



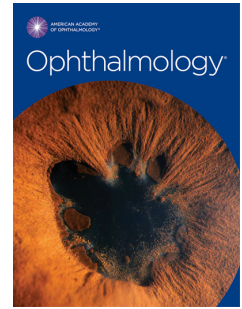
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Challenges and Lessons for Managing Glaucoma during COVID-19 Pandemic:
Perspectives from Asia

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1 **Challenges and Lessons for Managing Glaucoma during**
2 **COVID-19 Pandemic: Perspectives from Asia**

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19 Since the turn of the year, Asia has faced the mounting challenge of the
20 coronavirus (COVID-19) pandemic. The first cases were reported in China in late 2019,
21 while Singapore saw their first imported case in late January 2020. Over the last few
22 months, we have experienced many challenges in the clinical management of patients
23 with glaucoma. In this article, we provide perspectives from China and Singapore on
24 how glaucoma practice has adapted during this crisis.

25 **Perspectives from Guangzhou, China**

26 Firstly, the pandemic made it difficult for patients to access medical care. To
27 address this, we designed a chatbot program on the widely-used 'WeChat' app.
28 Patients were asked a series of set questions and responded by pressing the
29 appropriate button on their phones. They were also encouraged to take photographs
30 of their eyes and upload these to the program. The data were analyzed by either an
31 artificial intelligence (AI) program or by doctors, depending on the information
32 provided by the patient. A provisional diagnosis and management plan were then
33 made and conveyed to the patient via the app. If medications were required, they
34 were prescribed via the app. In terms of data privacy and security, this system utilizes
35 the inbuilt WeChat cybersecurity microprogram that complies with the requirements of
36 the "Network Security Law" and "Personal Information Protection Act" of China. The
37 patients' clinical data are only accessible by designated doctors who are granted
38 access, and each login attempt is tracked by the security system. In a users' survey,
39 over 90% of the 1500 patients so far enrolled in this project were satisfied with this
40 service.

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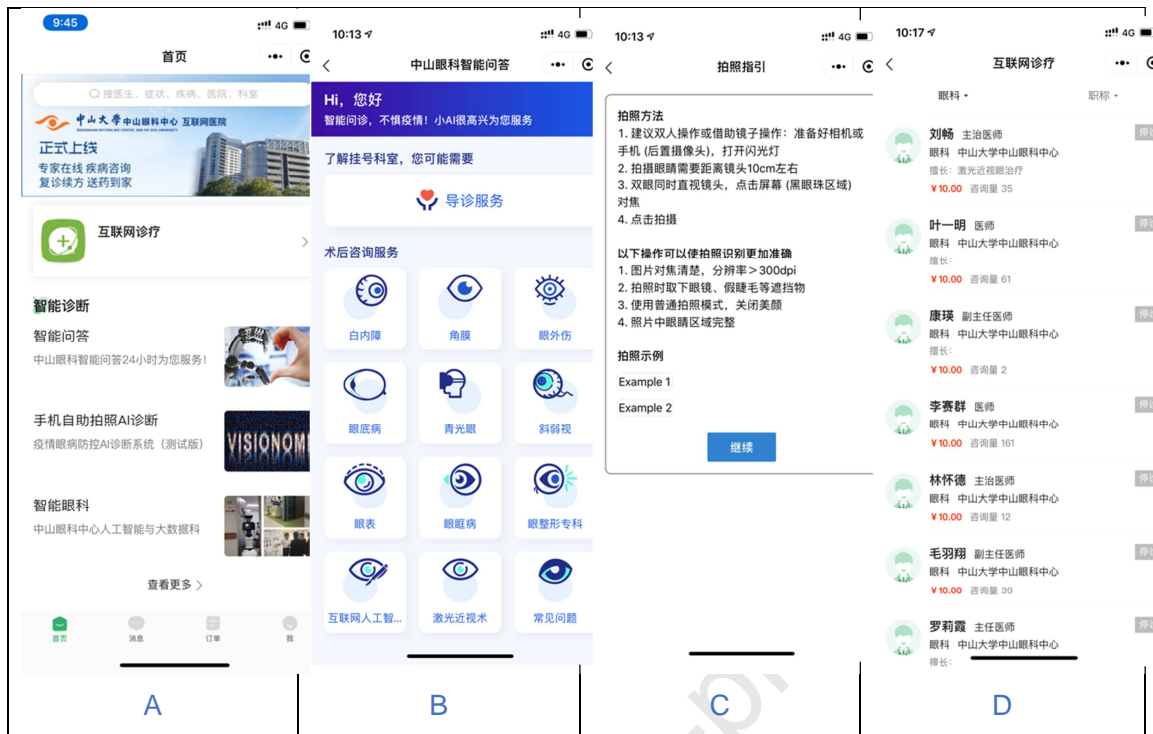


Figure 1: Illustrations of the WeChat App used in Guangzhou

We also recognized early on the need to drastically reduce the number of patients attending clinics and operation theatres (OT). By stratifying according to clinical need, non-urgent clinic cases were deferred, reducing clinics to a quarter of the usual load. Only patients who were deemed to be at high risk of permanent visual morbidity should their surgery be delayed underwent operations. All patients received a nasal swab and serology in the week prior to surgery to check for COVID-19 infection. After surgery, the OT was cleaned with chlorinated agents, with at least a 30-minute gap between cases.

Since the beginning of the pandemic, several ophthalmologists became infected and three died (in Wuhan) due to the lack of adequate protection. Once the health authorities had determined the transmission routes of COVID-19, we undertook a series of measures including mandating all staff use eye goggles and surgical masks, installing plastic shields (made from old x-ray films) on slit lamps between the patient and the examining ophthalmologist, as well as changing gloves and sterilizing slit lamps for each patient encounter. Intraocular pressure (IOP) was checked with non-contact tonometers, which were sterilized with alcohol wipes before each patient.

60 Gonioscopes were soaked in 75% alcohol for half an hour before being reused.

61 **Perspectives from Singapore**

62 Early on in this crisis, we recognized 3 principles that needed to be adhered to.
63 These were to protect staff and patients from acquiring and spreading infection, to
64 ensure adequate manpower was available to mitigate against staff illness (or home
65 quarantine) and to reduce any significant ocular morbidity due to the deferral of
66 appointments and treatment.

67 As in China, we implemented several changes in order to address these
68 principles such as the installation of plastic shields on slit lamps, mandatory use of
69 face masks as well as twice daily temperature monitoring of all healthcare personnel.
70 We segregated staff into 2 teams with designated rest areas for each, and no contact
71 allowed between teams. Finally, we deferred outpatient appointments for non-urgent
72 cases in order to decongest clinics, with the length of deferral determined by doctors
73 on review of the patients' electronic health records (EHR). This reduced clinic
74 numbers by approximately 50-80%. However, there have been many challenges in
75 implementing the above changes. For example, identifying patients suitable for
76 deferral of follow-up visits has been laborious, requiring the prospective categorization
77 of patients into mild, moderate or severe disease in order to decide who might be safe
78 for deferral or video consultation (VC).

79 In the next few weeks, we will be sending patients to new 'Investigation Units in
80 the Community' (IUCs) for visual acuity assessment, IOP measurement, visual field
81 testing and anterior and posterior segment photography. These IUCs are stand-alone
82 units in the community staffed by technicians. A video consultation (VC) will then be
83 conducted a week after the investigations with the data reviewed by the physician and
84 compared with data from the patient's EHR. Any medications required will be
85 delivered to the patient by courier. Patients whose condition is identified as worsening
86 can have their medications modified or can be brought back to the clinic for further
87 assessment.

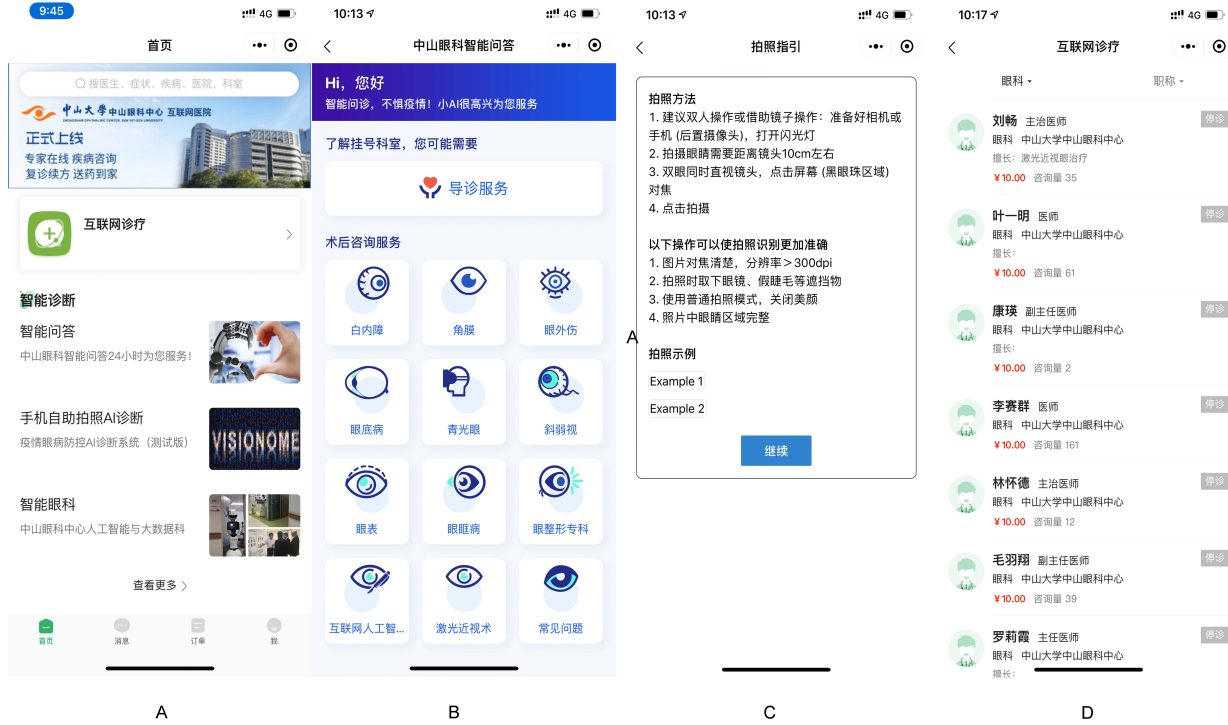
88 ***What we learned from the crisis that could help glaucoma services in the***
89 ***future***

90 Through this crisis, we have crucially learnt that the two modes of online and
91 offline medical care cannot replace each other - instead, a combination is necessary
92 to optimally manage patients with glaucoma while saving medical resources. Patients
93 should have the primary consultation first online and only those requiring further
94 assessment or surgical procedures should come to the hospital for in-person
95 management. If systems can be designed such that investigations can be performed
96 in the community without the need for human involvement (e.g. with the use of
97 automated devices), then the model of IUC and asynchronous VC can further help to
98 reduce COVID-19 spread whilst maintaining quality of care.

99 **Conclusions**

100 To reduce the risk of COVID-19 infection, changes have to be implemented as to
101 how patients with glaucoma are managed. Apart from the improved segregation of
102 patients and staff, as well as physical and chemical barriers to infection in clinics,
103 novel initiatives such as increasing investigations in the community, coupled with the
104 use of virtual consultations, will help minimize ocular morbidity from delayed care. The
105 use of new digital technologies such as smartphone-based apps and AI will represent
106 a further avenue to transform glaucoma management.

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