Correspondence:

**Experience of a Radiation Oncology Center Operating in the COVID-19 Outbreak**

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The epidemic now a pandemic of the novel coronavirus (officially designated as the COVID-19) with the rapid increase of case number in the Unites States has certainly caused much concern if not panic to the public. Cancer treatment under such circumstance become tremendously challenging as patients under radiation or chemotherapy may be more susceptible to infection, and as cancer treatments usually require extended and continuous courses. As the executive vice president of the Shanghai Proton and Heavy Ion Center (SPHIC), a tertiary cancer treatment facility in the front line against the COVID-19 epidemic responsible for patient care and infection control, our experience and opinions might be helpful for colleagues in the United States as a reference.

Equipped with the Siemens particle therapy system and 2 Varian TrumBeam®, SPHIC provides both photon- and particle beam-based radiation therapy to cancer patients. Since the inception of our clinical service, all patients treated at SPHIC have been required to be admitted for close monitoring and professional care during particle therapy. Unfortunately, the structure of our in-patient facility has a number of settings that made infection prevention difficult: The central air conditioning has ventilation connected across all rooms on the same floor, thus all patients and staffs on the same floor may be susceptible if one is infected; The hospital has 150 beds but only one isolation room (i.e., 1 bed) was established. Such a setting has made it extremely crucial to identify potential COVID-19 infected patients before their admission to the hospital, and referred for proper medical care under isolation. However, it is not practical to screen all patient on the spot at hospital entrance for testing by RT-PCR (for qualitative detection of SARS-CoV-2 RNA). The false negative rate might be high and influenced by technique of specimen collection, thus 2 tests (24 hours apart) are required to confirm a diagnosis.

To assure the safety of our patients and staff while preventing cluster infection, a number of measures were implemented as soon as the outbreak was announced. The hospital closed all but one entrance with a newly established triage area to take body temperatures in addition to the recording of travel and contact history for all people entering the hospital. Fortunately, as our mail room is near the main gate, all deliveries can be easily unloaded before entering the hospital. Anyone with a body temperature over 37.3°C and pertinent contact/travel history were transferred to a “Fever Clinic” of a designated hospital (special clinics of major general hospitals established during the 2003 SARS epidemic to triage and treat fever patients) to rule out COVID-19 infection.

In addition, a “buffer zone” in-patient floor was created for all newly admitted patients, in which they are put on the same floor for the first 7-14 days (depending on the availability of the rooms) of their treatment to avoid the contact of on-treatment patients with those newly admitted. Frankly, I am not sure if this practice is truly useful since patients are not admitted together in batches. Those relocated to another floor after 14 days of stay may have contacted an infected by an asymptomatic patient newly admitted to the same floor. However, psychologically the “buffer zone” worked very well for our patients.

All in-patients and their companions are required to take a low-dose CT of the thorax to screen for pneumonia at the cost of the hospital on the day of hospital admission. The hospital has allowed only one companion to stay with their respective patient during the treatment course while barring the entry of other visitors since the outbreak. Although our choice to CT screen all patients and visitors could be considered as an overreaction, it can still at least identify patients with symptomatic pneumonia for further management when testing of COVID-19 is not available.
After admission, all patients and their helpers are required to use masks if they need to leave their room and are discouraged to leave the floor unless necessary during their stay. CT of the thorax and CBC with differential are immediately ordered to rule out pneumonia for anyone who has developed a fever. We also repeat a CBC with differential as COVID-19 patients may have a decrease in lymph counts. Anyone who has clinical manifestation(s) of novel coronavirus pneumonia (NCP) would be referred to a designated hospital for further investigation including a qualitative detection of SARS-CoV-2 RNA by RT-PCR.

Since the onset of COVID-19 epidemic, the number of patients presented to our hospital dropped substantially due to the government-implemented travel restrictions and quarantine policies. However, most cancer care services to the local and foreign patients managed to come to Shanghai continued without interruption at SPHIC. The government requirement for all passengers from high-risk regions to be quarantined for 14 days after arrival. Such restriction has been vastly helpful in reducing the pressure of triaging potential COVID-19 infected patients at our hospital as we lack a clinical division for infectious disease.

From a professional point of view, I do not think it is necessary to delay chemotherapy or radiation treatment for cancer patients because of the COVID-19 mishap, unless one's infection is confirmed, highly suspected or for other medical reasons. Nevertheless, we had postponed a number of non-urgent services to reduce patient contact and unnecessary traveling. For example, post-treatment follow-ups at SPHIC were postponed for all patients without active symptoms, while follow-up in a nearby cancer center is highly encouraged for patients from other cities. Our physicians would communicate with the patients or their local physicians if disease progression is suspected. For patients with benign or indolent conditions (e.g., asymptomatic meningioma or chordoma), patients were given the choice to postpone their treatment to avoid traveling and the crowd of a hospital, both considered high-risk during the epidemic. These practices were implemented at our hospital for approximately 6 weeks and all clinical services were resumed recently.

Most hospitals in Shanghai and other major cities postponed elective and non-urgent surgeries for approximately 6 weeks during the epidemic, but also partly due to insufficient blood donation. In addition, several other specialties such as dental, ophthalmology and otolaryngology stopped clinical service due to higher risk of COVID-19 infection. Such practice has substantially reduced patient referral of head and neck cancer patients to radiation oncology, indirectly reducing the risk of transmission of the infection.

Clinicians certainly possess a higher risk encountering the COVID-19 than the public. Although radiation oncology is considered a low-risk specialty as compared to intensive care, pulmonology, and infectious disease, just to name a few, one cannot over emphasize self-protection during this outbreak. It is confirmed that the mode of transmission of COVID-19 is mainly by droplet spread, with the speculation of airborne transmission as well. Therefore, transmission-based especially droplet precautions for all patients were implemented at all time during the outbreak at SPHIC. Hand hygiene with alcohol-based hand sanitizer was emphasized and mask use was made mandatory for all patients at all time (unless in a single-person room like a private office). Except for head and neck cancer treatments, all patients are required to wear a surgical mask during transportation and radiation therapy. Physicians and nurses at SPHIC are required to wear surgical or N95 masks and gown for all interactions that may involve contact with a patient. Safety goggles were recommended for high-risk procedures, as transmission via mucous membranes (e.g., eyelid) is possible. Personally, I prefer surgical masks over N95 respirators for easy breathing and communication with my patients. And the results of a randomized trial recently published in JAMA
that compared N95 vs. surgical masks for preventing flu among health care personnel revealed no significant difference between the two\textsuperscript{1}.

The Shanghai municipal government did not issue “Shelter in Place” but requires everyone to wear a mask in public. Although it is debatable whether mask use by healthy people can effectively prevent the spread of COVID-19, I support such measure considering the density of the population of any metropolitan area in China. The person next to you can well be a passive or convalescent carrier of this highly contagious disease.

When I was checking the statistics today for this write-up, I was relieved to know that no physician was infected with the virus in the Greater Shanghai area in the past 3 months despite of the 350 confirmed diagnoses. In addition, all 1,649 physicians and nurses dispatched from Shanghai to support the city of Wuhan, the epicenter of the epidemic in the country, to fight the disaster, returned safe! The epidemic of COVID-19 in Mainland China appears to be dissipating sooner than predicted. The United States not only has the most advanced healthcare infrastructure in the world, but also the most developed medical principles and strategies to fight against such adversity. So stay vigilant and be confident!

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