



Combating COVID-19—How Can AR Telemedicine Help Doctors More Effectively Implement Clinical Work

Songxiang Liu¹ · Mao Xie¹ · Zhewei Ye¹

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Letters to Editor: With the global outbreak of COVID 19, many countries are facing various challenges to combat COVID 19, including a shortage of doctors, excessive workload, and the lack of adequate medical protection equipment for frontline health care workers [1, 2], difficulty and inconvenience for residents to see a doctor. Telemedicine plays an important role in fighting viruses [3]. Distance multidisciplinary collaboration and remote mentoring can alleviate the shortage of doctors, especially experts. Avoiding doctors' unnecessary trips to and from contaminated areas can reduce unnecessary waste of substances such as gowns, and is a viable alternative to alleviating medical shortages. However, the traditional remote guidance mode cannot realize an accurate and real-time guidance communication. While virtual reality is a purely virtual world, augmented reality (AR) can overlap the virtual world with the real world. AR telemedicine can realize video fusion, annotation and sketch between the guidance end and the directed end, which cannot be realized in the traditional video communication mode. In addition, AR telemedicine system can be loaded on smart phones and tablets, which is easy to carry. Therefore, AR telemedicine can expected to help address these global challenges during epidemic. However, AR telemedicine has not been used in covid-19 in previous literature. The purpose of this article is to provide

timely information on the clinical application of AR telemedicine for better combating COVID-19.

Covid-19 mainly causes lung damage, but can also involve multiple organs throughout the body or covid-19 patients with other diseases. In this case, AR distance multidisciplinary consultation will play an important role, so doctor can avoid unnecessary trips to and from contaminated areas, it can not only reduce unnecessary use of substances such as gowns, also can save the medical staff of energy and time. For example, in a patient with a calcaneal fracture with covid-19 in the department of infection, the orthopedic surgeon was able to conduct a remote consultation in the clean area via AR remote system (Fig. 1a, b) to make the clinical work more effective. In addition, the shortage of doctors has led to the recruitment of many young doctors, non-respiratory specialists such as surgeons, to fight the COVID-19. Ventilator plays an important role in the treatment of severe COVID-19. The operation and parameter adjustment of ventilator need certain specialty and learning curve. In order to solve this dilemma, the AR video fusion and labeling function to enable respiratory experts to conduct real-time remote guidance and training (Fig. 1.C,D), especially for the guidance of hospitals in remote areas. It can even be used for remote international guidance. Which can be similarly used for remote ultrasound guidance, emergency remote rescue, remote surgical guidance, and other accurate remote guidance. Our study provides timely information about AR telemedicine to be applied in the fight against the epidemic, so as to help those doctors facing the same dilemma to better implement the clinical practice by combining their own conditions with AR telemedicine. We call on the rational use of AR telemedicine to help more effectively conduct clinical work during epidemics.

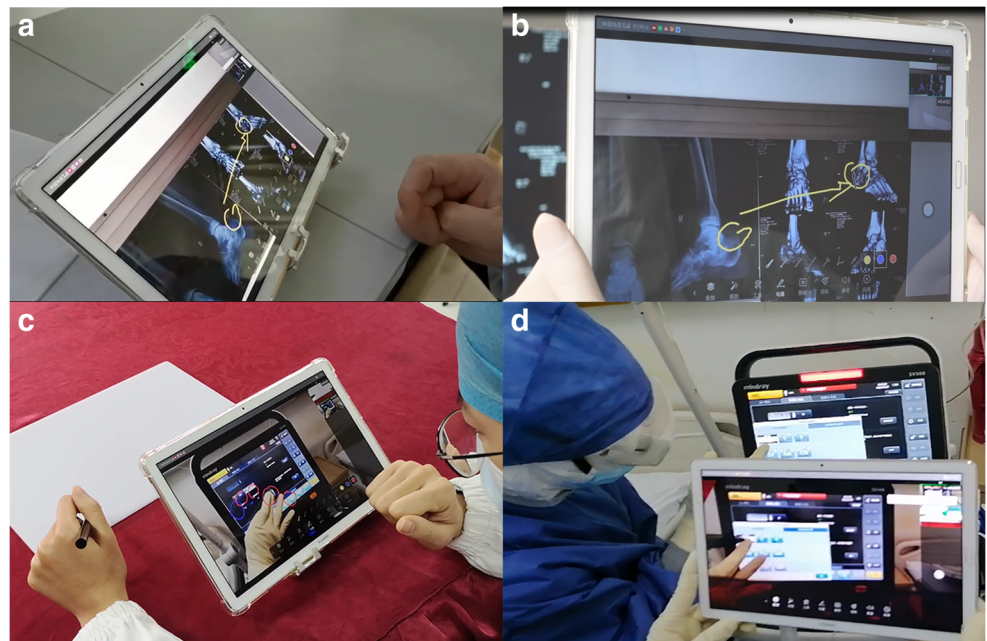
Songxiang Liu and Mao Xie contributed equally to this work.

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✉ Zhewei Ye
yezhewei@hust.edu.cn

¹ Department of Orthopedics, Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, China

Fig. 1 The clinical application scenarios in AR. A,B. The orthopedic surgeons in the orthopedic cleaning area (a) conducted real-time remote consultation of fracture patients in the infection department of the contaminated area (b) via AR remote system. C,D. The respiratory specialists (c) can guide the use and parameter adjustment of ventilator accurately (d)



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Compliance with ethical standards

Conflict of interest All author declares no conflict of interest.

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