

Guidelines for organ donation and transplantation in China during the outbreak of new coronavirus pneumonia (adopted on February 23, 2020)

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In December 2019, a new type of coronavirus pneumonia outbreak occurred in Hubei Province, China, and spread rapidly to many provinces and cities and even outside the country. On January 20, 2020, the new coronavirus pneumonia was included in the class A management of class B statutory infectious diseases stipulated in the Law of the People's Republic of China on the Prevention and Control of Infectious Diseases. On January 31, 2020, the World Health Organization (WHO) listed the outbreak of new coronavirus pneumonia as an "international public health emergency". On February 7, 2020, the WHO named the disease "COVID-19". On February 21, 2020, the National Health and Health Commission issued a letter revising the English name "New Coronary Pneumonia pneumonia" to "COVID-19", in line with the WHO, Chinese name remains unchanged.

China's organ transplantation has developed into high-quality service – in face of the COVID-19 outbreak, transplant specialists must determine how to carry out organ donation and transplantation in a scientific and orderly manner during the severe epidemic, summarize and analyze the clinical characteristics of COVID-19 organ transplant recipients and optimize the prevention, early diagnosis and treatment strategy of COVID-19, to ensure medical safety, not only related to the development of organ transplantation and end-stage organ failure patients treatment, but also related to the national and even global COVID-19 epidemic prevention and control of the overall situation. To this end, in accordance with the instructions of the National Health and Health Commission, the Chinese Medical Association Organ Transplant Association organized relevant domestic experts to write the "Guidelines for National Organ Donation and Transplantation During the Outbreak of New Coronary Virus Pneumonia" for china's organ donation and transplant workers and managers to implement. This guideline refers to the "expert advice", "prevention strategy" and "guidance" published in China, which are considered and adopted online by the Standing Committee of the Chinese Medical Association Organ Transplant Association, and will be revised with further understanding of COVID-19 and changes in the situation of epidemic prevention and control.

1 Organ donation during the outbreak - Risks and prevention and control measures

1.1 Risks of Organ Donation

1.1.1 Donor Risk Factors

(1) The donor's primary disease is critical, and in the process of evaluation of donor acceptability, the donor is prone to COVID-19 cross-infection, infected by medical personnel and organ transplant recipients through donors;

(2) More family members of donors, their mobility, prone to cluster infection and cross-infection;

(3) The area, type, epidemic, prevention and control of the hospital where the donor is treated are diverse and complex, which is not conducive to the donor's epidemiological investigation and the screening and prevention of COVID-19;

(4) The donor may harbor an infectious, yet asymptomatic infection.

1.1.2 Coordinator Risk Factors

Coordinator in the organ donation publicity and inspection activities of a wide range of contact with a large number of people, increased the difficulty of prevention and control, cross-infection risk.

1.2 Prevention and control measures

1.2.1 Donor Taboo

In addition to the usual donation taboos, organ donation taboos are listed as:

(1) COVID-19 confirmed patients or suspected patients or clinically diagnosed patients;

(2) A clear history of COVID-19 epidemiology or a history of exposure to persons with a history of COVID-19 prior to 14 d of the disease (donation may be considered after isolation observation 14 d);

(3) Organ donation is suspended in hospitals with high outbreak strains or COVID-19 cases within 14 d due to the risk of exposure to new coronavirus from unknown donors.

1.2.2 Potential Donor Management

During the outbreak, the following measures are taken to reduce the risk of transmission for potential donors and their families:

(1) Conducting rigorous epidemiological investigations of potential donors and their families;

(2) Collect the detailed medical history of potential donors parallel chest CT, virus-related detection, etc. to check COVID-19;

(3) Pay attention to the detection of suspected and clinically diagnosed cases, for suspected COVID-19 potential donors must consult the expert group, and conduct two viral nucleic acid tests to eliminate the new coronavirus infection;

(4) In the maintenance process of potential donors, the surrounding environment can not have COVID-19 confirmed or suspected patients, should be a single medical unit, reduce the number of medical staff involved in maintenance and fixed personnel, to avoid cross-infection in the maintenance process.

1.2.3 Coordinator management

(1) Strengthen the coordinator's self-protection consciousness with reference to the Public Protection Guide for New Coronary Virus Pneumonia and the relevant protection specifications for COVID-19 medical personnel;

(2) The coordinator should reduce the frequency of daily inspection spree of donated hospitals, and strengthen the contact with donor hospitals by telephone, WeChat, video communication and other measures;

(3) When entering different areas of the donor hospital, the same level of protective measures must be taken in accordance with the level of protection of the donor hospital;

(4) The coordinator maintains a distance of more than 1.5 m when communicating with the family;

(5) Avoid working in the intensive care unit (intensive care unit, ICU) for emergency and epidemic prevention tasks, and prohibit access to the COVID-19 isolation observation area, isolation area, isolation of ICU disease area.

1.2.4 Organ Assessment and Access Management

(1) organ assessment, acquisition and related personnel according to the acquisition of the environment to do their own protection, choose the appropriate level of operating room, wear the corresponding protective mask, goggles, protective clothing (surgical clothing), do a good job of the required equipment, equipment and articles (refrigerator, LifePort, in vitro membrane pulmonary oxygenation (extracorporeal membrane membrane oxygenation, ECMO), surgical instruments, etc.) of the protective packaging;

(2) Prohibit access to COVID-19 observation, isolation, diagnosis and treatment and related areas;

(3) The environment for organ acquisition, such as operating room, should be evaluated before entering;

(4) After acquisition, the outer packaging protective layer of the equipment carried is stored centrally, treated in accordance with infectious waste, and the external disinfection of organ preservation devices, refrigerators and other equipment.

2 Organ transplants during the outbreak

Risks and prevention and control measures

2.1 Risks of organ transplantation

2.1.1 Donor Risk Factors

If the donor is a patient with COVID-19 who has been missed, the recipient and medical personnel can be infected through organ transplants.

2.1.2 Candidate/Recipient Risk Factors

(1) Transplant waiting patients often exist in the treatment department and contact with many people and other phenomena, with COVID-19 cross-infection and high risk factors of epidemiology;

(2) Transplant patients may intentionally conceal their epidemiological history in order to receive an early organ transplant, resulting in a missed diagnosis of COVID-19;

(3) The transplant candidate and the recipient of asymptomatic COVID-19 donor during the perioperative period of transplantation may also be the source of infection;

(4) Unidentified COVID-19 transplant patients who receive transplants are at risk to accelerate the infection process, endangering life;

(5) Clinical symptoms and imaging manifestations of lung infection after transplantation are sometimes difficult to distinguish with COVID-19 and may delay the early diagnosis of COVID-19.

2.2 Prevention and control measures

2.2.1 Strengthening the management of transplant waiters

(1) Through the network of transplant patients and their families to carry out COVID-19 epidemic-related popular science education;

(2) In the course of sequential management of transplant patients, the competent physician should grasp the waiting condition situ in a timely and accurate manner, including residence, history of exposure, whether or not there are clinical symptoms, recent travel history and other information.

2.2.2 Organ Transplant Taboos

In addition to the usual transplant taboos, COVID specific taboos are listed as:

(1) Transplant waiting is a PATIENT diagnosed or suspected of diagnosis or clinical diagnosis of COVID-19;

(2) Transplant patients have a history of COVID-19 epidemiology or a history of exposure to those with a history of COVID-19 epidemiology (no disease after 14 d of isolation is required to be observed in isolation before a transplant can be considered for arrangement);

(3) Due to the existence of unknown organ transplant recipients of new coronavirus exposure risk, it is recommended that the high COVID-19 epidemic areas do not carry out organ transplantation.

2.2.3 Pre-Transplant Recipient Management

(1) The pre-transplant recipient and his close contacts need to carry out epidemiological investigation and temperature, cough and other symptoms of consultation and observation, solemnly inform the patient and his family deliberately conceal the COVID-19 epidemiological history and symptoms caused by delay diagnosis and treatment, the spread of the epidemic and other adverse consequences by the patient himself responsible for and to investigate its legal responsibility;

(2) Before transplantation, be informed of the results of blood routine, chest CT, C-reactive protein, feasible new coronavirus-related testing, according to the results of the examination, epidemiological history and clinical symptoms to exclude COVID-19, and sign the "on the new coronavirus pneumonia outbreak period to receive organ transplantation notice" after the feasible preoperative preparation;

(3) Medical personnel to strengthen the recipient and their families of the epidemic protection education, pre-transplant examination and family work should be in accordance with the provisions of the hospital during the outbreak to implement protection.

2.2.4 Post-Transplant Recipient Management

(1) Transplant perioperative ward strictly implement the disinfection isolation system, the same room bed spacing is greater than 1.2 m, the ward maintains good ventilation.

(2) Transplant perioperative recipient with suspected COVID-19 symptoms should be immediately isolated, contact with the recipient's medical staff should carry out medical isolation observation, timely report to the relevant hospital departments, obtain COVID-19 expert group consultation. Those identified as suspected cases of COVID-19 should be immediately transferred to a designated hospital;

2.2.5 Strengthening the protection of health care workers

Medical personnel in accordance with the standard prevention principle, according to the risk of possible transmission of medical operations, do a good job of personal protection, hand hygiene, disease area management, environmental ventilation, surface cleaning and disinfection of the object and medical waste management and other hospital infection control work, the maximum possible way to avoid hospital infection.

3 COVID-19 of organ transplant recipients

Clinical characteristics and diagnosis

The clinical characteristics and diagnosis of COVID-19 in transplant recipients are similar to those of the general population, and the pathogenic and epidemiological characteristics of the new coronavirus, as well as the clinical characteristics and diagnosis of COVID-19 in the general population, are referred to the "New Coronary Virus Pneumonia Treatment Program" jointly issued by the General Office of the National Health And Health Commission and the Office of the State Administration of Traditional Chinese Medicine.

3.1 Clinical characteristics and diagnosis

At present, the transplant recipient sought to confirm the case of COVID-19 is still few, the systematic summary of clinical characteristics is still insufficient evidence. Because of its long-term use of immunosuppressants, clinical characteristics on the basis of common with the general population has its particularity, in the diagnosis of transplant recipient COVID-19, because the clinical manifestations of its infection may not be typical, to bring some difficulty to early diagnosis, so transplant physicians during the outbreak should be highly alert to all discomforts of transplant recipients. Transplant recipients in epidemic areas, fever, accompanied by chest tightness, shortness of gas, chest CT characteristic lesions is the most important basis for early clinical diagnosis;

3.1.1 Clinical Performance

(1) Transplant recipients may not have fever or only slightly low fever, with dry cough, fatigue, chest tightness, shortness of breath as the main manifestation. Some recipients with dry cough as the first symptoms, some recipients early only manifested as diarrhea and other digestive symptoms and respiratory symptoms are not obvious, and chest imaging often lag behind clinical performance, therefore, there may be transplant recipients clinical performance of atypical and missed diagnosis.

(2) Due to the inhibition of immune function of the transplant recipient, rapid progress may be made after COVID-19, and acute respiratory distress syndrome (respiratory distress syndrome, ARDS) may occur in severe cases.

3.1.2 Laboratory inspection

(1) General laboratory examination: due to long-term use of immunosuppressants, transplant recipient peripheral lymphocytes are often lower than normal before onset, the number of peripheral blood lymphocytes after COVID-19 may be significantly lower than that of the general sick population, therefore, it is necessary to carefully consult their prior data, objective analysis and vertical comparison of peripheral blood routine test results.

(2) Pathogen examination: viral nucleic acid detection (transcript reverse polymerase chain reaction (transcription polymerase chain reaction (RT-PCR)) is relatively good in specificity and sensitivity, and can quickly distinguish between virus types and subtypes. However, the detection sensitivity of samples derived from pharynx swabs, sputum, lower respiratory secretions, blood and feces was different, and the false negative rate of pharynx swabs was relatively high. In order to improve the positive rate of nucleic acid monitoring, it is recommended to use sputum as much as possible, to implement tracheal intubation to collect lower respiratory tract secretions, specimen collection as soon as possible sent for examination. COVID-19 diagnosis relies on respiratory or blood samples for real-time fluorescent RT-PCR testing for new coronavirus nucleic acids. A negative RT-PCR test result cannot completely rule out the new coronavirus infection, highly suspected COVID-19, should strengthen the dynamic monitoring of pathogens.

3.1.3 Imaging Performance

(1) Imaging performance of THE transplant recipient COVID-19: the imaging performance of the transplant recipient COVID-19 is mostly with the general population, mostly manifested as the limitation of early lesions, characterized by patchy, sub-segment or segmented ground glass shadow, with or without alveolar interval thickening; Progress period lesions increasing, worsening of multiple lung lesions, ground glass shadow and real change shadow or strip shadow co-existence; Multiple accompaniment progressive air bronchial signs, rare thoracic fluid or lymph node swelling.

(2) Imaging screening of transplant recipients COVID-19: The current screening data for COVID-19 patients in the general population suggests that imaging screening may be more sensitive. It is recommended that transplant recipients who are highly suspected to be COVID-19 should perform chest imaging examination and dynamic monitoring as early as possible, preferring chest CT examination.

3.1.4 Trachea

During the COVID-19 outbreak, the tracheoscopy specialist should pay attention to isolation measures when operating. For suspected cases, the respiratory specimen through RT-PCR means of the new coronavirus nucleic acid testing, the elimination of cases can be subject to tracheoscopy, the detection process left to take alveopulmonary irrigation liquid or lung tissue again sent to the new coronavirus nucleic acid detection COVID-19;

3.2 Differential Diagnosis

3.2.1 Cytomegalovirus pneumonia and PJP pneumonia

After transplantation, common immunosuppressive host-associated pneumonia, such as cytomegavirus (CMV) pneumonia and pneumocystis jiroveci pneumonia (PJP), etc., has clinical symptoms similar to COVID-19 and need to be identified with COVID-19 (Table 1), especially for recipients 2 to 6 months after transplantation.

3.2.2 Other viral pneumonia

Other respiratory infections commonly found in transplant recipients include influenza viruses, adenoviruses, para-flu viruses, respiratory syncytial viruses, rhinoviruses, human lung viruses, etc. The viral force of these viruses is relatively weak, resulting in relatively low probability of viral pneumonia, clinical manifestations and imaging are not specific, the diagnosis mainly depends on RT-PCR detection of viral nucleic acids in airway secretions.

表 1 COVID-19 与 CMV 肺炎、PJP 的鉴别诊断要点
Table 1 Key points of differential diagnosis among COVID-19, CMV pneumonia and PJP

| 类型 | 临床表现 | 胸部 CT | | | 实验室检查 |
|----------|--------------------|-------------------------------|------------------|--------------------------|----------------------------|
| | | 病灶分布 | 早期表现 | 进展期 | |
| CMV 肺炎 | 早期症状轻, 肺内进展后出现呼吸困难 | 弥漫、血行, 可不对称分布 | 血行特征的粟粒小结节 | 出现间质改变伴小结节, 可合并实变 | 血、尿 CMV-DNA 阳性 |
| PJP | 快速进展, 进行性呼吸困难和低氧血症 | 双上肺和肺门周围分布为著, 对称分布, 胸膜下区域“空置” | 弥漫毛玻璃, 可出现马赛克样改变 | 出现间质改变, 可合并实变 | 血 1,3-β-D- 葡聚糖检测 (G 试验) 阳性 |
| COVID-19 | 早期症状进展慢, 进展期出现呼吸困难 | 胸膜下分布 | 斑片状或结节状毛玻璃 | 病灶融合, 出现细小网格的间质改变, 可合并实变 | 呼吸道标本新型冠状病毒核酸阳性 |

4 Organ transplant recipients

Treatment of COVID-19

The general principles of COVID-19 treatment for organ transplant recipients are generally consistent with that of the general population. Immune inhibitors need to be adjusted in real time during treatment to resist infection while avoiding rejection. Particular caution is needed with regard to COVID-19 transplant recipients whose function has been significantly reduced, during which time the loss of transplant function will have more serious consequences. Transplant recipients with COVID-19 should discuss the development of treatment options collectively based on the specific circumstances of the case (including age, type of transplant, clinical characteristics, severity of respiratory failure, rate of progression of the disease, immune state of the body, postoperative time, etc.) (multiple disciplinary team, MDT), etc., and discuss the development of treatment options.

4.1 Determining the place of treatment based on the severity of the condition

Due to the immunocompromise of the transplant recipient, the transplant physician should carefully decide whether a patient with mild symptoms can be treated in isolation at home. Recipients with a suspected history of exposure to new coronaviruses and symptoms should promptly follow chest CT to check for COVID-19, and dynamically monitor to avoid delaying the best treatment time;

4.2 Reasonable glucocorticoid therapy

4.2.1 Mechanism of action of glucocorticoids

Methylprednisolone can relieve the whole body inflammatory response of infected recipients, reduce the leakage of interstitial pulmonary mass, control body temperature, and prevent transplant rejection when other immunosuppressants are deactivated or reduced, and are recommended for early and rational use. However, excessive use of glucocorticoids can further reduce the recipient's immunity, affect the virus to clear, not conducive to pneumonia recovery, and may lead to long-term complications.

4.2.2 Application of glucocorticoid recommendations

(1) If the early COVID-19, chest CT if there is a typical grinding glass-like shadow, accompanied by or not accompanied by fever, the use of methylprednisolone can be 20 mg (intravenous, 1 time per day), after which the change sits can be increased as appropriate.

(2) If it is high heat, double lung multiple flaky or large grinding glass shadow, the use of methylprednisolone can be increased to 40 mg (intravenous, 2 times per day), but the total dose is not recommended to exceed 80 mg/d. If the body temperature is still poorly controlled, a small amount of dexamethasone can be intermittently given to assist in heat relief.

(3) During the use of glucocorticoids should pay attention to prevent and control the adverse reactions caused by it.

4.3 Immunosuppressant dose adjustment

(1) For transplant recipients who have no positive performance in chest CT and have mild clinical symptoms, the amount of immunosuppressants should be reduced as appropriate.

(2) If the chest CT has a positive or highly suspicious performance, it is recommended to discontinue anti-metabolic drugs (for mycophenolic acid, mycophenolate sodium, misolipin, thiopental), can appropriately reduce calcium phosphatase inhibitors (calcineurin inhibitor, CNI) drugs or sirolimus (rapamycin) dose, reduce the use of the process should be closely monitored their blood drug concentration, pay attention to the drug interaction.

(3) If the disease is more serious and chest CT has a typical, broader positive performance, in the appropriate amount of application of glucocorticoids (methylprednisolone 40 mg/d), immediately deactivate all other immunosuppressants.

(4) The recovery of immunosuppressants should be based on the improvement of chest CT and clinical symptoms, from the reduction of dose recovery of CNI drugs, the initial concentration of blood drug valley in the early stage of rehabilitation at taquemos 4 to 6 ng/mL, cyclosporine 50 to 80 ng/mL, according to the recovery situation gradually adjusted to the target blood concentration.

4.4 Breathing Support

4.4.1 Oxygen Therapy

Oxygen therapy measures include nasal catheters, mask oxygen feed or high flow oxygen storage mask oxygen absorption. For the basic heart rate increases rapidly (100 times /min), there is no hypoxemia recipients, that is, oxygen therapy, such as pulse oxygen saturation (pulse oxygen saturation, SpO₂) 95%, timely oxygen therapy is recommended, according to the specific condition to determine the oxygen therapy method, adjust the flow rate, to SpO₂ to 95%.

4.4.2 High-flow oxygen therapy or noninvasive mechanical ventilation

When breathing distress and/or hypoxemia cannot be alleviated after receiving standard oxygen therapy, you can choose to maintain 90% of SpO₂ based on high-flow oxygen therapy (high-flow oxygen, HFNO) or non-invasive mechanical ventilation (non-ventilation, NIV) based on respiratory failure. HFNO and NIV systems do not produce extensive exhalation diffusion, so the risk of airborne transmission should be low. If the condition does not improve or even worsen within a short period of time (1 to 2 h), the trachea intubation line should be in a timely manner with invasive mechanical ventilation.

4.4.3 Invasive mechanical ventilation

The lung protective ventilation strategy is used, i.e. low tide air volume (4 to 8 mL/kg ideal body mass) and low suction pressure (platform pressure 30 cmH₂O, 1 cmH₂O s 0.098 kPa) for mechanical ventilation, in order to reduce ventilator-related lung damage.

4.5 Antiviral Therapy

There are currently no proven antiviral drugs. The National Health Council's New Coronary Virus Pneumonia Treatment Program recommends: alpha-interferon (adults 5 million units or equivalent doses, added sterilized injection water 2 mL, 2 times a day, atomized inhalation), Lopinavir/Litonavir (adults 200 mg or 50 mg, 2 capsules per time, 2 times a day, no more than 10 d), Ribavirin intravenous

(recommended in combination with alpha-interferon or lopinavir/litonavir, adults 500 mg, 2 times a day, no more than 10 d), chloroquine phosphate (adult 500 mg, 2 times a day, no more than 10 d), Abidor (adult 200 mg, 3 times a day, no more than 10 d). Pay attention to lopinavir/ Litonavir-related diarrhea, nausea, vomiting, liver function damage and other adverse reactions, while paying attention to the interaction with other drugs, in addition, transplant recipients often have varying degrees of hyperlipidemia, with the use of Lopinavir/ Litonavir should be alert to severe hyperlipidemia induced pancreatitis. It is not recommended to apply 3 and more antiviral drugs at the same time, and adverse reactions should stop using the relevant drugs.

4.6 Support ingress and rebuilds

(1) Supporting treatment is very important in the treatment of transplant recipients, including ensuring adequate energy, maintaining the stability of the internal environment such as water, electrolyte and acid-base balance.

(2) For patients with severe illness, it is recommended to use a large dose of C globulin at a dose of 0.1 to 0.3 g/d, with a total dose of 1 to 2 g/kg.

(3) Due to the large metabolic consumption in the entire COVID-19 course, most recipients can develop hypoproteinemia, timely supplementation of albumin and supplemented with appropriate diuretic drugs to help the absorption of pulmonary impermeability.

(4) For patients with critical condition, thymus peptides can be used when the absolute value of peripheral blood T cells is significantly reduced.

4.7 Chinese Medicine Treatment

The disease belongs to the category of Chinese medicine epidemic, according to the condition, local climate characteristics and different physical conditions, reference to the National Health And Health Commission recommended program situ for dialectical treatment. Due to the particularity of transplant recipients, taking into account the complexity of combined drug use, the effect of certain Chinese herbal medicines or traditional Chinese medicines on the blood concentration of transplant recipients of immunosuppressants and the poor gastrointestinal tolerance of transplant recipients, it is necessary to be cautious when receiving chinese medicine treatment, pay attention to the effect that Traditional Chinese medicine may have on the metabolism of immunosuppressants, and closely monitor the concentration of immunosuppressant blood drugs.

4.8 Other treatments

(1) During the use of therapeutic drugs pay attention to the protection of liver and kidney function, especially transplant function insufficiency of the recipient, should avoid the use of liver, kidney function damage drugs, such as nonsteroidal anti-inflammatory drugs and certain antibiotics.

(2) Because the pathogenesis of COVID-19 is likely to be a series of waterfall reactions caused by the combination of the new coronavirus and the angiotensin conversion enzyme 2 (angiotensin-converting enzyme 2, ACE2), it is recommended to use angiotensin-converted enzyme inhibitor (angiotensin-converted enzyme, ACEI) or angiotensin II receptor antagonist II . The implant blocker, ARB) treats COVID-19 transplant recipients with high blood pressure, weighing the pros and cons, and can suspend ACEI or ARB and switch to calcium antagonists instead.

(3) Ammonia bromine has the effect of phlegm, there are studies show that may be targeted at the new coronavirus receptor ACE2 treatment drugs, transplant recipients can choose to use.

(4) In addition, the rehabilitation plasma treatment has no experience in the use of transplant recipients, intestinal micro-ecological regulator, to maintain the intestinal micro-ecological balance, prevention of secondary bacterial infection, plasma replacement, immunoadsorption, blood irrigation, blood filtration and other blood purification technology can be used according to the condition.

5 Organ transplants during the outbreak

Recipient Follow-up Management

5.1 Strengthening scientific protection

Transplant recipients who take immunosuppressants for a long time can reduce the body's defense against various pathogens, and is a susceptible group of COVID-19. Therefore, strengthening health management and follow-up measures for such patients during the outbreak is an effective means to reduce the incidence of COVID-19 and protect the long-term survival of transplants, with reference to the Public Protection Guide for New Coronary Virus Pneumonia.

5.2 Strengthening health management

(1) To guide transplant recipients should have adequate medicine, reduce the frequency of out-of-home purchases, and take drugs such as immunosuppressants on a regular basis and quantitatively as directed by the doctor, so as to avoid adjusting or replacing drugs at will.

(2) Transplant recipients should do a good job of self-monitoring records, such as blood pressure, pulse, body mass, access, blood sugar and discomfort symptoms, through the network or outpatient follow-up accurately provided to the transplant physician, to ensure the quality of follow-up.

(3) Transplant specialist medical personnel should cancel on-site transplant health education activities, should be through the network (push popular science articles or live classroom, etc.) health education, in addition to transplant self health management knowledge, increase COVID-19 related knowledge, to avoid its paralysis or excessive panic.

(4) Transplant recipients should be promptly admitted to the fever clinic if they experience symptoms of fever, cough, fatigue, wheezing and other discomforts. If the exclusion of COVID-19 suspected cases or confirmed cases, can be in their transplant hospital isolation treatment and continue to closely observe, medical personnel to take first-degree protective measures, especially for postoperative pneumonia, need dynamic chest CT examination and new coronavirus nucleic acid testing, further exclude COVID-19;

(5) Transplant recipients should keep in touch with transplant physicians after being discharged from THE hospital with COVID-19, carry out double follow-up to COVID-19 and organ transplantation, and ensure the scientific and rational individualized application of COVID-19 after treatment and immunosuppressants.

(6) Transplant recipients are more sensitive and concerned about fever and lung infection than the general patient, are prone to tension and anxiety, should strengthen psychological guidance, if necessary, ask mental health psychologists to give professional counseling.

5.3 Follow-up measures

(1) Transplant recipients should avoid follow-up to transplant hospitals in areas with high outbreak rates, and try to test at hospitals with a high incidence of the epidemic.

(2) A transplant recipient with a stable condition may extend the interval between visits according to the length of the transplant time. In order to avoid cross-infection caused by centralized waiting, the patient can be well-protected under the condition of blood pumping back home, the examination item should communicate with the transplant physician in advance, the physician can follow up the network according to the results of the examination and the recipient's self-monitoring record.

(3) The transplant recipient whose condition is not stable can carry out offline outpatient follow-up under the premise of personal protection.

(4) Out of region transplant recipients may review the results of the examination and self-monitoring records through the local hospital through the network transmission to the transplant physician for

network follow-up, it is recommended that the transplant physician is responsible for contacting the local transplant qualified hospital for collaborative follow-up.

(5) Transplant follow-up hospitals should do a good job in the outpatient hall, inspection department, clinic and other departments of disinfection and consultation order and medical personnel protection measures. Transplant clinic should be a doctor's one-patient room one patient, between the doctor and patient to maintain a distance of more than 1.5 m. Outpatient attending physicians should conduct COVID-19 secondary pre-screening and epidemiological investigation stamps on all follow-up transplant recipients and attendants. Transplant recipients do a good job of personal protection at the time of treatment, avoid walking through the fever clinic, emergency and other areas, the end of the visit as soon as possible to leave the hospital.

During the epidemic, transplant hospitals must be strictly managed, organ donation and transplantation work must be carried out in a safe and orderly manner, and health management and follow-up measures for transplant recipients should be effectively strengthened, so as to make due contributions to the further high-quality development of organ transplantation in China.