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Review

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Coronavirus Disease 2019 Infection and Nursing in Patients Undergoing Hemodialysis Treatment

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Abstract

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2. Patients undergoing chronic hemodialysis treatment are at a high risk of serious complications if infections occur because of suppressed immune system, cardiovascular disease, and important comorbidities, such as diabetes mellitus. To control and prevent the spread of the outbreak to patients and other healthcare professionals, it is necessary to be informed about COVID-19, to diagnose cases early, and to be treated. The purpose of this review is to discuss the communication, transport, predialysis screening and triage, and COVID-19 nursing management in patients undergoing hemodialysis treatment.
Keywords: Coronavirus disease 2019, hemodialysis, nursing, screening, triage

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INTRODUCTION

Coronavirus disease 2019 (COVID-19) is a zoonotic ribonucleic acid virus from the coronavirus family that can cause diseases in humans or animals (1-3). CO (Corona), VI (Virus), D (disease), and 19 (2019), derived from a combination of "COVID-19" is an infectious disease caused by the severe acute respiratory syndrome coronavirus 2, previously known as the 2019 new coronavirus (4).

The COVID-19 outbreak first appeared in Wuhan, China, on December 31, 2019, and then spread to other countries in Asia, Europe, Africa, North America, and, more recently, Latin America (2, 5). In the European region, including Turkey, the first two cases of coronavirus (who were Chinese tourists traveling to Italy) were reported by the Spallanzani Institute in Italy on January 30, 2020 (6). With this case report, the World Health Organization Emergency Committee declared the outbreak as an "international health emergency" on January 30, 2020, and the disease as a "pandemic" on March 11, 2020, with the spread of the epidemic to many countries (7).

Patients undergoing hemodialysis (HD) therapy are at a high risk of serious complications if infections occur because of their immune systems being suppressed and having significant comorbidities (especially cardiovascular disease and diabetes mellitus). In particular, these patients regularly receive 2-3 sessions of HD treatment per week. Because each session lasts for 3-4 h, the patients are exposed to infection for a long time in the presence of a possible COVID-19 infection. In addition, patients having to go for the HD treatment regularly and being transported constantly prevents them from staying in home isolation and increases their risk of infection (8). In a literature review, the rate of COVID-19 infection in patients undergoing HD treatment is 16%, and the mortality rate is 3%. In addition, the COVID-19 transmission rate was reported to be 12% for the healthcare personnel responsible for the care and treatment of the patients (9). These data show that the transmission risk of COVID-19 is very high.

In the COVID-19 outbreak, which is expected to infect 60% of the world population (10), important duties

about the spread and control of the disease are performed by the nurses who have the most contact with the patient (11). To control and prevent the spread of the outbreak to patients and other healthcare professionals, it is necessary to be informed about COVID-19, to diagnose cases early, and to be treated (12). The purpose of this review is to discuss the communication, transport, predialysis screening and triage, and COVID-19 nursing management in patients undergoing HD therapy.

Communication with Patients Undergoing HD Treatment

The HD nurse should reduce face-to-face contact with patients as much as possible. They should inform the patients about COVID-19 infection and direct them to the right sources where they can get more detailed information. They should provide the patients with telephone or video counseling services, for example, to use home delivery services, to provide their medication, or to choose local services for blood tests (13). In addition, patients should be informed that if any of the symptoms of fever and breathing (shortness of breath and cough) are present, they should notify the unit before coming to the dialysis units and report their symptoms about COVID-19 before leaving home for HD treatment (13, 14). Moreover, the HD nurse should support mental well-being to alleviate their anxiety and fears related to the COVID-19 pandemic (13).

Patients Unknown to COVID-19

For patients who are unaware about COVID-19, the HD nurse should encourage the patients and their caregivers to use their own means of transport when necessary and, if possible, to travel alone to the dialysis unit. The nurse should make careful planning before taking the patients to the HD unit and warn the patients not to come early to minimize the time they spend in the waiting room. Nevertheless, it should be ensured that patients who arrive early and whose health conditions are appropriate to wait outside the hospital (e.g., in the car) should inform by message or restricted and protective face-to-face communication (13-15).

COVID-19 Suspected or Diagnosed Patients

The HD nurse must comply with temporary infection prevention and implement the approved recommendations for COVID-19 or investigate the patients undergoing HD therapy (11, 13, 16). The nurses must wear FFP2/N95 respirators (respiratory protective masks) or personal protective equipment, such as face masks, goggles or face shields, gloves, and gowns, during any care and treatment that they will apply to the COVID-19-suspected patient (patients with symptoms whose test results are not yet available). In patients with COVID-19 infection confirmed by the test, FFP3 respiratory mask (respiratory protective masks), disposable overalls, goggles/face shields, pair gloves, shoe covers, and shoes in special areas are recommended (Table 1) (11, 17). Any surface, material, or equipment (e.g., HD machine) located near 2 m (6 ft) of symptomatic patients must be disinfected or disposed using disposable materials (16, 17). The HD nurse should perform the dialysis treatment and care of multiple patients with suspected or confirmed COVID-19 in the same shift (for example, the last shift of the day) and at the same place if there are insufficient isolation rooms. In particular, if the etiology of respiratory symptoms is known, patients with different etiologies should not be taken together to the HD unit. For example, although the respiratory symptoms are similar, patients with flu and patients with COVID-19 infection should not be admitted to the unit together (16).

Patients with Respiratory Infection

As part of routine infection control, the outpatient dialysis centers/units are required to prevent/reduce the spread of infectious respiratory pathogens of COVID-19. Policies and practices must be established for this purpose. The most important aspect of these policies and practices is screening and triage of patients before HD therapy (Figure 1) (14, 16, 18). It is important to immediately diagnose, isolate, and use face masks for patients with a respiratory infection. Screening of patients before entering the dialysis centers/units reduces the risk of exposures to other patients and medical staff and helps to prevent the spread of disease within the facility and use personal protective equipment effectively (18).

Patients with signs and symptoms of respiratory infection (e.g., fever and cough) or signs of conjunctivitis should be examined before they are admitted to the HD unit. Therefore, patients with fever or respiratory symptoms should be trained to call the healthcare providers to provide information about their condition so that they can prepare for infection prevention before coming for HD treatment (16-18). Patients should be screened for the signs of respiratory infection before taking HD treatment (14), and patients with any symptoms should wear a surgical mask (masks made of paper or fabric in 2 or 3 layers) (16) or FFP2/N95 mask (respiratory protection masks) (Table 1) (18). If necessary, medical staff should be present at all entrances and in the waiting area to ensure that patients are screened for fever and respiratory symptoms. If the screening nurse needs to be within 2 m (6 ft) of the patient, they must use appropriate personal protective equipment, such as a face mask, gloves, eye protection, and apron (if there will be intensive contact with patients). However, if possible, it is important that the nurse is separated with a physical barrier from patients, such as a glass or plastic window.

Main Points

- Coronavirus disease 2019 (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2.
- Patients undergoing chronic hemodialysis treatment are at a high risk of serious complications if infections occur because of suppressed immune system, important comorbidities such as diabetes mellitus and cardiovascular disease.
- To prevent the spread and control of COVID-19 infection in patients undergoing HD treatment, nurses should have knowledge about communication, transport, predialysis screening and triage, and COVID-19 nursing management.

Table 1. Recommended type of personal protective equipment to be used for COVID-19 cases by type of place, personnel, and activity (11, 13, 14, 16-18)

Place	Nurse/patient	COVID-19 condition or respiratory symptoms	Type of personal protective equipment
Hemodialysis room	Nurse	COVID-19 suspected patients	FFP2/N95 respirators, face mask, goggles or face shield, gloves and gown
		Patient with confirmed COVID-19 infection with the test	FFP3 respiratory mask, disposable overalls, goggles/face shield, pair gloves, shoe covers and shoes in special areas
Before HD treatment	Patient	Patient with symptoms of respiratory infection	Surgical mask (masks made of paper or fabric in 2 or 3 layers) or FFP2/N95 mask
Scan area	Nurse	If the screening nurse needs to be within 2 m (6 ft) of the patient	Face mask, gloves, eye protection, apron (if there will be intensive contact with patients)
Ambulance/ transfer vehicle	Patient	COVID-19 suspected patients	Mask if patient can tolerate
	Nurse	COVID-19 suspected patients	Face mask, gloves, eye protection, apron

COVID-19: coronavirus disease 2019; HD: hemodialysis

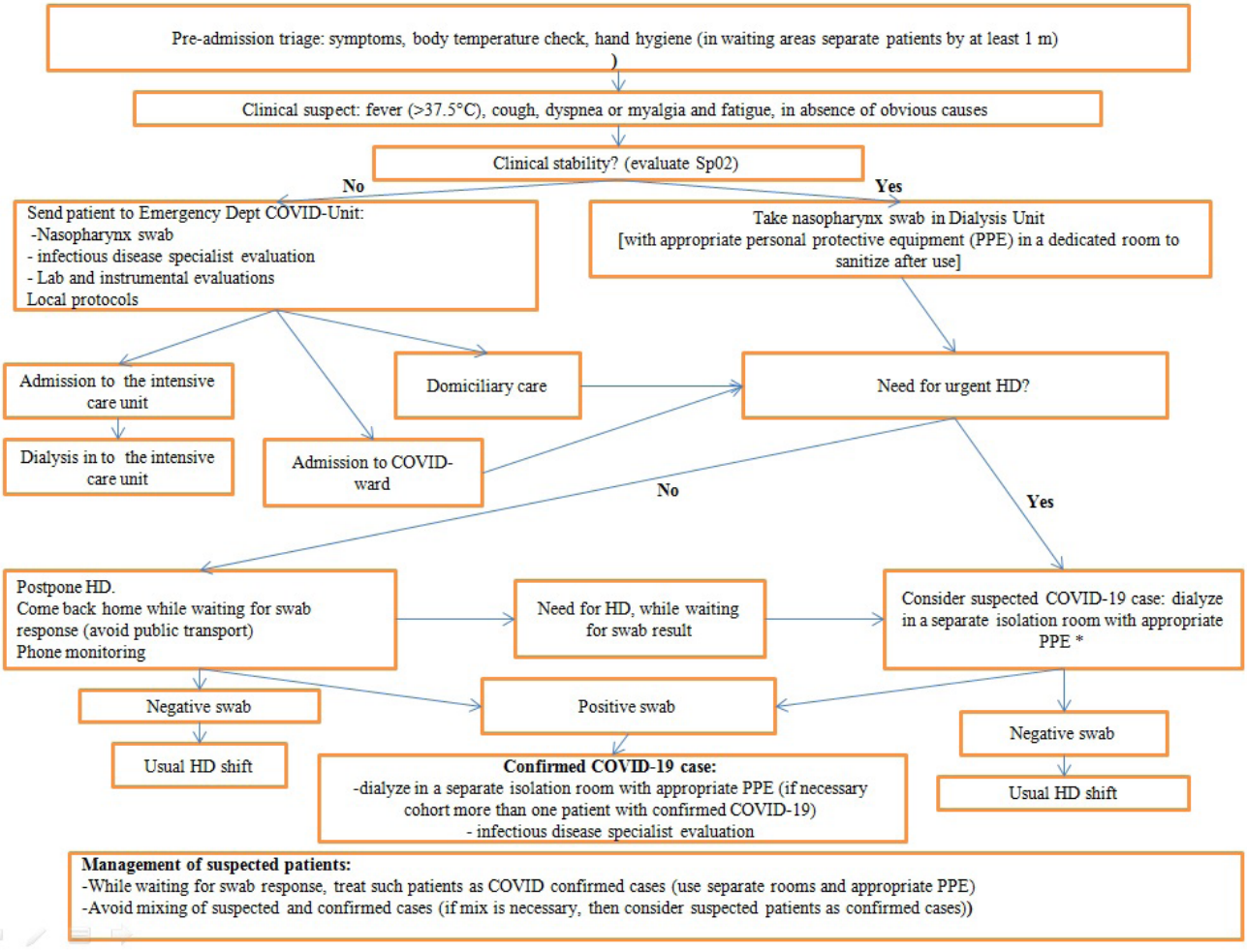

Figure 1. Screening and triage patients before hemodialysis treatment

*If possible, isolated rooms for patients with suspected and confirmed COVID-19 infection can be located at the COVID-19 ward using mobile dialysis water preparation devices

Nurses do not need to use personal protective equipment if this condition is met. If necessary, nurses can keep their interactions as short as possible by limiting the interaction with patients to screening questions only (13, 18). Patients whose symptoms have been identified need to be urgently reported to the physician or a healthcare professional to determine whether they require further clinical management (such as diagnostic testing) or higher care (13, 17, 18). Patients to be sampled for diagnostic testing should be taken either to a single-patient room or to a room designated for the sample. The room should be disinfected after sampling (17). For floor and surface disinfection, 1/100 diluted bleach (sodium hypochlorite) or chlorine tablet (according to product recommendation) can be used. For areas contaminated with patient secretions, 1/10 diluted bleach (sodium hypochlorite) or chlorine tablet (according to product recommendation) is used. For this purpose, 70% alcohol can also be used. It should be ensured that the disinfectant remains on the cleaned surface for at least 1 min (14).

Nurses should prepare and hang the visual training materials (such as pictures or portable document format [PDF]) that include information about symptoms of fever and respiratory infections, including hand hygiene, respiratory hygiene, and cough etiquette, for patients and healthcare staff in hospitals/dialysis centers. These materials should include information about how to use face masks, how to use the material to cover the nose and mouth when coughing or sneezing, how to dispose the tissues and contaminated substances in waste containers, and how and when to do hand hygiene (11, 14, 16). In addition, materials placed near dialysis beds and nurse care areas (such as alcohol-based hand disinfectants and sensor sockets) should be available to facilitate compliance with hand hygiene, respiratory hygiene, and cough etiquette (16).

Patient Placement and Isolation

Nurses should leave a space in the waiting areas for them to sit at least 2 m (6 ft) apart between patients to distinguish the symptomatic patients with respiratory infections from the patients without symptoms (16, 18). If there is an existing hospital facility, another room can be created as a waiting area for symptomatic patients (18). Medically stable patients may choose to wait in a personal vehicle or outside the healthcare facility. In this case, it is possible to communicate using the mobile phone when HD treatment is in order for the patients. Patients with respiratory symptoms should be brought back to a suitable treatment area as soon as possible to minimize the time in waiting areas (16).

Nurses should leave a distance of at least 2 m (6 ft) between the symptomatic patients and other patients during HD treatment and ensure that all patients wear masks (14, 16). If possible, HD treatment for symptomatic patients should be performed in a separate room with the door closed at the entrance and exit. For this, hepatitis B isolation rooms (if there is no patient hepatitis B currently receiving treatment) should be used only for patients with symptoms of respiratory infection for HD treatment. However, if there is no separate room, after wearing a mask, the patient should be treated in a remote corner or at least 2 m (6 ft) away from the nearest patient in all directions (Table 1) (16).

Personal Protective Equipment

Nurses who apply care and treatment to patients with undiagnosed respiratory tract infections should take standard, contact, and droplet precautions along with eye protection. These measures include applications, such as wearing a face mask during care and treatment, protection of the eyes (e.g., glasses and a disposable face shield covering the front and sides of the face), and wearing insulating clothes (13, 14, 16, 17).

Glasses should not be used alone for the protection of the eyes because personal glasses and contact lenses are not considered sufficient for eye protection (12, 16).

Insulation clothes/gowns should be worn instead of the cloth gown normally worn by the HD nurse (e.g., laboratory coat, gown, or combined sleeve gown). If there is a shortage of gowns, priority should be given to the care, treatment, and disinfection activities that take place in close contact with the patient's contaminated body secretions. These activities include initiation and termination of dialysis treatment, needle fistulous interventions or procedures applied to the dialysis catheter, helping the patient at the entrance and exit of the dialysis unit, disinfection of personal protective equipment, and cleaning the dialysis units. Once the gowns have been removed, they must be thrown into the waste bin before leaving the dialysis unit or put in laundry waste containers for washing. Disposable aprons should be discarded after use. Washable cloth aprons should be washed after each use (16).

Healthcare Professionals and Education

All healthcare professionals who are known or suspected or are interested in taking, evaluating, and maintaining the patients with COVID-19 infection must comply with the infection prevention and control guidelines (13). Healthcare professionals should know the use of personal protective equipment and in what order they are worn and removed. For this, they should follow the current guidelines of international organizations (13, 14). In addition, healthcare professionals should be provided with periodic training on COVID-19 symptoms and prevention methods, and such training should be recorded (14). For healthcare personnel who show signs of respiratory infection, sick leave policies should be applied without any need for a report, and they should take rest at home (16). If COVID-19 positivity is detected in the healthcare personnel, the management of the other personnel is planned according to the "Evaluation of the Contact Health Care Professionals" algorithm (Figure 2) (19).

Patients' HD Units and Transplantation from HD Units

Nurses should ensure that transport services bring patients on dialysis as scheduled to avoid worsening patients' health case. Although transfer services cannot be provided to patients, the risks and benefits of hospitalizing the patient should be consid-

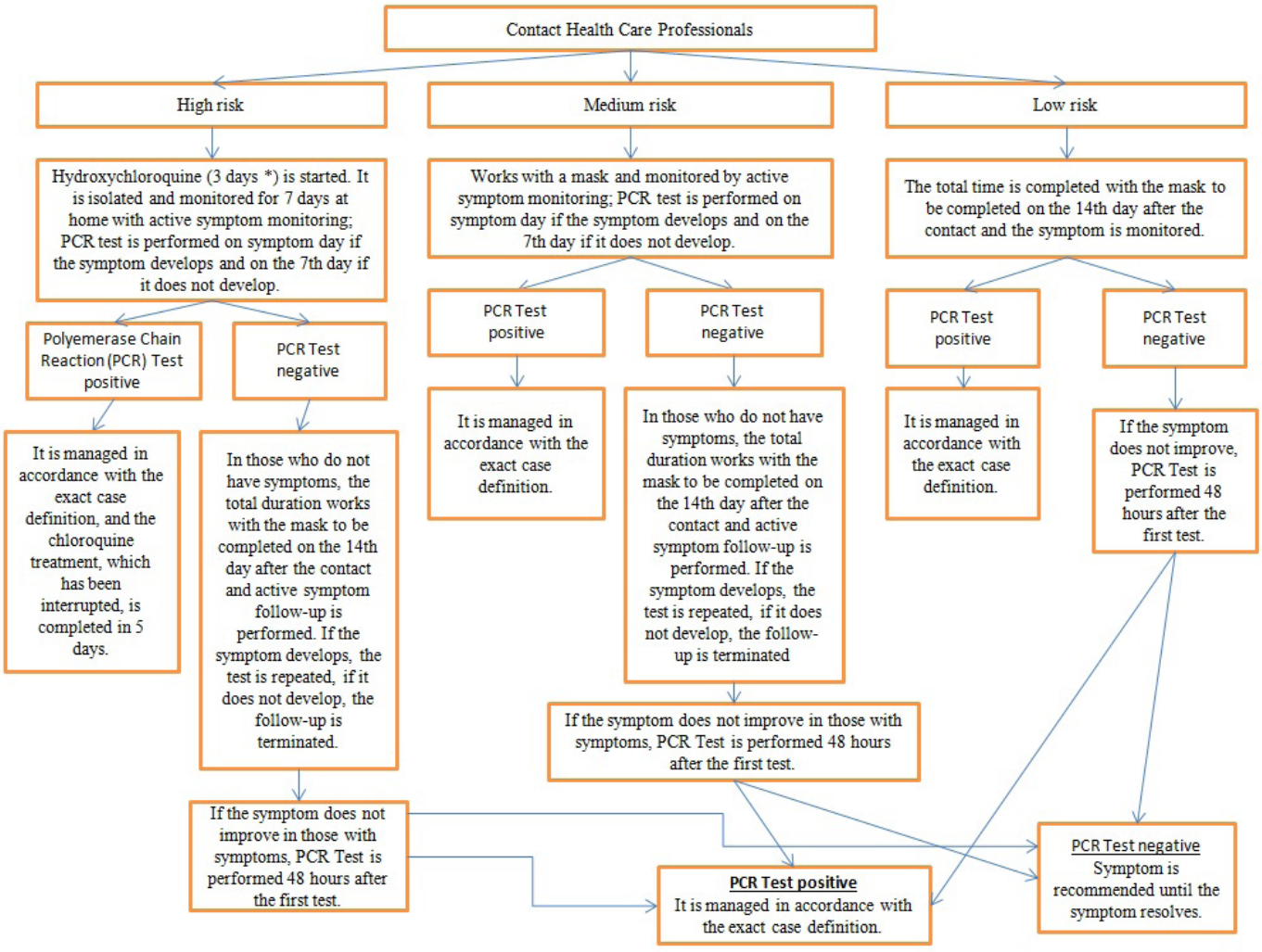

Figure 2. Laboratory algorithm to be applied according to the risk categories for healthcare professionals who come in contact with patients COVID-19
*Total 3 days, 2x200 mg. Although there is no strong evidence that the use of hydroxychloroquine in prophylaxis is effective, it has been suggested in high-risk patients

ered. Nurses should work with transplant services to make arrangements to ensure continuity in patient care and collaborate to minimize the cross-infection between COVID-19 suspected patients and patients diagnosed with COVID-19 (13).

Leadership and Communication Network Planning

HD nurses should develop individualized plans for patients to reduce the HD programs safely when needed, in cooperation with the healthcare team. With local policies, they should address the use of fluid restriction and potassium binder prescription to allow for the reduction of dialysis frequency. Regional, national, or international communication networks should be established, and HD capacity, supply chain, and rapid patient transfer issues should be evaluated and supervised within the scope of this network (13).

Recruitment of Staff When Labor Capacity Decreases

Personnel recruitment should be prioritized to maintain safe HD services. Because of the special skills and training needed, not every nurse can be employed in the HD unit. Therefore, regional networks should ensure the rapid transfer of health personnel from one organization to another to maintain safe levels of care, if needed. All the healthcare professionals who have dialysis experience but are not currently working should be identified, and, if necessary, training and support should be provided to enable them to participate in the dialysis workforce. Nurses or staff who do not have dialysis experience should be placed in dialysis units to support the trained personnel in patient care and unit management to assist the workflow. Staff levels should be reviewed regularly, and nurse-patient ratios should be adjusted flexibly, if necessary. The frequency of all routine evaluations should be reviewed, and only necessary/mandatory practices should be made (13).

Providing HD at Home

Patients should be provided with clinical care at home, without the need to come to the hospital, using telephone, computer, and other electronic systems as much as possible (14). Sufficient materials and personnel support should be provided to

patients to apply HD at home (13). As far as possible, home visits should be planned to support this process, using assistance or other electronic systems to support the clinical management of patients (17).

CONCLUSION

To prevent the spread and control of COVID-19 infection in patients undergoing HD treatment, nurses should have knowledge about communication, transport, predialysis screening and triage, and COVID-19 nursing management. According to this review, HD nurses should:

- support the mental well-being of patients to alleviate their anxiety and fears about COVID-19 pandemic,
- make plans to minimize the time the patients will spend in the waiting room before entering the HD unit and warn the patients not to come early to the unit,
- comply with temporary infection prevention and implement the approved recommendations for COVID-19 patients undergoing HD treatment,
- multiple COVID-19 suspected or confirmed patients should be given dialysis treatment and care in the same shift (e.g., last shift of the day) or in the same place, if there is insufficient isolation room,
- perform screening and triage before HD treatment in outpatient dialysis centers/units to reduce the spread of COVID-19 infection-causing respiratory pathogen,
- know how to use personal protective equipment and in what order to wear and remove it in all kinds of procedures for patients,
- follow the up-to-date guidelines from national and international organizations related to COVID-19,
- develop individualized plans to reduce dialysis programs safely, when necessary, in cooperation with the healthcare team for patients,
- provide patients with adequate material support to apply HD at home when needed.

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