Briefly, routine F2F sight testing was suspended in England from 1 April to 17 June 2020.⁸ This meant that in areas without previously locally commissioned urgent eye care services, patients with an acute eye problem had either to contact their general medical practitioner (GP) or hospital in order to receive eye care. In order to alleviate unnecessary demands on ophthalmologists, who were required to be redeployed to other overburdened hospital departments,^{9,10} the COVID urgent eye care service specification was published.¹¹ This specification was not intended to replace existing services that had the ability to be adapted to provide appropriate optometric consultations. Accordingly, in part due to local commissioning, some differences exist between CUES and existing services.

In the present study, patients are initially required to telephone a free of charge central phone number (0800) where the patient is registered on a custom built system designed by the eye care company (PENYH / Ocular Outcomes) developed by PharmOutcomes (Pinnacle Systems Management, phpartnership.com). The service is only available for patients registered with a GP within the area of the Clinical Commissioning Group. Accordingly, this first step (telephoning the 0800 number) is required to ensure that the patient is registered with a GP in the area; data is verified, where possible, using the national database of patient demographic information (Personal Demographic Service) which is extracted from the NHS

Spine. Once the patient has registered and their eligibility is confirmed, patient details and presenting symptoms are taken and sent electronically to an optometrist, who would then call the patient for a tele-consultation. Optometrists were able to use photos and video calling as well as the telephone to aid the consultation at their discretion. As the phone line is a central service, optometrists did not have access to the patient's clinical records; this is in contrast to a service where the telephone consultation was performed by the patient's regular optometric practice. However, as patients are able to move between different practices freely, it is not necessarily the case that a patient would visit their usual optometrist in the event of an acute eye problem. The outcome of the optometrist's tele-consultation could be patient self-management (e.g., over-the-counter medication); a direct referral to alternate care (hospital ophthalmology department, Accident & Emergency, GP) or a face to face (F2F) appointment with a participating optometrist (e.g., high street practice). Patients have free choice of which practice they visit and should their first choice practice not have an appointment available, the triaging optometrist will find an optometric practice that has availability within the specified timescale.

Optometrists for the telephone consultation service were either known to the directors of the companies or recruited via word-of-mouth and all had experience of providing MECS type services. Where possible, the optometrists should not work in the same area that they provide tele-consultations in order to reduce the likelihood of unconscious bias and directing patients to their own practice / place of work. Optometrists did not require any specific extensive local knowledge (i.e., of other locally commissioned services), as the outcome options of a consultation were contained within the service and referrals to F2F providers was done within PharmOutcomes.¹²

The present study aimed to determine the patient reported clinical safety and effectiveness of the scheme, specifically aiming to identify instances of patients whose problem was incorrectly managed.

METHOD

In order to meet the required minimal sample size for binomial logistic regression,^{13,14} a minimum sample size of 500 was required. The present study required patients to verbally consent twice: once at the initial telephone appointment (when they ring the telephone triage line), and once more when they were contacted by the research team. Previous research on telephone-based research indicates that 80%^{15,16} to 90%¹⁷ of patients who originally consent for a phone survey subsequently complete the survey (i.e., 10%–20% decline or were unable to be contacted). Moreover, Nelson and colleagues reported that when researchers require oral consent at an initial stage, when subsequently contacted, the final overall consent

rate was approximately 40%.¹⁸ Accordingly, our initial sample size aimed for a minimum of 1250 patients. As the providers of the services in the present study estimated that between 1000 and 2000 patients called the service per month, to ensure minimum sample size requirements, the study ran from 1 November 2020 to 24 December 2021 (54 days) in Luton and Bedford and from 30 November 2020 to 22 January 2021 (54 days) in Harrogate, East Riding and Hull. At the time of data collection, optometric practices were considered essential services and remained open to provide F2F care to patients. Data for patients who consented were extracted from PharmOutcomes and sent via an encrypted Microsoft Excel spreadsheet (microsoft.com) to the research team who subsequently attempted to contact the participants. Optometrists were not explicitly made aware that the patients they managed would be contacted for this evaluation.

For the present study, attempts to contact patients were made by one author (AS) a maximum of three times at differing times of day, usually on different days.¹⁹ Typically, this was once Monday to Friday (10:30–18:30), once Saturday to Sunday (10:30–18:30) and then finally Monday to Friday (after 18:30). The call was made from a mobile number (not withheld) and the researcher introduced themselves at the beginning of the call.²⁰ Clinical and demographic data were extracted from PharmOutcomes, including notes taken from the original reception staff stating the presenting symptoms of the patient. Starting approximately four weeks after the initial call, a member of the research team (AS) phoned all consenting patients to determine: (a) consent, (b) whether the patient could recall the appointment, (c) the patient's understanding of the treatment, (d) whether this treatment resolved the patient's issue, (e) whether the patient presented to another health care provider to get the issue resolved and (f) whether the patient was satisfied with the service.

For the purpose of the present study, we define the service's effectiveness at resolving patients' eye problems (correct / incorrect decisions) with respect to the definitions displayed in *Figure 1a* for telephone consultations and *Figure 1b* for F2F consultations.

These outcomes were patient-determined following discussion with the research team. For example, if the patient reported that the optometrist recommended ocular lubricants and that treatment resolved the problem, this was defined as correct. Conversely, if the recommended treatment did not resolve the patient's eye problem, this was classified as incorrect. Patient safety is assessed with regards to the number, and outcome of incorrect decisions made by the optometrists.

For the analysis of the service's effectiveness, an increased number of appointments is likely to eventually lead to the correct outcome. Therefore, unless otherwise indicated, we included only the outcome of the patient's first appointment. We acknowledge that even the most qualified and experienced professionals may not make the correct treatment decision on one visit. Therefore, if the

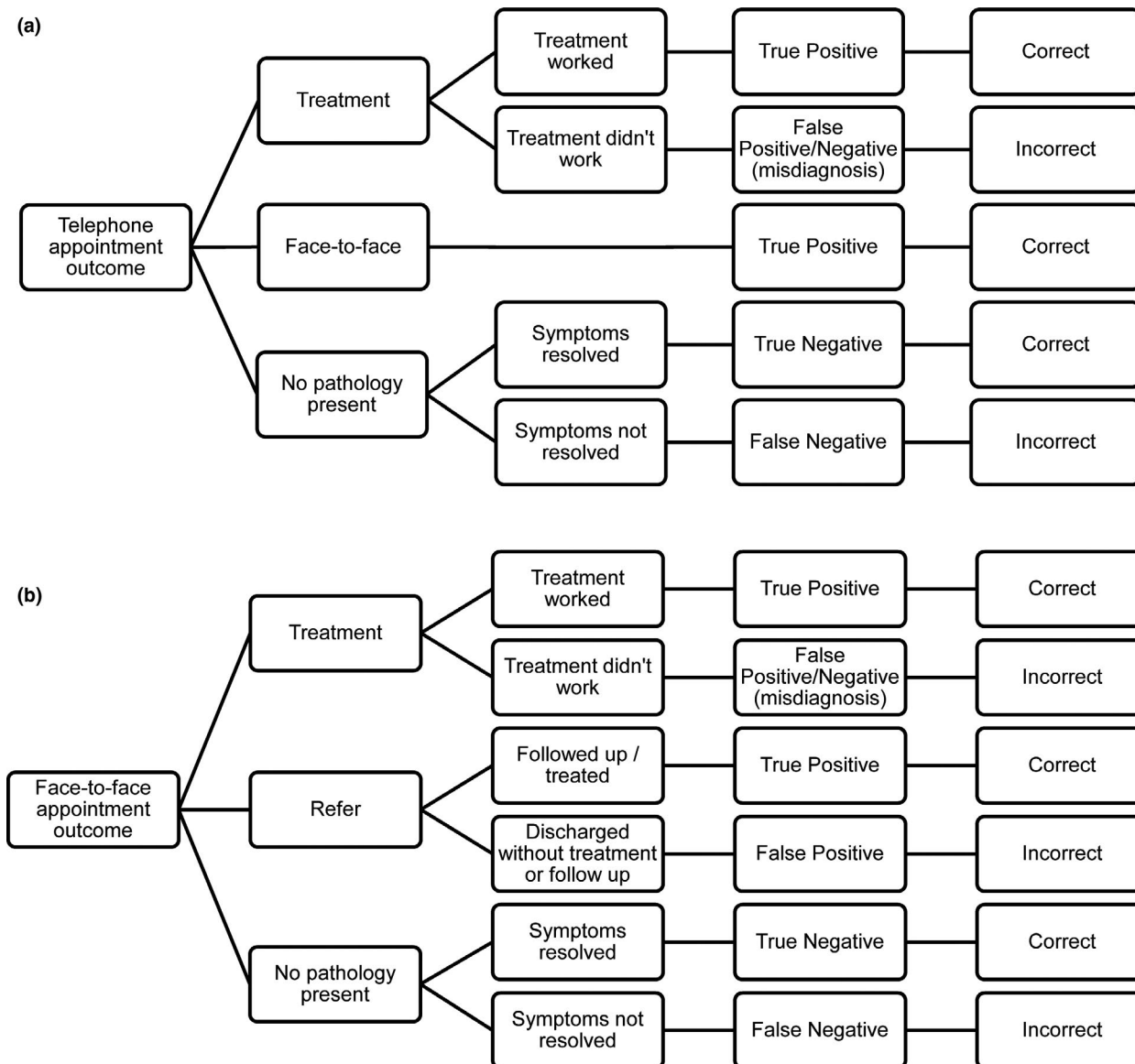


FIGURE 1 The diagnosis decision tree for consultations. (a) How correct / incorrect outcomes were determined for telephone consultations. (b) The decision tree for face-to-face consultations. In order to receive a face-to-face consultation, patients had to pass through the telephone consultation

follow up appointment was optometrist initiated, we assessed the overall outcome. All cases where the outcome was categorically correct (e.g., optometrist recommended 'xyz' and it resolved the problem) were marked as correct outcomes (true positives) by one author (AS). For all patients where the outcome was not categorically correct, the outcome was assessed by two authors (AS/CD) and any disparity of opinion was discussed until agreement was reached on the outcome classification.

Incorrect diagnoses were grouped into the following categories: recommendation did not work, unnecessary referrals, incorrect diagnosis and major errors. Major errors were defined as an error or omission (as judged by the authors AS and CD) that resulted in a problem that the patient identified, and is likely to have or could have resulted in serious harm. 'Major' is differentiated from when

the optometrist made a recommendation that didn't work by the nature of the symptom and the patient's report of how the condition deteriorated. For example, a patient who was recommended warm compresses which didn't resolve symptoms of bilateral itchy eyes would be categorised as 'recommendation that didn't work', rather than major error. If, on the other hand, the patient was subsequently diagnosed with scleritis, this would be classified as a major error. Incorrect diagnoses were able to be determined by the patient's account. For example, an incorrect diagnosis was determined to have occurred when: (a) the treatment partially resolved the patients symptoms, (b) the patient used a different treatment to what the optometrist recommended (which resolved the issue), (c) the patient didn't use the optometrist recommended treatment and the condition self-resolved, (d)

the patient was referred to the hospital and reported that what the optometrist had suggested was incorrect and (e) where the patient reported the condition resolved with the treatment but became apparent to not be what the optometrist had described.

For analysis of socioeconomic status, data were analysed by English lower-layer super output areas. These are areas in England which have an average population size of 1500.²¹ Socioeconomic status was determined using the Index of Multiple Deprivation (IMD), which is the ranking of lower-layer super output areas in order from most to least deprived (i.e., 1 to 10) nationally, based upon weights of various deprivation measurements. This study utilised data from the Ministry of Housing, Communities and Local Government to convert postcodes to IMD deciles.²² Regression analyses were performed using SPSS version 25.0 (IBM, ibm.com) and the ridge plot was created in R.²³

Ethics approval was granted by the Chair of the Biomedical, Natural, Physical and Health Sciences Research Ethics Panel at the University of Bradford on 21 September 2020.

RESULTS

Consenting participants

In total, 2372 patients were asked to participate. Of these, 1358 (57.3%) consented at the initial stage (when the patient originally contacted the telephone line). Of the 1358 patients who originally consented, 1106 (81.4%) patients comprise the final analysis (*Table 1*). 187 patients did not answer the phone, 33 could not remember the appointment, 21 declined to participate and 11 were removed for other reasons (e.g., deceased patient, outside time/location of present study, telephone number not in use).

Overall, 1106 patients had 1188 appointments included in the present study. A total of 1036 patients had one teleconsultation, 58 had two appointments and 12 had three appointments.

Age (in years) was available for all three groups: (1) those who didn't consent at stage one (when the patient rang the telephone line); (2) those that originally gave consent, but then withdrew from the study (did not attend /

TABLE 1 A breakdown of consent rate of patients in each area and the reasons for removing patients from the data analysis

Area	Total, <i>n</i>	First consent		Reasons for removal (<i>n</i>)				Second consent	
		<i>n</i>	%	DNA	Decline	Memory	Other	<i>n</i>	%
Luton	1252	124	53.2	20	3	3	0	98	79.0
Bedford		542		84	5	17	5	431	79.5
Harrogate	346	220	63.6	31	3	6	1	179	81.4
East Riding	766	348	61.6	39	6	6	3	294	84.5
Hull		124		13	4	1	2	104	83.9
Total	2364	1358	57.4	187	21	33	11	1106	81.4

Abbreviation: DNA, did not attend.

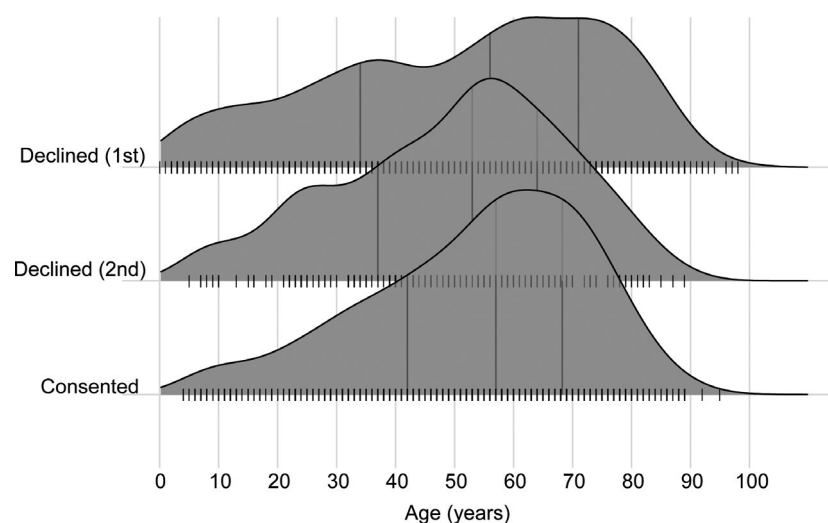


FIGURE 2 Ridge plot showing the distribution of the ages of the patients in each consent group. The median is depicted by the middle long line in each ridge. The two lines either side represent the end of the 1st (left) and 3rd (right) quartiles. The height of the ridge indicates the relative frequency of each age and the short bars at the base of each ridge represent the range of ages included in the distribution. The ridge itself is a density curve

declined / memory failure / other / incomplete data) and (3) those included in the final analysis (consented at both stages). The median age of each group is 56 (Declined first), 53 (Declined second) and 57 (Consented). These data are presented in the ridge plot in *Figure 2*.

For 26 patients, the overall outcome could not be determined – for example, the patient was referred routinely from a F2F consultation and hasn't been seen yet, or the telephone optometrist recommended treatment but the patient was unable/unwilling to adhere to the regime and, therefore, potentially may still be suffering with the same problem (e.g., recommended warm compress but the patient has not done this). Furthermore, two additional patients were removed from this analysis due to there being no date of birth recorded and four further records were removed for not specifying the optometrist. Accordingly, unless otherwise stated, subsequent analysis is based on 1074 first encounters.

Optometrists

Optometrists (eight male, three female) had a range of experience from 4 to 47 years post-qualification (median = 18 years, interquartile range 5–24.5 years). Data from nine optometrists were available for further qualifications and is provided in *Table 2*. An important consideration is that none of additional qualifications were in the area of telemedicine.

Regarding practice setting, of the nine optometrists, none were currently working in a university although one had prior experience of that type of work. One was currently delivering eye care in a hospital and a further two optometrists had previous experience of hospital optometry. Four were currently working in a multiple (e.g., national chain) practice and a further three had experience working in that type of practice. Finally, five optometrists were working in independent practice with a further two having experience of this type of work. In total, optometrists worked between 24 and 65 h per week (median = 44 h, interquartile range 34–48 h).

Service safety

The number of patients managed by each optometrist (telephone consultation) is given in *Table 3*. Due to the small number of patients cared for by optometrists 8, 9, 10 and 11, these are grouped together as 'other optometrists' in future analysis.

Overall, 18.4% of patients phoning the service were incorrectly managed. For the patients who were solely managed by a telephone optometrist, 27.0% of patients were incorrectly managed. Telephone optometrists attempted to manage 46.9% to 72.4% of their patients solely by telephone, with 27.6% to 53.1% being referred for a F2F appointment with another optometrist. On the other hand,

TABLE 2 The number of optometrists with each postgraduate qualification

Further qualification	Number
None	1
WOPEC MECS level 1	8
WOPEC MECS level 2	6
WOPEC Glaucoma level 1	3
WOPEC Glaucoma level 2	3
WOPEC Cataract	1
WOPEC Learning Disabilities	1
Professional Certificate in Glaucoma	2
Diploma in Diabetic Retinal Screening	1
Diploma in Independent Prescribing	1

Abbreviations: MECS, Minor Eye Condition Services; WOPEC, Wales Optometry Postgraduate Education Centre.

TABLE 3 The number of appointments managed correctly and incorrectly by each optometrist involved in the service

Management done by	Number of patients	Correct (n)	Incorrect (n)	Incorrect (%)
Optometrist 1	199	141	58	29.1
Optometrist 2	25	19	6	24.0
Optometrist 3	75	53	22	29.3
Optometrist 4	55	44	11	20.0
Optometrist 5	28	16	12	42.9
Optometrist 6	99	70	29	29.3
Optometrist 7	125	99	26	20.8
Other optometrists	23	17	6	26.1
Tele-consultation Total	629	459	170	27.0
F2F optometrist	445	417	28	6.3
Total	1074	876	198	18.4

Note: 'Other' is optometrists 8 to 11.

Abbreviation: F2F, face-to-face.

for patients who saw an optometrist in person, only 6.3% patients were incorrectly managed.

A binary logistic regression was used to assess the effect of area (Luton, Bedford, Harrogate, East Riding, Hull), Optometrist (1, 2, 3, 4, 5, 6, 7, other), source of referral to service (optometrist, GP, other), patient age (in years), socioeconomic status (IMD deciles 1–10) and whether the patient was seen in person [yes, no] on the outcome of the consultation (Correct / incorrect). The following equation was significant: $\chi^2(24) = 114.09, p < 0.001, R^2 = 0.16$ and the results are displayed in *Table 4*.

The only significant predictor of outcome was whether the patient was recommended to have a F2F appointment. Specifically, patients who were advised, and subsequently attended, a F2F consultation were 4.66 times more likely to be correctly managed, relative to those

TABLE 4 The results of the binomial logistic regression analysis examining predictors of whether a patient was correctly managed. Significant predictors are displayed in bold

Variable	Compared to	β	S.E.	Wald	df	Sig.	Exp (β)	95% CI for Exp (β)	
								Lower	Upper
Area				9.39	4	0.05			
East Riding	Bedford	0.51	0.26	3.85	1	0.05	1.66	1.00	2.75
Harrogate		0.06	0.27	0.05	1	0.82	1.07	0.63	1.81
Hull		-0.13	0.37	0.12	1	0.73	0.88	0.43	1.82
Luton		0.77	0.36	4.60	1	0.03	2.15	1.07	4.34
IMD decile				10.40	9	0.32			
2	1	-0.20	0.55	0.13	1	0.72	0.82	0.28	2.40
3		-0.12	0.54	0.05	1	0.83	0.89	0.31	2.54
4		-0.57	0.50	1.30	1	0.26	0.57	0.21	1.51
5		-0.31	0.51	0.37	1	0.54	0.73	0.27	1.99
6		-0.29	0.50	0.33	1	0.57	0.75	0.28	1.99
7		0.16	0.50	0.10	1	0.75	1.17	0.44	3.10
8		0.07	0.49	0.02	1	0.88	1.08	0.41	2.84
9		0.44	0.50	0.77	1	0.38	1.56	0.58	4.18
10		-0.21	0.49	0.18	1	0.67	0.81	0.32	2.10
Optometrist				7.86	7	0.35			
Optometrist 2	Optometrist 1	-0.10	0.42	0.05	1	0.82	0.91	0.40	2.08
Optometrist 3		-0.08	0.30	0.07	1	0.80	0.93	0.52	1.66
Optometrist 4		0.33	0.39	0.72	1	0.40	1.39	0.65	2.95
Optometrist 5		-0.78	0.40	3.76	1	0.05	0.46	0.21	1.01
Optometrist 6		-0.13	0.27	0.23	1	0.63	0.88	0.52	1.48
Optometrist 7		0.20	0.27	0.52	1	0.47	1.22	0.71	2.08
Other Optometrists		-0.07	0.45	0.03	1	0.87	0.93	0.39	2.23
Source of referral				1.08	2	0.58			
Optometrist	GP	-0.01	0.18	0.00	1	0.95	0.99	0.69	1.42
Other		0.41	0.41	0.96	1	0.33	1.50	0.67	3.37
F2F	Telephone	1.73	0.23	59.06	1	<0.001	5.66	3.64	8.80
Age		0.01	0.01	1.13	1	0.29	1.01	1.00	1.01
Constant		0.62	0.51	1.48	1	0.22	1.85		

Abbreviations: CI, Confidence Intervals; Exp (β), odds ratio; F2F, Face-to-Face; GP, General Medical Practitioner; IMD, Index of Multiple Deprivation; SE, standard error; β , Coefficient for the constant.

who were managed over the phone [Exp(β) for F2F, relative to telephone = 5.66, $p < 0.001$]. There was no significant effect of area ($p = 0.05$), socioeconomic status ($p = 0.32$), age ($p = 0.29$), optometrist ($p = 0.35$) or source of referral ($p = 0.58$), on outcome.

Errors are reported in *Table 5*. For the telephone consultation, all referrals to a F2F optometrist were considered appropriate with the exception of conditions that had self-resolved by the time of the appointment as well as those where the F2F optometrist correctly managed the patient over the phone ($n = 7$). There was one case of a patient attending a F2F appointment where they subsequently were referred to the Hospital Eye Service (HES) for suspect scleritis, but was diagnosed ultimately as keratitis ('incorrect diagnosis, referred to HES'). This was able

to be classified as an incorrect diagnosis only through the specificity provided by the patient on the phone call to the researcher. Similarly, two patients reported that the telephone optometrist diagnosed blepharitis, but as the condition improved it became clear (to the patient) that it was a sty. These are marked as 'incorrect diagnosis, treatment worked'. Further details of major errors are provided in *Table 6*.

Additionally, one patient was classed as a correct decision but the patient came to harm. The telephone optometrist referred the patient to secondary care (bypassing the F2F optometrist). The patient experienced severe difficulty getting seen and so just kept self-presenting to a hospital that kept turning the patient away. By the time the patient received an appointment, they were diagnosed with a

TABLE 5 The types and numbers of errors made by the telephone optometrists (tele) and face-to-face optometrists (F2F)

Outcome	Tele (n)	Tele (%)	F2F (n)	F2F (%)
Recommendation didn't work				
Condition deteriorated	17	10	2	7
Condition stable	62	37	7	25
Unnecessary referral to				
HES	4	2	15	54
GP	2	1	0	0
F2F	7	4	0	0
Incorrect diagnosis				
Resolved with treatment	2	1	0	0
Partially resolved with treatment	12	7	0	0
Px used different treatment which resolved	28	17	2	7
Unnecessary treatment (self-resolved)	15	9	0	0
Referred to HES	0	0	1	4
Major errors	23	14	1	4
Total	170		28	

Abbreviations: GP, General Medical Practitioner; HES, Hospital Eye Service; Px, patient.

macula-off retinal detachment, while at the time of telephone consultation, the symptom was 'misty vision'.

While *Table 6* highlights patients with flashing lights and floaters that subsequently deteriorated, instances of these symptoms where the telephone optometrist diagnosed a posterior vitreous detachment (PVD) / visual migraine and the symptoms have resolved are included as correct decisions. Importantly, recommending a sight test is considered a major error for the above people. As a sight test is indicated for patients with symptoms of a refractive nature, this is inappropriate for patients with acute-onset eye problems. *Table 7* details the presenting conditions for all patients who were recommended a sight test.

For the majority of patients who were recommended a sight test, an urgent eye care appointment would have been more appropriate (80.6%).

The present study can also be used to identify false-positive referrals to secondary care as a proportion of total referrals. Of the original 1106 patients, 164 (14.8%) were referred to secondary care. Of these, 115 (70.1%) were true positives (i.e., ophthalmology either treated or followed up, including foreign body removal), 27 (16.5%) were false positives (i.e., discharged without treatment, or given dry eye drops (i.e., within the scope of practice of an optometrist), and for 22 (13.4%) patients the outcome is unknown (e.g., referred for conditions where the patient has not yet had an appointment). Excluding the unknowns, this equates to 81% and 19% true- and false-positive rates, respectively. When breaking this down into tele-consultation and F2F

referrals, differences are apparent. For patients referred directly from telephone consultations, excluding unknown outcomes, 12/21 patients (57%) were true-positives, with the remaining 43% being false-positive referrals. In contrast, for patients who received a F2F consultation, 103/121 (85%) referrals to secondary care were true-positive and 15% were false-positive.

Due to the nature of the service, only patients with acute eye problems would be 'attending'. Accordingly, the overall uptake is low (0.075% of total population). Uptake of the service, however, is higher amongst the patients from higher socioeconomic areas (i.e., least deprived) (*Figure 3*).

Patient satisfaction was generally high. Satisfaction levels were obtained for 1055 patients (*Figure 4*).

Overall, 92.9% and 87.2% of patients were at least satisfied with their F2F and teleconsultation, respectively.

Alternate source of care

In total, 85 patients decided to seek alternative forms of care after their CUES consultation. Eighty-two of these were after the teleconsultation only and three were after a F2F optometrist appointment. Patients attended a wide range of providers which is detailed in *Table 8*.

Overall, out of the 630 patients managed by the telephone service without recommending further care, 13% of patients subsequently sought the advice of another professional. In contrast, only 0.7% sought alternative care after a F2F appointment with an optometrist.

DISCUSSION

This independent prospective evaluation of a CUES identifies that, as determined by patient outcomes, the initial telephone consultations conducted by optometrists in the present study were neither clinically effective, nor safe for some patients. Patients attending F2F appointments were approximately 4.7 times more likely to be managed correctly, relative to those who were solely managed via a teleconsultation. Despite this, within the context of a global pandemic, patients rated the service typically as either satisfactory or very satisfactory. The present study did not find any significant difference in performance among optometrists with a range of experience and qualifications. Overall, the service failed to manage patients with a number of serious conditions, such as strokes, intracranial hypertension, other potential space-occupying cranial lesions, orbital cellulitis, scleritis, anterior uveitis with macula oedema, wet age-related macular degeneration, retinal detachment and corneal ulcers, appropriately. Interestingly, patients living in higher socioeconomic areas were more likely to access the service. Thirteen percent and 0.7% of patients accessing telephone and F2F consultations, respectively, subsequently accessed an additional alternate provider of health care. An important consideration, however, is that the CUES

TABLE 6 The outcomes of major errors identified by the patient

Age / Sex	Problem	Advice/ Recommendation	Patient Reported Outcome
	F2F		
32 M	itchy, scratchy uncomfortable eye, painful on morning	Infection, recommended antibiotic eye drops	Px attended A&E who referred to HES and was diagnosed with recurrent corneal epithelial erosion.
	Tele-consultation		
50 M	Painless loss of vision in one eye after bending over and standing up	Book a sight test	Px felt it required more urgency – rang 111 who sent to walk in centre who referred immediately, and was admitted to the stroke ward for 3 days. Px was diagnosed by the stroke team as presently having a stroke. Now medicated.
82 F	Visual Aura	Would self-resolve	Px subsequently attended GP who referred to hospital. Px was diagnosed with, and treated for a stroke by the hospital stroke team, once treated, eye problem resolved.
23 F	Blurred vision in right eye that was accompanied by headaches and a very stiff neck and watery eye	Book a sight test	2 days later (before sight test) px could 'no longer see' and was vomiting. Px rang 999, who organised ambulance which took px to hospital. Here the px had a lumbar puncture and was diagnosed with LE optic nerve swelling as a result of intracranial hypertension. Saw ophthalmologist who expected px to be left blind in LE. Px has now being re-examined by ophthalmology who report vision has begun recovering in that eye. Px is now under neurology and ophthalmology.
26 F	Sharp pain in one eye on looking up	Would self-resolve	Getting worse and feels like the eye movement is becoming increasingly restricted. Now also gets 'stars in vision' when trying to look up
57 F	Flashes of light mainly in RE, but if closes eye can also see in LE	Visual migraine	Happened again the next day so rang GP who sent px to A+E. A+E admitted px as suspected 'brain bleed'. No brain bleed was found, but hospital ruled out migraine. GP subsequently referring px to refer to neurology.
23 F	Temple pressure affecting jaw, neck and shoulder	Book a sight test	In the time between the telephone consultation (CUES) and the recommended sight test, the condition had deteriorated. The px phoned 111 who sent them to A+E. A+E gave pain relief and told the px to see their GP. The GP wouldn't see the px as they had previously recommended contacting the telephone service (CUES). The px eventually got an appointment for a sight test, where the F2F optometrist referred the px back to the GP. The GP referred on to neurology, where the px has had an initial assessment and a follow up appointment is now booked for this month.
38 F	Spider like floaters which are visible at night	Migraine	Didn't resolve. Px went to A+E – CT was clear so wrote to GP to refer px for MRI. GP arranging MRI and changing medications as GP suspects a brain issue as px is experiencing hallucinations (not migraine).
68 M	LE ache followed by pixelated peripheral vision	Visual Migraine	Still gets pixelated peripheral vision after, for example, running up the stairs.
43 M	Itchy sore photophobic eye	Chloramphenicol	Condition deteriorated so the px rang back where telephone optometrist suggested different drops. This didn't work so px went to A+E who gave different drops and told him to ring back the phone line. Px rang back (3rd time) and was booked a F2F appointments. F2F referred emergency to HES who diagnosed orbital cellulitis (~1 week between first tele and F2F).
29 F	Bloodshot eye with a 'lump'	Chloramphenicol	Chloramphenicol didn't help, so the px rang back where the service arranged a F2F. The px never heard back from service with an appointment, so rang back again where they did arrange a F2F appointment. F2F referred to HES, diagnosed with scleritis. ~5 week wait between first phone call and F2F.

(Continues)

TABLE 6 (Continued)

Age / Sex	Problem	Advice/ Recommendation	Patient Reported Outcome
54 F	Px thought they had an eye infection, but after using chloramphenicol for a week still has a gritty watery red eye	Dry eye drops	Condition deteriorated so the px rang back where arranged F2F who referred the px to HES where they were diagnosed with corneal ulcer.
68 F	Sore, gritty eyes	Told this service is only for major eye issues, stop taking antibiotic and attend GP	Approx. 4 weeks later GP referred to HES. Px prescribed oral +topical antibiotics, cyclosporine +topical steroids.
68 M	Red, watery light sensitive eye	Dry eye drops	Conditioned deteriorated, so the GP referred the px to the HES where they were diagnosed with 'bilateral blepharoconjunctivitis' – prescribed 'prednisolone eye ointment +maxitrol drops +carbomer' and has had a follow-up and due back in just under 2 months' time
57 F	Very painful pressure sensation in RE and temple	Book a sight test	Caught COVID between telephone call and booking a sight test – so hasn't attended, now can't see well through that eye
29 F	Bilateral sore, painful eyes	Can't recall specific recommendation but knows it didn't work	Rang 111 who referred px to HES prescribed steroids and reviewed px a few times. Ultimately diagnosed with severe conjunctivitis.
57 F	Intermittent kaleidoscope type bright light in LE	Possible migraine, book a sight test	At the sight test (5 days later), the px was referred to the HES – 'detached retina' – At the time of ringing the optometrist and seeing them in person the only symptoms were flashes of light. Now the px is unable to see through this eye: 'just a black curtain across the whole eye'.
58 M	Eye pain when coughing and new floaters	Wait for diabetic retinal screening appointment (~1 week later)	Doctor found 'bleed on back of eye' which is now being scheduled for laser surgery.
66 F	RE misting over and noticing a floater in centre of vision	Self-resolve	Vision still feels like part of it is misted over and getting 'blind spots' in vision.
32 F	Flashes & Floaters in one eye	Migraine	Flashes and floaters now getting worse in that eye
50 M	'Shadow' in vision	Visual migraine	Still seeing shadow in vision – no change from when called
31 F	Floaters	Book a sight test	Px had to self-isolate (COVID) between tele-consultation and booking a sight test – not had it checked, still seeing floaters.
75 F	'In remission from AMD' and reading vision has suddenly deteriorated	Would self-resolve	Px disagreed with tele-consultation so rang own optometrist who saw px F2F. Diagnosed wet AMD in the good eye (other eye is already receiving injections for wet AMD) and now ophthalmology has scheduled px for injections in both eyes.
72 F	Eye became blurry and tired after COVID vaccine	Booked a F2F CUES, but suggested it was a visual migraine	Px didn't go to F2F (as tele had suggested visual migraine), however, px eventually attended eye casualty who diagnosed Inflammation of gut causing inflammation of eye. HES diagnosed uveitis and macula oedema. Px still under HES

Note: Red highlights potentially more severe missed pathology, relative to orange.

Abbreviations: 111, non-emergency helpline number in parts of the UK; 999, Emergency telephone number in the UK; A+E, Accident and Emergency; AMD, Age-related Macular Degeneration; CT, Computerised Tomography; F, Female; F2F, Face-to-Face; GP, General Medical Practitioner; HES, Hospital Eye Service; LE, Left Eye; M, Male; MRI, Magnetic Resonance Imaging; Px, Patient.

was commissioned to reduce potentially life-threatening F2F contact due to COVID-19. This is of particular importance for F2F optometrist consultations where prolonged close proximity can be involved. Throughout the study period, however, optometry practices were open and able to see patients for F2F consultations.

COVID-19 resulted in a rapid transfer of care based on the perceived risk of F2F consultations. Although this was done with the intention of reducing unnecessary F2F

contact during a global pandemic, the clinical safety of optometrists participating in a system that was novel to them and that they had little or no specific training for (telemedicine), was unknown. The methodology of the present study allowed for a comprehensive capture of what happened to patients who experienced optometrist-led telemedicine. The finding that 27% of patients who did not receive a F2F appointment did not have their presenting symptoms resolved by telemedicine is worth noting. The aim of the CUES

TABLE 7 Presenting conditions for patients who were recommended a 'sight test' and whether this was the most appropriate appointment type ($n = 186$)

Appropriate sight test recommendation?	Condition	Number
No	Flashes/ floaters/ visual disturbance	59
	Red eye(s)	19
	Sudden loss of vision (including peripheral)	13
	Painful eye(s)	12
	Sore/gritty/inflamed eyelid(s)	12
	Watery / sticky eye(s)	11
	Red and painful eye	8
	Sore eye(s)	4
	Painful and photophobic eye	3
	Growth/lump on eyeball	3
	Red and photophobic eye	2
	Sudden onset diplopia	1
	Headaches with jaw pain	1
	Dry eyes	1
	Photophobia	1
Total inappropriate	150	
Yes	Blurred vision	22
	Aching / tired eyes	5
	GP recommended a sight test	4
	Headaches	4
	Required more drops following cataract surgery	1
	Total appropriate	36

Abbreviation: GP, General Medical Practitioner

is to appropriately manage patients with acute, potentially sight threatening, eye problems. Accordingly, any errors could be sight-threatening. Previous studies have revealed that F2F MECS appointments reduce unnecessary referrals into the hospital eye service^{4,24} and are clinically satisfactory.^{4,25,26} To the author's knowledge, there is only one previous peer-reviewed article that aimed to examine the safety of urgent eye care schemes. Sheen *et al.*²⁵ reviewed hospital notes as a method of detecting patients that were inappropriately referred, and also conducted telephone interviews 1 and 4 weeks after F2F consultations to determine the appropriate management of patients who accessed the nationally commissioned Welsh PEARS. The specifics of the telephone interview outcomes are not reported in detail; however, the authors report that 3/289 patients were inappropriately managed. These appear to be patients who were referred to the GP but the referral letter did not contain sufficient information for the GP to act. Therefore, the authors state that approximately 1% of optometrist F2F appointments were incorrectly managed (when not referring to HES) and 18% to 25% of optometrists' referrals to the

HES were inappropriate. This false-positive rate is also in line with evaluation of other MECS in England.²⁷ The present study provides a similar value for false-positive secondary care referrals (19%), but a significantly larger number of incorrectly managed patients (18%). This large difference is possibly attributable, in part, to the methodological differences between that investigation and the present study. However, this does highlight the significant drawbacks of the current literature mainly focusing on false-positive referrals. The present study also highlights that direct referrals from telehealth optometrists to secondary care were true-positives in only 57% (12/21) of cases. In contrast, 85% (103/121) of referrals from F2F optometrists to secondary care were true-positives. Due to the small sample size of telephone optometrists' direct referrals, further research is required to determine whether the benefit in the 57% of cases (e.g., speed of treatment) is outweighed by the 43% of cases being incorrectly referred (unnecessarily taking up resources).

The addition of a compulsory telephone consultation in the present service appears to be partly attributable to the failures of the earlier service. 'Getting it right first time' is proposed to reduce waiting times, provide cost savings and improve the patient management.²⁸⁻³⁰ The service evaluated in the present study does not appear to meet this aim. Specifically, 41% ($n = 445$) of patients still required a F2F consultation; therefore, the separate phone line was an unnecessary additional step in the patient management. Of the remaining 59% ($n = 629$) of patients who were managed over the phone line, 13% ($n = 82$) went on to access alternate care and 27% ($n = 170$) had their problems unsolved. To highlight the severity of unnecessary delays in care, the present study unfortunately identified two confirmed cases of patients where a retinal detachment progressed from macula-on to macula-off before receiving a hospital ophthalmology appointment. These patients reported times of 2-5 days between first contacting an optometrist and receiving an ophthalmology appointment, which emphasises the importance of getting it right first time, and the need for direct communication with ophthalmologists minimising delays in access of care when even one additional day can result in permanent sight loss. An urgent eye care system (e.g., MECS) where an optometric practice sees the patient the same day, and subsequently refers the patient as an emergency to the hospital eye service is likely to have been quicker, and could, therefore, have prevented sight loss in these individuals. Similarly, the finding that for patients who solely had a teleconsultation, 27% did not have their presenting symptoms resolved, 13% subsequently accessed up to four further health care providers and 11% had to re-present, unscheduled, to the phone line suggests that this telephone service did not 'get it right first time'. This is in contrast to F2F consultations where patients presenting symptoms were not resolved in 6.2% of episodes and 0.7% of episodes resulted in the patient self-presenting to alternate health care providers. One of the limitations of a central phone line, rather than

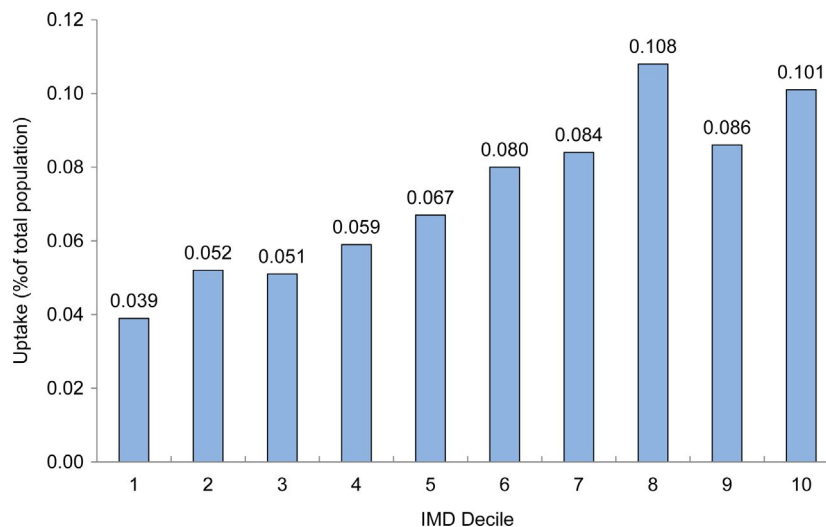


FIGURE 3 Service uptake was lower from patients living in the most (Index of Multiple Deprivation [IMD] decile 1), relative to least (IMD decile 10), socioeconomically deprived areas

individual practices calling the patients, is that the triaging optometrist has no access to the patients' past records and history. The approach of telephone discussions with patients utilised by Sheen *et al.*²⁵ and the present study is likely to underestimate the number of patients incorrectly diagnosed by optometrists: patients who are given treatment for a self-resolving condition or misdiagnosed the condition for another with a similar treatment plan would be unlikely to be accurately determined by the patient-reported outcome.

The 23 patients who were classified as 'major' errors highlight that diagnosing acute eye problems over the phone is difficult and requires implementation of evidence-based protocols. Those identified in the present study can be broadly categorised as four main types: systemic ($n = 8$); red/sore eyes ($n = 7$); flashes/floaters ($n = 6$) and acute vision loss ($n = 2$). For patients with flashing lights and floaters, it has been reported that 11%–14.5% have a retinal tear, hole or detachment^{31–34} and approximately 3% of patients with a PVD will subsequently develop a retinal tear or detachment. Seven patients in the present study were not directed to appropriate urgent F2F care and subsequently had ($n = 1$), or could have had ($n = 4$), a retinal tear/ detachment missed or a haemorrhage detected later than it might have been ($n = 1$). The advice for this group of patients is clear: they require urgent dilated fundus examination.³⁵ The College of Optometrists' guidance states that this cohort of patients can be managed in practice if there is no change in vision, no tear or detachment present, no anterior vitreous pigment and the patient is informed of what to do in the event of worsening symptoms (in writing). Some of these parameters cannot be measured over the phone and, therefore, it would be advisable to follow The College of Optometrists' advice in the design of any scheme to prevent the issues identified in the present study. For systemic issues, it is unclear whether these would have been correctly identified in a F2F appointment. The most

likely cause of a sudden 'painless loss of vision' in a patient aged over 30 is a central retinal artery occlusion which, if undetected, could be life threatening.^{36,37} The number of potentially missed systemic conditions ($n = 8$) that could have been life threatening might indicate deficiencies in the training of UK optometrists. Importantly, any missed conditions that ultimately resulted in loss of life would not have been detected by the present study due to the methodology, as deceased patients were not included. The remaining groups of major errors were red/sore eyes ($n = 7$) and loss of vision ($n = 2$). These errors highlight the difficulty of performing consultations on eyes relying on: (a) patients descriptions and (b) the optometrists adequately understanding these descriptions. This also highlights the difficulty in differentiating potentially sight threatening eye disease from non-sight threatening. Guidance does exist however, for GPs when examining patients with red eyes.^{38–40} Specifically, patients with moderate to severe pain, photophobia, marked redness, foreign body, reduced vision or unilateral symptoms require urgent ophthalmological opinion. If this guidance was followed at least four out of seven patients with missed potentially major pathology related to red eyes and two out of two patients with acute vision loss could have been detected.

The very large effect of F2F, relative to telephone consultations (Exp β : 5.7) when assessing whether the patient was correctly managed, and the overall low number of patients whose condition deteriorated despite having seen an optometrist in person (0.4%) point to the conclusion that optometrist F2F appointments are clinically safe. This is also in line with a recent report of the CUES in Manchester, England.⁴¹ The authors reported that patients who were seen in person by an optometrist were significantly more likely to have made a diagnosis that corresponded with the hospital ophthalmology department, relative to patients who were managed by a telephone optometrist.

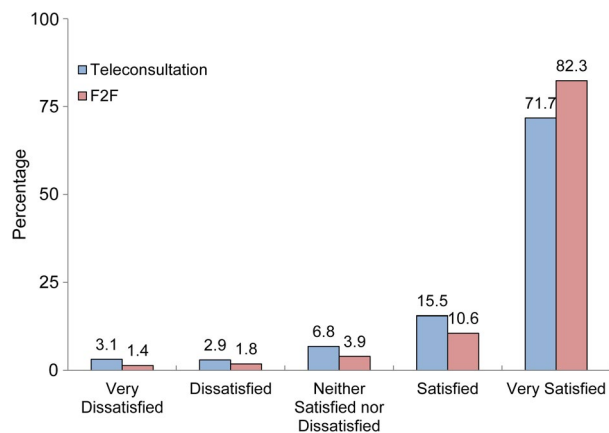


FIGURE 4 Satisfaction level of the service provided ($n = 1055$) for patients managed by face-to-face (F2F) appointments (blue bars, $n = 436$) and tele-consultations (red bars; $n = 619$)

Interestingly, the service in the present study employed a variety of optometrists with varying levels of experience (4 to 47 years qualified), additional qualifications and prior experience in different work settings. Despite this, there was no significant effect of optometrists' qualifications and/or experience on patient safety. Accordingly, future research is required to examine if qualifications and/or experience are significant predictors of improved patient care. Another interesting finding of the present study is that higher socioeconomic status is associated with an increase in likelihood of accessing the service. Patients living in the least deprived decile were approximately 2.6 times more likely to access the service, relative to those living in the most deprived quintile. Whilst the service potentially reduces costs of accessing the care (e.g., no travel), other factors appear not to be significantly reduced. Whilst there are no previous studies examining uptake of urgent eye care appointments in relation to socioeconomic status,

TABLE 8 Providers of care that patients attended without recommendation or referral by the optometrist ($n = 85$)

Original provider	Alternate provider				Patients (n)
	1	2	3	4	
Phone	Optometrist				27
	Optometrist	HES			4
	Optometrist	GP			1
	GP				17
	GP	HES			5
	GP	Hospital			1
	GP	A+E	HES	Neurology	1
	HES				4
	A+E				5
	A+E	GP	Neurology		1
	A+E	Optometrist			1
	A+E	HES			1
	Pharmacy				4
	999 (ambulance)	Hospital	HES	Neurology	1
	111	Walk in centre	HES		1
	111	Walk in centre	Stroke ward		1
	111	GP	A+E		1
	111	A+E			1
	111	HES			1
	Walk in centre				2
Urgent care centre				1	
GP practice nurse				1	
Total					82
F2F	Optometrist				2
	A+E	HES			1
Total					3

Abbreviations: 111, non-emergency helpline number in parts of the UK; 999, Emergency telephone number in the UK; A+E, Accident and Emergency; GP, General Medical Practice; HES, Hospital Eye Service.

inequalities of access to primary care sight tests and choice of provider have been reported.^{42–44} For example, uptake of NHS funded eye tests is 15%–71% higher in people living in the least, relative to the most, deprived quintile.^{42,43} Further work is required to reduce the barriers that patients living in the most deprived areas face while accessing acute primary eye care services.

Previous research has reported that MECS are cost-effective,²⁵ and provide,⁴⁵ or have the potential to provide⁴⁶ cost savings, compared with when MECS is not available. For example, Sheen and colleagues reviewed HES records to detect patients that subsequently presented to the HES after a PEARS appointment with a community optometrist. In the present study, of the 85 patients who reported that they sought further advice after the optometric appointment, only 19 (22%) ended up attending the HES. Similarly, Mason and colleagues⁴⁵ reported that two areas of London with a MECS had a significantly lower increase in overall eye health system costs, relative to an adjacent area without a MECS. One aim of the service examined here was to manage costs for delivering eye health care by paying a lower fee for telephone, relative to F2F, consultation within a set budget. The present study was not aimed specifically at examining the cost effectiveness of such a service. However, considering the proportion of patients subsequently accessing alternative forms of care (13%); the greater proportion of patients with ocular problems not resolved by the phone line who could have had or would have required another appointment (27%) and the unknown number of unnecessarily treated patients, suggests that reducing F2F consultations may reduce costs of one part of the health care system at the expense of an increase in costs elsewhere. It cannot be assumed that this alteration results in a decrease in overall system costs. Further research is required to quantify this.

One possible explanation for the poor safety of the service could be the funding structure. For example, as the companies were not being paid 'per patient', if patient numbers were higher than expected then the company would have to specifically reduce the number of F2F consultations in order to meet the budget. This could account for patients with symptoms requiring F2F consultations (e.g., flashes/floaters) either not receiving such a consultation or being incorrectly sent for a sight test. While under-funding of primary care services has been reported to be a contributor to poor uptake of NHS sight tests,^{47–49} the effect of funding structures on acute eye consultations is unknown. One of the main differences between commissioners and service providers arising from the recommendation of a sight test, rather than an urgent eye care appointment, is funding. Specifically, while the local Clinical Commissioning Groups pay for urgent eye care appointments, if the telephone service recommends a 'sight test', then this is funded by the patient (or NHS England if they are eligible). Therefore, the finding of this study that a significant proportion of patients who were directed to a sight test would have been

more suitable for an urgent eye care examination, points to the conclusion that the financial package and/or structure may be an influence in telephone optometrists' decision making. A qualitative stakeholder study, such as that conducted by Konstantakopoulou *et al.*,²⁴ would be useful in understanding what factors influence optometrists' decision making.

In summary, the optometrist-led tele-consultations in the present study do not appear to provide appropriate patient care for patients with acute onset eye problems. Commissioning of services should be based on available evidence. Where this evidence isn't available, audit and inbuilt service evaluation is essential from the start to prevent harm coming to patients.

Limitations

The main limitation of the study is that the results are patient determined. For example, there was no clinician checking and confirming the diagnosis of the optometrists. It was based purely on the patient's subjective opinion of whether the treatment resolved their symptoms or not. Accordingly, some of the patients where the optometrist-recommended treatment did not work could have resulted in major misdiagnosis or deterioration that the present study could not determine. However, this limitation can be balanced against the purpose of an acute eye service – to resolve problems that the patient perceives to be present. Similarly, this classification will also over-estimate the proportion of patients correctly managed. For example, a patient who was recommended treatment for a self-limiting condition would be classified as correct. Furthermore, as this study was a service evaluation / clinical audit, the results are not generalizable to other services with different service specifications.

Although the present study did not specifically include a qualitative element, positive ratings of the telephone service were often quantified with comments such as, 'not much you can do over the phone,' or 'difficult over the phone to get it correct'. Also, a number of patients reported that the tele-consultation delayed their access to care, resulted in communication issues and didn't resolve their anxiety. Accordingly, the satisfaction level should only be used as an indicator of patients' experience through a global pandemic where patients were generally informed of the need of minimising F2F contact. This is not to say that patients would rate the service highly when F2F contact is re-normalised. Further research is required to explore patient opinions.

Another limitation is that patients who were managed over the telephone might have been systematically different from those managed in person. However, it would be expected that if there was any communication issue or ambiguity of presenting symptoms, a F2F consultation would have been recommended. Accordingly, it would be expected that F2F consultations would see patients of

increased complexity, and therefore result in more adverse events. This appears not to be the case.

A further limitation is that the present study was not conducted to explore the root cause of incorrect decisions made by optometrists. For example, it could be that poor communication and integration between primary and secondary care and / or financially motivated reasons might account for some of the service's deficiencies. Further work is required to explore this.

CONCLUSION

A separate initial telephone assessment service delivered by optometrists should not be assumed to be clinically effective until evidence is provided to support this. Moreover, services should be commissioned either: (a) on an existing evidence base or (b) in the absence of existence evidence, with initial and continual prospective audit and system learning.

Some major errors resulting in potential harm to patients could have been avoided, and patient safety improved, by: (a) increasing optometrists' awareness of systemic disease and (b) ensuring there is a formal procedure and protocol for referring patients to F2F appointments, with direct communication between all providers (telephone optometrist, F2F optometrist and ophthalmologists) in line with evidence-based guidance (e.g., The College of Optometrists, The Royal College of Ophthalmologists and the National Institute for Health and Care Excellence).

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CONFLICT OF INTEREST

None to declare.

AUTHOR CONTRIBUTIONS

Alexander G Swystun: Conceptualization (equal); Data curation (lead); Formal analysis (lead); Investigation (lead); Methodology (equal); Project administration (lead); Writing-original draft (lead); Writing-review & editing (lead).

Christopher J Davey: Conceptualization (equal); Data curation (supporting); Formal analysis (supporting); Investigation (supporting); Methodology (equal); Project administration (supporting); Supervision (lead); Writing-original draft (supporting); Writing-review & editing (supporting).

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