

Lessons from the Experience in Wuhan to Reduce Risk of COVID-19 Infection in Patients Undergoing Long-Term Hemodialysis

Junhua Li and Gang Xu

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Introduction

Since December 2019, an outbreak of new coronavirus disease (coronavirus disease 2019 [COVID-19]) has developed into a world pandemic (1). The city of Wuhan in China, as one of the most seriously affected areas, is now out of the woods (2), and the aggressive quarantine performed by the government played a crucial role. COVID-19 is insidious and highly contagious, and it is prone to cause cluster outbreaks (3,4). The patients in the dialysis centers are relatively dense and mobile, and the particularity of patients with uremia who require long-term hemodialysis makes it more difficult to prevent and control infectious diseases than in general population (5). Our clinical investigation found that COVID-19 infection at the dialysis centers in Wuhan city was up to 10% in patients and 6.4% in medical staff (F. He and G. Xu, unpublished data). Here, we have summarized our approach for prevention and control of COVID-19 in dialysis centers in the worst affected areas (6,7).

Management and Protection of Medical Staff

(1) A severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection prevention and control leading group was established for dialysis centers that trained all medical staff on prevention and control of SARS-CoV-2.

(2) Cluster medical activities, like large shifts, group rounds, group studies, and patient discussion, were reduced, and instead, they were held by telephone or through the internet. When gathering was necessary, it was required to wear protective equipment to ensure our safety.

(3) All staff members were required to take body temperature and observe respiratory symptoms every day. If the body temperature is $\geq 37.3^{\circ}\text{C}$, they would be reported, and there was prompt intervention. The staff members with close contact history in dialysis centers needed to complete the detection of SARS-CoV-2 nucleic acid and chest computed tomography (CT) screening, and they could return to work only after the detection was negative.

(4) All workers took protective measures and effective precautions, including wearing masks, hats, and gowns that met the requirements. Hand hygiene was

strictly implemented. Standard precautions, such as wearing goggles or face screens and wearing protective isolation clothing, were taken under the following circumstances: pre-examination, invasive operations, connection of vascular access, injections, blood drawing, and other operations that may bring staff members in contact with the patient's blood and body fluids.

Patients and Accompanying Personnel Management

(1) Education and information about COVID-19 were provided to patients on hemodialysis and the accompanying personnel for prevention and control of SARS-CoV-2 infection; they included avoidance of large gatherings, maintenance of hand hygiene, and standardization of the correct use of protective equipment. Hemodialysis facilities could not be changed casually by patients on hemodialysis.

(2) Compulsory temperature checks were performed on every patient before entering the hemodialysis facilities. The body temperature would be measured again if it was $>37.3^{\circ}\text{C}$, and if the patients had abnormal body temperature twice, they were sent to a fever clinic for treatment. Patients with respiratory symptoms were also sent for standardized diagnosis and treatment as required.

(3) In Wuhan, one of the most seriously affected area, we set up dialysis centers in COVID-19-designated hospitals to centrally isolate and manage the large number of COVID-19-positive patients on hemodialysis. Setting up a dialysis center in a COVID-19-designated dialysis hospital was crucial for the prevention and control of the COVID-19 epidemic, and the standards that were set were according to the requirements of the isolation ward. Thus, a large number of patients with COVID-19 were managed centrally, the medical staff members were all in standard protection to reduce the risk of crossinfection, and resources were saved. If it was not possible to set up a COVID-19-designated hospital, we referred patients with COVID-19 to the standard setting of the last shift of each day and a relatively isolated area.

Department of Nephrology, Tongji Hospital Affiliated to Tongji Medical College, Huazhong University of Science and Technology, Wuhan, Hubei, China

Correspondence: Prof. Gang Xu, Department of Nephrology, Tongji Hospital Affiliated to Tongji Medical College, Huazhong University of Science and Technology, 1095 Jiefang Avenue, Wuhan 430030, China. Email: xugang@tjh.tjmu.edu.cn

(4) COVID-19 is transmitted through droplets and close contact; it is highly contagious and has insidious symptoms after infection (3). Closed spaces in dialysis centers can easily cause the virus to spread. The target of SARS-CoV-2 on the human body is mainly the lower respiratory tract, and it manifests as viral pneumonia. The sensitivity of a single throat swab early in the course of disease is only 70% (8), and chest CT examination was faster and more effective than etiologic examination for screening of COVID-19. It was recommended to set up designated dialysis hospitals to centrally isolate and manage the numerous patients with COVID-19 on hemodialysis in epidemic areas and to perform chest CT screening for all patients on hemodialysis in nondesignated hospitals (Figure 1).

Additional Patient Management

(1) Patients with normal CT and no symptoms could proceed to dialysis according to the routine medical procedures.

(2) If the CT scan indicated nonviral pneumonia, the patient underwent routine dialysis. The patient was

rechecked with CT after treatment and would be sent to the fever clinic if there was no progress.

(3) If the CT scan indicated viral pneumonia associated with fever and respiratory symptoms, patients were assigned to COVID-19–designated hospitals for the detection of common respiratory viruses and SARS-CoV-2 nucleic acid. If determined to be COVID-19 positive, the patients would be transferred to the COVID-19–designated dialysis centers. Critical patients with COVID-19 and uremia were sent to isolation wards in COVID-19–designated hospitals, and they were treated with continuous renal replacement therapy separately. If there were several critical patients, they would be concentrated in one or two isolation wards for unified management and continuous renal replacement therapy.

(4) If patients were suspected of having virus infection on CT scan but did not have obvious symptoms (we found a large number of such patients), we sent the patients to the fever clinic for at least two SARS-CoV-2 nucleic acid tests.

1. If SARS-CoV-2 positive, the patient would be transferred to a dialysis center of a COVID-19–designated hospital.

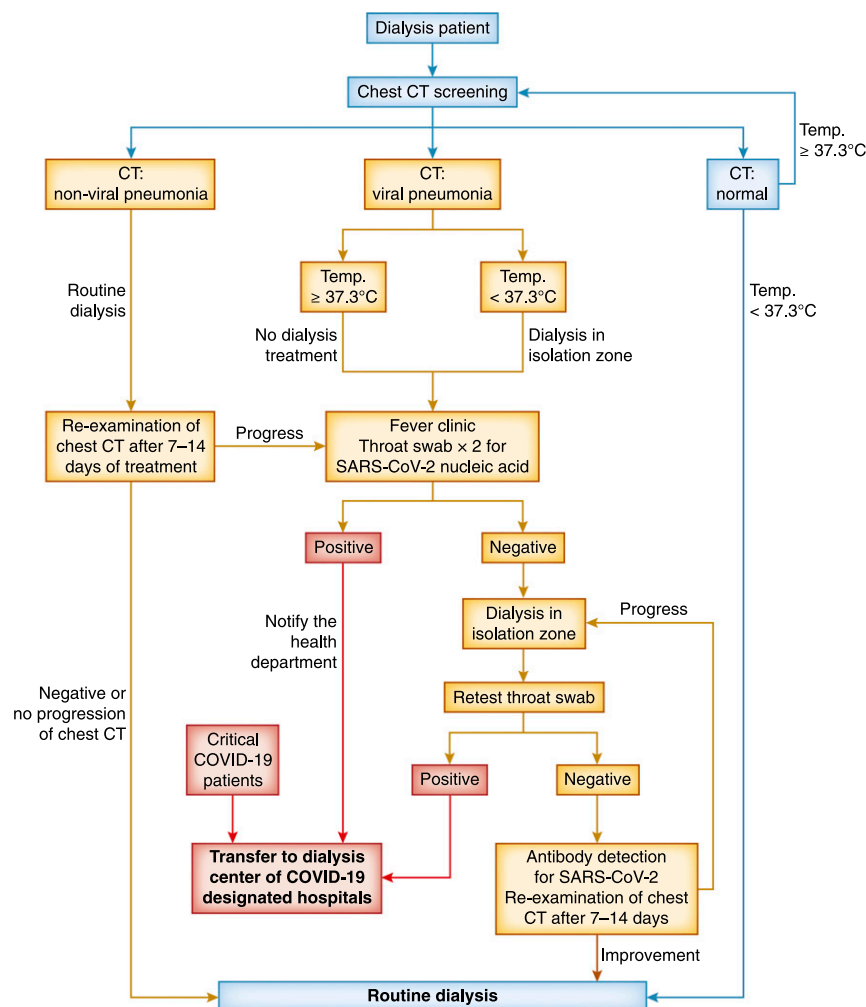


Figure 1. | Experience of managing hemodialysis patients to control COVID-19 in dialysis centers in the worst affected areas (Wuhan, China). Dialysis in isolation zone indicates dialysis during the last shift of each day in a relatively isolated area on the fixed machine. CT, computed tomography; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

2. If SARS-CoV-2 negative, the patient would be scheduled for dialysis during the last shift of each day in a relatively isolated area on the fixed machine. The patient was managed by separate medical staff (with standard protection) with close attention to the symptoms. The terminal disinfection was done after treatment.
3. If the patient had fever or respiratory symptoms, he or she would be assigned to a designated dialysis hospital for diagnosis and treatment.
4. The asymptomatic patients were re-examined at least twice for SARS-CoV-2 nucleic acid, detection of SARS-CoV-2 antibody, and chest CT after 7–14 days. If nucleic acid appeared to be positive and the SARS-CoV-2 antibody became positive or the CT scan showed pulmonary progress, the patient would be transferred to a COVID-19–designated hospital.
5. If the re-examined patients showed negative nucleic acid, negative antibody, and improved pulmonary imaging, radiology and respiratory experts were consulted to exclude the diagnosis of COVID-19. The deisolation was done after 14 days of dialysis in isolation zone, and these patients went back to the normal dialysis process.

Triage of Pre-Examination

(1) We requested that all patients and their families wear disposable surgical masks (if they did not have masks, we would supply them). We took the temperature of each patient with a temperature gun in waiting room or at the entrance of the reception room, and inquired whether there was any epidemiologic contact history and whether they were keeping each other at arm's length.

(2) If there was no fever (body temperature $\leq 37.3^{\circ}\text{C}$) and no contact history, the patient could proceed to normal dialysis treatment. If the patient had an abnormal body temperature ($>37.3^{\circ}\text{C}$), he or she would be measured again with a mercury thermometer or ear thermometer. A patient with a temperature $>37.3^{\circ}\text{C}$ would be sent to COVID-19–designated hospital for diagnosis and treatment. If COVID-19 was excluded, the patient could come back for routine dialysis.

In view of the high infection rate of medical staff and patients in the early stage (the whole January) of the COVID-19 epidemic, it was urgent to take steps in every hospital, and we performed the aggressive prevention and control program detailed above in hemodialysis facilities starting February 2 (9). As of now, there are no new infected medical staff members in the dialysis center of the main campus of our hospital since February.

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Disclosures

Dr. Li and Dr. Xu have nothing to disclose.

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