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# COVID-19 infection prevention and control practices in Wuhan radiotherapy

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| **Corresponding Author:** | Steven J Chmura, MD, PhD<br>University of Chicago<br>Chicago, IL United States |
| **First Author:** | Cheng Chen, M.Sc. |
| **Order of Authors:** | Cheng Chen, M.Sc. |
| | Zhengkai Liao, M.D., Ph.D. |
| | Steven J Chmura, MD, PhD |
| | Ralph R. Weichselbaum, M.D. |
| **Abstract:** | Radiotherapy outcomes depend on the presence of skilled technical staff. There is concern as to how to protect staff and patients when receiving daily radiotherapy. In Wuhan, during the COVID-19 outbreak from January 28 2020 to March 10 2020, 153 patients with 1,752 visits underwent radiotherapy in Zhongnan Hospital. Of 39 staff personnel none as yet have developed symptoms and / or molecular indication of COVID-19 infection, including SARS-Cov-2 Real-time RT-PCR, IgM, and IgG. To achieve these results, we implemented the measures outlined below (Figure 1). |

# COVID-19 infection prevention and control practices in Wuhan radiotherapy

Cheng Chen, M.Sc.[1], Zhengkai Liao, M.D., Ph.D.[1]*, Steven J. Chmura, M.D., Ph.D.[2], Ralph R. Weichselbaum, M.D.[2]

1 Department of Radiation and Medical Oncology, and Hubei Cancer Clinical Study Center, Zhongnan Hospital of Wuhan University, Wuhan, Hubei 430070, China
2 Department of Radiation and Cellular Oncology, and the Ludwig Center for Metastasis Research, University of Chicago Medicine, Chicago IL 60637

* Correspondence: Zhengkai Liao, M.D., Ph.D. Department of Radiation and Medical Oncology, and Hubei Cancer Clinical Study Center, Zhongnan Hospital of Wuhan University, Wuhan, Hubei 430070, China. Tel: +86 18971206661; Email address: zliao@whu.edu.cn

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# COVID-19 infection prevention and control practices in Wuhan radiotherapy

In Wuhan, during the COVID-19 outbreak from January 28 2020 to March 10 2020, 153 patients with 1,752 visits underwent radiotherapy in Zhongnan Hospital. Of 39 staff personnel with ages ranging from 26-51, none developed symptoms and / or molecular indication of COVID-19 infection. Thirty nine staff were examined with SARS-Cov-2 Real-time RT-PCR between February 20 and March 22 2020. All had negative results with the exception of one staff member who rejected the throat swab test. In addition, 35 staff were examined with the IgM and IgG tests (chemiluminescence immunoassay) for SARS-Cov-2 and all were negative. Four staff were not studied as they had left the facility in the interim. To achieve these results, we implemented the measures outlined below (Figure 1).

1. Patients were informed of scheduled treatment times by phone and text message to reduce the waiting room density of patients. Patients were also informed of infection prevention strategies prior to arrival in radiotherapy.
2. Screening for temperature, symptoms of viral infection, and contact history was conducted for patients and staff in a "containment area" outside of the radiotherapy center (Figure 2).
3. A compulsory temperature check was performed each day on staff and patients. Infection hazards such as phones, keyboards, and doorknobs, were disinfected at least 3 times per day. An appropriate ventilation system is essential. Staff who are in direct contact with patients followed biosafety level 2 guidelines, wearing appropriate PPE which includes disposable gloves, disposable gowns, N95 masks, eye protection, cap, and shoe covers (Figure 3). Protection at biosafety level 3 is applicable to all individuals performing procedures with a high risk of being exposed to SARS-Cov-2.[1,2]
4. Patients were divided into three groups: confirmed COVID-19 patients, patients with some symptoms but unconfirmed infection, and patients without symptoms. Patients were placed in different rooms at different times each treatment room was

decontaminated prior to start of daily treatments and after the completion of daily treatments each day. Following each patient's treatment, the tabletop of the linear accelerator and the path traversed by the patient was decontaminated (Figure 4).

5. Hand hygiene is a simple yet effective way to prevent SARS-Cov-2 infections. Staff and patients were required to wash their hands following the "seven step guide of hand-washing" [3] for at least 20 seconds or to clean hands with an alcohol-based hand sanitizer that contains 60 to 95% alcohol. Hand hygiene was performed by staff before and after contact with patients or their surrounding environment; during steps of removing PPE; and before leaving the treatment room. PPE were disposed of promptly into a clinical waste bin used for infectious or contaminated waste. Staff wore an N95 mask when in contact with patients and a surgical mask at other times. Staff was instructed to wash hands before eating and drinking, before and after bathroom usage.
6. Patients were instructed to wear a surgical mask at all time in the radiotherapy center. To avoid difficult breathing, we would open a window around the mouth and nose in the thermoplastic mask during radiotherapy. The distance between patients was at least 1.5 meters. All patients were followed up for 14 days to make sure there is no SARS-Cov-2 infection.
7. UV irradiation is recommended for the cleaning and sterilization of air. 75% alcohol is recommended for surfaces, such as personal electronic, linear accelerator, treatment couch. Chlorine-containing detergent is recommended for daily floor and walls cleaning.[4]

These recommendations are based on what was carried out in Wuhan and are supported by the testing results and follow up studies. We hope these data procedures are found useful in countries and regions in different stages of the pandemic attempting to deliver high quality radiotherapy. In addition, there are serious questions being raised as to how to re-open aspects of health care after the initial wave of cases is mitigated. These procedures here demonstrate that even in the height of infection serious adverse events to staff and patients can be mitigated in a high volume radiation oncology center and may serve as a blueprint for going forward.

References


1. Laboratory testing for Middle East Respiratory Syndrome Coronavirus: Interim guidance Geneva: WHO; 2018. *Available from: https://wwwwhoint/csr/disease/coronavirus_infections/mers-laboratory-testing/en/*.
2. Bayot ML, Limaiem F. Biosafety Guidelines. In: *StatPearls*. Treasure Island (FL): StatPearls Publishing StatPearls Publishing LLC.; 2020.
3. NHS HAND CLEANING TECHNIQUES. *Available from: https://wwwuhbnhsuk/Downloads/pdf/HandHygienePosterpdf*.
4. National Health and Health Commission releases new coronary pneumonia diagnosis and treatment plan (Version 7.0) 2020. *Available from: http://wwwgovcn/zhengce/zhengceku/2020-03/04/5486705/files/ae61004f930d47598711a0d4cbf874a9pdf*.

**Figure 1**. Diagnosis and treatment workflow in a radiotherapy center during the COVID-19 outbreak.

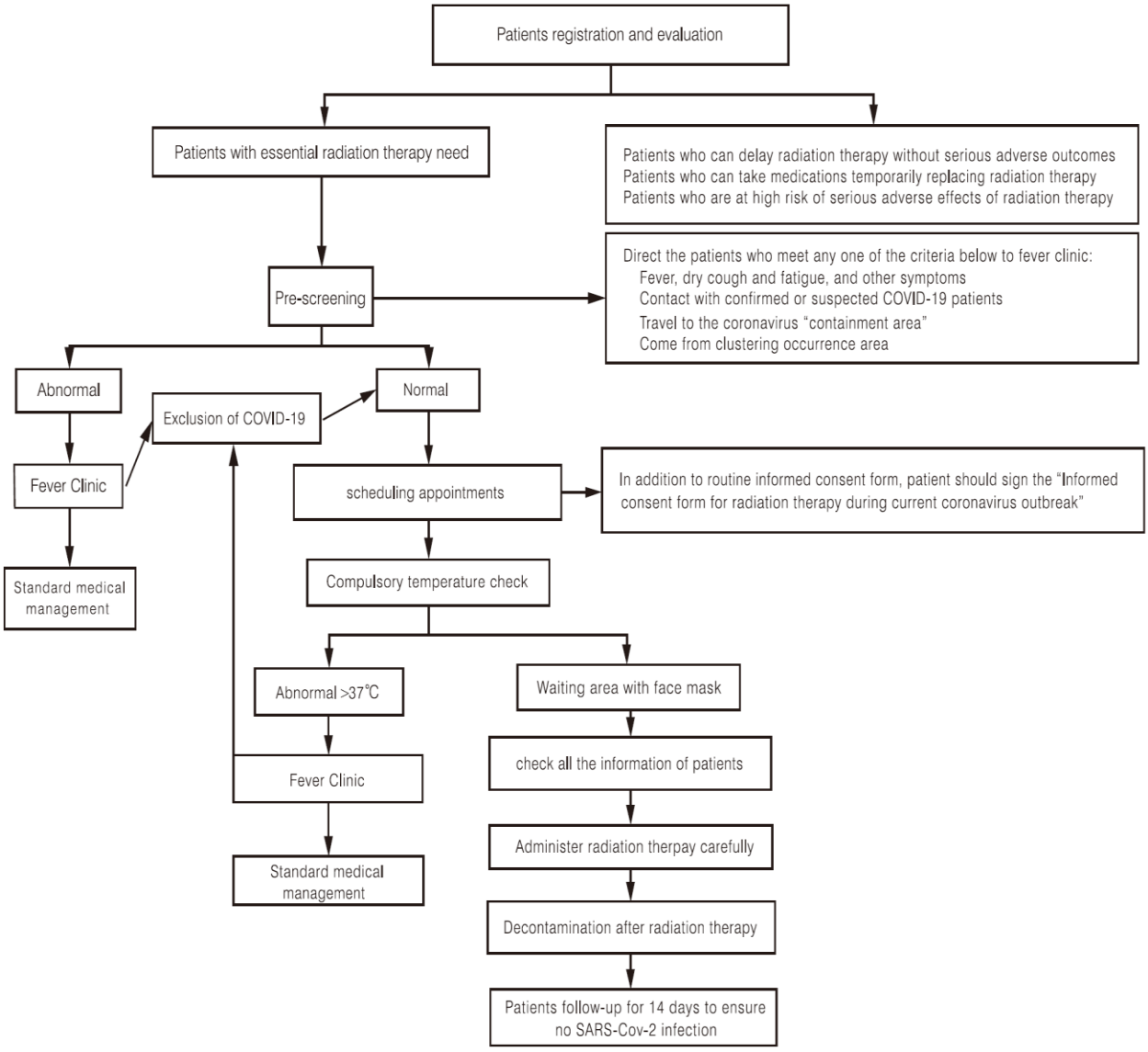

**Figure 2.** A triage station outside the radiation therapy center. Screening for temperature, symptoms of viral infection, and contact history was conducted for ***all*** patients and staff.

**Figure 3.** The staff in direct contact with patients wear appropriate PPE including disposable gloves, disposable gowns, N95 masks, eye protection, cap, and shoe covers.

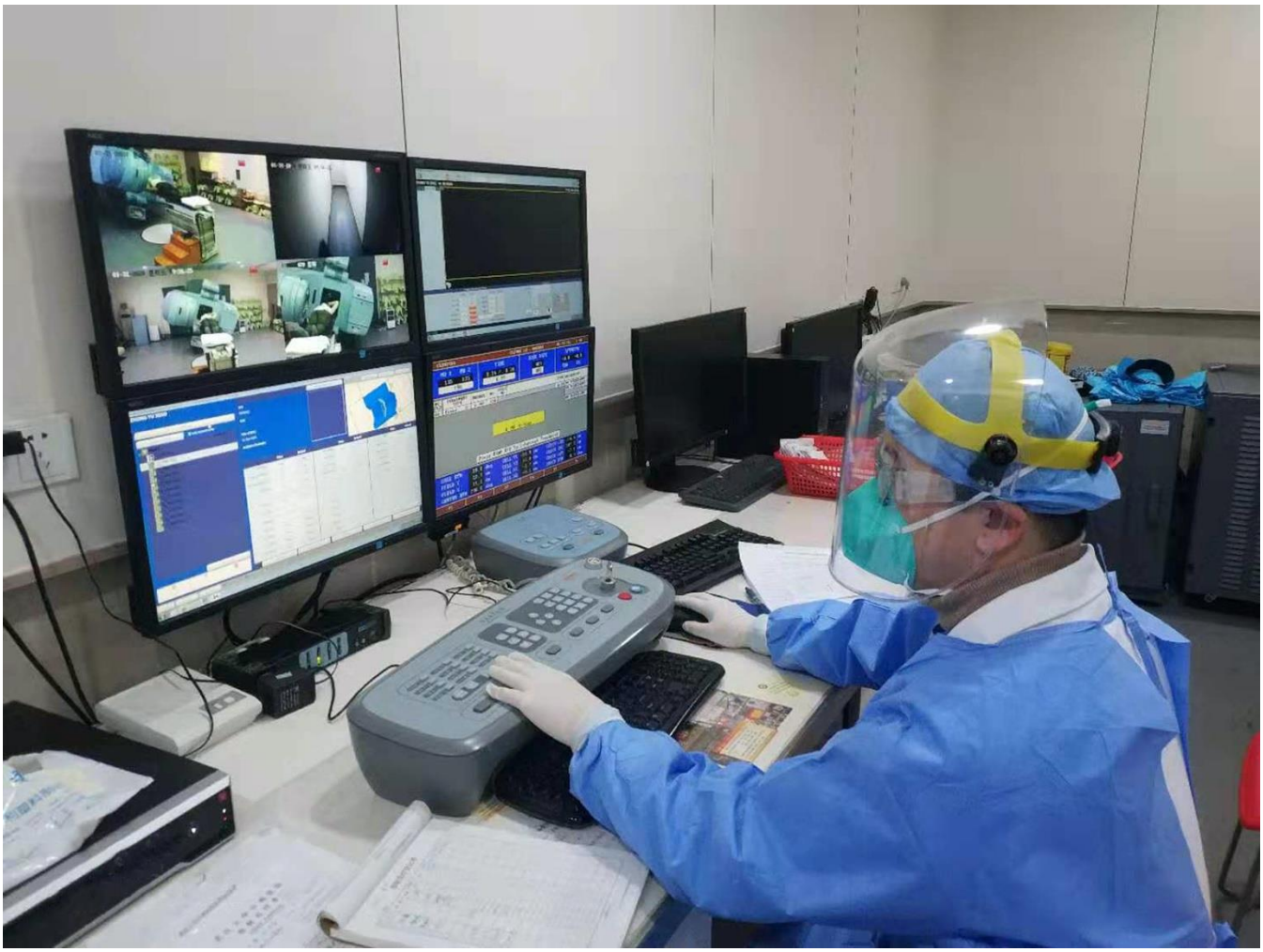

**Figure 4.** Following each patient's treatment, the treatment room was decontaminated using 75% alcohol locally including the linear accelerator and the path traversed by the patient.

# Supplementary Appendix

This appendix has been provided by the authors to give readers additional information about their work.

Supplement to: Cheng C, Liao ZK, Chmura SJ. Weichselbaum RR. COVID-19 infection prevention and control practices in Wuhan radiotherapy. Advances in Radiation Oncology 2020;

**Procedures for putting on PPE**

1. In the clean area: hand washing → put on cap → put on N95 mask → put on scrub suit and / or white coat → put on inner gloves → put on disposable gowns (isolation clothing or protective clothing) → put on goggles → put on second pair of gloves over the cuff → put on shoe cover → enter the contaminated area.
3. In the contaminated area: if under a high risk of being exposed to SARS-Cov-2, staff should wear protective masks or comprehensive respiratory protective devices (biosafety level 3).

**Procedures for taking off PPE**

1. In the first removal area (contaminated): take off outer pair of gloves → disinfect hands → take off goggles / protective masks → take off isolation clothes or protective clothing → take off shoe covers → wash hands and / or disinfect hands → enter the second removal area.
2. In the second removal area (potentially contaminated): wash hands and / or disinfect hands → take off white coat → take off inner pair of gloves → take off N95 mask → take off cap → wash hands and / or disinfect hands → entering the clean area.
3. The equipment after use should be disposed promptly into a clinical waste bin used for infectious or contaminated waste.
4. In the clean area: may take a shower and change clothes → leave the clean area.

**Abbreviation**

COVID-19: Coronavirus Disease 2019
SARS-Cov-2: severe acute respiratory syndrome associated coronavirus 2
PPE: personal protective equipment
UV Radiation : Ultraviolet Radiation