Kidney360 Publish Ahead of Print, published on March 25, 2020 as doi:10.34067/KID.0001452020

Management of hemodialysis patients with suspected or confirmed COVID-19 Infection: Perspective of two nephrologists in the United States

Michele H. Mokrzycki[1,2] and Maria Coco[1]

[1] Division of Nephrology, Montefiore Medical Center, Bronx, New York

[2]Albert Einstein College of Medicine, Bronx, New York

Correspondence:

Michele H. Mokrzycki

Division of Nephrology, Montefiore Medical Center

3411 Wayne Ave, Suite 5H

Bronx, New York 10467

United States

mmokrzyc@montefiore.org

Overview

The COVID19 pandemic is unprecedented, and information about the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is evolving rapidly. New York is one of the epicenters of the COVID-19 outbreak in the United States reporting over 1000 confirmed cases as of March 17, which is escalating exponentially. The majority of the cases are in Westchester County (n=220) and New York City (n=463), which includes Bronx (1). The local index patient case was a Westchester man, who became ill on February 22, was not associated with a recent travel exposure to a country on the watch list (China, Iran, South Korea, and Italy) or known direct contact with a COVID-19 confirmed patient. At the present time it is estimated that community-wide transmission accounts for 87% of confirmed cases. Nephrologists in the Bronx have been handicapped in managing End Stage Kidney Disease (ESKD) patients during the early weeks of the COVID19 pandemic due to the limitations of available rapid SARS-CoV-2 testing. Montefiore Medical Center, located in the north Bronx in close proximity to Westchester, has been one of the main tertiary care hospitals in New York City caring for persons under investigation (PUI) and for COVID19 confirmed cases. Our nephrology division's clinical faculty care for approximately ~850 ESKD patients (hemodialysis ~800 and peritoneal dialysis ~50), in 12 outpatient HD facilities (2 Fresenius and 10 DaVita) in the Bronx. We report our experience with caring for the ESKD population and hospitalized patients with acute kidney injury in the Bronx during the first 3 weeks of the local New York City COVID-19 pandemic.

Outpatient dialysis population

Strategies proposed for the prevention and management of COVID19 transmission for end stage kidney disease (ESKD) patients in the outpatient dialysis facilities have been dynamic. The American Society of Nephrology's *Nephrologists Transforming Dialysis Safety Website* (NTDS) has been on the forefront of informing the nephrology community with the earliest and most updated guidance from the Centers for Disease Control (CDC) about COVID19 preparation and management of ESKD patients in the outpatient dialysis setting (2, 3). The NTDS's initial release of FAQs for outpatient dialysis facilities based on CDC guidelines was on March 4, and the ASN and CDC provided an informational webinar on March 11, which is still available on the website (4). The most updated policies of the large dialysis organizations (LDO), including DaVita and Fresenius, were distributed to medical directors and staff on March 16, for the Bronx facilities. Table 1 provides a timeline of the COVID-19 pandemic in Westchester and New York City and illustrates the necessary adaptations of CDC recommendations and the LDOs policies and procedures as the number of PUI and confirmed COVID-19 cases increased in our region and as more information became available. Table 1 illustrates the changing policies at Montefiore-affiliated outpatient hemodialysis facilities as guidelines and knowledge of the pandemic evolved.

Early actions implemented first week of March

Distribution of information to patients

The NTDS poster on "COVID-19 awareness" and CDC posters on "cough etiquette" and "hand washing" were posted at the entrance of the facilities and in the lobby both in Spanish and English. Educational material was distributed to patients, families and staff. More frequent antiseptic

cleaning of chairs and door handles in the lobby was ordered and providing easy access to 60-95% alcohol based hand sanitizers was implemented in the waiting room.

Use of the CDC's patient screening questionnaire and situation guidelines

Initially, patients were advised to call ahead to the outpatient hemodialysis facility or call their nephrologist to report fever or respiratory symptoms so they could be advised whether to proceed to the hospital or be safely evaluated in the hemodialysis facility. The provider could then call the hospital staff to prepare for their arrival or the hemodialysis facility could prepare to screen them. For patients arriving to the outpatient facility, only symptomatic outpatients were being formally screened and given a mask. Patients who met criteria for a PUI were sent to the hospital and the provider called the hospital staff in advance. At this time, the recommendations were that it would be advisable to refer symptomatic PUIs to an acute hospital setting where hemodialysis could be performed in an airborne isolation room and where staff would use PPE including an N95 mask. Those PUIs sent to the hospital would have a respiratory viral panel performed to test for both influenza A and B, and respiratory syncytial viral. Due to severe limitations on COVID-19 testing, which were initially sent to the CDC, then were performed by the New York State Department of Health with a 1-2 day time to result, this testing was reserved only for the moderate to severely ill PUI patients.

Revisions to hemodialysis situation guidelines and screening: mid-March

The revised CDC recommendations in this period were such that droplet isolation and use of facemasks was acceptable, due to shortage of N95 masks, unless an aerosolized procedure was planned. This facilitated that hemodialysis could now performed in the outpatient facility under specific conditions outlined in Table 1. Hospitalization was reserved for the most ill ESKD patients who required an acute level of care. A triage plan, coordinated by centralized infection prevention managers working with the dialysis staff and physician, was instrumental to determine the most appropriate setting to provide hemodialysis for patients under investigation (PUI) who are asymptomatic, symptomatic and COVID-19 confirmed with the goal to avoid unnecessary emergency department visits and hospitalizations.

As the number of PUIs and confirmed COVID-19 patients has grown, so has the need to expand outpatient screening to everyone. The revised screening policy at the 2 major LDOs now mandate that all patients, visitors, staff, physicians, and physician extenders entering the dialysis clinic must be screened for signs and symptoms of COVID-19 prior to admittance to the dialysis treatment floor.

Policy for use of personal protective equipment (PPE)

Initially, only patients who arrived to the dialysis facility with fever or respiratory symptoms were asked to put on a mask prior to entering. Health care workers were only required to wear masks during catheter connection procedures or if with a cough. Due to the rapid rise in COVID-19 cases, the LDOs soon intensified their PPE policy beyond that recommended by the CDC. The current revised policy is that <u>all</u> patients are required to wear a mask upon entry to the facility, regardless of risk or symptoms, and

throughout their treatment. All other essential visitors must wear a mask while in the facility. All health care providers are required to wear a face mask at all times, both on and off the treatment floor.

All staff members providing direct patient care are now required to wear full PPE including gowns, gloves, face shields or goggles, and surgical face masks from the first patient interaction in the facility lobby to the treatment floor. In the medication preparation area, staff are required to only wear a surgical face mask, and are be expected to remove PPE (except facemasks) prior to entry to the medication preparation area, and don new PPE, including gown, gloves, and face shield upon leaving the medication preparation area and returning to the treatment floor. The obvious potential downside to these extreme measures is the risk of potentially competing with acute hospitals for the limited and rapidly shrinking supply of PPE.

Plans for outpatient HD provision for COVID-19 patients

The first COVID-19 confirmed hemodialysis patient dialyzing at one of our Montefiore-affiliated outpatient LDO facilities presented in the 3rd week of March. The patient was dialyzed at the outpatient facility 2 days before, and was asymptomatic and screened negative, and denied fever, respiratory symptoms, recent travel exposure or other known exposure. The outpatient hemodialysis staff, patients and visitors who may have been exposed are being evaluated to determine the level of exposure to determine if they meet criteria for a PUI, and are being closely monitored for fever (temperature taken twice daily, monitor for respiratory symptoms) for 14 days.

One of the LDOs reported that 6 hemodialysis patients in their U.S. facilities have been confirmed COVID-19 positive as of March 17 and were receiving hemodialysis in the acute hospital setting. As we anticipate more hemodialysis patients testing COVID-19 positive, the Montefiore-affiliated LDO facilities plan is to cohort confirmed COVID-19 patients who are medically stable in designated COVID-19 units in the Bronx. The proposed plan is for symptomatic PUIs to be dialyzed on the last shift and separated by the other patients, so as to allow for a proper environmental disinfection period. Ideally PUIs should undergo rapid testing, however local testing sites and labs were severely limited, and as of March 20 have been closed by the New York State Department of Health due to a severe shortage of test kits and PPE for staff manning these testing sites. These patients may also dialyze at an allocated "COVID-19 facility" providing that the symptomatic PUI and those confirmed COVID-19 dialyze on different days. The CDC has provided recommended guidelines for transport of a PUI or COVID19 documented patient to an acute hospital or outpatient hemodialysis, but this pertains to trained emergency medical services using appropriate PPE and environmental disinfection (5). The local department of health must closely monitor every COVID-19 confirmed patient, perform an evaluation of residence and provide PPE for cohabitants.

New outpatient hemodialysis placement

Testing for COVID-19 would be invaluable to place new hemodialysis patients for admission to the appropriate outpatient facility, similar to what is done for hepatitis B and tuberculosis screening. No policy exists at this time.

Hospitalized patients

Established hemodialysis patients presenting to the acute hospital

Figure 1 is a flow diagram illustrates the proposed plan for management of hemodialysis patients sent to the Montefiore emergency department with fever, respiratory symptoms, known travel or known COVID-19 exposure as of the morning of March 20. This has been a dynamic decision process and adjustments have been made on an almost daily basis. As the number of COVID-19 patients requiring hospitalization has increased, it has been decided to now cohort all COVID-19 patients (3 Montefiore affiliated hospitals) to the Moses hospital to conserve on PPE and streamline protocols.

Patients are immediately masked (if not already done) and isolated. The evaluating emergency room providers wear full PPE during the screening process. Confirmed COVID-19 patients are issued an "orange" tag (high risk) and clinical stability for discharge is determined. If stable, they are reassigned to a designated "COVID19" outpatient hemodialysis facility. A PUI receives a "blue" tag (intermediate risk) and undergo further testing for COVID-19 and a respiratory viral pathogen panel. If a PUI is stable for discharge they may be assigned to a "PUI" designated last shift or isolation room at an outpatient HD facility until COVID testing results become available. COVID-19 tests were initially sent to the CDC for testing, and then the New York State Department of Health. As of now, Montefiore Lab has the capability to perform on site rapid COVID-19 testing in a limited quantity. Hemodialysis patients requiring urgent dialysis in the emergency department, and are either COVID-19 or PUI status, are treated in the isolation room which is then disinfected and requires a down period 207 minutes before the room can be used.

Hemodialysis procedure for COVID-19 or PUI patients assigned to the hospital floor

For COVID-19 confirmed patients or PUIs who require hospitalization, the level of patient acuity dictates whether they require a critical care setting or may be closely monitored on the dedicated COVID19 positive floor. COVID-19 and PUI patients receive bedside hemodialysis in their room using a portable hemodialysis machine with portable reverse osmosis, which is hooked up to the acorn cold water source. The efflux goes directly into the acorn drain to prevent excess splash. Droplet precautions are maintained. The dialysis staff uses full PPE, including isolation gowns, masks (preferably N-95 as available), appropriate eye protection and gloves. The staff has been trained to don and doff their protective gear according to CDC protocols. The dialysis machine is cleaned and disinfected with a 1:100 bleach wipes. The machines are not dedicated to any individual patient. The tubing and dialyzers are discarded in the red hazardous waste bins.

COVID-19 or PUI patients assigned to the critical care setting

The nephrology team assesses the need for renal replacement therapy and which modality is most appropriate. When in the patient room, full PPE is required. Limited medical staff exposure is advised and physical exam is performed only when necessary. Patients who receive continuous veno-venous hemodialysis (CVVHD) require a dialysis catheter (un-tunneled or tunneled) for vascular access. The CVVHD effluent is directed into a dedicated acorn drain to minimize splash and does not require any additional disinfection. CVVHD is performed by the critical care nursing staff wearing full PPE. Critical patients who receive intermittent hemodialysis are treated by the dialysis nursing staff in full PPE, as described previously. The dialysis nursing

staff minimizes time in the patient room by sitting outside the glass partition as is possible. Intubation procedures are performed by the critical care team using the appropriate PPE including N-95 masks.

COVID-19 or PUI patients with acute kidney injury (AKI)

Patients with AKI requiring renal replacement therapy are triaged in the same manner as to whether they require intensive care or can be treated on the medically floor. An un-tunneled dialysis catheter is placed by either critical care, interventional radiology or the nephrology team. If hemodynamically unstable, the patient is transferred to ICU for either intermittent hemodialysis or CVVHD. If hemodynamically stable, the patient can be cohorted on a dedicated COVID-19 medical floor and receive hemodialysis at bedside in their room. Hemodialysis nurses wear full PPE and minimize exposure time by sitting immediately outside of the doorway during the hemodialysis treatment. Planning meetings by the hospital and nephrology leadership have been ongoing to adapt to the rise in the number of COVID-19 patients. We have been able to increase our dialysis capacity on several dedicated COVID-19 floors by installing additional acorns in the rooms with appropriate hemodialysis plumbing. The goal is to try to further increase capacity by purchasing more hemodialysis machines and CVVHD machines, however these supplies are in high demand. The major limiting factor is the number rooms with hemodialysis plumbing on the COVID19 cohort floors and the number of hemodialysis nursing staff available, as these individualize treatments in the patient's room require one-to-one nursing. A potential future option in the AKI patients is to provide acute peritoneal dialysis, however we have not implemented this yet.

Montefiore Nephrology Service Census for COVID-19 confirmed cases

As of March 20, the Montefiore Medical Center inpatient Nephrology Services have cared for 20 COVID-19 confirmed patients, 7 were ESKD hemodialysis patients (5 receiving hemodialysis in their room bedside and 2 receiving CVVHD in the intensive care unit) and 13 are AKI patients (6 have not required renal replacement therapy, 5 receiving CVVHD in the intensive care unit and 2 receiving hemodialysis in the intensive care unit). One of the ICU patients died after withdrawal of care, and one AKI patient died.

Discharge planning for COVID-19 or PUI patients

Discharge planning for hospitalized confirmed COVID-19 or PUI hemodialysis patients requires appropriate planning and allocation to the outpatient facility, as described above. As described previously, the CDC has provided recommended guidelines for transport of a PUI or COVID19 documented patient to an outpatient hemodialysis (5). The local department of health must monitor every COVID-19 confirmed patient, perform an evaluation of residence and provide PPE for cohabitants before discharge. The New York City Department of Health does not require a negative COVID19 test to discharge a patient from a health care facility. As per the NYC Department of Health, after discharge a confirmed COVID-19 or PUI patients should self-isolate and remind their household contacts to self-monitor (6). Self-isolation for persons who are not hospitalized and COVID-19 or PUI is recommended for 7 days following onset of illness and 72 hours after being consistently afebrile (without antipyretics) with resolving respiratory symptoms as per the NYC Department of Health (6). If discharge prior to this self-isolation period, it is

recommended that COVID-19 confirmed patients and PUIs may dialyze at an allocated "COVID-19 facility", providing that they dialyze on different days than and those outpatient hemodialysis patients who are confirmed COVID-19. The duration required for placing a discharged PUI or COVID-19 confirmed patient at a COVID-19 outpatient hemodialysis facility may need to be for a longer period. Future guidelines are needed as to timing of patient discharge from a COVID-19 hemodialysis facility to their home facility, and should consider the utility of requiring a negative COVID-19 viral test result, when testing becomes more widely available.

Disclosures

The authors have nothing to disclose.

Author Contributions

M. Mokrzycki: Conceptualization; Writing - original draft

M. Coco: Data curation; Writing - original draft

References

1. https://www.health.ny.gov. Novel coronavirus (COVID-19) March 17, 2020
2. https://www.asn-online.org/ntds/
3. https://www.cdc.gov/coronavirus/2019-ncov/healthcare-facilities/dialysis.html
4. https://www.asn-online.org/ntds/resources/Webcast_2020_03_11_COVID-19.mp4
5. https://www.cdc.gov/coronavirus/2019-ncov/hcp/guidance-for-ems.html
6. https://www1.nyc.gov/assets/doh/downloads/pdf/han/alert/2020/covid-19-03152020.pdf

	March 3, 2020	March 7, 2020	March 17, 2020
All COVID-19 confirmed patients in Westchester and New York City	2	82	1,024
Affected geographical areas	International travel to affected geographic areas within 14 days • China • Iran • Italy • Japan • South Korea	National geographical areas • New Rochelle and New York City • Washington State	Global spread Now largely community transmission without known exposure
Sampling of specimens	• Upper respiratory nasopharyngeal swab and oropharyngeal swab • Sputum if productive cough • BAL or tracheal aspirate		Recommendation revised: A single upper respiratory nasopharyngeal swab
Lab testing locations	Ship overnight to CDC or New York State Department of Health Restricted testing hospitalized patients with severe symptoms only After negative influenza and respiratory viral panel	More local and commercial labs begin testing, but still very limited	
Mask and isolation recommendations	N95 mask or respirator Airborne isolation	Facemasks are an acceptable alternative due to limited availability of N95 masks (unless aerosolized procedure planned) Droplet isolation	
Policies specific for outpatient hemodialysis location	Dialysis should not occur in an outpatient facility for a PUI unless an airborne isolation room (AIIR) is available, preferably in an acute care	Dialysis for PUIs may occur in outpatient hemodialysis facilities • Maintain at least 6 feet of separation between masked, symptomatic PUIs and other patients in	

	hospital in an AIIR at this time	waiting areas and during dialysis treatment. • Ideally, dialyze symptomatic PUIs in a separate room with the door closed. Hepatitis B isolation rooms should only be used if: 1) The patient is hepatitis B surface antigen positive or 2) The facility has no patients on the census with hepatitis B infection who would require treatment in the isolation room. • If a separate room is not available, the masked PUI should be treated at a corner or end-of-row station, away from the main flow of traffic and separated by at least 6 feet from the nearest patient (in all directions). Cohorting symptomatic PUIs and COVID confirmed HD patients and the HCP caring for them together • In the section of the unit and/or on the same shift (the last shift of the day) separating symptomatic PUIs from COVID-19 confirmed cases by day Cohort into a designated COVID-19 facility
EMS Transportation of PUI or COVID-19 patient to health care facilities	• Recommendations are for EMS workers trained in infection control and use of PPE. a. <u>No information exists for non EMS staff.</u> b. Use full PPE (N95 or facemask, eye protection, gowns, gloves) • Notify facility in advance so infection control measures may be taken prior to arrival • Patient should wear a facemask and be separated as much as possible • Family members and contacts should not ride if possible. If riding in vehicle, they should wear a mask • When possible, isolate the driver from patient compartment and close windows. Ventilation should be non-recirculated mode • If vehicle without an isolated driver compartment, outside air ventilation must be implemented •	
Patient screening and use of facemasks	Prior to arrival Patients with fever or respiratory symptoms advised to call ahead to facility or	Patients call ahead to facility or physician to prepare and triage in the facility Infection prevention manager assists staff with

	physician to prepare and triage (possibly to an acute hospital setting)	patient screening • Goal is to keep patients out of the acute hospital setting if medically stable and can be dialyzed as outpatient	
	Patients who have arrived to facility Patients with symptoms should put on a facemask at check in	All patients are required to wear a mask regardless of symptoms	
Essential visitors	Limit visitors to essential visitors Facemask not required unless respiratory symptoms		All essential visitors are now screened and must wear a mask while in facility (LDO policy)
Health care providers **Facemask use**	HCPs required to wear a face mask • during catheter connection and disconnection or • when caring for a PUI or COVID-19+ patient* * until the supply of N95 masks is restored		All HCPs are required to wear a facemask* at all times while in facility (LDO policy) * until the supply of N95 masks is restored
PPE use **Eye protection** **Disposable gown and non-sterile gloves**	HCPs required to use full PPE • during catheter connection and disconnection or • when caring for a PUI or COVID-19+ patient and • change PPE between PUI or COVID-19 patients		HCPs providing direct patient care are now required to use full PPE from the first patient interaction in the waiting room to the treatment floor • Remove PPE, except facemask prior to entering medication room • Don new PPE upon leaving medication room (LDO policy)

Table 1. Timeline and evolution of COVID-19 outpatient hemodialysis management recommendations (CDC) and policy changes (CDC and LDOs) for Montefiore- affiliated facilities. LDO, large dialysis organizations DaVita Kidney Care and Fresenius Kidney Care. PPE, personal protective equipment. PUI, persons under investigation. EMS: emergency medical services. HCP: health care provider

Figure 1.Management of ESKD COVID-19 and PUI in the emergency department