Implementation of a new telephone triage system in ophthalmology emergency department during COVID-19 pandemic: clinical effectiveness, safety and patient satisfaction

Yunzi Chen1 · Rehab Ismail1 · Muhammad R. Cheema1 · Darren S. J. Ting2,3 · Ibrahim Masri1

Received: 17 January 2021 / Revised: 28 February 2021 / Accepted: 31 March 2021 / Published online: 25 May 2021 © The Author(s), under exclusive licence to The Royal College of Ophthalmologists 2021

To the Editor:

Since the WHO declaration of COVID-19 pandemic in March 2020, various countries have implemented regional and/or national lockdown with stringent rules on social distancing to minimise the risk of transmission. This has significantly affected the service delivery across all medical fields, including ophthalmology [1, 2]. In addition, studies have shown that patients would delay seeking ocular treatment due to fear of contracting COVID-19 infection [3, 4].

In response to the COVID-19 pandemic, we had reformed our eye emergency service in 2020 by introducing a new telephone triage system (TSS) to cope with the reduced health service capacity and protect patients and front-line staff, aligned with the national and Royal College guidance [5]. All patients were triaged and assessed via TSS before being accepted for face-to-face consultation if deemed necessary. In this study, we aimed to report the effectiveness, safety, and acceptability of this new TSS.

All telephone triage encounters and attendances to the eye emergency department (EED) at Sunderland Eye Infirmary, UK, during April–May 2020 were included. Relevant data, including the number of attendances, waiting times, presenting diagnoses and patient/staff satisfaction (assessed via questionnaires—Supplementary Material), were analysed. The safety of TSS was examined via analysis of repeat callers (patients who accessed the TSS more than once for the same complaint) and their final diagnosis at EED. Ethical approval was not required as this retrospective study was considered a clinical service evaluation study.

Of all 2682 phone calls (n = 2293 patients), 52% were managed successfully via TSS and 48% subsequently reviewed at EED. Compared to 2019, there was a significant 65% reduction in overall EED attendances (p < 0.001; Table 1). Mean arrival-to-treatment time significantly reduced by 43 min. There was a significant increase in ocular trauma and reduction in oculoplastic and conjunctival diagnosis (p < 0.001).

There were 169 (7%) repeat callers (Table 2), with a higher proportion in older age groups. Of those, 90 (53%) patients attended EED eventually. Following the review, only 7 (0.3%) triage decisions out of 2682 calls were considered inappropriate and classed as missed diagnosis. These included retinal detachment (n = 2), contact lens-related infectious keratitis (n = 1), wet age-related macular degeneration (n = 1), non-ischaemic anterior ischaemic optic neuropathy (n = 1), macular hole (n = 1) and marginal keratitis (n = 1). In all cases, the triage decisions were made by the consultants. Potential harm to vision was considered avoidable in four cases if the patient was reviewed earlier at EED.

A total of 69 (17%) patients responded to the survey. The majority (96%) of patients described their experience of using TSS as good-to-outstanding, 88% indicated that they would use the service again, 91% recommended the service, and 93% recommended the continuation of the TSS. Of 36 (64%) responding staff, 94% described a positive experience with the TSS and 100% recommended the future use of TSS.

The COVID-19 pandemic has posed an unprecedented challenge to ophthalmic service delivery due to cancellation...
Conditions being seen whilst the proportion of more serious lysis of diagnoses demonstrated that there were fewer minor 
leveling with the only ~50% converting to face-to-face consultation, para-
TSS served as an effective model to triage the patients, with 
EED during COVID-19 pandemic. Our data showed that 
effectiveness and safety of TSS in a previously open-access 
study serves as one of the few UK studies that examined the 
of the routine services. To the best of our knowledge, this 
study serves as one of the few UK studies that examined the 
effectiveness and safety of TSS in a previously open-access 
EED during COVID-19 pandemic. Our data showed that 
TSS served as an effective model to triage the patients, with 
only ~50% converting to face-to-face consultation, paral-
leling with the findings in literature [6]. Furthermore, anal-
ysis of diagnoses demonstrated that there were fewer minor 
conditions being seen whilst the proportion of more serious 

### Table 1 Summary of the patient attendances to eye emergency department in April–May 2019 and April–May 2020.

| Parameters                              | 2019       | 2020       | P value<sup>a</sup> |
|-----------------------------------------|------------|------------|---------------------|
| Gender                                  |            |            | <0.001              |
| Female                                  | 2312 (50.6)| 597 (44.5) |                     |
| Male                                    | 2254 (49.4)| 745 (55.5) |                     |
| Age, years                              |            |            | <0.001              |
| 0–29                                    | 965 (21.1) | 241 (17.9) |                     |
| 30–49                                   | 1159 (25.4)| 385 (28.7) |                     |
| 50–60                                   | 1465 (32.1)| 497 (37.0) |                     |
| >70                                     | 977 (21.4) | 219 (16.3) |                     |
| Types of attendance                     |            |            | <0.001              |
| New attendance                          | 4104 (90.0)| 1250 (93.1)|                     |
| Planned follow-up                       | 236 (5.2)  | 61 (4.6)   |                     |
| Unplanned follow-up                     | 226 (4.9)  | 31 (2.3)   |                     |
| Mean time to assessment, mins<sup>b</sup>|           |            | <0.033              |
| Mean time to treatment, mins<sup>c</sup>|           |            | 0.042               |
| Out of hours attendances<sup>d</sup>    | 916 (20.1) | 217 (16.2) | <0.001              |
| EED diagnosis                           |            |            |                     |
| Trauma                                  | 781 (17.1) | 368 (27.4) |                     |
| Corneal                                 | 742 (16)   | 213 (16)   |                     |
| Retinal                                 | 537 (12)   | 157 (12)   |                     |
| Conjunctival                            | 783 (17.1) | 127 (9.5)  |                     |
| Oculoplastic                            | 682 (14.9) | 149 (11.1) |                     |
| Others                                  | 1041 (22.8)| 328 (25.6) |                     |
| Disposal description                    |            |            | <0.001              |
| Discharge without follow-up             | 3291 (72.1)| 1009 (75.2)|                     |
| Referral to clinic                      | 579 (12.7) | 178 (13.3) |                     |
| Referral to EED                        | 280 (6.1)  | 79 (5.9)   |                     |
| Referral to GP                         | 115 (2.5)  | 46 (3.4)   |                     |
| Admission                              | 31 (0.7)   | 16 (1.2)   |                     |
| Others                                  | 270 (5.9)  | 14 (1.0)   |                     |

<sup>a</sup> P values are calculated using Chi-square test (for categorical variables) and unpaired T test (for continuous variables). Continuous values are presented in mean ± standard deviation. Significant p values are underlined.

<sup>b</sup> Time from arrival to assessment.

<sup>c</sup> Time from arrival to treatment.

<sup>d</sup> Defined as between 17:00 till 8:00 next day.

or urgent ophthalmic diagnoses were maintained. We also observed a dramatic improvement in waiting time compared to before, which allowed strict social distancing precautions to take place and protect vulnerable patients from infection exposures.

Notably, only 0.3% triage decisions were considered to be inappropriate. This was similar to a Paris study, which reported 1% of misdiagnosis of teleconsultation in EED leading to delayed ophthalmic care during COVID-19 lockdown [7]. We observed two missed cases of retinal detachment, highlighting the difficulty in safely triaging patients complaining of flashes and floaters. Furthermore, all missed diagnoses were made by consultants, suggesting that reliance on experience alone may not be sufficient to guarantee safety and a consistent triage protocol will be required. That said, nearly all patients and staff expressed high level of satisfaction with the TSS in view of the perceived benefits of immediate access to advice, reduced waiting time, prioritisation of true emergencies, and low risk of COVID-19.

Considering the persistent COVID-19 pandemic with further waves of infection, healthcare digitalisation using tele-ophthalmology (with potential integration of artificial intelligence) is emerging as a potentially long-term solution to assessing and managing ophthalmic diseases at the frontline service while minimising the risk of COVID-19 [8–10].

**Author contributions** YC and IM contributed to the study conception and design. Material preparation, data collection and analysis were performed by YC, RI, MC, DT and IM. The first draft of the paper was written by YC, DT and IM and all authors commented on previous versions of the paper. All authors read and approved the final paper.

**Compliance with ethical standards**

**Conflict of interest** The authors declare no competing interests.
Publisher’s note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

References

1. Ting DSJ, Deshmukh R, Said DG, Dua HS. The impact of COVID-19 pandemic on ophthalmology services: are we ready for the aftermath? Ther Adv Ophthalmol. 2020;12:1–3.
2. Romano MR, Montericcio A, Montalbano C, Raimondi R, Allegrini D, Ricciardelli G, et al. Facing COVID-19 in ophthalmology department. Curr Eye Res. 2020;45:653–8.
3. Ting DSJ, Krause S, Said DG, Dua HS. Psychosocial impact of COVID-19 pandemic lockdown on people living with eye diseases in the UK. Eye. 2020. https://doi.org/10.1038/s41433-020-01130-4.
4. Wickham L, Hay G, Hamilton R, Wooding J, Tossounis H, da Cruz L, et al. The impact of COVID policies on acute ophthalmology services—experiences from Moorfields. Eye Hospital NHS Found Trust Eye. 2020;34:1189–92.
5. RCOphth. The Royal College of Ophthalmologists Protecting Patients, Protecting Staff. 2020. https://www.rcophth.ac.uk/wp-content/uploads/2020/03/Protecting-Patients-Protecting-Staff-UPDATED-300320.pdf.
6. Bunn F, Byrne G, Kendall S. Telephone consultation and triage: effects on health care use and patient satisfaction. Cochrane Database Syst Rev. 2004;CD004180. https://doi.org/10.1002/14651858.CD004180.pub2.
7. Bourdon H, Jaillant R, Ballino A, El Kaim P, Debillon L, Bodin S, et al. Teleconsultation in primary ophthalmic emergencies during the COVID-19 lockdown in Paris: experience with 500 patients in March and April 2020. J Fr Ophtalmol. 2020;43:577–85.
8. Ting DSJ, Foo VHX, Yang LWY, Sia JT, Ang M, Lin H, et al. Artificial intelligence for anterior segment diseases: emerging applications in ophthalmology. Br J Ophthalmol. 2021;105:158–68.
9. Ting DSJ, Ang M, Mehta JS, Ting DSW. Artificial intelligence-assisted telemedicine platform for cataract screening and management: A potential model of care for global eye health. Br J Ophthalmol. 2019;103:1537–8.
10. Wu X, Chen J, Yun D, Yuan M, Liu Z, Yan P, et al. Effectiveness of an ophthalmic hospital-based virtual service during the COVID-19 pandemic. Ophthalmology. 2021. https://doi.org/10.1016/j.ophtha.2020.10.012.