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## COVID-19 Rapid Letter

# Managing a radiotherapy center safely and efficiently using risk-adaptive strategies during coronavirus disease pandemic: Experience from national cancer center of China <sup>☆</sup>



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Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), previously known as the novel coronavirus that causes coronavirus disease 2019 (COVID-19) emerged in December 2019 and spread worldwide. The World Health Organization declared this pandemic outbreak a global public health emergency, and as of April 7, 2020, 1,282,931 cases and 72,774 deaths have been reported in 211 countries [1]. Approximately 18 million cases of cancer are diagnosed worldwide annually [2]; thus, treating and simultaneously protecting these patients against SARS-CoV-2 infection is a challenge. Approximately 40–50% of patients with cancer and COVID-19 can be expected to develop severe events (complications requir-

ing intensive care, ventilation, or deaths), with mortality as high as 30% [3].

Radiotherapy (RT) is a common treatment option that benefits more than 50% of patients with cancer. RT practice during the epidemic in China included the following challenges:

1. The administration was complex at multiple levels, requiring an infusion of large RT facilities with robust technical support teams;
2. RT treatment resources were available only in hospitals;
3. Long delays or interruptions in RT compromised its therapeutic efficacy;
4. Given the long course of treatment (months) involving visits to providers, the risk for infected patients with subclinical manifestations was significantly higher, which might have led to the spread of COVID-19.

So the burning question is, how should RT clinical services prepare for COVID-19?

The current COVID-19 epidemic is similar to the 2003 SARS outbreak in many respects. We experienced the SARS epidemic from February to July in 2003, and learned vital lessons, including the protection of healthcare workers (HCWs), efficient use of limited medical supplies, reorganization and allocation of the workforce and resources, and strict screening measures to identify pre-symptomatic infected patients. We documented differentiated risk-based, adaptable workflows and policies for clinical care at different stages of the pandemic in China's high-volume RT National

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Cancer Center. We focused on identifying patients with subclinical manifestations of SARS-CoV-2 to provide an example that might be useful for other centers.

### Early stage of the epidemic

The crucial task was to prevent nosocomial infection in 463 patients undergoing RT in the department. We first adjusted the clinic layout; three entrances to the RT center were closed and one was left open. Temperature checks were required of all patients upon arrival at entrances to the hospital and RT center. Patients provided recent travel histories and contact tracing information for the past 14 days. They wore face masks to lower the risk of respiratory diseases, especially transmission from asymptomatic and minimally symptomatic patients [4]. For patients with head and neck cancers who had received a tracheostomy, a special system or mask was used to minimize aerosol infection. Patient flow was managed to minimize contact between patients and maintain a distance of at least one meter from others when possible. The main strategies for managing patients included education about the signs and symptoms of COVID-19 and minimizing patients' clinical exposure, especially hospital admissions for in-patient cancer care. Phone calls, WeChat, and online consultations replaced home visits.

RT machines were limited and allocated in a rational and ethical way to provide the best care for the greatest number of patients. We arranged appointments for patients who were not local residents with treatment providers at their local RT centers. The prioritization of new patients involved conditions with urgent indications of high mortality and/or morbidity or impaired quality of life (e.g., RT for brain metastasis with intracranial hypertension or opioid-refractory pain crisis owing to bone metastases). Hypofractionated regimens were used when possible. Over a one-month period, the clinic load dropped by 50%, mostly due to deferments of non-urgent treatments.

### Lock-down stage of the epidemic

Gradual containment of the COVID-19 epidemic was reached after implementation of extraordinary public health measures. However, there is still a chance of losing control of the COVID-19 epidemic after resuming routine clinical practice. Strict triaging procedures should be continued to assess COVID-19 symptoms and the urgency and necessity of hospitalization.

For patients waiting to be admitted to the oncology or RT ward, symptoms associated with COVID-19 (e.g., fever and cough) were routinely recorded to ensure patients did not present with any COVID-19-compatible symptoms before admission to these wards. Novel digital technologies, such as the Quick Response health-code system, were helpful for conducting credible contact tracing conveniently and rapidly. Mandatory routine blood tests and computed tomography (CT) scans of the lungs were performed. Patients with suspected pneumonia underwent COVID-19 virus nucleic acid tests and CT imaging. A Wuhan-based study of 1,014 COVID-19 cases reported positive rates of 88% and 59% [5], respectively, for chest CT imaging and reverse transcription polymerase chain reaction (RT-PCR) assay for a suspected diagnosis of COVID-19. The sensitivity of chest CT imaging for COVID-19 was 97% using RT-PCR as a reference. To minimize the risk of COVID-19 spread, suspected patients were first admitted to an isolation

room and observed for 7–10 days before receiving treatment (e.g., surgery or radiotherapy) [4].

The delivery of treatment was prioritized according to the magnitude of its potential benefits and therapeutic intent. The length of time a patient waited for a treatment was another factor to consider. Higher priority was given to treatments for aggressive tumors with a high risk of early mortality, treatments with a definitive curative intent, adjuvant therapies, and palliative indications with substantial survival benefits and/or major symptom control. Treatments following breast-conserving surgery for ductal carcinoma in situ, and for low-risk prostate cancers and inoperable early-stage non-small cell lung cancer were postponed.

### Protection of healthcare workers (HCWs)

We adopted a risk-based approach for using personal protective equipment (PPE) by oncologists, therapists, and nurses from a national guideline, to avoid overuse of limited medical supplies. For example, a surgical mask was worn during routine clinical practice, a N95 mask was worn when examining febrile patients, and full PPE, including gown, N95 mask, face shield, and gloves, was used when examining patients with suspected COVID-19. An individual's registration and epidemiological-survey APP were used to monitor HCWs' risks for SARS-CoV-2 infection.

### Sterilization of radiotherapy equipment

Ethyl alcohol (75%) or chlorine-containing disinfectant, which inactivates coronaviruses, was used to sterilize surfaces of RT machines and the treatment environment at least twice daily. Ultraviolet disinfection was used nightly for air sterilization of all machine rooms.

During epidemics, it is most important to balance infection control and the provision of therapeutic services. This balance will shift during different stages of the COVID-19 outbreak. Different risk-based containment strategies were needed during the outbreak's different stages. From January 20, 2020 to April 7, 2020, the Department of Radiation Oncology of the National Cancer Center in China delivered 10,677 treatment fractions involving 739 patients (276 newly enrolled) safely. With adherence to strict screening procedures, pre-treatment observation, and effective protective measures, no patients or medical staff were diagnosed with COVID-19 as of April 3, 2020. The above strategies might be constructive for radiation practice in different countries during different phases of COVID-19.

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