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QUALITY IMPROVEMENT

# Restructuring emergency eye services during COVID-19 in a tertiary referral centre

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## Abstract

**Background/Aims** Maintaining emergency eye services is crucial during the COVID-19 pandemic. This article describes the introduction of a new restructured referral pathway to reduce the burden on healthcare providers and create a safe environment.

**Methods** During January and February 2020 (group 1), all appointments were face-to-face with a walk-in eye casualty. The first audit cycle comprised all patients in group 1. The primary audit criteria were discharge rates, referral to subspeciality and reattendance. In April 2020, a remodelled system was implemented in which walk-in attendance ceased and was replaced with telephone triage coupled with digital imaging via NHS email for remote clinical review. Patients requiring further assessment following this triage were invited in for face-to-face appointments. A reaudit was conducted during April–July 2020 (group 2) following implementation of these COVID-19 protocol changes.

**Results** In group 1, 2868 appointments (100.0%) were face-to-face and in group 2 4870 (100.0%) appointments were telephone consults that resulted in 2639 (54.2%) face-to-face appointments. The rate of discharge in the first cycle and second cycle were 55.3% and 76.9% respectively ($P<0.0001$). Furthermore 2298 (47.2%) patients were able to be discharged following telephone consultation in group 2.

**Conclusions** Using this telephone and digital imaging review triage system, the authors have demonstrated a significant reduction in the need for face-to-face reviews. The reduction in avoidable patient face-to-face reviews allows the system to move from saturated to sustainable while increasing accessibility to services for patients who may not be able to present for face-to-face review. This complete audit cycle successfully charts interventions that maximise accessibility, reduce unnecessary hospital visits and deliver safe and prompt management during the pandemic.

Key words: COVID-19; Eye emergency department; Eye casualty; SARS-CoV-2; Service improvement

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## Introduction

Eye casualty departments have seen increasing demand over the years because of the changes in demographics, such as an ageing population, which requires longer-term care (The Royal College of Ophthalmologists, 2017). Most teaching hospitals provide a dedicated eye casualty service for patients presenting with ocular complaints. Maintaining these emergency services has been crucial since the emergence of COVID-19, allowing patients to receive a timely diagnosis and appropriate care while reducing the burden on general emergency departments. COVID-19 was declared a global pandemic on 11 March 2020 (World Health Organization, 2020), and routine outpatient face-to-face care was stepped down from 23 March 2020 with the enforcement of a nationwide lockdown. In response to this, the authors' department has had to adapt to provide necessary care in this environment while maintaining high standards of patient safety. This article discusses the methods adopted to meet demand and maintain efficiency of emergency eye services and examines the impact of the altered service provision at a tertiary referral centre at University Hospitals Coventry and Warwickshire NHS Trust. The trust is a busy teaching hospital serving a population of over 1 million people (Care Quality Commission, 2018).

The article describes a restructured referral pathway, initiated following the findings of the first audit cycle, in keeping with COVID-19 clinical guidance from NHS England

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(2020) and The Royal College of Ophthalmologists (2020). The aims of this pathway were to minimise patient anxiety, reduce unnecessary hospital visits, enable better social distancing measures, streamline consultations and only bring patients who require clinical review into a high-risk environment during the pandemic, all while maximising patient accessibility and ultimately delivering prompt, safe management.

## Methods

### Old protocol

Before the restructuring of eye casualty services, a 6-day a week walk-in service and 24-hour a day emergency on-call service were provided. This consisted of a three-tier on-call system with a first and second on-call doctor. The overall on-call team was supported by the consultant on call for the week.

The walk-in service operated 5 days a week from 08.30 to 16.30, with a reduced service at the weekend from 08.30 to 12.30. Patients were able to walk in and be seen by an ophthalmologist or allied health professional. All cases were triaged on arrival by a nurse (band 5 or 6) and graded as green, amber or red, depending on severity. Outside of these times a non-resident on-call system was operational, where the on-call team would be able to take calls from the main emergency department, out-of-hours GPs, community opticians, walk-in-centres or any inpatient referrals.

During normal working hours, any patient referred via these services was reviewed in the eye casualty clinics. Patients who needed review after 16.30 were reviewed in the main emergency department in a dedicated eye room, on their respective wards or in a dedicated eye room on a surgical ward.

### New protocol

When the UK government declared lockdown on 23 March because of the COVID-19 pandemic, the eye casualty department closed this walk-in facility. The quality improvement interventions were prepared following focus groups with the multidisciplinary team in the weeks leading up to the lockdown (including nurses, healthcare assistants, optometrists and doctors), with involvement of the ophthalmology clinical lead, lead for eye casualty and managerial team. The targeted intervention was the introduction of a telephone triage service and a new on-call phone triage system from 24 March 2020. This consisted of four phone lines that were operational from 08.30 to 19.00 on weekdays and 09.00 to 12.00 at weekends. Any clinical queries or emergencies outside of these times were received by the first on-call as a first port of call. The phone lines were manned by two allied healthcare professionals (including an optometrist and an orthoptist) and one or two ophthalmologists per session. An NHS.net e-referral system was introduced for exclusive use by community optometrists and this was staffed by hospital optometrists. Consultant connect is an app-based system connecting primary care with this service. It is monitored daily by in-house optometrists who triage queries, and attached images, and discuss any complex clinical cases the on-call team. The department has a 24-hour turnaround to ensure prompt responses to queries.

Each telephone consultation was logged via a standard proforma and electronic patient records (Medisoft software). The proforma included basic patient demographics, COVID-19 assessment and ocular assessment. An NHS trust email address that was accessible by trust ophthalmologists, optometrists and orthoptists was created where patients could directly email photographs to help with clinical assessment during telephone consultations. All images were uploaded to electronic patient records for data protection and safety. A triage tool was designed with various presenting symptoms and the timeframe in which they needed to be assessed. Each subspeciality also generated standard operating procedures to ensure the safe diagnosis and management of urgent ocular pathologies.

If a patient was deemed to have an ocular emergency or pathology that required urgent medical attention, they were booked into an eye casualty or acute vitreoretinal clinic slot either on the same day or a few days later for a face-to-face consultation. Any patients not requiring a face-to-face consultation were managed via a telephone consultation and assessment of clinical images, with prescriptions generated for patients to collect from the hospital pharmacy.

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All changes were communicated to the whole ophthalmology department and specific sessions (drills) were held to inform all members of the team. These sessions were designed to ensure all staff were up to date with the processes established to allow a patient who is positive for or suspected of having COVID-19 to be seen in the department in a timely manner with minimal risk. They also provided an opportunity to discuss any new departmental or trust policies in a rapidly changing and evolving working environment.

## Additional COVID-19 specific considerations

Patient flow was also modified to enable any patients who were suspected or known to have COVID-19 to be treated safely and efficiently. A clinical suite with five assessment rooms was set aside for the treatment of COVID-19 positive patients, with an adjacent dedicated area for donning and doffing of personal protective equipment. All slit lamps were protected with slit lamp guards and full personal protective equipment was provided for any staff members assessing COVID-19 positive patients. COVID-19 patient protocols and drills were practiced twice a day to ensure all members of staff were aware of guidance and safety measures that had been put in place.

To minimise the risk of cross-contamination across the hospital an eye room was set up in a surgical ward that was dedicated to seeing any eye patients out of hours, away from the high-risk main emergency department. This surgical ward was a low COVID-19 risk clinical area and therefore improved patient safety.

A separate slit lamp was also supplied to the paediatric eye casualty to make it easier to examine any paediatric cases and to improve accessibility to equipment from other parts of the hospital.

New acute eye clinics were set up on a daily basis to deal with the possibility of overcrowding in the waiting areas. All patients were booked in via a risk stratification tool.

To maintain patient safety while in the department all patients were asked to come alone if possible, with exceptions such as children. Otherwise, people accompanying patients, such as relatives, were only permitted to enter in exceptional circumstances, such as for patients with dementia. All patients, and accompanying people if present, were questioned regarding shortness of breath, fever and new cough in themselves or family members. A face mask was provided on arrival. Everyone entering the outpatient department was required to use hand sanitizer and have their temperature taken on arrival. The layout of the eye department fortunately allowed multiple access routes to various examination rooms, laser and ultrasound machines, meaning that patients could bypass the high-risk COVID-19 suite as they waited for their appointment.

## Data collection

This study was conducted in accordance with the Declaration of Helsinki principles for ethical research. Data were extracted from the performance analyst department, looking at the outcomes of patient interactions, following approval to access and export the results by the managerial department. The database was prospectively and consecutively populated by the data coding department following each patient encounter (both telephone consultation and following face-to-face consultation in the second cycle) by the clinician that reviewed the patient. There were no exclusion criteria. The data collected included consultation type (phone or face-to-face) and patient outcomes following clinician review.

The first audit cycle was conducted retrospectively for a 2-month period of January–February 2020 (group 1), during which time 2868 patients were seen face-to-face in eye casualty. The data in the first cycle confirmed that the eye casualty service was often saturated as a walk-in service with no control to prevent clusters of patients presenting. Additionally, as the clinical necessity of visits could not be determined before clinical review, this could lead to patients facing long waiting times in crowded clinical areas. With the onset of COVID-19, urgent changes to current practice were required, hence the department decided to significantly restructure eye casualty services as described. The on-call team still consisted of a first, second and consultant on-call, but a back-up rota was also created to cover any unforeseen absences and sickness.

A reaudit was initiated in April 2020 for a 4-month period from April–July, following establishment of the new emergency eye services protocol, which included 4870 patient

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**Table 1. Number of appointments and subsequent outcomes in January–February and April–July 2020**

| Month | Total phone | Total face-to-face | Discharge overall | Discharge face-to-face | Discharge phone | Total number of patients |
|---|---|---|---|---|---|---|
| January | - | 1493 (100.0%) | 817 (54.7%) | 817 (54.7%) | - | 1493 (100.0%) |
| February | - | 1375 (100.0%) | 770 (56.0%) | 770 (56.0%) | - | 1375 (100.0%) |
| April | 964 (100.0%) | 356 (36.9%) | 814 (84.4%) | 208 (58.4%) | 606 (62.9%) | 964 (100.0%) |
| May | 1176 (100.0%) | 556 (47.3%) | 933 (79.3%) | 310 (55.8%) | 623 (53.0%) | 1176 (100.0%) |
| June | 1336 (100.0%) | 815 (61.0%) | 1002 (75.0%) | 441 (54.1%) | 561 (42.0%) | 1336 (100.0%) |
| July | 1394 (100.0%) | 912 (65.4%) | 996 (71.4%) | 488 (53.5%) | 508 (36.4%) | 1394 (100.0%) |

*January and February = group 1 (pre-COVID-19), April–July = group 2 (during COVID-19).*

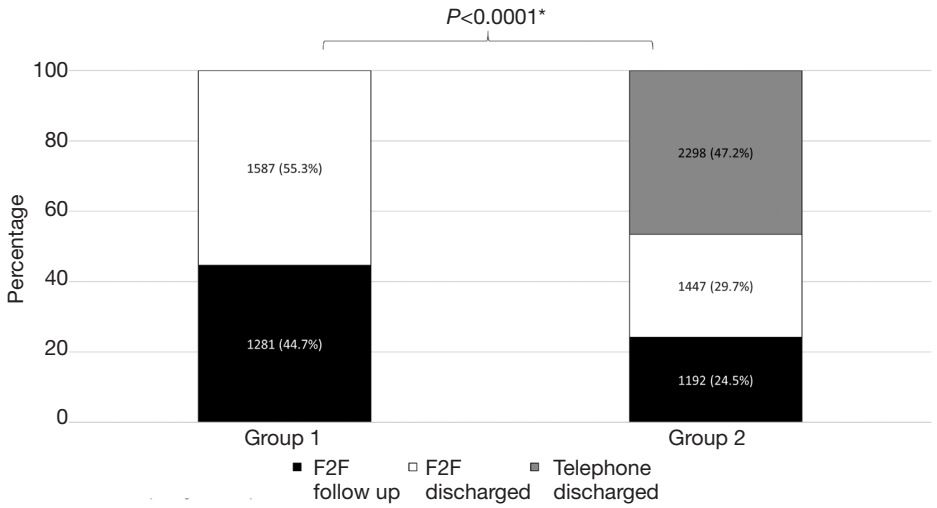


**Figure 1.** Number of appointments and subsequent outcomes in group 1 and group 2. Fisher exact test comparing face-to-face (F2F) follow up and discharge in group 1 (pre-COVID-19) and group 2 (during COVID-19). *Statistical significance.

interactions. A subsequent time period following establishment of interventions was not required as the department needed to respond to the COVID-19 changes immediately.

## Statistical analysis

For April appointments, a patient calling phone triage and being subsequently reviewed face-to-face was classified as a single patient event rather than two to avoid inflating patient interactions through duplication of numbers of patients.

Fisher exact test was used for nominal variables. Analyses were performed using SPSS Statistics for Windows, Version 26.0 (IBM Corp, Armonk NY). Statistical significance was defined as $P<0.05$.

# Results

The number of follow ups performed is summarised in Table 1 and Figure 1. After initiation of lockdown on 23 March, there were fewer patient events in April 2020 compared to group 1 on average (964 and 1343 respectively), of which 36.9% resulted in a face-to-face appointment (Table 1). The number of patient interactions steadily increased and reached pre-lockdown levels by June–July 2020 (Table 1). In group 1, 1281 (44.7%) patients required face-to-face follow up compared to 1192 (24.5%) in group 2 ($P<0.0001$, Figure 1).

The results show a significantly higher proportion of discharges ($P<0.0001$), a significant reduction in face-to-face visits ($P<0.0001$) and a significant number of patients discharged without requiring face-to-face consultations ($P<0.0001$) in group 2 compared to group 1

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**Table 2. Number of appointments and subsequent outcomes in group 1 and group 2**

| Month | Group 1 (pre-COVID-19) | Group 2 (during COVID-19) | *P* value* |
|---|---|---|---|
| Total phone | 0 (0.0%) | 4870 (100.0%) | - |
| Total face-to-face | 2868 (100.0%) | 2639 (54.2%) | <0.0001† |
| Discharge overall (% yes) | 1587 (55.3%) | 3745 (76.9%) | <0.0001† |
| Discharge face-to-face (% yes) | 1587 (55.3%) | 1447 (54.8%) | 0.7245 |
| Discharge phone | 0 (0.0%) | 2298 (47.2%) | <0.0001† |
| Patients/month | 1343 | 1218 | - |
| Total no of patients | 2868 | 4870 | - |

**Fisher's exact test; † statistically significant results*

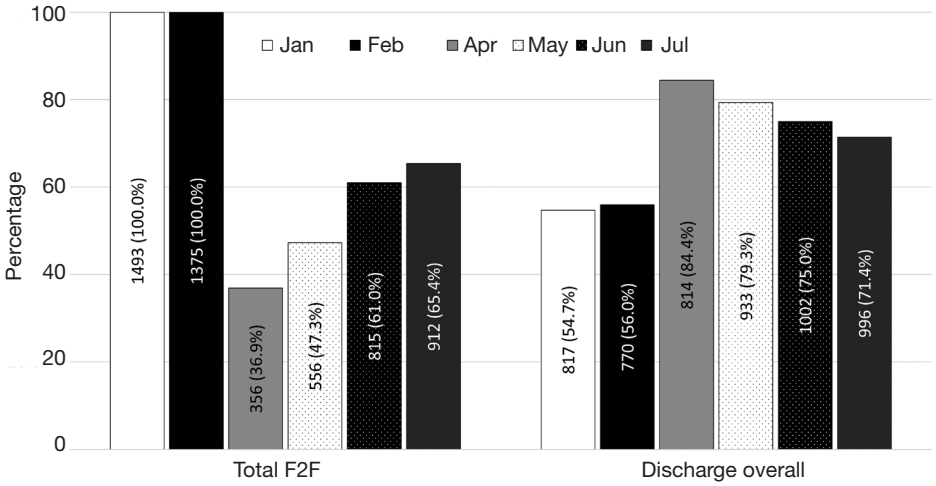


**Figure 2.** Trend in face-to-face (F2F) visits and discharge rate over time.

(Table 2). Comparing face-to-face appointments only in group 1 and group 2, there was no significant change in discharge rate (*P*=0.7245).

## Sustainability

Itemised data by month for 4 months after initiating the new protocol and compared to the 2 months pre-COVID-19 are presented in Table 1 and Figure 2. By July 2020 the UK government had relaxed lockdown and the department experienced the highest number of patient interactions under the new protocol (*n*=1394). A favourable overall discharge rate was being maintained relative to the old protocol. July 2020 had significantly fewer face-to-face appointments than group 1 (*P*<0.0001) and a significantly higher overall discharge rate than group 1 (*P*=0.0006)

# Discussion

There were fewer patient events in April 2020 compared to either month of group 1. The UK experienced a 25% decrease in emergency department attendances in the first week following the March 2020 lockdown (Thornton, 2020). The reasons for this are complex and multifactorial (Leow et al, 2020; Pikoulis et al, 2020). The national message of 'staying at home to protect the NHS' may have resulted in more patients either self-managing or seeking advice from their GP in the first instance. Patients, including a significant proportion of the population who had been told to shield, may have been reluctant to attend hospital for eye complaints because of fears of contracting COVID-19 (Lazzerini et al, 2020). With the extremely dynamic scenario created by COVID-19, patient health-seeking behaviours continue to evolve. Since April 2020, the number of patients attending the emergency

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department has steadily increased, as evidenced by the weekly surveillance reports carried out by Public Health England (2020). In this study, the number of patient interactions has also steadily increased and is currently at pre-pandemic levels. This has led to an increased trend in the proportion of face-to-face reviews and a reduction in the overall discharge rate. The authors hypothesise that this significant increase in patient interactions and face-to-face reviews is the result of a combination of factors: a relaxation of lockdown measures, passing the 'peak' and the end of shielding may have psychologically made patients feel safer and therefore more comfortable in accessing acute services. Patients with significant pathology who did not attend in the first instance may have had a progression in their condition and now require face-to-face review, be that in eye casualty clinics or via onward referral to acute specialty clinics. Restarting routine surgery will have also increased the number of patients requiring face-to-face postoperative review. Despite this increased workload, the sustainability of the new protocol has been demonstrated, with favourable discharge rates relative to the pre-pandemic protocol. There has been a significant reduction in the need for face-to-face reviews compared to the pre-COVID-19 era and the overall discharge rate remains significantly better (55.3% vs 76.8%, $P<0.0001$), with a telephone discharge rate of 47.2%.

Patients with recognised conditions, such as recurrent episcleritis and some ocular surface disorders, can be managed remotely with prescriptions for non-urgent conditions issued via the GP or outpatient hospital pharmacy. Clinicians working in triage are also able to seek subspecialist or senior input for certain conditions for which an emailed image helps to quantify the severity of the condition, for example in lagophthalmos. Therefore, a safe and more definitive management plan can be formulated remotely. This approach may also have contributed to the overall reduced number of patients being referred to outpatient clinics.

The outcome of patients who underwent a face-to-face review remained the same as that of patients treated under the previous model – they were just as likely to be discharged (55.3% vs 54.8%). Before the new system and need for social distancing, clinicians may have had a lower threshold for bringing patients back for follow up. Now, the need for follow up is more closely scrutinised and any unnecessary follow up more appropriately vetted. This may explain why the rate of discharge following a face-to-face appointment is the same. As we are seeing more appropriate referrals, this represents a lower proportion of overall patients.

The new telephone triage system has many advantages. The reduction in unnecessary patient face-to-face reviews allows the eye casualty system to move from being overwhelmed to sustainable nunmbers. Those with sight-threatening conditions such as potential giant cell arteritis can be seen promptly instead of waiting 4 hours or longer for clinical review in an eye casualty, during which time their condition may deteriorate. This increases accessibility to eye care services for patients who may otherwise not present for various reasons such as the vulnerable, elderly, those who are shielding or who are physically impaired. The system allows minor eye conditions to be managed, taking the burden off busy emergency departments during the pandemic period. It allows for a socially distanced eye casualty waiting area. Moreover, telephone triage allows the development of roles undertaken by in-hospital allied healthcare professionals such as orthoptists and optometrists, with the triage tool and standard operating procedures enabling uniform decision making.

Owing to the close integration of the service with primary care providers, no additional direct patient education was required to access emergency eye services and so there have been no instances of delayed presentations as a result of an inability to contact the department. The new system was patient-centric and patient safety was core to its implementation. Anecdotally, patients are presenting sooner with this new system in place as many hurdles have been overcome. Additionally, patients can also be booked into a virtual follow-up clinic to ensure efficacy of remote treatment with the option of subsequent face-to-face review or referral directly into the relevant subspecialty clinic within the required timeframe if deemed necessary. Furthermore, all telephone triage consultations are documented, with a copy being sent to the GP and patient, as with standard consultations. The documentation includes relevant safety netting advice for the patients as well as out of hours contact details in case of an emergency. Patients who are not keen to come into the hospital but require assessment or long-term review of their condition are managed via specific community optometry services. If they require further advice, they are able to get in touch with the on-call ophthalmologist.

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## Key points

- Maintaining emergency eye services is crucial during the COVID-19 pandemic.
- This article describes the introduction of a new restructured referral pathway to reduce burden and create a safe environment, whereby face-to-face consultations were replaced with an initial telephone triage coupled with digital imaging via NHS email for remote clinical review, to either discharge, remotely treat or risk stratify and arrange further face-to-face visits.
- Using this new system, a significant reduction in face-to-face consultations from 100.0% to 54.2% has been demonstrated, along with an increase in the discharge rate from 55.3% to 76.9%.
- This complete audit cycle demonstrates an intervention to maximise accessibility, reduce unnecessary hospital visits and deliver safe, prompt management during the pandemic.

There are a few limitations associated with this study. It presents only 4 months of data during a lockdown period. As the new system was rolled out at the end of March, uptake by patients and healthcare providers was less than projected. Continual audit and re-assessment of the strategy will be key to assess the sustainability and outcomes associated with this new telephone triage model. In the 4 months since its inception, there have been no serious clinical incidents declared with respect to this new emergency eye services pathway. This has been achieved while significantly reducing patient re-attendance and increasing discharge rates, emphasising the robustness of the system.

## Conclusions

A sizeable improvement in the running of the eye casualty has been achieved. COVID-19 presented many challenges to the authors' current and future service provision for ophthalmic patients. Risk stratification will be vital in tackling the backlog of those requiring review. COVID-19 has required eye services to move quickly and adopt the use of technology to replace the traditional face-to-face encounters for some patients as illustrated by these successful interventions. This translates to reduced waiting times and improved outcomes for patients requiring face-to-face appointments. This quality improvement project shows that the use of telephone triage and virtual reviews allows many patients to be managed in a safe and timely manner, which, although borne out of necessity, may prove to be a sustainable model for eye casualty services across the country.

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**Conflicts of interest**

The authors declare that there are no conflicts of interest.

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