

# NOTTO Transplant Specific Guidelines with Reference to COVID-19

## Introduction

Novel corona virus (SARS-CoV-2) infection starting since December 2019 has resulted in pandemic within few weeks' time. In addition to elderly and patients with associated comorbidities, organ transplant recipients are at a risk for more severe COVID-19 if they get SARS CoV-2 viral infection. Further, there is potential risk of infection transmission from the donor to recipient through organ transplantation. Also, there are issues in recipient and donor selection for transplant. In view of these issues, organ transplant at the time of COVID-19 pandemic should be undertaken with caution. The optimal approach to corona virus disease (COVID-19) screening in organ recipients and donors may change over time as more data accumulate.<sup>[1-3]</sup>

Organ transplantation for end stage organ failure can be a lifesaving intervention in patients with organ failure and mostly can be performed electively with few exceptions. Patients with acute liver failure, acute on chronic liver failure, and those with hepatocellular cancer need an urgent transplant. Some countries have stopped living donor organ transplants (with exception for life saving measures) while some continue with deceased donor organ transplantation. However, due to risk of COVID-19-related morbidity and mortality in the recipient and living donor and cross infection of COVID-19 among other patients and health care workers (HCW), there is need for assessing the overall risk v/s benefit of organ transplantation. If in certain organs the risk of death is higher due to waiting then that patient should be considered for organ transplantation. As the situation improves, there may need to be a phased increment in

transplantation services. It may be prudent to limit transplants to those who are struggling with non-transplant modalities of treatment.

The risk-benefit ratio should be the key point to be exercised in deciding the need for transplantation as post-transplant these patients will be kept on immunosuppressive drugs which will make them prone to acquiring covid-19 infection.

All transplant teams can quickly build up a database and assess regarding number of patients currently contactable, their ability to procure medicines in the current lockdown and connectivity with their doctors, number of patients who developed COVID-19, and their outcome. This will help each of the regions to set up support systems not only for already transplanted patients but also for the new transplants.

While recommending organ transplantation during COVID-19 pandemic, following general safeguards have to be ensured by each hospital:

- Safety of health care professionals (doctors, nurses, coordinators, technicians, hospital attendants, housekeeping staffs, ambulance drivers) by providing required PPE as per their risk stratification
- Prevention of transmission of COVID-19 from patients (recipients and donors) to HCWs and vice-versa by having proper facilities for universal precaution including isolation in pre and post-transplant period.
- Prevention of cross infection of COVID-19 from these patients (recipients and donors) to other non-transplant patients.

## General Precautions

- Before restarting transplant program in the era of COVID-19, **we recommend** that each transplant hospital does a

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detailed assessment of epidemiology, **current trends, surge capacity and impact** of COVID-19 as well as assessment of ICU facility and team in respective hospitals. Only after that, transplant can proceed with caution if the above concerns have been addressed.

2. Before transplanting new patient, **we suggest** to initiate assessment of existing transplant recipients for their access to drugs. Patients transplanted in COVID-19 pandemic should have the same stringent follow up as they would have got prior to it.
3. **We suggest** a team of HCW (transplant coordinators and transplant team members) should be designated to care **EXCLUSIVELY** for transplant cases (**COVID FREE safe transplant pathway**) to reduce the risk of transmission. When feasible all transplant teams should define two teams which are separate and not working together and which should have independent transplant surgeon, physician and intensivist so that all surgical and medical problems can be handled if one team gets quarantined or exposed. The teams can alternate for each patient. Transplant teams should reserve personnel at all levels so that in case a member needs quarantine on account of COVID-19 infection, the care of the patient should not suffer. Alternatively, an informal understanding should take place between transplant centres in the same city to provide cross over in such an eventuality
4. **We recommend** all transplant recipients and donors should sign the fully documented written informed **CONSENT** accepting a potential risk of COVID-19 infection during hospital stay and after transplant. It should include risk and benefit of transplantation vs available alternative treatment such as dialysis in case of renal failure.
5. **We recommend** adequate availability of personal protective equipment (PPE) (i.e., triple layer masks, N95 respirators (preferably without valves), gloves, gowns, goggles, face shields, shoes/shoe covers) as per GOVERNMENT guidelines.<sup>[1,2]</sup>
6. **We recommend** routine training of HCW on use and disposal of PPE.<sup>[1,2]</sup> [Tables 1 and 2].
7. **We recommend** ensuring HCW should receive adequate required training on various component of “universal

precautions” (hand hygiene, respiratory etiquette, and social distancing, etc.)<sup>[1,2]</sup>

### Recipient and Donor Related

8. **We recommend** haemodialysis unit preparedness and safe dialysis delivery based on the Government of India guidelines for dialysis before transplant.<sup>[4,5]</sup>
9. **We recommend** routine **CLINICAL** and **EPIDEMIOLOGICAL** screening for COVID-19 in donors, recipients, HCW and care takers<sup>[6-8]</sup> [Tables 1 and 2].
  - a. **CLINICAL** screening: fever (>38°C or 100.3°F) and/or respiratory symptoms (cough, shortness of breath, wheezing or chest tightness), anosmia, sore throat, flu-like symptoms.
  - b. **EPIDEMIOLOGICAL**:
    - i. Travel to or residing in an area in the preceding 21 days, where local COVID-19 transmission is occurring
    - ii. Confirmed diagnosis of COVID-19 in the last 28 days
    - iii. Direct contact with known or suspected case of COVID-19 in the preceding 21 days.
    - iv. Travel to or residing in an area which has been designated as a containment zone in the last 28 days.
10. **We recommend** routine **LABORATORY** screening with COVID-19 real time polymerase chain reaction (RT-PCR) test of airway specimen for both donor and recipient with the testing occurring as close as possible prior to surgery within 24–72 hours in both living and deceased donor organ transplants. Chest CT scan of the donor is mandatory prior to lung transplantation and may also be required in other transplants for donor and/or recipient if suggested by the transplant team.<sup>[9,10]</sup>
11. Living donor with positive COVID-19 test should not donate for at least 3–6 months until the long-term outcome of cured COVID-19 becomes clear. However, in case of life saving transplants, **we suggest** accepting donor with a previous diagnosis of COVID-19 with documented two negative COVID-19 tests and complete

**Table 1: Transplant unit preparedness checklist to deliver safe transplant during and after COVID-19 pandemic**

Checklist for transplantation	Donor	Recipient	HCW	Care Givers
1) Social distancing: Practicing social distancing for 14 days prior to surgery to avoid unnecessary exposure	Yes/No	Yes/No	Yes/No	Yes/No
2) Health education on COVID-19 prevention	Yes/No	Yes/No	Yes/No	Yes/No
3) COVID-19 Diagnosis				
Epidemiological screening for travel and potential exposures				
Travel to or residing in an area in the preceding 21 days, where local COVID-19 transmission is occurring	Yes/No	Yes/No	Yes/No	Yes/No
Direct contact with known or suspected case of COVID-19 in the preceding 21 days	Yes/No	Yes/No	Yes/No	Yes/No
Confirmed Diagnosis of COVID 19 in the last 28 days	Yes/No	Yes/No	Yes/No	Yes/No
Travel to or residing in an area which has been designated as a containment zone in the last 28 days	Yes/No	Yes/No	Yes/No	Yes/No
Any suspicion to conceal history of exposure to COVID-19 in patient and donor in order to receive transplant	Yes/No	Yes/No	NA	NA
CLINICAL screening for COVID-19 symptoms				
History of fever (>38°C or 100.3°F) and or	Yes/No	Yes/No	Yes/No	Yes/No
Respiratory symptoms: Cough shortness of breath, wheezing or chest tightness, sore throat, flu like symptoms. Consider excluding symptoms attributable to other causes and allergies	Yes/No	Yes/No	Yes/No	Yes/No
Temperature (thermal screening)	Yes/No	Yes/No	Yes/No	Yes/No
Laboratory screening with COVID-19 RT-PCR test of airway specimen (1-3 days before transplant)			If required or hospital is a COVID facility	
Date and time				
Specimen used: nasopharyngeal, oropharyngeal swab, bronchoalveolar lavage, endotracheal aspirate or a combination				
Results	+ve/-ve	+ve/-ve	+ve/-ve	+ve/-ve
4) Potential risk of COVID-19 consent: have transplant recipient and donor signed an informed consent accepting a potential risk of COVID-19 infection in hospital and after transplant?			NA	
5) Other Optional Tests if suggested by the transplant team				
CT chest				
Date and time				
Results : normal/suspicious of COVID-19				
LABORATORY screening (COVID-19 RT-PCR test of airway specimen) (second test such as in hot spot)				
Date and time				
Specimen used				
Results				
PCR every week during their stay and before discharge				
COVID-19 IgM/IgG antibody rapid test if approved by the government				
Pro-calcitonin				
Highly reactive C reactive protein				
Complete blood count: lymphocyte count				
6) COVID-19 assessment Acceptable To Proceed for surgery	Yes/No	Yes/No	Yes/No	Yes/No
Date and time of proposed surgery				
Is laboratory testing compatible with proposed transplant date and time?	Yes/No	Yes/No	Yes/No	Yes/No
Remark				
Date: _____ Name/Signature _____				

This checklist should be used in conjunction with policies and official guidance from local health authorities or hospitals

symptom resolution for 28 days and another negative test at the time of donation.

12. **We suggest** practicing social distancing for 14 days prior to surgery for both living donor and recipient

and using surgical facemask when going out in public

13. **We recommend** minimizing the use of energy devices during procedures when possible. When energy is

**Table 2: Check list for transplant unit**

Is there enough stock of PPE and drugs?	Yes/No
Are all HCW patients, attendants and caregivers wearing a three-layer surgical facemask inside the pre and post-transplant area?	Yes/No
Is training for use of PPE including donning, doffing and proper disposal is completed for HCW?	Yes/No
Have HCW received training in updated clinical knowledge of COVID-19 & guidelines from government, academic society, and hospital authority, cough etiquette, hand hygiene, social distancing, PPE and universal precautions?	Yes/No
Have HCW received training for clinical, epidemiology, laboratory screening of patients, donors, care takers and COVID consent process?	Yes/No
Have HCW self-monitored their symptoms and informed transplant program head in case they or their family members develop symptom(s) suggestive of COVID-19?	Yes/No
Is list of staff recorded and be retained by transplant team head?	Yes/No
Have HCW had meals at different times after washing hands with flowing water?	Yes/No
<b>COVID FREE SAFE PATHWAY FOR TRANSPLANT</b>	Yes/No
Is there a designated entry and exit for patients and HCW involved in transplant?	Yes/No
Is there a dedicated area for pre-transplant evaluation to maintain distance between patients, donors and health workers, and is it cleaned between sessions?	Yes/No
Is cleaning and disinfection time table of pre-transplant area displayed at entry gate?	Yes/No
<b>PRE AND POST-TRANSPLANT OPD AND WARD</b>	Yes/No
Is there an alcohol-based hand sanitizer at entry?	Yes/No
Are the following equipment either used separately for each patient OR disinfect between the shifts?	Yes/No
Stethoscopes (diaphragms and tubing cleaned with an alcohol based disinfectant)	Yes/No
BP cuffs (NIBP cuffs can be cleaned by alcohol or 1% sodium hypochlorite)	Yes/No
Oxygen saturation probes	Yes/No
No sharing of thermometers	Yes/No
Are posters displayed on education and preventions of COVID-19 (hand hygiene, social distancing, COVID-19 symptoms and testing and universal precautions)?	Yes/No
Transplant infectious disease assessment if required	Yes/No
Transplant psychiatry assessment if required	Yes/No
Are disinfection, environmental cleanliness, and good air conditioning & ventilation conditions instituted?	Yes/No
Is social distancing followed?	Yes/No
Are all frequently touched surfaces inside the transplant unit, cleaned and disinfected frequently and duty list maintained?	Yes/No
<b>Transplant OT</b>	Yes/No
Is there dedicated transplant OT and HCW for surgery?	Yes/No
Is there cleaning and disinfection of OT and timetable?	Yes/No
<b>Post-Transplant</b>	Yes/No
Post-transplant patient and donor in separate rooms with an attached bathroom	Yes/No
Are visitors limited to one visitor for 10 minutes with social distancing (2 meter), wearing a surgical mask and a gown?	Yes/No
Determine approaches to minimize exposure to the healthcare setting for non-essential services	Yes/No
Is telemedicine and emergency consultation contact number available?	Yes/No
Recipients should avoid travel to area with COVID-19 cases	Yes/No
Can patients find information about the latest developments regarding COVID-19 on the hospital and government website? visit <a href="https://www.mohfw.gov.in/">https://www.mohfw.gov.in/</a>	Yes/No
Remark :	
Date:           Name/Signature	

needed, we recommend avoiding the ultrasonic scalpel and lower energy settings to minimize surgical smoke.

14. **We suggest** use of induction and other immunosuppressive drugs based on recipient's own immune risk stratification as being practised before COVID-19.

15. **We suggest** restricting movement of recipient to other hospital areas. Use designated portable X-ray equipment and/or other designated diagnostic equipment. If transport is mandatory, use predetermined transport

routes to minimize exposure to staff, other patients, and visitors, and patient must use surgical mask. Ensure that HCWs who are transporting patients perform hand hygiene and use surgical mask.

16. **We recommend** limiting visitors to those essential for patient support and visitor use surgical mask and keep social distancing. Visitor's records should be maintained for contact tracing if required in future.

17. **We suggest** managing laboratory specimens, laundry, food service utensils, and medical waste following safe

routine procedures according to infection prevention control guidelines.

18. **We recommend** use of disposable equipment as far as possible or if equipment (e.g., stethoscopes, blood pressure cuffs, thermometers, food trays) need to be re-used, then clean and disinfect between use for each patient (e.g., by cleaning with ethyl alcohol 70% or 1% sodium hypochlorite).
19. **We recommend** routine cleaning and disinfecting surfaces with which the patient is in contact with 1% sodium hypochlorite solution.
20. If recipient and/or donor become COVID-19 positive, **we suggest** treatment as per local authority guidelines as currently there is no standard accepted treatment guidelines. There is no consensus regarding modification in immunosuppressive regimen. Transplant team should make a CASE BY CASE evaluation for dose adjustment to balance infection control & rejection.
21. **We suggest** telemedicine for encouraging social distancing when feasible. Telemedicine consultation is not a substitute to in-person consultation where clinical examination is required.
22. **We suggest** using AarogyaSetuApp, taking extra care of the elderly, healthy lifestyle for all, and strict adherence to universal precautions all the time to mitigate the spread of COVID-19.
23. **We recommend** these guidelines and checklist should be used in conjunction with local policies and official guidance from health authorities or hospitals as per changing situation.
24. **We recommend** that all infection prevention and control measures shall be implemented.
25. In order to ensure monitoring the compliance to guidelines, State appropriate authority, concerned SOTTO and ROTTO should monitor compliance to the guidelines through seeking detailed data from the hospitals in this regard and sharing the same with NOTTO on regular basis.

Futuristic approach for COVID-19 testing protocol for planned surgery- The patients should get admitted in isolation 24 hours before planned surgery [Table 3]<sup>[11]</sup>

**Table 3: COVID tests and action required for transplantation**

RTPCR	IgM	IgG	Action proposed
Negative		Positive	May be taken for transplantation, no testing during hospital stay and exit test
Negative	Negative	Negative	No infection- Go for transplantation, PCR testing every 6-7 days of stay and exit PCR test
Positive	Negative		Defer transplantation till PCR negative & IgG appears

Assumed IgG is universally protective and specificity of the antibody test is 100% or close to it

At present, there is no recommendation for prophylactic medications such as hydroxychloroquine for transplant patients.

## Conclusion

Given that the epidemiological situation is constantly evolving, it is recommended that each transplant team assess the current scenario that best describes their local situation.<sup>[6,12]</sup> Any transplant program should make a CASE BY CASE evaluation when assessing the convenience of carrying out a transplant based on availability of health care resources including ICU; risk/benefit of exposing an immunosuppressed patient to the potential risk of COVID-19 (according to the number of cases and the possibility of admission under ideal isolation conditions) versus the urgent medical need for transplantation (clinical situation of the patient).

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## Conflicts of interest

There are no conflicts of interest.

## References

1. Available from: <https://www.mohfw.gov.in/>. [Last accessed on 2020 Apr 19].
2. WHO. Available from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>. [Last accessed on 2020 Jun 01].
3. ECDC. Available from: <https://www.ecdc.europa.eu/en/publicationsdata/risk-assessment-outbreak-acute-respiratory-syndrome-associatednovel-1>. [Last accessed on 2020 Jun 01].
4. Available from: <https://www.mohfw.gov.in/pdf/GuidelinesforDialysisofCovid19Patients.pdf>. [Last accessed on 2020 Jun 01].
5. Available from: <https://cdn.georgeinstitute.org/sites/default/files/covid19-hemodialysis-unit-preparedness-checklist.pdf>. [Last accessed on 2020 Jun 01].
6. Ahn C, Amer H, Anglicheau D, Ascher N, Baan C, Bat-Iredui, *et al.* Global transplantation COVID report March 2020. *Transplantation* 2020. doi: 10.1097/TP.0000000000003258.
7. Available from: [https://notto.gov.in/WriteReadData/Portal/News/711\\_1\\_FINAL\\_GUIDANCE\\_COVID-19\\_31.03.2020.pdf](https://notto.gov.in/WriteReadData/Portal/News/711_1_FINAL_GUIDANCE_COVID-19_31.03.2020.pdf). [Last accessed on 2020 Apr 01].
8. Saigal S, Gupta S, Sudhindran S, Goyal N, Rastogi A, Jacob M, *et al.* Liver transplantation and COVID-19 (Coronavirus) infection: Guidelines of the liver transplant Society of India (LTSI). *Hepatol Int* 2020;14:429-31.
9. D'Andrea A, Di Giannuario G, Marrazzo G, Riegler L, Mele D, Rizzo M, *et al.* The role of multimodality imaging in COVID-19 patients: From diagnosis to clinical monitoring and prognosis]. *G ItalCardiol (Rome)*. Italian 2020;21:345-53.

10. Zhou S, Wang Y, Zhu T, Xia L. CT Features of coronavirus disease 2019(COVID-19) pneumonia in 62 patients in Wuhan, China. *AJR Am J Roentgenol* 2020;214:1287-94.
11. Al-Muharraqi MA. Testing recommendation for COVID-19 (SARSCoV-2) in patients planned for surgery-continuing the service and 'suppressing' the pandemic. *Br J Oral Maxillofac Surg* 2020. doi: 10.1016/j.bjoms. 2020.04.014.
12. Martino F, Plebani M, Ronco C. Kidney transplant programmes during the COVID-19 pandemic. *Lancet Respir Med* 2020;8:e39.