

Global Transplantation COVID Report March 2020

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The COVID-19 pandemic has hit the entire world in an almost unprecedented way. The crisis has spread rapidly, disease burden and casualties continue to rise, and the impact of the crisis is spreading through developing countries. Social distancing, travel restrictions, and intensified testing have improved the rate of the rise in new cases in some regions; however, it remains unclear when normality will return. Mechanisms of the disease remain largely unclear; treatment, if available, is mostly supportive. As during times of war, the challenges of the coronavirus crisis change our views in almost any aspect.

Transplant patients and those with end-stage organ failure are in a particular vulnerable position. Elective surgeries including live donor transplant procedures have paused in many countries. Deceased donor transplants, where the procedure is established, continue in some countries, albeit with modified donor and recipient criteria, in an attempt to reduce the risk of COVID transmission or an infection after transplantation. Those who are immunocompromised are probably at increased risk of severe disease, though the role of immunosuppression is debated and uncertain.

Communication of knowledge is a critical component of the current crisis. Responses, experiences, and outcomes have been different around the world as different countries and regions experience different impacts and different rates of infection and death. Sharing how others have coped in practice will assist in planning and managing this most stressful and challenging situation for patients and health workers alike.

As a transplant community, many are currently engaged in optimizing our immediate responses. With our actions largely based on epidemiological assessments, there is a critical lack of data on the consequences of COVID on transplant patients or those with end-stage organ disease. This report is designed to assist in understanding the approaches taken in other countries and different phases of the epidemic. There are new opportunities coming to the

forefront in these otherwise gloomy days: virtual meetings, clinical visits, increased use of electronic communication, and improved remote monitoring may very well be one of the beneficial legacies of this crisis and our responses.

Editors and contributors to *Transplantation* have shared their thoughts on how they are dealing with the current crisis. While we understand that the information of today may be quite different tomorrow in this fast-moving pandemic, this report will open our forum of an international exchange on COVID for the transplant community.

AUSTRALIA

Acute transplantation activity has substantively reduced nationally. Living donor kidney transplantation has stopped for the past few days, and deceased donor transplantation, which was being assessed on a case-by-case basis, has also stopped entirely for a period, depending on hospital Intensive Care and Emergency Department capacity. All deceased donors have required COVID testing, but the number of deceased donors has dropped dramatically. We have also slowed down all elective surgery, endoscopies, and bronchoscopies, as well as auxiliary and allied health services. The government has today banned all non-urgent elective surgery.

We are committed to ensure the safety and well-being of our transplant recipients, and as a clinical group, we have decided it would be inappropriate to subject high-risk patients to intensive immunosuppression during the COVID-19 pandemic. Reduced expert staff availability and a limited supply of Personal Protective Equipment availability are additional concerns for frontline clinical staff.

Chronic transplant recipients are being distributed to consultants' private clinics as well as using telehealth and "apps" for consultations. Laboratory tests are being done outside the hospitals in private pathology laboratories. Clinic rooms have been converted into COVID screening rooms for at-risk and exposed immunosuppressed patients. Transplant recipients are encouraged to use telehealth for their regular clinic visits. A service, while useful for the young and IT literate, is extremely difficult for patients with culturally and linguistically diverse backgrounds. New challenges include broadband availability and connectivity, the lack of personal interactions, difficulty in directly engaging patients and their caregivers, and

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inability to perform a full physical examination, and the acceptance and willingness to conduct a telehealth conference varies substantially between patients.

Our trial-based activity and clinical research have also been affected. We have stopped all trial recruitments and only conduct clinically relevant patient follow-up in trials when necessary.

CANADA, MONTREAL

We have stopped living donor kidney transplantation and are not accepting offers of deceased donor kidneys for recipients >70 years unless they are highly sensitized. All deceased donor kidney offers have been assessed on a case-by-case basis to assess individual risk/benefits for a transplant at this time, but we have now put a hold on transplants. We are planning to reassess that decision in 2 weeks. All donors must be tested for COVID-19 PCR before transplantation. All recipients have been screened by phone by the transplant nephrologist on-call about travel history and fever and respiratory symptoms, but we have not tested the recipients for COVID-19 PCR.

Our goal in clinic follow-up is to reduce clinic visits and maximize blood testing as needed by time posttransplant (<1 month, continue current clinic follow-up; 1–4 months, blood tests 2 weekly with reassessment clinic only on a case-by-case need; 4–6 months, clinic visit monthly; >6 months, delay clinic by 1 month and reduce laboratory tests). We are aiming to ensure that all blood tests are taken at home for patients >70 years. Transplant coordinators will call patients at home and document their clinical status, BP, heart rate, and weight; this will be followed by the nephrologist via telephone to review the laboratory tests to assess overall management and medications.

CANADA, TORONTO

Since March 16, 2020, the 2 adult kidney transplant programs in Toronto, Canada, have suspended living donor kidney transplants and all new or ongoing workups to reduce the risk of COVID-19 exposure among recipient and donor candidates. Similarly, deceased donor kidney transplants and workups have been placed on pause except for patients currently active on the waiting list who have been deemed medically urgent (eg, terminal vascular access) or those with cPRA >99% whose access to kidneys is already very limited. The pancreas transplant program has followed a similar strategy to kidney.

The lung transplant program has been suspended to free up beds for critical patients with COVID-19, and this is being regularly reevaluated. Lung transplants in rapidly deteriorating patients continue to be considered on a case-by-case basis. Liver transplantation from deceased donors remains active, with DCD being restricted to donors <35 years of age. Living liver donor transplantation continues but targets patients with increased acuity. Heart transplants continue to be performed in patients at the highest risk of mortality, while small bowel transplants have been placed on hold.

For deceased donors, we have developed a clinical screening tool in conjunction with our organ procurement organization. In addition, all deceased donors evaluated by the province's organ donation organization are undergoing screening with NAT for COVID-19 on both

nasopharyngeal swabs and endotracheal aspirates and/or BAL specimens. All recipients are also being tested for COVID-19 by NP swab in advance of their intended transplant. Test turn-around times are approximately 6–8 hours. When possible, recipient COVID-19 testing results are ascertained before transplantation. There is a decline in donor volumes, and this may become a greater issue as critical care units become more overwhelmed with COVID-19.

Patient traffic in the transplant clinics has been reduced by 75%, with much of the follow-up now being done virtually via the local telemedicine network. For transplant recipients with confirmed or suspected COVID-19, our transplant infectious diseases service advises on the need for investigational therapies.

CHINA, WUHAN

Compared with a total number of 67000 cases of COVID-19 in the Hubei Province, only a total of 22 cases were confirmed in organ transplant recipients. There were 19 kidney and 3 liver transplant patients diagnosed since the day of Wuhan's closure on January 23. We believe this is largely due to years of health follow-up education for transplant recipients. Transplant patients have a better sense of self-protection, especially wearing masks during intense influenza seasons. This provides additional evidence that transplant patients can protect themselves from infection with SARS-COV-2 using distancing, masking, hand washing, and self-isolating measures, although their immunity is lower than normal.

Treatment of COVID-19–positive transplant patients was undertaken by reduction or discontinuation of immunosuppression, combined with strengthened supportive treatment according to the severity of lung lesion in patients. According to Chinese national COVID-19 treatment guidelines and our experience in the treatment of cytomegalovirus pneumonia, we made use of low-dose methylprednisolone. One of the 22 transplant patients died; the others have recovered and been discharged. After summarizing our actual treatment results in time, we immediately prepared and published new guidance on organ transplantation during the COVID-19 epidemic and communicated with the colleagues from Chinese Organ Transplant Society through several remote video conferences, which provided guidance for the prevention and control of SARS-COV-2 infection in organ transplant recipients in other regions effectively.

In the epidemic area, the follow-up of transplant patients has been greatly affected due to the lockdown on the movement of people. To avoid the risk of cross-infection, we consult and deal with simple clinical problems using the hospital online outpatient consultation platform. In cooperation with courier companies, the blood samples of transplant patients were sent to the transplant centers for CNI concentration detection to allow us to guide the patients with the dosage adjustment of immunosuppressants remotely.

In the epidemic area, organ donation had stopped due to the blockage of Wuhan and risk of potential infection as well as the heavy treatment pressure in ICU. At present, the epidemic situation in Wuhan, China, has been basically controlled, and social life is gradually recovering with an

emergence of new potential donors. Moreover, we are working on the protocols for evaluation and determination of organ donation of organs to ensure the safety of recipients and medical workers.

No organ transplant surgery was performed during the COVID-19 epidemic, even living donor organ transplantation between relatives, because we have been concerned about the risk of infection and we did not have sufficient medical resources. We now hope that the work of transplantation can recover gradually without the risk of infection in all donors, patients, and our medical staff following the passing of the epidemic situation.

DENMARK

The first confirmed case of COVID-19 in Denmark was on February 27 from a skiing holiday in Northern Italy; since then it has grown to 1724 on March 25, with 350 in hospital and 87 in intensive care, and 34 have died. Initially most patients were believed to have been infected abroad; the majority are now acquiring the disease in Denmark. To prevent rapid spread, there are border closures, closing of schools, universities, and nonessential public work functions, a ban on any public or private event involving >10 people, closure of restaurants, bars, cafes, shopping centers, hair salons, and similar businesses, and an extensive set of guidelines for the public to avoid spreading of the disease.

Preparations have been made by national and regional health authorities to accommodate the expected number of patients requiring admission and intensive care, including temporary cessation of all nonessential treatments and interventions. Shortage of ventilators, personal protective equipment, and SARS-Co-2 test reagents are all of concern.

National health authorities have defined transplantations of vital organs as treatments that should not be postponed or canceled. Deceased donor kidney, liver, lung, and heart transplantations are being continued at all Danish centers performing these. Combined kidney-pancreas transplantation has been paused. Organ exchange within the Scandinavian deceased donor exchange program is maintained at present. The number of deceased donors currently appears to be stable. All potential deceased donors are tested for SARS-Co-2, and to date, no donor has tested positive. Scheduled living donor kidney transplants will proceed at some kidney renal transplant centers, while others have canceled these. No new living donor kidney transplantations are scheduled. A planned match run within the Scandinavian living donor kidney paired donation program has been canceled. All kidney transplant centers have converted almost all follow-ups to telephone visits. Locally, standard letters have been offered to kidney transplant patients to inform their employers of their risk status. There are reports of COVID-19–infected transplant recipients; however, none of these are thought to be among the dead.

ENGLAND, LONDON

The liver transplant program normally undertakes 250 liver transplants per year and currently has 150 patients on the waiting list. The events are changing rapidly by day. Currently, there are 60 COVID-19–positive patients in general intensive care, 35 ventilated. The general theaters

have been converted to intensive care beds with the view of increasing numbers of infected patients requiring ITU management. Specialized theaters and Hepatobiliary, Cardiothoracic, Orthopedic, and Neurosurgical theaters are covering general surgery emergencies. With increasing numbers of staff testing positive or in self-isolation, many transplant medical personnel will be helping in intensive care and all clinical academics have been asked to stop research activity and return to full-time clinical work. Surgeons will also be trained in intensive care management.

Patients with acute liver failure are still listed and transplanted. We are still proceeding with routine transplantation; however, we believe that it may slow because of an increasing number of COVID-19–positive donors and a lack of intensive care beds. The 16 dedicated liver intensive care beds are increasingly given over to serve general intensive care needs. Admissions for routine transplant assessment have been canceled. Pediatric liver transplant activity may be transferred to another “clean” site; however, it will continue for now. All elective adult and pediatric living donor liver transplants (LDLTs) have been canceled. We are still providing the National Organ Retrieval Service 24-hour on-call team for retrievals, but the number of donors has been declining partly because of COVID-19 positivity. There are no plans to decrease or cease retrieval activities.

All elective posttransplant surgical cases have been canceled or postponed. Most of the chronic patients have been managed with virtual clinics and their medications sent to them by post. Primary care physicians are repeating blood tests and seeing patients when required. The UK government has just published guidelines including transplant patients among the extremely vulnerable from COVID-19 and recommended isolation for 12 weeks. Currently, we are in discussion on the matter of providing bloods and support to patients’ homes. All transplant patients have access to 24-hour online support.

FRANCE, PARIS, LIVER

The burden of COVID-19 infection in France is lower than in Italy, but as of March 24 almost 20 000 infected patients have been identified and 860 died, including 5 doctors. The number of infected patients is growing exponentially, but there are disparities between different regions in the country with a higher prevalence in the east of France and a lower prevalence in the west. The government has declared lockdown in the whole country.

The hospitals’ priority is to create units for patients with COVID-19 infection and educate physicians, nurses, and all caregivers on how to manage these patients and protect themselves. In Paris, about 1000 intensive care beds are available that we are trying to double. Nonurgent medical care and elective surgery have been canceled in all hospitals. To date, the number of medical staff tested positive is relatively limited, but 3 physicians died during the last 48 hours.

The national regulatory authority “Agence de la Biomédecine” has decided to continue organ procurement including DCD donors. All donors have to be tested for COVID-19. Because organs are scarce and many patients are at risk of dying on the waiting list, we have decided to continue the program of liver transplantation. However,

intensivists will be massively involved by the management of ICU patients with COVID-19 infection, and it can be anticipated that the number of donors will decrease in the next weeks. A dedicated COVID-free ICU where transplant recipients can be admitted may be 1 solution. The ward where liver transplant recipients are transferred or admitted is also COVID free. Only the sickest patients are still active on the waiting list. Several liver transplant recipients have been tested positive in recent days and infection had a benign course except in 1 relatively old patient with comorbidities who had to be transferred to the ICU with severe pneumonia. Chronic transplant patient on site clinics have been canceled to limit traveling and avoid infection risk. Unfortunately, no dedicated telemedicine system exists in France.

FRANCE, PARIS, KIDNEY

To prevent transplant patients coming to the transplant center, clinics are undertaken through the phone and we have created a file of all 2300 follow-up patients to send them information and new follow-up processes. The role of doctors has been modified to allow each of us to take care of a specific phase of care. Kidney transplantation with deceased and living donors has stopped until further notice. When transplant patients suspected of infection come to the hospital, they are seen in the infectious disease unit, tested by PCR, and then allocated to a COVID-19–positive hospital since ours has been designated COVID negative. In less than a week, 11 patients are positive, 10 tests are awaited, 3 patients are in intensive care, and 2 are in a very bad situation. With COVID-19–positive patients, we stop MMF and mTOR inhibitors. In patients with ARDS, we also stop tacrolimus so patients remain only on steroids. We call each positive patient every day to monitor progress. The important clinical symptoms include anosmia and ageusia. CT scanning is critical to evaluate severity and oximetry to regulate O₂ therapy.

FRANCE, STRASBOURG

All acute living and deceased donor kidney transplantation activity has totally stopped from March 9, 2020, and most of the outpatients are contacted and managed through video or teleconference. A Crisis Coordination Committee involving the manager of each medical unit helps manage the hospital on a day-to-day basis with a daily video conference. Patients are being separated into COVID-19–positive and COVID-19–negative groups when hospitalization is necessary. Medical staff are also separated into dual on-call teams on the nephrology ward, 1 for positive patients and 1 for negative.

The telephone is the most important communication tool with the patients both inside and outside the hospital, with lists of the phone numbers of patients' rooms communicated to the medical and nurse staff. Collection of functional signs, interrogation of the patient, and questions and explanations of the clinical situation as well as provision of information for the patient are all undertaken by phone. We have limited the number of doctors in contact with patients. A doctor assesses the respiratory frequency and signs of respiratory distress and performs clinical examination if necessary but retains the same mask and glasses all morning. Phone communication occurs between junior

and senior doctors to avoid contact. There is no sharing of computers and evaluation of diets, provision of physiotherapy advice, and psychological support of patients and families are all through the phone.

It is important to keep the COVID-19–positive staff team with masks and protected by distance and specific procedures to prevent contagiousness. It is a rapidly evolving and very tense situation requiring transfer to ICU, sedation, and high death rates with essentially no guidelines and little or no basic evidence.

GERMANY

Throughout Germany, living kidney donor transplant procedures are mostly being postponed. Cadaveric transplantation activities are being performed as normal for the time being. Testing for COVID-19 will be performed on cadaveric donors, but the results will generally not be used to determine if the organ is transplanted; the testing is for the purpose of recording whether the donor was positive or negative for the virus.

Standard follow-up visits for transplant recipients will be kept to a minimum, but a higher density of visits will be maintained at our institution for patients with problems or those in the early period after transplantation. Where possible with regard to long-term care, patients will be contacted by telephone, or some sites have the capability of conducting video conferencing with patients; some of these systems will be provided free of charge during the coronavirus pandemic situation.

Some additional specific actions are relevant for liver transplantation. High urgency children at our institution are currently planned to receive either deceased or LDLTs without major restrictions. For adults on the waiting list, normal demands for recertification of, for example, MELD score will be eased, and the details surrounding this issue are under continuous discussion. Deceased donor liver transplants will still be performed in lower urgency situations on a case-by-case basis, depending on the COVID-19 burden on the system at the time. As with all hospitals at the current time, we are preparing for the expected rapid influx of patients, which might require reprioritization as necessary.

Transport of organs across country borders remains active with only some restrictions. The transplantation society in collaboration with other medical societies plans to establish a COVID-19 transplantation registry as part of a larger existing database.

HONG KONG

As of March 25, 2020, there have been 410 cases of COVID-19 in Hong Kong with a population of just under 8 million. Since the first outbreak in January 2020, we saw an initial surge in the number of infections by mid-February 2020 after the Chinese New Year, followed by a rapid decline in the number of cases from late February to early March (averaging 2–3 cases per day). However, with the recent global increase, we have seen a huge influx of returning local residents to Hong Kong. As a result, we are now witnessing a second surge in the number of new cases with over 100 new cases reported just within 1 week.

The liver transplant service at Queen Mary Hospital has seen a 50% reduction in elective LDLTs in response to the hospital's request to optimize the utilization of available

PPE for frontline staff in ICU and isolation wards and to ensure the availability of healthcare providers to fight the infection. LDLT for urgent conditions, however, remained unaffected. On the other hand, deceased donor liver transplantation service was severely affected with an all-time low organ donation rate from brain dead donors and only 2 DDLT occurred in February. Paradoxically, there has been a sharp increment in the number of LDLT, mostly for liver failure. As of today, a total of 12 LDLTs have been performed when compared with 5 LDLTs in the previous year. Both potential living donors and recipients are only screened for COVID infection if they have symptoms or a history of recent travels. For deceased donors, screening is only performed in the presence of clinical symptoms or a recent travel history.

INDIA, NORTH WEST

India took relatively early steps by stopping air traffic with affected countries and limited the inflow of passengers to only returning Indian citizens together with airlifting of stranded Indian citizens in affected countries with COVID-19 testing before travel or on arrival and with strict quarantine.

Initial limitation of kits for testing meant that the test was only offered to the few who were suspected on the basis of symptoms and travel history. Testing is now available in large numbers through private laboratories and a number of private hospitals. We anticipate that the true trend in the number of infected cases will become evident and will assist us to know whether the relatively early intervention by the central government has helped.

There is poor adherence to calls for social distancing, though in the past 2 days more people have come to terms with the likely reality and following social distancing with some seriousness. This is mainly because of the lockdown imposed by government—a near curfew not witnessed before even during the religious riots in 1992. However, domestic trains returning migrants to their hometowns in other states were crowded. All international flights, domestic flights, and long-distance railways have stopped. Interstate transport has stopped. People have been asked to work from home. Government offices are working at 20% capacity. All nonessential services have been stopped, and total lockdown has been ordered.

Hospitals have been asked to treat only emergency cases, and routine outpatient clinics in hospitals have been put on hold. We have moved to online consultation wherever necessary. We are admitting only patients who need urgent attention or those who will potentially worsen without admission. All nonemergent surgeries have been stopped.

Governments particularly in large cities are making huge efforts to take on the situation that will arise with exponential growth in 3 or 4 weeks. In Mumbai, a large hospital with 1200-bed capacity has been earmarked for COVID-19–positive patients. All large private hospitals have been ordered to reserve a certain number of beds for COVID-19 patients. Since the number of known patients is still small, it is too early to understand how things will unfold. We also face hoarding. For example, a large number of N95 masks have been bought by the wealthier members of the general public, leaving a huge deficit preventing protection of healthcare workers. As reports of the possible benefit of

chloroquine and hydroxychloroquine started circulating, hydroxychloroquine ran out of stock in most pharmacies.

Live donor transplants have stopped across Mumbai, but each hospital is taking its own decision outside Mumbai as of today. Deceased donor kidney transplants have also stopped in Mumbai and the region. There is no national direction from NOTTO or from the regional body ROTTO to stop deceased donor liver and heart transplants yet.

All nonemergency work is on hold. Chronic care patients are being encouraged to get blood tests done and then connect on the phone by voice or video call to their physician. We have also instituted zero waiting time for transplant patients if they are compelled to visit the hospital. All patients have been asked to keep a minimum 1 month's medicine stock. The Apex Foundation in Mumbai has resolved to support transplant patients running out of money because of loss of job/wages since many are entering a very difficult economic situation.

INDIA, SOUTH

Indians stranded across the world have been evacuated, quarantined, tested, and discharged when negative. Southern states such as Kerala and Tamilnadu have shut down domestic borders; temperature tests are done to screen those in cars and trains, and the Government has just ordered a nationwide lockdown. Schools and universities have been shut down and so are swimming pools, gyms, malls, and movie theaters. Weddings and other public gatherings are banned. There has been an increase in the number of the research laboratories approved for testing for coronavirus. Government directives and guidelines have been released to provide for measures and infrastructure changes to hospitals to tackle the expected explosion in cases coming. Private and public sector hospitals are gearing up with stringent screening measures, emergency room triage areas, and dedicated isolated COVID-19 floors with beds and ICU. Healthcare workers are being trained to work efficiently and safely during the crisis. Any optimism needs to be tempered. The sobering thought that if in fact the low incidence of the disease to date the small number of patients in intensive care and the limited mortality above observed in India to date are wrong, then India with its archaic public health system, one of the lowest per capita ICU bed ratios in the world, lack of adequately trained personnel, and a large impoverished rural and slum population, will hopelessly careen toward a catastrophic health crisis. It will be an economic and social disaster from which India might take decades to recover.

JAPAN

The country is seeing a steadily increasing number of patients each day. Testing capacity is increasing but remains insufficient. The Japanese Society for Transplantation published a guideline on March 6, 2020, aiming to prevent transmission from donors and infection of recipients as well as protect medical professionals.

Japan continues life-saving transplantation with informed consent about the risks for heart, lung, and status 1 liver recipients, but it has been recommended to postpone kidney, pancreas, and bowel transplants. We recommend test screening of those with significant exposure

to COVID-19, travel history to high-risk countries, or with fever and respiratory symptoms. But NAT testing is not mandatory for donors, though preferable. It is recommended that living donors for kidney, lung, and liver transplant stay at home or isolated in hospital for 14 days before the donation to avoid unnecessary exposure. Where testing is available, it is recommended 14 days and 1 day before transplantation in both donors and recipients. Chest CT scans are also recommended before transplantation in donors and recipients.

We recommend education of all transplant patients about general procedures to avoid infection, extended periods between outpatient visits for as long as possible, and prescription of additional drugs to prepare for possible national lockdown. We have recommended preparation of institutional policies on acceptance of transplanted patients with COVID-19 and extensive use of the telephone for follow-up of patients.

SOUTH KOREA

South Korea is one of the earliest countries that experienced COVID-19 outbreak. Up to March 25, 357 896 have been tested and 9137 diagnosed as COVID-19 positive. Detection of new patients peaked at February 28, which was 813 new patients on the day. Since March 12th, the number of new patients has been under 200, so the cumulative growth curve has flattened. Six thousand four hundred fifty-six positive patients were in Daegu City and 1262 patients were in the Kyungpook Province. To date, 131 patients have died, yielding a mortality rate of 1.43%. The early explosion of COVID-19 occurred through a cult religious group—Shincheonji—allowing a focus of COVID-19 screening, which detected affected patients even among asymptomatic people. The heavily affected area of Daegu and Kyungpook has suffered from a shortage of hospital beds. Rigorous testing of 20 000 people a day in 633 sites with positive patient isolation enabled rapid control.

A single living liver donor is COVID-19 positive after liver donation to her mother with both the donor and recipient well. A number of COVID-19–positive solid organ transplant patients are under review in Daegu City.

Some living donor kidney transplants have been postponed, especially if undergoing desensitization for ABO or HLA incompatibility, but urgent living donor kidney transplantation and deceased donor programs have continued. All deceased donors are tested for COVID-19 by screening, while living donation COVID-19 screening has been an individual center decision. The Korean Society for Transplantation released a guideline on March 13th recommending routine COVID-19 screening of both donor and recipient.

Most centers are running daily self-reported symptom surveys of staff at the entrance of the hospital, self-reporting using a mobile phone app.

Symptomatic outpatients are obliged to use different hospital entrances leading to an isolated pathway to a secure outpatient clinic. Symptomatic in-hospital patients are managed in a negative pressure ward and screened for COVID-19. A shortage of ICU beds for deceased donor care has not occurred. A separate set of ICU beds is used for severe COVID-19 pneumonia patients who are transferred to a national or regional hospital qualified for the

COVID care including negative pressure system. However, the shortage of wards and ICU beds in Daegu/Kyungpook where the major outbreak occurred led to mortality among those awaiting admission to hospital.

The Korean Society for Transplantation released guidance statements for COVID-19, among them recommendations for transplanted patients as follows. Recommendations for care of transplant patients have been created by the Korean Society of Infectious Diseases, Korean Network for Organ Sharing, Korea Organ Donation Agency, and transplantation experts.

MONGOLIA, ULAANBAATAR

We postponed living donor transplantations in March, with the exception of 1 liver transplantation at a national cancer center on Friday, March 13th. To prevent transplant patients being at risk from the general public, follow-up of patients is occurring on Saturdays and in clinics isolated from general hospital care. Transplant coordinators are communicating through doctors in the provinces to reduce intercity travel visits, and much consulting is being done through the phone with both primary care doctors and patients. As of today, due to international flight restrictions, we now have very limited supplies of some immunosuppressant drugs.

THE NETHERLANDS

The kidney transplant program of the largest transplant center stopped on March 13, 2020. Since then neither deceased donor nor living donor kidney transplantations have been performed. All living donor transplants have been put on hold, including patients scheduled to undergo blood group ABO-incompatible kidney transplantation already treated with alemtuzumab before the decision to stop acute kidney transplants. The main reason for stopping at present is the perception that immunosuppressed patients may be at increased risk for severe COVID-19. The 6 other Dutch transplant centers have all ceased their living donor kidney transplant activities, while the centers that at present (March 23) face a smaller influx of SARS-CoV-2–infected patients will still transplant deceased donor kidneys.

This policy has been communicated to referring nephrologists and patients via email and social media (www.niertransplantatie.info/). Patients can find information about the latest developments regarding COVID-19 on the website of the Dutch Transplantation Society (www.transplantatiestichting.nl).

At present, only 2 renal transplant patients have been admitted to our hospital because of SARS-CoV-2 infection. The continuation and dose of immunosuppressive drugs is under discussion. Our current strategy is not to change a patient's maintenance immunosuppressive regimen unless life-threatening complications arise.

The liver, lung, and heart transplant programs are still active. However, all 3 programs have noted a remarkable decrease in the number of donors. Fear of SARS-CoV-2 transmission and the limited time of Dutch intensivists to identify and work up potential donors are likely explanations. Another problem, raising a medical-ethical issue, is the current reluctance of some ICU specialists to make beds available for recipients of a liver or thoracic organ

despite the fact that the ICU capacity in the Netherlands is still sufficient today.

The care of transplant recipients in the maintenance phase is ongoing although at a low ebb. Scheduled appointments are postponed or rearranged as consultations by phone or email. Moreover, patients are extremely reluctant to come and visit the outpatient clinic.

This coming week we will likely see a surge in the number of COVID-19 patients, and preparations are thus ongoing through a daily discussion between representatives of all Dutch transplant centers. Yesterday, the Netherlands saw the largest number of patients admitted to hospital in a single day since the start of the outbreak. It is expected that all transplant physicians will participate in the pool of medical specialists that will be redirected to one of the newly formed COVID-19 wards. Three members of our medical staff have been infected with SARS-CoV-2. To lower the risk of transmission among ourselves, all meetings related to patient care are now being conducted via Skype or Zoom.

NEW ZEALAND

As of March 25, 2020, there is limited community transmission of COVID-19 in New Zealand, with most cases related to overseas travel or close contacts of people who have recently returned from overseas. NZ is currently going into “lockdown,” which will see all people isolating at home and only essential businesses including healthcare and food production continuing.

Health services are preparing for a substantial influx of patients, but currently most infected patients are in self-isolation at home. There are few patients in hospitals and intensive care units. All activity that can be has been deferred, including elective surgery, outpatient reviews, and diagnostics.

Deceased donor kidney transplantation continues to be offered at 2 of the 3 transplant centers. This is reviewed daily at each unit, who are making independent decisions about their ongoing ability to support care of recently transplanted patients. Live kidney donor transplantation activity has essentially currently stopped due to limitation on citizen movements, including that of potential donors. Patients who were suspended from the deceased donor waiting list pending kidney exchange transplantation have been reactivated on the deceased donor waiting list where appropriate for their clinical circumstance.

Telehealth and remote monitoring are being used wherever possible, as well as deferral of nonurgent reviews.

SINGAPORE

Singapore took early measures to screen and isolate suspected COVID-19 cases from January 2, 2020. Hospitals were at heightened vigilance setting up multidisciplinary command centers, creating capacity in emergency departments and isolation wards, implementing mandatory “mask up” at healthcare facilities, developing contact tracing teams, and setting up acute respiratory tract infection wards to accommodate patients with respiratory tract infections who would then be screened for COVID-19. Singapore opened the National Centre for Infectious Disease in September 2019, which is a 330-bedded hospital that is equipped to handle highly contagious diseases

like Ebola and SARS. As a result, most of the COVID-19 patients have been admitted to the National Centre for Infectious Disease. By January 23, 2020, Singapore had diagnosed its first confirmed case in a tourist from Wuhan. Restrictions were imposed on the number of visitors in the hospital who had to fill up a declaration form that they are free from COVID-19 risk factors; thermal scanners were set up at hospital entrances with registration of visitors. Elective procedures, including living kidney donor transplants, were postponed, and clinics were downsized or rescheduled. Virtual clinics with remote monitoring have replaced physical interviews, and counseling and home delivery of medications facilitated.

Hospital staff were forbidden to take leave; meetings had to be via video conferencing. Transplant teams were split into smaller teams working separately in different areas. If staff were ill, they were required to report sick to the staff clinic and not elsewhere, for monitoring and contact tracing if required. It was also forbidden for staff to move between hospitals to work so as to avoid cross-hospital infections. Staff who have traveled to high-risk countries were asked to take leaves of absence for 14 days before returning to work but as the global situation worsened overseas travel was forbidden. Routine instructions started being issued twice a day to keep all hospital staff informed on daily policies and procedures. All staff take their temperatures twice a day, practice social distancing, and retrain in the use of personal protection equipment.

We set up our own acute respiratory tract infection ward where renal patients, including kidney transplant recipients, with respiratory complaints were admitted to be screened for COVID-19 while being able to be dialyzed by the bedside without moving them. Physicians from my renal medicine department are rostered to be part of the acute respiratory tract infection renal team to look after patients admitted to the acute respiratory tract infection wards. Nebulized therapies including Pentamidine prophylaxis were discontinued. Patients in the acute respiratory tract infection ward had to have 2 swabs negative for COVID-19 before transferring them to the general ward and allow sufficient bed capacity for incoming new admissions with respiratory symptoms. Up to March 24, 2020, we have had 7 kidney transplant recipients admitted to the acute respiratory tract infection ward, but none have been diagnosed with COVID-19. This is an unusually low number of kidney transplant patients being admitted for respiratory tract infections, and we postulate that our patients are now taking additional precautions themselves by staying at home and self-enforcing hand hygiene discipline. Advisories have been sent to our patients on how to keep safe during this period.

Though an advisory was issued by our Ministry of Health on February 19 that transplant centers could continue to perform living kidney donor transplantation, we have stopped doing living kidney donor transplantation with the exception of 1 patient who was running out of dialysis access options. For this living kidney donor transplant recipient, a throat swab for COVID-19 was performed for both the recipient and her living kidney donor on D-15 and D-2 before kidney transplantation. CXR was also done on admission and on D-2 before surgery to exclude occult pneumonia. Deceased donor kidney transplantation has also been suspended except for patients who

are on the priority waitlist for failing dialysis access or pure red cell aplasia, but we have no such patients on the list. As a result, we have not performed any deceased donor kidney transplantation since the first case of COVID-19 was diagnosed in Singapore. Before this advisory, there were several referrals of potential deceased donors, but we rejected all of them due to respiratory tract infections and travel history. Liver and heart/lung transplantation are permissible as long as they fulfilled certain criteria of medical urgency. To date, 1 liver and lung transplant has been performed from the same deceased donor who underwent PCR testing for COVID-19 thrice and a CT thorax to exclude COVID-19 infection. These recipients are reported to be doing well.

Our transplant program has ring fenced beds for gastroenteritis because of case reports of transplant recipients presenting primarily with diarrhea but with pneumonia on X-ray or becoming COVID-19 positive days later. Transplant recipients with gastroenteritis are required to be screened for COVID-19 PCR. As of March 25, 2020, the hospital has received 29 out of the 509 COVID-19 cases diagnosed in Singapore, but no transplant recipients have tested COVID-19 positive to date. Both organ donation and blood donation have diminished substantially. Morale of the healthcare sector has been enhanced by significant community and ministerial political support.

SOUTH AFRICA

The South African population has varying levels of economic development; however, a large percentage belong to the low- and middle-income population groups. With the onset of COVID-19 in our country, we are especially concerned about the resources available, specifically in the state sector hospitals. Unfortunately, in South Africa, there is a poorly and unevenly structured healthcare service: 85% of our population is depending on the state sector for medical care, but the resources are mostly situated in the private sector. In large parts of the country, we have limited ICU capacity and ventilators and therefore we are currently making contingency plans for critically ill patients. The availability of transplantation services is also constrained by the availability of specialist physicians and surgeons and pathology facilities. Transplant services in the state sector have stopped. In the private sector, there is still capacity for transplant services, but this is limited by a lack of deceased donors. In the Western Cape, most donors come from the state sector hospitals, resulting in a lack of organs available for transplantation. Living donation has come to a complete standstill in South Africa. Deceased transplantation will continue to take place in facilities that have enough staff and infrastructure available. In most state hospitals, this is not possible or feasible due to a lack of deceased donors and healthcare resources. We are currently trying to reduce our outpatient workload and are concentrating on discharging nonurgent cases from the hospital. South Africa is locking down as of March 25, 2020, and nobody will be allowed to travel. All restaurants have been closed, and only essential services are taking place.

South Africa also has some of the highest rates of HIV and TB in the world, which we fear might result in an increased mortality from COVID-19 if the virus spreads widely in our population.

Across the rest of sub-Saharan Africa, in those places where transplantation is active, almost all living donor transplantation has ceased and there is no deceased organ donation. No transplant patients have yet been identified with COVID-19 and logistical problems of clinical follow-up and drug supply are the major issues at present.

SPAIN

When we learned about COVID-19 in China, it seemed like something happening far away that would never reach our homes. Then, we saw it happening in Italy but still could not understand the threat that the disease would become for our country. Isolation measures were decided by the government on March 12th, but it was clearly too late, and the pandemic is hitting our cities to a point that medical care could collapse soon if heroic movements are not made. It is sad to see that other countries are making the same mistakes, waiting for the infection to explode before deciding drastic isolation measures that on the other side could jeopardize their economy. The infection spreads really fast: in <2 weeks, our hospital has changed from not having a single case to needing 50 intensive care beds and we are planning to open still more.

Elective and living donor transplantation has been postponed, and only emergency life-saving transplant procedures continue, but with the difficulty of excluding COVID-19 in both the donor and recipient. We have canceled all nonemergency appointments, laboratory tests, and procedures. We are using telemedicine for most of our patients to avoid hospital visits. Intensive care beds need to be preserved for COVID-19–positive patients, so there are no elective procedures requiring intensive care. We have redirected staff to COVID-positive floors and intensive care units and have hired new staff. Distinctions between specialties have disappeared, and now there are only patients and physicians.

We have changed shifts and created groups of personnel that always work together and do not mix with the other teams to minimize contact. Every episode of fever, even mild fever, is considered a potential COVID patient, and they are always isolated while waiting for test results.

SWITZERLAND

In Switzerland, Ticino, which is close to Lombardy, was the first to be hit hard by COVID described graphically: “We recorded our first local case on the 1 March, in the first week the new cases were coming in slowly, now the gates have opened up and it is like the monsoon season in the rain forest.” It is now apparent that the hardest hit cantons in Switzerland are Geneva and Vaud. The first national case was diagnosed on February 25. Today there are 7726 confirmed cases with 99 fatalities, roughly 50% being in the 3 cantons of Geneva, Vaud, and Ticino, but the wave will undoubtedly move in the northeast direction.

On March 13th, Swisstransplant coordinated with the 6 transplant centers in the country and the Federal Office of Public Health a 6-stage plan to address the progression of the epidemic. The plans stages are (1) stop all live donor transplantation activities; (2) stop all deceased donor pancreas and islet transplants; (3) stop all deceased donor kidney transplants; (4) a selected and tailored approach to urgent status for liver, lung, and heart transplants; (5)

only urgent transplants to be performed; and (6) stop all transplant activities.

To mirror this donor activity continued initially; the second stage requires all DCD programs to stop with DBD programs still active; then a reduction of DBD detection and procurement programs, in coordination with Swisstransplant. DBD detection and procurement would then only be for urgent transplants before all donor detection and procurement is ceased.

Hospitals are making their own decisions on the implementation of the staging with Geneva ahead of the others with my hospital governance's grateful assent; we reached the final stages on March 22 and have in effect discontinued all transplant and procurement activities, urgent cases (eg, fulminant hepatitis) being still considered.

The reason is the exponential increase of COVID patients hospitalized in Geneva University Hospitals, among whom 20% are on a vent in the ICU. Chiefs of division get a situation update 3 times daily. The hospital is working continuously on increasing its regular and ICU bed and ventilator capacity for COVID patients; currently, 74% of the capacity is utilized, but projections suggest that we may have reached full capacity before the end of the week. Most surgical activities have been discontinued. Emergency and oncological surgeries will be performed in private hospitals that have been requisitioned by the state. Geneva University Hospitals is currently the only designated COVID hospital in Geneva, but there are plans to extend this to others as the needs arise.

We still have a few transplant patients hospitalized in a non-COVID wing of the hospital and plan to keep the number of hospitalized patients as low as possible. Most of our outpatient clinics are undertaken by phone unless there is an absolute need to see the patient physically. The hospital has put together a versatile and user-friendly solution for this.

TURKEY, ANKARA

As of today, the number of confirmed cases is 1872 with 44 deaths. Most of the deaths in Turkey to date have been elderly, 2 were age 50–60, 1 was 91, and all the others were older than 61. Schools, universities, mosques, shopping malls, and hairdressers have been temporarily closed and professional sports have been halted as part of measures to contain the virus. The Ministry of Health also announced that cafes, restaurants, pastry shops, and similar workplaces are closed and will only fulfill online orders and takeaway. There are restrictions on supermarkets and banks, and public transport systems are obliged to limit their numbers to a maximum of 50% of their licensed capacity. Turkish citizens who are older than 65 and/or suffer from chronic illnesses are restricted from leaving home or even walking in open areas such as parks and gardens.

The first batch of rapid COVID-19 tests arrived last week. Fifty thousand quick diagnostic kits allowing comprehensive results in 60 minutes arrived today with an additional 300 000 kits arriving this week. All private and foundation hospitals have been announced as pandemic hospitals as of last Friday. At Baskent Ankara Hospital, we have currently assigned 1 floor for COVID-19–positive patients. Transplant surgery and general surgeries, except

for transplants for acute liver failure, as well as cancer and emergency surgery are postponed in all public and private hospitals in Turkey. Detailed information can be reached through following link provided by the Ministry of Health: <https://hsgm.saglik.gov.tr/tr/covid19>.

THE UNITED STATES, NEW YORK

Since last Wednesday, we have had 2 doublings of the volume of COVID-19–positive patients. We now have over 600 COVID-19 inpatients out of a total 4000 beds with many being admitted and about 150 in ICUs. We are testing about 1000 patients per day with 25% positive. We have been directed by the governor to add another 2000 beds into the system by opening up all kinds of rooms to accommodate patients.

We have performed 1 heart, 1 lung, 3 livers, and 5 kidneys in the past week. This is not likely to be sustained; all clinic activities have been virtualized. We have tested 76 patients at our center with some 20 COVID-19–positive results. One lung transplant patient is currently critically ill.

Quite a few of our staff have been exposed, and several are ill with the disease. We have virtualized the inpatient rounds and minimized the team numbers in the hospital at any time.

The operating rooms have been greatly scaled down and each is to be converted to a 2-person intensive care. We are currently experimenting with double ventilation from a single machine in an attempt to double our ICU capacity. Transplants are still considered emergencies, but we are having fewer donors though there are 7 active donor cases right now in the system but that referral to the Organ Procurement Organisation is slowing down as the regional hospitals are becoming overwhelmed.

It appears likely that transplant will be subsumed by the broader public health efforts, depending on the slope of the new cases' curve, but to date we are tracking to projections that we are about 4 weeks away from the peak.

THE UNITED STATES, MIDWEST

COVID-19 arrived here later than other areas of the United States, but preparations are underway for an expected exponential increase. The goal for our response is to reduce risks to transplant candidates, donors, recipients, and providers and also prepare for the expected high influx of patients with suspected and confirmed COVID-19. All elective surgical procedures are on hold. Routine, nonurgent clinic visits are on hold or transitioned to telehealth.

In the past week, a hold has been placed on all living donor transplants initially, anticipating this to continue throughout April but to be reassessed depending on the spread of COVID-19 locally and nationally. Deceased donor transplants are currently ongoing but on a case-by-case basis. New donor and recipient evaluations are on hold for now. Our local organ procurement organization is active and testing all donors for COVID-19. Transplant is considered tier 3b by the centers for Medicare Services and as such can currently proceed, but each program and center must decide on what is in the best interest of their patients.

Chronic care of transplant patients is being transitioned to telehealth if no urgent face-to-face evaluation is needed, using phone calls and video calls. We serve patients of

varying duration from transplant and over a wide geographic area. These patients will be handled based on perceived risk of leaving home to visit a laboratory compared with the risk of missing an important abnormal laboratory result. A laboratory visit for someone in a low prevalence area who can drive to the laboratory and take contact precautions will be much lower than someone in a high prevalence area needing to take public transportation.

Our healthcare providers have or have access to the necessary equipment to conduct clinical video visits, phone visits, and documentation in the electronic health record either on campus or preferably from their own home.

THE UNITED STATES, SOUTH

In the south, we are just starting to see the volume of COVID-19 cases in our hospital spike this week and have instituted a number of steps. We have ceased kidney transplant evaluations and limited liver transplant evaluations to those with high MELD scores. Posttransplant follow-up appointments are being conducted via telemedicine to the maximum extent possible. Scheduled living donor kidney transplants are being postponed. Deceased donor kidney transplant activity continues at a lower level with emphasis on selection of donors not expected to have DGF to minimize the posttransplant hospital stay. Deceased donor liver transplantation continues with all transplant candidates screened for COVID-19 risk before being called in.

The local organ procurement organization is testing all donors for COVID-19 and only referring transplant donors to the recovery center once they have tested negative. External procurement teams are not allowed into the facility using local surgeons for all organ recovery.

THE UNITED STATES, EAST COAST

COVID-19 came recently to Baltimore and is increasing at rates similar to China and Europe despite early adaptation of social distancing and closing restaurants and bars 1 week ago and now all nonessential businesses. As of Sunday (2 days ago), there were 15 patients with COVID-19 admitted to Johns Hopkins. Nine of them are on ventilators. Two patients have been transplant patients. Both have been liver transplant patients.

The Comprehensive Transplant Center has several concerns that are informing policy and approach notably: the risk of transmission from donor to recipient and availability, timing, and accuracy of test results. Because of pressure on beds and workforce, all elective surgeries are canceled and the concern remains that new transplant

patients could occupy beds needed for COVID-19 patients especially in intensive care. In response to these concerns, transplants will proceed only for life saving, including liver transplant recipients with high MELD; heart transplants with high HAS implying that they are already occupying an ICU bed; lung recipients with high LAS; and kidney transplants with 100% PRA, 0 Ag mismatch, to avoid dialysis, vascular access failure, and pediatric patients.

Follow-up of transplanted patients is being modified. We are considering replacing cardiac catheters for dd-cfDNA after heart transplantation. Laboratory tests will be done by home phlebotomy; the frequency will be reduced as much as possible and follow undertaken by coordinators and physicians using telemedicine.

THE UNITED STATES, WEST COAST

The region started “shelter in place” on March 16 with the rest of the state following 5 days later. While there have been clusters of COVID-19 in Santa Clara and Los Angeles, San Francisco has seen relatively few cases. In UCSF, there are currently 3 patients in intensive care and 8 others hospitalized. About 30 are awaiting test results.

We continue to perform deceased donor liver and kidney transplants but not pancreas transplants. Deceased donor testing is currently done on all potential lung donors and “as indicated” by clinical circumstances and is increasing. We continue to perform live donor kidney and liver transplants, hoping to have preoperative testing of pairs soon.

CONCLUSIONS

There are some common themes arising in different nations depending on the phase of the epidemic and the underlying health services capacity.

1. Hospital facilities and workforce are being diverted from transplantation to COVID-19.
2. There is uncertainty about the risks of transmission from use of COVID-19–positive donors.
3. There is prioritization of intensive care capacity for COVID-19 patients and thus restricted availability for care of both donors and postoperative nonrenal transplant recipients.
4. There is substantial concern about creation of high-risk immunosuppressed patients from stable medium-risk dialysis patients with reduced staff available to look after them postoperatively.
5. Most programs have moved to telephone consultation for outpatient follow-up, and the busiest services are using telephones for inpatient management as much as possible.
6. There is no agreement on how to manage immunosuppression in the context of COVID-19.