


The effect of the COVID-19 pandemic on working practices of UK primary care optometrists

Manbir Nagra¹ , Peter M Allen² , Yvonne Norgett² , Eldre Beukes² , Michael Bowen³ and Marta Vianya-Estopa² 

¹Vision and Eye Research Institute (VERI), Anglia Ruskin University, Cambridge, UK, ²Vision and Hearing Sciences Research Centre, Anglia Ruskin University, Cambridge, UK, and ³The College of Optometrists, London, UK

Citation information: Nagra M, Allen PM, Norgett Y, Beukes E, Bowen M, & Vianya-Estopa M. The effect of the COVID-19 pandemic on working practices of UK primary care optometrists. *Ophthalmic Physiol Opt* 2021; 41: 378–392. <https://doi.org/10.1111/opo.12786>

Keywords: COVID-19, infection control, optometry, PPE, telehealth

Correspondence: Manbir Nagra
E-mail address: nagra.manbirk@gmail.com

Received: 11 August 2020; Accepted: 7 December 2020; Published online: 2 February 2021

Abstract

Purpose: In late 2019, a new coronavirus capable of infecting humans, SARS-CoV-2, was identified in Wuhan, China. The resultant respiratory disease was subsequently named COVID-19. In March 2020, in response to the COVID-19 pandemic, primary care optometry practices only remained open to deliver essential or emergency eye care. This study aimed to characterise the experiences of United Kingdom (UK)-based primary care optometrists during the COVID-19 pandemic.

Methods: An email invitation to participate in an online cross-sectional survey was sent to 3000 UK-based, currently practicing members of The College of Optometrists (UK). Responses to the structured questionnaire were analysed using descriptive statistics, including frequencies, means and standard deviations. Frequency analyses were used to evaluate items with multiple responses. Free-text responses were examined using thematic analyses.

Results: After data cleaning, a total of 1250 responses remained. Sixty-three percent were female, 70% self-identified as being of white ethnicity and 78% were based in England. During the first national lockdown, over half of all respondents were involved with the provision of remote consultations for emergency/urgent care. The majority felt 'very'/'moderately' comfortable conducting remote consultations, but 66% felt professional liability was increased. Forty percent were involved in the provision of face-to-face consultations. Eye-health and vision-related problems were the most commonly reported patient issues during both remote and face-to-face consultations, while contact-lens related problems were the least. Thematic analysis of the responses showed several challenges adjusting to the pandemic (e.g., working safely), but also some potential benefits (e.g., increased skills).

Conclusions: The findings provide an overview of changes to optometric practice in the UK during the COVID-19 pandemic. The results may be used to inform the development of professional guidance and facilitate resource allocation for safe and effective eye care during this and any future pandemics.

Introduction

A new coronavirus capable of infecting humans, SARS-CoV-2, was identified in Wuhan, China in December 2019. The resultant respiratory disease was

subsequently named COVID-19.¹ A timeline of key dates is shown in *Table 1*. On 23 March 2020, in response to the COVID-19 pandemic, The College of Optometrists issued a statement indicating that primary care optometry practices should only remain open to

Table 1. Timeline of key dates in the context of optometric COVID-19 pandemic in the UK

December 2019	First human infections of SARS-CoV-2 identified in Wuhan, China ³
31 January 2020	First two cases of COVID-19 confirmed in the UK ⁴
3 March 2020	Joint regulatory statement published, with the General Optical Council (GOC) as a signatory ⁵
11 March 2020	The World Health Organization (WHO) declared COVID-19 a global pandemic ⁶
17 March 2020	Suspension of routine optical services in Wales ⁷
23 March 2020	Suspension of routine optical services in Scotland ⁸
26 March 2020	Lockdown measures imposed in England, Scotland and Wales ²
28 March 2020	Lockdown measures imposed in Northern Ireland ²
30 March 2020	Optical practices added to list of primary care providers who require appropriate personal protective equipment (PPE) ⁹
1 April 2020	Suspension of routine optical services in England and Northern Ireland ^{10,11}
12 April 2020	NHS England published framework for redeployment of the optical workforce to support NHS COVID-19 delivery plan ¹³
17 April 2020	COVID-19 Urgent Eyecare Service (CUES) introduced in England ¹²

deliver essential or emergency eye care. The same day, the UK Government announced a lockdown: restricting the movement, social interactions and working practices of UK citizens.²

Optometrists were identified as key workers and permitted to undertake essential eye care.¹⁰ In the weeks that followed, several important issues emerged: use of Personal Protective Equipment (PPE), how healthcare workers could adapt their mode of care delivery and issues specific to optometrists such as clinical procedures permissible during the pandemic.¹⁴ Optometric practices began transitioning to new ways of working, including remote consultations and face-to-face essential emergency consultations; however, the economic ramifications of lockdown necessitated the furloughing of some staff.

Before the pandemic, most optometrists had little need for remote consultations, with adequate public access to primary healthcare across most of the UK.¹⁵ Telehealth, or the use of technology to deliver medical services remotely, is not new to worldwide optometric services, but the pandemic resulted in an increased need to adopt this technology.¹⁶ Additionally, retinal imaging technology and Optical Coherence Tomography (OCT) has the potential to improve community access to specialist care and screening. Collaboration between primary and secondary services may

lead to improved efficiency of service delivery and improved accessibility to, and compliance with, screening programmes, particularly for remote communities.^{17–21} The pandemic has forced UK optometrists to make a rapid adjustment to this new way of assessing patient needs.²² Professional, regulatory and membership bodies responded with advice and guidance,^{23–25} and providers of Continuing Professional Development (CPD) produced webinars and other materials, such as a triage form and visual acuity charts.^{26–28}

Some practices conducted urgent and essential face-to-face consultations for patients presenting with potentially sight threatening conditions, and for patients to whom a delay in care would be detrimental to their sight or wellbeing.¹⁰ To limit time and interaction between patient and practitioner, patients were initially triaged via telephone or video, and eye examinations were tailored to the essential needs of the patient.¹⁴ The General Optical Council (GOC), along with other healthcare regulators, was signatory to a joint statement acknowledging the necessary departure from established procedures, and outlining how any concerns raised about a practitioner would be treated on a case-by-case basis with regard to the protocols and guidelines available at the time.⁵ Clinically-trained members of the optical workforce were invited to volunteer for a redeployment scheme to support medical staff in a variety of clerical and clinical roles.¹³

Patients in England were seen through the General Ophthalmic Services (GOS), the existing Minor Eye Conditions Service (MECS),²⁹ or the new COVID-19 Urgent Eyecare Service (CUES) pathway,³⁰ developed by NHS England, Local Optical Committee Support Unit and the Clinical Council for Eye Health Commissioning, clinically endorsed by The College of Optometrists and the Royal College of Ophthalmologists. The National Eyecare Framework in Scotland detailed provision of Scottish eye care, including the establishment of Emergency Eyecare Treatment Centres for provision of face-to-face emergency eye care after triage by an optometrist.³¹ In Wales, patients were seen through the existing Eye Health Examination Wales (EHEW), part of the Wales Eye Care Service (WECS).³² For most optometrists, use of PPE and infection prevention and control (IPC) was new, and there were daily reports in the media of PPE being in short supply.^{33–35} The World Health Organization (WHO) warned of a global shortage of PPE,³⁶ and UK supplies were initially prioritised for hospital use. Optometrists were advised to use a mask when working within 2 m of a patient, and guidance on the use and disposal of masks and other PPE was issued on government websites, as well as by the NHS and professional bodies.^{37–40} In Wales, all optometrists were asked to complete the national Wales Optometry Postgraduate Education Centre (WOPEC)

COVID-19 training module to ensure understanding of when and how to use PPE.⁴¹

There has been potential for an increase in stress and anxiety for some optometrists, through new ways of working imposed without time for preparation or inadequate PPE, and for others through loss of income and an economically uncertain future. Personal or family illness, fear of illness, home schooling and other issues relating to care and support have also been challenges faced by many.⁴² Yet, there are potential opportunities for the profession. The longer-term impact on optometrists, whether financial, emotional, or otherwise remains unclear. While in some parts of the country the lockdown restrictions had begun to ease by Autumn 2020, other areas have seen further restrictions. Knowledge of COVID-19 symptoms, its mode of transmission and implications have improved, and it seems apparent that optometrists will not be able to return to their previous way of working for some time.

This study aimed to characterise the experiences of UK-based primary care optometrists during the COVID-19 pandemic as they were adapting to new ways of practising. Developing a better understanding of different care delivery modes could facilitate future resource allocation and provide information to guide development of new care protocols as the lockdown restrictions are eased.

Methods

Study design

A cross-sectional survey design was used to investigate the impact of the COVID-19 pandemic on primary care optometry practice in the UK. Ethical approval was granted by the Faculty of Science and Engineering Research Ethics Panel at Anglia Ruskin University (reference number FSE/FREP/19/928). Respondents gave informed consent online at the start of the survey and the study was conducted following the tenets of the Declaration of Helsinki. The Equator (Enhancing the QUALity and Transparency of health Research) network checklist for reporting results of internet e-surveys was used to report the methods and results of the survey.

Survey development

The survey questions were generated through an iterative process. The research team identified a list of possible questions based on guidance given to the profession since the outbreak of the pandemic from regulatory, professional and membership bodies, the NHS and Public Health England, as well as personal experience and that of colleagues. The questions were further refined by the Director of Research at the College of Optometrists (MB) and by several practising optometrists. The proposed questions were

appraised and reduced by the research team to a 46-item survey, by considering the face validity and content validity of each item.

The final survey explored the following areas:

- Current employment situation and type of practice work before the pandemic, including any prior experience of remote consultations;
- Experience of telehealth, both video and telephone, since the cessation of routine primary eye care;
- Experience of face-to-face consultations for urgent and emergency eye care, including use of PPE;
- Wellbeing amongst members of the profession;
- Opinions of practitioners on regulatory and indemnity issues, risks, challenges and potential opportunities for the profession.

The survey was uploaded to the online platform Qualtrics (www.qualtrics.com) and then reviewed by research team members to ensure functionality. Errors identified were corrected before the survey was launched. As different clinical situations involved varying experiences, some questions were only presented to respondents depending on their responses to preceding questions using the skip logic algorithms in Qualtrics.

Survey distribution

The online platform was used to disseminate the survey, and was open from 7 May 2020 to 1 June 2020. Inclusion criteria were primary care optometrists practising in the UK before the outbreak of the pandemic. Participants were directed to a data encrypted website where they indicated their consent to participate after reading an information sheet.

An email invitation to participate in the survey was sent to 3000 members of The College of Optometrists. These optometrists were randomly selected from the 10487 practising members on the College's database of UK optometrists using a random number generating function in Excel (www.microsoft.com).

Data analysis

Data cleaning was initially undertaken to remove cases that did not meet study eligibility. The Statistical Package for Social Sciences (SPSS) version 26.0 (<https://www.ibm.com/uk-en/analytics/spss-statistics-software>) was used for quantitative data analysis. Responses to the structured questionnaire were analysed using descriptive statistics, including frequencies, means and standard deviations. Frequency analyses were used to analyse items with multiple responses.

Qualitative data coding was performed using NVivo 12 software (<https://www.qsrinternational.com/nvivo-qualita>)

tive-data-analysis-software/home). Analysis of the free-text responses was undertaken using a thematic analysis framework. Individual statements were coded, and similar codes were grouped into themes. The coverage was calculated by counting the number of times the theme appeared in relation to the total number of free-text comments. Themes with a coverage below 0.1 were excluded as they suggested lack of sufficient relevance. All coding was performed by author EB and validated by author PA.

Results

Demographics

A total of 1391 participants provided consent for the study. As the focus of this research was on primary care optometry, during data cleaning, surveys from respondents primarily involved in other types of optometric work (e.g., hospital, research, etc.) were removed, as were surveys that were <15% complete. After data cleaning, a total of 1250 responses remained. *Table 2* presents information on participant demographics (sex, race, location, and age) and the reported emotional and cognitive effects of the COVID-19 pandemic.

Sixty-three percent were female, 70% self-identified as being of white ethnicity, and 78% were based in England.

The current work status of participants is shown in *Table 3a*. Portfolio careers meant that not all participants identified as falling into a single category for work status. In addition, *Table 3b* indicates the respondents' current or most recent place of employment where they carried out the majority of their work before the pandemic (if currently on furlough/unemployed). *Table 3c* indicates those who volunteered for the NHS redeployment scheme.

After gathering demographic information, the survey explored whether respondents were involved in remote

Table 3. (a) Work status; (b) place of work where respondents carried out most of their work (before the pandemic or currently if working when completing the survey) and (c) response to the redeployment scheme for optometrists to support NHS services

(a) Work status	Percentage (n = 1250)
Furlough	42% (526)
Currently working (involved in emergency/urgent care)	38% (475)
Self-employed (unemployed)	13% (161)
Unemployed	4% (47)
Other (e.g., on maternity leave)	3% (41)
(b) Primary role	Percentage (n = 1250)
Practice owners or franchisees	32% (395)
Employed by large multiple	31% (390)
Employed by independent or small group	20% (256)
Self-employed	16% (194)
Other	1% (15)
(c) Volunteered for the redeployment scheme	Percentage (n = 1022)
Yes	10% (101)
No	49% (497)
Considering applying for the scheme	17% (173)
Not heard of the scheme	24% (251)

consultations and/or face-to-face consultations. As shown in the flowchart provided in *Figure 1*, respondents skipped questions not relevant to them (dashed lines). All respondents were asked about liability issues and redeployment opportunities to support the NHS as shown in the flowchart. This structure is used to present the outputs of this investigation.

Remote consultations

During the lockdown over half of all respondents (54%, $n = 673$) were involved with the provision of remote consultations for emergency/urgent care; the remainder were either not offering remote consultations (45% $n = 559$) or left this question blank (1%, $n = 18$). Of those involved in remote consultations, 41% were doing so through MECS ($n = 274$), 8% through CUES ($n = 56$), 20% through other recognised pathways ($n = 137$) and 42% through other not-recognised pathways ($n = 283$).

Prior to the pandemic, most respondents did not use any form of telehealth; survey responses showed optometrists 'rarely/never' undertook remote consultations via telephone (92%, $n = 1155$) or video (98%, $n = 1227$). *Figure 2a* shows how respondents quickly adapted their practice and began using either telephone only, or both

Table 2. Demographics of survey respondents, including percentages and sample size (n)

Demographics (n = 1250)			
Sex	Race	Location	Age
Female 63% ($n = 791$)	White 70% ($n = 880$)	England 78% ($n = 971$)	18–24 years 4% ($n = 47$)
Male 36% ($n = 444$)	Asian 24% ($n = 305$)	Scotland 11% ($n = 143$)	25–34 years 23% ($n = 289$)
Gender diverse 0% ($n = 1$)	Mixed 3% ($n = 31$)	Wales 7% ($n = 89$)	34–44 years 25% ($n = 316$)
Prefer not to say 1% ($n = 14$)	Black 1% ($n = 14$)	Northern Ireland 4% ($n = 47$)	45–54 years 26% ($n = 321$)
	Other 2% ($n = 20$)		55–64 years 18% ($n = 227$)
			65 years or older 4% ($n = 50$)

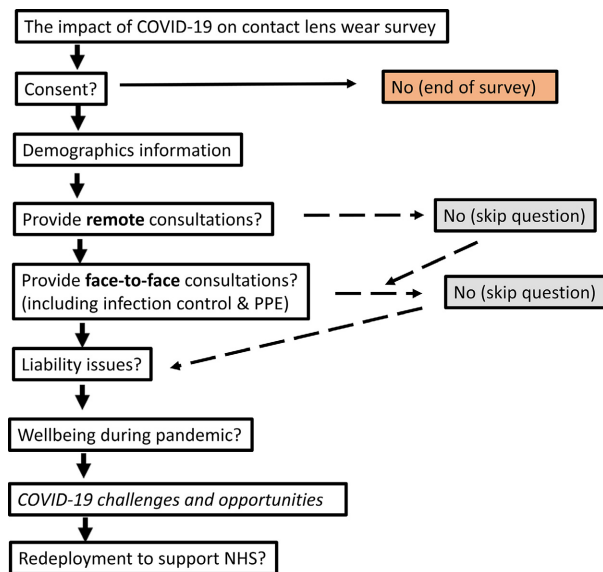


Figure 1. Flowchart indicating the areas explored in the final Qualtrics survey.

telephone and video consultations. *Figure 2b* shows that the majority of respondents felt ‘very’/‘moderately’ comfortable conducting remote consultations (83%, $n = 452$).

The survey also explored which video platforms were used during remote consultations. Respondents indicated using WhatsApp (www.whatsapp.com) (44%, $n = 113$), FaceTime (www.apple.com) (26%, $n = 67$), Zoom (www.zoom.us) (18%, $n = 45$), Skype (www.skype.com) (6%, $n = 15$), and ‘other’ platforms (53%, $n = 136$). Analysis of the free text comments under ‘other’ indicated that AccuRx Fleming (www.fleming.accurx.com) was the most frequently used platform. Additional platforms included Attend

Anywhere (www.attendanywhere.com), Whereby (www.whereby.com), Clinic.co (www.clinic.co), and the use of photographs sent via emails/texts.

Sixty-six per cent ($n = 722/1096$) of all respondents felt professional liability was greater with remote consultations compared to face-to-face appointments, over a quarter thought liability was the same (26%, $n = 282/1096$), and a minority believed liability was lower (8%, $n = 92/1096$). Similar results were found if only the responses from individuals currently conducting remote consultations were considered.

Appointment type

Respondents were asked which types of vision/eye health problems were most commonly encountered during remote consultations. As shown in *Figure 3*, eye health and vision related problems were the most commonly reported issues and contact lens related problems were the least.

Protocols used for the assessment of ocular issues

Prior to the pandemic, most practitioners did not use specific protocols/forms to undertake remote consultations (only 23%, $n = 288/1250$ acknowledged their use), but there was a noticeable increase in uptake during the pandemic (62%, $n = 419/675$). The form produced by The College of Optometrists was most frequently used (31% $n = 207/675$), although many optometrists (18%, $n = 124$) preferred using a traditional case history approach as opposed to specific protocols during the pandemic.

Frequency analysis of responses regarding how vision loss was assessed showed that nearly all the respondents relied upon case history to establish vision loss (91%,

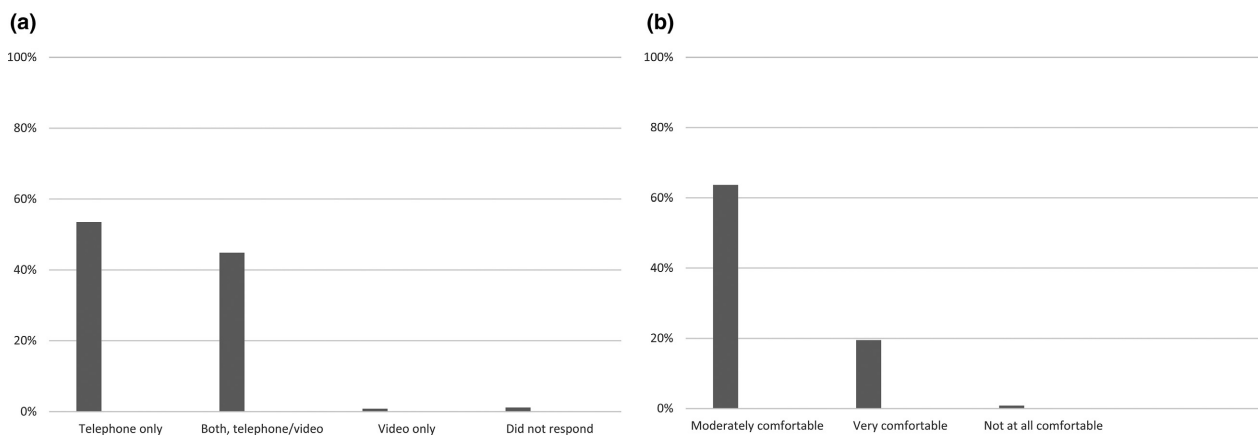


Figure 2. Bar chart indicating (a) which tools were used during remote consultations and (b) how comfortable respondents felt undertaking remote consultations.

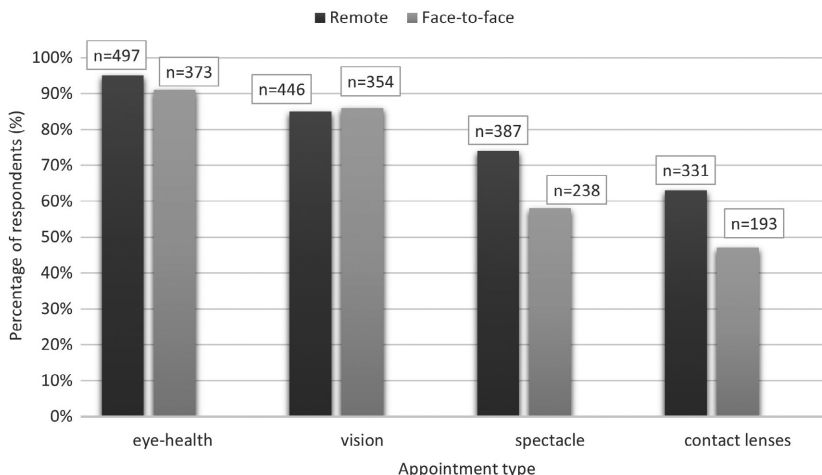


Figure 3. Frequency analysis of the responses illustrating the types of problems explored under remote consultations (dark grey bars, total number of respondents $n = 525$) and face-to-face consultations (light-grey bars, total number of respondents $n = 411$) since COVID-19 restrictions came into place.

$n = 495$) with smaller percentages of respondents using the chart produced by The College of Optometrists (17%, $n = 90$) and smartphone apps (3%, $n = 18$). Additionally, to establish any vision loss 8% ($n = 43$) of the respondents indicated using other methods such as asking patients to check their vision with common everyday items in the house such as clocks or subtitles on the TV and/or to compare differences in vision between eyes.

Similarly, when assessing visual distortion, the majority of respondents relied on case history alone (76%, $n = 412$); fewer used the Amsler grid (34%, $n = 182$), whereas smartphone apps were seldom used (2%, $n = 9$). More accessible ways of assessing visual distortion were also mentioned, such as asking the patient to judge the shape of door frames (10%, $n = 56$). With regards to assessment of anterior eye

abnormalities/redness, the majority of respondents relied upon case histories (69%, $n = 375$), use of photographs (65%, $n = 354$) and visual observation during videoconference calls (38%, $n = 206$).

Face-to-face consultations

In total, 507 respondents were involved in the provision of face-to-face consultations as part of emergency care during the COVID-19 pandemic. Frequency of response analysis showed that the decision as to whether a patient case qualified as an emergency was most frequently made by a GOC registrant (94%). However, 33% reported they felt pressured to see patients face-to-face who they did not deem to be true emergencies.

How have you adjusted your face-to-face examination during the pandemic?

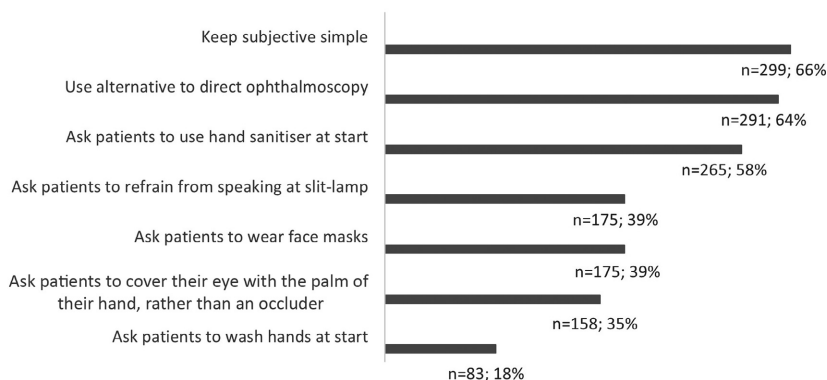


Figure 4. Frequency analysis of responses to the question ‘How have you adjusted your face-to-face examination during the pandemic?’ Total number of respondents $n = 454$ and total number of responses to this multiple response question $n = 1446$.

As shown in *Figure 3*, frequency analysis of responses for face-to-face consultations showed a similar pattern to remote consultations.

Adjustments to face-to-face examination

On questioning regarding adjustment of face-to-face examination during the pandemic, the majority of respondents indicated that they simplified the subjective routine, used alternatives to direct ophthalmoscopy to examine ocular health and asked patients to use hand sanitiser at the start of the examination (*Figure 4*). Some respondents also adjusted their face-to-face examination by positioning themselves further away than usual and limiting contact

time (for example, performing case history over the phone or in a different room, or conducting a symptom-based examination only). Widefield fundus photography and optical coherence tomography were also mentioned as alternatives to direct ophthalmoscopy for ocular health examination.

Infection control

When questioned about handwashing, 99% of the respondents were using NHS/WHO handwashing recommendations during the pandemic (note that 41% started using these recommendations during the pandemic). *Figure 5* shows infection control procedures undertaken routinely between patients. The infection control action

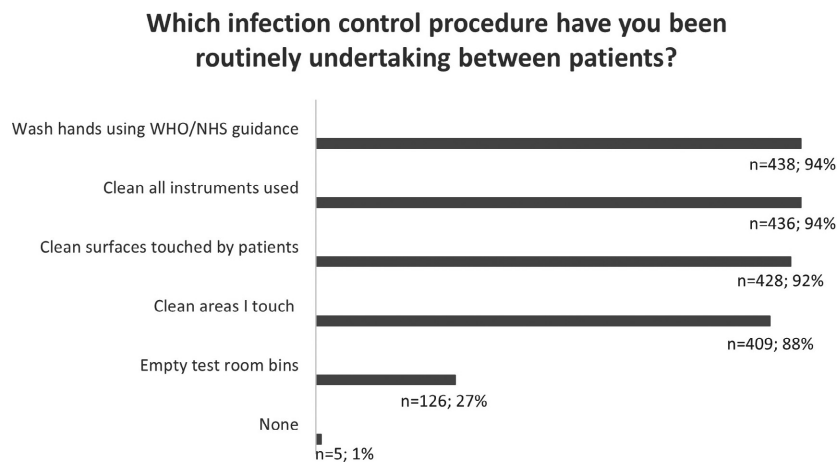


Figure 5. Frequency analysis of question ‘Which infection control procedure have you been routinely undertaking between patients?’ Total number of respondents $n = 465$ and total number of responses to this multiple response question, $n = 1842$.

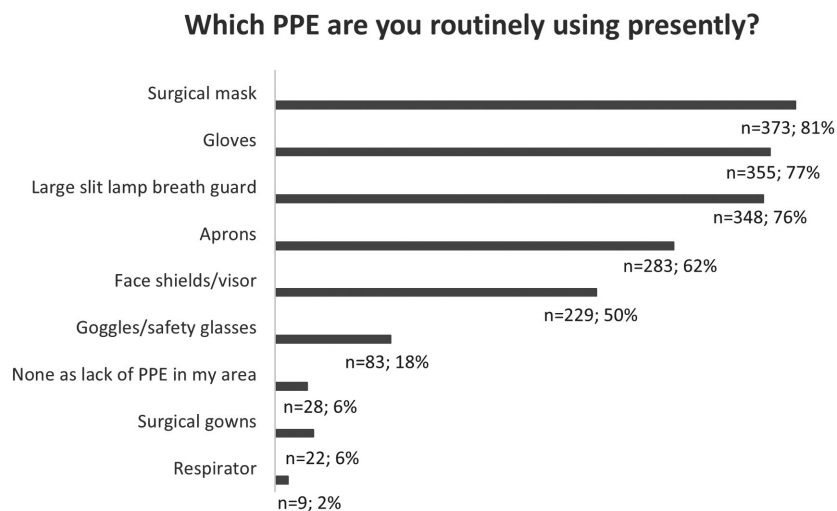


Figure 6. Frequency analysis of the question ‘Which PPE are you routinely using presently?’ Total number of respondents $n = 460$ and total number of responses to this multiple response question $n = 1735$. PPE, Personal Protective Equipment.

undertaken least frequently was daily emptying of test room bins (27%). The additional free-text responses included other infection control measures such as change of PPE (21 responses), cleaning of surfaces regardless of whether they were touched, cleaning trial lenses/frames between patients and ensuring bins in the testing room had lids.

Use of Personal Protective Equipment (PPE)

Figure 6 shows that the most common types of PPE used routinely by respondents included surgical masks (82%), gloves (77%), large slit lamp breath guards (76%), aprons (62%) and face shields/visors (50%). Twenty-eight (6%) respondents indicated that they were not routinely using PPE due to a lack of PPE in their area.

Of 441 respondents, 233 (53%) indicated they had raised concerns with their employer or professional body about access to PPE; 193 (44%) had not, and the rest preferred not to answer ($n = 15, 3\%$).

In addition, of 454 respondents, 261 (58%) acknowledged having to supply their own PPE; 178 (39%) employers provided PPE and the rest preferred not to answer ($n = 15, 3\%$). Frequency analysis of responses relating to training on the use and disposal of PPE showed that 39% ($n = 175$) of the respondents indicated they received information through their professional/member bodies, 35% did their own research ($n = 160$), 28% ($n = 127$) received PPE training through their employer and 18% ($n = 80$) received no training.

Psychological wellbeing during the COVID-19 pandemic

In general, the problem-solving ability of respondents was high among optometrists: 94% reported feeling able to think clearly ($n = 964/1022$); 94% reported being able to make up their own minds ($n = 960/1022$) and 93% reported they dealt well with emotional problems ($n = 951/1022$). Respondents also felt positive about emotional effects: 77% felt close to others ($n = 787/1022$); 70% felt relaxed ($n = 716/1022$) and 68% felt useful ($n = 699/1022$). A lower percentage felt optimistic (64%, $n = 652/1022$).

Challenges regarding working practices identified during the COVID-19 pandemic

Thematic analysis of the free-text responses identified five overarching themes within the free text responses: working safely, service provision, professional body support, the future of the profession and the financial implications of the pandemic. Each theme included further sub-themes as shown in Table 4 and illustrated by quotes from the respondents.

Safety concerns during face-to-face appointments centred on the close proximity between patient and practitioner during eye examinations, the challenges associated with the availability of PPE, the need for longer appointments to accommodate use of PPE and personal health concerns about contracting the virus at work. The use of PPE by optometrists and patients posed challenges. Respondents were concerned that PPE use and ocular assessment restrictions could compromise interpretation of clinical results.

An additional challenge raised was adapting to changes such as the use of teleconsultation, and ensuring patients could be examined fully with the safety restrictions in place. Respondents also expressed anxieties regarding what would be expected of them, and whether training would be provided. Additionally, they were concerned that remote consultations were not always possible or appropriate, and felt guidelines were ambiguous on the definitions of urgent referrals, which could result in interpretation differences between optometrists. Urgent care provision varied geographically, and respondents felt this may create barriers to accessing urgent care which could lead to the development of more serious ocular problems. At the time of the survey, respondents felt that there was limited professional body guidance and, where provided, the response from professional bodies was slow.

The changes imposed by the pandemic brought numerous financial concerns. For practices, there were increased expenses through securing PPE and alternative equipment, and adapting clinics to fulfil social distancing guidelines. Moreover, income was expected to reduce as fewer patients could be seen. This necessitated reducing staffing, and employees were concerned whether they would retain their jobs, have full time positions or find sufficient self-employed work. Financial concerns also made some respondents question the future of the profession. Some anticipated that services would look very different and practices may close; others postulated that optometrists may be forced to seek alternative employment if fewer staff could be permanently employed. Many felt that optometrists did not receive the recognition they deserved for their services, which provided less hope for the future of the profession.

Potential opportunities arising from changes brought about by COVID-19

Thematic analysis identified four overarching themes regarding the opportunities identified: improved professional relationships, increased skills, refined pathways and streamlining service provision (see Table 5). Of note were comments where respondents felt the pandemic had led to an increase in their skills as more continued education

Table 4. Themes, sub-themes and respondents' quotes regarding the challenges identified due to COVID-19 pandemic

Theme	Sub-theme	Number of responses	Coverage	Respondents' quotes
Working safely	Maintaining safe practices	20	3.36%	"Need to solve the problems of prolonged close contact with possible carriers. How can we refract properly and maintain social distancing"
	Personal health concerns contracting virus at work	14	2.83%	"I am 64 years old and I have been working part time, I am therefore in a more at risk category. Unfortunately I cannot see myself returning to work due to the nature and close proximity of our work"
	PPE concerns	9	0.96%	"Concerns about how employer, colleagues and patients will interpret and implement safety measures. Will there be sufficient equipment e.g., PPE, disinfection products, time to safely manage and prepare for each patient?"
Service provision	Accessibility	16	2.58%	"Unfortunately, in our area CUES has not been commissioned and there have been huge tensions about urgent provision for patients"
	Adapting to change	15	1.96%	"I have been expecting to come off furlough and commence teleconsultation and face-to-face. I have great anxiety about it because, of part of furlough you cannot contact work or colleagues to discuss how to perform these tasks. I feel out of my depth and want to provide a professional and confident persona to any patient I come in contact with. While inside I am lacking confidence and unsure. I think it's inevitable that teleconsultation and face-to-face is the new normal, but because I can't sit with someone to be shown technology it's scary"
	Referral pathways	14	2.39%	"I am concerned how some Optometrists are interpreting the guidelines about triaging and seeing 'emergency only' face-to-face. What they consider as emergency wouldn't necessarily be agreed upon by other optometrists"
	Proper examination	13	1.55%	"I am very concerned regarding how well we are examining patients due to the restrictions being imposed by doing 'safe' COVID examinations. I do not like reducing/adapting my subjective routine as I feel this isn't giving patients the best vision correction which is what they would usually have"
	Examining using PPE	9	1.55%	"The need to address changes in how we exam safely patients on the slit lamp with full PPE. If you have tried it, you will appreciate the difficulty of the constant fogging up of the eye pieces and if the patient wears a mask the fogging up of your Volk lens"
	Remote services	8	1.60%	"Remote consultations are fraught with problems; e.g., I have had referral from HES for anisocoria via MECS which is impossible to investigate remotely. I have received training where I was shown to ask patients to check their own IOP by digital palpation! I do not think remote consultations are useful, viable or safe"
	Professional body support	Guidance lacking	10	1.74%
Lack of support		8	1.14%	"The fact the GOC has not provided any care or consideration to its members in means of financial or simply advice on how to overcome this situation as all are in different positions"
Slow response		6	0.49%	"I'm aware that these are unprecedented circumstances but guidance from professional bodies has been slow to arrive. In many cases I have had to make educated guesses on how to proceed, as advice came later"
Future of the profession	Low recognition	11	1.75%	"I was hoping with the pandemic the optometry profession would get greater recognition as clinical service provider but once again we are still seen as glasses salesmen"
	Future services	10	1.81%	"I also have concerns about the future of the business models of our profession and to where we all fit in"
	Staffing	9	0.90%	"The impact of having to reduce staff numbers permanently after furlough and the uncertainty of returning. Many optometrists will leave the profession"

(continued)

Table 4. (continued)

Theme	Sub-theme	Number of responses	Coverage	Respondents' quotes
Financial implications	Financial pressure on services	35	4.76%	"I'm worried about the financial impact to the small practices I work for, having to invest in more expensive testing equipment to facilitate socially distanced testing in the near future." "The increase in costs having to invest in more expensive testing equipment and decrease in productivity will be a potential problem, possibly resulting in reduced staffing hours or redundancies"
	Services underfunded	27	3.94%	"Possibly need to move away from NHS testing if fees stay the same. Unable to sustain business on one test an hour for £21"
	Reduced personal income	19	3.25%	"I am very concerned as a locum that I will not be able to find any work for a long time as practices will not be running at capacity for the foreseeable future"

CUES, COVID-19 Urgent Eyecare Service; GOC, General Optical Council; HES, Hospital Eye Service; IOP, intraocular pressure; MECS, Minor Eye Conditions Service; PPE, personal protective equipment.

training was available regarding provision of remote services. Others were also pleased that skills they had not been using previously were now utilised due to an expansion of their roles, for instance, independent prescribing.

Respondents also felt positively about carrying out tailored eye-examinations focused on addressing the principal concern/chief complaint rather than the traditional rigid approach which includes refraction as part of the eye examination.

Discussion

This is the first large-scale research study of UK optometrist experiences during the COVID-19 pandemic, highlighting the changes to both employment and working practices resulting from the pandemic. Although 38% of respondents were involved with emergency/urgent care, the majority had been furloughed (42%). Optometry has historically relied on locums, (17.5% locums in 2015),⁴³ but this group may be particularly at risk of unemployment during the pandemic. Sixteen percent of all respondents identified as self-employed (excluding practice owners), while 13% identified as both being self-employed and unemployed (see *Table 3*); the data suggest 80% of self-employed optometrists, presumed to be locums, were unemployed during the pandemic.

Lower psychological wellbeing and higher levels of anxiety and depression have been reported in the general public since the COVID-19 pandemic.⁴⁴ Amongst healthcare professionals, at least one in five has reported symptoms of depression and anxiety, and four in 10 have reported sleeping difficulties during the COVID-19 pandemic.⁴⁵ In our survey, lower psychological wellbeing was not evident among primary care optometrists. This may, in part, relate to primary care optometrists not working on the frontline

treating COVID-19, or simply that the potential benefits identified provided hope to overcome the challenges faced.

Those working during the pandemic indicated how they adapted working practices to minimise risks by increasing remote working, adopting better hand hygiene and using a broad range of PPE. While these changes may have a positive influence on future practice, this process has been borne out of necessity without the usual beta testing and development stages which may have led to the concerns relating to remote consultation.

Telehealth

The chief advantage of telehealth during the COVID-19 pandemic is that it helps limit transmission of the SARS-CoV-2 virus.²² Telehealth can also benefit patients with mobility issues, those with care commitments, and individuals' residing in rural areas where they may face barriers to accessing healthcare. While this is perhaps the first time in recent history that a large part of the UK has been compelled to adopt telehealth, in other parts of the world, natural disasters and poor access to healthcare have necessitated establishing telehealth systems.²²

The increase in uptake of remote consulting by UK optometrists during the pandemic has been considerable, though concerns about professional liability were raised. Also, there was a noticeable increase in triage forms, such as the one produced by The College of Optometrists, although some respondents continued to use a traditional case history approach for remote consultations.

The CUES pathway was a new service through which optometrists in England could examine patients presenting with an urgent eye condition while routine eye examinations were suspended because of the pandemic.⁴⁶ However, the survey showed that just 8.3% of remote consultations

Table 5. Themes, sub-themes and respondents' quotes regarding perceived opportunities during the COVID-19 pandemic

Theme	Subtheme	Number of responses	Coverage	Respondents' quotes
Improved professional relationships	Recognition	11	1.58%	"Hopefully, the industry will realise and value the clinical contribution that optometrists provide in terms of diagnosis, referral and management of ocular health rather than being used to pursue ever shortening testing times and ample refractions so that patients buy more and more glasses"
	Improved communication	6	1.16%	"Better communication between GP and optometrists and between hospital eye clinics & optometrists, hopefully!"
	Building professional relationships	8	1.13%	"Closer professional relationships with other healthcare providers (particularly with the Hospital Eye Service)"
Increased skills	Utilising skills	5	0.84%	"Those of us who have higher qualifications, such as IP, will finally be [able] to use it, in community ophthalmology clinics"
	Continued education	4	0.81%	"Remote CET is excellent"
Pathways refined	Pathways streamlined	13	2.76%	"Better interaction and less visits to different clinics by using video-linking between patient, primary care and secondary care"
	Effective referrals	5	0.92%	"I also can see how it will refine referral pathways by linking primary and secondary much closer. Overall, it should be beneficial to all parties, most importantly our patients"
Service provision	Tailored	17	2.69%	"So a less rigid format of the routine sight test, removing the need to do a refraction on a previously known asymptomatic emmetrope"
	Offering remote care	9	1.58%	"Telephone history and symptoms ahead of a face-to-face appointment has been very useful in eliminating non-essential visits and in reducing time in the test room for those that need to attend"

CET, continuing education and training; GP, general practitioner; IP, independent prescribing.

were carried out through the CUES pathway. Reasons for the relatively low uptake of CUES could include the pathway not having been implemented in all areas because of the length of time required for commissioning or possibly a low proportion of the consultations representing urgent conditions.

In general, eye health and vision related concerns were the most common issues dealt with during remote consultations (see Figure 3). Unsurprisingly, the use of telephones to undertake consultations was greater than video (Figure 2a: 54% phone only, 45% phone/video and <1% video only). The telephone is a form of technology with which most patients and optometrists are familiar, whereas video presents several additional technical barriers.⁴⁷ Nevertheless, when consulting patients about anterior segment ocular disease (including red eyes), around 38% of respondents used video and 63% used photographs, which suggests optometrists were able to adapt their approach to teleconsultation when needed.

There was a general willingness amongst optometrists to adopt telecommunication aspects of telehealth (i.e., speaking to the practice), but they were less embracing of store-and-forward tele- or mobile health (mHealth) (i.e., remote monitoring through use of tests or phone apps). While it is understandable that optometrists may not wish to use unestablished, or unvalidated smartphone apps as part of

their examination, it is less clear why there was also a poor uptake of well-established tools, such as the Amsler grid for assessing visual distortion. In addition to practitioner related factors, patient willingness and the speed at which practices had to implement new protocols may have also influenced adoption of telehealth and teleconsultations.

Much work has been undertaken to identify barriers to telehealth uptake. Safety and efficacy are important to clinicians, but training in telehealth must also be provided and ideally integrated into university curricula,^{22,48} with future developments embedded into continuing professional development programmes. Consideration must also be given to telehealth as a business model; a report of UK health care practitioners found a key barrier to telehealth was a lack of funding, cost and resources.⁴⁹ Separate billing systems and NHS funding, with fee structures that reflect the work undertaken, may help encourage uptake of remote consultations.

Face-to-face consultations, infection control and Personal Protective Equipment (PPE)

While there are very few surveys of PPE use in UK optometric practice, a survey undertaken in March 2020 of eye care practitioners in Germany, Austria and Switzerland found 75% of respondents planned to wear masks when

undertaking refractions, and that 73% planned to disinfect frames after they'd been tried on by patients.⁵⁰ The findings highlight the rapidity with which the situation, and eye care practitioners' views have changed. While evidence of the efficacy of masks and other types of PPE is emerging,⁵¹ some scientists have advocated application of the 'precautionary principle' i.e., wearing masks in the absence of strong evidence, because not doing so risks serious consequences and the relative cost and inconvenience of implementing such measures is modest.⁵² Based on this survey, optometrists appear to have embraced this cautionary approach to PPE; for example, despite only limited evidence for use of protective measures such as larger slit lamp breath guards against droplet exposure, many optometrists chose to employ this measure.⁵³ Use of PPE alone cannot, however, provide full protection against COVID-19 and must be combined with other types of infection control.⁵⁴ As shown in *Figure 4*, respondents indicated precautions taken during face-to-face consultations to minimise close contact with the patient such as keeping the subjective refraction as simple as possible and/or the use of hand sanitiser at the start of the examination.

This study highlights that while in more than 90% of cases, the decision whether to see a patient face-to-face was made by a GOC registrant, 33% of respondents reported feeling pressured to see patients they did not deem to be an emergency. Undue pressure leading to unnecessary patient contact and consultations could, therefore, have increased the risk of COVID-19 transmission. It is unclear from whom the pressures stem; three of the free text responses attributed the pressure placed upon optometrists to come from patients. The findings are particularly worrying when viewed in the context of PPE issues encountered by some optometrists. During the pandemic, a large proportion of respondents were found to have supplied their own PPE ($n = 261$). Not all optometrists received training in the use and disposal of PPE ($n = 80$); of those who did, most individuals either relied on professional bodies or their own research, for guidance, rather than their employers. While the PPE situation may have evolved since the time of gathering the responses to this survey, given the close nature of optometric examination, PPE remains a concern as optometrists resume optometric care during the pandemic.

Future of optometric practice

Given that many optometrists expressed their comfort with undertaking remote consultations, there may be potential to offer flexible working opportunities such as working from home. For General Practitioner (GP) medical consultations, a telephone-first system has been shown to decrease delays in accessing healthcare⁵⁵; similar systems could be trialled within optometry. Augmenting face-to-face

optometric practice with telehealth could also help to minimise on-site personnel and time spent in the consultation room, thus reducing the overall risk of COVID-19 transmission. Provision of greater teleconsultation guidance and clarity from optometric bodies may also help assuage optometrist concerns about professional indemnity.

During the pandemic there has been a fall in the number of patients seeking help for urgent health needs, which was a concern raised by some respondents. Prior to the pandemic, it had been estimated that up to 22 patients a month suffered from vision loss as a result of health service-initiated delays.⁵⁶ Given the increase in *patient*-initiated delays, and taking into account the number of individuals self-isolating or shielding, it is reasonable to expect that the prevalence of vision loss will rise, particularly if there is an increase of COVID-19 cases with a second wave.⁵⁷ Once lockdown restrictions are relaxed further, and individuals begin to more readily seek medical care, there is also a potential risk that patient demand may outstrip capacity.

While the changes in working practices provided opportunities regarding improved professional relationships, increasing professional skills, refining pathways and streamlining service provision, there are also challenges that need to be addressed. These include the financial implications of the pandemic, ensuring safe working practices due to personal health and PPE concerns, lack of professional body support and concerns regarding the future of the profession and services. As the pandemic evolves, future resources will need to continuously adapt to ensure optometrists have the right level of support during the pandemic.

Since the close of the survey there has been a reported reduction in locum optometrist rates⁵⁸; a major optometry chain has announced practice closures⁵⁹; a prominent lens manufacturing lab has closed⁶⁰ and there have been job losses in the support offices of a major multiple optometry chain.⁶¹ The full economic impact is, as yet, unclear.

Study limitations

The number of respondents who identified their ethnicity as white was higher than expected when compared to the proportion of GOC registrants also identifying as white.⁶² A recent Public Health England report has shown the COVID-19 related mortality rate to be significantly higher in individuals from Black, Asian and Minority Ethnic (BAME) backgrounds, particularly individuals of Bangladeshi ethnicity.⁶³ There could be other COVID-19 and optometry related concerns which disproportionately affect optometrists from specific ethnicities, but without a representative cohort a comprehensive insight cannot be provided.

Another consideration is the difference in practice and regulations between different parts of the UK. Differences in care pathways and lockdown rules may have affected some of the survey outcomes, though most respondents were based in England. As the pandemic continued, geographical differences in the SARS-CoV-2 reproduction number (R) have emerged, indicating an increased risk of transmission in some regions.⁶⁴ It is possible that differences in risk rates may have led to changes in the behaviour of optometrists e.g., individuals may have been dissuaded from volunteering for redeployment, but we were not able to capture such detailed data as part of this study. Please note, the imposition of regional lockdowns was introduced after the close of our survey. There was also a second national lockdown in November 2020, although it differed from the first in terms of which businesses and services were allowed to open.

Additional factors which may affect optometric practice, but did not form part of our survey, are questions around consumer and patient confidence and how it may be affected by both the ongoing threat of COVID-19 and the economic recession.

Summary

In summary, the COVID-19 pandemic has led to a substantial increase in optometrists embracing remote consultations; the majority appear to be comfortable with the concept. Further reassurance and guidance may be required to navigate the medico-legal implications that are associated with remote consultations. Other adaptations have included changes in face-to-face consultations and increased use of infection control methods. The findings provide an overview of changes to optometrist working practices during the pandemic and highlight areas for further investigation. The outcomes may be used to inform the development of professional guidance and facilitate resource allocation during the COVID-19 era.

Acknowledgements

The authors would like to acknowledge The College of Optometrists UK for their support in distributing this survey and Gaynor Kirk for her comments on the draft survey.

Conflicts of interest

The authors report no conflicts of interest and have no proprietary interest in any of the materials mentioned in this article. This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Author contributions

Manbir Nagra: Conceptualization (equal); Methodology (equal); Writing-original draft (equal); Writing-review & editing (equal). **Peter M Allen:** Conceptualization (equal); Methodology (equal); Writing-original draft (equal); Writing-review & editing (equal). **Yvonne Norgett:** Conceptualization (equal); Methodology (equal); Writing-original draft (equal); Writing-review & editing (equal). **Eldre Beukes:** Conceptualization (equal); Methodology (equal); Writing-original draft (equal); Writing-review & editing (equal). **Michael Bowen:** Conceptualization (equal); Methodology (equal); Writing-original draft (equal); Writing-review & editing (equal). **Marta Vianya-Estopa:** Conceptualization (equal); Methodology (equal); Writing-original draft (equal); Writing-review & editing (equal).

References

1. Andersen KG, Rambaut A, Lipkin WI, Holmes EC & Garry RF. The proximal origin of SARS-CoV-2. *Nat Med* 2020; 26: 450–452.
2. Jess Sargeant AN. *Coronavirus lockdown rules in each part of the UK 2020*. Institute for Government. <https://www.instituteforgovernment.org.uk/explainers/coronavirus-lockdown-rules-four-nations-uk> (Accessed 9/8/20).
3. World Health Organization. *Situation Report*, 2020. Report No.: 1. https://www.who.int/docs/default-source/coronavirus/situation-reports/20200121-sitrep-1-2019-ncov.pdf?sfvrsn=20a99c10_4 (Accessed 9/8/20).
4. BBC News. *Coronavirus: Two cases confirmed in UK*, 2020, 08/08/2020. <https://www.bbc.co.uk/news/health-51325192> (Accessed 9/8/20).
5. General Optical Council. *How we will continue to regulate in light of novel coronavirus (Covid19)*, 2020 08/08/2020. https://www.optical.org/filemanager/root/site_assets/publications/covid_19/covid-19_joint_regulators_statement_-_final.pdf (Accessed 9/8/20).
6. Cucinotta D & Vanelli M. WHO declares COVID-19 a pandemic. *Acta Bio-med* 2020; 91: 157–160.
7. Goodall A. *Covid-19: Temporary Primary Care Contract Changes*, 2020 08/08/2020. College of Optometrists UK. <https://www.college-optometrists.org/uploads/assets/0d193f7a-904a-42f1-be7a5c806ff4760a/Wales-Temporary-Primary-Care-Contract-Changes-20-March-2020.pdf> (Accessed 9/8/20).
8. Optometry Scotland. *PCA(O)2020(4) – COVID-19: Suspension of routine eye examinations*, 2020 08/08/20. <https://www.optometryscotland.org.uk/2020/03/20/pcao20204-covid-19-suspension-of-routine-eye-examinations-financial-support-measures-for-community-optometry-practices-other-important-covid-19-updates/> (Accessed 9/8/20).
9. College of Optometrists. *30th March Daily Update*, 2020 08/08/2020. <https://www.college-optometrists.org/the-college/>

- media-hub/news-listing/coronavirus-2019-advice-for-optometrists.html#PastUpdates (Accessed 9/8/20).
10. Sharma P. *Publication reference: 0015592020*. NHS England. <https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/04/C0127-optical-letter-1-april-2020.pdf> (Accessed 9/8/20).
 11. Health and Social Care Board. *Guidance on Urgent and Essential Services Provision*, 2020. http://www.hscbusiness.hscni.net/pdf/OPH_COVID-19-Bulletin-No2_030420.pdf (Accessed 9/8/20).
 12. College of Optometrists. *17th April Daily Update*, 2020. <http://www.college-optometrists.org/the-college/media-hub/news-listing/coronavirus-2019-advice-for-optometrists.html#PastUpdates> (Accessed 9/8/20).
 13. NHS England. *Deploying the clinical and non-clinical optical workforce to support the NHS clinical delivery plan for COVID-19*, 2020; Publications reference: 001559. https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/04/C0207_COVID-19-Deploying-the-optical-workforce_v1_12-April.pdf (Accessed 9/8/20).
 14. College of Optometrists. *The College of Optometrists primary eye care COVID-19 guidance: Red phase*, 2020. <https://www.college-optometrists.org/the-college/media-hub/news-listing/coronavirus-covid-19-guidance-for-optometrists.html> (Accessed 9/8/20).
 15. Shah R, Evans BJ & Edgar D. A survey of the availability of state-funded primary eye care in the UK for the very young and very old. *Ophthalmic Physiol Opt* 2007; 27: 473–481.
 16. Higgins C, Dunn E & Conrath D. Telemedicine: an historical perspective. *Telecommun Policy* 1984; 8: 307–313.
 17. Kelly SP, Wallwork I, Haider D & Qureshi K. Teleophthalmology with optical coherence tomography imaging in community optometry. Evaluation of a quality improvement for macular patients. *Clin Ophthalmol* 2011; 5: 1673–1678.
 18. Zapata MA, Arcos G, Fonollosa A *et al.* Telemedicine for a general screening of retinal disease using nonmydriatic fundus cameras in optometry centers: three-year results. *Telemed e-Health*. 2017; 23: 30–36.
 19. Cuadros J & Bresnick G. EyePACS: an adaptable telemedicine system for diabetic retinopathy screening. *J Diabetes Sci Technol* 2009; 3: 509–516.
 20. Rono H, Bastawrous A, Macleod D, Wanjala E, Gichuhi S & Burton M. Peek Community Eye Health-mHealth system to increase access and efficiency of eye health services in Trans Nzoia County, Kenya: study protocol for a cluster randomised controlled trial. *Trials* 2019; 20: 502.
 21. Bartnik SE, Copeland SP, Aicken AJ & Turner AW. Optometry-facilitated teleophthalmology: an audit of the first year in Western Australia. *Clin Exp Optom* 2018; 101: 700–703.
 22. Smith AC, Thomas E, Snoswell CL *et al.* Telehealth for global emergencies: implications for coronavirus disease 2019 (COVID-19). *J Telemed Telecare* 2020; 26: 309–313.
 23. General Optical Council. *Coronavirus (COVID-19) latest information*. https://www.optical.org/en/news_publications/Publications/joint-statement-and-guidance-on-coronavirus-covid19/index.cfm (Accessed 9/8/20).
 24. AOP. *Coronavirus updates*, 2020 08/08/2020. <https://www.aop.org.uk/coronavirus-updates> (Accessed 9/8/20).
 25. Optometrists Co. *COVID-19: College updates*, 2020. <http://www.College-optometrists.org/the-college/media-hub/news-listing/coronavirus-2019-advice-for-optometrists.html> (Accessed 9/8/20).
 26. Nagra M, Vianya-Estopa M & Wolffsohn JS. Could telehealth help eye care practitioners adapt contact lens services during the COVID-19 pandemic? *Cont Lens Anterior Eye* 2020; 43: 204–207.
 27. College of Optometrists. *Clinical Telephone Review Form*, 2020. <https://www.college-optometrists.org/uploads/assets/0d35dcd-2d56-4bd1-a56fd53189cd429a/db07b6b5-4039-4739-ba75986f47e88d8d/Clinical-telephone-review-form-1-April-2020.pdf> (Accessed 9/8/20).
 28. College of Optometrists. *Home Sight Test Chart*, 2020. <https://www.college-optometrists.org/uploads/assets/e4899558-1945-49e3-9b3735345fb5a65e/2ba200e5-bed0-4979-90998b72eff71c7d/visual-acuity-chart-for-remote-consultations-14-April-2020.pdf> (Accessed 9/8/20).
 29. LOCSU. *Minor Eye Conditions Service*. <https://www.locsu.co.uk/commissioning/pathways/minor-eye-conditions-service/> (Accessed 9/8/20).
 30. NHS England, Local Optical Committee Support Unit, the Clinical Council for Eye Health Commissioning. *CUES: COVID-19 Urgent Eye Care Service: Patient Pathway*, 2020. <https://www.college-optometrists.org/uploads/assets/4c8a90b3-7775-4e46-a3b4a58230302e1c/CUES-Patient-pathway.pdf> (Accessed 9/8/20).
 31. Scottish Government. *General Ophthalmic Services (GOS) – COVID-19: Further important information for community eyecare providers*, 2020. <https://nhsnss.org/media/4147/pcao-2020-7.pdf> (Accessed 9/8/20).
 32. Welsh Government. *Provision of emergency or essential eye care during ‘lockdown’*, 2020. <https://www.college-optometrists.org/uploads/assets/effe2e69-1321-4f59-8bdb9d17a0354ef2/Welsh-Government-Optometry-Practice-Services.pdf> (Accessed 9/8/20).
 33. Glenza J. *‘The new gold’: demand for PPE soars again amid shortage as US cases rise*, 2020. <https://www.theguardian.com/world/2020/jun/29/demand-ppe-soars-again-amid-shortage-us-cases-rise> (Accessed 9/8/20).
 34. Roberts M. *Coronavirus- has the NHS got enough PPE?*, 2020. <https://www.bbc.co.uk/news/health-52254745> (Accessed 9/8/20).
 35. Lintern S. *Coronavirus: Hospitals hours from running out of equipment as leaked NHS email reveals demand up 2,000 per cent*, 2020. <https://www.independent.co.uk/news/health/coronavirus-nhs-ppe-equipment-shortage-infection-doctors-a9410436.html> (Accessed 9/8/20).
 36. Chaib F. *Shortage of personal protective equipment endangering health workers worldwide*. World Health Organization [Internet], 2020. <https://www.who.int/news-room/detail/03->

- 03-2020-shortage-of-personal-protective-equipment-endangering-health-workers-worldwide (Accessed 9/8/20).
37. NHS Scotland. *National Infection Prevention and Control Manual*, 2020. <http://www.nipcm.scot.nhs.uk/appendices/appendix-6-best-practice-putting-on-and-removing-ppe/> (Accessed 9/8/20).
 38. AOP. *PPE Guide*, 2020. <https://www.aop.org.uk/corona-virus-updates/ppe-guide> (Accessed 9/8/20).
 39. General Optical Council. *General Optical Council (GOC) statement on infection prevention and control during COVID-19 pandemic*. https://www.optical.org/filemanager/root/site_assets/publications/covid_19/statement_on_infection_control_during_covid-19_emergency_final_200706.pdf (Accessed 9/8/20).
 40. Cambridge University Hospitals. *PPE Procedure for Primary Care*, 2020. <https://www.youtube.com/watch?v=j3hfEjAx0E&feature=youtu.be> (Accessed 9/8/20).
 41. Welsh Government. *Optometry recovery guidance (amber phase): COVID-19*, 2020. <https://gov.wales/optometry-recovery-guidance-amber-phase-covid-19> (Accessed 9/8/20).
 42. Shanafelt T, Ripp J & Trockel M. Understanding and addressing sources of anxiety among health care professionals during the COVID-19 pandemic. *JAMA* 2020; 323: 2133–2134.
 43. College of Optometrists. *Optical Workforce Survey*, 2015. <https://www.college-optometrists.org/the-college/research/research-projects/optical-workforce-survey2.html> (Accessed 9/8/20).
 44. Vindegaard N & Benros ME. COVID-19 pandemic and mental health consequences: systematic review of the current evidence. *Brain Behav Immun* 2020; 89: 531–542.
 45. Pappa S, Ntella V, Giannakas T, Giannakoulis V, Papoutsis E & Katsaounou P. Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: a systematic review and meta-analysis. *Brain Behav Immun* 2020; 88: 901–907.
 46. College of Optometrists. *COVID-19 Urgent Eyecare Service (CUES) in England*, 2020. <https://www.college-optometrists.org/the-college/media-hub/news-listing/nhs-england-covid-19-urgent-eyecare-service-cues.html> (Accessed 9/8/20).
 47. Clay-Williams R, Baysari M, Taylor N *et al*. Service provider perceptions of transitioning from audio to video capability in a telehealth system: a qualitative evaluation. *BMC Health Serv Res* 2017; 17: 558.
 48. Edirippulige S & Armfield N. Education and training to support the use of clinical telehealth: a review of the literature. *J Telemed Telecare*. 2017; 23: 273–282.
 49. Kayyali R, Hesso I, Mahdi A, Hamzat O, Adu A & Nabhani GS. Telehealth: misconceptions and experiences of healthcare professionals in England. *Int J Pharm Pract* 2017; 25: 203–209.
 50. Pult H. COVID-19 pandemic: survey of future use of personal protective equipment in optometric practice. *Cont Lens Anterior Eye* 2020; 43: 208–210.
 51. Feng S, Shen C, Xia N, Song W, Fan M & Cowling BJ. Rational use of face masks in the COVID-19 pandemic. *Lancet Respir Med* 2020; 8: 434–436.
 52. Greenhalgh T, Schmid MB, Czypionka T, Bassler D & Gruer L. Face masks for the public during the COVID-19 crisis. *BMJ* 2020; 369: m1435.
 53. Murnain KL, Ooi JL & Sharma NS. Evaluation of the slit lamp shield to reduce droplet exposure. Letter to the Editor. *Clin Exp Optom* 2020; 103: 555–557.
 54. Efron N & Efron SE. Optometry in times of pandemic: Spanish flu (1919) versus COVID-19 (2020). *Clin Exp Optom* 2020; 103: 399–404.
 55. Miller D, Loftus AM, O’Boyle PJ *et al*. Impact of a telephone-first consultation system in general practice. *Postgrad Med J* 2019; 95: 590–595.
 56. Foot B & MacEwen C. Surveillance of sight loss due to delay in ophthalmic treatment or review: frequency, cause and outcome. *Eye* 2017; 31: 771–775.
 57. Xu S & Li Y. Beware of the second wave of COVID-19. *Lancet* 2020; 395: 1321–1322.
 58. Association of Optometrists, *Optometry Today website*. <https://www.aop.org.uk/ot/professional-support/aop/2020/05/14/employers-urged-by-aop-to-make-sure-they-treat-local-staff-fairly-and-retain-trust> (Accessed 23/7/20).
 59. *Optician magazine website*. <https://www.opticianonline.net/news/boots-opticians-announces-job-losses-and-closures> (Accessed 23/7/20).
 60. Association of Optometrists, *Optometry Today website*. <https://www.aop.org.uk/ot/industry/eyewear-and-lenses/2020/07/06/norville-group-enters-into-administration> (Accessed 23/7/20).
 61. Association of Optometrists, *Optometry Today website*. <https://www.aop.org.uk/ot/industry/high-street/2020/05/19/specsavers-announces-450-support-office-jobs-at-risk-of-redundancy> (Accessed 23/7/20).
 62. General Optical Council. *Equality and Diversity Monitoring report. 2018. Link to report? Is this 2018–19 or 2017–18?*
 63. UK Government. *Understanding the impact of COVID-19 on BAME groups*, 2020. <https://www.gov.uk/government/publications/covid-19-understanding-the-impact-on-bame-communities> (Accessed 9/8/20).
 64. UK Government. <https://www.gov.uk/guidance/the-r-number-in-the-uk#latest-r-number-and-growth-rate> (Accessed 17/9/20).