PRACTICAL REPORT

Protecting the patient with lung transplant during the COVID-19 pandemic in New York City, USA

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Abstract

When the novel coronavirus began spreading rapidly in New York City, pulmonary transplant patients were considered as one of the highest medically vulnerable patient populations. It became a priority to devise a plan to safely provide quality care to patients, with as minimal exposure to the outside world as possible. Utilizing a telemedicine system that was already in place, the program was able to be expanded to include all of our 77 transplanted patients who would track their vital signs and spirometry at home twice daily, while also having telemedicine visits with recent blood work with a member of our team. This allowed other team members to provide care to COVID-19 patients who were hospitalized and mechanically ventilated.

Aim: This paper aims to demonstrate one way a successful pulmonary transplant program kept all patients safe from the novel coronavirus and demonstrates the success of social distancing and quarantining in an extremely vulnerable population.

Methods and Results: There were three main components that led to the success of this program during the first 10 weeks of the pandemic: (1) dividing our team to promote social distancing; (2) quarantining all patients and families; and (3) using the already-in-place home monitoring devices to monitor vital signs twice daily for all patients. This frequent monitoring allowed us to track trends and provide treatment with as minimal exposure to the outside world as possible.

Conclusion: Early quarantine and early adaptation of utilizing telemedicine helped promote positive outcomes and decreased hospitalizations.

Key words: COVID-19, medically vulnerable, telemedicine, transplant

INTRODUCTION

In late 2019, a flu-like illness began spreading rapidly throughout Wuhan, China, causing severe pneumonias with a high mortality rate. This illness would come to be identified as a novel coronavirus, later named COVID-19. As the new virus began to spread throughout the world, an international pandemic followed. This pandemic is different from others in the past because of its virulence and how fast it spreads. This disease also is unique because now we have the use of new technologies

that can trace and treat patients diagnosed with the virus. This practical report examines a pulmonary transplant program and its use of telemedicine at a medical center located in what became the epicenter of cases in the United States, New York City. It involves examination of patients over an 10-week period.

Even though telemedicine has been around for many years, one news source recently reported that “the COVID-19 pandemic has accelerated the use of telemedicine to the forefront of the hard-hit health-care industry”.¹ By definition, telemedicine involves the remote delivery of health care and information “through HIPAA-compliant technology,” meaning encrypted technology private only to the patient and the health care provider. It is a means by which patients can actually see and talk with physicians and other healthcare personnel from their homes, thereby eliminating exposure to diseases.²

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By spring of 2020, there were 204,111 confirmed cases with 20,795 deaths in New York City, which is comprised of Queens, Kings (Brooklyn), New York (Manhattan), Bronx and Richmond (Staten Island) counties. As more data amassed, patterns emerged that revealed higher mortality rates in individuals older than age 60 years, or those with a history of obesity and/or underlying comorbidities such as cardiac or pulmonary disease or immunosuppression.³ In terms of lung transplant programs, this equates to all of the patients on our service. Our transplant team consists of three attending pulmonary critical care physicians, three nurse practitioners, two medical secretaries, and two surgeons. We created an action plan in order to best assist and care for our patients through this pandemic.

Prior to the outbreak of COVID-19, our team had been using telemedicine to widen our availability in the region and to make our program more convenient for patients who do not live geographically close to a lung transplant program. Our home monitoring system allowed us to maintain our patients' current and active baseline values for evaluation after they returned home from their transplant hospitalization. This involved partnering with an information technology team and setting up medical devices connected to Bluetooth, which integrated directly into both the application for review and our electronic medical record via the patient's telephone. These devices included basic vital sign monitoring as well as home spirometry, a way to measure lung function, specifically the amount of air inhaled and exhaled over time. By using these systems, we were already prepared to expand our work once the pandemic spread. We worked to maximize isolation, maintain basic care, and prevent spread of disease among our patients and the community. By using a variety of skills, including critical care medicine, outpatient management, telemedicine, and home monitoring, we collectively devised systems to maintain care across the spectrum of lung transplantation, as well as to contribute to the improved outcomes of those suffering from COVID-19.

METHODS AND DISCUSSION

With the knowledge that the pandemic was quickly reaching New York City, our team split into three groups to best protect our patients. The week of March 9, 2020, we formed three teams, each consisting of a nurse practitioner and a pulmonary critical care attending physician: an outpatient team; an inpatient team; and a COVID-19 team. The first task for the outpatient team was to make telephone calls to our patients who had

previously undergone transplantation in order to educate them on the novel coronavirus and the importance of a strict quarantine for themselves and their families. This isolation involved both patients and family members making only essential grocery store and pharmacy trips and wearing a mask in public at all times.

The inpatient team continued to take care of the remaining hospitalized patients who had had more recent transplants and assisted them to become competent in their understanding of new medications and how to take them. It was important that patients take this responsibility, because visitors were not allowed in the building, as per institutional policy. At this time, the COVID team was not deployed into any hospital COVID unit, but they continued to do telemedicine consults, organize the existing transplant service, and research this new and strange disease to further understand its presentation and treatment methods.

This all changed the following week, March 16–23, 2020, when New York City became the epicenter of the global pandemic. The patients on the United Network for Organ Sharing (UNOS) national transplant waiting list received telephone calls notifying them that they would be made inactive (not able to receive organ offers) until the hospital was able to safely perform transplants again. The inpatient team quickly discharged the remaining patients, all of whom were on immunosuppressant therapy to prevent organ rejection, to their families with weekly telemedicine visits and phlebotomists, who would travel to their homes to get lab samples, for the first several weeks as per our standard of care. The outpatient team provided care to 77 transplanted patients and many of the pre-transplant consults via telemedicine starting on March 23rd.

We began conducting meaningful telemedicine visits for all patients by utilizing the home lab work, home monitoring via the phone application, and video technology. Due to our telemedicine infrastructure already being in place prior to the pandemic, we were able to determine that three of our patients exhibited the major symptoms of COVID-19: shortness of breath, loss of taste or smell, new onset cough and fevers. Thus, of all the patients with pulmonary transplants, three tested positive for COVID-19. The three patients were at home with symptoms and we were able to coordinate nasal pharyngeal swabs at our home institution testing site for them. The patients provided their own transportation to receive their nasal swab. They were then instructed to return home and self-quarantine, along with anyone else they may live with until the results were released. Two of these patients did ultimately require hospitalization

several days after their positive COVID-19 test, yet none were intubated or required the use of a ventilator. Only one patient required oxygen via nasal cannula at a maximum of 4 Liters/minute. Several other patients and their families exhibited minor symptoms that were discussed at telemedicine visits, but it was decided that because their symptoms were milder, a test was not needed and they could continue to self-quarantine and contact our office if symptoms progressed. All three patients who tested positive via nasal pharyngeal swab were also prescribed a combination of the anti-bacterial medicine, azithromycin, and the anti-malaria drug, hydroxychloroquine, to take while self-quarantining at home. At that particular time, the latter medication had not been officially approved for treating COVID-19, but many doctors considered it a promising treatment for virus. The courses of these medications continued for the two patients that were ultimately hospitalized.

Another protocol our transplant institution created was to have the transplant infectious disease nurse practitioner call every COVID-19-positive patient who received a transplant from our institution (including heart, kidney, liver, and pancreas organs) for a duration of 14 days. She listened to the patient's history and provided symptom management as well as general guidance to these patients via telemedicine daily. She communicated directly with our outpatient pulmonary transplant team regarding the symptoms the patients were experiencing. All of our providers, regardless of what team they were assigned during the pandemic, continued their on-call shifts during nights and on weekends, so our patients had constant access to a specialty provider via telephone if necessary.

Bringing the focus to the outpatient team, the attending physician and nurse practitioner were able to provide telemedicine for all 77 patients throughout the peak days of the pandemic. They built on practices they had already established; prior to the pandemic, our team had practiced telemedicine weekly for patients who traveled long distances to receive their lung transplant at our institution. Once protocols were set for the pandemic, at the time of discharge, all of our patients received a scale to assess their daily weight and fluid status, and a blood pressure cuff to help monitor their blood pressure and heart rate. Provision of a basic spirometer allowed our provider team to monitor vulnerable patients' lung functions at home, because pulmonary function tests were unavailable due to the pandemic. We utilized the spirometer at home because it helped us to diagnose infections and rejection early. Due to the nature of our patient's chronic lung diseases, the patients all previously

had their own pulse oximeters. Combining all of these tools and an application for smart phones that consolidated all health information allowed us to remotely monitor the patients on a daily basis. During the pandemic, we instructed patients to provide their vital signs and other data twice daily. If the patient tested positive for the virus, they had to take their vital signs four times daily.

One of the major hurdles for the outpatient team was getting reliable blood work from the patients when medically appropriate. Prior to the pandemic, our patients were up-to-date on lab work, with a few patients needing minor medication adjustments due to changes in glomerular filtration rates, the occasional drug-induced neutropenia, and varying tacrolimus levels (the level of the immunosuppression medication in the patients' blood that prevents rejection of their donated organ). Due to prolonged quarantine and the frequent need for blood work, however, we used a staggered approach for setting up routine home laboratory procedures so as not to overwhelm the home laboratory company. In the beginning, the patients who had acute issues were the first to be set up for home laboratory procedures. As the pandemic persisted, routine laboratory samples were drawn a week prior to the patient's telemedicine visit, so medications could be adjusted accordingly and proper symptom management could take place. For more than 6 weeks, the patients had telemedicine appointments at the same interval they would need a face-to-face visit. We deferred the physical examination given the nature of telemedicine; however, we did use the phone's camera.

RESULTS

At the time of publication, the pulmonary transplant program at our institution, one that houses highly vulnerable patients, did not have any deaths due to COVID-19. Due to the fact that we are a large transplant volume center, we believe our quarantining protocol that began prior to state and city orders helped keep the majority of our patients symptom- and sickness-free. This is in concert with historical data, which showed that isolation interventions that start early reduce mortality rates from epidemics.⁴ Dividing our team and maintaining social distancing early on very likely contributed to our positive results. These measures should be considered for inclusion as companion measures when developing effective medication regimens for treatment. Overall, more information is needed to determine what specific measures kept our patients the safest.

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